DRAFT
INITIAL STUDY/
MITIGATED NEGATIVE DECLARATION
TECHNICAL APPENDICES

SITE B-2 HOTEL

Lead Agency
City of Garden Grove
Community and Economic Development Department
11222 Acacia Parkway
Garden Grove, CA 92840

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June 2022

APPENDICES

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Appendix A
Shade and Shadow Study

Shade/Shadow Study
for
Site B-2 Hotel

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May 2022

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1.0 PURPOSE OF THE STUDY

The purpose of this Shade/Shadow Study (Study) is to describe the existing shade/shadow conditions at the project site and in the immediate vicinity, as well as to analyze the introduction of new sources of shade/shadow associated with the site plan and project description for the Site B-2 Hotel Project (hereafter referred to as the "proposed project"), as described in further detail below in Section 1.1, Project Description. The information upon which this Study was based was compiled from site photographs, field and desktop reconnaissance conducted by AECOM personnel, and shade/shadow diagrams prepared by Kam Sang Company for both the existing and proposed conditions.

1.1 PROJECT DESCRIPTION

PROJECT LOCATION

The proposed project is located in the City of Garden Grove (City), California, within the northwestern portion of Orange County, California. The project site is located at the northwest corner of Harbor Boulevard and Twintree Avenue, along the west and east sides of Thackery Drive, east of Tamerlane Drive. The project site is comprised of Assessor's Parcel Numbers 231-471-06 through 231-471-24. The project site is located within an urbanized area of the City, and it is generally surrounded by mixed uses. The Sheraton Garden Grove – Anaheim South Hotel (Sheraton Hotel) and associated parking are located north of the project site along with other retail/commercial uses, including the Delta Hotels Anaheim Garden Grove by Marriott (Marriott Hotel); to the west, north/northwest of the project site are residential uses; to the south of the project site, across Twintree Avenue, are a mix of retail/commercial and residential uses; and, to the east of the project site, across Harbor Boulevard, are vacant parcels as well as a mix of retail/commercial and residential uses.

PROJECT DESCRIPTION

The proposed project involves construction of a full-service high-rise (maximum height of 350 feet) resort hotel with hotel program entertainment/pool deck (height of approximately 61 feet) on a 3.72-acre site. The proposed hotel would include 500 guest suites with balconies; themed pool experience with lazy river; storage and loading area at 8,600 square feet maximum; event space with a 600-person maximum occupancy theater; a grand ballroom at 9,490 square feet; two (2) meeting rooms at 4,194 square feet and 4,031 square feet, respectively; a variety of food and beverage opportunities to be placed throughout the hotel totaling a maximum of 22,296 square feet; themed amenities totaling 13,238 square feet; a 7,000-square foot arcade; and a spa and fitness center at 8,532 square feet (see Table 1). All hotel amenities, except for the ballroom, meeting rooms, and 11,148 square feet of restaurant, would be for the hotel guests use only.

Table 1: Project Summary

Project Features	Summary
Project Site Area	3.72 acres (161,933 square feet [SF])
Landscape Area (Additional 12,000 SF to be provided at the podium for a grand total of 51,711 SF of landscape or 31% coverage.)	26,224 SF (at street level) 13,487 SF (at podium level) 39,711 SF (27% coverage)
Total Hotel Rooms	500 keys
Ballroom	
Ballroom	9,490 SF
Meeting Room (A)	4,194 SF
Meeting Room (B)	4,031 SF
Restaurant, Meeting Rooms, Lobby	
Food and Beverage	22,296 SF
Hotel Themed Amenities	13,238 SF
Nick Studio (Theater)	7,039 SF
Studio Hall	6,448 SF
Nick Arcade	7,000 SF
Spa/Fitness	8,532 SF
Hotel Themed Pool	24,980 SF
Office, Back of House, Others	
Hotel Office (Production)	3,173 SF
Hotel Support (Offices)	11,329 SF
Back of House (Support)	16,492 SF
Retail	5,480 SF
Hotel	289,891 SF
Storage, Loading	8,600 SF
Parking (528 spaces)	249,480 SF
Below Grade Parking	52,206 SF
Hotel Tower Maximum Height	350 feet
Hotel Program Entertainment/Pool Deck	60 feet 7 inches
Total Building Area	691,693 SF

The proposed project would also include a five-level (approximately 51 feet) parking garage (four levels above grade and one level below grade) with a grand total of 528 spaces to serve the 500 guest suites, event space, commercial and retail uses, food and beverage needs, as well as other amenities such as spa and fitness center (see Table 2).

Table 2: Parking Summary

Parking Level	Total Space
Level 4 (52,206 SF)	110
Level 3 (52,206 SF)	110
Level 2 (52,206 SF)	110
Level1 (40,656 SF)	84
Level B1 (52,206 SF)	114
Total Parking Spaces Provided	528
Total EV Parking Spaces Provided	28
Total ADA Spaces Provided	20
Notes: All entertainment, restaurants, spa, fitness, Nick studio, Nick Amenities, retail, ballroom, meeting space are intended for occupied guest of the hotel	

The proposed project construction would take approximately 30 months in a single phase. The construction and grading activities hours would comply with the noise limitation provisions set forth in the City of Garden Grove's Noise Ordinance, Garden Grove Municipal Code Sections 8.47.040 to 8.47.060, except that permitted hours and days of construction and grading will be as follows: Monday through Saturday – not before 7:00 a.m. and not after 8:00 p.m. (of the same day); and Sunday and Federal Holidays – may work the same hours, but be subject to the restrictions as stipulated in Sections 8.47.040 to 8.47.060 of the Municipal Code. The maximum number of employees during construction would be 210 toward the last six-month period of construction.

2.0 METHODOLOGY

Shading refers to the effect of shadows cast upon adjacent areas by proposed structures. Consequences of shadows upon land uses may be positive, including cooling effects during warm weather, or negative, such as the loss of natural light necessary for solar energy purposes or the loss of warming influences during cool weather. Shadow effects are dependent upon several factors, including the local topography, the height and bulk of the proposed project's structural elements, sensitivity of adjacent land uses, season, and duration of shadow projection. Facilities and operations sensitive to the effects of shading include: routinely useable outdoor spaces associated with residential, recreational, or institutional (e.g., schools, convalescent homes) land uses; commercial uses such as pedestrian-oriented outdoor spaces, hotels with outdoor pools, or restaurants with outdoor eating areas; nurseries; and existing solar collectors. These uses are considered sensitive because sunlight is important to function, physical comfort, or commerce.

In order to identify the proposed project's potential shadow-related impacts, existing and project-generated morning, afternoon, and evening shade patterns were compared for each of the four seasons. Specifically, four (4) dates and time ranges were used for analysis purposes: Summer

Solstice (June 20th, from 9:00 a.m. and 5:00 p.m. Pacific Standard Time [PST]) and Winter Solstice (December 21st, from 9:00 a.m. and 3:00 p.m. PST), when the sun is at its highest and lowest point, respectively; and, the Spring Equinox (March 20th, from 9:00 a.m. and 3:00 p.m. PST) and Fall Equinox (September 22nd, from 9:00 a.m. and 5:00 p.m. PST), when day and night are of approximately equal length. The shortest shadows are cast during the summer months and the longest shadows are cast during the winter months. The following discussion describes the Summer and Winter Solstices as well as the Spring and Fall Equinoxes phenomenon, local topography, and some general assumptions that affect shadow patterns in the project vicinity.

2.1 SUMMER AND WINTER SOLSTICES

“Solstice” is defined as either of the two points on the ecliptic that lie midway between the equinoxes (separated from them by an angular distance of 90°). At the solstices, the sun’s apparent position on the celestial sphere reaches its greatest distance above or below the celestial equator, about 23.5° of the arc. At the time of Summer Solstice, approximately June 21st, the sun is directly overhead at noon at the Tropic of Cancer. In the Northern Hemisphere, the longest day and shortest night of the year occur on this date, marking the beginning of summer. At the time of the Winter Solstice, approximately December 21st, the sun is overhead at noon at the Tropic of Capricorn; this marks the beginning of winter in the Northern Hemisphere. Measuring shadow lengths for the summer and winter solstices represents the extreme shadow patterns that occur throughout the year. Shadows cast on the Summer Solstice are the shortest shadows during the year, becoming progressively longer until Winter Solstice when the shadows are the longest they are all year.

2.2 SPRING AND FALL EQUINOXES

An equinox is the moment when the sun passes over the equator. The event occurs twice a year, approximately March 20th and September 22nd. The equinoxes are the two days each year when the middle of the sun is an equal amount of time above and below the horizon for every location on Earth. In the Northern Hemisphere, the March Equinox is known as the Spring Equinox and the September Equinox is the Fall Equinox. In the Southern Hemisphere, the names are reversed. In practice, at the equinox, the day is longer than the night. The equinoxes can be interpreted as virtual points in the sky. As Earth moves around the sun, the apparent position of the sun relative to the other stars moves in a full circle over the period of a year. This circle is called the ecliptic, and is also the plane of Earth's orbit projected against the whole sky. Other bright planets like Venus, Mars, and Saturn also appear to move along the ecliptic, because their orbits are in a similar plane to Earth's. Another virtual circle in the sky is the celestial equator, or the projection of the plane of Earth's equator against the whole sky. Because Earth's axis of rotation is tilted relative to the plane of Earth's orbit around the sun, the celestial equator is inclined to the ecliptic by about 23.5°.

2.3 SHADE/SHADOW DIAGRAMS

The shade/shadow diagrams are composed of a series of three-dimensional rendered site plans. The site plans consist of the proposed project massing models, as well as the surrounding context and geography. The 3D model was created in Sketchup with applied geometry based on the project site coordinates to create the model's base. The SketchUp model was built in 3D based on the proposed building heights. The 3D model is geolocated, so the correct longitude and latitude are built into the model to ensure accurate shade/shadow analysis. Within SketchUp, the model location, times, and dates are set to render the shadow conditions. The models illustrate the shadow effects of existing buildings and the shadow effects of the new building proposed as part of the proposed project. As discussed above, the dates and time ranges used for the analysis were the following: Summer Solstice (June 20th, from 9:00 a.m. and 5:00 p.m. Pacific Standard Time [PST]) and Winter Solstice (December 21st, from 9:00 a.m. and 3:00 p.m. PST), when the sun is at its highest and lowest point, respectively; and, the Spring Equinox (March 20th, from 9:00 a.m. and 3:00 p.m. PST) and Fall Equinox (September 22nd, from 9:00 a.m. and 5:00 p.m. PST), when day and night are of approximately equal length.

3.0 EXISTING CONDITIONS

The project site consists of a previously disturbed site that was occupied by former residential and commercial uses, which were demolished between 2004 and 2013. The north/northeastern parcels of the project site are paved and used for parking by the adjacent Sheraton Hotel, and the remaining parcels are comprised of dirt pads with limited vegetation that are mostly vacant except for the southeastern parcels that are used for temporary construction storage. The easterly portion of Thackery Drive from the centerline of the street has been demolished recently; the westerly paved street portion of Thackery Drive continues to remain. The existing site is fenced and not accessible to the public.

The project site is located within an urbanized area of the City, and it is generally surrounded by mixed uses:

- North: Sheraton Hotel (with outdoor pool) and associated parking, Marriott Hotel (with outdoor pool), along with other retail/commercial uses (with covered outdoor seating at some restaurants)
- Northwest: Residential uses (where the single-family homes have front and back yards, and the apartments have front lawns and covered parking in the back)
- South (Across Twintree Avenue): Residential (with front and back yards) and retail/commercial uses (with no outdoor uses)
- East (Across Harbor Boulevard): Vacant parcels as well as a mix of retail/commercial (with no outdoor uses) and residential uses (with front and back yards)
- West: Residential uses (with front and back yards)

3.1 CLIMATE

The City climate is usually hot and dry in the summer and has mild winters (City of Garden Grove 2019). Data from the Western Regional Climate Center, from 1906 to 2016, shows the record maximum temperatures were a high of 112 degrees Fahrenheit (°F) (on June14, 1917) and a low of 22°F (on December 31, 1918) (City of Garden Grove 2019). Average summer highs range from the lower to upper 80s. Average winter lows range from the lower to upper 40s. Garden Grove averages 25 days each year with temperatures exceeding 90°F. Annual precipitation averages just over 13 inches in the Garden Grove vicinity; more than 50 percent of the annual precipitation normally occurs from December through February (City of Garden Grove 2019).

3.2 EXISTING SHADE/SHADOW CONDITIONS

Kam Sang Company prepared shade/shadow diagrams for the existing conditions, which are provided in Exhibits 1 through 4 below. Residences to the west and north/northwest of project site (between Tamerlane Drive and Downing Street) and hotel uses to the north of the project site, are highlighted in orange to show the vicinity of the project site with the most potential for shade/shadow impacts associated with the proposed project.

The following describes the existing shadow conditions in the vicinity of the project site during the Summer and Winter Solstices as well as the Spring and Fall Equinoxes.

June 20th. As shown on Exhibit 1 (Existing Condition – Summer Solstice – June 20th Shadow Simulation), the ground-level outdoor pool area in the center of the Marriott Hotel is partially shaded between 9:00 a.m. and 10:00 a.m. PST due to the Marriott Hotel's shadow. In summary, no shadow-sensitive uses are currently shaded for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST by existing, adjacent structures during the Summer Solstice.

December 21st. As shown on Exhibit 2 (Existing Condition – Winter Solstice – December 21st Shadow Simulation), at 9:00 a.m. PST, four (4) residences located north of the project site (immediately adjacent to the Sheraton Hotel to the west at 12132, 12142, 12162, and 12172 Tamerlane Drive) and the ground-level outdoor pool area in the center of the Marriott Hotel are partially shaded by the Sheraton Hotel's shadow. In summary, no shadow-sensitive uses are currently shaded for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST by existing, adjacent structures during the Winter Solstice.

March 20th. As shown on Exhibit 3 (Existing Condition – Spring Equinox – March 20th Shadow Simulation), the ground-level outdoor pool area in the center of the Marriott Hotel is partially shaded between 9:00 a.m. and 10:00 a.m. PST by the Marriott Hotel's shadow. In summary, no shadow-sensitive uses are currently shaded for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST by existing, adjacent structures.



7:00 AM PST



8:00 AM PST



9:00 AM PST



10:00 AM PST



11:00 AM PST



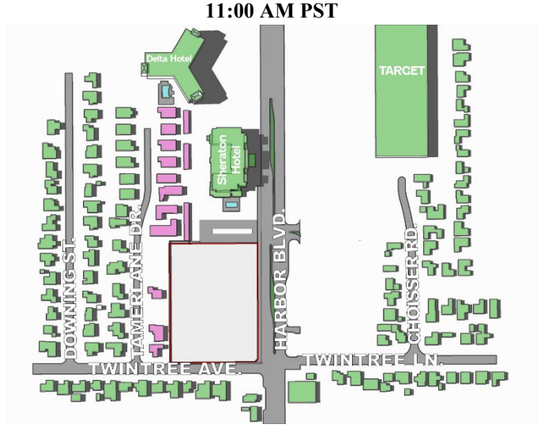
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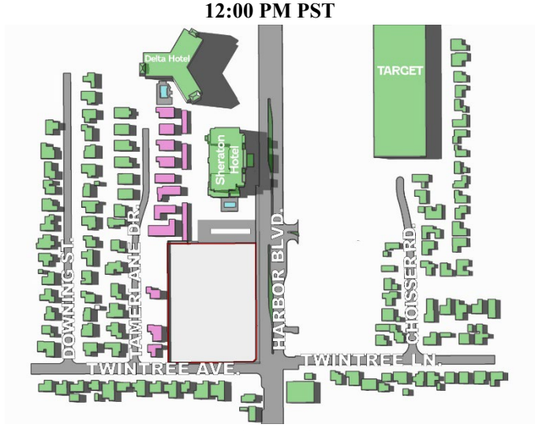
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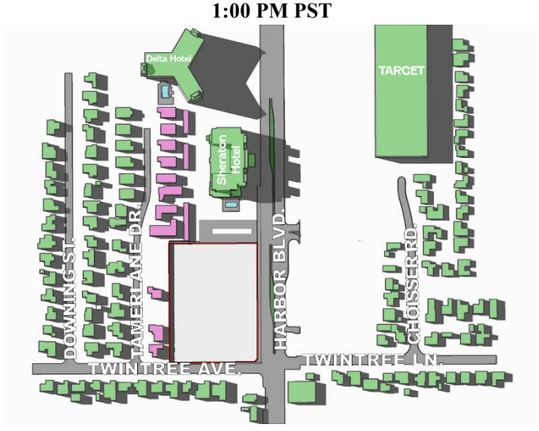
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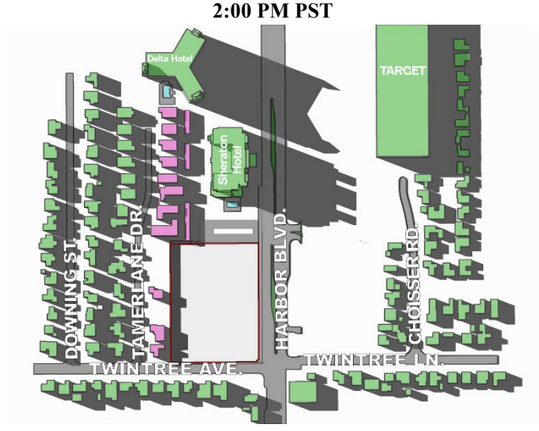
3:00 PM PST



4:00 PM PST



5:00 PM PST



6:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

Project Site

Exhibit 1

Existing Condition – Summer Solstice – June 20th Shadow Simulation



7:00 AM PST



8:00 AM PST



9:00 AM PST



10:00 AM PST



11:00 AM PST



12:00 PM PST



1:00 PM PST



2:00 PM PST



3:00 PM PST



4:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

N

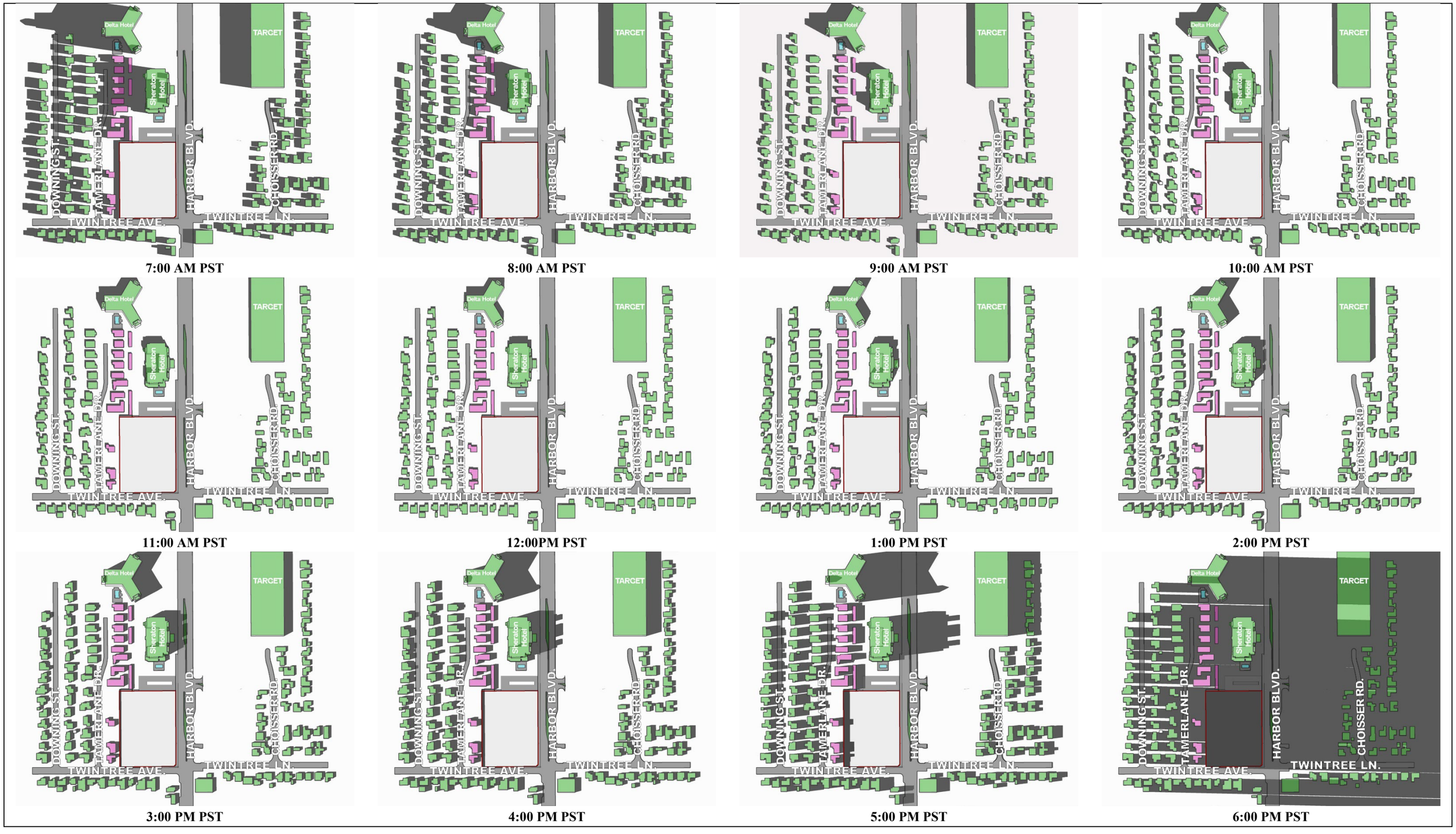
Not to Scale

Legend

Project Site

Exhibit 2

Existing Condition – Winter Solstice – December 21st Shadow Simulation



7:00 AM PST | 8:00 AM PST | 9:00 AM PST | 10:00 AM PST

11:00 AM PST | 12:00PM PST | 1:00 PM PST | 2:00 PM PST

3:00 PM PST | 4:00 PM PST | 5:00 PM PST | 6:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

Project Site

Exhibit 3

Existing Condition – Spring Equinox – March 20th Shadow Simulation



7:00 AM PST



8:00 AM PST



9:00 AM PST



10:00 AM PST



11:00 AM PST



12:00 PM PST



1:00 PM PST



2:00 PM PST



3:00 PM PST



4:00 PM PST



5:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

Project Site

Exhibit 4

Existing Condition – Fall Equinox – September 22nd Shadow Simulation

September 22nd. As shown on Exhibit 4 (Existing Condition – Fall Equinox – September 22nd Shadow Simulation), at 9:00 a.m. PST, the ground-level outdoor pool area in the center of the Marriott Hotel is partially shaded by the Marriott Hotel's shadow. Also, between 4:00 p.m. and 5:00 p.m. PST, seven (7) residences located northeast of the project site (across Harbor Boulevard adjacent to Target) at 12091, 12101, 12111, 12121, 12131, 12141, and 12151 Bangor Street would be shaded by the Target building's shadow (where most of residences would be completely shaded, except for 12151 Bangor Street, which would be partially shaded); however, such residences would be shaded for less than one (1) hour between 4:00 p.m. and 5:00 p.m. PST. In summary, no shadow-sensitive uses are currently shaded for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST by existing, adjacent structures during the Fall Equinox.

4.0 SHADE/SHADOW ANALYSIS

4.1 THRESHOLDS OF SIGNIFICANCE

A project would have a significant impact if:

- Shadow-sensitive use areas (where sunlight is important to its function) would be shaded by project-related structures for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST (between late October and early April), or for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST (between early April and late October), compared to existing conditions.

4.2 IMPACTS AND MITIGATION MEASURES

The proposed project includes construction of a full-service high-rise (maximum height of 350 feet) resort hotel with a separate five-story parking structure garage (four (4) levels above grade [approximately 61 feet in height] and one (1) level below grade) on a 3.72-acre site. Construction of the new building and parking structure would cast shadows on nearby residential and commercial uses. The following analysis describes the proposed project's potential shadow impacts on surrounding uses during the summer and winter solstices as well as the spring and fall equinoxes. Exhibits 5 through 8 illustrate the potential shadow conditions during these seasons.

SUMMER SOLSTICE

June 20th. As shown on Exhibit 5 (Proposed Condition – Summer Solstice – June 20th Shadow Simulation), four (4) residences immediately adjacent to the proposed project to the west would be shaded by the proposed project at 9:00 a.m. PST. Specifically, two (2) of the four (4) residences (at 12272 and 12312 Tamerlane Drive) would be completely shaded, whereas the remaining two (2) residences would be partially shaded (at 12322 and 12242 Tamerlane Drive). However, by 10:00 a.m. PST, only two (2) of these four (4) residences would be partially shaded (at 12242 and 12312 Tamerlane Drive), and by 11:00 a.m. PST, both residences would be unshaded and would remain unshaded through 5:00 p.m. PST. From 11:00 a.m. to 1:00 p.m.

PST, minimal shadow would be cast by the proposed project and would be limited to the confines of the project site. From 2:00 p.m. to 4:00 p.m. PST, the shadow cast by the proposed project would gradually extend east across Harbor Boulevard but would not reach any shadow-sensitive uses. Between 4:00 p.m. PST and 5:00 p.m. PST, the shadow cast by the proposed project would continue to extend across Harbor Boulevard and would partially shade seven (7) residences (at 12291 Choisser Road, and 12542, 12552, 12572, 12582, 12602, and 12612 Twintree Lane) and completely shade two (2) residences (at 12581 and 12601 Twintree Lane); however, such residences would be shaded for less than one (1) hour between 4:00 p.m. and 5:00 p.m. PST.

Lastly, the existing shadows described previously in Section 3.2 of this study would remain unchanged. Thus, the ground-level outdoor pool area in the center of the Marriott Hotel would continue to go from being completely shaded to partially shaded between 9:00 a.m. and 10:00 a.m. PST by the Marriott Hotel's shadow.

In summary, similar to existing conditions, no shadow-sensitive uses would be partially or completely shaded for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST by the proposed project. Therefore, the proposed project's impacts during the Summer Solstice would be less than significant.

WINTER SOLSTICE

December 21st. As shown on Exhibit 6 (Proposed Condition – Winter Solstice – December 21st Shadow Simulation), 17 residences located adjacent to the proposed project to the west and northwest would be shaded by the proposed project at 9:00 a.m. PST. Specifically, eight (8) of the 17 residences (12222 Downing Street; and, 12261, 12231, 12181, 12171, 12202, 12212, and 12312 Tamerlane Drive) would be partially shaded, whereas the remaining nine (9) residences (12162, 12182, 12192, and 12202 Downing Street; and 12211, 12201, 12222, 12242, 12272 Tamerlane Drive) would be completely shaded by the proposed project. However, the shadow cast by the proposed project would gradually lessen as the sun rotates from northwest to northeast between 10:00 a.m. and 1:00 p.m. PST. By 1:00 p.m. PST, no residences would be shaded with the exception of a covered parking area associated with one (1) residence located at 12222 Tamerlane Drive. While the covered parking area associated with that residence would be shaded for more than three (3) hours (between 9:00 a.m. and 1:00 p.m. PST), the residence itself would only be shaded for two (2) of those hours (specifically, between 9:00 a.m. and 11:00 a.m. PST). Additionally, the covered parking area is not considered a shadow-sensitive use; thus, this would not be a significant impact. In addition, the Sheraton Hotel (including the outdoor pool area) would be partially shaded between 12:00 p.m. and 3:00 p.m. PST as the proposed project's shadow moves from the northeast to the east across Harbor Boulevard; however, it would not be shaded for more than three (3) hours between 9:00 a.m. and 3:00 p.m. PST.

Lastly, the existing shadows described previously in Section 3.2 of this study would remain unchanged. Thus, at 9:00 a.m. PST, four (4) residences located north of the project site (immediately adjacent to the Sheraton Hotel to the west at 12132, 12142, 12162, and 12172 Tamerlane Drive) and the ground-level outdoor pool area in the center of the Marriott Hotel would continue to be partially shaded by the Sheraton Hotel's shadow.

In summary, similar to existing conditions, no shadow-sensitive uses would be partially or completely shaded for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST by the proposed project. Therefore, the proposed project's impacts during the Winter Solstice would be less than significant.

SPRING EQUINOX

March 20th. As shown on Exhibit 7 (Proposed Condition – Spring Equinox – March 20th Shadow Simulation), twelve (12) residences located adjacent to the proposed project to the west and northwest would be shaded by the proposed project at 9:00 a.m. PST. Specifically, four (4) of the twelve (12) residences (12272, 12241, 12242, and 12231 Tamerlane Drive) would be completely shaded, whereas the remaining eight (8) residences (12222 and 12232 Downing Street; and, 12222, 12271, 12261, 12211, 12312, and 12322 Tamerlane Drive) would be partially shaded by the proposed project. However, by 11:00 a.m. PST, only one (1) residence (12222 Tamerlane Drive) would continue to be partially shaded by the proposed project. By 12:00 p.m. PST, only the covered parking area associated with one (1) residence (12222 Tamerlane Drive), which would be a non-shadow-sensitive use, would continue to be partially shaded by the proposed project. From 1:00 p.m. to 3:00 p.m. PST, minimal shadow would be cast and mostly limited to the project site and slightly across Harbor Boulevard.

Lastly, the existing shadows described previously in Section 3.2 of this study would remain unchanged. Thus, the ground-level outdoor pool area in the center of the Marriott Hotel would continue to be partially shaded between 9:00 a.m. and 10:00 a.m. PST by the Marriott Hotel's shadow.

In summary, no shadow-sensitive uses would be partially or completely shaded for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST by existing, adjacent structures. Therefore, the proposed project's impacts during the Spring Equinox would be less than significant.

FALL EQUINOX

September 22nd. As shown on Exhibit 8 (Proposed Condition – Fall Equinox – September 22nd Shadow Simulation), nine (9) residences located adjacent to the proposed project to the west and northwest would be shaded by the proposed project at 9:00 a.m. PST. Specifically, seven (7) of the nine (9) residences (at 12261, 12241, 12231, 12211, 12222, 12312, and 12322 Tamerlane Drive) would be partially shaded, whereas the remaining two (2) residences (at 12242 and 12272 Tamerlane Drive) would be completely shaded by the proposed project. However, by 10:00 a.m. PST, only three (3) residences (12222, 12312, and 12242 Tamerlane Drive) would continue to be partially shaded; also, another residence located west of the proposed project at 12212 Tamerlane Drive would also be partially shaded. At 11:00 a.m. PST, the two (2) residences (12212 and 12222 Tamerlane Drive) would continue to be partially shaded, and by 12:00 p.m. PST, only the covered parking area associated with one (1) residence at 12222 Tamerlane Drive would be partially shaded, which is a non-shadow-sensitive use. From 1:00 p.m. PST to 2:00 p.m. PST, minimal shadow would be cast and would be mostly limited to the confines of the project site and

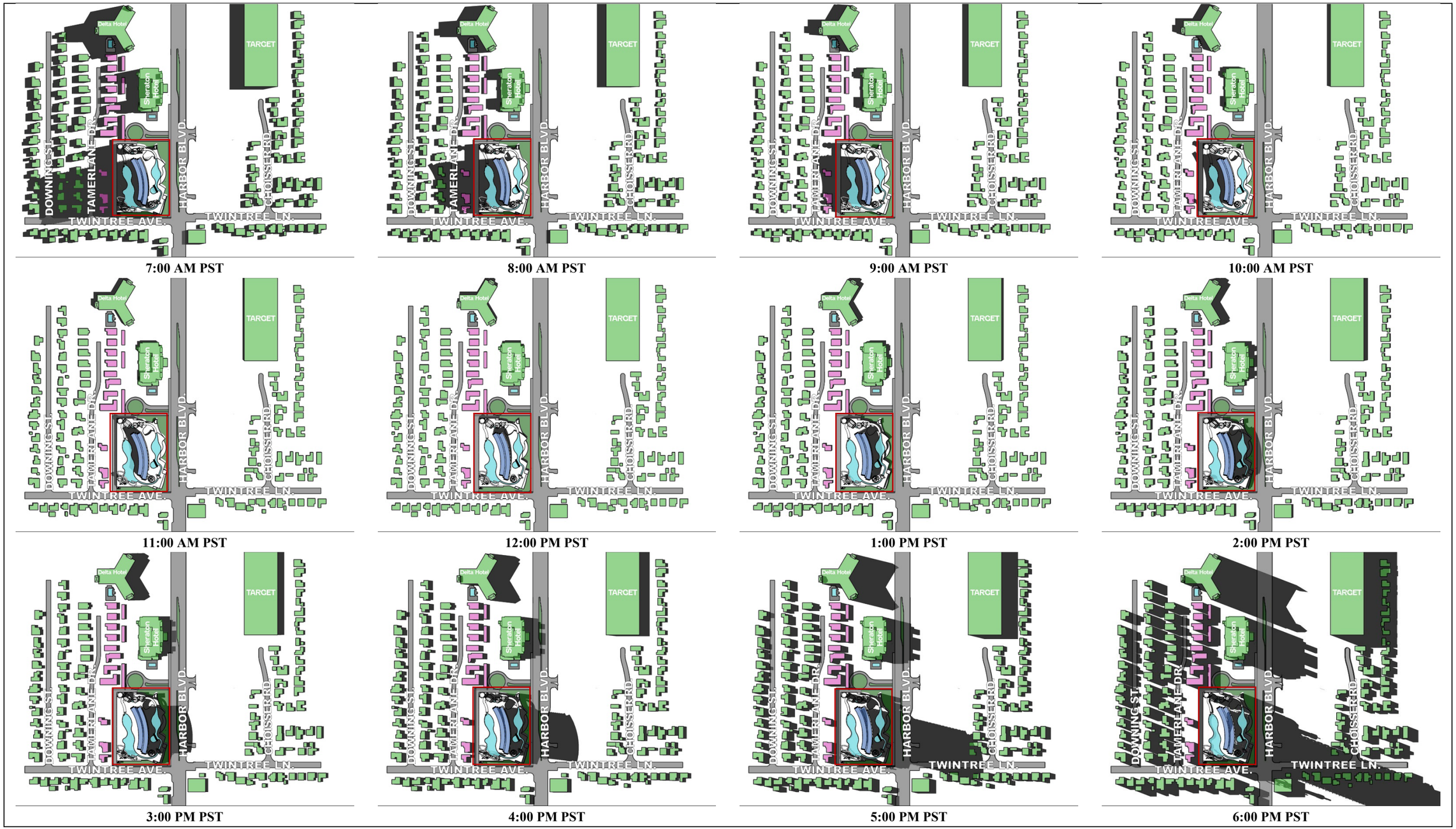
parking lot of the Sheraton Hotel; furthermore, the residences noted above would be unshaded. From 2:00 p.m. to 3:00 p.m. PST, the shadow cast by the proposed project would gradually extend east across Harbor Boulevard but would not reach any shadow-sensitive uses. Between 4:00 p.m. PST and 5:00 p.m. PST, the shadow cast by the proposed project would continue to extend across Harbor Boulevard and would shade a total of twenty (20) residences. Specifically, six (6) of the twenty (20) residences would be partially shaded (at 12581 and 12601 Twintree Lane; 12238, 12240, and 12242 Choisser Road; and 12241 Bangor Street), whereas the remaining fourteen (14) residences would be completely shaded (at 12241, 12251, 12271, 12280, 12281, 12291, and 12292 Choisser Road; and 12601, 12611, 12612, 12621, 12622, 12632, and 12642 Greentree Avenue); however, such residences would be shaded for less than one (1) hour between 4:00 p.m. and 5:00 p.m. PST.

Lastly, the existing shadows described previously in Section 3.2 of this study would remain unchanged. Thus, at 9:00 a.m. the ground-level outdoor pool area in the center of the Marriott Hotel would continue to be partially shaded by the Marriott Hotel's shadow. Also, between 4:00 p.m. and 5:00 p.m. PST, seven (7) residences located northeast of the project site (across Harbor Boulevard adjacent to Target) at 12091, 12101, 12111, 12121, 12131, 12141, and 12151 Bangor Street would be shaded by the Target building's shadow (where most of residences would continue to be completely shaded, except for 12151 Bangor Street, which would continue to be partially shaded); however, such residences would be shaded for less than one (1) hour between 4:00 p.m. and 5:00 p.m. PST.

In summary, no shadow-sensitive uses would be partially or completely shaded for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST by the proposed project. Therefore, the proposed project's impacts during the Fall Equinox would be less than significant.

IMPACT CONCLUSION

As described above, while the proposed project would cast a new shadow onto surrounding shadow-sensitive use areas (e.g., residential and hotels uses), these shadow-sensitive use areas would not be partially or completely shaded by project-related structures for more than three (3) hours between the hours of 9:00 a.m. and 3:00 p.m. PST (between late October and early April [illustrated in Exhibits 6 and 7 showing the Winter Solstice and Spring Equinox]), or for more than four (4) hours between the hours of 9:00 a.m. and 5:00 p.m. PST (between early April and late October [illustrated in Exhibits 5 and 8 showing the Summer Solstice and Fall Equinox]), compared to existing conditions. Therefore, implementation of the proposed project would result in a less than significant impact related to shade/shadow.



Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

Project Site

Exhibit 5

Proposed Condition – Summer Solstice – June 20th Shadow Simulation



7:00 AM PST



8:00 AM PST



9:00 AM PST



10:00 AM PST



11:00 AM PST



12:00 PM PST



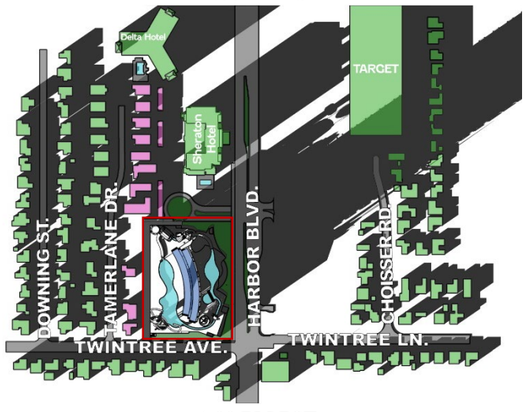
1:00 PM PST



2:00 PM PST



3:00 PM PST



4:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

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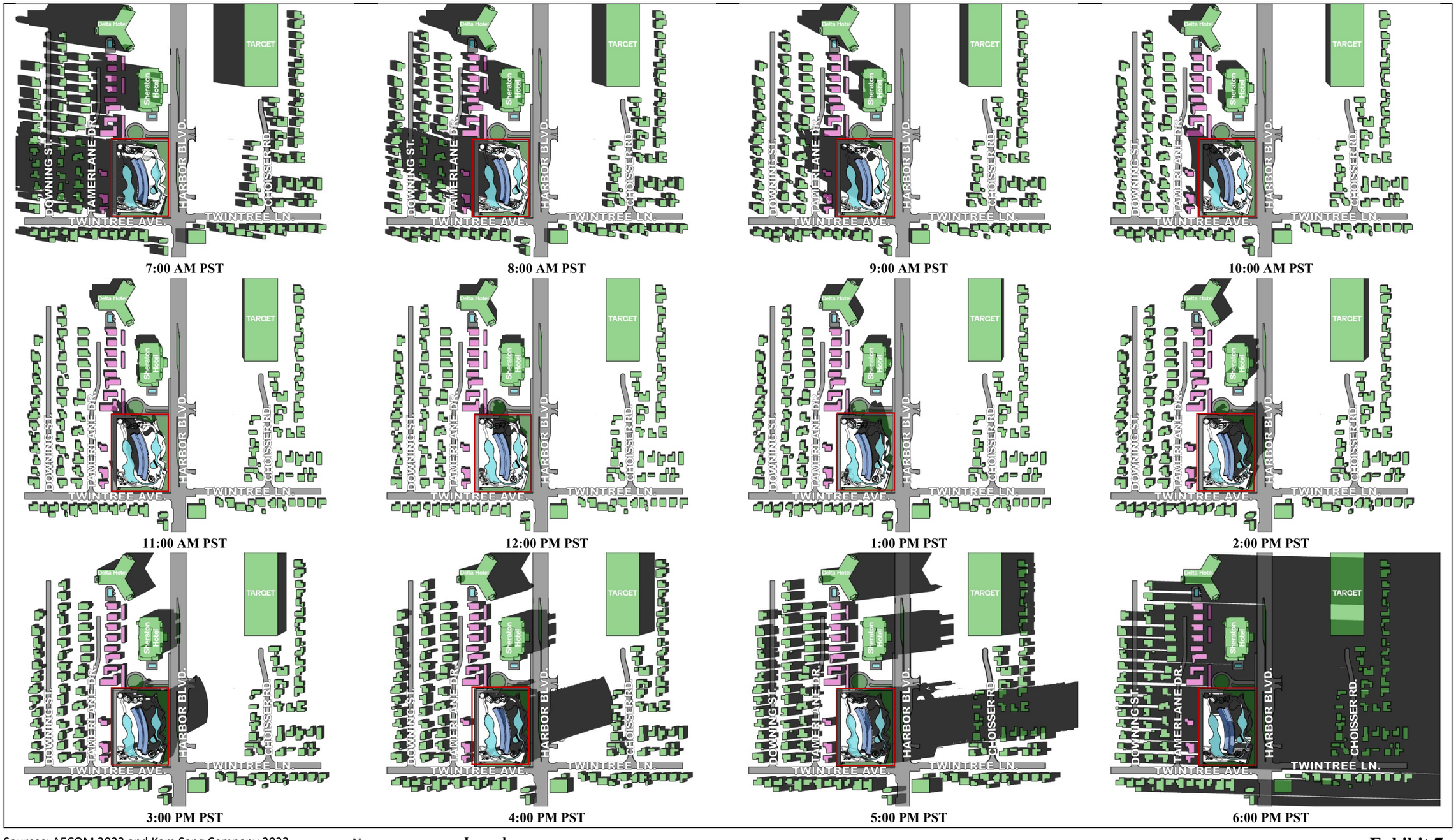
Not to Scale

Legend

Project Site

Exhibit 6

Proposed Condition – Winter Solstice – December 21st Shadow Simulation



Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

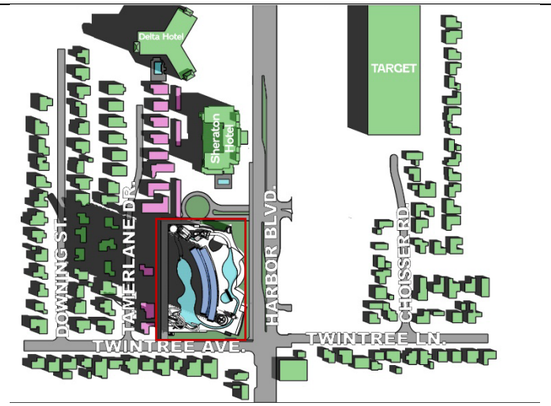
Project Site

Exhibit 7

Proposed Condition – Spring Equinox – March 20th Shadow Simulation



7:00 AM PST



8:00 AM PST



9:00 AM PST



10:00 AM PST



11:00 AM PST



12:00 PM PST



1:00 PM PST



2:00 PM PST



3:00 PM PST



4:00 PM PST



5:00 PM PST

Sources: AECOM 2022 and Kam Sang Company 2022

N

Not to Scale

Legend

Project Site

Exhibit 8

Proposed Condition – Fall Equinox – September 22nd Shadow Simulation

5.0 REFERENCES

5.1 PREPARERS

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999 Town & Country Road
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Hallie Fitzpatrick, AICP, Environmental Planner

5.2 DOCUMENTS

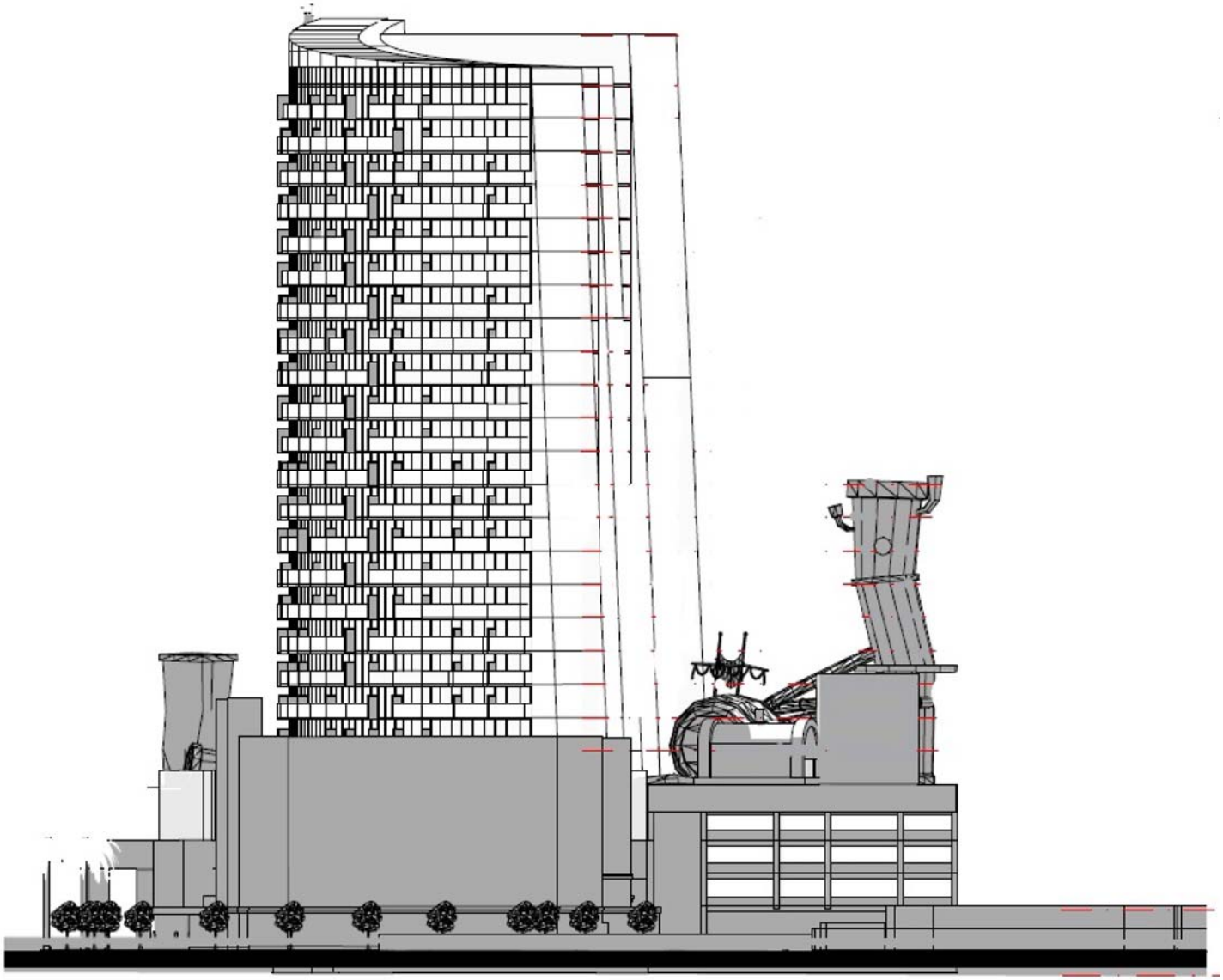
City of Garden Grove. 2019. Local Hazard Mitigation Plan. Available at https://ggcity.org/sites/default/files/Garden%20Grove%20LHMP%20January%202020%20Public%20Review%20Complete.pdf (accessed June 2021).

City of Los Angeles. 2006. L. A. CEQA Thresholds Guide. Available at: https://planning.lacity.org/eir/CrossroadsHwd/deir/files/references/A07.pdf (accessed July 2021).

Kam Sang Company. 2022. Shade Shadow Diagrams. May.

Appendix B
Air Quality and Greenhouse Gas Impact Study

GARDEN GROVE HOTEL SITE B-2
AIR QUALITY AND GREENHOUSE GAS IMPACT STUDY
City of Garden Grove



RK engineering group, inc.

GARDEN GROVE HOTEL SITE B-2
AIR QUALITY AND GREENHOUSE GAS IMPACT STUDY
City of Garden Grove, California

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April 26, 2022

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1.0 Introduction

The purpose of this air quality and greenhouse gas (GHG) impact study is to determine whether the estimated criteria air pollutants and greenhouse gas emissions potentially generated from the construction and operation of the proposed Garden Grove Hotel Site B-2 (hereinafter referred to as project) would cause a significant effect on the environment.

This assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000, et seq.). The methodology follows the California Air Resources Board (CARB), the South Coast Air Quality Management District (SCAQMD), and City of Garden Grove recommendations for the quantification and evaluation of air quality and GHG emissions.

1.1 Site Location

The project site is located at the northwest corner of Harbor Boulevard and Twintree Avenue, in the City of Garden Grove.

The project site is located within the South Coast Air Basin (SCAB), the SCAQMD Inland Orange County General Forecast Area, and the Central Orange County monitoring Area - 17.

The project location map is provided in Exhibit A.

1.2 Project Description

The project consists of the construction and operation of a 500 room high-rise resort hotel with a 5-level parking garage (4 levels above grade, 1 level below grade) and several on-site guest amenities. The project site is approximately 3.72 acres.

The site plan used for this analysis is illustrated on Exhibits B.

Table 1 summarizes the proposed project land uses.

Table 1
Land Use Summary

Project Land Use	CalEEMod Land Use Category	Amount	Metric
Resort Hotel[1]	Hotel	500 379,366[1]	Rooms Square Feet
Parking Structure	Enclosed Parking with Elevator	528 249,480	Spaces Square Feet
Hotel Themed Pool	Recreational Swimming Pool	24,980	Square Feet
Hotel Theater	Movie Theater (No Matinee)	7,039	Square Feet
Food and Beverage	Quality Restaurant	22,296	Square Feet
Spa / Fitness	Health Club	8,532	Square Feet
Total Building Area		**691,693**	**Square Feet**
Total Project Site Area		**3.72**	**Acres**

[1] Resort Hotel land use includes ancillary land uses such as ball rooms/meeting rooms, lobby, studio hall, arcade, amenities, office, back of house retail, retail, and storage.

Construction of the project is estimated to begin in the year 2022 to last approximately 33 months. Construction of the project is expected to occur in one phase and consist of site preparation, grading, building construction, paving, and architectural coating.

The project is expected to require the total export of approximately 60,720 cubic yards of earthwork material for grading purposes. The project site is currently vacant, and demolition is not expected to be required as part of the project.

1.3 Sensitive Receptors

Sensitive receptors are considered land uses or other types of population groups that are more sensitive to air pollution exposure. Sensitive population groups include children, the elderly, the acutely and chronically ill, and those with cardio-respiratory diseases. For CEQA purposes, the SCAQMD considers a sensitive receptor to be a location where a sensitive individual could remain for 24-hours or longer, such as residences, hospitals, and schools (etc), as described in the Localized Significance Threshold Methodology (SCAQMD 2008a, page 3-2).

Several sensitive land uses are present surrounding the project site include the following:

- Existing residential uses located immediately adjacent to the west of the site (less than 25 meters/approximately 82 feet).

- Existing apartment homes located immediately adjacent to the northwest of the project site (less than 25 meters / approximately 82 feet).

- Existing residential homes located approximately 55 feet to the south of the project site, along south side of Twintree Avenue (less than 25 meters / approximately 82 feet).

- Existing Sheraton Hotel to the north of the project site, approximately 100 feet from the project site to the nearest building façade (less than 50 meters to building façade / approximately 164 feet).

1.4 Summary of Air Quality and GHG Impacts

Table 2 provides a summary of the CEQA air quality impact analysis results.

Table 2
CEQA Air Quality Impact Criteria

Air Quality Impact Criteria	Potentially Significant	Potentially Significant Unless Mitigated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with, or obstruct implementation of, the applicable air quality plan?			X	
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable Federal or State ambient air quality standard?			X	
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?			X	

Table 3 provides a summary of the CEQA GHG impact criteria analysis results.

Table 3
CEQA GHG Impact Criteria

GHG Impact Criteria	Potentially Significant	Potentially Significant Unless Mitigated	Less Than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?		X		
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of greenhouse gases?		X		

1.5 Recommended Greenhouse Gas Mitigation Measures

This section provides a summary of the recommended mitigation measures that have been identified to help reduce the project's impact from GHG emissions.

Operational Mitigation Measures:

GHG-1 The number of large diesel trucks coming to the site (i.e. for deliveries, trash collection, or other services) shall be limited to 20 trucks per day or less. This restriction is specifically applicable to trucks classified as medium-heavy duty and heavy-heavy duty with gross vehicle weight (GVW) greater than 19,500 pounds.

GHG-2 On-site renewable energy sources (i.e. solar panels) shall be installed capable of generating up to 25% of the project's total electricity demand.

GHG-3 Prior to receiving a Certificate of Occupancy, the project shall demonstrate to the satisfaction of the Garden Grove Building and Safety Division that water conservation strategies have been implemented, including low flow fixtures and toilets, water efficient irrigation systems, drought tolerant/native landscaping, and pool water recycling systems.

GHG-4 Waste management, recycling and composting programs shall be implemented to divert up to 50% of waste away from a landfill.

GHG-5 Electric landscaping equipment, such as leaf blowers and pressure washers shall be used.

GHG-6 No on-site natural gas fire places or fire pits shall be installed.

GHG-7 Trip reduction measures and project design features shall be implemented to reduce the number of auto-based trips generated by the project and to encourage the use of transit, bicycling, and walking through the following measures.

1. Improve the walkability and design of the project by providing pedestrian and bicycling connections within the project site and to adjacent off-site facilities (i.e., sidewalks, crosswalks, wayfinding signage, etc.).

2. Provide traffic calming measures (i.e., marked crosswalks, raised crosswalks, raised intersections, count-down signal timers, curb extensions, speed tables, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc.)

3. Provide secure on-site bicycle racks and provide bicycle rentals for hotel guests.

4. Provide transit/shuttle service for guests to local area attractions. The shuttle service shall operate on a regular daily basis and be offered to all guests staying at the hotel.

5. Hotel management/concierge should provide information that promotes walking, bicycling and public transit options to nearby attractions. This should include information on local bus routes and schedules and wayfinding to the existing transit stops along Harbor Boulevard.

1.6 Recommended Project Design Features

The following recommended project design features include standard rules and requirements, best practices and building code requirements that serve to help reduce air quality and GHG emissions. Project design features are assumed to be included as part of the conditions of approval for the project.

Construction Design Features:

DF-1 Prior to starting construction, the project should submit a Construction Management Plan to the City of Garden Grove that specifies how all construction design features will be implemented.

DF-2 The project must follow the standard SCAQMD rules (Rule 403) and requirements applicable to fugitive dust control, which includes, but are not limited to the following:

1. All active construction areas shall be watered two (2) times daily.
2. Speed on unpaved roads shall be reduced to less than 15 mph.
3. Any visible dirt deposition on any public roadway shall be swept or washed at the site access points within 30 minutes.
4. Any on-site stockpiles of debris, dirt or other dusty material shall be covered or watered twice daily.
5. All operations on any unpaved surface shall be suspended if winds exceed 15 mph.
6. Access points shall be washed or swept daily.
7. Construction sites shall be sandbagged for erosion control.
8. Apply nontoxic chemical soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for 10 days or more).
9. Cover all trucks hauling dirt, sand, soil, or other loose materials, and maintain at least 2 feet of freeboard space in accordance with the requirements of California Vehicle Code (CVC) section 23114.
10. Pave or provide gravel construction access roads at least 100 feet onto the site from the main road and use gravel aprons at truck exits.
11. Replace the ground cover of disturbed areas as quickly possible.

DF-3 All diesel construction equipment should have Tier 4 low emission "clean diesel" engines (OEM or retrofit) that include diesel oxidation catalysts and diesel particulate filters that meet the latest CARB best available control technology.

DF-4 Construction equipment should be maintained in proper tune.

DF-5 All construction vehicles should be prohibited from excessive idling. Excessive idling is defined as five (5) minutes or longer.

DF-6 Minimize the simultaneous operation of multiple construction equipment units, to the maximum extent feasible.

DF-7 The use of heavy construction equipment and earthmoving activity should be suspended during Air Alerts when the Air Quality Index reaches the "Unhealthy" level.

DF-8 Establish an electricity supply to the construction site and use electric powered equipment instead of diesel-powered equipment or generators, where feasible.

DF-9 Establish staging areas for the construction equipment that as far from adjacent residential homes, as feasible.

DF-10 Use haul trucks with on-road engines instead of off-road engines for on-site hauling.

Operational Design Features:

DF-11 The project should comply with the mandatory requirements of the latest California Building Standards Code, Title 24, Part 6 (Energy Code) and Part 11 (CALGreen), including the provisions for bicycle parking, electric vehicle charging stations, energy efficiency, material conservation, and water/waste reduction.

DF-12 Install signage at loading docks requiring trucks to limit engine idling times to 5 minutes or less.

2.0 Air Quality Setting

The Federal Clean Air Act (§ 7602) defines air pollution as any agent or combination of such agents, including any physical, chemical, biological, or radioactive substance which is emitted into or otherwise enters the ambient air. Household combustion devices, motor vehicles, industrial facilities and forest fires are common sources of air pollution. Air pollution can cause disease, allergies and even death. It affects soil, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate. It can also cause damage to and deterioration of property, present hazards to transportation, and negatively impact the economy.

This section provides background information on criteria air pollutants, the applicable federal, state and local regulations concerning air pollution, and the existing physical setting of the project within the context of local air quality.

2.1 Description of Air Pollutants[1].

The following section describes the air pollutants of concern related to the project. Criteria air pollutants are defined as those pollutants for which the federal and state governments have established air quality standards for outdoor or ambient concentrations to protect public health. The following descriptions of criteria air pollutants have been provided by the SCAQMD.

- **Carbon Monoxide (CO)** is a colorless, odorless, toxic gas produced by incomplete combustion of carbon-containing fuels (e.g., gasoline, diesel fuel, and biomass). Sources include motor vehicle exhaust, industrial processes (metals processing and chemical manufacturing), residential wood burning, and natural sources. CO is somewhat soluble in water; therefore, rainfall and fog can suppress CO conditions. CO enters the body through the lungs, dissolves in the blood, and competes with oxygen, often replacing it in the blood, thus reducing the blood's ability to transport oxygen to vital organs in the body. The ambient air quality standard for carbon monoxide is intended to protect persons whose medical condition already compromises their circulatory system's ability to deliver oxygen. These medical conditions include certain heart ailments, chronic lung diseases, and anemia. Persons with these conditions have reduced exercise capacity even when exposed to relatively low levels of CO. Fetuses are at risk because their blood has an even greater affinity to bind with CO. Smokers are also at risk from ambient CO levels because smoking

[1] SCAQMD. Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning (May 6, 2005)

increases the background level of CO in their blood. The South Coast basin has recently achieved attainment status for carbon monoxide by both USEPA and CARB.

- **Nitrogen Dioxide (NO_2)** is a byproduct of fuel combustion. The principal form of nitrogen oxide produced by combustion is nitric oxide (NO), but NO reacts quickly to form NO_2, creating the mixture of NO and NO_2 commonly called NO_x. NO_2 acts as an acute irritant and, in equal concentrations, is more injurious than NO. At atmospheric concentrations, however, NO_2 is only potentially irritating. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase in bronchitis in young children has also been observed at concentrations below 0.3 parts per million (ppm). NO_2 absorbs blue light which results in a brownish red cast to the atmosphere and reduced visibility. Although NO_2 concentrations have not exceeded national standards since 1991 and the state hourly standard since 1993, NO_x emissions remain of concern because of their contribution to the formation of O_3 and particulate matter.

- **Ozone (O_3)** is one of several substances called photochemical oxidants that are formed when volatile organic compounds (VOC) and NO_x react in the presence of ultraviolet sunlight. O_3 concentrations in the South Coast basin are typically among the highest in the nation, and the damaging effects of photochemical smog, which is a popular name for a number of oxidants in combination, are generally related to the concentrations of O_3. Individuals exercising outdoors, children, and people with preexisting lung disease, such as asthma and chronic pulmonary lung disease, are considered to be the subgroups most susceptible to O_3 effects. Short-term exposures (lasting for a few hours) to O_3 at levels typically observed in southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. In recent years, a correlation between elevated ambient O_3 levels and increases in daily hospital admission rates, as well as mortality, has also been reported. The South Coast Air Basin is designated by the USEPA as an extreme non-attainment area for ozone. Although O_3 concentrations have declined substantially since the early 1990s, the South Coast basin continues to have peak O_3 levels that exceed both state and federal standards.

- **Fine Particulate Matter (PM_{10})** consists of extremely small, suspended particles or droplets 10 microns or smaller in diameter that can lodge in the lungs, contributing to respiratory problems. PM_{10} arises from such sources as re-entrained road dust, diesel soot, combustion products, tire and brake abrasion, construction operations, and fires. It is also formed in the atmosphere from NO_x and SO_2 reactions with ammonia. PM_{10} scatters light and significantly reduces visibility. Inhalable particulates

pose a serious health hazard, alone or in combination with other pollutants. More than half of the smallest particles inhaled will be deposited in the lungs and can cause permanent lung damage. Inhalable particulates can also have a damaging effect on health by interfering with the body's mechanism for clearing the respiratory tract or by acting as a carrier of an absorbed toxic substance. The South Coast basin has recently achieved federal attainment status for PM_{10}, but is non-attainment based on state requirements.

- **Ultra-Fine Particulate Matter ($PM_{2.5}$)** is defined as particulate matter with a diameter less than 2.5 microns and is a subset of PM_{10}. $PM_{2.5}$ consists mostly of products from the reaction of NO_x and SO_2 with ammonia, secondary organics, finer dust particles, and the combustion of fuels, including diesel soot. $PM_{2.5}$ can cause exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease, declines in pulmonary function growth in children, and increased risk of premature death from heart or lung diseases in the elderly. Daily fluctuations in $PM_{2.5}$ levels have been related to hospital admissions for acute respiratory conditions, school absences, and increased medication use in children and adults with asthma. The South Coast basin is designated as non-attainment for $PM_{2.5}$ by both federal and state standards.

- **Sulfur dioxide (SO_2)** is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. Health effects include acute respiratory symptoms and difficulty in breathing for children. Individuals with asthma may experience constriction of airways with exposure to SO_2. Though SO_2 concentrations have been reduced to levels well below state and federal standards, further reductions in SO_2 emissions are needed because SO_2 is a precursor to sulfate and PM_{10}. The South Coast basin is considered a SO_2 attainment area by USEPA and CARB.

- **Lead (Pb)** is a toxic heavy metal that can be emitted into the air through some industrial processes, burning of leaded gasoline and past use of lead-based consumer products. Lead is a neurotoxin that accumulates in soft tissues and bones, damages the nervous system, and causes blood disorders. It is particularly problematic in children, in that permanent brain damage may result, even if blood levels are promptly normalized with treatment. Concentrations of lead once exceeded the state and federal air quality standards by a wide margin, but as a result of the removal of lead from motor vehicle gasoline, ambient air quality standards for lead have not been exceeded since 1982. Though special monitoring sites immediately downwind of lead sources recorded localized violations of the state standard in 1994, no violations have been recorded since. Consequently, the South Coast basin is designated as an attainment area for lead by both the USEPA and CARB. This report

does not analyze lead emissions from the project, as it is not expected to emit lead in any significant measurable quantity.

- **Volatile Organic Compounds (VOC),** although not actually a criteria air pollutant, VOCs are regulated by the SCAQMD because they cause chemical reactions which contribute to the formation of ozone. VOCs are also transformed into organic aerosols in the atmosphere, contributing to higher PM_{10} and lower visibility levels. Sources of VOCs include combustion engines, and evaporative emissions associated with fuel, paints and solvents, asphalt paving, and the use of household consumer products such as aerosols. Although health-based standards have not been established for VOCs, health effects can occur from exposures to high concentrations of VOC. Some hydrocarbon components classified as VOC emissions are hazardous air pollutants. Benzene, for example, is a hydrocarbon component of VOC emissions that are known to be a human carcinogen. The term reactive organic gases (ROG) are often used interchangeably with VOC.

- **Toxic Air Contaminants (TACs)** are defined as air pollutants which may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health, and for which there is no concentration that does not present some risk. This contrasts with the criteria pollutants, in that there is no threshold level for TAC exposure below which adverse health impacts are not expected to occur. The majority of the estimated health risk from TACs can be attributed to a relatively few compounds, the most common being diesel particulate matter (DPM) from diesel engine exhaust. In addition to DPM, benzene and 1,3-butadiene are also significant contributors to overall ambient public health risk in California.

2.2 Federal and State Ambient Air Quality Standards

The Federal Clean Air Act, which was last amended in 1990, requires the EPA to set National Ambient Air Quality Standards (NAAQS) for criteria pollutants considered harmful to public health and the environment. The State of California has also established additional and more stringent California Ambient Air Quality Standards (CAAQS) in addition to the seven criteria pollutants designated by the federal government.

AAQS are designed to protect the health and welfare of the populace with a reasonable margin of safety. The standards are divided into two categories, primary standards, and secondary standards. Primary standards are implemented to provide protection for the "sensitive" populations such as those with asthma, or the children and elderly. Secondary standards are to provide protection against visible pollution as well as damage to the surrounding environment, including animals, crops, and buildings.

Table 4 shows the Federal and State Ambient Air Quality Standards.

Table 4
Federal and State Ambient Air Quality Standards (AAQS)[1]

Air Pollutant	Averaging Time [2]	Federal Standard (NAAQS)[2]	California Standard (CAAQS)[2]
Ozone	1 Hour	--	0.09 ppm
	8 Hour	0.070 ppm	0.070 ppm
Carbon Monoxide (CO)	1 Hour	35 ppm	20 ppm
	8 Hour	9 ppm	9 ppm
Nitrogen Dioxide (NO_2)	1 Hour	0.100 ppm	0.18 ppm
	Annual	0.053 ppm	0.030 ppm
Sulfur Dioxide (SO_2)	1 Hour	0.075 ppm	0.25 ppm
	3 Hour	0.5 ppm[3]	--
	24 Hour	--	0.04 ppm
Particulate Matter (PM_{10})	24 Hour	150 $\mu g/m^3$	50 $\mu g/m^3$
	Mean	--	20 $\mu g/m^3$
Particulate Matter (PM2.5)	24 Hour	35 $\mu g/m^3$	--
	Annual	12 $\mu g/m^3$	12 $\mu g/m^3$
Lead	30-day	--	1.5 $\mu g/m$
	Quarter	1.5 $\mu g/m$	--
	3-month average	0.15 $\mu g/m$	--
Visibility reducing particles	8 Hour	--	0.23/km extinction coefficient. (10-mile visibility standard)
Sulfates	24 Hour	--	25 $\mu g/m$
Vinyl chloride	24 Hour	--	0.01 ppm
Hydrogen sulfide	24 Hour	--	0.03 ppm

[1] Source: USEPA: https://www.epa.gov/criteria-air-pollutants/naaqs-table and
CARB: https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards

[2] ppm = parts per million of air, by volume; µg/m3 = micrograms per cubic meter; Annual = Annual Arithmetic Mean; 30-day = 30-day average; Quarter = Calendar quarter.

[3] Secondary standards

Several pollutants listed in Table 4 are not addressed in this analysis. Lead is not included because the project is not anticipated to emit lead. Visibility-reducing particles are not explicitly addressed in this analysis because particulate matter is addressed. The project is not expected to generate or be exposed to vinyl chloride because proposed project uses do not utilize the chemical processes that create this pollutant and there are no such uses in the project vicinity. The proposed project is not expected to cause exposure to hydrogen sulfide because it would not generate hydrogen sulfide in any substantial quantity.

2.3 Attainment Status

The Clean Air Act requires states to prepare a State Implementation Plan (SIP) to ensure air quality meets the NAAQS. The California Air Resources Board (CARB) provides designations of attainment for air basins where AAQS are either met or exceeded. If the AAQS are met, the area is designated as being in "attainment", if the air pollutant concentrations exceed the AAQS, than the area is designated as being "nonattainment". If there is inadequate or inconclusive data to make a definitive attainment designation, the area is considered "unclassified."

National nonattainment areas are further designated as marginal, moderate, serious, severe, or extreme as a function of deviation from standards. Each standard has a different definition, or 'form' of what constitutes attainment, based on specific air quality statistics. For example, the Federal 8-hour CO standard is not to be exceeded more than once per year; therefore, an area is in attainment of the CO standard if no more than one 8-hour ambient air monitoring values exceeds the threshold per year. In contrast, the federal annual $PM_{2.5}$ standard is met if the three-year average of the annual average $PM_{2.5}$ concentration is less than or equal to the standard.

When a state submits a request to the EPA to re-designate a nonattainment area to attainment, the Clean Air Act (CAA) section 175A(a) requires that the state (or states, if the area is a multi-state area) submit a maintenance plan ensuring the area can maintain the air quality standard for which the area is to be re-designated for at least 10 years following the effective date of re-designation.

Table 5 lists the attainment status for the criteria pollutants in the South Coast Air Basin (SCAB).

Table 5
South Coast Air Basin Attainment Status[1]

Pollutant	State Status	National Status
Ozone	Nonattainment	Nonattainment (Extreme)[2]
Carbon monoxide	Attainment	Attainment (Maintenance)
Nitrogen dioxide	Attainment	Attainment (Maintenance)
PM_{10}	Nonattainment	Attainment (Maintenance)
$PM_{2.5}$	Nonattainment	Nonattainment
Lead	Attainment	Nonattainment (Partial)[3]

[1] Source: California Air Resources Board. http://www.arb.ca.gov/desig/adm/adm.htm
[2] 8-Hour Ozone.
[3] Partial Nonattainment designation – Los Angeles County portion of Basin only.

2.4 South Coast Air Quality Management District (SCAQMD)

The agency responsible for air pollution control for the South Coast Air Basin (SCAB) is the South Coast Air Quality Management District (SCAQMD). SCAQMD is responsible for controlling emissions primarily from stationary sources. SCAQMD maintains air quality monitoring stations throughout the SCAB. SCAQMD, in coordination with the Southern California Association of Governments, is also responsible for developing, updating, and implementing the Air Quality Management Plan (AQMP) for the SCAB. An AQMP is a plan prepared and implemented by an air pollution district for a county or region designated as nonattainment of the federal and/or California ambient air quality standards. The term nonattainment area is used to refer to an air SCAB where one or more ambient air quality standards are exceeded.

The latest version is the 2016 AQMP. The 2016 AQMP is a regional blueprint for achieving the federal air quality standards and healthful air. While air quality has dramatically improved over the years, the SCAB still exceeds federal public health standards for both ozone and particulate matter (PM) and experiences some of the worst air pollution in the nation. The 2016 AQMP includes both stationary and mobile source strategies to ensure that rapidly approaching attainment deadlines are met, that public health is protected to the maximum extent feasible, and that the region is not faced with burdensome sanctions if the Plan is not approved or if the NAAQS are not met on time.

According to the 2016 AQMP, the most significant air quality challenge in the SCAB is to reduce nitrogen oxide (NOx) emissions sufficiently to meet the upcoming ozone standard deadlines. Based on the inventory and modeling results, 522 tons per day (tpd) of total

SCAB NOx 2012 emissions are projected to drop to 255 tpd and 214 tpd in the 8-hour ozone attainment years of 2023 and 2031 respectively, due to continued implementation of already adopted regulatory actions ("baseline emissions"). The analysis suggests that total SCAB emissions of NOx must be reduced to approximately 141 tpd in 2023 and 96 tpd in 2031 to attain the 8-hour ozone standards. This represents an additional 45 percent reduction in NOx in 2023, and an additional 55 percent NOx reduction beyond 2031 levels.[2]

2.4.1 SCAQMD Rules and Regulations

The SCAQMD establishes a program of rules and regulations to achieve attainment of the state and federal standards in conjunction with the AQMP. Several of the rules and regulations that may be applicable to this project include, but are not limited to, the following:

- **SCAQMD Rule 402** prohibits a person from discharging from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

- **SCAQMD Rule 403** governs emissions of fugitive dust during construction and operation activities. Compliance with this rule is achieved through application of standard Best Management Practices, such as application of water or chemical stabilizers to disturbed soils, covering haul vehicles, restricting vehicle speeds on unpaved roads to 15 miles per hour, sweeping loose dirt from paved site access roadways, cessation of construction activity when winds exceed 25 mph, and establishing a permanent ground cover on finished sites.

- **SCAQMD Rule 445** restricts wood burning devices from being installed into any new development and is intended to reduce the emissions of particulate matter for wood burning devices.

- **SCAQMD Rule 1113** governs the sale, use, and manufacturing of architectural coating and limits the VOC content in paints and paint solvents. This rule regulates the VOC content of paints available during construction. Therefore, all paints and

[2] SCAQMD. Final 2016 Air Quality Management Plan. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp

solvents used during construction and operation of project must comply with Rule 1113.

- **SCAQMD Rule 1143** governs the manufacture, sale, and use of paint thinners and solvents used in thinning of coating materials, cleaning of coating application equipment, and other solvent cleaning operations by limiting their VOC content. This rule regulates the VOC content of solvents used during construction. Solvents used during the construction phase must comply with this rule.

- **SCAQMD Rule 1186** limits the presence of fugitive dust on paved and unpaved roads and sets certification protocols and requirements for street sweepers that are under contract to provide sweeping services to any federal, state, county, agency or special district such as water, air, sanitation, transit, or school district.

2.5 Local Climate and Meteorology

The project is in the South Coast Air Basin (SCAB). Climatological data from the nearest weather station to the project site is summarized in Table 6.

Table 6
Meteorological Summary[1]

Month	Temperature (˚F)			Mean Precipitation (inches)
	Max.	Min.	Mean	
January	55.8	68.1	43.1	2.73
February	56.9	68.9	44.9	3.05
March	58.7	70.7	46.7	2.21
April	61.6	73.1	50.0	1.05
May	64.6	75.2	54.0	0.25
June	68.0	78.6	57.4	0.06
July	72.2	83.5	60.9	0.02
August	73.2	84.7	61.6	0.06
September	71.6	83.9	59.3	0.22
October	66.9	79.4	54.5	0.49
November	60.8	74.2	47.5	1.28
December	56.2	68.8	43.6	2.28
Yearly Average	**63.9**	**75.8**	**52.0**	**13.70**

[1] Source: Western Regional Climate Center 2012. Averages derived from measurements recorded between 1906 and 2016, Santa Ana Fire Station.

2.6 Local Air Quality

The air quality at any site is dependent on the regional air quality and local pollutant sources. Regional air quality is determined by the release of pollutants throughout the air basin. Estimates of the existing emissions in the Basin provided in the Final 2016 Air Quality Management Plan, prepared by SCAQMD, March 2017, indicate that collectively, mobile sources account for 60 percent of the VOC, 90 percent of the NOx emissions, 95 percent of the CO emissions and 34 percent of directly emitted PM2.5, with another 13 percent of PM2.5 from road dust.

The SCAQMD has divided the SCAB into fourteen general forecasting areas and thirty eight Source Receptor Areas (SRA) for monitoring and reporting local air quality. The SCAQMD provides daily reports of the current air quality conditions in each general forecast area and SRA. The monitoring areas provide a general representation of the local meteorological, terrain, and air quality conditions within the SCAB.

Table 7 summarizes the published air quality monitoring for the most recent 3-year period available. These pollutant levels were used to comprise a "background" for the project location and existing local air quality. For criteria pollutants not monitored near the site, data from the nearest monitoring station with a comparable setting were used.

Table 7
Local Air Quality

Air Pollutant Location	Averaging Time	Item	2018	2019	2020
Carbon Monoxide -- Central Orange County	1 Hour	Max 1-Hour (ppm)	2.3	2.4	2.3
		Exceeded State Standard (20 ppm)	No	No	No
		Exceeded National Standard (35 ppm)	No	No	No
	8 Hour	Max 8 Hour (ppm)	1.9	1.3	1.7
		Exceeded State Standard (9 ppm)	No	No	No
		Exceeded National Standard (9 ppm)	No	No	No
Ozone -- Central Orange County	1 Hour	Max 1-Hour (ppm)	0.112	0.096	0.142
		Days > State Standard (0.09 ppm)	1	1	6.0
	8 Hour	Max 8 Hour (ppm)	0.071	0.082	0.097
		Days > State Standard (0.07 ppm)	1	1	15
		Days >National Standard (0.070 ppm)	1	1	15
Nitrogen Dioxide -- Central Orange County	1 Hour	Max 1-Hour (ppm)	0.0617	0.0594	0.071
		Exceeded State Standard (0.18 ppm)	No	No	No
	Annual	Annual Average (ppm)	0.0208	0.0127	0.013
		Exceeded >State Standard (0.030 ppm)	No	No	No
		Exceeded >National Standard (0.053 ppm)	No	No	No
Sulfur Dioxide -- Central LA	1 Hour	Max 1 Hour (ppm)	0.0179	0.0100	--
		Exceed State Standard (0.25 ppm)	No	No	--
		Exceed National Standard (0.075 ppm)	No	No	--
Coarse Particles (PM10) -- Central Orange County	24 Hour	Max 24-Hour ($\mu g/m^3$)	129	127	120
		Days > State Standard (50 $\mu g/m^3$)	13	13	13
		Days >National Standard (150 $\mu g/m^3$)	0	0	0
	Annual	Annual Average ($\mu g/m^3$)	27.2	21.9	23.90
		Exceeded State Standard (20 $\mu g/m^3$)	No	No	Yes
Fine Particulates (PM2.5) -- Central Orange County	24 Hour	Max 24-Hour ($\mu g/m^3$)	54.1	36.1	41.40
		Days >National Standard (35 $\mu g/m^3$)	3	3	1
	Annual	Annual Average ($\mu g/m^3$)	11.02	9.32	11.27
		Exceeded State Standard (12 $\mu g/m^3$)	No	No	No
		Exceeded National Standard (15 $\mu g/m^3$)	No	No	No

Source: https://www.aqmd.gov/home/air-quality/historical-air-quality-data/historical-data-by-year
$\mu g/m^3$ = micrograms per cubic meter
ARB = California Air Resource Board
EPA= Environmental Protection Agency
ppm = part per million
(- -) = Data not provided

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3.0 Global Climate Change Setting

Global climate change is the change in the average weather of the earth that is measured by such things as alterations in temperature, wind patterns, storms, and precipitation. Current data shows that the recent period of warming is occurring more rapidly than past geological events. The average global surface temperature has increased by approximately 1.4° Fahrenheit since the early 20th Century. 1.4° Fahrenheit may seem like a small change, but it's an unusual event in Earth's recent history, and as we are seeing, even small changes in temperature can cause enormous changes in the environment.

The planet's climate record, preserved in tree rings, ice cores, and coral reefs, shows that the global average temperature has been stable over long periods of time. For example, at the end of the last ice age, when the Northeast United States was covered by more than 3,000 feet of ice, average global temperatures were only 5° to 9° Fahrenheit cooler than today. The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5° to 10° Fahrenheit over the next century. Therefore, significant changes to the environment are expected in the near future.

The consequences of global climate change include more frequent and severe weather, worsening air pollution by increasing ground level ozone, higher rates of plant and animal extinction, more acidic and oxygen depleted oceans, strain on food and water resources, and threats to densely populated coastal and low lying areas from sea level rise.

The impacts of climate change are already visible in the Southwest United States. In California, the consequences of climate change include;

- A rise in sea levels resulting in the displacement of coastal businesses and residencies
- A reduction in the quality and supply of water from the Sierra snowpack
- Increased risk of large wildfires
- Exacerbation of air quality problems
- Reductions in the quality and quantity of agricultural products
- An increased temperature and extreme weather events
- A decrease in the health and productivity of California's forests

3.1 Greenhouse Gases

GHGs comprise less than 0.1 percent of the total atmospheric composition, yet they play an essential role in influencing climate. Greenhouse gases include naturally occurring compounds such as carbon dioxide (CO_2), methane (CH_4), water vapor (H_2O), and nitrous oxide (N_2O), while others are synthetic. Man-made GHGs include chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), as well as sulfur hexafluoride (SF_6).

Different GHGs have different effects on the Earth's warming. GHGs differ from each other in their ability to absorb energy (their "radiative efficiency") and how long they stay in the atmosphere, also known as the "lifetime".

The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period. The time period usually used for GWPs is 100 years. GWPs provide a common unit of measure, which allows analysts to add up emissions estimates of different gases and allows policymakers to compare emissions reduction opportunities across sectors and gases.

Table 8 lists the 100-year GWP of GHGs from the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5).

Table 8
Global Warming Potential of Greenhouse Gases[1, 2]

Gas Name	Formula	Lifetime (years)	GWP
Carbon Dioxide	CO_2		1
Methane	CH_4	12	28
Nitrous Oxide	N_2O	114	265
Sulphur Hexafluoride	SF_6	3200	23,500
Nitrogen Trifluoride	NF_3	740	16,100
Hexafluoroethane (PFC-116)	C_2F_6	10,000	11,100
Octafluoropropane (PFC-218)	C_3F_8	2,600	8,900
Octafluorocyclobutane (PFC-318)	C_4F_8	3,200	9,540
Tetrafluoromethane (PFC-14)	CF_4	50,000	6,630
Hydrofluorocarbon 125	HFC-125	29	3,170
Hydrofluorocarbon 134a	HFC-134a	14	1,300
Hydrofluorocarbon 143a	HFC-143a	52	4,800
Hydrofluorocarbon 152a	HFC-152a	1	138
Hydrofluorocarbon 227ea	HFC-227ea	34	3,350
Hydrofluorocarbon 23	HFC-23	270	12,400
Hydrofluorocarbon 236fa	HFC-236fa	240	8,060
Hydrofluorocarbon 245fa	HFC-245fa	8	858
Hydrofluorocarbon 32	HFC-32	5	677
Hydrofluorocarbon 365mfc	HFC-365mfc	9	804
Hydrofluorocarbon 43-10mee	HFC-43-10mee	16	1,650

[1] Source: IPCC Fifth Assessment Report (AR5)
https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf
[2] GWPs are used to convert GHG emission values to "carbon dioxide equivalent" (CO_2e) units

3.2 GHG Regulatory Setting – State of California

The State of California has been a leader in climate change legislation and has passed numerous bills to reduce greenhouse gas emissions across all sectors of the economy. Some of the key climate legislation in the State include the following:

- **Assembly Bill (AB) 32, California Global Warming Solutions Act of 2006.** AB 32 set the stage for the State's transition to a sustainable, low-carbon future. AB 32 was the first program in the country to take a comprehensive, long-term approach to addressing climate change.[3]

- **Senate Bill (SB) 375, Sustainable Communities & Climate Protection Act of 2008.** SB 375 requires the Air Resources Board to develop regional greenhouse gas emission reduction targets for passenger vehicles GHG reduction targets for 2020 and 2035 for each region covered by the State's 18 metropolitan planning organizations.[4]

- **Senate Bill (SB) 100, California Renewables Portfolio Standard Program.** SB 100 established a landmark policy requiring renewable energy and zero-carbon resources supply 100 percent of electric retail sales to end-use customers by 2045.[5]

3.3 GHG Emissions Inventory

Table 9 shows the latest GHG emission inventories at the national, state, regional and local levels.

Table 9
GHG Emissions Inventory[1]

United States (2019)[2]	State of California (2019)[3]	SCAG (2020)[4]
6,558 $MMTCO_2e$	418.2 $MMTCO_2e$	216.4 $MMTCO_2e$

[1] $MMTCO_2e$ = Million Metric Tons of Carbon Dioxide Equivalent
2 https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
3 https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2019/ghg_inventory_trends_00-19.pdf.
4 http://www.scag.ca.gov/programs/Pages/GreenhouseGases.aspx. Projected Emission from SACG - Regional GHG Inventory and Reference Case Projections, 1990-2035, dated May 30, 2012.

[3] California Air Resources Board. AB 32 Global Warming Solutions Act of 2006. https://ww2.arb.ca.gov/resources/fact-sheets/ab-32-global-warming-solutions-act-2006
[4] California Air Resources Board. Sustainable Communities and Climate Protection Program. https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-climate-protection-program/about
[5] California Energy Commission. SB 100 Joint Agency Report. https://www.energy.ca.gov/sb100

4.0 Modelling Parameters and Assumptions

The California Emissions Estimator Model Version 2020.4.0 (CalEEMod) was used to calculate criteria air pollutants and GHG emissions from the construction and operation of the project. CalEEMod is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify criteria air pollutant and GHG emissions.

The model quantifies direct emissions from construction and operation activities (including vehicle use), as well as indirect emissions, such as GHG emissions from off-site energy generation, solid waste disposal, vegetation planting and/or removal, and water use. The model also identifies mitigation measures to reduce criteria pollutant and GHG emissions. The model was developed for the California Air Pollution Control Officers Association (CAPCOA) in collaboration with the California air districts.

4.1 Construction Assumptions

Construction of the project is estimated to begin in the year 2022 and last approximately 33 months. Construction activities are expected to consist of site preparation, grading, building construction, paving, and architectural coating. The project is expected to be operational in the year 2025. Construction phases are adjusted based on the information provided by the applicant and are not expected to overlap.

The project site is currently vacant, and no demolition is expected to be required.

The project is expected to export approximately 60,720 cubic yards of earthwork material as part for grading purposes.

The CalEEMod default construction equipment list is based on surveyed data and the size of the site. The parameters used to estimate construction emissions, such as the worker and vendor trips and trip lengths, utilize the CalEEMod defaults.

The project will be required to comply with several standard fugitive dust control measures, per SCAQMD Rule 403. The following key inputs are utilized in CalEEMod and are based upon data provided from SCAQMD[6]:

[6] SCAQMD. Fugitive Dust Mitigation Measures. http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies/fugitive-dust

- Soil stabilizers - 30% PM_{10} and $PM_{2.5}$ reduction.
- Replace ground cover - 15% PM_{10} and $PM_{2.5}$ reduction.
- Water exposed areas 2x per day.
- Unpaved road moisture content – 25%.
- Unpaved road vehicle speed – 15 mph.

4.2 Localized Construction Analysis Modeling Parameters

CalEEMod calculates construction emissions based on the number of equipment hours and the maximum daily disturbance activity possible for each piece of equipment. This report identifies the following parameters in the project design or applicable mitigation measures in order to compare CalEEMod reported emissions against the localized significance threshold lookup tables:

1) The off-road equipment list (including type of equipment, horsepower, and hours of operation) assumed for the day of construction activity with maximum emissions.
2) The maximum number of acres disturbed on the peak day.
3) Any emission control devices added onto off-road equipment.
4) Specific dust suppression techniques used on the day of construction activity with maximum emissions.

4.3 Operational Assumptions

Operational emissions occur over the life of the project and are considered "long-term" sources of emissions. Operational emissions include both direct and indirect sources. This section briefly describes the operational sources of emissions analyzed for the project.

4.3.1 Mobile Source Emissions

Mobile source emissions are the largest source of long-term air pollutants from the operation of the project. Mobile sources are direct sources of project emissions that are primarily attributed to tailpipe exhaust and road dust (tire, brake, clutch, and road surface wear) from motor vehicles traveling to and from the site.

Estimates of mobile source emissions require information on four parameters: trip generation, trip length, vehicle/fleet mix, and emission factors (quantity of emission for each mile traveled or time spent idling by each vehicle).

The Emission Factors (EMFAC) 2017 model is used to estimate the mobile source emissions are embedded in the CalEEMod emissions model. No adjustments have been made to default emission factors.

The project's total vehicle miles traveled estimated by CalEEMod is shown in the Table 10 for this project.

Table 10
Operational Vehicle Miles Traveled

Land Use	Annual Vehicle Miles Traveled (VMT)[1]
Hotel	9,196,985
Movie Theater	1,218,365
Total	**10,415,350**

[1] Unmitigated VMT. Total may not add due to rounding.

The trip generation rates for this project are based on the Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

The CalEEMod default fleet mix used for unmitigated conditions is indicated in Table 12 and is based on area-wide averages.

4.3.2 Energy Source Emissions

Energy usage includes both direct and indirect sources of emissions. Direct sources of emissions include on-site natural gas usage (non-hearth) for heating, while indirect emissions include electricity generated by offsite power plants. Natural gas use is measured in units of a thousand British Thermal Units (kBTU) per size metric for each land use subtype and electricity use is measured in kilowatt hours (kWh) per size metric for each land use subtype.

CalEEMod divides building electricity and natural gas use into uses that are subject to Title 24 standards and those that are not. Lighting electricity usage is also calculated as a separate category in CalEEMod. For electricity, Title 24 uses include the major building envelope systems covered by Part 6 (California Energy Code) of Title 24, such as space heating, space cooling, water heating, and ventilation. Non-Title 24 uses include all other end uses, such as appliances, electronics, and other miscellaneous plug-in uses. Because some lighting is not considered as part of the building envelope energy budget, and since a

separate mitigation measure is applicable to this end use, CalEEMod makes lighting a separate category.

For natural gas, uses are likewise categorized as Title 24 or Non-Title 24. Title 24 uses include building heating and hot water end uses. Non-Title 24 natural gas uses include cooking and appliances (including pool/spa heaters).

The baseline values are based on the California Energy Commission (CEC) sponsored California Commercial End Use Survey (CEUS).

Table 11 shows the total annual expected electricity and natural gas usage for the proposed project. CalEEMod does not provide energy usage rates for recreational swimming pool, therefore, to estimate the energy requirements for the operation of recreational swimming pool, additional energy usage has been added to the swimming pool land use and is based on usage rates consistent with the hotel use.

Table 11
Electricity and Natural Gas Usage

Land Use	Electricity Usage[1] (KWhr/yr)[2]	Natural Gas Usage[1] (KBTU/yr)[2]
Hotel	3,319,450.00	12,879,500.00
Movie Theater (Nick Studio)	58,212.50	146,130.00
Quality Restaurant	792,623.00	5,764,180.00
Health Club (Spa)	70,559.6	177,124
Recreational Swimming Pool[3]	218,575	848,071
Enclosed Parking with Elevator	1,357,170	--
Total	**4,956,900.6**	**15,780,088**

[1] CalEEMod unmitigated default estimates.
[2] KWhr/yr = Kilowatt Hours per Year
KBTU/yr = Thousand British Thermal Units per Year
[3] Electricity usage for Recreational Swimming Pool is modeled in CalEEMod using Hotel Energy Usage rates.

4.3.3 Area Source Emissions

Area source emissions are direct sources of emissions that fall under four categories: hearths, consumer products, architectural coatings, and landscaping equipment.

Per SCAQMD rule 445, no wood burning devices are allowed in new developments; therefore, no wood hearths are included in this project.

Consumer products are various solvents used in non-industrial applications which emit ROGs during their product use. These typically include cleaning supplies, kitchen aerosols, cosmetics, and toiletries.

Architectural coating includes VOC off-gassing emissions that result from evaporation of solvents contained in surface coatings such as in paints and primers. CalEEMod calculates the VOC evaporative emissions from the re-application of surface coatings on the project site.

Landscaping equipment includes fuel combustion emissions from equipment such as lawn mowers, roto tillers, shredders/grinders, blowers, trimmers, chain saws, and hedge trimmers, as well as air compressors, generators, and pumps. The emissions from landscape equipment are based on the OFFROAD 2011 and CARB's Technical Memo: Change in Population and Activity Factors for Lawn and Garden Equipment (June 13, 2003)[7].

4.3.4 Other Sources of Operational Emissions

Water. Greenhouse gas emissions are generated from the upstream energy required to supply and treat the water used on the project site. Indirect emissions from water usage are counted as part of the project's overall impact. The estimated water usage for the project is reported in Table 14 and recommendations to reduce water usage are discussed in Section 6.0.

Waste. CalEEMod calculates the indirect GHG emissions associated with waste that is disposed of at a landfill. The program uses annual waste disposal rates from the California Department of Resources Recycling and Recovery (CalRecycle) data for individual land uses. The program quantifies the GHG emissions associated with the decomposition of the waste which generates methane based on the total amount of degradable organic carbon.

The estimated waste generation by the project is reported in Table 12 and recommendations to reduce waste generation in landfills are discussed in Section 6.0

[7] California Air Resources Board. OFFROAD Modeling Change Technical Memo. Website: https://ww3.arb.ca.gov/msei/2001_residential_lawn_and_garden_changes_in_eqpt_pop_and_act.pdf

Table 12
Operational Water Usage and Waste Generation

Land Use	Water Usage (gallons/year)			Waste Generation (tons/year)[1]
	Indoor	Outdoor	Total	
Hotel	12,683,385.00	1,409,265.00	14,092,650.00	273.75
Movie Theater (Nick Studio)	2,827,274.29	180,464.32	3,007,738.61	41.04
Quality Restaurant	6,768,801.79	432,051.18	7,200,852.97	20.35
Health Club (Spa)	504,491.00	309,204.00	813,695.00	48.62
Recreational Swimming Pool	1,477,395.74	905,500.61	2,382,896.35	142.39
Total	**24,261,348**	**3,236,485**	**27,497,833**	**525.24**

[1] CalEEMod unmitigated default estimates.

5.0 Significance Thresholds

5.1 Air Quality Significance Thresholds

The SCAQMD has established air quality emissions thresholds for criteria air pollutants for the purposes of determining whether a project may have a significant effect on the environment per Section 15002(g) of the Guidelines for implementing CEQA. By complying with the thresholds of significance, the project would be in compliance with the SCAQMD Air Quality Management Plan (AQMP) and the federal and state air quality standards.

Table 13 lists the air quality significance thresholds for the six air pollutants analyzed in this report. Lead is not included as part of this analysis as the project is not expected to emit lead in any significant measurable quantity.

Table 13
SCAQMD Air Quality Significance Thresholds

Pollutant	Construction (lbs/day)	Operation (lbs/day)
NO_X	100	55
VOC	75	55
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_X	150	150
CO	550	550

[1] Source: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf

5.2 Air Quality Localized Significance Thresholds

Air quality emissions were analyzed using the SCAQMD's Mass Rate Localized Significant Threshold (LST) Look-up Tables.

Table 14 lists the Localized Significance Thresholds (LST) used to determine whether a project may generate significant adverse localized air quality impacts. LSTs represent the maximum emissions from a project that are not expected to cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard.

LSTs are developed based on the ambient concentrations of four applicable air pollutants for source receptor area (SRA) 17 –Central Orange County.

The nearest existing sensitive receptors are located along the northern, southern and western property line of the site, less than 25 meters (approximately 82 feet) from potential areas of on-site construction and operational activity. Although receptors are located closer than 25 meters to the site, SCAQMD LST methodology states that projects with boundaries located closer than 25 meters to the nearest receptor should use the LSTs for receptors located at 25 meters.

The daily disturbance area is estimated to be 3.5 acres, however LST thresholds are only based on 1, 2 and 5-acre sites. Using a linear trend line analysis, the localized significance thresholds are calculated below.

Table 14
SCAQMD Localized Significance Thresholds[1] (LST)

Pollutant	Construction (lbs/day)	Operation (lbs/day)
NO_X	147.0	147.0
CO	975.2	975.2
PM_{10}	9.6	2.4
$PM_{2.5}$	5.5	1.6

[1] Source: SCAQMD Mass Rate Localized Significance Thresholds for 3.5-acre site in SRA-17 at 25 meters

5.3 GHG Significance Thresholds

5.3.1 SCAQMD recommended GHG Thresholds

SCAQMD has developed recommended GHG thresholds of significance to assist local agencies with determining the impact of a project for CEQA. SCAQMD's objective in providing the GHG guidelines is to establish a performance standard that will ultimately contribute to reducing GHG emissions below 1990 levels, and thus achieve the requirements of the California Global Warming Solutions Act (AB 32).

SCAQMD first issued the *Interim CEQA Greenhouse Gas (GHG) Significance Thresholds* guidance document in October 2008 and has since held several stakeholder working group meetings where staff has presented updated recommendations to the interim document.

The latest recommended GHG thresholds are based on the GHG CEQA Significance Threshold Stakeholder Working Group #15, September 2010.

The SCAQMD describes a five-tiered approach for determining GHG Significance Thresholds.

- **Tier 1 -** If a project is exempt from CEQA, project-level and cumulative GHG emissions are less than significant.

- **Tier 2 -** If the project complies with a GHG emissions reduction plan or mitigation program that avoids or substantially reduces GHG emissions in the project's geographic area (i.e., city or county), project-level and cumulative GHG emissions are less than significant.

For projects that are not exempt or where no qualifying GHG reduction plans are directly applicable, SCAQMD requires an assessment based on the following tiers.

- **Tier 3 -** Consists of screening values that are intended to capture 90 percent of the GHG emissions from projects. If a project's emissions are under the screening thresholds, then the project is less than significant. SCAQMD has presented two options that lead agencies could choose for screening values. Option #1 sets the thresholds for residential projects to 3,500 $MTCO_2e$/year, commercial projects to 1,400 $MTCO_2e$/year), and mixed use projects to 3,000 $MTCO_2e$/year. Option #2 sets a single numerical threshold for all non-industrial projects of 3,000 $MTCO_2e$/year. The current staff recommendation is to use option #2, but allows lead agencies to choose option #1 if they prefer. Regardless of which option a lead agency chooses to follow, it is recommended that the same option is consistently used for all projects.

Table 15 shows the screening levels described in option #2, which has been used previously in the City of Garden Grove.

Table 15
SCAQMD Tier 3 GHG Screening Values

Land Use	Screening Value
Industrial Projects	10,000 $MTCO_2e$/Yr
Residential/Commercial Projects	3,000 $MTCO_2e$/Yr

- **Tier 4 -** includes performance standards compliance options to demonstrate that a project is not significant for GHG emissions.

  Compliance Option 1: The lead agency would calculate GHG emissions for a project using a BAU methodology. Once GHG emissions are calculated, the project proponent would need to incorporate design features into the project and/or implement GHG mitigation measures to demonstrate a 30 percent reduction from BAU. Although a 30 percent reduction below BAU is consistent with the target objectives of AB 32, it will continue to reduce GHG emissions beyond 2020, thus, contributing to GHG reductions pursuant to the Governor's Executive Order S-3- 05 (a 90 percent reduction compared to current GHG emissions). A 30 percent reduction is also considered to be an achievable GHG reduction target based on current technologies.

- **Tier 5 –** involves implementing off-site mitigation or the purchasing of offsets to reduce GHG emissions to less than the proposed screening level. The project proponent would be required to provide offsets for the life of the project, which is defined as 30 years.

By complying with the SCAQMD GHG thresholds of significance, the project is considered to be in compliance with the applicable State GHG legislation.

5.3.2 CARB 2017 Climate Change Scoping Plan Update

As of January 20, 2017, the California Air Resources Board (CARB) has updated the scoping plan established for the State of California to achieve the target greenhouse gas reductions. The latest scoping plan provides the framework for reducing 2030 GHG emission levels by 40% below 1990 level. This report suggests that to be consistent with the latest scoping plan, the proposed project must demonstrate it can achieve a 40% reduction in long term operational emissions compared to BAU conditions.

6.0 Air Quality Impact Analysis

Consistent with and the State CEQA Guidelines Appendix G, a significant impact related to air quality would occur if the proposed project is determined to:

a) Conflict with or obstruct implementation of the applicable air quality plan.

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable Federal or State ambient air quality standard.

c) Expose sensitive receptors to substantial pollutant concentrations.

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

6.1 Short Term Air Quality Impacts - Construction

6.1.1 Regional Daily Emissions - Construction

Daily air quality emissions include both on-site and off-site emissions associated with construction of the project. Regional daily emissions of criteria pollutants are compared to the SCAQMD thresholds of significance.

As shown in Table 16, daily emissions of criteria pollutants are expected to be below the applicable thresholds of significance.

CalEEMod unmitigated daily emissions outputs are provided in Appendix A.

Table 16
Daily Construction Emissions – Unmitigated

Maximum Daily Emissions (lbs/day)[1]						
Activity	**VOC**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Site Preparation	0.52	2.06	21.46	0.04	7.78	3.98
Grading	1.64	50.73	31.68	0.21	8.68	3.21
Building Construction	1.33	6.95	28.01	0.07	4.05	1.15
Paving	0.27	0.98	14.07	0.02	0.25	0.09
Architectural Coating	52.68	0.22	3.39	0.01	0.66	0.18
Maximum[1]	**52.68**	**50.73**	**31.68**	**0.21**	**8.68**	**3.98**
SCAQMD Threshold	75	100	550	150	150	55
Exceeds Threshold (?)	**No**	**No**	**No**	**No**	**No**	**No**

[1] Maximum daily emission during summer or winter; includes both on-site and off-site project emissions.

The project must follow mandatory SCAQMD rules and requirements with regards to fugitive dust control, as described in Section 6.1.3. Compliance with the standard dust control measures is considered to be part of the conditions of approval for the project and built into the design features.

Table 16 shows that the project's daily construction emissions will be below the applicable SCAQMD air quality standards and thresholds of significance. As a result, the project would not contribute substantially to an existing or projected air quality violation.

Furthermore, by complying with the SCAQMD standards, the project would not contribute to a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

The project's short-term construction impact on regional air resources is less than significant.

6.1.2 Localized Emissions - Construction

Table 17 illustrates the construction related localized emissions and compares the results to SCAQMD LST thresholds. As shown in Table 17, the emissions will be below the SCAQMD thresholds of significance for localized construction emissions. The project must follow all

standard SCAQMD rules and requirements with regards to fugitive dust control, as described in Section 6.1.3. Compliance with the dust control is considered a standard requirement and included as part of the project's design features, not mitigation.

The project's short-term construction impact to localized air resources is less than significant.

Table 17
Localized Construction Emissions – Unmitigated

Maximum Daily Emissions (lbs/day)[1]				
Activity	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**
On-site Emissions	2.23	20.87	7.58	3.93
SCAQMD Construction Threshold[2]	147.0	975.2	9.6	5.5
Exceeds Threshold (?)	**No**	**No**	**No**	**No**

[1] Maximum daily emission during summer or winter; includes on-site project emissions only.
[2] Reference 2006-2008 SCAQMD Mass Rate Localized Significant Thresholds for construction and operation. SRA-17, Central Orange County, 3.5-acre site, receptor distance 25 meters.

6.1.3 Fugitive Dust - Construction

The project is required to comply with regional rules that assist in reducing short-term air pollutant emissions associated with suspended particulate matter, also known as fugitive dust. Fugitive dust emissions are commonly associated with land clearing activities, cut-and-fill grading operations, and exposure of soils to the air and wind. SCAQMD Rule 403 requires that fugitive dust is controlled with best-available control measures so that the presence of such dust does not remain visible in the atmosphere beyond the property line of the emission source. In addition, SCAQMD Rules 402 and 403 require implementation of dust suppression techniques to prevent fugitive dust from creating a nuisance off site.

To ensure full compliance with the applicable dust control standards, the following are recommended for the project:

DF-1 Prior to starting construction, the project should submit a Construction Management Plan to the City of Garden Grove that specifies how all construction design features will be implemented.

DF-2 The project must follow the standard SCAQMD rules (Rule 403) and requirements applicable to fugitive dust control, which includes, but are not limited to the following:

1. All active construction areas shall be watered two (2) times daily.
2. Speed on unpaved roads shall be reduced to less than 15 mph.
3. Any visible dirt deposition on any public roadway shall be swept or washed at the site access points within 30 minutes.
4. Any on-site stockpiles of debris, dirt or other dusty material shall be covered or watered twice daily.
5. All operations on any unpaved surface shall be suspended if winds exceed 15 mph.
6. Access points shall be washed or swept daily.
7. Construction sites shall be sandbagged for erosion control.
8. Apply nontoxic chemical soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for 10 days or more).
9. Cover all trucks hauling dirt, sand, soil, or other loose materials, and maintain at least 2 feet of freeboard space in accordance with the requirements of California Vehicle Code (CVC) section 23114.
10. Pave or provide gravel construction access roads at least 100 feet onto the site from the main road and use gravel aprons at truck exits.
11. Replace the ground cover of disturbed areas as quickly possible.

6.1.4 Odors - Construction

Heavy-duty equipment in the project area during construction will emit odors; however, the construction activity would cease to occur after individual construction is completed. The project is required to comply with Rule 402 during construction, which states that a person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. No other sources of objectionable odors have been identified for the proposed Project.

Therefore, the project impact from odor emissions is less than significant.

6.1.5 Asbestos - Construction

Asbestos is a carcinogen and is categorized as a hazardous air pollutant by the Environmental Protection Agency (EPA). Asbestos fibers imbedded within construction

materials become a health hazard once they are disturbed and rendered airborne, such as through physical contact like building renovation and demolition activities. Asbestos is regulated through the National Emissions Standards for Hazardous Air Pollutants (NESHAP) and SCAQMD is the local enforcement authority for asbestos.

The project is not expected to require the demolition of existing building or structures. Therefore, the potential risk from exposure to asbestos during construction is small.

Asbestos also occurs naturally in serpentine and ultramafic rock. Based on the California Division of Mines and Geology General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos, naturally occurring asbestos has not been shown to occur within in the vicinity of the project site. Therefore, the potential risk for naturally occurring asbestos (NOA) during project construction is small.

In the event asbestos is found on the site, the project will be required to comply with SCAQMD and NESHAP standards and protocols. SCAQMD Rule 1403 establishes the survey requirements, notification, and work practice requirements to prevent asbestos emissions during construction activities. By following the required asbestos abatement protocols, the project impact from asbestos would be less than significant.

6.1.6 Diesel Particulate Matter - Construction

The project will generate diesel particulate matter (DPM) during construction from off-road diesel equipment and trucks. The California Office of Environmental Health Hazard Assessment (OEHHA) adopted the Guidance Manual for Preparation of Health Risk Assessments (HRA Guidelines) to provide procedures for use in the Air Toxics Hot Spots Program or for the permitting of existing, new, or modified stationary sources.[8]

The HRA Guidelines provide risk factors based on exposure to toxic substances over a 30-year lifetime span. The proposed project's construction activity is not expected to be a long-term (i.e., 30 years) source of toxic air contaminant emissions and short-term risk factors have not been developed. Due the significantly reduced risk from short-term exposure, SCAQMD does not typically require the evaluation of long-term cancer risk or chronic health impacts for construction operations from a project such as the one being proposed.

[8] OEHHA. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance for Preparation of Health Risk Assessments. February 2015.

Hence, the impacts from short-term exposure to DMP during project construction may be presumed to be less than significant without the need for a detailed HRA study.

To help further reduce the potential health risks associated with DPM exposure during construction, the following project design features are recommended. Project design features include a recommendation for Tier 4 engines on all off-road diesel equipment. Tier 4 engines, along with the latest national fuel standards, have been shown to yield PM reductions of over 95% from the typical Tier 2 and Tier 3 engines.[9] Thus ensuring the potential DPM exposure to adjacent sensitive receptors is reduced to the maximum extent feasible.

DF-3 All diesel construction equipment should have Tier 4 low emission "clean diesel" engines (OEM or retrofit) that include diesel oxidation catalysts and diesel particulate filters that meet the latest CARB best available control technology.

DF-4 Construction equipment should be maintained in proper tune.

DF-5 All construction vehicles should be prohibited from excessive idling. Excessive idling is defined as five (5) minutes or longer.

DF-6 Minimize the simultaneous operation of multiple construction equipment units, to the maximum extent feasible.

DF-7 The use of heavy construction equipment and earthmoving activity should be suspended during Air Alerts when the Air Quality Index reaches the "Unhealthy" level.

DF-8 Establish an electricity supply to the construction site and use electric powered equipment instead of diesel-powered equipment or generators, where feasible.

DF-9 Establish staging areas for the construction equipment that as far from adjacent residential homes, as feasible.

DF-10 Use haul trucks with on-road engines instead of off-road engines for on-site hauling.

[9] EPA. Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel; Final Rule. (40 CFR Parts 9, 69, et al.)

6.2 Long Term Air Quality Impacts - Operation

6.2.1 Daily Emissions - Operation

Long-term operational air pollutant impacts from the project are shown in Table 18. The project is not expected to exceed any of the allowable daily emissions thresholds for criteria pollutants at the regional level. CalEEMod daily emissions outputs are provided in Appendix A.

The project's daily operational emissions will be below the applicable SCAQMD air quality thresholds of significance and the project would not contribute substantially to an existing or projected air quality violation. Furthermore, by complying with the SCAQMD standards, the project would not contribute to a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

The project related long-term air quality impacts are less than significant.

Table 17
Daily Operational Emissions

Maximum Daily Emissions (lbs/day)[1,2,3]						
Activity	**VOC**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Mobile Sources	10.51	8.56	93.27	0.20	23.48	6.34
Energy Sources	0.59	5.32	4.47	0.03	0.40	0.40
Area Sources	9.44	0.00	0.11	0.00	0.00	0.00
Total	**20.54**	**13.88**	**97.85**	**0.23**	**23.88**	**6.74**
SCAQMD Threshold	55	55	550	150	150	55
Exceeds Threshold (?)	No	No	No	No	No	No

[1] Maximum daily emission during summer or winter; includes both on-site and off-site project emissions.
[2] Daily emissions reports are provided in Appendix A.
[3] Values shown represent unmitigated conditions. Operational air quality emissions would be even less with the inclusion of the recommended GHG mitigation measures.

6.2.2 Localized Operational Emissions - Operation

Table 19 shows the localized operational emissions and compares the results to SCAQMD LST thresholds of significance. As shown in Table 19, the emissions will be below the SCAQMD thresholds of significance for localized operational emissions. **The project will result in less than significant localized operational emissions impacts.**

Table 19
Localized Operational Emissions

Maximum Daily Emissions (lbs/day)[1,4]				
LST Pollutants	NOx (lbs/day)	CO (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)
On-site Emissions[2]	5.75	9.25	1.6	0.7
SCAQMD Operation Threshold[3]	147.0	975.2	2.4	1.6
Exceeds Threshold (?)	**No**	**No**	**No**	**No**

[1] Maximum daily emission in summer or winter.
[2] Mobile source emissions include on-site vehicle emissions only. It is estimated that approximately 5% of mobile emissions will occur on the project site.
[3] Reference: 2006-2008 SCAQMD Mass Rate Localized Significant Thresholds for construction and operation Table C-1 through C-6; SRA 17, Central Orange County disturbance area of 3.5-acre and receptor distance of 25 meters.
[4] Values shown represent unmitigated conditions. Operational air quality emissions would be even less with the inclusion of the recommended GHG mitigation measures.

6.2.3 Odors - Operation

Land uses that commonly receive odor complaints include agricultural uses (farming and livestock), chemical plants, composting operations, dairies, fiberglass molding facilities, food processing plants, landfills, refineries, rail yards, and wastewater treatment plants. The proposed project does not contain land uses that would typically be associated with significant odor emissions.

The project will be required to comply with standard building code requirements related to exhaust ventilation, as well as comply with SCAQMD Rule 402. Rule 402 requires that a person may not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. Project related odors are not

expected to meet the criteria of being a nuisance. **The project's operation would result in less than significant odor impacts.**

6.2.4 Toxic Air Contaminants - Operations

The project would consist of resort hotel land uses. These types of projects do not include major sources of toxic air contaminants (TAC) emissions that would result in significant exposure of sensitive receptors to substantial pollutant concentrations. Examples of land uses that are major sources of TACs include distribution centers with heavy truck traffic, rail yards, ports, refineries, chrome plating facilities, dry cleaners, and gasoline dispensing stations. **The project impact is considered less than significant.**

7.0 Greenhouse Gas Impact Analysis

Consistent with CEQA Guidelines, a significant impact related to greenhouse gas would occur if the proposed project were determined to:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of greenhouse gases.

7.1 Greenhouse Gas Emissions - Construction

Greenhouse gas emissions are estimated for on-site and off-site construction activity using CalEEMod. Table 20 shows the construction greenhouse gas emissions, including equipment and worker vehicle emissions for all phases of construction. Construction emissions are amortized over 30 years and added to the long-term operational emissions, pursuant to SCAQMD recommendations.

CalEEMod unmitigated annual GHG output calculations are provided in Appendix C and mitigated annual GHG reports are provided in Appendix D.

Table 18
Construction Greenhouse Gas Emissions

Activity	Emissions ($MTCO_2e$)[1]		
	On-site	Off-site	Total
Site Preparation	33.71	1.57	35.28
Grading	32.83	245.57	278.40
Building Construction	641.32	1,248.25	1,889.57
Paving	37.14	3.65	40.79
Architectural Coating	9.59	17.63	27.22
Total	754.59	1,516.67	2,271.26
Amortized over 30 years[2]	**25.15**	**50.56**	**75.71**

[1] $MTCO_2e$ = metric tons of carbon dioxide equivalents (includes carbon dioxide, methane, nitrous oxide, and/or hydrofluorocarbon).
[2] The emissions are amortized over 30 years and added to the operational emissions, pursuant to SCAQMD recommendations.

Because impacts from construction activities occur over a relatively short-term period of time, they contribute a relatively small portion of the overall lifetime project GHG emissions and GHG emissions reduction measures for construction equipment are relatively limited. Therefore, SCAQMD recommends that construction emissions be amortized over a 30-year project lifetime and added to the overall project operational emissions.[10] In doing so, construction GHG emissions are included in the overall contribution of the project, as further discussed in the following section.

7.2 Greenhouse Gas Emissions - Operation

Greenhouse gas emissions are estimated for on-site and off-site operational activity using CalEEMod. Greenhouse gas emissions from mobile sources, area sources and energy sources are shown in Table 21. CalEEMod mitigated annual GHG output calculations are provided in Appendix D.

The analysis first compares the Project's GHG emissions to the SCAQMD's Tier 3 threshold, which limits GHG emissions to 3,000 MTCO2e per year. As shown in Table 21, both unmitigated and mitigated GHG emissions are expected to exceed 3,000 MTCO2e. Therefore, the SCAQMD Tier 4 approach is applicable. To help align the project with the State's GHG reduction goals, a 30% reduction in GHG emissions beyond business as usual (BAU) conditions has been used for significant impact analysis purposes. Per SCAQMD guidelines, BAU is based on current regulatory requirements, and is considered the level from which GHG reductions must occur. This approach is consistent with the GHG impact analyses for other similar development projects in the City of Garden Grove.

Table 21 shows that with the recommended mitigation measures the project will provide greater than 30% reduction from BAU conditions, thus complying with the SCAQMD Tier 4 (compliance option 1) significance threshold.

Additionally, it is also demonstrated that project will achieve more than a 40% reduction in GHG emissions with the recommended mitigation measures, which is consistent with the latest 2017 CARB Scoping Plan 2030 target of 40 percent emissions reductions below 1990 levels. It should be noted, however, that the Scoping Plan's statewide GHG reduction targets are not considered to be established significance thresholds under CEQA. The comparison is instead provided for evaluating the project's GHG emissions by their effect on the state's efforts to meet its long-term goals.

[10] SCAQMD. Interim CEQA GHG Significance Thresholds. Page 3-10. 2008

Table 19
Operational Greenhouse Gas Emissions

Emission Source	Emissions ($MTCO_2e$)[1]	
	Unmitigated (BAU)[2]	With Mitigation
Mobile Source	3,220.78	1,180.77
Energy Source	2,100.56	1,841.34
Area Source	0.03	0.02
Water	95.75	86.17
Waste	264.14	132.07
Construction (30 year amortization)	75.71	75.71
Total Annual Emissions	**5,756.97**	**3,316.08**
SCAQMD Tier 3 Threshold[3]	3,000 MTCO2e/year	
Reduction in Emissions	**42%**	
SCAQMD Tier 4 Threshold for GHG Reduction[3]	30%	
Project Consistent with SCAQMD Significance Guidelines?	Yes	
CARB 2017 Scoping Plan Target GHG Reduction[4]	40%	
Project Consistent with CARB Scoping Plan?	Yes	
Significant Impact?	**No**	

[1] $MTCO_2e$ = metric tons of carbon dioxide equivalents
[2] BAU = Business as usual. BAU is used to estimate future emissions from a project. BAU is based on current regulatory requirements and is considered the level from which GHG reductions must occur.
[3] Per South Coast Air Quality Management District (SCAQMD) Draft Guidance Document - Interim CEQA Greenhouse Gas (GHG) Significance Threshold, October 2008.
[4] Per California Air Resources Board 2017 Climate Change Scoping Plan Update, January 2017.

With the inclusion of mitigation measures, the project's impact from GHG emissions would be less than significant.

7.2 Greenhouse Gas Mitigation Measures

The following recommended mitigation measures that have been identified to help reduce the project's GHG emissions to be less than significant:

GHG-1 The number of large diesel trucks coming to the site (i.e. for deliveries, trash collection, or other services) shall be limited to 20 trucks per day or less. This restriction is specifically applicable to trucks classified as medium-heavy duty and heavy-heavy duty with gross vehicle weight (GVW) greater than 19,500 pounds.

GHG-2 On-site renewable energy sources (i.e. solar panels) shall be installed capable of generating up to 25% of the projects total electricity demand.

GHG-3 Prior to receiving a Certificate of Occupancy, the project shall demonstrate to the satisfaction of the Garden Grove Building and Safety Division that water conservation strategies have been implemented, including low flow fixtures and toilets, water efficient irrigation systems, drought tolerant/native landscaping, and pool water recycling systems.

GHG-4 Waste management, recycling and composting programs shall be implemented to divert up to 50% of waste away from a landfill.

GHG-5 Electric landscaping equipment, such as leaf blowers and pressure washers shall be used.

GHG-6 No on-site natural gas fire places or fire pits shall be installed.

GHG-7 Trip reduction measures and project design features shall be implemented to reduce the number of auto-based trips generated by the project and to encourage the use of transit, bicycling, and walking through the following measures.

1. Improve the walkability and design of the project by providing pedestrian and bicycling connections within the project site and to adjacent off-site facilities (i.e., sidewalks, crosswalks, wayfinding signage, etc.).

2. Provide traffic calming measures (i.e., marked crosswalks, raised crosswalks, raised intersections, count-down signal timers, curb extensions, speed tables, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc.)

3. Provide secure on-site bicycle racks and provide bicycle rentals for hotel guests.

4. Provide transit/shuttle service for guest to local area attractions. The shuttle service shall operate on a regular daily basis and be offered to all guests staying at the hotel.

5. Hotel management/concierge should provide information that promotes walking, bicycling and public transit options to nearby attractions. This should include information on local bus routes and schedules and wayfinding to the existing transit stops along Harbor Boulevard.

Exhibits

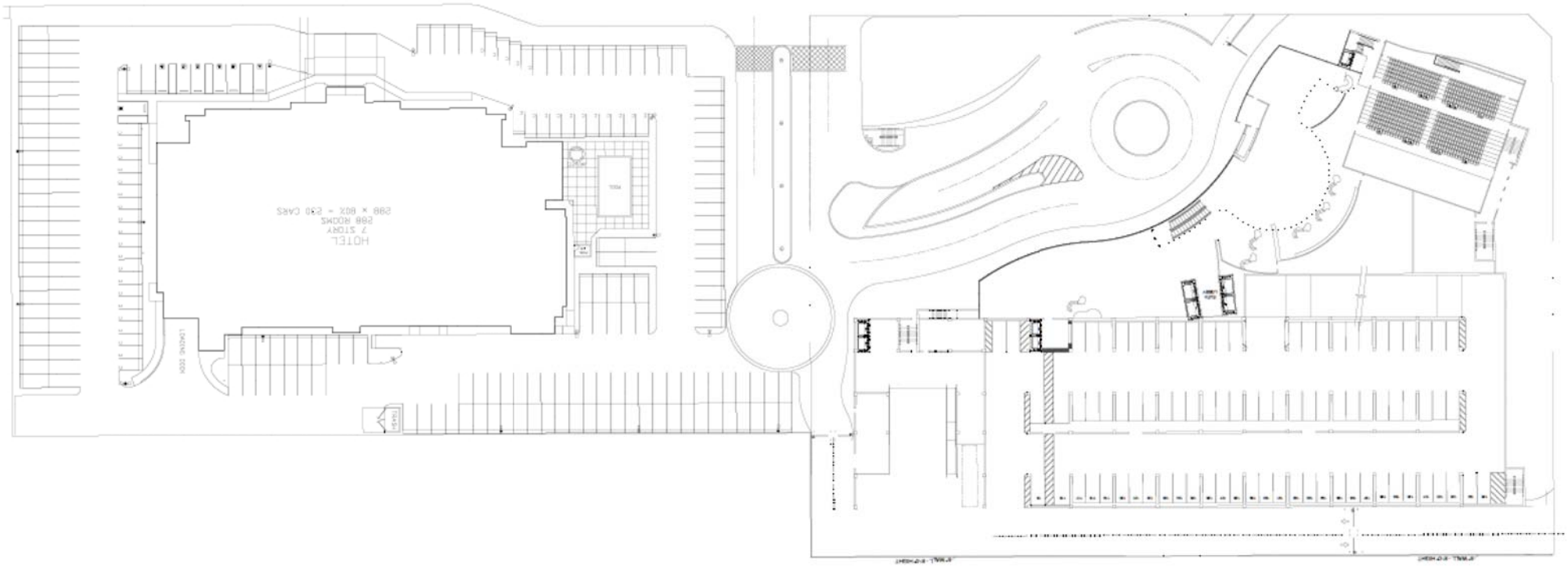
Exhibit A

Location Map



N

Exhibit B
Site Plan



N

Appendices

Appendix A

Daily Emissions Calculations Output - Unmitigated
(CalEEMod)

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated

Orange County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Hotel	500.00	Room	3.72	379,366.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	18.00	75.00
tblConstructionPhase	NumDays	230.00	550.00
tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	PhaseEndDate	11/24/2023	7/28/2025
tblConstructionPhase	PhaseEndDate	10/5/2023	2/10/2025
tblConstructionPhase	PhaseEndDate	11/17/2022	1/2/2023
tblConstructionPhase	PhaseEndDate	10/31/2023	4/14/2025
tblConstructionPhase	PhaseEndDate	11/7/2022	11/28/2022
tblConstructionPhase	PhaseStartDate	11/1/2023	4/15/2025
tblConstructionPhase	PhaseStartDate	11/18/2022	1/3/2023
tblConstructionPhase	PhaseStartDate	11/8/2022	11/29/2022
tblConstructionPhase	PhaseStartDate	10/6/2023	2/11/2025
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.57	0.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.20	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.2243	68.1533	29.0437	0.2123	19.8582	1.6137	21.4719	10.1558	1.4846	11.6404	0.0000	23,546.9953	23,546.9953	2.8890	3.2909	24,599.9009
2023	2.5068	54.1438	27.6127	0.2014	12.8197	1.0087	13.8283	4.9607	0.9366	5.8973	0.0000	22,434.2429	22,434.2429	2.8914	3.1178	23,435.6260
2024	2.3548	17.8637	26.1019	0.0735	3.9752	0.6504	4.6256	1.0706	0.6118	1.6824	0.0000	7,493.7412	7,493.7412	0.7937	0.3726	7,624.6084
2025	52.8111	16.8259	25.5204	0.0722	3.9752	0.5641	4.5393	1.0706	0.5307	1.6012	0.0000	7,386.3566	7,386.3566	0.7869	0.3646	7,514.6911
Maximum	**52.8111**	**68.1533**	**29.0437**	**0.2123**	**19.8582**	**1.6137**	**21.4719**	**10.1558**	**1.4846**	**11.6404**	**0.0000**	**23,546.9953**	**23,546.9953**	**2.8914**	**3.2909**	**24,599.9009**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.6381	48.8718	31.5237	0.2123	8.2768	0.4070	8.6837	3.9176	0.3914	3.9806	0.0000	23,546.9953	23,546.9953	2.8890	3.2909	24,599.9009
2023	1.2619	37.7816	30.6147	0.2014	8.2765	0.2822	8.5587	2.8203	0.2721	3.0923	0.0000	22,434.2429	22,434.2429	2.8914	3.1178	23,435.6260
2024	1.2111	6.6546	27.3953	0.0735	3.9752	0.0779	4.0531	1.0706	0.0757	1.1463	0.0000	7,493.7412	7,493.7412	0.7937	0.3726	7,624.6084
2025	52.6700	6.5910	26.8960	0.0722	3.9752	0.0773	4.0525	1.0706	0.0752	1.1458	0.0000	7,386.3566	7,386.3566	0.7869	0.3646	7,514.6911
Maximum	**52.6700**	**48.8718**	**31.5237**	**0.2123**	**8.2768**	**0.4070**	**8.6837**	**3.9176**	**0.3914**	**3.9806**	**0.0000**	**23,546.9953**	**23,546.9953**	**2.8914**	**3.2909**	**24,599.9009**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**6.76**	**36.36**	**-7.53**	**0.00**	**39.69**	**77.99**	**42.99**	**48.55**	**77.15**	**55.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.5131	7.9264	93.0916	0.2029	23.3410	0.1378	23.4788	6.2117	0.1279	6.3396		21,159.6212	21,159.6212	1.3412	0.7835	21,426.6186
Total	**20.5370**	**13.2498**	**97.6735**	**0.2348**	**23.3410**	**0.5427**	**23.8837**	**6.2117**	**0.5328**	**6.7445**		**27,546.6402**	**27,546.6402**	**1.4642**	**0.9005**	**27,851.6065**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.5131	7.9264	93.0916	0.2029	23.3410	0.1378	23.4788	6.2117	0.1279	6.3396		21,159.6212	21,159.6212	1.3412	0.7835	21,426.6186
Total	**20.5370**	**13.2498**	**97.6735**	**0.2348**	**23.3410**	**0.5427**	**23.8837**	**6.2117**	**0.5328**	**6.7445**		**27,546.6402**	**27,546.6402**	**1.4642**	**0.9005**	**27,851.6065**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	
4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Building Construction	Cranes	1	7.00	231	0.29
Grading	Excavators	1	8.00	158	0.38
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Grading	Graders	1	8.00	187	0.41
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.6570	0.0000	19.6570	10.1025	0.0000	10.1025			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**19.6570**	**1.6126**	**21.2696**	**10.1025**	**1.4836**	**11.5860**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0542	0.0364	0.5924	1.7500e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		178.3944	178.3944	4.1700e-003	3.9800e-003	179.6856
Total	**0.0542**	**0.0364**	**0.5924**	**1.7500e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**178.3944**	**178.3944**	**4.1700e-003**	**3.9800e-003**	**179.6856**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5188	0.0000	7.5188	3.8642	0.0000	3.8642			0.0000			0.0000
Off-Road	0.4656	2.0175	20.8690	0.0380		0.0621	0.0621		0.0621	0.0621	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**0.4656**	**2.0175**	**20.8690**	**0.0380**	**7.5188**	**0.0621**	**7.5809**	**3.8642**	**0.0621**	**3.9263**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0542	0.0364	0.5924	1.7500e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		178.3944	178.3944	4.1700e-003	3.9800e-003	179.6856
Total	**0.0542**	**0.0364**	**0.5924**	**1.7500e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**178.3944**	**178.3944**	**4.1700e-003**	**3.9800e-003**	**179.6856**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**7.3573**	**0.9409**	**8.2981**	**3.4663**	**0.8656**	**4.3319**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.2298	47.2678	13.2774	0.1812	5.2950	0.3576	5.6526	1.4500	0.3422	1.7922		20,526.2869	20,526.2869	1.9566	3.2876	21,554.8946
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0451	0.0303	0.4936	1.4600e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		148.6620	148.6620	3.4700e-003	3.3200e-003	149.7380
Total	**1.2749**	**47.2982**	**13.7710**	**0.1826**	**5.4626**	**0.3585**	**5.8212**	**1.4945**	**0.3430**	**1.8375**		**20,674.9489**	**20,674.9489**	**1.9601**	**3.2909**	**21,704.6326**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.2298	47.2678	13.2774	0.1812	5.2950	0.3576	5.6526	1.4500	0.3422	1.7922		20,526.2869	20,526.2869	1.9566	3.2876	21,554.8946
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0451	0.0303	0.4936	1.4600e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		148.6620	148.6620	3.4700e-003	3.3200e-003	149.7380
Total	**1.2749**	**47.2982**	**13.7710**	**0.1826**	**5.4626**	**0.3585**	**5.8212**	**1.4945**	**0.3430**	**1.8375**		**20,674.9489**	**20,674.9489**	**1.9601**	**3.2909**	**21,704.6326**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.7109	17.9359	14.7507	0.0297		0.7749	0.7749		0.7129	0.7129		2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**1.7109**	**17.9359**	**14.7507**	**0.0297**	**7.3573**	**0.7749**	**8.1322**	**3.4663**	**0.7129**	**4.1793**		**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6327	36.1809	12.4027	0.1704	5.2947	0.2329	5.5276	1.4499	0.2228	1.6728		19,416.7553	19,416.7553	1.9591	3.1147	20,393.9120
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0423	0.0270	0.4593	1.4100e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		144.7966	144.7966	3.1400e-003	3.0900e-003	145.7958
Total	**0.6750**	**36.2079**	**12.8620**	**0.1718**	**5.4624**	**0.2338**	**5.6962**	**1.4944**	**0.2236**	**1.7180**		**19,561.5519**	**19,561.5519**	**1.9623**	**3.1178**	**20,539.7078**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6327	36.1809	12.4027	0.1704	5.2947	0.2329	5.5276	1.4499	0.2228	1.6728		19,416.7553	19,416.7553	1.9591	3.1147	20,393.9120
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0423	0.0270	0.4593	1.4100e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		144.7966	144.7966	3.1400e-003	3.0900e-003	145.7958
Total	**0.6750**	**36.2079**	**12.8620**	**0.1718**	**5.4624**	**0.2338**	**5.6962**	**1.4944**	**0.2236**	**1.7180**		**19,561.5519**	**19,561.5519**	**1.9623**	**3.1178**	**20,539.7078**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1141	3.9602	1.6419	0.0203	0.7226	0.0203	0.7429	0.2080	0.0194	0.2274		2,231.1780	2,231.1780	0.1327	0.3202	2,329.8979
Worker	0.8200	0.5246	8.9105	0.0275	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,809.0537	2,809.0537	0.0610	0.0599	2,828.4383
Total	**0.9341**	**4.4848**	**10.5524**	**0.0478**	**3.9752**	**0.0370**	**4.0122**	**1.0706**	**0.0347**	**1.1053**		**5,040.2317**	**5,040.2317**	**0.1936**	**0.3801**	**5,158.3361**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0269		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.3278**	**2.2347**	**17.4603**	**0.0269**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1141	3.9602	1.6419	0.0203	0.7226	0.0203	0.7429	0.2080	0.0194	0.2274		2,231.1780	2,231.1780	0.1327	0.3202	2,329.8979
Worker	0.8200	0.5246	8.9105	0.0275	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,809.0537	2,809.0537	0.0610	0.0599	2,828.4383
Total	**0.9341**	**4.4848**	**10.5524**	**0.0478**	**3.9752**	**0.0370**	**4.0122**	**1.0706**	**0.0347**	**1.1053**		**5,040.2317**	**5,040.2317**	**0.1936**	**0.3801**	**5,158.3361**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1124	3.9486	1.6297	0.0200	0.7225	0.0213	0.7438	0.2080	0.0203	0.2283		2,196.5659	2,196.5659	0.1341	0.3165	2,294.2388
Worker	0.7708	0.4713	8.3053	0.0266	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,741.4764	2,741.4764	0.0553	0.0561	2,759.5620
Total	**0.8832**	**4.4199**	**9.9351**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,938.0423**	**4,938.0423**	**0.1893**	**0.3726**	**5,053.8008**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1124	3.9486	1.6297	0.0200	0.7225	0.0213	0.7438	0.2080	0.0203	0.2283		2,196.5659	2,196.5659	0.1341	0.3165	2,294.2388
Worker	0.7708	0.4713	8.3053	0.0266	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,741.4764	2,741.4764	0.0553	0.0561	2,759.5620
Total	**0.8832**	**4.4199**	**9.9351**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,938.0423**	**4,938.0423**	**0.1893**	**0.3726**	**5,053.8008**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1108	3.9291	1.6232	0.0196	0.7225	0.0214	0.7439	0.2079	0.0205	0.2284		2,155.4440	2,155.4440	0.1358	0.3119	2,251.7855
Worker	0.7280	0.4272	7.8126	0.0257	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,674.4383	2,674.4383	0.0502	0.0527	2,691.4076
Total	**0.8387**	**4.3563**	**9.4358**	**0.0452**	**3.9752**	**0.0365**	**4.0118**	**1.0706**	**0.0344**	**1.1050**		**4,829.8822**	**4,829.8822**	**0.1860**	**0.3646**	**4,943.1930**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1108	3.9291	1.6232	0.0196	0.7225	0.0214	0.7439	0.2079	0.0205	0.2284		2,155.4440	2,155.4440	0.1358	0.3119	2,251.7855
Worker	0.7280	0.4272	7.8126	0.0257	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,674.4383	2,674.4383	0.0502	0.0527	2,691.4076
Total	**0.8387**	**4.3563**	**9.4358**	**0.0452**	**3.9752**	**0.0365**	**4.0118**	**1.0706**	**0.0344**	**1.1050**		**4,829.8822**	**4,829.8822**	**0.1860**	**0.3646**	**4,943.1930**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8197	7.5321	12.1778	0.0189		0.3524	0.3524		0.3259	0.3259		1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8197**	**7.5321**	**12.1778**	**0.0189**		**0.3524**	**0.3524**		**0.3259**	**0.3259**		**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0500	0.0294	0.5369	1.7600e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		183.8102	183.8102	3.4500e-003	3.6200e-003	184.9765
Total	**0.0500**	**0.0294**	**0.5369**	**1.7600e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**183.8102**	**183.8102**	**3.4500e-003**	**3.6200e-003**	**184.9765**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2194	0.9509	13.5323	0.0189		0.0293	0.0293		0.0293	0.0293	0.0000	1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.2194**	**0.9509**	**13.5323**	**0.0189**		**0.0293**	**0.0293**		**0.0293**	**0.0293**	**0.0000**	**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0500	0.0294	0.5369	1.7600e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		183.8102	183.8102	3.4500e-003	3.6200e-003	184.9765
Total	**0.0500**	**0.0294**	**0.5369**	**1.7600e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**183.8102**	**183.8102**	**3.4500e-003**	**3.6200e-003**	**184.9765**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**52.6660**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1451	0.0851	1.5571	5.1200e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		533.0496	533.0496	0.0100	0.0105	536.4318
Total	**0.1451**	**0.0851**	**1.5571**	**5.1200e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**533.0496**	**533.0496**	**0.0100**	**0.0105**	**536.4318**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0297	0.1288	1.8324	2.9700e-003		3.9600e-003	3.9600e-003		3.9600e-003	3.9600e-003	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**52.5249**	**0.1288**	**1.8324**	**2.9700e-003**		**3.9600e-003**	**3.9600e-003**		**3.9600e-003**	**3.9600e-003**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1451	0.0851	1.5571	5.1200e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		533.0496	533.0496	0.0100	0.0105	536.4318
Total	**0.1451**	**0.0851**	**1.5571**	**5.1200e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**533.0496**	**533.0496**	**0.0100**	**0.0105**	**536.4318**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	10.5131	7.9264	93.0916	0.2029	23.3410	0.1378	23.4788	6.2117	0.1279	6.3396		21,159.6212	21,159.6212	1.3412	0.7835	21,426.6186
Unmitigated	10.5131	7.9264	93.0916	0.2029	23.3410	0.1378	23.4788	6.2117	0.1279	6.3396		21,159.6212	21,159.6212	1.3412	0.7835	21,426.6186

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		
Hotel	3,995.00	4,035.00	2970.00	9,196,985	9,196,985
Movie Theater (No Matinee)	549.68	699.11	576.71	1,218,192	1,218,192
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.68	4,734.11	3,546.71	10,415,177	10,415,177

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
NaturalGas Unmitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	485.272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35286.2	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	400.355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15792.3	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2323.48	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0.485272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35.2862	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	0.400355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15.7923	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2.32348	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

6.0 Area Detail

6.1 Mitigation Measures Area

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Unmitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

7.0 Water Detail

7.1 Mitigation Measures Water

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated

Orange County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Hotel	500.00	Room	3.72	379,366.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	18.00	75.00
tblConstructionPhase	NumDays	230.00	550.00
tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	PhaseEndDate	11/24/2023	7/28/2025
tblConstructionPhase	PhaseEndDate	10/5/2023	2/10/2025
tblConstructionPhase	PhaseEndDate	11/17/2022	1/2/2023
tblConstructionPhase	PhaseEndDate	10/31/2023	4/14/2025
tblConstructionPhase	PhaseEndDate	11/7/2022	11/28/2022
tblConstructionPhase	PhaseStartDate	11/1/2023	4/15/2025
tblConstructionPhase	PhaseStartDate	11/18/2022	1/3/2023
tblConstructionPhase	PhaseStartDate	11/8/2022	11/29/2022
tblConstructionPhase	PhaseStartDate	10/6/2023	2/11/2025
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.57	0.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.20	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.2291	70.0130	29.2036	0.2123	19.8582	1.6137	21.4719	10.1558	1.4846	11.6404	0.0000	23,544.7448	23,544.7448	2.8871	3.2920	24,597.9296
2023	2.5790	55.6857	27.7173	0.2015	12.8197	1.0093	13.8290	4.9607	0.9372	5.8979	0.0000	22,444.8707	22,444.8707	2.8891	3.1209	23,447.1128
2024	2.4252	18.0862	25.5934	0.0723	3.9752	0.6505	4.6257	1.0706	0.6119	1.6825	0.0000	7,366.1812	7,366.1812	0.7948	0.3769	7,498.3502
2025	52.8256	17.0436	25.0488	0.0710	3.9752	0.5642	4.5394	1.0706	0.5308	1.6013	0.0000	7,262.2658	7,262.2658	0.7879	0.3687	7,391.8293
Maximum	**52.8256**	**70.0130**	**29.2036**	**0.2123**	**19.8582**	**1.6137**	**21.4719**	**10.1558**	**1.4846**	**11.6404**	**0.0000**	**23,544.7448**	**23,544.7448**	**2.8891**	**3.2920**	**24,597.9296**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.6122	50.7316	31.6836	0.2123	8.2768	0.4077	8.6845	3.9176	0.3922	3.9806	0.0000	23,544.7448	23,544.7448	2.8871	3.2920	24,597.9296
2023	1.3341	39.3235	30.7193	0.2015	8.2765	0.2828	8.5594	2.8203	0.2727	3.0929	0.0000	22,444.8706	22,444.8706	2.8891	3.1209	23,447.1128
2024	1.2815	6.8771	26.8868	0.0723	3.9752	0.0780	4.0532	1.0706	0.0758	1.1464	0.0000	7,366.1812	7,366.1812	0.7948	0.3769	7,498.3502
2025	52.6844	6.8087	26.4244	0.0710	3.9752	0.0775	4.0527	1.0706	0.0753	1.1459	0.0000	7,262.2658	7,262.2658	0.7879	0.3687	7,391.8293
Maximum	**52.6844**	**50.7316**	**31.6836**	**0.2123**	**8.2768**	**0.4077**	**8.6845**	**3.9176**	**0.3922**	**3.9806**	**0.0000**	**23,544.7448**	**23,544.7448**	**2.8891**	**3.2920**	**24,597.9296**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**6.79**	**35.50**	**-7.58**	**0.00**	**39.69**	**77.96**	**42.99**	**48.55**	**77.11**	**55.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.3977	8.5591	93.2656	0.1949	23.3410	0.1379	23.4788	6.2117	0.1279	6.3396		20,328.3042	20,328.3042	1.3965	0.8216	20,608.0464
Total	**20.4216**	**13.8824**	**97.8474**	**0.2269**	**23.3410**	**0.5428**	**23.8837**	**6.2117**	**0.5328**	**6.7445**		**26,715.3231**	**26,715.3231**	**1.5195**	**0.9387**	**27,033.0343**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.3977	8.5591	93.2656	0.1949	23.3410	0.1379	23.4788	6.2117	0.1279	6.3396		20,328.3042	20,328.3042	1.3965	0.8216	20,608.0464
Total	**20.4216**	**13.8824**	**97.8474**	**0.2269**	**23.3410**	**0.5428**	**23.8837**	**6.2117**	**0.5328**	**6.7445**		**26,715.3231**	**26,715.3231**	**1.5195**	**0.9387**	**27,033.0343**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	
4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Building Construction	Cranes	1	7.00	231	0.29
Grading	Excavators	1	8.00	158	0.38
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Grading	Graders	1	8.00	187	0.41
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.6570	0.0000	19.6570	10.1025	0.0000	10.1025			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**19.6570**	**1.6126**	**21.2696**	**10.1025**	**1.4836**	**11.5860**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0590	0.0400	0.5512	1.6700e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		169.8412	169.8412	4.2600e-003	4.2400e-003	171.2111
Total	**0.0590**	**0.0400**	**0.5512**	**1.6700e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**169.8412**	**169.8412**	**4.2600e-003**	**4.2400e-003**	**171.2111**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5188	0.0000	7.5188	3.8642	0.0000	3.8642			0.0000			0.0000
Off-Road	0.4656	2.0175	20.8690	0.0380		0.0621	0.0621		0.0621	0.0621	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**0.4656**	**2.0175**	**20.8690**	**0.0380**	**7.5188**	**0.0621**	**7.5809**	**3.8642**	**0.0621**	**3.9263**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0590	0.0400	0.5512	1.6700e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		169.8412	169.8412	4.2600e-003	4.2400e-003	171.2111
Total	**0.0590**	**0.0400**	**0.5512**	**1.6700e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**169.8412**	**169.8412**	**4.2600e-003**	**4.2400e-003**	**171.2111**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**7.3573**	**0.9409**	**8.2981**	**3.4663**	**0.8656**	**4.3319**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1999	49.1246	13.4715	0.1812	5.2950	0.3584	5.6534	1.4500	0.3429	1.7929		20,531.1640	20,531.1640	1.9547	3.2884	21,559.9854
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0333	0.4594	1.3900e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		141.5344	141.5344	3.5500e-003	3.5300e-003	142.6759
Total	**1.2491**	**49.1579**	**13.9309**	**0.1826**	**5.4626**	**0.3593**	**5.8220**	**1.4945**	**0.3437**	**1.8382**		**20,672.6984**	**20,672.6984**	**1.9582**	**3.2920**	**21,702.6612**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1999	49.1246	13.4715	0.1812	5.2950	0.3584	5.6534	1.4500	0.3429	1.7929		20,531.1640	20,531.1640	1.9547	3.2884	21,559.9854
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0333	0.4594	1.3900e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		141.5344	141.5344	3.5500e-003	3.5300e-003	142.6759
Total	**1.2491**	**49.1579**	**13.9309**	**0.1826**	**5.4626**	**0.3593**	**5.8220**	**1.4945**	**0.3437**	**1.8382**		**20,672.6984**	**20,672.6984**	**1.9582**	**3.2920**	**21,702.6612**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.7109	17.9359	14.7507	0.0297		0.7749	0.7749		0.7129	0.7129		2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**1.7109**	**17.9359**	**14.7507**	**0.0297**	**7.3573**	**0.7749**	**8.1322**	**3.4663**	**0.7129**	**4.1793**		**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.5956	37.7201	12.5388	0.1705	5.2947	0.2336	5.5283	1.4499	0.2235	1.6734		19,434.3062	19,434.3062	1.9568	3.1176	20,412.2613
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0462	0.0297	0.4279	1.3500e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		137.8735	137.8735	3.2200e-003	3.2900e-003	138.9334
Total	**0.6418**	**37.7498**	**12.9666**	**0.1719**	**5.4624**	**0.2344**	**5.6968**	**1.4944**	**0.2243**	**1.7186**		**19,572.1797**	**19,572.1797**	**1.9600**	**3.1209**	**20,551.1947**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.5956	37.7201	12.5388	0.1705	5.2947	0.2336	5.5283	1.4499	0.2235	1.6734		19,434.3062	19,434.3062	1.9568	3.1176	20,412.2613
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0462	0.0297	0.4279	1.3500e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		137.8735	137.8735	3.2200e-003	3.2900e-003	138.9334
Total	**0.6418**	**37.7498**	**12.9666**	**0.1719**	**5.4624**	**0.2344**	**5.6968**	**1.4944**	**0.2243**	**1.7186**		**19,572.1797**	**19,572.1797**	**1.9600**	**3.1209**	**20,551.1947**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1101	4.1368	1.6944	0.0203	0.7226	0.0205	0.7430	0.2080	0.0196	0.2275		2,234.4596	2,234.4596	0.1323	0.3209	2,333.3874
Worker	0.8961	0.5760	8.3007	0.0261	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,674.7453	2,674.7453	0.0624	0.0638	2,695.3084
Total	**1.0063**	**4.7128**	**9.9951**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,909.2049**	**4,909.2049**	**0.1948**	**0.3846**	**5,028.6958**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0269		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.3278**	**2.2347**	**17.4603**	**0.0269**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1101	4.1368	1.6944	0.0203	0.7226	0.0205	0.7430	0.2080	0.0196	0.2275		2,234.4596	2,234.4596	0.1323	0.3209	2,333.3874
Worker	0.8961	0.5760	8.3007	0.0261	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,674.7453	2,674.7453	0.0624	0.0638	2,695.3084
Total	**1.0063**	**4.7128**	**9.9951**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,909.2049**	**4,909.2049**	**0.1948**	**0.3846**	**5,028.6958**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1084	4.1250	1.6811	0.0200	0.7225	0.0214	0.7439	0.2080	0.0205	0.2284		2,199.8763	2,199.8763	0.1337	0.3172	2,297.7528
Worker	0.8452	0.5174	7.7455	0.0253	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,610.6060	2,610.6060	0.0567	0.0596	2,629.7897
Total	**0.9537**	**4.6424**	**9.4266**	**0.0453**	**3.9752**	**0.0372**	**4.0124**	**1.0706**	**0.0350**	**1.1056**		**4,810.4823**	**4,810.4823**	**0.1904**	**0.3769**	**4,927.5425**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1084	4.1250	1.6811	0.0200	0.7225	0.0214	0.7439	0.2080	0.0205	0.2284		2,199.8763	2,199.8763	0.1337	0.3172	2,297.7528
Worker	0.8452	0.5174	7.7455	0.0253	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,610.6060	2,610.6060	0.0567	0.0596	2,629.7897
Total	**0.9537**	**4.6424**	**9.4266**	**0.0453**	**3.9752**	**0.0372**	**4.0124**	**1.0706**	**0.0350**	**1.1056**		**4,810.4823**	**4,810.4823**	**0.1904**	**0.3769**	**4,927.5425**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1068	4.1051	1.6734	0.0196	0.7225	0.0215	0.7440	0.2079	0.0206	0.2285		2,158.7625	2,158.7625	0.1354	0.3126	2,255.3032
Worker	0.8006	0.4689	7.2908	0.0245	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,547.0290	2,547.0290	0.0516	0.0561	2,565.0280
Total	**0.9074**	**4.5740**	**8.9642**	**0.0440**	**3.9752**	**0.0367**	**4.0119**	**1.0706**	**0.0345**	**1.1051**		**4,705.7915**	**4,705.7915**	**0.1870**	**0.3687**	**4,820.3312**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1068	4.1051	1.6734	0.0196	0.7225	0.0215	0.7440	0.2079	0.0206	0.2285		2,158.7625	2,158.7625	0.1354	0.3126	2,255.3032
Worker	0.8006	0.4689	7.2908	0.0245	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,547.0290	2,547.0290	0.0516	0.0561	2,565.0280
Total	**0.9074**	**4.5740**	**8.9642**	**0.0440**	**3.9752**	**0.0367**	**4.0119**	**1.0706**	**0.0345**	**1.1051**		**4,705.7915**	**4,705.7915**	**0.1870**	**0.3687**	**4,820.3312**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8197	7.5321	12.1778	0.0189		0.3524	0.3524		0.3259	0.3259		1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8197**	**7.5321**	**12.1778**	**0.0189**		**0.3524**	**0.3524**		**0.3259**	**0.3259**		**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0550	0.0322	0.5011	1.6800e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		175.0535	175.0535	3.5400e-003	3.8500e-003	176.2906
Total	**0.0550**	**0.0322**	**0.5011**	**1.6800e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**175.0535**	**175.0535**	**3.5400e-003**	**3.8500e-003**	**176.2906**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2194	0.9509	13.5323	0.0189		0.0293	0.0293		0.0293	0.0293	0.0000	1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.2194**	**0.9509**	**13.5323**	**0.0189**		**0.0293**	**0.0293**		**0.0293**	**0.0293**	**0.0000**	**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0550	0.0322	0.5011	1.6800e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		175.0535	175.0535	3.5400e-003	3.8500e-003	176.2906
Total	**0.0550**	**0.0322**	**0.5011**	**1.6800e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**175.0535**	**175.0535**	**3.5400e-003**	**3.8500e-003**	**176.2906**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**52.6660**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1596	0.0935	1.4532	4.8700e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		507.6553	507.6553	0.0103	0.0112	511.2427
Total	**0.1596**	**0.0935**	**1.4532**	**4.8700e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**507.6553**	**507.6553**	**0.0103**	**0.0112**	**511.2427**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0297	0.1288	1.8324	2.9700e-003		3.9600e-003	3.9600e-003		3.9600e-003	3.9600e-003	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**52.5249**	**0.1288**	**1.8324**	**2.9700e-003**		**3.9600e-003**	**3.9600e-003**		**3.9600e-003**	**3.9600e-003**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1596	0.0935	1.4532	4.8700e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		507.6553	507.6553	0.0103	0.0112	511.2427
Total	**0.1596**	**0.0935**	**1.4532**	**4.8700e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**507.6553**	**507.6553**	**0.0103**	**0.0112**	**511.2427**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	10.3977	8.5591	93.2656	0.1949	23.3410	0.1379	23.4788	6.2117	0.1279	6.3396		20,328.3042	20,328.3042	1.3965	0.8216	20,608.0464
Unmitigated	10.3977	8.5591	93.2656	0.1949	23.3410	0.1379	23.4788	6.2117	0.1279	6.3396		20,328.3042	20,328.3042	1.3965	0.8216	20,608.0464

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		
Hotel	3,995.00	4,035.00	2970.00	9,196,985	9,196,985
Movie Theater (No Matinee)	549.68	699.11	576.71	1,218,192	1,218,192
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.68	4,734.11	3,546.71	10,415,177	10,415,177

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
NaturalGas Unmitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	485.272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35286.2	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	400.355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15792.3	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2323.48	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0.485272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35.2862	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	0.400355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15.7923	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2.32348	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

6.0 Area Detail

6.1 Mitigation Measures Area

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Unmitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

7.0 Water Detail

7.1 Mitigation Measures Water

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix B

Daily Emissions Calculations Output - Mitigated
(CalEEMod)

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated

Orange County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0
Hotel	500.00	Room	3.72	379,366.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Mobile Land Use Mitigation -

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation -

Water Mitigation -

Waste Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	18.00	75.00
tblConstructionPhase	NumDays	230.00	550.00
tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LandUseSquareFeet	8,530.00	8,532.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	7,040.00	7,039.00
tblLandUse	LandUseSquareFeet	22,300.00	22,296.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.20	0.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.57	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.2243	68.1533	29.0437	0.2123	19.8582	1.6137	21.4719	10.1558	1.4846	11.6404	0.0000	23,546.9953	23,546.9953	2.8890	3.2909	24,599.9009
2023	2.5068	54.1438	27.6127	0.2014	12.8197	1.0087	13.8283	4.9607	0.9366	5.8973	0.0000	22,434.2429	22,434.2429	2.8914	3.1178	23,435.6260
2024	2.3548	17.8637	26.1019	0.0735	3.9752	0.6504	4.6256	1.0706	0.6118	1.6824	0.0000	7,493.7412	7,493.7412	0.7937	0.3726	7,624.6084
2025	52.8111	16.8259	25.5204	0.0722	3.9752	0.5641	4.5393	1.0706	0.5307	1.6012	0.0000	7,386.3566	7,386.3566	0.7869	0.3646	7,514.6911
Maximum	**52.8111**	**68.1533**	**29.0437**	**0.2123**	**19.8582**	**1.6137**	**21.4719**	**10.1558**	**1.4846**	**11.6404**	**0.0000**	**23,546.9953**	**23,546.9953**	**2.8914**	**3.2909**	**24,599.9009**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.6381	48.8718	31.5237	0.2123	8.2768	0.4070	8.6837	3.9176	0.3914	3.9806	0.0000	23,546.9953	23,546.9953	2.8890	3.2909	24,599.9009
2023	1.2619	37.7816	30.6147	0.2014	8.2765	0.2822	8.5587	2.8203	0.2721	3.0923	0.0000	22,434.2429	22,434.2429	2.8914	3.1178	23,435.6260
2024	1.2111	6.6546	27.3953	0.0735	3.9752	0.0779	4.0531	1.0706	0.0757	1.1463	0.0000	7,493.7412	7,493.7412	0.7937	0.3726	7,624.6084
2025	52.6700	6.5910	26.8960	0.0722	3.9752	0.0773	4.0525	1.0706	0.0752	1.1458	0.0000	7,386.3566	7,386.3566	0.7869	0.3646	7,514.6911
Maximum	**52.6700**	**48.8718**	**31.5237**	**0.2123**	**8.2768**	**0.4070**	**8.6837**	**3.9176**	**0.3914**	**3.9806**	**0.0000**	**23,546.9953**	**23,546.9953**	**2.8914**	**3.2909**	**24,599.9009**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**6.76**	**36.36**	**-7.53**	**0.00**	**39.69**	**77.99**	**42.99**	**48.55**	**77.15**	**55.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.5133	7.9266	93.0934	0.2029	23.3414	0.1378	23.4792	6.2119	0.1279	6.3397		21,160.0233	21,160.0233	1.3412	0.7835	21,427.0259
Total	**20.5372**	**13.2499**	**97.6753**	**0.2348**	**23.3414**	**0.5427**	**23.8841**	**6.2119**	**0.5328**	**6.7446**		**27,547.0422**	**27,547.0422**	**1.4642**	**0.9006**	**27,852.0138**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4326	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	7.5605	4.0762	45.2067	0.0737	8.0545	0.0590	8.1135	2.1435	0.0546	2.1982		7,691.0458	7,691.0458	0.7616	0.4256	7,836.9261
Total	**17.5786**	**9.3991**	**49.7419**	**0.1057**	**8.0545**	**0.4636**	**8.5181**	**2.1435**	**0.4593**	**2.6029**		**14,077.9546**	**14,077.9546**	**0.8842**	**0.5427**	**14,261.7950**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.41**	**29.06**	**49.07**	**55.00**	**65.49**	**14.57**	**64.34**	**65.49**	**13.79**	**61.41**	**0.00**	**48.89**	**48.89**	**39.61**	**39.73**	**48.79**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	
4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.6570	0.0000	19.6570	10.1025	0.0000	10.1025			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**19.6570**	**1.6126**	**21.2696**	**10.1025**	**1.4836**	**11.5860**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0542	0.0364	0.5924	1.7500e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		178.3944	178.3944	4.1700e-003	3.9800e-003	179.6856
Total	**0.0542**	**0.0364**	**0.5924**	**1.7500e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**178.3944**	**178.3944**	**4.1700e-003**	**3.9800e-003**	**179.6856**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5188	0.0000	7.5188	3.8642	0.0000	3.8642			0.0000			0.0000
Off-Road	0.4656	2.0175	20.8690	0.0380		0.0621	0.0621		0.0621	0.0621	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**0.4656**	**2.0175**	**20.8690**	**0.0380**	**7.5188**	**0.0621**	**7.5809**	**3.8642**	**0.0621**	**3.9263**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0542	0.0364	0.5924	1.7500e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		178.3944	178.3944	4.1700e-003	3.9800e-003	179.6856
Total	**0.0542**	**0.0364**	**0.5924**	**1.7500e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**178.3944**	**178.3944**	**4.1700e-003**	**3.9800e-003**	**179.6856**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**7.3573**	**0.9409**	**8.2981**	**3.4663**	**0.8656**	**4.3319**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.2298	47.2678	13.2774	0.1812	5.2950	0.3576	5.6526	1.4500	0.3422	1.7922		20,526.2869	20,526.2869	1.9566	3.2876	21,554.8946
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0451	0.0303	0.4936	1.4600e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		148.6620	148.6620	3.4700e-003	3.3200e-003	149.7380
Total	**1.2749**	**47.2982**	**13.7710**	**0.1826**	**5.4626**	**0.3585**	**5.8212**	**1.4945**	**0.3430**	**1.8375**		**20,674.9489**	**20,674.9489**	**1.9601**	**3.2909**	**21,704.6326**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.2298	47.2678	13.2774	0.1812	5.2950	0.3576	5.6526	1.4500	0.3422	1.7922		20,526.2869	20,526.2869	1.9566	3.2876	21,554.8946
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0451	0.0303	0.4936	1.4600e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		148.6620	148.6620	3.4700e-003	3.3200e-003	149.7380
Total	**1.2749**	**47.2982**	**13.7710**	**0.1826**	**5.4626**	**0.3585**	**5.8212**	**1.4945**	**0.3430**	**1.8375**		**20,674.9489**	**20,674.9489**	**1.9601**	**3.2909**	**21,704.6326**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.7109	17.9359	14.7507	0.0297		0.7749	0.7749		0.7129	0.7129		2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**1.7109**	**17.9359**	**14.7507**	**0.0297**	**7.3573**	**0.7749**	**8.1322**	**3.4663**	**0.7129**	**4.1793**		**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6327	36.1809	12.4027	0.1704	5.2947	0.2329	5.5276	1.4499	0.2228	1.6728		19,416.7553	19,416.7553	1.9591	3.1147	20,393.9120
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0423	0.0270	0.4593	1.4100e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		144.7966	144.7966	3.1400e-003	3.0900e-003	145.7958
Total	**0.6750**	**36.2079**	**12.8620**	**0.1718**	**5.4624**	**0.2338**	**5.6962**	**1.4944**	**0.2236**	**1.7180**		**19,561.5519**	**19,561.5519**	**1.9623**	**3.1178**	**20,539.7078**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6327	36.1809	12.4027	0.1704	5.2947	0.2329	5.5276	1.4499	0.2228	1.6728		19,416.7553	19,416.7553	1.9591	3.1147	20,393.9120
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0423	0.0270	0.4593	1.4100e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		144.7966	144.7966	3.1400e-003	3.0900e-003	145.7958
Total	**0.6750**	**36.2079**	**12.8620**	**0.1718**	**5.4624**	**0.2338**	**5.6962**	**1.4944**	**0.2236**	**1.7180**		**19,561.5519**	**19,561.5519**	**1.9623**	**3.1178**	**20,539.7078**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1141	3.9602	1.6419	0.0203	0.7226	0.0203	0.7429	0.2080	0.0194	0.2274		2,231.1780	2,231.1780	0.1327	0.3202	2,329.8979
Worker	0.8200	0.5246	8.9105	0.0275	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,809.0537	2,809.0537	0.0610	0.0599	2,828.4383
Total	**0.9341**	**4.4848**	**10.5524**	**0.0478**	**3.9752**	**0.0370**	**4.0122**	**1.0706**	**0.0347**	**1.1053**		**5,040.2317**	**5,040.2317**	**0.1936**	**0.3801**	**5,158.3361**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0269		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.3278**	**2.2347**	**17.4603**	**0.0269**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1141	3.9602	1.6419	0.0203	0.7226	0.0203	0.7429	0.2080	0.0194	0.2274		2,231.1780	2,231.1780	0.1327	0.3202	2,329.8979
Worker	0.8200	0.5246	8.9105	0.0275	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,809.0537	2,809.0537	0.0610	0.0599	2,828.4383
Total	**0.9341**	**4.4848**	**10.5524**	**0.0478**	**3.9752**	**0.0370**	**4.0122**	**1.0706**	**0.0347**	**1.1053**		**5,040.2317**	**5,040.2317**	**0.1936**	**0.3801**	**5,158.3361**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1124	3.9486	1.6297	0.0200	0.7225	0.0213	0.7438	0.2080	0.0203	0.2283		2,196.5659	2,196.5659	0.1341	0.3165	2,294.2388
Worker	0.7708	0.4713	8.3053	0.0266	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,741.4764	2,741.4764	0.0553	0.0561	2,759.5620
Total	**0.8832**	**4.4199**	**9.9351**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,938.0423**	**4,938.0423**	**0.1893**	**0.3726**	**5,053.8008**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1124	3.9486	1.6297	0.0200	0.7225	0.0213	0.7438	0.2080	0.0203	0.2283		2,196.5659	2,196.5659	0.1341	0.3165	2,294.2388
Worker	0.7708	0.4713	8.3053	0.0266	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,741.4764	2,741.4764	0.0553	0.0561	2,759.5620
Total	**0.8832**	**4.4199**	**9.9351**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,938.0423**	**4,938.0423**	**0.1893**	**0.3726**	**5,053.8008**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1108	3.9291	1.6232	0.0196	0.7225	0.0214	0.7439	0.2079	0.0205	0.2284		2,155.4440	2,155.4440	0.1358	0.3119	2,251.7855
Worker	0.7280	0.4272	7.8126	0.0257	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,674.4383	2,674.4383	0.0502	0.0527	2,691.4076
Total	**0.8387**	**4.3563**	**9.4358**	**0.0452**	**3.9752**	**0.0365**	**4.0118**	**1.0706**	**0.0344**	**1.1050**		**4,829.8822**	**4,829.8822**	**0.1860**	**0.3646**	**4,943.1930**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1108	3.9291	1.6232	0.0196	0.7225	0.0214	0.7439	0.2079	0.0205	0.2284		2,155.4440	2,155.4440	0.1358	0.3119	2,251.7855
Worker	0.7280	0.4272	7.8126	0.0257	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,674.4383	2,674.4383	0.0502	0.0527	2,691.4076
Total	**0.8387**	**4.3563**	**9.4358**	**0.0452**	**3.9752**	**0.0365**	**4.0118**	**1.0706**	**0.0344**	**1.1050**		**4,829.8822**	**4,829.8822**	**0.1860**	**0.3646**	**4,943.1930**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8197	7.5321	12.1778	0.0189		0.3524	0.3524		0.3259	0.3259		1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8197**	**7.5321**	**12.1778**	**0.0189**		**0.3524**	**0.3524**		**0.3259**	**0.3259**		**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0500	0.0294	0.5369	1.7600e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		183.8102	183.8102	3.4500e-003	3.6200e-003	184.9765
Total	**0.0500**	**0.0294**	**0.5369**	**1.7600e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**183.8102**	**183.8102**	**3.4500e-003**	**3.6200e-003**	**184.9765**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2194	0.9509	13.5323	0.0189		0.0293	0.0293		0.0293	0.0293	0.0000	1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.2194**	**0.9509**	**13.5323**	**0.0189**		**0.0293**	**0.0293**		**0.0293**	**0.0293**	**0.0000**	**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0500	0.0294	0.5369	1.7600e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		183.8102	183.8102	3.4500e-003	3.6200e-003	184.9765
Total	**0.0500**	**0.0294**	**0.5369**	**1.7600e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**183.8102**	**183.8102**	**3.4500e-003**	**3.6200e-003**	**184.9765**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**52.6660**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1451	0.0851	1.5571	5.1200e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		533.0496	533.0496	0.0100	0.0105	536.4318
Total	**0.1451**	**0.0851**	**1.5571**	**5.1200e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**533.0496**	**533.0496**	**0.0100**	**0.0105**	**536.4318**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0297	0.1288	1.8324	2.9700e-003		3.9600e-003	3.9600e-003		3.9600e-003	3.9600e-003	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**52.5249**	**0.1288**	**1.8324**	**2.9700e-003**		**3.9600e-003**	**3.9600e-003**		**3.9600e-003**	**3.9600e-003**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1451	0.0851	1.5571	5.1200e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		533.0496	533.0496	0.0100	0.0105	536.4318
Total	**0.1451**	**0.0851**	**1.5571**	**5.1200e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**533.0496**	**533.0496**	**0.0100**	**0.0105**	**536.4318**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Density

Increase Diversity

Improve Walkability Design

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Limit Parking Supply

Implement Trip Reduction Program

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	7.5605	4.0762	45.2067	0.0737	8.0545	0.0590	8.1135	2.1435	0.0546	2.1982		7,691.0458	7,691.0458	0.7616	0.4256	7,836.9261
Unmitigated	10.5133	7.9266	93.0934	0.2029	23.3414	0.1378	23.4792	6.2119	0.1279	6.3397		21,160.0233	21,160.0233	1.3412	0.7835	21,427.0259

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Hotel	3,995.00	4,035.00	2970.00	9,196,985	3,173,633
Movie Theater (No Matinee)	549.75	699.21	576.79	1,218,365	420,425
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.75	4,734.21	3,546.79	10,415,350	3,594,058

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Percent of Electricity Use Generated with Renewable Energy

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
NaturalGas Unmitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	485.272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35286.2	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	400.355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15792.3	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2323.48	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0.485272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35.2862	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	0.400355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15.7923	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2.32348	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	9.4326	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Unmitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.3400e-003	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Total	**9.4326**	**5.6000e-004**	**0.0644**	**0.0000**		**1.7000e-004**	**1.7000e-004**		**1.7000e-004**	**1.7000e-004**		**0.1287**	**0.1287**	**2.6000e-004**		**0.1352**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated

Orange County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0
Hotel	500.00	Room	3.72	379,366.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Mobile Land Use Mitigation -

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation -

Water Mitigation -

Waste Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
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tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
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tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
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tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LandUseSquareFeet	8,530.00	8,532.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	7,040.00	7,039.00
tblLandUse	LandUseSquareFeet	22,300.00	22,296.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.20	0.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.57	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	3.2291	70.0130	29.2036	0.2123	19.8582	1.6137	21.4719	10.1558	1.4846	11.6404	0.0000	23,544.7448	23,544.7448	2.8871	3.2920	24,597.9296
2023	2.5790	55.6857	27.7173	0.2015	12.8197	1.0093	13.8290	4.9607	0.9372	5.8979	0.0000	22,444.8707	22,444.8707	2.8891	3.1209	23,447.1128
2024	2.4252	18.0862	25.5934	0.0723	3.9752	0.6505	4.6257	1.0706	0.6119	1.6825	0.0000	7,366.1812	7,366.1812	0.7948	0.3769	7,498.3502
2025	52.8256	17.0436	25.0488	0.0710	3.9752	0.5642	4.5394	1.0706	0.5308	1.6013	0.0000	7,262.2658	7,262.2658	0.7879	0.3687	7,391.8293
Maximum	**52.8256**	**70.0130**	**29.2036**	**0.2123**	**19.8582**	**1.6137**	**21.4719**	**10.1558**	**1.4846**	**11.6404**	**0.0000**	**23,544.7448**	**23,544.7448**	**2.8891**	**3.2920**	**24,597.9296**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.6122	50.7316	31.6836	0.2123	8.2768	0.4077	8.6845	3.9176	0.3922	3.9806	0.0000	23,544.7448	23,544.7448	2.8871	3.2920	24,597.9296
2023	1.3341	39.3235	30.7193	0.2015	8.2765	0.2828	8.5594	2.8203	0.2727	3.0929	0.0000	22,444.8706	22,444.8706	2.8891	3.1209	23,447.1128
2024	1.2815	6.8771	26.8868	0.0723	3.9752	0.0780	4.0532	1.0706	0.0758	1.1464	0.0000	7,366.1812	7,366.1812	0.7948	0.3769	7,498.3502
2025	52.6844	6.8087	26.4244	0.0710	3.9752	0.0775	4.0527	1.0706	0.0753	1.1459	0.0000	7,262.2658	7,262.2658	0.7879	0.3687	7,391.8293
Maximum	**52.6844**	**50.7316**	**31.6836**	**0.2123**	**8.2768**	**0.4077**	**8.6845**	**3.9176**	**0.3922**	**3.9806**	**0.0000**	**23,544.7448**	**23,544.7448**	**2.8891**	**3.2920**	**24,597.9296**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**6.79**	**35.50**	**-7.58**	**0.00**	**39.69**	**77.96**	**42.99**	**48.55**	**77.11**	**55.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	10.3979	8.5593	93.2674	0.1949	23.3414	0.1379	23.4793	6.2119	0.1279	6.3398		20,328.6905	20,328.6905	1.3965	0.8216	20,608.4382
Total	**20.4218**	**13.8826**	**97.8492**	**0.2269**	**23.3414**	**0.5428**	**23.8842**	**6.2119**	**0.5328**	**6.7447**		**26,715.7094**	**26,715.7094**	**1.5195**	**0.9387**	**27,033.4261**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4326	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Energy	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
Mobile	7.4045	4.4034	47.6308	0.0710	8.0545	0.0590	8.1135	2.1435	0.0547	2.1982		7,408.9035	7,408.9035	0.8171	0.4482	7,562.8954
Total	**17.4226**	**9.7263**	**52.1660**	**0.1030**	**8.0545**	**0.4637**	**8.5182**	**2.1435**	**0.4593**	**2.6029**		**13,795.8124**	**13,795.8124**	**0.9398**	**0.5653**	**13,987.7643**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.69**	**29.94**	**46.69**	**54.61**	**65.49**	**14.57**	**64.34**	**65.49**	**13.79**	**61.41**	**0.00**	**48.36**	**48.36**	**38.15**	**39.78**	**48.26**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	
4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.6570	0.0000	19.6570	10.1025	0.0000	10.1025			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**3.1701**	**33.0835**	**19.6978**	**0.0380**	**19.6570**	**1.6126**	**21.2696**	**10.1025**	**1.4836**	**11.5860**		**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0590	0.0400	0.5512	1.6700e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		169.8412	169.8412	4.2600e-003	4.2400e-003	171.2111
Total	**0.0590**	**0.0400**	**0.5512**	**1.6700e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**169.8412**	**169.8412**	**4.2600e-003**	**4.2400e-003**	**171.2111**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5188	0.0000	7.5188	3.8642	0.0000	3.8642			0.0000			0.0000
Off-Road	0.4656	2.0175	20.8690	0.0380		0.0621	0.0621		0.0621	0.0621	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	**0.4656**	**2.0175**	**20.8690**	**0.0380**	**7.5188**	**0.0621**	**7.5809**	**3.8642**	**0.0621**	**3.9263**	**0.0000**	**3,686.0619**	**3,686.0619**	**1.1922**		**3,715.8655**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0590	0.0400	0.5512	1.6700e-003	0.2012	1.0900e-003	0.2023	0.0534	1.0000e-003	0.0544		169.8412	169.8412	4.2600e-003	4.2400e-003	171.2111
Total	**0.0590**	**0.0400**	**0.5512**	**1.6700e-003**	**0.2012**	**1.0900e-003**	**0.2023**	**0.0534**	**1.0000e-003**	**0.0544**		**169.8412**	**169.8412**	**4.2600e-003**	**4.2400e-003**	**171.2111**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.9486	20.8551	15.2727	0.0297		0.9409	0.9409		0.8656	0.8656		2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**1.9486**	**20.8551**	**15.2727**	**0.0297**	**7.3573**	**0.9409**	**8.2981**	**3.4663**	**0.8656**	**4.3319**		**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1999	49.1246	13.4715	0.1812	5.2950	0.3584	5.6534	1.4500	0.3429	1.7929		20,531.1640	20,531.1640	1.9547	3.2884	21,559.9854
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0333	0.4594	1.3900e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		141.5344	141.5344	3.5500e-003	3.5300e-003	142.6759
Total	**1.2491**	**49.1579**	**13.9309**	**0.1826**	**5.4626**	**0.3593**	**5.8220**	**1.4945**	**0.3437**	**1.8382**		**20,672.6984**	**20,672.6984**	**1.9582**	**3.2920**	**21,702.6612**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.0464	2,872.0464	0.9289		2,895.2684
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.0464**	**2,872.0464**	**0.9289**		**2,895.2684**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1999	49.1246	13.4715	0.1812	5.2950	0.3584	5.6534	1.4500	0.3429	1.7929		20,531.1640	20,531.1640	1.9547	3.2884	21,559.9854
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0333	0.4594	1.3900e-003	0.1677	9.0000e-004	0.1686	0.0445	8.3000e-004	0.0453		141.5344	141.5344	3.5500e-003	3.5300e-003	142.6759
Total	**1.2491**	**49.1579**	**13.9309**	**0.1826**	**5.4626**	**0.3593**	**5.8220**	**1.4945**	**0.3437**	**1.8382**		**20,672.6984**	**20,672.6984**	**1.9582**	**3.2920**	**21,702.6612**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.3573	0.0000	7.3573	3.4663	0.0000	3.4663			0.0000			0.0000
Off-Road	1.7109	17.9359	14.7507	0.0297		0.7749	0.7749		0.7129	0.7129		2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**1.7109**	**17.9359**	**14.7507**	**0.0297**	**7.3573**	**0.7749**	**8.1322**	**3.4663**	**0.7129**	**4.1793**		**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.5956	37.7201	12.5388	0.1705	5.2947	0.2336	5.5283	1.4499	0.2235	1.6734		19,434.3062	19,434.3062	1.9568	3.1176	20,412.2613
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0462	0.0297	0.4279	1.3500e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		137.8735	137.8735	3.2200e-003	3.2900e-003	138.9334
Total	**0.6418**	**37.7498**	**12.9666**	**0.1719**	**5.4624**	**0.2344**	**5.6968**	**1.4944**	**0.2243**	**1.7186**		**19,572.1797**	**19,572.1797**	**1.9600**	**3.1209**	**20,551.1947**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8142	0.0000	2.8142	1.3259	0.0000	1.3259			0.0000			0.0000
Off-Road	0.3632	1.5737	17.7527	0.0297		0.0484	0.0484		0.0484	0.0484	0.0000	2,872.6910	2,872.6910	0.9291		2,895.9182
Total	**0.3632**	**1.5737**	**17.7527**	**0.0297**	**2.8142**	**0.0484**	**2.8626**	**1.3259**	**0.0484**	**1.3743**	**0.0000**	**2,872.6910**	**2,872.6910**	**0.9291**		**2,895.9182**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.5956	37.7201	12.5388	0.1705	5.2947	0.2336	5.5283	1.4499	0.2235	1.6734		19,434.3062	19,434.3062	1.9568	3.1176	20,412.2613
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0462	0.0297	0.4279	1.3500e-003	0.1677	8.6000e-004	0.1685	0.0445	7.9000e-004	0.0453		137.8735	137.8735	3.2200e-003	3.2900e-003	138.9334
Total	**0.6418**	**37.7498**	**12.9666**	**0.1719**	**5.4624**	**0.2344**	**5.6968**	**1.4944**	**0.2243**	**1.7186**		**19,572.1797**	**19,572.1797**	**1.9600**	**3.1209**	**20,551.1947**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1101	4.1368	1.6944	0.0203	0.7226	0.0205	0.7430	0.2080	0.0196	0.2275		2,234.4596	2,234.4596	0.1323	0.3209	2,333.3874
Worker	0.8961	0.5760	8.3007	0.0261	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,674.7453	2,674.7453	0.0624	0.0638	2,695.3084
Total	**1.0063**	**4.7128**	**9.9951**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,909.2049**	**4,909.2049**	**0.1948**	**0.3846**	**5,028.6958**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0269		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.3278**	**2.2347**	**17.4603**	**0.0269**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1101	4.1368	1.6944	0.0203	0.7226	0.0205	0.7430	0.2080	0.0196	0.2275		2,234.4596	2,234.4596	0.1323	0.3209	2,333.3874
Worker	0.8961	0.5760	8.3007	0.0261	3.2527	0.0166	3.2693	0.8626	0.0153	0.8779		2,674.7453	2,674.7453	0.0624	0.0638	2,695.3084
Total	**1.0063**	**4.7128**	**9.9951**	**0.0465**	**3.9752**	**0.0371**	**4.0123**	**1.0706**	**0.0349**	**1.1055**		**4,909.2049**	**4,909.2049**	**0.1948**	**0.3846**	**5,028.6958**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1084	4.1250	1.6811	0.0200	0.7225	0.0214	0.7439	0.2080	0.0205	0.2284		2,199.8763	2,199.8763	0.1337	0.3172	2,297.7528
Worker	0.8452	0.5174	7.7455	0.0253	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,610.6060	2,610.6060	0.0567	0.0596	2,629.7897
Total	**0.9537**	**4.6424**	**9.4266**	**0.0453**	**3.9752**	**0.0372**	**4.0124**	**1.0706**	**0.0350**	**1.1056**		**4,810.4823**	**4,810.4823**	**0.1904**	**0.3769**	**4,927.5425**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1084	4.1250	1.6811	0.0200	0.7225	0.0214	0.7439	0.2080	0.0205	0.2284		2,199.8763	2,199.8763	0.1337	0.3172	2,297.7528
Worker	0.8452	0.5174	7.7455	0.0253	3.2527	0.0158	3.2685	0.8626	0.0146	0.8772		2,610.6060	2,610.6060	0.0567	0.0596	2,629.7897
Total	**0.9537**	**4.6424**	**9.4266**	**0.0453**	**3.9752**	**0.0372**	**4.0124**	**1.0706**	**0.0350**	**1.1056**		**4,810.4823**	**4,810.4823**	**0.1904**	**0.3769**	**4,927.5425**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1068	4.1051	1.6734	0.0196	0.7225	0.0215	0.7440	0.2079	0.0206	0.2285		2,158.7625	2,158.7625	0.1354	0.3126	2,255.3032
Worker	0.8006	0.4689	7.2908	0.0245	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,547.0290	2,547.0290	0.0516	0.0561	2,565.0280
Total	**0.9074**	**4.5740**	**8.9642**	**0.0440**	**3.9752**	**0.0367**	**4.0119**	**1.0706**	**0.0345**	**1.1051**		**4,705.7915**	**4,705.7915**	**0.1870**	**0.3687**	**4,820.3312**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3278	2.2347	17.4603	0.0270		0.0408	0.0408		0.0408	0.0408	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.3278**	**2.2347**	**17.4603**	**0.0270**		**0.0408**	**0.0408**		**0.0408**	**0.0408**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.1068	4.1051	1.6734	0.0196	0.7225	0.0215	0.7440	0.2079	0.0206	0.2285		2,158.7625	2,158.7625	0.1354	0.3126	2,255.3032
Worker	0.8006	0.4689	7.2908	0.0245	3.2527	0.0152	3.2679	0.8626	0.0140	0.8766		2,547.0290	2,547.0290	0.0516	0.0561	2,565.0280
Total	**0.9074**	**4.5740**	**8.9642**	**0.0440**	**3.9752**	**0.0367**	**4.0119**	**1.0706**	**0.0345**	**1.1051**		**4,705.7915**	**4,705.7915**	**0.1870**	**0.3687**	**4,820.3312**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8197	7.5321	12.1778	0.0189		0.3524	0.3524		0.3259	0.3259		1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8197**	**7.5321**	**12.1778**	**0.0189**		**0.3524**	**0.3524**		**0.3259**	**0.3259**		**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0550	0.0322	0.5011	1.6800e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		175.0535	175.0535	3.5400e-003	3.8500e-003	176.2906
Total	**0.0550**	**0.0322**	**0.5011**	**1.6800e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**175.0535**	**175.0535**	**3.5400e-003**	**3.8500e-003**	**176.2906**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.2194	0.9509	13.5323	0.0189		0.0293	0.0293		0.0293	0.0293	0.0000	1,805.3926	1,805.3926	0.5673		1,819.5741
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.2194**	**0.9509**	**13.5323**	**0.0189**		**0.0293**	**0.0293**		**0.0293**	**0.0293**	**0.0000**	**1,805.3926**	**1,805.3926**	**0.5673**		**1,819.5741**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0550	0.0322	0.5011	1.6800e-003	0.2236	1.0400e-003	0.2246	0.0593	9.6000e-004	0.0603		175.0535	175.0535	3.5400e-003	3.8500e-003	176.2906
Total	**0.0550**	**0.0322**	**0.5011**	**1.6800e-003**	**0.2236**	**1.0400e-003**	**0.2246**	**0.0593**	**9.6000e-004**	**0.0603**		**175.0535**	**175.0535**	**3.5400e-003**	**3.8500e-003**	**176.2906**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**52.6660**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1596	0.0935	1.4532	4.8700e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		507.6553	507.6553	0.0103	0.0112	511.2427
Total	**0.1596**	**0.0935**	**1.4532**	**4.8700e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**507.6553**	**507.6553**	**0.0103**	**0.0112**	**511.2427**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	52.4951					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0297	0.1288	1.8324	2.9700e-003		3.9600e-003	3.9600e-003		3.9600e-003	3.9600e-003	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**52.5249**	**0.1288**	**1.8324**	**2.9700e-003**		**3.9600e-003**	**3.9600e-003**		**3.9600e-003**	**3.9600e-003**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1596	0.0935	1.4532	4.8700e-003	0.6483	3.0200e-003	0.6513	0.1719	2.7800e-003	0.1747		507.6553	507.6553	0.0103	0.0112	511.2427
Total	**0.1596**	**0.0935**	**1.4532**	**4.8700e-003**	**0.6483**	**3.0200e-003**	**0.6513**	**0.1719**	**2.7800e-003**	**0.1747**		**507.6553**	**507.6553**	**0.0103**	**0.0112**	**511.2427**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Density

Increase Diversity

Improve Walkability Design

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Limit Parking Supply

Implement Trip Reduction Program

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	7.4045	4.4034	47.6308	0.0710	8.0545	0.0590	8.1135	2.1435	0.0547	2.1982		7,408.9035	7,408.9035	0.8171	0.4482	7,562.8954
Unmitigated	10.3979	8.5593	93.2674	0.1949	23.3414	0.1379	23.4793	6.2119	0.1279	6.3398		20,328.6905	20,328.6905	1.3965	0.8216	20,608.4382

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Hotel	3,995.00	4,035.00	2970.00	9,196,985	3,173,633
Movie Theater (No Matinee)	549.75	699.21	576.79	1,218,365	420,425
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.75	4,734.21	3,546.79	10,415,350	3,594,058

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Percent of Electricity Use Generated with Renewable Energy

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336
NaturalGas Unmitigated	0.5855	5.3223	4.4708	0.0319		0.4045	0.4045		0.4045	0.4045		6,386.7802	6,386.7802	0.1224	0.1171	6,424.7336

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	485.272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35286.2	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	400.355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15792.3	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2323.48	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	0.485272	5.2300e-003	0.0476	0.0400	2.9000e-004		3.6200e-003	3.6200e-003		3.6200e-003	3.6200e-003		57.0908	57.0908	1.0900e-003	1.0500e-003	57.4301
Hotel	35.2862	0.3805	3.4594	2.9059	0.0208		0.2629	0.2629		0.2629	0.2629		4,151.3217	4,151.3217	0.0796	0.0761	4,175.9910
Movie Theater (No Matinee)	0.400355	4.3200e-003	0.0393	0.0330	2.4000e-004		2.9800e-003	2.9800e-003		2.9800e-003	2.9800e-003		47.1006	47.1006	9.0000e-004	8.6000e-004	47.3805
Quality Restaurant	15.7923	0.1703	1.5483	1.3005	9.2900e-003		0.1177	0.1177		0.1177	0.1177		1,857.9162	1,857.9162	0.0356	0.0341	1,868.9568
Recreational Swimming Pool	2.32348	0.0251	0.2278	0.1914	1.3700e-003		0.0173	0.0173		0.0173	0.0173		273.3509	273.3509	5.2400e-003	5.0100e-003	274.9752
Total		**0.5855**	**5.3223**	**4.4708**	**0.0320**		**0.4045**	**0.4045**		**0.4045**	**0.4045**		**6,386.7802**	**6,386.7802**	**0.1224**	**0.1171**	**6,424.7336**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	9.4326	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Unmitigated	9.4385	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0102	1.0100e-003	0.1111	1.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004		0.2387	0.2387	6.2000e-004		0.2543
Total	**9.4385**	**1.0100e-003**	**0.1111**	**1.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**		**0.2387**	**0.2387**	**6.2000e-004**		**0.2543**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.0787					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.3496					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.3400e-003	5.6000e-004	0.0644	0.0000		1.7000e-004	1.7000e-004		1.7000e-004	1.7000e-004		0.1287	0.1287	2.6000e-004		0.1352
Total	**9.4326**	**5.6000e-004**	**0.0644**	**0.0000**		**1.7000e-004**	**1.7000e-004**		**1.7000e-004**	**1.7000e-004**		**0.1287**	**0.1287**	**2.6000e-004**		**0.1352**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix C

Annual Emission Calculations Output - Unmitigated
(CalEEMod)

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated

Orange County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Hotel	500.00	Room	3.72	379,366.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	18.00	75.00
tblConstructionPhase	NumDays	230.00	550.00
tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	PhaseEndDate	11/24/2023	7/28/2025
tblConstructionPhase	PhaseEndDate	10/5/2023	2/10/2025
tblConstructionPhase	PhaseEndDate	11/17/2022	1/2/2023
tblConstructionPhase	PhaseEndDate	10/31/2023	4/14/2025
tblConstructionPhase	PhaseEndDate	11/7/2022	11/28/2022
tblConstructionPhase	PhaseStartDate	11/1/2023	4/15/2025
tblConstructionPhase	PhaseStartDate	11/18/2022	1/3/2023
tblConstructionPhase	PhaseStartDate	11/8/2022	11/29/2022
tblConstructionPhase	PhaseStartDate	10/6/2023	2/11/2025
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.57	0.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.20	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0708	1.1785	0.5518	2.9400e-003	0.3520	0.0317	0.3838	0.1609	0.0294	0.1903	0.0000	291.3044	291.3044	0.0423	0.0359	303.0517
2023	0.3259	2.5042	3.4325	9.6500e-003	0.5283	0.0959	0.6242	0.1408	0.0902	0.2310	0.0000	891.1340	891.1340	0.0956	0.0467	907.4338
2024	0.3086	2.3721	3.3719	9.5100e-003	0.5118	0.0852	0.5970	0.1380	0.0802	0.2182	0.0000	879.3745	879.3745	0.0945	0.0449	895.1015
2025	2.0320	0.4642	0.7742	1.7900e-003	0.0855	0.0182	0.1036	0.0229	0.0171	0.0400	0.0000	163.5064	163.5064	0.0229	5.3200e-003	165.6644
Maximum	**2.0320**	**2.5042**	**3.4325**	**9.6500e-003**	**0.5283**	**0.0959**	**0.6242**	**0.1609**	**0.0902**	**0.2310**	**0.0000**	**891.1340**	**891.1340**	**0.0956**	**0.0467**	**907.4338**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0247	0.6365	0.5933	2.9400e-003	0.1757	5.5200e-003	0.1812	0.0728	5.3300e-003	0.0781	0.0000	291.3043	291.3043	0.0423	0.0359	303.0516
2023	0.1640	0.9226	3.5915	9.6500e-003	0.5161	0.0102	0.5263	0.1386	9.9200e-003	0.1485	0.0000	891.1337	891.1337	0.0956	0.0467	907.4334
2024	0.1588	0.9037	3.5413	9.5100e-003	0.5118	0.0102	0.5220	0.1380	9.9200e-003	0.1480	0.0000	879.3742	879.3742	0.0945	0.0449	895.1011
2025	1.9982	0.1296	0.8255	1.7900e-003	0.0855	2.0700e-003	0.0875	0.0229	2.0200e-003	0.0250	0.0000	163.5063	163.5063	0.0229	5.3200e-003	165.6643
Maximum	**1.9982**	**0.9226**	**3.5915**	**9.6500e-003**	**0.5161**	**0.0102**	**0.5263**	**0.1386**	**9.9200e-003**	**0.1485**	**0.0000**	**891.1337**	**891.1337**	**0.0956**	**0.0467**	**907.4334**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.31**	**60.23**	**-5.18**	**0.00**	**12.76**	**87.87**	**22.91**	**19.53**	**87.46**	**41.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	11-1-2022	1-31-2023	1.4923	0.7573
2	2-1-2023	4-30-2023	0.6858	0.2600
3	5-1-2023	7-31-2023	0.7024	0.2622
4	8-1-2023	10-31-2023	0.7057	0.2656
5	11-1-2023	1-31-2024	0.6993	0.2707
6	2-1-2024	4-30-2024	0.6562	0.2591
7	5-1-2024	7-31-2024	0.6643	0.2584
8	8-1-2024	10-31-2024	0.6676	0.2617

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

9	**11-1-2024**	**1-31-2025**	0.6607	0.2668
10	**2-1-2025**	**4-30-2025**	0.5676	0.3592
11	**5-1-2025**	**7-31-2025**	1.7178	1.6810
		Highest	1.7178	1.6810

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Energy	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	2,088.9501	2,088.9501	0.1073	0.0299	2,100.5553
Mobile	1.7268	1.4784	15.9661	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.3895	3,177.3895	0.2144	0.1276	3,220.7826
Waste						0.0000	0.0000		0.0000	0.0000	106.6190	0.0000	106.6190	6.3010	0.0000	264.1440
Water						0.0000	0.0000		0.0000	0.0000	7.6970	62.4016	70.0986	0.7958	0.0193	95.7471
Total	**3.5556**	**2.4498**	**16.7959**	**0.0394**	**3.9118**	**0.0974**	**4.0091**	**1.0425**	**0.0957**	**1.1382**	**114.3160**	**5,328.7683**	**5,443.0842**	**7.4186**	**0.1769**	**5,681.2578**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Energy	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	2,088.9501	2,088.9501	0.1073	0.0299	2,100.5553
Mobile	1.7268	1.4784	15.9661	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.3895	3,177.3895	0.2144	0.1276	3,220.7826
Waste						0.0000	0.0000		0.0000	0.0000	106.6190	0.0000	106.6190	6.3010	0.0000	264.1440
Water						0.0000	0.0000		0.0000	0.0000	7.6970	62.4016	70.0986	0.7958	0.0193	95.7471
Total	**3.5556**	**2.4498**	**16.7959**	**0.0394**	**3.9118**	**0.0974**	**4.0091**	**1.0425**	**0.0957**	**1.1382**	**114.3160**	**5,328.7683**	**5,443.0842**	**7.4186**	**0.1769**	**5,681.2578**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Building Construction	Cranes	1	7.00	231	0.29
Grading	Excavators	1	8.00	158	0.38
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Grading	Graders	1	8.00	187	0.41
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1966	0.0000	0.1966	0.1010	0.0000	0.1010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0317	0.3308	0.1970	3.8000e-004		0.0161	0.0161		0.0148	0.0148	0.0000	33.4394	33.4394	0.0108	0.0000	33.7098
Total	**0.0317**	**0.3308**	**0.1970**	**3.8000e-004**	**0.1966**	**0.0161**	**0.2127**	**0.1010**	**0.0148**	**0.1159**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7098**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**5.4000e-004**	**4.1000e-004**	**5.6400e-003**	**2.0000e-005**	**1.9800e-003**	**1.0000e-005**	**1.9900e-003**	**5.2000e-004**	**1.0000e-005**	**5.3000e-004**	**0.0000**	**1.5617**	**1.5617**	**4.0000e-005**	**4.0000e-005**	**1.5743**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0752	0.0000	0.0752	0.0386	0.0000	0.0386	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.6600e-003	0.0202	0.2087	3.8000e-004		6.2000e-004	6.2000e-004		6.2000e-004	6.2000e-004	0.0000	33.4394	33.4394	0.0108	0.0000	33.7097
Total	**4.6600e-003**	**0.0202**	**0.2087**	**3.8000e-004**	**0.0752**	**6.2000e-004**	**0.0758**	**0.0386**	**6.2000e-004**	**0.0393**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7097**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**5.4000e-004**	**4.1000e-004**	**5.6400e-003**	**2.0000e-005**	**1.9800e-003**	**1.0000e-005**	**1.9900e-003**	**5.2000e-004**	**1.0000e-005**	**5.3000e-004**	**0.0000**	**1.5617**	**1.5617**	**4.0000e-005**	**4.0000e-005**	**1.5743**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0890	0.0000	0.0890	0.0417	0.0000	0.0417	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0234	0.2503	0.1833	3.6000e-004		0.0113	0.0113		0.0104	0.0104	0.0000	31.2657	31.2657	0.0101	0.0000	31.5185
Total	**0.0234**	**0.2503**	**0.1833**	**3.6000e-004**	**0.0890**	**0.0113**	**0.1002**	**0.0417**	**0.0104**	**0.0521**	**0.0000**	**31.2657**	**31.2657**	**0.0101**	**0.0000**	**31.5185**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0146	0.5966	0.1603	2.1700e-003	0.0626	4.3000e-003	0.0669	0.0172	4.1100e-003	0.0213	0.0000	223.4759	223.4759	0.0213	0.0358	234.6748
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**0.0152**	**0.5970**	**0.1659**	**2.1900e-003**	**0.0645**	**4.3100e-003**	**0.0688**	**0.0177**	**4.1200e-003**	**0.0218**	**0.0000**	**225.0376**	**225.0376**	**0.0213**	**0.0358**	**236.2491**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0340	0.0000	0.0340	0.0159	0.0000	0.0159	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3600e-003	0.0189	0.2130	3.6000e-004		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004	0.0000	31.2657	31.2657	0.0101	0.0000	31.5185
Total	**4.3600e-003**	**0.0189**	**0.2130**	**3.6000e-004**	**0.0340**	**5.8000e-004**	**0.0346**	**0.0159**	**5.8000e-004**	**0.0165**	**0.0000**	**31.2657**	**31.2657**	**0.0101**	**0.0000**	**31.5185**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0146	0.5966	0.1603	2.1700e-003	0.0626	4.3000e-003	0.0669	0.0172	4.1100e-003	0.0213	0.0000	223.4759	223.4759	0.0213	0.0358	234.6748
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**0.0152**	**0.5970**	**0.1659**	**2.1900e-003**	**0.0645**	**4.3100e-003**	**0.0688**	**0.0177**	**4.1200e-003**	**0.0218**	**0.0000**	**225.0376**	**225.0376**	**0.0213**	**0.0358**	**236.2491**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0197	0.0000	0.0197	3.6100e-003	0.0000	3.6100e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.6000e-004	8.9700e-003	7.3800e-003	1.0000e-005		3.9000e-004	3.9000e-004		3.6000e-004	3.6000e-004	0.0000	1.3030	1.3030	4.2000e-004	0.0000	1.3136
Total	**8.6000e-004**	**8.9700e-003**	**7.3800e-003**	**1.0000e-005**	**0.0197**	**3.9000e-004**	**0.0201**	**3.6100e-003**	**3.6000e-004**	**3.9700e-003**	**0.0000**	**1.3030**	**1.3030**	**4.2000e-004**	**0.0000**	**1.3136**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1000e-004	0.0190	6.2300e-003	9.0000e-005	2.6100e-003	1.2000e-004	2.7200e-003	7.1000e-004	1.1000e-004	8.3000e-004	0.0000	8.8106	8.8106	8.9000e-004	1.4100e-003	9.2540
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	2.0000e-005	2.2000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0634	0.0634	0.0000	0.0000	0.0639
Total	**3.3000e-004**	**0.0191**	**6.4500e-003**	**9.0000e-005**	**2.6900e-003**	**1.2000e-004**	**2.8000e-003**	**7.3000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**8.8740**	**8.8740**	**8.9000e-004**	**1.4100e-003**	**9.3179**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5400e-003	0.0000	7.5400e-003	1.3800e-003	0.0000	1.3800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.8000e-004	7.9000e-004	8.8800e-003	1.0000e-005		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	1.3030	1.3030	4.2000e-004	0.0000	1.3136
Total	**1.8000e-004**	**7.9000e-004**	**8.8800e-003**	**1.0000e-005**	**7.5400e-003**	**2.0000e-005**	**7.5600e-003**	**1.3800e-003**	**2.0000e-005**	**1.4000e-003**	**0.0000**	**1.3030**	**1.3030**	**4.2000e-004**	**0.0000**	**1.3136**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1000e-004	0.0190	6.2300e-003	9.0000e-005	2.6100e-003	1.2000e-004	2.7200e-003	7.1000e-004	1.1000e-004	8.3000e-004	0.0000	8.8106	8.8106	8.9000e-004	1.4100e-003	9.2540
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	2.0000e-005	2.2000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0634	0.0634	0.0000	0.0000	0.0639
Total	**3.3000e-004**	**0.0191**	**6.4500e-003**	**9.0000e-005**	**2.6900e-003**	**1.2000e-004**	**2.8000e-003**	**7.3000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**8.8740**	**8.8740**	**8.9000e-004**	**1.4100e-003**	**9.3179**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2037	1.8628	2.1036	3.4900e-003		0.0906	0.0906		0.0853	0.0853	0.0000	300.1871	300.1871	0.0714	0.0000	301.9724
Total	**0.2037**	**1.8628**	**2.1036**	**3.4900e-003**		**0.0906**	**0.0906**		**0.0853**	**0.0853**	**0.0000**	**300.1871**	**300.1871**	**0.0714**	**0.0000**	**301.9724**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5372	0.2158	2.6300e-003	0.0922	2.6400e-003	0.0948	0.0266	2.5200e-003	0.0291	0.0000	262.2822	262.2822	0.0156	0.0377	273.8951
Worker	0.1065	0.0761	1.0993	3.4300e-003	0.4137	2.1500e-003	0.4159	0.1099	1.9800e-003	0.1119	0.0000	318.4877	318.4877	7.3200e-003	7.6000e-003	320.9348
Total	**0.1210**	**0.6133**	**1.3151**	**6.0600e-003**	**0.5059**	**4.7900e-003**	**0.5107**	**0.1365**	**4.5000e-003**	**0.1410**	**0.0000**	**580.7698**	**580.7698**	**0.0229**	**0.0453**	**594.8299**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0425	0.2894	2.2611	3.4900e-003		5.2800e-003	5.2800e-003		5.2800e-003	5.2800e-003	0.0000	300.1868	300.1868	0.0714	0.0000	301.9720
Total	**0.0425**	**0.2894**	**2.2611**	**3.4900e-003**		**5.2800e-003**	**5.2800e-003**		**5.2800e-003**	**5.2800e-003**	**0.0000**	**300.1868**	**300.1868**	**0.0714**	**0.0000**	**301.9720**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5372	0.2158	2.6300e-003	0.0922	2.6400e-003	0.0948	0.0266	2.5200e-003	0.0291	0.0000	262.2822	262.2822	0.0156	0.0377	273.8951
Worker	0.1065	0.0761	1.0993	3.4300e-003	0.4137	2.1500e-003	0.4159	0.1099	1.9800e-003	0.1119	0.0000	318.4877	318.4877	7.3200e-003	7.6000e-003	320.9348
Total	**0.1210**	**0.6133**	**1.3151**	**6.0600e-003**	**0.5059**	**4.7900e-003**	**0.5107**	**0.1365**	**4.5000e-003**	**0.1410**	**0.0000**	**580.7698**	**580.7698**	**0.0229**	**0.0453**	**594.8299**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1928	1.7611	2.1179	3.5300e-003		0.0803	0.0803		0.0756	0.0756	0.0000	303.7223	303.7223	0.0718	0.0000	305.5179
Total	**0.1928**	**1.7611**	**2.1179**	**3.5300e-003**		**0.0803**	**0.0803**		**0.0756**	**0.0756**	**0.0000**	**303.7223**	**303.7223**	**0.0718**	**0.0000**	**305.5179**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5418	0.2166	2.6200e-003	0.0933	2.7900e-003	0.0961	0.0269	2.6700e-003	0.0296	0.0000	261.2083	261.2083	0.0159	0.0377	272.8306
Worker	0.1014	0.0691	1.0374	3.3600e-003	0.4185	2.0700e-003	0.4206	0.1111	1.9100e-003	0.1130	0.0000	314.4439	314.4439	6.7200e-003	7.1800e-003	316.7530
Total	**0.1158**	**0.6110**	**1.2540**	**5.9800e-003**	**0.5118**	**4.8600e-003**	**0.5166**	**0.1380**	**4.5800e-003**	**0.1426**	**0.0000**	**575.6522**	**575.6522**	**0.0226**	**0.0449**	**589.5836**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0429	0.2928	2.2873	3.5300e-003		5.3400e-003	5.3400e-003		5.3400e-003	5.3400e-003	0.0000	303.7220	303.7220	0.0718	0.0000	305.5175
Total	**0.0429**	**0.2928**	**2.2873**	**3.5300e-003**		**5.3400e-003**	**5.3400e-003**		**5.3400e-003**	**5.3400e-003**	**0.0000**	**303.7220**	**303.7220**	**0.0718**	**0.0000**	**305.5175**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5418	0.2166	2.6200e-003	0.0933	2.7900e-003	0.0961	0.0269	2.6700e-003	0.0296	0.0000	261.2083	261.2083	0.0159	0.0377	272.8306
Worker	0.1014	0.0691	1.0374	3.3600e-003	0.4185	2.0700e-003	0.4206	0.1111	1.9100e-003	0.1130	0.0000	314.4439	314.4439	6.7200e-003	7.1800e-003	316.7530
Total	**0.1158**	**0.6110**	**1.2540**	**5.9800e-003**	**0.5118**	**4.8600e-003**	**0.5166**	**0.1380**	**4.5800e-003**	**0.1426**	**0.0000**	**575.6522**	**575.6522**	**0.0226**	**0.0449**	**589.5836**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0198	0.1808	0.2332	3.9000e-004		7.6500e-003	7.6500e-003		7.2000e-003	7.2000e-003	0.0000	33.6283	33.6283	7.9000e-003	0.0000	33.8260
Total	**0.0198**	**0.1808**	**0.2332**	**3.9000e-004**		**7.6500e-003**	**7.6500e-003**		**7.2000e-003**	**7.2000e-003**	**0.0000**	**33.6283**	**33.6283**	**7.9000e-003**	**0.0000**	**33.8260**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5800e-003	0.0597	0.0239	2.8000e-004	0.0103	3.1000e-004	0.0106	2.9800e-003	3.0000e-004	3.2700e-003	0.0000	28.3715	28.3715	1.7800e-003	4.1100e-003	29.6403
Worker	0.0106	6.9300e-003	0.1081	3.6000e-004	0.0463	2.2000e-004	0.0465	0.0123	2.0000e-004	0.0125	0.0000	33.9563	33.9563	6.8000e-004	7.5000e-004	34.1961
Total	**0.0122**	**0.0666**	**0.1319**	**6.4000e-004**	**0.0566**	**5.3000e-004**	**0.0572**	**0.0153**	**5.0000e-004**	**0.0158**	**0.0000**	**62.3278**	**62.3278**	**2.4600e-003**	**4.8600e-003**	**63.8364**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7500e-003	0.0324	0.2532	3.9000e-004		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	33.6283	33.6283	7.9000e-003	0.0000	33.8259
Total	**4.7500e-003**	**0.0324**	**0.2532**	**3.9000e-004**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**33.6283**	**33.6283**	**7.9000e-003**	**0.0000**	**33.8259**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5800e-003	0.0597	0.0239	2.8000e-004	0.0103	3.1000e-004	0.0106	2.9800e-003	3.0000e-004	3.2700e-003	0.0000	28.3715	28.3715	1.7800e-003	4.1100e-003	29.6403
Worker	0.0106	6.9300e-003	0.1081	3.6000e-004	0.0463	2.2000e-004	0.0465	0.0123	2.0000e-004	0.0125	0.0000	33.9563	33.9563	6.8000e-004	7.5000e-004	34.1961
Total	**0.0122**	**0.0666**	**0.1319**	**6.4000e-004**	**0.0566**	**5.3000e-004**	**0.0572**	**0.0153**	**5.0000e-004**	**0.0158**	**0.0000**	**62.3278**	**62.3278**	**2.4600e-003**	**4.8600e-003**	**63.8364**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0184	0.1695	0.2740	4.3000e-004		7.9300e-003	7.9300e-003		7.3300e-003	7.3300e-003	0.0000	36.8511	36.8511	0.0116	0.0000	37.1405
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0184**	**0.1695**	**0.2740**	**4.3000e-004**		**7.9300e-003**	**7.9300e-003**		**7.3300e-003**	**7.3300e-003**	**0.0000**	**36.8511**	**36.8511**	**0.0116**	**0.0000**	**37.1405**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1300e-003	7.4000e-004	0.0115	4.0000e-005	4.9400e-003	2.0000e-005	4.9600e-003	1.3100e-003	2.0000e-005	1.3300e-003	0.0000	3.6214	3.6214	7.0000e-005	8.0000e-005	3.6469
Total	**1.1300e-003**	**7.4000e-004**	**0.0115**	**4.0000e-005**	**4.9400e-003**	**2.0000e-005**	**4.9600e-003**	**1.3100e-003**	**2.0000e-005**	**1.3300e-003**	**0.0000**	**3.6214**	**3.6214**	**7.0000e-005**	**8.0000e-005**	**3.6469**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9400e-003	0.0214	0.3045	4.3000e-004		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	36.8510	36.8510	0.0116	0.0000	37.1405
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.9400e-003**	**0.0214**	**0.3045**	**4.3000e-004**		**6.6000e-004**	**6.6000e-004**		**6.6000e-004**	**6.6000e-004**	**0.0000**	**36.8510**	**36.8510**	**0.0116**	**0.0000**	**37.1405**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1300e-003	7.4000e-004	0.0115	4.0000e-005	4.9400e-003	2.0000e-005	4.9600e-003	1.3100e-003	2.0000e-005	1.3300e-003	0.0000	3.6214	3.6214	7.0000e-005	8.0000e-005	3.6469
Total	**1.1300e-003**	**7.4000e-004**	**0.0115**	**4.0000e-005**	**4.9400e-003**	**2.0000e-005**	**4.9600e-003**	**1.3100e-003**	**2.0000e-005**	**1.3300e-003**	**0.0000**	**3.6214**	**3.6214**	**7.0000e-005**	**8.0000e-005**	**3.6469**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.9686					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.4100e-003	0.0430	0.0678	1.1000e-004		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	9.5747	9.5747	5.2000e-004	0.0000	9.5878
Total	**1.9750**	**0.0430**	**0.0678**	**1.1000e-004**		**1.9300e-003**	**1.9300e-003**		**1.9300e-003**	**1.9300e-003**	**0.0000**	**9.5747**	**9.5747**	**5.2000e-004**	**0.0000**	**9.5878**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	3.5700e-003	0.0557	1.9000e-004	0.0239	1.1000e-004	0.0240	6.3400e-003	1.0000e-004	6.4500e-003	0.0000	17.5032	17.5032	3.5000e-004	3.9000e-004	17.6268
Total	**5.4700e-003**	**3.5700e-003**	**0.0557**	**1.9000e-004**	**0.0239**	**1.1000e-004**	**0.0240**	**6.3400e-003**	**1.0000e-004**	**6.4500e-003**	**0.0000**	**17.5032**	**17.5032**	**3.5000e-004**	**3.9000e-004**	**17.6268**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.9686					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1100e-003	4.8300e-003	0.0687	1.1000e-004		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	9.5747	9.5747	5.2000e-004	0.0000	9.5878
Total	**1.9697**	**4.8300e-003**	**0.0687**	**1.1000e-004**		**1.5000e-004**	**1.5000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**9.5747**	**9.5747**	**5.2000e-004**	**0.0000**	**9.5878**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	3.5700e-003	0.0557	1.9000e-004	0.0239	1.1000e-004	0.0240	6.3400e-003	1.0000e-004	6.4500e-003	0.0000	17.5032	17.5032	3.5000e-004	3.9000e-004	17.6268
Total	**5.4700e-003**	**3.5700e-003**	**0.0557**	**1.9000e-004**	**0.0239**	**1.1000e-004**	**0.0240**	**6.3400e-003**	**1.0000e-004**	**6.4500e-003**	**0.0000**	**17.5032**	**17.5032**	**3.5000e-004**	**3.9000e-004**	**17.6268**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.7268	1.4784	15.9661	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.3895	3,177.3895	0.2144	0.1276	3,220.7826
Unmitigated	1.7268	1.4784	15.9661	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.3895	3,177.3895	0.2144	0.1276	3,220.7826

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		
Hotel	3,995.00	4,035.00	2970.00	9,196,985	9,196,985
Movie Theater (No Matinee)	549.68	699.11	576.71	1,218,192	1,218,192
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.68	4,734.11	3,546.71	10,415,177	10,415,177

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,031.5470	1,031.5470	0.0871	0.0106	1,036.8686
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,031.5470	1,031.5470	0.0871	0.0106	1,036.8686
NaturalGas Mitigated	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	1,057.4031	1,057.4031	0.0203	0.0194	1,063.6867
NaturalGas Unmitigated	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	1,057.4031	1,057.4031	0.0203	0.0194	1,063.6867

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	177124	9.6000e-004	8.6800e-003	7.2900e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4520	9.4520	1.8000e-004	1.7000e-004	9.5082
Hotel	1.28795e+007	0.0695	0.6314	0.5303	3.7900e-003		0.0480	0.0480		0.0480	0.0480	0.0000	687.2979	687.2979	0.0132	0.0126	691.3821
Movie Theater (No Matinee)	146130	7.9000e-004	7.1600e-003	6.0200e-003	4.0000e-005		5.4000e-004	5.4000e-004		5.4000e-004	5.4000e-004	0.0000	7.7980	7.7980	1.5000e-004	1.4000e-004	7.8444
Quality Restaurant	5.76418e+006	0.0311	0.2826	0.2374	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.5989	307.5989	5.9000e-003	5.6400e-003	309.4268
Recreational Swimming Pool	848071	4.5700e-003	0.0416	0.0349	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.2563	45.2563	8.7000e-004	8.3000e-004	45.5252
Total		**0.1069**	**0.9713**	**0.8159**	**5.8300e-003**		**0.0738**	**0.0738**		**0.0738**	**0.0738**	**0.0000**	**1,057.4031**	**1,057.4031**	**0.0203**	**0.0194**	**1,063.6867**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	177124	9.6000e-004	8.6800e-003	7.2900e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4520	9.4520	1.8000e-004	1.7000e-004	9.5082
Hotel	1.28795e+007	0.0695	0.6314	0.5303	3.7900e-003		0.0480	0.0480		0.0480	0.0480	0.0000	687.2979	687.2979	0.0132	0.0126	691.3821
Movie Theater (No Matinee)	146130	7.9000e-004	7.1600e-003	6.0200e-003	4.0000e-005		5.4000e-004	5.4000e-004		5.4000e-004	5.4000e-004	0.0000	7.7980	7.7980	1.5000e-004	1.4000e-004	7.8444
Quality Restaurant	5.76418e+006	0.0311	0.2826	0.2374	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.5989	307.5989	5.9000e-003	5.6400e-003	309.4268
Recreational Swimming Pool	848071	4.5700e-003	0.0416	0.0349	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.2563	45.2563	8.7000e-004	8.3000e-004	45.5252
Total		**0.1069**	**0.9713**	**0.8159**	**5.8300e-003**		**0.0738**	**0.0738**		**0.0738**	**0.0738**	**0.0000**	**1,057.4031**	**1,057.4031**	**0.0203**	**0.0194**	**1,063.6867**

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	1.35717e+006	240.6883	0.0203	2.4600e-003	241.9299
Health Club	70559.6	12.5134	1.0600e-003	1.3000e-004	12.5780
Hotel	3.31945e+006	588.6901	0.0497	6.0200e-003	591.7271
Movie Theater (No Matinee)	58212.5	10.3237	8.7000e-004	1.1000e-004	10.3770
Quality Restaurant	792623	140.5681	0.0119	1.4400e-003	141.2933
Recreational Swimming Pool	218575	38.7633	3.2700e-003	4.0000e-004	38.9633
Total		**1,031.5470**	**0.0871**	**0.0106**	**1,036.8686**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	1.35717e+006	240.6883	0.0203	2.4600e-003	241.9299
Health Club	70559.6	12.5134	1.0600e-003	1.3000e-004	12.5780
Hotel	3.31945e+006	588.6901	0.0497	6.0200e-003	591.7271
Movie Theater (No Matinee)	58212.5	10.3237	8.7000e-004	1.1000e-004	10.3770
Quality Restaurant	792623	140.5681	0.0119	1.4400e-003	141.2933
Recreational Swimming Pool	218575	38.7633	3.2700e-003	4.0000e-004	38.9633
Total		**1,031.5470**	**0.0871**	**0.0106**	**1,036.8686**

6.0 Area Detail

6.1 Mitigation Measures Area

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Unmitigated	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1969					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5238					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2800e-003	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Total	**1.7219**	**1.3000e-004**	**0.0139**	**0.0000**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**0.0271**	**0.0271**	**7.0000e-005**	**0.0000**	**0.0288**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1969					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5238					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2800e-003	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Total	**1.7219**	**1.3000e-004**	**0.0139**	**0.0000**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**0.0271**	**0.0271**	**7.0000e-005**	**0.0000**	**0.0288**

7.0 Water Detail

7.1 Mitigation Measures Water

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	70.0986	0.7958	0.0193	95.7471
Unmitigated	70.0986	0.7958	0.0193	95.7471

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0.504491 / 0.309204	1.9343	0.0166	4.1000e-004	2.4701
Hotel	12.6834 / 1.40927	36.0892	0.4160	0.0101	49.4949
Movie Theater (No Matinee)	2.82727 / 0.180464	7.7813	0.0927	2.2500e-003	10.7683
Quality Restaurant	6.7688 / 0.432051	18.6293	0.2220	5.3800e-003	25.7804
Recreational Swimming Pool	1.4774 / 0.905501	5.6645	0.0486	1.1900e-003	7.2335
Total		**70.0986**	**0.7958**	**0.0193**	**95.7471**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0.504491 / 0.309204	1.9343	0.0166	4.1000e-004	2.4701
Hotel	12.6834 / 1.40927	36.0892	0.4160	0.0101	49.4949
Movie Theater (No Matinee)	2.82727 / 0.180464	7.7813	0.0927	2.2500e-003	10.7683
Quality Restaurant	6.7688 / 0.432051	18.6293	0.2220	5.3800e-003	25.7804
Recreational Swimming Pool	1.4774 / 0.905501	5.6645	0.0486	1.1900e-003	7.2335
Total		**70.0986**	**0.7958**	**0.0193**	**95.7471**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	106.6190	6.3010	0.0000	264.1440
Unmitigated	106.6190	6.3010	0.0000	264.1440

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Health Club	48.62	9.8694	0.5833	0.0000	24.4511
Hotel	273.75	55.5688	3.2840	0.0000	137.6693
Movie Theater (No Matinee)	40.13	8.1460	0.4814	0.0000	20.1814
Quality Restaurant	20.35	4.1309	0.2441	0.0000	10.2341
Recreational Swimming Pool	142.39	28.9039	1.7082	0.0000	71.6082
Total		**106.6190**	**6.3010**	**0.0000**	**264.1440**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Health Club	48.62	9.8694	0.5833	0.0000	24.4511
Hotel	273.75	55.5688	3.2840	0.0000	137.6693
Movie Theater (No Matinee)	40.13	8.1460	0.4814	0.0000	20.1814
Quality Restaurant	20.35	4.1309	0.2441	0.0000	10.2341
Recreational Swimming Pool	142.39	28.9039	1.7082	0.0000	71.6082
Total		**106.6190**	**6.3010**	**0.0000**	**264.1440**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Garden Grove Hotel Site B-2 AQ & GHG - Unmitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix D

Annual Emission Calculations Output - Mitigated
(CalEEMod)

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated

Orange County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	528.00	Space	0.00	249,480.00	0
Health Club	8.53	1000sqft	0.00	8,532.00	0
Hotel	500.00	Room	3.72	379,366.00	0
Movie Theater (No Matinee)	7.04	1000sqft	0.00	7,039.00	0
Quality Restaurant	22.30	1000sqft	0.00	22,296.00	0
Recreational Swimming Pool	24.98	1000sqft	0.00	24,980.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	30
Climate Zone	8			**Operational Year**	2025
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - The project would consist of approximately 500 rooms resort style hotel with meeting/conference rooms, restaurants, outdoor pool deck, etc. on approximately a 3.72-acre site.

Construction Phase - he project site is currently vacant and requires no demolition. Construction phases are based on the information provided by the applicant.

Grading - The project anticipates 60,720 cubic yards of export.

Vehicle Trips - The trip generation rates are adjusted to be consistent with Garden Grove Site B-2 Hotel Traffic Impact Study, by RK Engineering Group.

Energy Use - Swimming Pool energy usuage has been conservatively adjusted to account for pool and water park operations.

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Construction Off-road Equipment Mitigation - Project will be required to comply with SCAQMD Rule 403 regarding fugitive dust control and will use Tier 4 construction engines.

Fleet Mix - Operational fleet mix adjusted to equal 2% trucks with GVWR > 10,000 lbs.

Mobile Land Use Mitigation -

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation -

Water Mitigation -

Waste Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	11.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	18.00	75.00
tblConstructionPhase	NumDays	230.00	550.00
tblConstructionPhase	NumDays	8.00	25.00
tblConstructionPhase	NumDays	18.00	45.00
tblConstructionPhase	NumDays	5.00	20.00
tblEnergyUse	LightingElect	0.00	3.03
tblEnergyUse	NT24E	0.00	3.24
tblEnergyUse	NT24NG	0.00	5.15
tblEnergyUse	T24E	0.00	2.48
tblEnergyUse	T24NG	0.00	28.80
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	HHD	4.9260e-003	1.8820e-003
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDA	0.55	0.55
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT1	0.06	0.06
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	LHD2	6.6790e-003	6.7620e-003
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MCY	0.02	0.03
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MDV	0.13	0.13
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MH	3.8010e-003	3.8480e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	MHD	0.01	5.6180e-003
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	OBUS	6.6200e-004	6.7000e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	SBUS	7.0500e-004	7.1400e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblFleetMix	UBUS	3.7800e-004	3.8300e-004
tblGrading	MaterialExported	0.00	60,720.00
tblLandUse	LandUseSquareFeet	211,200.00	249,480.00
tblLandUse	LandUseSquareFeet	8,530.00	8,532.00
tblLandUse	LandUseSquareFeet	726,000.00	379,366.00
tblLandUse	LandUseSquareFeet	7,040.00	7,039.00
tblLandUse	LandUseSquareFeet	22,300.00	22,296.00
tblLandUse	LotAcreage	4.75	0.00
tblLandUse	LotAcreage	0.20	0.00
tblLandUse	LotAcreage	16.67	3.72
tblLandUse	LotAcreage	0.16	0.00
tblLandUse	LotAcreage	0.51	0.00
tblLandUse	LotAcreage	0.57	0.00
tblVehicleTrips	ST_TR	20.87	0.00
tblVehicleTrips	ST_TR	8.19	8.07
tblVehicleTrips	ST_TR	90.04	0.00
tblVehicleTrips	ST_TR	9.10	0.00
tblVehicleTrips	SU_TR	26.73	0.00
tblVehicleTrips	SU_TR	5.95	5.94
tblVehicleTrips	SU_TR	71.97	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblVehicleTrips	SU_TR	13.60	0.00
tblVehicleTrips	WD_TR	32.93	0.00
tblVehicleTrips	WD_TR	8.36	7.99
tblVehicleTrips	WD_TR	83.84	0.00
tblVehicleTrips	WD_TR	28.82	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0708	1.1785	0.5518	2.9400e-003	0.3520	0.0317	0.3838	0.1609	0.0294	0.1903	0.0000	291.3044	291.3044	0.0423	0.0359	303.0517
2023	0.3259	2.5042	3.4325	9.6500e-003	0.5283	0.0959	0.6242	0.1408	0.0902	0.2310	0.0000	891.1340	891.1340	0.0956	0.0467	907.4338
2024	0.3086	2.3721	3.3719	9.5100e-003	0.5118	0.0852	0.5970	0.1380	0.0802	0.2182	0.0000	879.3745	879.3745	0.0945	0.0449	895.1015
2025	2.0320	0.4642	0.7742	1.7900e-003	0.0855	0.0182	0.1036	0.0229	0.0171	0.0400	0.0000	163.5064	163.5064	0.0229	5.3200e-003	165.6644
Maximum	**2.0320**	**2.5042**	**3.4325**	**9.6500e-003**	**0.5283**	**0.0959**	**0.6242**	**0.1609**	**0.0902**	**0.2310**	**0.0000**	**891.1340**	**891.1340**	**0.0956**	**0.0467**	**907.4338**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0247	0.6365	0.5933	2.9400e-003	0.1757	5.5200e-003	0.1812	0.0728	5.3300e-003	0.0781	0.0000	291.3043	291.3043	0.0423	0.0359	303.0516
2023	0.1640	0.9226	3.5915	9.6500e-003	0.5161	0.0102	0.5263	0.1386	9.9200e-003	0.1485	0.0000	891.1337	891.1337	0.0956	0.0467	907.4334
2024	0.1588	0.9037	3.5413	9.5100e-003	0.5118	0.0102	0.5220	0.1380	9.9200e-003	0.1480	0.0000	879.3742	879.3742	0.0945	0.0449	895.1011
2025	1.9982	0.1296	0.8255	1.7900e-003	0.0855	2.0700e-003	0.0875	0.0229	2.0200e-003	0.0250	0.0000	163.5063	163.5063	0.0229	5.3200e-003	165.6643
Maximum	**1.9982**	**0.9226**	**3.5915**	**9.6500e-003**	**0.5161**	**0.0102**	**0.5263**	**0.1386**	**9.9200e-003**	**0.1485**	**0.0000**	**891.1337**	**891.1337**	**0.0956**	**0.0467**	**907.4334**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.31**	**60.23**	**-5.18**	**0.00**	**12.76**	**87.87**	**22.91**	**19.53**	**87.46**	**41.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	11-1-2022	1-31-2023	1.4923	0.7573
2	2-1-2023	4-30-2023	0.6858	0.2600
3	5-1-2023	7-31-2023	0.7024	0.2622
4	8-1-2023	10-31-2023	0.7057	0.2656
5	11-1-2023	1-31-2024	0.6993	0.2707
6	2-1-2024	4-30-2024	0.6562	0.2591
7	5-1-2024	7-31-2024	0.6643	0.2584
8	8-1-2024	10-31-2024	0.6676	0.2617

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

9	**11-1-2024**	**1-31-2025**	0.6607	0.2668
10	**2-1-2025**	**4-30-2025**	0.5676	0.3592
11	**5-1-2025**	**7-31-2025**	1.7178	1.6810
		Highest	1.7178	1.6810

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Energy	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	2,088.9501	2,088.9501	0.1073	0.0299	2,100.5553
Mobile	1.7269	1.4784	15.9664	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.4425	3,177.4425	0.2144	0.1276	3,220.8363
Waste						0.0000	0.0000		0.0000	0.0000	106.6190	0.0000	106.6190	6.3010	0.0000	264.1440
Water						0.0000	0.0000		0.0000	0.0000	7.6970	62.4016	70.0986	0.7958	0.0193	95.7471
Total	**3.5556**	**2.4498**	**16.7962**	**0.0394**	**3.9118**	**0.0974**	**4.0092**	**1.0425**	**0.0957**	**1.1382**	**114.3160**	**5,328.8212**	**5,443.1372**	**7.4186**	**0.1769**	**5,681.3115**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7212	7.0000e-005	8.0500e-003	0.0000		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	0.0146	0.0146	3.0000e-005	0.0000	0.0153
Energy	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	1,831.0633	1,831.0633	0.0856	0.0273	1,841.3381
Mobile	1.2164	0.7528	8.0647	0.0122	1.3499	0.0100	1.3599	0.3598	9.3100e-003	0.3691	0.0000	1,157.0972	1,157.0972	0.1247	0.0690	1,180.7742
Waste						0.0000	0.0000		0.0000	0.0000	53.3095	0.0000	53.3095	3.1505	0.0000	132.0720
Water						0.0000	0.0000		0.0000	0.0000	6.9273	56.1614	63.0887	0.7162	0.0174	86.1724
Total	**3.0444**	**1.7242**	**8.8887**	**0.0181**	**1.3499**	**0.0839**	**1.4338**	**0.3598**	**0.0832**	**0.4429**	**60.2368**	**3,044.3365**	**3,104.5733**	**4.0770**	**0.1137**	**3,240.3721**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.38**	**29.62**	**47.08**	**54.17**	**65.49**	**13.85**	**64.24**	**65.49**	**13.08**	**61.09**	**47.31**	**42.87**	**42.96**	**45.04**	**35.74**	**42.96**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	11/1/2022	11/28/2022	5	20	
2	Grading	Grading	11/29/2022	1/2/2023	5	25	
3	Building Construction	Building Construction	1/3/2023	2/10/2025	5	550	

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4	Paving	Paving	2/11/2025	4/14/2025	5	45	
5	Architectural Coating	Architectural Coating	4/15/2025	7/28/2025	5	75	

Acres of Grading (Site Preparation Phase): 30

Acres of Grading (Grading Phase): 25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 625,850; Non-Residential Outdoor: 208,617; Striped Parking Area: 14,969 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	7,590.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	291.00	113.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	58.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1966	0.0000	0.1966	0.1010	0.0000	0.1010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0317	0.3308	0.1970	3.8000e-004		0.0161	0.0161		0.0148	0.0148	0.0000	33.4394	33.4394	0.0108	0.0000	33.7098
Total	**0.0317**	**0.3308**	**0.1970**	**3.8000e-004**	**0.1966**	**0.0161**	**0.2127**	**0.1010**	**0.0148**	**0.1159**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7098**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**5.4000e-004**	**4.1000e-004**	**5.6400e-003**	**2.0000e-005**	**1.9800e-003**	**1.0000e-005**	**1.9900e-003**	**5.2000e-004**	**1.0000e-005**	**5.3000e-004**	**0.0000**	**1.5617**	**1.5617**	**4.0000e-005**	**4.0000e-005**	**1.5743**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0752	0.0000	0.0752	0.0386	0.0000	0.0386	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.6600e-003	0.0202	0.2087	3.8000e-004		6.2000e-004	6.2000e-004		6.2000e-004	6.2000e-004	0.0000	33.4394	33.4394	0.0108	0.0000	33.7097
Total	**4.6600e-003**	**0.0202**	**0.2087**	**3.8000e-004**	**0.0752**	**6.2000e-004**	**0.0758**	**0.0386**	**6.2000e-004**	**0.0393**	**0.0000**	**33.4394**	**33.4394**	**0.0108**	**0.0000**	**33.7097**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**5.4000e-004**	**4.1000e-004**	**5.6400e-003**	**2.0000e-005**	**1.9800e-003**	**1.0000e-005**	**1.9900e-003**	**5.2000e-004**	**1.0000e-005**	**5.3000e-004**	**0.0000**	**1.5617**	**1.5617**	**4.0000e-005**	**4.0000e-005**	**1.5743**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0890	0.0000	0.0890	0.0417	0.0000	0.0417	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0234	0.2503	0.1833	3.6000e-004		0.0113	0.0113		0.0104	0.0104	0.0000	31.2657	31.2657	0.0101	0.0000	31.5185
Total	**0.0234**	**0.2503**	**0.1833**	**3.6000e-004**	**0.0890**	**0.0113**	**0.1002**	**0.0417**	**0.0104**	**0.0521**	**0.0000**	**31.2657**	**31.2657**	**0.0101**	**0.0000**	**31.5185**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0146	0.5966	0.1603	2.1700e-003	0.0626	4.3000e-003	0.0669	0.0172	4.1100e-003	0.0213	0.0000	223.4759	223.4759	0.0213	0.0358	234.6748
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**0.0152**	**0.5970**	**0.1659**	**2.1900e-003**	**0.0645**	**4.3100e-003**	**0.0688**	**0.0177**	**4.1200e-003**	**0.0218**	**0.0000**	**225.0376**	**225.0376**	**0.0213**	**0.0358**	**236.2491**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0340	0.0000	0.0340	0.0159	0.0000	0.0159	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3600e-003	0.0189	0.2130	3.6000e-004		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004	0.0000	31.2657	31.2657	0.0101	0.0000	31.5185
Total	**4.3600e-003**	**0.0189**	**0.2130**	**3.6000e-004**	**0.0340**	**5.8000e-004**	**0.0346**	**0.0159**	**5.8000e-004**	**0.0165**	**0.0000**	**31.2657**	**31.2657**	**0.0101**	**0.0000**	**31.5185**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0146	0.5966	0.1603	2.1700e-003	0.0626	4.3000e-003	0.0669	0.0172	4.1100e-003	0.0213	0.0000	223.4759	223.4759	0.0213	0.0358	234.6748
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	4.1000e-004	5.6400e-003	2.0000e-005	1.9800e-003	1.0000e-005	1.9900e-003	5.2000e-004	1.0000e-005	5.3000e-004	0.0000	1.5617	1.5617	4.0000e-005	4.0000e-005	1.5743
Total	**0.0152**	**0.5970**	**0.1659**	**2.1900e-003**	**0.0645**	**4.3100e-003**	**0.0688**	**0.0177**	**4.1200e-003**	**0.0218**	**0.0000**	**225.0376**	**225.0376**	**0.0213**	**0.0358**	**236.2491**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0197	0.0000	0.0197	3.6100e-003	0.0000	3.6100e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.6000e-004	8.9700e-003	7.3800e-003	1.0000e-005		3.9000e-004	3.9000e-004		3.6000e-004	3.6000e-004	0.0000	1.3030	1.3030	4.2000e-004	0.0000	1.3136
Total	**8.6000e-004**	**8.9700e-003**	**7.3800e-003**	**1.0000e-005**	**0.0197**	**3.9000e-004**	**0.0201**	**3.6100e-003**	**3.6000e-004**	**3.9700e-003**	**0.0000**	**1.3030**	**1.3030**	**4.2000e-004**	**0.0000**	**1.3136**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1000e-004	0.0190	6.2300e-003	9.0000e-005	2.6100e-003	1.2000e-004	2.7200e-003	7.1000e-004	1.1000e-004	8.3000e-004	0.0000	8.8106	8.8106	8.9000e-004	1.4100e-003	9.2540
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	2.0000e-005	2.2000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0634	0.0634	0.0000	0.0000	0.0639
Total	**3.3000e-004**	**0.0191**	**6.4500e-003**	**9.0000e-005**	**2.6900e-003**	**1.2000e-004**	**2.8000e-003**	**7.3000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**8.8740**	**8.8740**	**8.9000e-004**	**1.4100e-003**	**9.3179**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.3 Grading - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5400e-003	0.0000	7.5400e-003	1.3800e-003	0.0000	1.3800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.8000e-004	7.9000e-004	8.8800e-003	1.0000e-005		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	1.3030	1.3030	4.2000e-004	0.0000	1.3136
Total	**1.8000e-004**	**7.9000e-004**	**8.8800e-003**	**1.0000e-005**	**7.5400e-003**	**2.0000e-005**	**7.5600e-003**	**1.3800e-003**	**2.0000e-005**	**1.4000e-003**	**0.0000**	**1.3030**	**1.3030**	**4.2000e-004**	**0.0000**	**1.3136**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1000e-004	0.0190	6.2300e-003	9.0000e-005	2.6100e-003	1.2000e-004	2.7200e-003	7.1000e-004	1.1000e-004	8.3000e-004	0.0000	8.8106	8.8106	8.9000e-004	1.4100e-003	9.2540
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	2.0000e-005	2.2000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0634	0.0634	0.0000	0.0000	0.0639
Total	**3.3000e-004**	**0.0191**	**6.4500e-003**	**9.0000e-005**	**2.6900e-003**	**1.2000e-004**	**2.8000e-003**	**7.3000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**8.8740**	**8.8740**	**8.9000e-004**	**1.4100e-003**	**9.3179**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2037	1.8628	2.1036	3.4900e-003		0.0906	0.0906		0.0853	0.0853	0.0000	300.1871	300.1871	0.0714	0.0000	301.9724
Total	**0.2037**	**1.8628**	**2.1036**	**3.4900e-003**		**0.0906**	**0.0906**		**0.0853**	**0.0853**	**0.0000**	**300.1871**	**300.1871**	**0.0714**	**0.0000**	**301.9724**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5372	0.2158	2.6300e-003	0.0922	2.6400e-003	0.0948	0.0266	2.5200e-003	0.0291	0.0000	262.2822	262.2822	0.0156	0.0377	273.8951
Worker	0.1065	0.0761	1.0993	3.4300e-003	0.4137	2.1500e-003	0.4159	0.1099	1.9800e-003	0.1119	0.0000	318.4877	318.4877	7.3200e-003	7.6000e-003	320.9348
Total	**0.1210**	**0.6133**	**1.3151**	**6.0600e-003**	**0.5059**	**4.7900e-003**	**0.5107**	**0.1365**	**4.5000e-003**	**0.1410**	**0.0000**	**580.7698**	**580.7698**	**0.0229**	**0.0453**	**594.8299**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0425	0.2894	2.2611	3.4900e-003		5.2800e-003	5.2800e-003		5.2800e-003	5.2800e-003	0.0000	300.1868	300.1868	0.0714	0.0000	301.9720
Total	**0.0425**	**0.2894**	**2.2611**	**3.4900e-003**		**5.2800e-003**	**5.2800e-003**		**5.2800e-003**	**5.2800e-003**	**0.0000**	**300.1868**	**300.1868**	**0.0714**	**0.0000**	**301.9720**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5372	0.2158	2.6300e-003	0.0922	2.6400e-003	0.0948	0.0266	2.5200e-003	0.0291	0.0000	262.2822	262.2822	0.0156	0.0377	273.8951
Worker	0.1065	0.0761	1.0993	3.4300e-003	0.4137	2.1500e-003	0.4159	0.1099	1.9800e-003	0.1119	0.0000	318.4877	318.4877	7.3200e-003	7.6000e-003	320.9348
Total	**0.1210**	**0.6133**	**1.3151**	**6.0600e-003**	**0.5059**	**4.7900e-003**	**0.5107**	**0.1365**	**4.5000e-003**	**0.1410**	**0.0000**	**580.7698**	**580.7698**	**0.0229**	**0.0453**	**594.8299**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1928	1.7611	2.1179	3.5300e-003		0.0803	0.0803		0.0756	0.0756	0.0000	303.7223	303.7223	0.0718	0.0000	305.5179
Total	**0.1928**	**1.7611**	**2.1179**	**3.5300e-003**		**0.0803**	**0.0803**		**0.0756**	**0.0756**	**0.0000**	**303.7223**	**303.7223**	**0.0718**	**0.0000**	**305.5179**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5418	0.2166	2.6200e-003	0.0933	2.7900e-003	0.0961	0.0269	2.6700e-003	0.0296	0.0000	261.2083	261.2083	0.0159	0.0377	272.8306
Worker	0.1014	0.0691	1.0374	3.3600e-003	0.4185	2.0700e-003	0.4206	0.1111	1.9100e-003	0.1130	0.0000	314.4439	314.4439	6.7200e-003	7.1800e-003	316.7530
Total	**0.1158**	**0.6110**	**1.2540**	**5.9800e-003**	**0.5118**	**4.8600e-003**	**0.5166**	**0.1380**	**4.5800e-003**	**0.1426**	**0.0000**	**575.6522**	**575.6522**	**0.0226**	**0.0449**	**589.5836**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0429	0.2928	2.2873	3.5300e-003		5.3400e-003	5.3400e-003		5.3400e-003	5.3400e-003	0.0000	303.7220	303.7220	0.0718	0.0000	305.5175
Total	**0.0429**	**0.2928**	**2.2873**	**3.5300e-003**		**5.3400e-003**	**5.3400e-003**		**5.3400e-003**	**5.3400e-003**	**0.0000**	**303.7220**	**303.7220**	**0.0718**	**0.0000**	**305.5175**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0145	0.5418	0.2166	2.6200e-003	0.0933	2.7900e-003	0.0961	0.0269	2.6700e-003	0.0296	0.0000	261.2083	261.2083	0.0159	0.0377	272.8306
Worker	0.1014	0.0691	1.0374	3.3600e-003	0.4185	2.0700e-003	0.4206	0.1111	1.9100e-003	0.1130	0.0000	314.4439	314.4439	6.7200e-003	7.1800e-003	316.7530
Total	**0.1158**	**0.6110**	**1.2540**	**5.9800e-003**	**0.5118**	**4.8600e-003**	**0.5166**	**0.1380**	**4.5800e-003**	**0.1426**	**0.0000**	**575.6522**	**575.6522**	**0.0226**	**0.0449**	**589.5836**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0198	0.1808	0.2332	3.9000e-004		7.6500e-003	7.6500e-003		7.2000e-003	7.2000e-003	0.0000	33.6283	33.6283	7.9000e-003	0.0000	33.8260
Total	**0.0198**	**0.1808**	**0.2332**	**3.9000e-004**		**7.6500e-003**	**7.6500e-003**		**7.2000e-003**	**7.2000e-003**	**0.0000**	**33.6283**	**33.6283**	**7.9000e-003**	**0.0000**	**33.8260**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5800e-003	0.0597	0.0239	2.8000e-004	0.0103	3.1000e-004	0.0106	2.9800e-003	3.0000e-004	3.2700e-003	0.0000	28.3715	28.3715	1.7800e-003	4.1100e-003	29.6403
Worker	0.0106	6.9300e-003	0.1081	3.6000e-004	0.0463	2.2000e-004	0.0465	0.0123	2.0000e-004	0.0125	0.0000	33.9563	33.9563	6.8000e-004	7.5000e-004	34.1961
Total	**0.0122**	**0.0666**	**0.1319**	**6.4000e-004**	**0.0566**	**5.3000e-004**	**0.0572**	**0.0153**	**5.0000e-004**	**0.0158**	**0.0000**	**62.3278**	**62.3278**	**2.4600e-003**	**4.8600e-003**	**63.8364**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Building Construction - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7500e-003	0.0324	0.2532	3.9000e-004		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	33.6283	33.6283	7.9000e-003	0.0000	33.8259
Total	**4.7500e-003**	**0.0324**	**0.2532**	**3.9000e-004**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**33.6283**	**33.6283**	**7.9000e-003**	**0.0000**	**33.8259**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5800e-003	0.0597	0.0239	2.8000e-004	0.0103	3.1000e-004	0.0106	2.9800e-003	3.0000e-004	3.2700e-003	0.0000	28.3715	28.3715	1.7800e-003	4.1100e-003	29.6403
Worker	0.0106	6.9300e-003	0.1081	3.6000e-004	0.0463	2.2000e-004	0.0465	0.0123	2.0000e-004	0.0125	0.0000	33.9563	33.9563	6.8000e-004	7.5000e-004	34.1961
Total	**0.0122**	**0.0666**	**0.1319**	**6.4000e-004**	**0.0566**	**5.3000e-004**	**0.0572**	**0.0153**	**5.0000e-004**	**0.0158**	**0.0000**	**62.3278**	**62.3278**	**2.4600e-003**	**4.8600e-003**	**63.8364**

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0184	0.1695	0.2740	4.3000e-004		7.9300e-003	7.9300e-003		7.3300e-003	7.3300e-003	0.0000	36.8511	36.8511	0.0116	0.0000	37.1405
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0184**	**0.1695**	**0.2740**	**4.3000e-004**		**7.9300e-003**	**7.9300e-003**		**7.3300e-003**	**7.3300e-003**	**0.0000**	**36.8511**	**36.8511**	**0.0116**	**0.0000**	**37.1405**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1300e-003	7.4000e-004	0.0115	4.0000e-005	4.9400e-003	2.0000e-005	4.9600e-003	1.3100e-003	2.0000e-005	1.3300e-003	0.0000	3.6214	3.6214	7.0000e-005	8.0000e-005	3.6469
Total	**1.1300e-003**	**7.4000e-004**	**0.0115**	**4.0000e-005**	**4.9400e-003**	**2.0000e-005**	**4.9600e-003**	**1.3100e-003**	**2.0000e-005**	**1.3300e-003**	**0.0000**	**3.6214**	**3.6214**	**7.0000e-005**	**8.0000e-005**	**3.6469**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Paving - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9400e-003	0.0214	0.3045	4.3000e-004		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	36.8510	36.8510	0.0116	0.0000	37.1405
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.9400e-003**	**0.0214**	**0.3045**	**4.3000e-004**		**6.6000e-004**	**6.6000e-004**		**6.6000e-004**	**6.6000e-004**	**0.0000**	**36.8510**	**36.8510**	**0.0116**	**0.0000**	**37.1405**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1300e-003	7.4000e-004	0.0115	4.0000e-005	4.9400e-003	2.0000e-005	4.9600e-003	1.3100e-003	2.0000e-005	1.3300e-003	0.0000	3.6214	3.6214	7.0000e-005	8.0000e-005	3.6469
Total	**1.1300e-003**	**7.4000e-004**	**0.0115**	**4.0000e-005**	**4.9400e-003**	**2.0000e-005**	**4.9600e-003**	**1.3100e-003**	**2.0000e-005**	**1.3300e-003**	**0.0000**	**3.6214**	**3.6214**	**7.0000e-005**	**8.0000e-005**	**3.6469**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.9686					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.4100e-003	0.0430	0.0678	1.1000e-004		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	9.5747	9.5747	5.2000e-004	0.0000	9.5878
Total	**1.9750**	**0.0430**	**0.0678**	**1.1000e-004**		**1.9300e-003**	**1.9300e-003**		**1.9300e-003**	**1.9300e-003**	**0.0000**	**9.5747**	**9.5747**	**5.2000e-004**	**0.0000**	**9.5878**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	3.5700e-003	0.0557	1.9000e-004	0.0239	1.1000e-004	0.0240	6.3400e-003	1.0000e-004	6.4500e-003	0.0000	17.5032	17.5032	3.5000e-004	3.9000e-004	17.6268
Total	**5.4700e-003**	**3.5700e-003**	**0.0557**	**1.9000e-004**	**0.0239**	**1.1000e-004**	**0.0240**	**6.3400e-003**	**1.0000e-004**	**6.4500e-003**	**0.0000**	**17.5032**	**17.5032**	**3.5000e-004**	**3.9000e-004**	**17.6268**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Architectural Coating - 2025

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.9686					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1100e-003	4.8300e-003	0.0687	1.1000e-004		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	9.5747	9.5747	5.2000e-004	0.0000	9.5878
Total	**1.9697**	**4.8300e-003**	**0.0687**	**1.1000e-004**		**1.5000e-004**	**1.5000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**9.5747**	**9.5747**	**5.2000e-004**	**0.0000**	**9.5878**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	3.5700e-003	0.0557	1.9000e-004	0.0239	1.1000e-004	0.0240	6.3400e-003	1.0000e-004	6.4500e-003	0.0000	17.5032	17.5032	3.5000e-004	3.9000e-004	17.6268
Total	**5.4700e-003**	**3.5700e-003**	**0.0557**	**1.9000e-004**	**0.0239**	**1.1000e-004**	**0.0240**	**6.3400e-003**	**1.0000e-004**	**6.4500e-003**	**0.0000**	**17.5032**	**17.5032**	**3.5000e-004**	**3.9000e-004**	**17.6268**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Density

Increase Diversity

Improve Walkability Design

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Limit Parking Supply

Implement Trip Reduction Program

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.2164	0.7528	8.0647	0.0122	1.3499	0.0100	1.3599	0.3598	9.3100e-003	0.3691	0.0000	1,157.0972	1,157.0972	0.1247	0.0690	1,180.7742
Unmitigated	1.7269	1.4784	15.9664	0.0336	3.9118	0.0235	3.9353	1.0425	0.0218	1.0643	0.0000	3,177.4425	3,177.4425	0.2144	0.1276	3,220.8363

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Health Club	0.00	0.00	0.00		

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Hotel	3,995.00	4,035.00	2970.00	9,196,985	3,173,633
Movie Theater (No Matinee)	549.75	699.21	576.79	1,218,365	420,425
Quality Restaurant	0.00	0.00	0.00		
Recreational Swimming Pool	0.00	0.00	0.00		
Total	4,544.75	4,734.21	3,546.79	10,415,350	3,594,058

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Health Club	16.60	8.40	6.90	16.90	64.10	19.00	52	39	9
Hotel	16.60	8.40	6.90	19.40	61.60	19.00	58	38	4
Movie Theater (No Matinee)	16.60	8.40	6.90	1.80	79.20	19.00	66	17	17
Quality Restaurant	16.60	8.40	6.90	12.00	69.00	19.00	38	18	44
Recreational Swimming Pool	16.60	8.40	6.90	33.00	48.00	19.00	52	39	9

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Health Club	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Hotel	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Movie Theater (No Matinee)	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Quality Restaurant	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848
Recreational Swimming Pool	0.554229	0.060926	0.187329	0.128053	0.024536	0.006762	0.005618	0.001882	0.000670	0.000383	0.025051	0.000714	0.003848

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Percent of Electricity Use Generated with Renewable Energy

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	773.6602	773.6602	0.0653	7.9200e-003	777.6514
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,031.5470	1,031.5470	0.0871	0.0106	1,036.8686
NaturalGas Mitigated	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	1,057.4031	1,057.4031	0.0203	0.0194	1,063.6867
NaturalGas Unmitigated	0.1069	0.9713	0.8159	5.8300e-003		0.0738	0.0738		0.0738	0.0738	0.0000	1,057.4031	1,057.4031	0.0203	0.0194	1,063.6867

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	177124	9.6000e-004	8.6800e-003	7.2900e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4520	9.4520	1.8000e-004	1.7000e-004	9.5082
Hotel	1.28795e+007	0.0695	0.6314	0.5303	3.7900e-003		0.0480	0.0480		0.0480	0.0480	0.0000	687.2979	687.2979	0.0132	0.0126	691.3821
Movie Theater (No Matinee)	146130	7.9000e-004	7.1600e-003	6.0200e-003	4.0000e-005		5.4000e-004	5.4000e-004		5.4000e-004	5.4000e-004	0.0000	7.7980	7.7980	1.5000e-004	1.4000e-004	7.8444
Quality Restaurant	5.76418e+006	0.0311	0.2826	0.2374	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.5989	307.5989	5.9000e-003	5.6400e-003	309.4268
Recreational Swimming Pool	848071	4.5700e-003	0.0416	0.0349	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.2563	45.2563	8.7000e-004	8.3000e-004	45.5252
Total		**0.1069**	**0.9713**	**0.8159**	**5.8300e-003**		**0.0738**	**0.0738**		**0.0738**	**0.0738**	**0.0000**	**1,057.4031**	**1,057.4031**	**0.0203**	**0.0194**	**1,063.6867**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health Club	177124	9.6000e-004	8.6800e-003	7.2900e-003	5.0000e-005		6.6000e-004	6.6000e-004		6.6000e-004	6.6000e-004	0.0000	9.4520	9.4520	1.8000e-004	1.7000e-004	9.5082
Hotel	1.28795e+007	0.0695	0.6314	0.5303	3.7900e-003		0.0480	0.0480		0.0480	0.0480	0.0000	687.2979	687.2979	0.0132	0.0126	691.3821
Movie Theater (No Matinee)	146130	7.9000e-004	7.1600e-003	6.0200e-003	4.0000e-005		5.4000e-004	5.4000e-004		5.4000e-004	5.4000e-004	0.0000	7.7980	7.7980	1.5000e-004	1.4000e-004	7.8444
Quality Restaurant	5.76418e+006	0.0311	0.2826	0.2374	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.5989	307.5989	5.9000e-003	5.6400e-003	309.4268
Recreational Swimming Pool	848071	4.5700e-003	0.0416	0.0349	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.2563	45.2563	8.7000e-004	8.3000e-004	45.5252
Total		**0.1069**	**0.9713**	**0.8159**	**5.8300e-003**		**0.0738**	**0.0738**		**0.0738**	**0.0738**	**0.0000**	**1,057.4031**	**1,057.4031**	**0.0203**	**0.0194**	**1,063.6867**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	1.35717e+006	240.6883	0.0203	2.4600e-003	241.9299
Health Club	70559.6	12.5134	1.0600e-003	1.3000e-004	12.5780
Hotel	3.31945e+006	588.6901	0.0497	6.0200e-003	591.7271
Movie Theater (No Matinee)	58212.5	10.3237	8.7000e-004	1.1000e-004	10.3770
Quality Restaurant	792623	140.5681	0.0119	1.4400e-003	141.2933
Recreational Swimming Pool	218575	38.7633	3.2700e-003	4.0000e-004	38.9633
Total		**1,031.5470**	**0.0871**	**0.0106**	**1,036.8686**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	1.01788e+006	180.5162	0.0152	1.8500e-003	181.4475
Health Club	52919.7	9.3851	7.9000e-004	1.0000e-004	9.4335
Hotel	2.48959e+006	441.5176	0.0373	4.5200e-003	443.7953
Movie Theater (No Matinee)	43659.4	7.7428	6.5000e-004	8.0000e-005	7.7827
Quality Restaurant	594467	105.4261	8.9000e-003	1.0800e-003	105.9700
Recreational Swimming Pool	163931	29.0725	2.4500e-003	3.0000e-004	29.2225
Total		**773.6602**	**0.0653**	**7.9300e-003**	**777.6514**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Electric Lawnmower

Use Electric Leafblower

Use Electric Chainsaw

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.7212	7.0000e-005	8.0500e-003	0.0000		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	0.0146	0.0146	3.0000e-005	0.0000	0.0153
Unmitigated	1.7219	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1969					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5238					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2800e-003	1.3000e-004	0.0139	0.0000		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	0.0271	0.0271	7.0000e-005	0.0000	0.0288
Total	**1.7219**	**1.3000e-004**	**0.0139**	**0.0000**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**0.0271**	**0.0271**	**7.0000e-005**	**0.0000**	**0.0288**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1969					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5238					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	5.4000e-004	7.0000e-005	8.0500e-003	0.0000		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	0.0146	0.0146	3.0000e-005	0.0000	0.0153
Total	**1.7212**	**7.0000e-005**	**8.0500e-003**	**0.0000**		**2.0000e-005**	**2.0000e-005**		**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0146**	**0.0146**	**3.0000e-005**	**0.0000**	**0.0153**

7.0 Water Detail

7.1 Mitigation Measures Water

Apply Water Conservation Strategy

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	63.0887	0.7162	0.0174	86.1724
Unmitigated	70.0986	0.7958	0.0193	95.7471

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0.504491 / 0.309204	1.9343	0.0166	4.1000e-004	2.4701
Hotel	12.6834 / 1.40927	36.0892	0.4160	0.0101	49.4949
Movie Theater (No Matinee)	2.82727 / 0.180464	7.7813	0.0927	2.2500e-003	10.7683
Quality Restaurant	6.7688 / 0.432051	18.6293	0.2220	5.3800e-003	25.7804
Recreational Swimming Pool	1.4774 / 0.905501	5.6645	0.0486	1.1900e-003	7.2335
Total		**70.0986**	**0.7958**	**0.0193**	**95.7471**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Health Club	0.454042 / 0.278284	1.7408	0.0149	3.7000e-004	2.2231
Hotel	11.415 / 1.26834	32.4803	0.3744	9.0800e-003	44.5454
Movie Theater (No Matinee)	2.54455 / 0.162418	7.0032	0.0834	2.0200e-003	9.6914
Quality Restaurant	6.09192 / 0.388846	16.7664	0.1998	4.8400e-003	23.2023
Recreational Swimming Pool	1.32966 / 0.814951	5.0980	0.0437	1.0700e-003	6.5102
Total		**63.0887**	**0.7163**	**0.0174**	**86.1724**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Garden Grove Hotel Site B-2 AQ & GHG - Mitigated - Orange County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	53.3095	3.1505	0.0000	132.0720
Unmitigated	106.6190	6.3010	0.0000	264.1440

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Health Club	48.62	9.8694	0.5833	0.0000	24.4511
Hotel	273.75	55.5688	3.2840	0.0000	137.6693
Movie Theater (No Matinee)	40.13	8.1460	0.4814	0.0000	20.1814
Quality Restaurant	20.35	4.1309	0.2441	0.0000	10.2341
Recreational Swimming Pool	142.39	28.9039	1.7082	0.0000	71.6082
Total		**106.6190**	**6.3010**	**0.0000**	**264.1440**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Health Club	24.31	4.9347	0.2916	0.0000	12.2255
Hotel	136.875	27.7844	1.6420	0.0000	68.8347
Movie Theater (No Matinee)	20.065	4.0730	0.2407	0.0000	10.0907
Quality Restaurant	10.175	2.0654	0.1221	0.0000	5.1170
Recreational Swimming Pool	71.195	14.4519	0.8541	0.0000	35.8041
Total		**53.3095**	**3.1505**	**0.0000**	**132.0720**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix C
California Department of Fish and Wildlife
California Natural Diversity Database

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Anaheim (3311778))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia villosa var. aurita chaparral sand-verbena	PDNYC010P1	None	None	G5T2?	S2	1B.1
Anniella stebbinsi Southern California legless lizard	ARACC01060	None	None	G3	S3	SSC
Astragalus hornii var. hornii Horn's milk-vetch	PDFAB0F421	None	None	GUT1	S1	1B.1
Atriplex parishii Parish's brittlescale	PDCHE041D0	None	None	G1G2	S1	1B.1
Bombus crotchii Crotch bumble bee	IIHYM24480	None	None	G3G4	S1S2	
Buteo swainsoni Swainson's hawk	ABNKC19070	None	Threatened	G5	S3	
Centromadia parryi ssp. australis southern tarplant	PDAST4R0P4	None	None	G3T2	S2	1B.1
Coccyzus americanus occidentalis western yellow-billed cuckoo	ABNRB02022	Threatened	Endangered	G5T2T3	S1	
Eumops perotis californicus western mastiff bat	AMACD02011	None	None	G4G5T4	S3S4	SSC
Euphydryas editha quino quino checkerspot butterfly	IILEPK405L	Endangered	None	G5T1T2	S1S2	
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Nasturtium gambelii Gambel's water cress	PDBRA270V0	Endangered	Threatened	G1	S1	1B.1
Oncorhynchus mykiss irideus pop. 10 steelhead - southern California DPS	AFCHA0209J	Endangered	None	G5T1Q	S1	
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G3G4	S3S4	SSC
Polioptila californica californica coastal California gnatcatcher	ABPBJ08081	Threatened	None	G4G5T3Q	S2	SSC
Sidalcea neomexicana salt spring checkerbloom	PDMAL110J0	None	None	G4	S2	2B.2
Spea hammondii western spadefoot	AAABF02020	None	None	G2G3	S3	SSC
Symphyotrichum defoliatum San Bernardino aster	PDASTE80C0	None	None	G2	S2	1B.2

Record Count: 18

Appendix D
Cultural, Paleontological and Tribal Cultural Resources Technical Memorandum

AECOM
300 S Grand Avenue,
Los Angeles, CA 90071
www.aecom.com

213.593.8100 tel
213.593.8053 fax

Memorandum

To	Ms. Monica L. Covarrubias Office of Economic Development City of Garden Grove
Subject	Site B-2 Hotel Project: Cultural, Paleontological and Tribal Cultural Resources Technical Memorandum
From	Allison Hill M.A., RPA, AECOM
Date	March 11, 2022

Introduction

This technical memorandum describes the potential impacts to cultural, tribal cultural, and paleontological resources associated with the Site B-2 Hotel Project (proposed project) to be located at the northwest corner of Harbor Boulevard and Twintree Avenue, south of Sheraton Hotel, and east of Tamerlane Drive in the City of Garden Grove (project site). The proposed project will consist of the development of a full-service high-rise resort hotel on a 3.72-acre site. Regional access to the project site is provided by State Route 22 and Interstate 5 (Figure 1 of Attachment 1). Local access to the project site is currently provided via Harbor Boulevard, Twintree Avenue, and Thackery Drive (Figure 2 of Attachment 1). The project site is identified by Assessor's Parcel Numbers 231-471-06 through 231-471-24. The proposed hotel would be a maximum height of 350 feet and include 500 guest suites with balconies; themed pool experience with lazy river; storage and loading area at 8,600 square feet maximum; event space with a 600 maximum occupancy theater; grand ballroom at 9,490 square feet; two (2) meeting rooms with a combined area of 8,225 square feet; various food and beverage opportunities to be placed throughout the hotel totaling a maximum of 22,296 square feet; themed amenities totaling 13,238 square feet; a 7,000-square foot arcade; and spa and fitness center at 8,532 square feet. All hotel amenities, except for the ballroom, meeting rooms, and 11,148 square feet of restaurant, would be for the hotel guests use only. The proposed project would also include a five-level parking garage (four levels above grade and one level below grade) with a total of 528 spaces to serve the suites, event space, commercial and retail uses, and food and beverage needs, as well as other amenities such as the spa and fitness center. As discussed in this memorandum, the proposed project will have no potentially significant adverse impacts related to paleontological resources, cultural resources, or tribal cultural resources, and no further action is recommended for the proposed project.

Cultural Setting

As a framework for discussing the types of cultural resources that might be encountered in the vicinity of the proposed project, the following section summarizes our current understanding of major prehistoric and historic developments in and around the Los Angeles Basin and the greater Southern California area.

Prehistoric Overview

The earliest occupation of Southern California may be associated with the peoples who first colonized North America in the terminal Pleistocene and earliest Holocene (Arnold et al. 2004). A key indicator of these early cultures are fluted points, which have been reported at a number of locations in Southern California (Rondeau 2008). Clovis is the earliest universally recognized material culture in North America and dates to approximately 11,500 radiocarbon years before present (B.P.).

However, scholarly consensus holds that the earliest unambiguous evidence of human occupation in the Los Angeles Basin dates to at least 9000 B.P. and is associated with a period known as the Millingstone Cultural Horizon (Wallace 1955; Warren 1968). Millingstone populations established permanent settlements that were located primarily on the coast and in the vicinity of estuaries, lagoons, lakes, streams, and marshes where a variety of resources, including seeds, fish, shellfish, small mammals, and birds, were exploited. Early Millingstone occupations are typically identified by the presence of handstones (manos) and millingstones (metates), while those Millingstone occupations dating later than 5000 B.P. contain a mortar and pestle complex as well, signifying the exploitation of acorns in the region.

Although many aspects of Millingstone culture persisted, by 3500 B.P., a number of socioeconomic changes occurred (Erlandson 1994; Wallace 1955; Warren 1968). These changes are associated with the period known as the Intermediate Horizon (Wallace 1955). Increasing population size necessitated the intensification of existing terrestrial and marine resources (Erlandson 1994). This was accomplished in part through use of new technological innovations such as the circular shell fishhook on the coast and, in inland areas, use of the mortar and pestle to process an important new vegetal food staple (acorns); and the dart and atlatl, which resulted in a more diverse hunting capability. Evidence for shifts in settlement patterns has been noted as well at a variety of locations at this time and is seen by many researchers as reflecting increasingly territorial and sedentary populations. The Intermediate Horizon marks a period in which specialization in labor emerged, trading networks became an increasingly important means by which both utilitarian and nonutilitarian materials were acquired, and travel routes were extended.

The late prehistoric period, spanning from approximately 1500 B.P. to the Spanish mission era, is the period associated with the florescence of contemporary Native American groups. The group occupying the southern Channel Islands and adjacent mainland areas of Los Angeles and Orange Counties came to be known as the Gabrielino, after Mission San Gabriel. They are reported to have been second only to their Chumash neighbors in terms of population size, regional influence, and degree of sedentism (Bean and Smith 1978). The boundary between these two groups is commonly believed to be in the area by Topanga Canyon, with the Chumash living along the beaches of Malibu up to the area of Paso Robles and the Gabrielino residing along the coast to southern Orange County. The Gabrielino are estimated to have numbered around 5,000 in the pre-contact period (Kroeber 1925). Maps produced by early explorers indicate the existence of at least 40 Gabrielino villages, but as many as 100 may have existed prior to contact with Europeans (Bean and Smith 1978; McCawley 1996; Reid 1939 [1852]).

Higher densities of archaeological sites have been documented along the coast and in the foothills and mountains east and south of the project site. The lower Santa Ana River corridor also has increased sensitivity for archaeological sites such as CA-ORA-58, a well-documented village, which exhibits cogged stone artifacts, distant trade goods, dense habitation debris, and hundreds of burials. The site was in use by 1500 BC through the late prehistoric period (Koerper et al. 1996).

Subsistence during the late prehistoric period consisted of hunting, fishing, and gathering. Small terrestrial game was hunted with deadfalls and rabbit drives, and by burning undergrowth, while larger game such as deer were hunted using bows and arrows. Fish were taken by hook and line, nets, traps, spears, and poison (Bean and Smith 1978; Reid 1939 [1852]). The primary plant resources were acorns gathered in the fall and processed with mortars and pestles, and various seeds that were harvested in late spring and summer and ground with manos and metates. The seeds included chia and other sages, various grasses, and Islay or holly-leafed cherry (Reid 1939 [1852]).

Historic Overview

Spanish explorers made brief visits to Gabrielino territory in 1542 and 1602, and on both occasions the two groups exchanged trade items (McCawley 1996). Sustained contact with Europeans did not commence until the Spanish Period, which began in 1769 when Gaspar de Portola and a small Spanish contingent began their

exploratory journey along the California coast from San Diego to Monterey. During this expedition, the party camped east of Garden Grove in a wide grassy plain they named Sana Ana Valley (Garden Grove 2005).

Gabrielino villages are reported by early explorers to have been most abundant along the dominant rivers of the Los Angeles Basin, including the Los Angeles, San Gabriel, and Santa Ana Rivers. Two Gabrielino villages have been documented in the vicinity of the project site. The community of *Hotuukngа* has been well documented on the north bank of the Santa Ana River just downstream of Santa Ana Canyon near the Bernardo Yorba adobe (McCawley 1996:60) about 9 miles northeast of the project site. Closer to the project site is the community of *Pasbengna* on the east side of the Santa Ana River near the modern-day City of Santa Ana (McCawley 1996:60) possibly 2 to 3 miles southeast of the project site. Other known place names in the region include *Wanawna*, a Gabrielino name for the Santa Ana River; *Katuktu*, possibly a Luiseno word for Red Hill near Irvine; and *AXawkna*, a place name near Santa Ana meaning 'in the net" (McCawley 1996:60–61).

By the early 1800s, the majority of the surviving native population had entered the mission system. Mission San Gabriel Arcángel was founded September 8, 1771, and in 1776 moved to its present location, approximately 12.5 miles east of the project vicinity. Approximately 24 miles south of the project site, Mission San Juan Capistrano was founded in 1776 by Padre Junipero Serra as the seventh mission in the eventual 21 mission system in Alta California. (Paddison 1999; Wright 1992). The establishment of the Mission was associated with a decline in the traditional Native American economic and social systems, as well as overall population due to epidemics and subsistence instabilities. This lifestyle change brought significant negative consequences for Gabrielino health and cultural integrity (Jackson 1999).

Alongside mission development was the foundation of *El Pueblo de la Reyna de Los Angeles,* a secular community established by colonists in 1781. This community was formed by 11 families that included 44 individuals as part of a colonization effort that eventually became the City of Los Angeles (Poole and Ball 2002). The growth of *El Pueblo de la Reyna de Los Angeles* became established after the Mexican empire gained independence and formed what would become the state of Alta California in 1821. The authority of the California missions gradually declined, culminating with their secularization in 1834. Although the Mexican government directed that each mission's lands, livestock, and equipment be divided among its converts, the majority of these holdings quickly fell into non-Indigenous hands. Mission buildings were abandoned and quickly fell into decay. If mission life was difficult for Native Americans, secularization was no better. After two generations of dependence on the missions, they were suddenly disenfranchised. After secularization, "nearly all of the Gabrielinos went north while those of San Diego, San Luis, and San Juan overran this county, filling the Angeles and surrounding ranchos with more servants than were required" (Reid 1977 [1851]:104).

The project site is located predominantly within the Rancho Las Bolsas, granted in 1834, which included 33,000 acres, bounded by the Santa Ana River to the east and the Pacific Ocean on the south. It was first owned by Manuel Nieto, who was provided a land grant by the Spanish government in 1784 (Orange County Historical Society n.d.) and later subdivided into several large ranchos, many of which were purchased by Abel Sterns, a prominent land baron in the region. (Garden Grove 2005). Ranching was a prominent economic enterprise during this period, with meat, hide, and tallow being traded for goods and services by the landholding elite. Juan Pablo Grijalva started running cattle southeast of the Sana Ana River in 1800 and, by 1810, his grandson Juan Pablo Peralta and son-in-law Jose Antonio Yorba received a formal land grand known as the Rancho Santiago de Santa Ana, located east of Las Bolsas (Orange County Historical Society n.d.).

The first party of U.S. immigrants arrived in Los Angeles in 1841, although commerce had previously been conducted between Mexican California and residents of the United States and its territories. As the possibility of a takeover of California by the United States loomed large, the Mexican government increased the number of land grants in an effort to keep the land in the hands of upper-class *Californios* like the Dominguez, Lugo, and Sepulveda families (Wilkman and Wilkman 2006:14–17). Governor Pio Pico and his predecessors made more than 600 rancho grants between 1833 and 1846, putting most of the state's lands into private ownership for the first time (Gumprecht 1999).

The United States took control of California after the Mexican–American War of 1846, and seized Monterey, San Francisco, San Diego, and Los Angeles (then the state capital) with little resistance. Local unrest soon bubbled to the surface, however, and Los Angeles slipped from U.S. control in 1847. Hostilities officially ended with the signing of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico $15 million for the conquered territory, which included California, Nevada, and Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming. The conquered territory represented nearly half of Mexico's pre-1846 holdings. California joined the United States in 1850 as the 31st state (Wilkman and Wilkman 2006:15).

The discovery of gold in northern California led to an enormous influx of American citizens in the 1850s and 1860s, and these settlers rapidly displaced the old rancho families. While the increase of people initially led to a new and larger market for their beef, hide, and tallow, the poor land management and grazing practices, several seasons of inhospitable weather, and steep competition that drove down prices eventually contributed to the end of the rancho system (Isenberg 2005). With the high cost to maintain cattle and the increased demand for fiber during the shortage of cotton during the Civil War, many landowners transitioned to grazing sheep and lands were sold off to settlers and developers.

In 1874, Dr. Alonzo Cook purchased 160 acres of land in the area. He donated some land to be used for a school house and post office. The area came to be known as the village of Garden Grove and it was initially located within the boundary of Los Angeles County, a two days' ride from the county seat. Following an election in 1889, the County of Orange was formed, encompassing the village that had about 200 residents at the time (Brigandi 2010; Garden Grove 2005).

The Southern Pacific Railroad extended its line from San Francisco to Los Angeles in 1876, passing through the San Fernando Valley thanks to a new tunnel through Newhall Pass. Newcomers continued to pour into Los Angeles and the population nearly doubled between 1870 and 1880. The completion of the second transcontinental rail line, the Santa Fe, took place in 1886 causing a fare war, which drove fares to an unprecedented low. More settlers continued to head west and the demand for real estate skyrocketed. In 1905 the Pacific Electric Railway was constructed through Garden Grove and bought an influx of settlers and visitors. The railroad also helped local farmers send their harvest to more distant consumers and packing houses were built along the railroad. From 1905 to the 1940s, agriculture was the heart of the Garden Grove economy, where farmers grew oranges, walnuts, sugar beets, lima beans, and chili peppers (Garden Grove 2005).

Following the end of World War II, a housing boom swept southern California as soldiers returned from war, eager to fulfill the American Dream. Due to its location near major urban area, abundance of undeveloped land, and low prices, Garden Grove experienced a major building boom in the 1950s and was the fastest growing city in the nation for many years in the 1950s and 1960s. It was not until June 15, 1956, that the City of Garden Grove was incorporated into Orange County as a legal entity.

Archival Research

As part of this cultural resources assessment, an archival research program was conducted. The purpose of this research is to identify known cultural resources in the project site, provide context for the evaluation of cultural resources within this area that are 45 years or older, and provide information regarding the potential to encounter previously unidentified cultural resources in the course of ground-disturbing work associated with the proposed project.

Archival research included a records search at the South Central Coastal Information Center (SCCIC), review of local cultural resource registers, and review of local and regional historic maps. Supplemental research in published and unpublished sources was also conducted to provide prehistoric and historic contexts for the project site. Finally, the Native American Heritage Commission (NAHC) was contacted to request a Sacred

Lands File (SLF) search of the project site, and a Native American contact program was conducted to solicit input from regional Native American individuals and organizations.

Due to pandemic restrictions, SCCIC is currently closed to visitors, and all records searches are conducted by IC staff. Results of the SCCIC records search, which identified previous studies and previously recorded cultural resources within a 0.25-mile radius of the project site, were received June 22, 2021. Additional archival research was conducted by AECOM archaeologists Marc A. Beherec, Ph.D., RPA, and Allison Hill, M.A. RPA, which included review of previously recorded archaeological site records and reports, historic site and property inventories, and historic maps. Inventories of the National Register of Historic Places, the California Register of Historical Resources, the California Office of Historic Preservation (OHP)'s Built Environment Resource Directory (BERD), and California Historical Landmarks and Points of Interest, were also reviewed to identify cultural resources within a 0.25-mile radius of the project site.

Previous Cultural Resources Investigations Reports

The records search revealed that one cultural resources investigation overlaps the project site (Table 1). In addition, four cultural resource investigations were previously conducted within a 0.25-mile radius of the project site.

Table 1. Previous Investigations Conducted within the Project Site

Author	Report #	Description	Date
Padron, Beth, Deborah McClean, and Ivan Strudwick	OR-01949	Cultural Resource Assessment for the City of Garden Grove	1995

Previously Recorded Cultural Resources

The SCCIC records search identified 17 previously recorded cultural resources mapped within 0.25 mile of the project site (Table 2). All of the resources are historic homes and converted offices that have been determined not eligible for listing in federal registers or recommended not eligible for listing in the National Register of Historic Places (NRHP) and not a significant property for CEQA. One Tudor-style building and 16 ranch-style buildings are present. None of the resources are on the project site.

California State Built Environment Resources Directory (BERD)

Study of the OHP's BERD focused on properties within 0.25 mile of the project site that faced streets bordering the project site, including Harbor Boulevard, Twintree Avenue, Twintree Lane, Thackery Drive, and Tamerlane Drive. Thirteen properties are listed in the BERD for Harbor Boulevard and Twintree Lane within 0.25 mile of the project site (Table 3). None of the properties are on the project site.

Table 2. Previously Recorded Cultural Resource Sites within 0.25 Mile of the Project Site

Primary Number (P-30-)	Historic Name/Description	Time Period	Eligibility Evaluation
157376	Tudor-style building	Historic (ca. 1930 –– -1940)	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176886	Ranch-style dwelling	Historic	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176887	Ranch-style dwelling	Historic	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176888	Ranch-style dwelling	Historic	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176889	Ranch-style dwelling	Historic	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176890*	Rectilinear-plan converted from ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176891*	Ranch-style dwelling	Historic	Recommended not eligible for listing in NR and not a significant property for CEQA through survey evaluation
176892*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176893*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176894*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176895*	Rectilinear-plan converted from ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176896*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176897*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176898*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176899*	Ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106

Primary Number (P-30-)	Historic Name/Description	Time Period	Eligibility Evaluation
			process – Not evaluated for CR or local listing.
176900*	L-plan converted from a ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.
176901*	L-plan converted from a ranch-style dwelling	Historic	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.

CRHR = California Register of Historical Resources; NRHP = National Register of Historic Places; N/A = Not Available; * = Resource also listed in Table 3

Table 3. BERD Properties within 0.25 Mile of the Project Site

Primary Number	Name	Street Address	Date	Evaluation Status
30-162556	Belisle Restaurant	12001 Harbor Blvd	--	--
30-176892*	N/A	12361 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176893*	N/A	12371 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176894*	N/A	12381 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176895*	N/A	12401 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176896*	N/A	12411 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176897*	N/A	12421 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176898*	N/A	12431 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176899*	N/A	12451 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176900*	N/A	12461 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176901*	N/A	12471 Harbor Blvd	1953	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†
30-176891*	N/A	12511 Twintree Lane	1954	N/A
30-176890*	N/A	12512 Twintree Lane	1954	Determined ineligible for NR by consensus through Section 106 process – Not evaluated for CR or local listing.†

CR = California Register of Historical Resources; NR = National Register of Historic Places; N/A = Not Available; * = Resource also listed in Table 2; † = Resource treated as potentially eligible for CR. Resource not located within the project site and no evaluation required for this assessment.

California Historical Landmarks

California Historical Landmarks are buildings, structures, sites, or places determined to have statewide historical interest. A search of the California Historical Landmarks list revealed no California Historic Landmarks within 0.25 mile of the project site.

Orange County Historic Sites

The nonprofit corporation Preserve Orange County was founded in 2016 with the goal for promoting conservation of historic architecture and cultural heritage in the county. The organization maintains a list of historic built environment resources, including those listed on national, state, and local historic registers, as well as undesignated places that are historic but have yet to be formally documented. One resource was observed within 0.25 mile of the project site (Table 4). This resource, Bob's Big Boy building, is mapped approximately 0.15 miles northeast of the project site. The project site is visible from the building; however, it is partially obscured by an existing hotel just north of the project site. No information on the evaluation status of this building was identified. It should be treated as a potentially eligible resources that requires further evaluation. This resource is not located within the project site and no work is required for this assessment.

Table 4. Preserve Orange County Identified Resources within 0.25 Mile of the Project Site

Resource Name	Street Address	Resource Type	Date	Evaluation Status
Bob's Big Boy	12032 Harbor Boulevard	Prototype design for Bob's Big Boy chain with Googie style architecture	1964	Not currently listed on a historic register

Historic Maps and Aerial Photographs

Historic map research was conducted to understand past land use and disturbance and to identify possible locations of archaeological sensitivity within the project site. General Land Office (GLO), U.S. Geological Survey (USGS), and Sanborn Fire Insurance maps were consulted.

No GLO maps or Sanborn Fire insurance maps depicting the project site were identified in online repositories at the time of this archival search. The earliest USGS topographic map, the 1896 Anaheim, CA USGS 1:62500 map, shows a north-south road, which is likely Harbor Boulevard, dotted with sparse buildings on either side. The Santa Ana Branch of the Southern Pacific Railroad is mapped about 1.37 miles northeast of the project site at this time. There are no buildings or other landmarks present in the project site. This remains true for the 1989 and 1901 Anaheim maps at the same scale, which show no changes to the project site. The 1902 Corona, CA 1:125000 map depicts no notable changes in the vicinity of the project site as well. In the 1935 Garden Grove, CA 1:31680 map, the north-south road is clearly Harbor Boulevard and the Pacific Electric Railroad transects the city in a northwest-southeast direction about 1.65 miles southwest of the project site. A single structure is present just south of the project site. The1942 Anaheim 1:62500 map shows one building in the southeast corner of the project site, just north of the building present in the 1935 map. By the time the1949 and 1950 Anaheim 1:24000 maps were created, the structure present in the project site in 1942 appears to be gone. On the 1965 Anaheim 1:24000 map, Twintree Avenue appears for first time and the entire area is developed.

Historic aerial images from the University of California, Santa Barbara Library Geospatial Collection and the Nationwide Environmental Title Research, LLC online repositories were reviewed. A 1938 map shows the

general vicinity comprises agricultural lands with associated buildings and houses sparsely scattered across the tree groves and fields. The project site is located in a grove of trees with a structure present just south of the project. The next aerial image of the project site was taken in 1952 (Plate 1). It shows that a portion of the grove within the project site has been removed. There also appears to be some stained soil in the location where the building was observed in the 1942 Anaheim map, providing further evidence there was likely a building in the southeast portion of the project site constructed between 1938 and 1942 and then removed before 1949. The 1938 image also shows a driveway and a structure with a small grove of trees and a few rows of crops in the northern portion of the project site. A 1963 aerial image shows the project site as developed with a housing tract around a single north-south–oriented cul-de-sac making up the western 75 percent of the property. A north-south alley divides the neighborhood from what appear to be businesses along the eastern project site boundary facing Harbor Boulevard. Minor changes to the businesses along Harbor Boulevard, such as expansion of parking lots, occur through the years. Between 2003 and 2014, all of the buildings were removed from the project site, leaving only the cul-de-sac and the alley. By 2016, a parking lot was constructed in the northeast portion of the project site. Vegetation has grown fairly dense in recent years and it appears the southeastern portion of the project site was used as a laydown yard for a period between 2019 and 2020.



Plate 1: Approximate Location of the Project Site in 1952 (UCSB Library 1952)

Native American Contact Program

As part of this investigation, an SLF search of the project site and vicinity was requested from the NAHC. A letter was prepared and mailed to the NAHC on May 19, 2021. The letter requested that an SLF check be conducted for the proposed project and that contact information be provided for Native American groups or individuals that may have concerns about cultural resources in the project site. The NAHC responded with a letter dated June 2, 2021. The letter stated that an SLF search had been conducted with negative results and included a list of tribes culturally affiliated with the project site who may have information about the project site. Representatives for these tribes were contacted with letters dated June 9, 2021, that contained information regarding the proposed project and its geographical location. The letters requested additional knowledge tribal representatives may have on the area and included an invitation to consult with the City of Garden Grove under Assembly Bill 52 (AB 52).

Tribal representatives were directed to engage with a point of contact provided for the City of Garden Grove to initiate government-to-government consultation. The letter stated that, pursuant to PRC § 21080.3.1, representatives had 30 days from the receipt of this notice to request consultation, in writing with the City of Garden Grove, regarding this project. Those who did not respond to the letter were subsequently contacted by email or phone by AECOM on behalf of the City of Garden Grove. The purpose of the SLF check and Native American contact was to identify Native American sacred sites and potential tribal cultural resources located within the project vicinity and to support initial AB 52 consultation.

The SLF search returned a negative result, indicating no resources in the NAHC SLF database were present in the project site. This negative result does not indicate the absence of cultural resources within the project site and the NAHC recommends other sources of cultural resource information should be examined. As a result of outreach efforts to Native American representatives, AECOM received one response. Shasta Gaughen, Tribal Historic Preservation Officer for the Pala Band of Mission Indians indicated the proposed project is not within the Pala Indian Reservation and is beyond the Traditional Use Area of the tribe. Ms. Gaughen indicated the Pala Band declined to participate in AB 52 consultation at this time but does not waive the right to request consultation under other applicable laws in the future. The City of Garden Grove did not receive any requests for consultation as a result of the letters, follow up calls and emails. The results of the SLF search and Native American contact program conducted by AECOM are included in confidential Attachment 2.

Paleontological Research

The project site is mapped as having surficial deposits of Quaternary young alluvial fan deposits ranging in age from the Holocene and latest Pleistocene. This includes unconsolidated deposits of alluvial fans and headward drainages of fans that consist predominately of gravel, sand, and silt. Trunk drainages and proximal parts of fans contain higher percentage of coarse-grained sediment than distal parts. Silty sand alluvial fan deposits are mapped within the project site, with gravelly sand alluvial fan deposits to the north, east, and south, and arenaceous alluvial fan deposits to the west (Morton 2004). These sediments were deposited by the Santa Ana River and represent an ancient floodplain that began to form as the ocean levels rose and fell during the Cenozoic period, exposing more dry land across California (Irvine Valley College n.d.). The region is underlain by the Los Angeles Basin, which includes up to 4,200 feet of relatively unconsolidated Pleistocene marine and non-marine sediments and up to 170 feet of unconsolidated nonmarine sediments (Garden Grove 2018). Finer-grained sediments located farther from basement rock are more likely to preserve fossil specimens, particularly sands, silts, and clays in ocean, lake, river, and floodplain settings (Freeberg and Scott 2019).

The surficial sediments of younger Quaternary alluvium are not likely to produce significant vertebrate fossils, though sensitivity increases with depth where earlier Pleistocene deposits may be encountered. No fossilized remains have been documented in the project site according to archival research. A fossil specimen of sheep (*Ovis*) was identified at fossil locality LACM 1652, located west of the Santa Ana River near Rio Vista Avenue to the south of Lincoln Avenue. A fossil horse (*Equus*) specimen was identified in older Quaternary sediments at a depth of 8 to 10 feet below the surface at fossil locality LACM 4943, located east of the Santa Ana River near Fletcher Avenue and Glassell Street (Garden Grove 2018). Other Pleistocene age vertebrate fossil specimens have been identified across Orange county, including mammoths (*Mammuthus* sp.), elephant (Proboscidea), camels (Camelidae), and bison (*Bison* sp.), encountered at depths of 6 to 8 feet below surface (Freeberg and Scott 2019).

Ground-disturbing activities occurring at shallow depths, such as grading or trenching less than 5 feet below ground surface, are unlikely to encounter significant vertebrate fossil remains in the younger Quaternary alluvial fan sediments that cover the project site. Excavations at greater depth, such as those proposed in this project for the parking garage, increase the potential for encountering older Quaternary alluvial sediments, which have potential to yield fossil specimens (Garden Grove 2018).

Recommendations

The following section presents recommended mitigation measures for further action regarding paleontological, archaeological, and potential tribal cultural resources within the project site. These recommendations are based on information collected from archival research, which examined records kept at the SCCIC, local cultural resource listings, historic maps, contemporary archaeological literature, local prehistoric land use patterns and resource availability, information provided by the NAHC and Native American representatives, and geological publications.

In the event paleontological or archeological resources are found during construction, all attempts will be made to preserve in place or leave in an undisturbed state in compliance with applicable laws.

The likelihood of the proposed project to encounter significant fossil remains appears low to moderate. The paleontological records search indicates that surficial deposits of Late Pleistocene to Holocene silty sand alluvial fan sediments exist in the project site. No fossil specimens are known to have been documented within the project site, but these deposits have yielded fossils in the region, typically at depths of greater than 6 feet below surface. Paleontological sensitivity does increase with depth as older alluvial deposits in the region have yielded vertebrate fossil specimens. Past building and demolition activities within the project site likely removed some overlying soil, and artificial or disturbed fill may be present in the upper levels. However, intact deposits of fossil-bearing Pleistocene sediments have potential to be encountered at depth within the project site. Shallow grading and other ground-disturbing activities less than 6 feet below surface are not likely to encounter fossil specimens but deeper excavation activities for building foundations or the parking garage have low to moderate potential to encounter paleontological remains.

No paleontological monitoring is recommended at this time. In the event that fossil specimens are encountered on the site and cannot be preserved in place, a qualified paleontologist should be contacted and work in the vicinity of the discovery will halt until appropriate assessment and treatment of the resource is determined by the paleontologist (work can continue elsewhere on the project site). If recommended by the project paleontologist, monitoring may be implemented, collection of specimens or appropriate sediment samples may be conducted, and remains may be curated at a repository.

Based on the results of the archival research, it is possible, but unlikely, that significant cultural resources will be encountered during ground-disturbing activities for the proposed project. The site is located within a heavily disturbed urban area. Prior to World War II, the project site was utilized for agricultural purposes, with a grove of trees present on most of the property and one building that was present in the southeast corner for a short period of time. During the housing boom of the 1950s, the project site was developed with a residential tract and commercial buildings established by 1963. During the 1940s, earth excavation for residential construction is described as at minimum four to five feet of vertical excavation (Graham and Emery 1945). A 1969 building and construction manual suggests concrete pads for single-story buildings be placed on “natural undisturbed subsoil,” and if the subsoil is poor quality a system of piles foundations would be used carried down to a “firm stratum” (Barry 1969). Pile foundations are driven (hammered or vibrated) into the earth and do not entail excavation. By the 1960s, for residential developments slab-on-grade foundations were typical because they were quicker to construct. Early slab-on-grade foundations were unreinforced and prone to cracking, and by the late-1950s, building codes required slabs be reinforced with steel rebar. Slab-on-grade foundations required sustainably less excavation, of 1 to 2 feet to merely remove the topsoil and vegetation, because more attention was given to reinforcement. If pile foundations were used to supplement this reinforcement they typically would go 4-6 feet deep. By the 1970s, foundation placement is described as 1 to 2 feet below the finished grade (Nichols 1976). Between one to five feet of the soil was likely disturbed by construction, grading, and the placement of utilities for a 1950s and1960s-era tract development.

All buildings in the project site were removed between 2004 and 2014, leaving only the cul-de-sac and alley between the dirt lots. The process appears to have removed building foundations and grading the surface. This

process likely disturbed soils between one to five feet below surface and may have destroyed any cultural resources that might have existed at the site at that time. Based on the results of the archival research, no previously recorded resources are within the project site and there is low potential that cultural resources will be encountered during ground-disturbing activities for the proposed project.

No archaeological monitoring is recommended at this time. If cultural resources are encountered during ground-disturbing activities and cannot be preserved in place, the City of Garden Grove will contact a qualified archaeologist to evaluate and determine appropriate treatment for the resource in accordance with Public Resources Code (PRC) Section 21083.2(i).

The sensitivity of the project site for tribal cultural resources appears low. The NAHC conducted an SLF search, which was negative, and no resources were identified as a result of outreach to Native American representatives. The Native American contact program is detailed in Attachment 2. No potential tribal cultural resources were identified during the archival research, and any prehistoric archaeological remains are likely to have been heavily disturbed or destroyed in the middle twentieth century for the reasons described in the paragraph above. However, if any Native American cultural material is encountered within the project site, interested Native American parties established in the contact program or through consultation with the lead agency will be notified. The City of Garden Grove should determine during consultation whether the resources constitute tribal cultural resources and solicit any comments the Native American parties may have regarding appropriate treatment and disposition of the resources.

If human remains are discovered, work in the immediate vicinity of the discovery will be suspended and the Orange County Coroner contacted. If the remains are deemed Native American in origin, the Coroner will contact the NAHC and identify a Most Likely Descendant pursuant to PRC Section 5097.98 and California Code of Regulations Section 15064.5. Work may be resumed at the landowner's discretion but will only commence after consultation and treatment have been concluded. Work may continue on other parts of the project site while consultation and treatment are conducted.

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Attachments:
Attachment 1 – Project Site Maps
Attachment 2 – Sacred Lands File Search and Native American Contact Program

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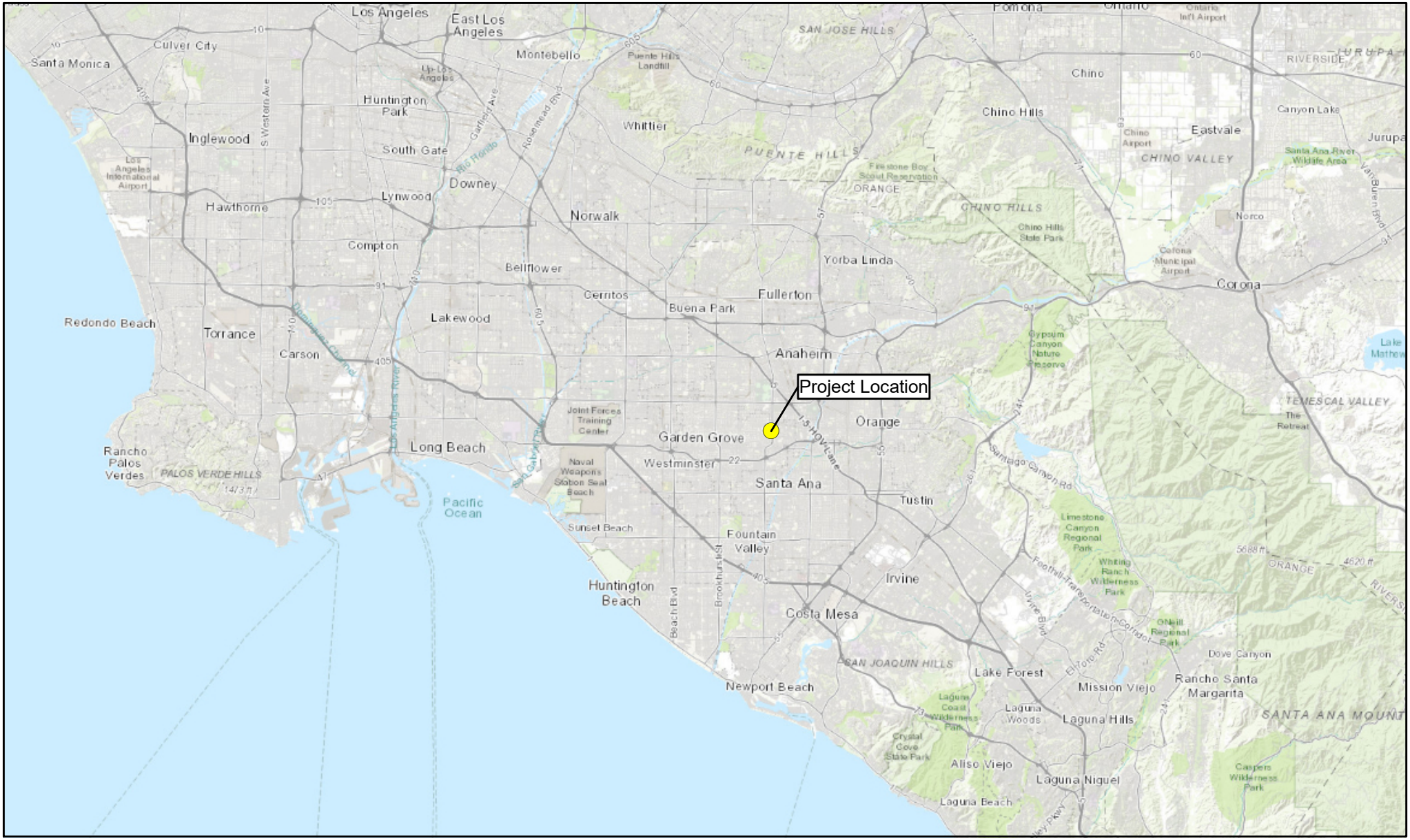
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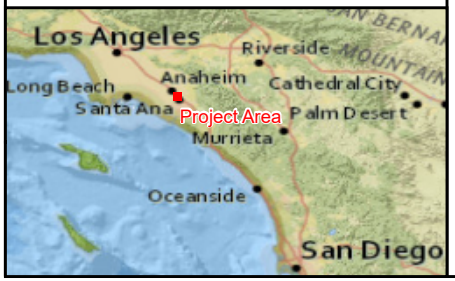
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Attachment 1

Project Site Maps



Overview Map



Legend

- Project Location

0 2 4 8 12 Miles

0 2 4 8 12 16 Kilometers

1 inch = 30,887 feet

1:360,000

N

Date: 7/12/2021

Site B-2 Hotel Project

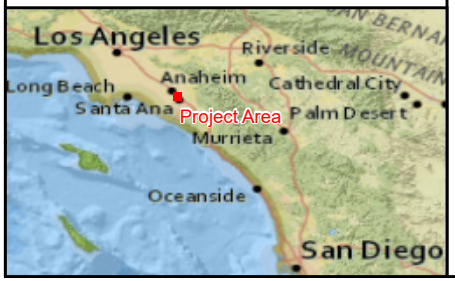
VICINITY MAP

AECOM

Figure 1



Overview Map



Legend

Project Location

0 75 150 300 450 Feet

0 20 40 80 120 160 Meters

1 inch = 300 feet

1:3,600

N

Date: 7/12/2021

Site B-2 Hotel Project

PROJECT LOCATION

AECOM

Figure 2

Attachment 2

Sacred Lands File Search and Native American Contact Program

(Confidential)

Appendix E
Geotechnical Investigation

GEOTECHNICAL INVESTIGATION

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND
TWINTREE LANE
GARDEN GROVE, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

KAM SANG COMPANY, INC.
ARCADIA, CALIFORNIA

PROJECT NO. A9839-88-01

AUGUST 15, 2018

Project No. A9839-88-01
August 15, 2018

Mr. John Hicks
Kam Sang Company, Inc.
411 East Huntington Drive, Suite 305
Arcadia, California 91006

Subject: GEOTECHNICAL INVESTIGATION
PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

Dear Mr. Hicks:

In accordance with your authorization of our revised proposal dated June 29, 2018, we have performed a geotechnical investigation for the proposed hotel development located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed, provided the recommendations of this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

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PE 87489	GE 3092	CEG 1754

(EMAIL) Addressee

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- PRIOR REPORT

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed hotel development located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate subsurface soil and geologic conditions underlying the site and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included review of a previous geotechnical report, a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on July 20, 2018, by excavating three 8-inch diameter borings to depths of approximately 40½ and 75½ feet below the existing ground surface utilizing a truck-mounted hollow-stem auger drilling machine. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2A). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analyses of the data obtained during our investigation, as well as the data obtained during the previous investigations by Cal Land Engineering, Inc., and our experience with similar soil and geologic conditions. The prior investigation is summarized in Section 3, Background Review. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California. The site is approximately 9.55 acres and currently consists of vacant land and a combination of single- and multi-family residential housing. The site is bounded by Harbor Boulevard to the east, two 7- to 8-story hotel structures and associated paved parking areas to the north, Twintree Lane to the south, and residential structures to the west. The site is relatively level. Surface water drainage at the site appears to be by sheet flow along the existing ground contours to the city streets. Vegetation is not present within the majority of the southern portion of the site. However, within the residential portion of the site, vegetation consists of grass, trees, and shrubs typical of residential landscaping.

Based on the information provided by the Client, It is our understanding that the proposed project consists of an 18-story hotel tower with a roof deck; a 16-story hotel tower; an 8-story timeshare tower; and parking structures. The proposed hotel complex will include on-grade structures and also two levels of subterranean space extending to depths of up to 25 feet below the ground surface. The proposed development is depicted on the Site Plan (see Figure 2A).

Based on the preliminary nature of the design at this time, wall and column loads were not available. It is estimated that wall loads may be up to 20 kips per linear foot and column loads may be up to 2,000 kips.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. BACKGROUND REVIEW

We reviewed a prior report for the existing Sheraton Hotel (see Site Plan, Figure 2A) provided to us by the Client:

1) *Geotechnical Report, Proposed Hotel Development, Corner of Harbor Boulevard and Twin Tree Avenue, Garden Grove, California*, prepared by Cal Land Engineering, Inc., dated June 14, 2005.

The prior geotechnical investigation prepared in 2005 by Cal Land Engineering, Inc. (Cal Land) included the excavation and logging of seven borings. The borings were excavated to a maximum depth of 51½ feet below the ground surface and encountered loose to medium dense silty sand to a depth of approximately 4 to 5 feet. These materials were underlain by medium dense, fine-grained silty sand and poorly graded sand to depths of approximately 38 to 40 feet that were in turn underlain by stiff clayey silt to the maximum depth explored. Groundwater was not encountered in the borings drilled as part of this investigation.

Geocon West, Inc. has reviewed the referenced report by Cal Land Engineering, Inc. and the recommendations presented herein are based on analysis of the subsurface and laboratory data obtained from these prior investigations as well as our own subsurface and laboratory data. Furthermore, we assume responsibility for the utilization of the exploration and laboratory data presented within the reports by Cal Land Engineering, Inc. A copy of the prior report is provided in Appendix C.

4. GEOLOGIC SETTING

The subject site is located within the south-central portion of the Orange County Coastal Plain, a relatively flat-lying alluviated surface with an average slope of less than 20 feet per mile. The lowland surface is bounded by hills and mountains on the north and east, and by the Pacific Ocean to the south and southwest (California Department of Water Resources [CDWR], 1967). Prominent structural features within the Orange County Coastal Plain include the central lowland plain, the northwest trending line of low hills and mesas along the coast underlain by the Newport-Inglewood Fault Zone, and the San Joaquin Hills to the southeast (CDWR, 1967). The northwest-trending Newport-Inglewood Fault Zone is located approximately 7.4 miles to the south-southwest (California Division of Mines and Geology [CDMG], 2012).

5. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and Holocene age alluvium (California Geological Survey [CGS], 2012). Detailed stratigraphic profiles of the materials encountered at the site are provided on the boring logs in Appendix A.

5.1 Artificial Fill

Artificial fill was encountered in our field explorations to a maximum depth of 2 feet below existing ground surface. The fill generally consists of brown silty sand and is characterized as fine-grained, dry to slightly moist and loose to medium dense. The fill is likely the result of past grading or construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

5.2 Alluvium

Holocene age alluvium was encountered beneath the fill to the maximum depth explored. The alluvium generally consists of interbedded poorly graded sand, sand with silt, silty sand, sandy silt, and silt. Clay was encountered below a depth of 42 feet beneath the existing ground surface. The alluvium is characterized as slightly moist to wet and loose to very dense or soft to hard.

6. GROUNDWATER

Based on a review of the Seismic Hazard Zone Report for the Anaheim and Newport Beach Quadrangles (CDMG, 1997, revised 2001), the historically highest groundwater level in the area is approximately 30 feet beneath the existing ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s.

Groundwater was encountered in boring B1 at a depth of 62.5 feet below the existing ground surface. Groundwater was not encountered in the previous borings drilled at the site by Cal Land in 2005 to a maximum depth of 51½ feet beneath the existing ground surface. Considering the historic high groundwater levels in the site vicinity, the depth to groundwater encountered in our boring and the borings adjacent to the site, and the depth of proposed construction, groundwater is neither expected to be encountered during construction, nor have a detrimental effect on the project. However, groundwater seepage may be encountered during construction. It is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed (especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall), groundwater seepage levels encountered during construction may be actually higher than those encountered during our investigation. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (See Section 8.26).

7. GEOLOGIC HAZARDS

7.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (CGS, 2018a). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 17,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a state-designated Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards (CGS, 2018b). No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults. The faults in the vicinity of the site are shown in Figure 3, Regional Fault Map.

Nearby active faults include the Newport-Inglewood Fault Zone, the Whittier Fault, the Chino Fault, the Elsinore Fault, and the Palos Verdes Fault (offshore segment) located approximately 7.4 miles south-southwest, 10½ miles northeast, 17 miles northeast, 18 miles east-northeast, and 19 miles southwest of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 42 miles northeast of the site (Ziony and Jones, 1989).

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin, including Orange County, at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3.0 kilometers. The October 1, 1987, M_w 5.9 Whittier Narrows earthquake and the January 17, 1994, M_w 6.7 Northridge earthquake were a result of movement on the Puente Hills Blind Thrust and the Northridge Thrust, respectively. The San Joaquin Hills Blind Thrust underlies the San Joaquin Hills and is located approximately 5 miles south-southeast of the site. This thrust fault and others in the Southern California area are not exposed at the surface and do not present a potential surface fault rupture hazard at the site; however, these deep thrust faults are considered active features capable of generating future earthquakes that could result in moderate to significant ground shaking at the site.

7.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 4, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto-Hemet area	April 21, 1918	6.8	53	E
Near Redlands	July 23, 1923	6.3	41	ENE
Long Beach	March 10, 1933	6.4	12	SSW
San Fernando	February 9, 1971	6.6	105	NW
Whittier Narrows	October 1, 1987	5.9	51	NW
Sierra Madre	June 28, 1991	5.8	21	NW
Landers	June 28, 1992	7.3	33	NNW
Big Bear	June 28, 1992	6.4	89	ENE
Northridge	January 17, 1994	6.7	69	ENE
Hector Mine	October 16, 1999	7.1	46	NW

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

7.3 Seismic Design Criteria

The following table summarizes summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the computer program *U.S. Seismic Design Maps*, provided by the USGS. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.474g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.537g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.0	Table 1613.3.3(1)
Site Coefficient, F_V	1.5	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.474g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.806g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.983g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.537g	Section 1613.3.4 (Eqn 16-40)

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10.

ASCE 7-10 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.531g	Figure 22-7
Site Coefficient, F_{PGA}	1.0	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.531g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2016 California Building Code and ASCE 7-10, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain "Life Safety" during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS online Unified Hazard Tool, 2008 Conterminous U.S. Dynamic edition. The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.54 magnitude event occurring at a hypocentral distance of 16.23 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.6 magnitude occurring at a hypocentral distance of 22.82 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California" and "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

The State of California Seismic Hazard Zone Map for the Anaheim Quadrangle (CDMG, 1998) indicates that the site is located in an area designated as having a potential for liquefaction. In addition, the City of Garden Grove Safety Element (2008) indicates that the site is located within an area identified as having a potential for liquefaction.

Liquefaction analysis of the soils underlying the site was performed using an updated version of the spreadsheet template LIQ2_30.WQ1 developed by Thomas F. Blake (1996). This program utilizes the 1996 NCEER method of analysis. This semi-empirical method is based on a correlation between values of Standard Penetration Test (SPT) resistance and field performance data.

Screening criteria developed by Bray and Sancio (2006) characterize fine-grained soils which are not susceptible to liquefaction as soils with a plasticity index (PI) that is greater than 18 or with a saturated moisture content that is less than 80 percent of the liquid limit. In order to apply the screening criteria, laboratory testing was performed to evaluate the Atterberg Limits and saturated moisture content of select soil samples. Laboratory test results used for the screening criteria are presented as Figure B7.

The liquefaction analysis was performed for a Design Earthquake level by using a historic high groundwater table of 30 feet below the ground surface, a magnitude 6.6 earthquake, and a peak horizontal acceleration of 0.354g ($⅔PGA_M$). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 0.3 inches of total settlement during Design Earthquake ground motion (see enclosed calculation sheets, Figures 5 and 6).

It is our understanding that the intent of the Building Code is to maintain "Life Safety" during Maximum Considered Earthquake level events. Therefore, additional analysis was performed to evaluate the potential for liquefaction during a MCE event. The structural engineer should evaluate the proposed structure for the anticipated MCE liquefaction induced settlements and verify that anticipated deformations would not cause the foundation system to lose the ability to support the gravity loads and/or cause collapse of the structure.

The liquefaction analysis was also performed for the Maximum Considered Earthquake level by using a historic high groundwater table of 30 feet below the ground surface, a magnitude 6.54 earthquake, and a peak horizontal acceleration of 0.531g (PGA_M). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 2.6 inches of total settlement during Maximum Considered Earthquake ground motion (see enclosed calculation sheets, Figures 7 and 8).

7.5 Seismically Induced Settlement

Dynamic compaction of dry and loose sands may occur during a major earthquake. Typically, settlements occur in thick beds of such soils. The seismically induced settlement calculations were performed in accordance with the American Society of Civil Engineers, Technical Engineering and Design Guides as adapted from the US Army Corps of Engineers, No. 9.

The calculations provided herein for boring B1 indicates that the soil above the historic high groundwater level of 30 feet could be susceptible to approximately 0.07 inches of settlement as a result of the Design Earthquake peak ground acceleration ($⅔PGA_M$).

The calculations provided herein for boring B1 indicates that the soil above the historic high groundwater level of 30 feet could be susceptible to approximately 0.14 inches of settlement as a result of the Maximum Considered Earthquake peak ground acceleration (PGA_M).

Calculation of the anticipated seismically-induced settlements is provided as Figures 9 and 10.

7.6 Slope Stability

The site is relatively level to gently sloping to the southeast. The site is not within an area identified by the City of Garden Grove (2008) or the County of Orange (2004) as having a potential for slope stability hazards. Additionally, the State of California Seismic Hazard Zone Map for the Anaheim Quadrangle (CDMG, 1998) indicates that the site is not located within a zone of required investigation for earthquake-induced landslides. There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for landslides to adversely impact the site is considered low.

7.7 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. Review of the Safety Element of the Orange County General Plan (2004) indicates that the site is located within the Prado Dam inundation boundary. However, this dam, as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design, construction practices, and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

7.8 Tsunamis, Seiches, and Flooding

The site is not located within a coastal area. Therefore, tsunamis are not considered a potential hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Therefore, flooding resulting from a seismically-induced seiche is considered unlikely.

According to the City of Garden Grove, the southern portion of the site is located within a 100-year flood zone (City of Garden Grove, 2008). However, more recent flood hazard maps by the Federal Emergency Management Agency (FEMA) indicate the site is located within a Flood Zone X, defined as an area with reduced flood risk due to levees (FEMA, 2009).

7.9 Oil Fields & Methane Potential

Based on a review of the California Division of Oil, Gas and Geothermal Resources (DOGGR) Well Finder Website, the site is not located within the limits of an oilfield and oil or gas wells are not located in the immediate site vicinity (DOGGR, 2018). However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the location map and undocumented wells could be encountered during construction. Any wells encountered during construction will need to be properly abandoned in accordance with the current requirements of the DOGGR.

Since the site is not located within the boundaries of a known oil field, the potential for the presence of methane or other volatile gases at the site is considered low. However, should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

7.10 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence. No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site or in the general site vicinity. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed development provided the recommendations presented herein are followed and implemented during design and construction. The geotechnical design parameters presented herein should be reviewed and updated once proposed building elevations are finalized and structural loads are available.

8.1.2 The purpose of this investigation was to evaluate subsurface soil and geologic conditions at the site and based on the conditions encountered, to provide initial recommendations pertaining to the geotechnical aspects of developing the property. While it is our opinion that neither soil nor geologic conditions would preclude the construction of the proposed project, additional site exploration and laboratory testing will be required prior to building permits to confirm the existing conditions throughout the site. The findings of the additional work should be incorporated into an updated geotechnical investigation report.

8.1.3 Up to 2 feet of existing artificial fill was encountered during the site investigation. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. Future demolition of the existing structures which occupy the site will likely disturb the upper few feet of soil. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the Grading section of this report are followed (see Section 8.4).

8.1.4 The enclosed liquefaction and seismically-induced settlement analyses indicate that the site soils could be susceptible to approximately 0.37 inches of total settlement as a result of the Design Earthquake peak ground acceleration ($⅔PGA_M$). Differential settlement at the ground surface is anticipated to be less than 0.19 inches over a distance of 30 feet. The foundation design recommendations presented herein are intended to minimize the effects of settlement on the proposed improvements.

8.1.5 Excavation for the subterranean portions of the structures is anticipated to penetrate through the existing artificial fill and expose undisturbed alluvial soils throughout the excavation bottom.

8.1.6 Groundwater was encountered during site exploration at a depth of approximately 62.5 feet below existing ground surface. Excavation for construction of the proposed subterranean level is anticipated to extend to depths of approximately 25 feet below the ground surface,

including foundation excavations. Based on these considerations, the current groundwater table is sufficiently deep that it not expected to be encountered during construction. However, local seepage could be encountered during excavation of the subterranean level, especially if conducted during the rainy season.

8.1.7 As a minimum, the upper 6 feet of existing site soils within the proposed on-grade footprint areas should be excavated and properly compacted for foundation and slab support. Excavation should be conducted as necessary to completely remove all artificial fill and any soft, unsuitable alluvium at the direction of the Geotechnical Engineer (a representative of Geocon). The excavation should extend laterally a minimum distance of 3 feet beyond the building footprint area or a distance equal to the depth of fill below the foundation, whichever is greater. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 8.4).

8.1.8 It is anticipated that the tower cores will be supported on reinforced concrete mat foundations, and that elsewhere conventional spread foundations may be used. Recommendations for mat foundations and conventional spread foundations are provided herein as Sections 8.5 through 8.7. All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.1.9 Once proposed building loads become available and elevations are established, additional analyses will be required to evaluate the anticipated total and differential settlements between the foundation elements to check if the settlements are within tolerance as evaluated by the project structural engineer or provide updated foundation design recommendations.

8.1.10 Excavations up to 25 feet in vertical height are anticipated for construction of the subterranean levels, including foundation depths. Due to the depth of the excavation and the proximity to the property lines, city streets and adjacent offsite structures and improvements, excavation of the proposed subterranean level will require sloping and/or shoring in order to provide a stable excavation. Where shoring is required it is recommended that a soldier pile shoring system be utilized. In addition, where the proposed excavation will be deeper than and adjacent to an offsite structure, the proposed shoring should be designed to resist the surcharge imposed by the adjacent offsite structure. Recommendations for shoring are provided in Section 8.20 of this report.

8.1.11 Due to the nature of the proposed design and intent for a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.1.12 Where new paving is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill and soft alluvial soils in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of subgrade soil should be scarified and properly compacted for paving support. Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 8.12).

8.1.13 Foundations for small outlying structures, such as block walls less than 6 feet in height, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, foundations may derive support directly in the competent undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

8.1.14 Once the foundation loading configuration and design elevations for the existing and proposed structures proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, as necessary. Based on the final foundation loading configurations and building elevations, the potential for settlement should be reevaluated by this office.

8.1.15 Any changes in the design, location or elevation, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

8.2 Soil and Excavation Characteristics

8.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Some caving should be anticipated in unshored excavations, especially where granular soils are encountered.

8.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of existing adjacent improvements.

8.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping or shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 8.19).

8.2.4 The upper 5 feet of existing site soils encountered during this investigation are considered to have a "very low" expansive potential (EI = 0); and are classified as "non-expansive" based on the 2016 California Building Code (CBC) Section 1803.5.3. Recommendations presented herein assume that the building foundations and slabs will derive support in these materials.

8.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

8.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "moderately corrosive" with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B11) and should be considered for design of underground structures.

8.3.2 Laboratory tests were performed on representative samples of the site materials to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B11) and indicate that the on-site materials possess "negligible" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-11 Sections 4.2 and 4.3.

8.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

8.4 Grading

8.4.1 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soil encountered during exploration is suitable for re-use as engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris are removed.

8.4.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer, geotechnical engineer, and building official in attendance. Special soil handling requirements can be discussed at that time.

8.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.4.4 All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.4.5 As a minimum, it is recommended that the upper 6 feet of existing site soils within the proposed on-grade building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavation should be conducted as necessary to completely remove all existing artificial fill or soft soil at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. The engineered fill blanket should extend at least 3 feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater.

8.4.6 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to optimum moisture content, and properly compacted to a minimum 90 percent of the maximum dry density in accordance with ASTM D 1557 (latest edition).

8.4.7. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 8.12).

8.4.8 Foundations for small outlying structures, such as block walls less than 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed building, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

8.4.9 Although not anticipated for this project, all imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. If necessary, import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B11).

8.4.10 Utility trenches should be properly backfilled in accordance with the requirements of the Green Book (latest edition). The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry is also acceptable as backfill. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

8.4.11 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, steel, gravel, or concrete.

8.5 Foundation Design

8.5.1 It is anticipated that the tower cores will be supported on reinforced concrete mat foundations, and that elsewhere conventional spread foundations may be used. All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.5.2 Once proposed foundation depths and building loads are available, additional analyses may be required to evaluate the anticipated total and differential settlements between the foundation elements for verification that the settlements are within tolerance as evaluated by the project structural engineer. Updated foundation design recommendations will be provided as necessary in an addendum report.

8.5.3 No special subgrade presaturation is required prior to placement of concrete. However, the slab and foundation subgrade should be sprinkled as necessary; to maintain a moist condition as would be expected in any concrete placement.

8.5.4 Waterproofing of subterranean walls and slabs is recommended for this project for any portions of the structure that will be constructed below the groundwater table. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.5.5 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of the methane system, reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

8.5.6 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

8.6 Conventional Foundation Design

8.6.1 Continuous footings may be designed for an allowable bearing capacity of 3,000 pounds per square foot (psf), and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

8.6.2 Isolated spread foundations may be designed for an allowable bearing capacity of 3,500 psf, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

8.6.3 The allowable soil bearing pressure above may be increased by 250 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 5,000 psf. Higher bearing capacities are feasible; however, the use of higher bearing capacities will require coordination with the structural engineer on anticipated total and differential settlements.

8.6.4 The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

8.6.5 If depth increases are utilized for the perimeter foundations, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

8.6.6 Continuous footings should be reinforced with four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. Reinforcement for spread footings should be designed by the project structural engineer.

8.6.7 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.

8.7 Mat Foundation Design – Tower Core

8.7.1 It is anticipated that the mat foundations constructed for support of the towers will impart an average pressure of approximately 4,000 to 6,000 psf. The recommended maximum allowable bearing value is 6,000 psf. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.7.2 A vertical modulus of subgrade reaction of 150 pounds per cubic inch (pci) may be used in the design of mat foundations deriving support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

8.7.3 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

8.7.4 For seismic design purposes, a coefficient of friction of 0.4 may be utilized between the concrete mat and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

8.8 Foundation Settlement

8.8.1 The enclosed liquefaction and seismically-induced settlement analyses indicate that the site soils could be susceptible to approximately 0.37 inches of total settlement as a result of the Design Earthquake peak ground acceleration (⅔PGA_M). The differential settlement at the ground surface is anticipated to be less than 0.19 inches over a distance of 30 feet. These settlements are in addition to the static settlements indicated below and must be considered in the structural design.

8.8.2 The maximum static settlement for conventional foundations deriving support at or near the ground surface in the recommended bearing materials and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than 1 inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is expected to be less than ½ inch over a distance of 20 feet. Based on seismic considerations, the proposed structure supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ¾ inch over a distance of 20 feet.

8.8.3 The maximum expected static settlement for an assumed 40-foot by 30-foot mat foundation deriving support at or near the ground surface in the recommended bearing material and utilizing a maximum allowable bearing pressure of 6,000 psf is estimated to be less than 3½ and occur below the central portion of the mat. The differential settlement between the center and corner of the mat is estimated to be less than 1 inch. Based on seismic considerations, the proposed structure supported on a reinforced concrete mat foundation should be designed for a combined static and seismically induced differential settlement of 2 inches over a distance of 20 feet.

8.8.4 The maximum static settlement for conventional foundations deriving support at or near the proposed subterranean depth of 25 feet in the recommended bearing materials and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than ⅓ inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is expected to be less than ⅓ inch over a distance of 20 feet. Based on seismic considerations, the proposed structure supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ⅔ inch over a distance of 20 feet.

8.8.5 Due to the various depths at which different portions of the structure will derive support, differential settlements across the stepped transitions needs to be carefully designed for. The recommended bearing pressures presented below are based on a preliminary plan set, as well as several assumptions. As the project progresses, Geocon should work closely with the project structural engineer to confirm the foundation loading configuration and anticipated total and differential settlement.

8.8.6 Differential settlement across the stepped transitions between the various building levels could be on the order of 1 inch or greater and will likely require a heavily reinforced structural connection, or a structural separation to account for the anticipated differential movements.

8.8.7 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

8.9 Lateral Design

8.9.1 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.4 may be used with the dead load forces in the competent alluvial soils or in properly compacted engineered fill.

8.9.2 Passive earth pressure for the sides of foundations and slabs poured against properly compacted engineered fill or competent alluvial soils may be computed as an equivalent fluid having a density of 250 pcf with a maximum earth pressure of 2,500 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

8.10 Miscellaneous Foundations

8.10.1 Foundations for small outlying structures, such as block walls less than 6 feet in height, planter walls or trash enclosures which will not be tied to the proposed structure may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12 inch embedment into the recommended bearing materials.

8.10.2 If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.10.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

8.11 Concrete Slabs-on-Grade

8.11.1 Concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Pavement Recommendations* section of this report (Section 8.12).

8.11.2 The project structural engineer may determine and design the necessary slab thickness and reinforcing for this structure. Unless specifically analyzed and designed by the project structural engineer, the slab-on-grade and ramp should be a minimum of 5 inches concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions and positioned vertically near the slab midpoint. The concrete slab-on-grade may bear directly on newly placed engineered fill or competent alluvial soils. Any disturbed soils should be properly compacted for slab support.

8.11.3 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning is recommended. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

8.11.4 Due to the nature of the proposed design and intent for a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete

walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.11.5 For seismic design purposes, a coefficient of friction of 0.4 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

8.11.6 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. The project structural engineer should design construction joints as necessary.

8.11.7 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.12 Preliminary Pavement Recommendations

8.12.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial materials be excavated and properly recompacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

8.12.2 The following pavement sections are based on an assumed R-Value of 35. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

8.12.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking And Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	3.5	9.0

8.12.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction"* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation"* (Caltrans). The use of Crushed Miscellaneous Base in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction"* (Green Book).

8.12.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction as determined by ASTM Test Method D 1557 (latest edition).

8.12.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

8.13 Retaining Walls Design

8.13.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 25 feet. In the event that walls significantly higher than 25 feet are planned, Geocon should be contacted for additional recommendations.

8.13.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* sections of this report (see Section 8.6).

8.13.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 36 pcf.

8.13.4 Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 57 pcf.

8.13.5 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 90 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

8.13.6 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils. If sloping techniques are to be utilized for construction of proposed walls, which would result in a wedge of engineered fill behind the retaining walls, revised earth pressures may be required. This should be evaluated once the use of sloping measures is established and once the geotechnical characteristics of the engineered backfill soils can be further evaluated.

8.13.7 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic, or adjacent structures. Recommendations for the incorporation of surcharges are provided in Section 8.25 of this report. Once the design becomes more finalized, an addendum letter can be prepared revising recommendations and addressing specific surcharge conditions throughout the project, if necessary.

8.13.8 In addition to the recommended earth pressure, the upper 10 feet of the subterranean wall adjacent to the street and parking lot should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the walls due to normal street traffic. If the traffic is kept back at least 10 feet from the subterranean walls, the traffic surcharge may be neglected.

8.13.9 Seismic lateral forces should be incorporated into the design as necessary, and recommendations for seismic lateral forces are presented below.

8.14 Dynamic (Seismic) Lateral Forces

8.14.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2016 CBC).

8.14.2 A seismic load of 10 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. The earth pressure is based on half of two thirds of PGA_M calculated from ASCE 7-10 Section 11.8.3.

8.15 Retaining Wall Drainage

8.15.1 Retaining walls should be provided with a drainage system. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 11). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

8.15.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 12). These vertical columns of drainage material would then be connected at the bottom of the wall to a collection panel or a 1-cubic-foot rock pocket drained by a 4-inch subdrain pipe.

8.15.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures. Drainage should not be allowed to flow uncontrolled over descending slopes.

8.15.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.16 Swimming Pool

8.16.1 The proposed swimming pools should be designed as free-standing structures, deriving support in the competent alluvial soils generally found at or below a depth of 2 feet below the ground surface and/or newly placed engineered fill.

8.16.2 Swimming pool foundations and walls may be designed in accordance with the foundation design recommendations below and *Retaining Wall Design* section of this report (see Section 8.13). The proposed pools should be constructed utilizing an expansive soils design, and a hydrostatic relief valve should be considered as part of the swimming pool design unless a gravity drain system can be placed beneath the pool shell.

8.16.3 A reinforced concrete mat foundation may be utilized for support of the proposed swimming pool. The mat foundation for the pool may derive support in the undisturbed alluvial soils generally found at or below a depth of 2 feet below the ground surface. Any soils unintentionally disturbed should be properly compacted for foundation support.

8.16.4 It is anticipated that the proposed mat foundation will impart an average pressure of less than 1,500 psf. The recommended maximum allowable bearing value is 1,500 psf. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.16.5 It is recommended that a modulus of subgrade reaction of 100 pci be utilized for the design of the mat foundation deriving support in newly placed engineered fill and/or competent alluvium found at or below a depth of 2 feet below the ground surface. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

8.16.6 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

8.16.7 Based on the soil overburden load that will be removed during excavation of the swimming pool, anticipated settlements are expected to be very small. We estimate the total settlements for a mat foundation to be less than ½ inch, with differential settlements on the order of ¼ inch over a horizontal distance of 40 feet.

8.16.8 Foundation excavations should be observed by Geocon, prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

8.17 Elevator Pit Design

8.17.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. As a minimum the slab-on-grade for the elevator pit bottom should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Elevator pit walls may be designed in accordance with the recommendations in the *Conventional Foundation Design* and *Retaining Wall Design* section of this report (see Section 8.6 and 8.13).

8.17.2 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent foundations and should be designed for each condition as the project progresses.

8.17.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 8.15).

8.17.4 It is suggested that the exterior walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

8.18 Elevator Piston

8.18.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation or shoring pile, or the drilled excavation could compromise the existing foundation or pile support, especially if the drilling is performed subsequent to the foundation or pile construction.

8.18.2 Caving is anticipated especially where granular soils are encountered. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.

8.18.3 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

8.19 Temporary Excavations

8.19.1 Excavations on the order of 25 feet in height are anticipated for excavation and construction of the proposed subterranean levels, including foundation excavations. The excavations are expected to expose artificial fill and alluvial soils, which may be subject to caving where granular soils are encountered. Vertical excavations up to 5 feet in height may be attempted where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.

8.19.2 Vertical excavations greater than 5 feet will require sloping and/or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter, up to a maximum of 12 feet in height. A uniform slope does not have a vertical portion. Where space is limited, shoring measures will be required. *Shoring* data is provided in Section 8.20 of this report.

8.19.3 Where temporary construction slopes are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary slopes are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

8.20 Shoring – Soldier Pile Design and Installation

8.20.1 The following information on the design and installation of shoring is preliminary. Review of the final shoring plans and specifications should be made by this office prior to bidding or negotiating with a shoring contractor.

8.20.2 One method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. The steel soldier piles may also be installed utilizing high frequency vibration. Where maximum excavation heights are less than 12 feet the soldier piles are typically designed as cantilevers. Where excavations exceed 12 feet or are surcharged, soldier piles may require lateral bracing utilizing drilled tie-back anchors or raker braces to maintain an economical steel beam size and prevent excessive deflection. The size of the steel beam, the need for lateral bracing, and the acceptable shoring deflection should be determined by the project shoring engineer.

8.20.3 The design embedment of the shoring pile toes must be maintained during excavation activities. The toes of the perimeter shoring piles should be deepened to take into account any required excavations necessary for foundations and/or adjacent drainage systems.

8.20.4 The proposed soldier piles may also be designed as permanent piles. The required pile depths, dimensions, and spacing should be determined and designed by the project structural and shoring engineers. All piles utilized for shoring can also be incorporated into a permanent retaining wall system (shotcrete wall) provided they are designed in accordance with the earth pressure provided in the *Retaining Wall Design* section of this report (see Section 8.13).

8.20.5 Drilled cast-in-place soldier piles should be placed no closer than three diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the soil. For design purposes, an allowable passive value for the soils below the bottom plane of excavation may be assumed to be 320 psf per. Where piles are installed by vibration techniques, the passive pressure may be assumed to mobilize across a width equal to the two times the dimension of the beam flange. The allowable passive value may be doubled for isolated piles spaced a minimum of three the pile diameter. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed soils.

8.20.6 Groundwater was encountered during site exploration at a depth of 62.5 feet below the ground surface; however, groundwater levels can fluctuate and may be different at the time of construction. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Therefore the contractor should be prepared for groundwater during pile installation should the need arise. If more than 6 inches of water is present in the bottom of the excavation, a tremie is required to place the concrete into the bottom of the hole. A tremie should consist of a rigid, water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube should be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie should be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end should be closed at the start of the work to prevent water entering the tube and should be entirely sealed at all times, except when the concrete is being placed. The tremie tube should be kept full of concrete. The flow should be continuous until the work is completed and the resulting concrete seal should be monolithic and homogeneous. The tip of the tremie tube should always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

8.20.7 A special concrete mix should be used for concrete to be placed below water. The design should provide for concrete with an unconfined compressive strength psi of 1,000 pounds per square inch (psi) over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste should be included. The slump should be commensurate to any research report for the admixture, provided that it should also be the minimum for a reasonable consistency for placing when water is present.

8.20.8 Caving is anticipated to occur where granular soils are encountered, and the contractor should have casing available prior to commencement of pile excavation. When casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

8.20.9 If a vibratory method of solider pile installation is utilized, predrilling may be performed prior to installation of the steel beams. If predrilling is performed, it is recommended that the bore diameter be at least 2 inches smaller than the largest dimension of the pile to prevent excessive loss in the frictional component of the pile capacity. Predrilling should not be conducted below the proposed excavation bottom.

8.20.10 If a vibratory method is utilized, the owner should be aware of the potential risks associated with vibratory efforts, which typically involve inducing settlement within the vicinity of the pile which could result in a potential for damage to existing improvements in the area.

8.20.11 The level of vibration that results from the installation of the piles should not exceed a threshold where occupants of nearby structures are disturbed, despite higher vibration tolerances that a building may endure without deformation or damage. The main parameter used for vibration assessment is peak particle velocity in units of inch per second (in/sec). The acceptable range of peak particle velocity should be evaluated based on the age and condition of adjacent structures, as well as the tolerance of human response to vibration.

8.20.12 Based on Table 19 of the *Transportation and Construction Induced Vibration Guidance Manual* (Caltrans 2013), a continuous source of vibrations (ex. vibratory pile driving) which generates a maximum peak particle velocity of 0.5 in/sec is considered tolerable for modern industrial/commercial buildings and new residential structures. The Client should be aware that a lower value may be necessary if older or fragile structures are in the immediate vicinity of the site.

8.20.13 Vibrations should be monitored and record with seismographs during pile installation to detect the magnitude of vibration and oscillation experienced by adjacent structures. If the vibrations exceed the acceptable range during installation, the shoring contractor should modify the installation procedure to reduce the values to within the acceptable range. Vibration monitoring is not the responsibility of the Geotechnical Engineer.

8.20.14 Geocon does not practice in the field of vibration monitoring. If construction techniques will be implemented, it is recommended that qualified consultant be retained to provide site specific recommendations for vibration thresholds and monitoring.

8.20.15 The frictional resistance between the soldier piles and retained soil may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.4 based on uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 610 psf.

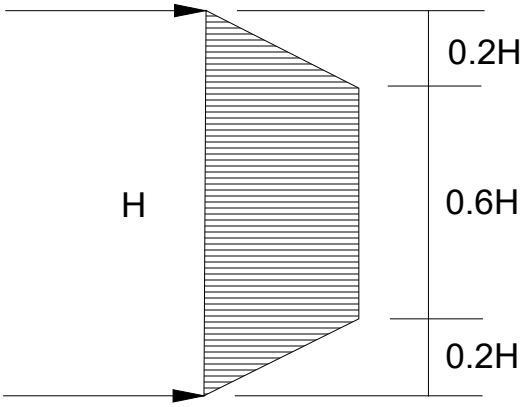
8.20.16 Due to the nature of the site soils, it is expected that continuous lagging between soldier piles will be required. However, it is recommended that the exposed soils be observed by the Geotechnical Engineer (a representative of Geocon West, Inc.), to verify the presence of any competent, cohesive soils and the areas where lagging may be omitted.

8.20.17 The time between lagging excavation and lagging placement should be as short as possible soldier piles should be designed for the full-anticipated pressures. Due to arching in the soils, the pressure on the lagging will be less. It is recommended that the lagging be designed for the full design pressure but be limited to a maximum of 400 psf.

8.20.18 For the design of shoring, it is recommended that an equivalent fluid pressure be utilized for design. A trapezoidal distribution of lateral earth pressure may be used where shoring will be restrained by bracing or tie backs. The recommended active and trapezoidal pressure are provided in the following table. A diagram depicting the trapezoidal pressure distribution of lateral earth pressure is provided below the table.

HEIGHT OF SHORING (FEET)	EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot) (ACTIVE PRESSURE)	EQUIVALENT FLUID PRESSURE (Pounds Per Square Foot per Foot) Active Trapezoidal (Where H is the height of the shoring in feet)
Up to 25	33	21H

Trapezoidal Distribution of Pressure



8.20.19 It is very important to note that active pressures can only be achieved when movement in the soil (earth wall) occurs. If movement in the soil is not acceptable, such as adjacent to an existing structure, an at-rest pressure of 54 pcf should be considered for design purposes.

8.20.20 Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure should be added for a surcharge condition due to slopes, vehicular traffic or adjacent structures and should be designed for each condition. The surcharge pressure should be evaluated in accordance with the recommendations in Section 8.25 of this report.

8.20.21 In addition to the recommended earth pressure, the upper 10 feet of the shoring adjacent to the street or driveway areas should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least 10 feet from the shoring, the traffic surcharge may be neglected.

8.20.22 It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is recommended that the deflection be minimized to prevent damage to existing structures and adjacent improvements. Where public rights-of-way are present or adjacent offsite structures do not surcharge the shoring excavation, the shoring deflection should be limited to less than 1 inch at the top of the shored embankment. Where offsite structures are within the shoring surcharge area it is recommended that the beam deflection be limited to less than ½ inch at the elevation of the adjacent offsite foundation, and no deflection at all if deflections will damage existing structures. The allowable deflection is dependent on many factors, such as the presence of structures and utilities near the top of the embankment, and will be assessed and designed by the project shoring engineer.

8.20.23 Some means of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles.

8.20.24 Due to the depth of the excavation and proximity to adjacent structures, it is suggested that prior to excavation the existing improvements be inspected to document the present condition. For documentation purposes, photographs should be taken of preconstruction distress conditions and level surveys of adjacent grade and pavement should be considered. During excavation activities, the adjacent structures and pavement should be periodically inspected for signs of distress. In the even that distress or settlement is noted, an investigation should be performed and corrective measures taken so that continued or worsened distress or settlement is mitigated. Documentation and monitoring of the offsite structures and improvements is not the responsibility of the geotechnical engineer.

8.21 Temporary Tie-Back Anchors

8.21.1 Temporary tie-back anchors may be used with the solider pile wall system to resist lateral loads. Post-grouted friction anchors are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge and to greater lengths if necessary to develop the desired capacities. The locations and depths of all offsite utilities should be thoroughly checked and incorporated into the drilling angle design for the tie-back anchors.

8.21.2 The capacities of the anchors should be determined by testing of the initial anchors as outlined in a following section. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Anchors should be placed at least 6 feet on center to be considered isolated. For preliminary design purposes, it is estimated that drilled friction anchors constructed without utilizing post-grouting techniques will develop average skin frictions as follows:

- 5 feet below the top of the excavation – 970 pounds per square foot
- 15 feet below the top of the excavation – 1,600 pounds per square foot

8.21.3 Depending on the techniques utilized, and the experience of the contractor performing the installation, a maximum allowable friction capacity of 3.0 kips per linear foot for post-grouted anchors (for a minimum 20-foot length beyond the active wedge) may be assumed for design purposes. Only the frictional resistance developed beyond the active wedge should be utilized in resisting lateral loads. Higher capacity assumptions may be acceptable, but must be verified by testing.

8.22 Anchor Installation

8.22.1 Tied-back anchors are typically installed between 20 and 40 degrees below the horizontal; however, occasionally alternative angles are necessary to avoid existing improvements and utilities. The locations and depths of all offsite utilities should be thoroughly checked prior to design and installation of the tie-back anchors. Caving of the anchor shafts, particularly within sand and gravel deposits or seepage zones, should be anticipated during installation and provisions should be implemented in order to minimize such caving. It is suggested that hollow-stem auger drilling equipment be used to install the anchors. The anchor shafts should be filled with concrete by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. In order to minimize the chances of caving, it is recommended that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill should be placed by pumping; the sand may contain a small amount of cement to facilitate pumping.

8.23 Anchor Testing

8.23.1 All of the anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches. The rate of creep under the 150 percent test load should not exceed 0.1 inch over a 15-minute period in order for the anchor to be approved for the design loading.

8.23.2 At least 10 percent of the anchors should be selected for "quick" 200 percent tests and three additional anchors should be selected for 24-hour 200 percent tests. The purpose of the 200 percent tests is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. These tests should be performed prior to installation of additional tiebacks. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

8.23.3 The total deflection during the 24-hour 200 percent test should not exceed 12 inches. During the 24-hour tests, the anchor deflection should not exceed 0.75 inches measured after the 200 percent test load is applied.

8.23.4 For the "quick" 200 percent tests, the 200 percent test load should be maintained for 30 minutes. The total deflection of the anchor during the 200 percent quick tests should not exceed 12 inches; the deflection after the 200 percent load has been applied should not exceed 0.25 inch during the 30-minute period.

8.23.5 After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within 10 percent of the design load. A representative of this firm should observe the installation and testing of the anchors.

8.24 Internal Bracing

8.24.1 Rakers may be utilized to brace the soldier piles in lieu of tieback anchors. The raker bracing could be supported laterally by temporary concrete footings (deadmen) or by the permanent, interior footings. For design of such temporary footings or deadmen, poured with the bearing surface normal to rakers inclined at 45 degrees, a bearing value of 2,000 psf may be used, provided the shallowest point of the footing is at least 1 foot below the lowest adjacent grade. The structural engineer should review the shoring plans to determine if raker footings conflict with the structural foundation system. The client should be aware that the utilization of rakers could significantly impact the construction schedule due to their intrusion into the construction site and potential interference with equipment.

8.25 Surcharge from Adjacent Structures and Improvements

8.25.1 Additional pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses.

8.25.2 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For\ {}^{x}/_{H} \leq 0.4$$

$$\sigma_H(z) = \frac{0.20 \times \left(\frac{z}{H}\right)}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^2} \times \frac{Q_L}{H}$$

and

$$For\ {}^{x}/_{H} > 0.4$$

$$\sigma_H(z) = \frac{1.28 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^2} \times \frac{Q_L}{H}$$

where x is the distance from the face of the excavation or wall to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation or wall, z is the depth at which the horizontal pressure is desired, Q_L is the vertical line-load and $\sigma_H(z)$ is the horizontal pressure at depth z.

8.25.3 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For\ {}^{x}/_{H} \leq 0.4$$

$$\sigma_H(z) = \frac{0.28 \times \left(\frac{z}{H}\right)^2}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_P}{H^2}$$

and

$$For\ {}^{x}/_{H} > 0.4$$

$$\sigma_H(z) = \frac{1.77 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_P}{H^2}$$

then

$$\sigma'_H(z) = \sigma_H(z) cos^2(1.1\theta)$$

where x is the distance from the face of the excavation/wall to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_P is the vertical point-load, $\sigma_H(z)$ is the horizontal pressure at depth z, θ is the angle between a line perpendicular to the excavation/wall and a line from the point-load to location on the excavation/wall where the surcharge is being evaluated, and $\sigma_H(z)$ is the horizontal pressure at depth z.

8.26 Surface Drainage

8.26.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

8.26.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within 5 feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within 5 feet of the building perimeter footings except when enclosed in protected planters.

8.26.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.

8.26.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

8.27 Plan Review

8.27.1 Grading, foundation, and shoring plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

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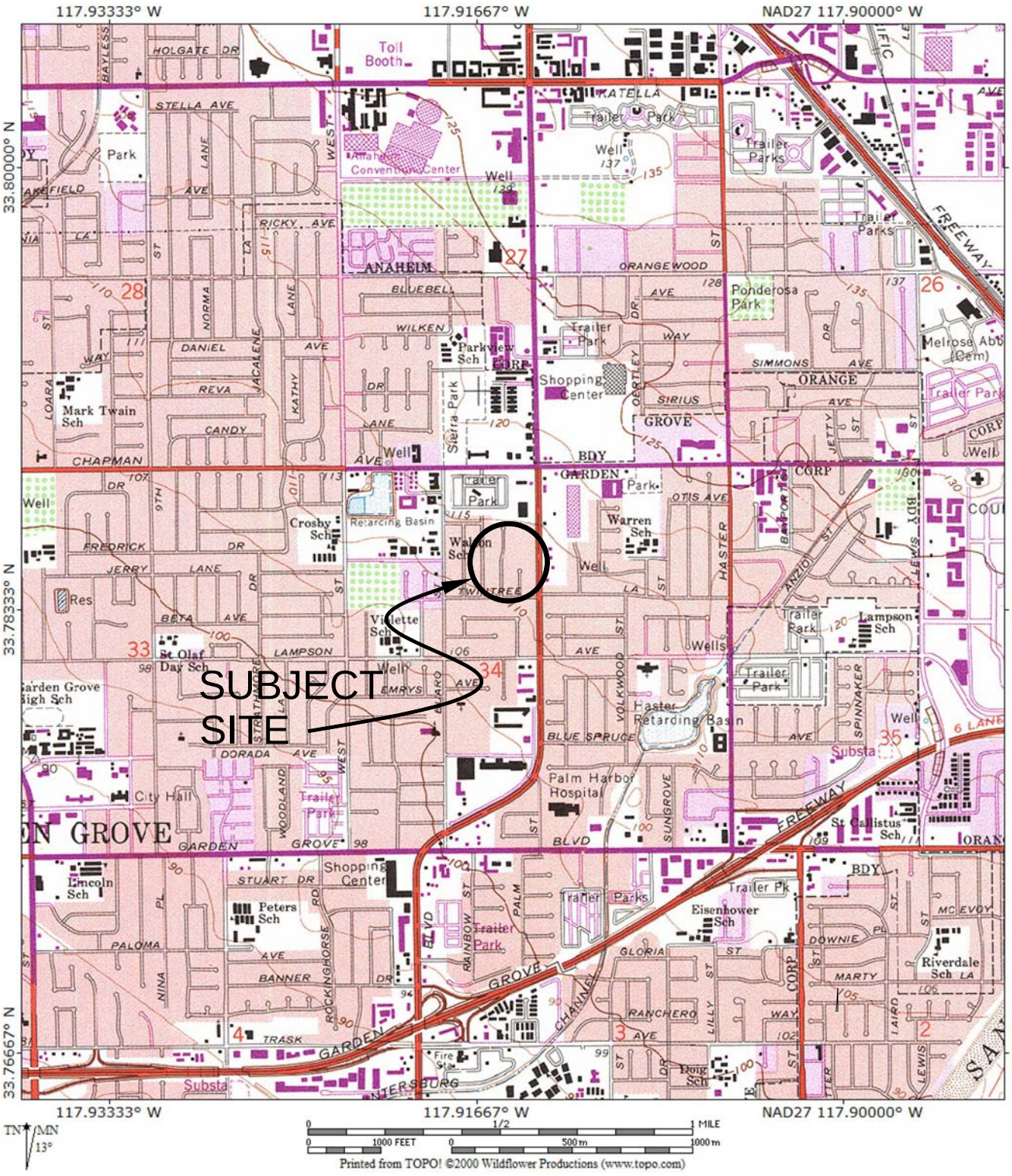
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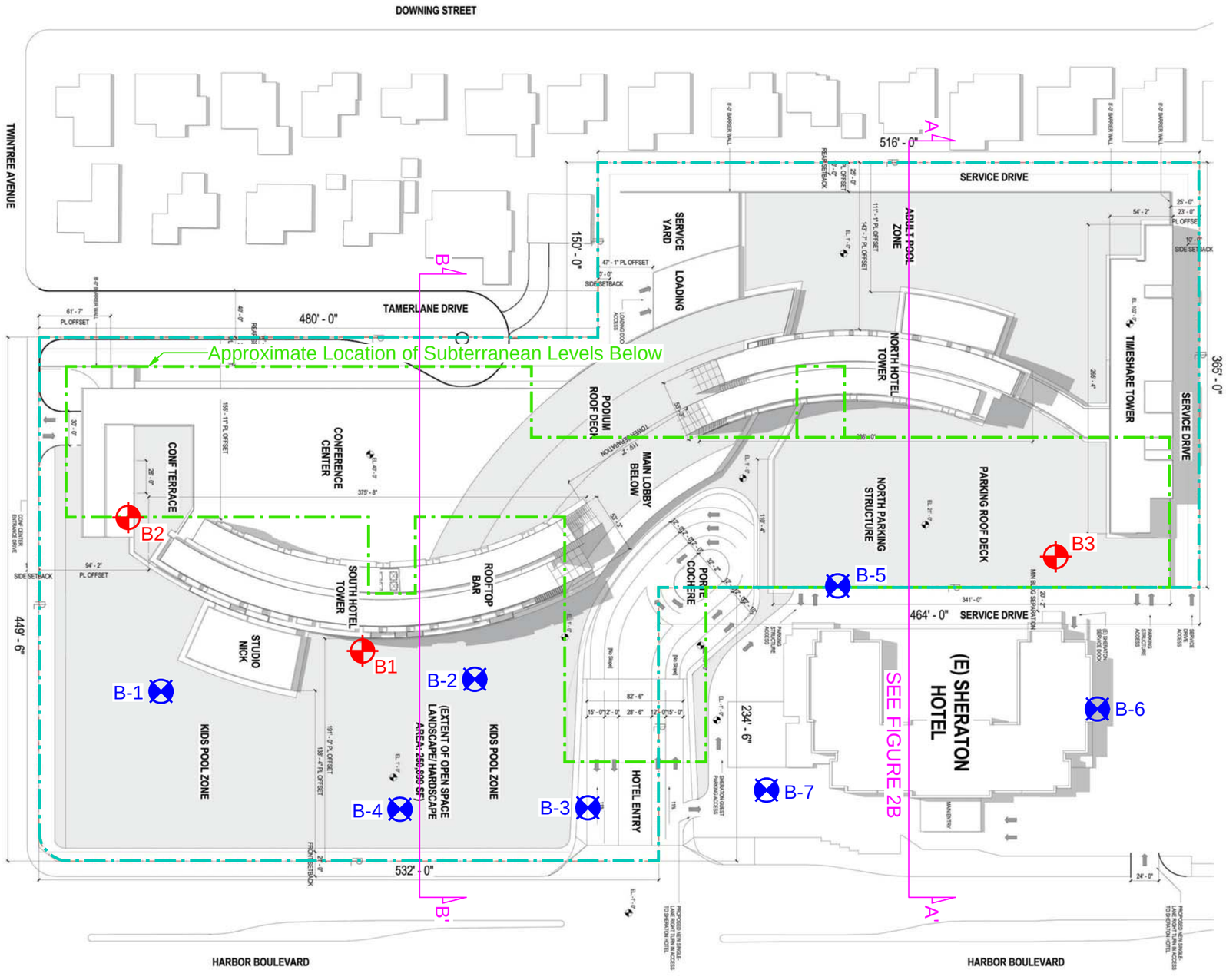
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VICINITY MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 1



LEGEND

- B3 — Approximate Location of Boring (Geocon, 2018)
- B1 — Approximate Location of Boring (CalLand, 2005)
- Approximate Location of Property Line

0 100' 200'

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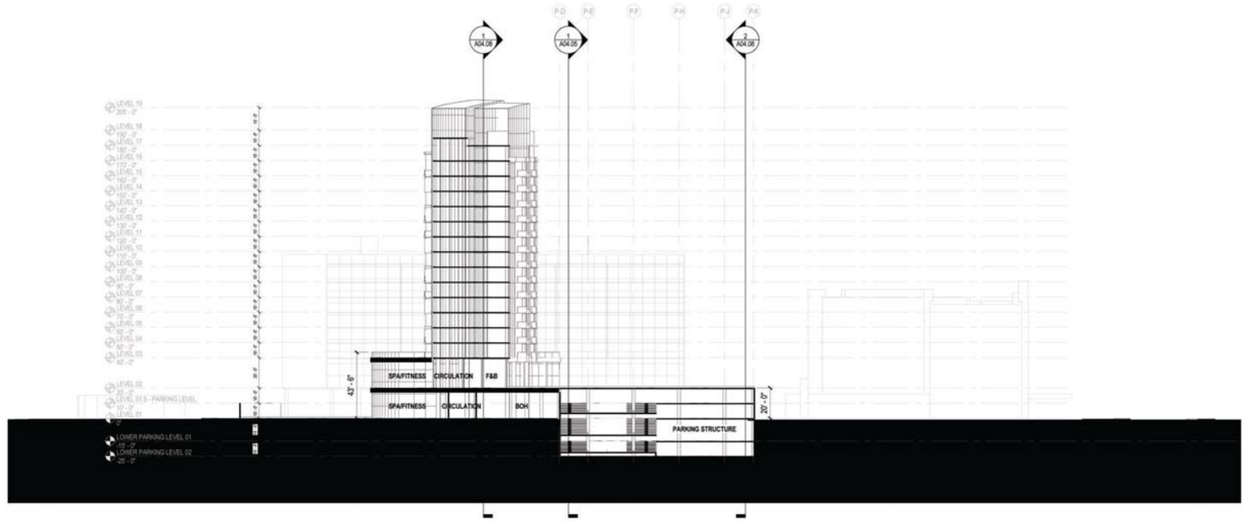
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SITE PLAN

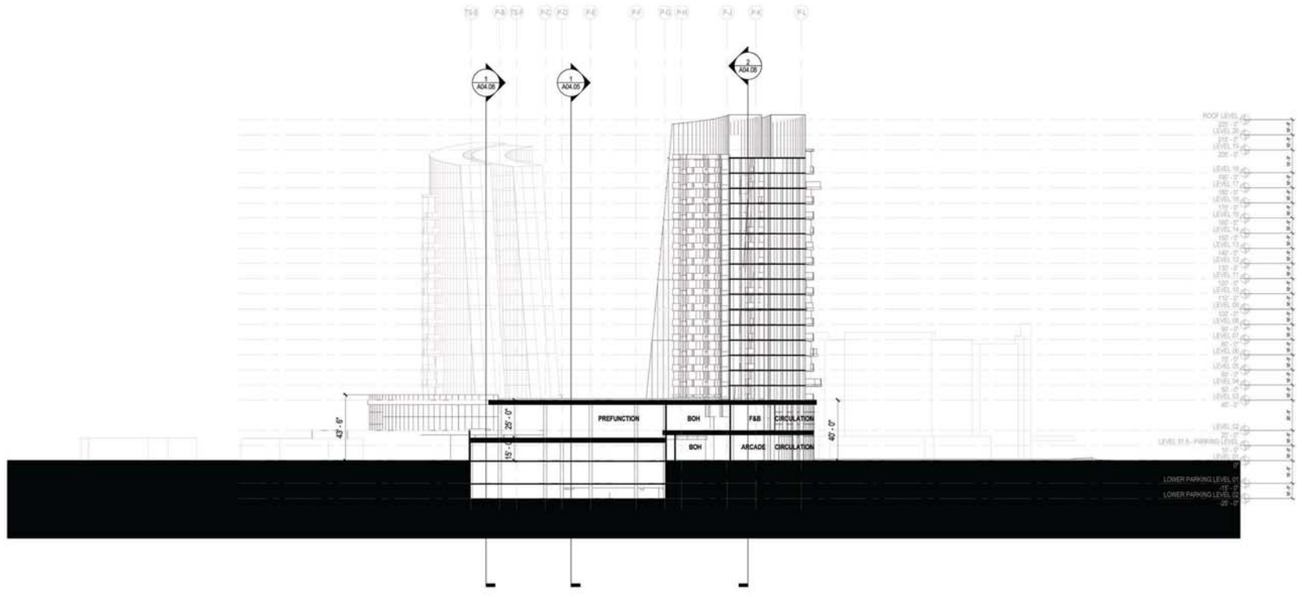
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 2A



SECTION A-A'



SECTION B-B'

0 100' 200'

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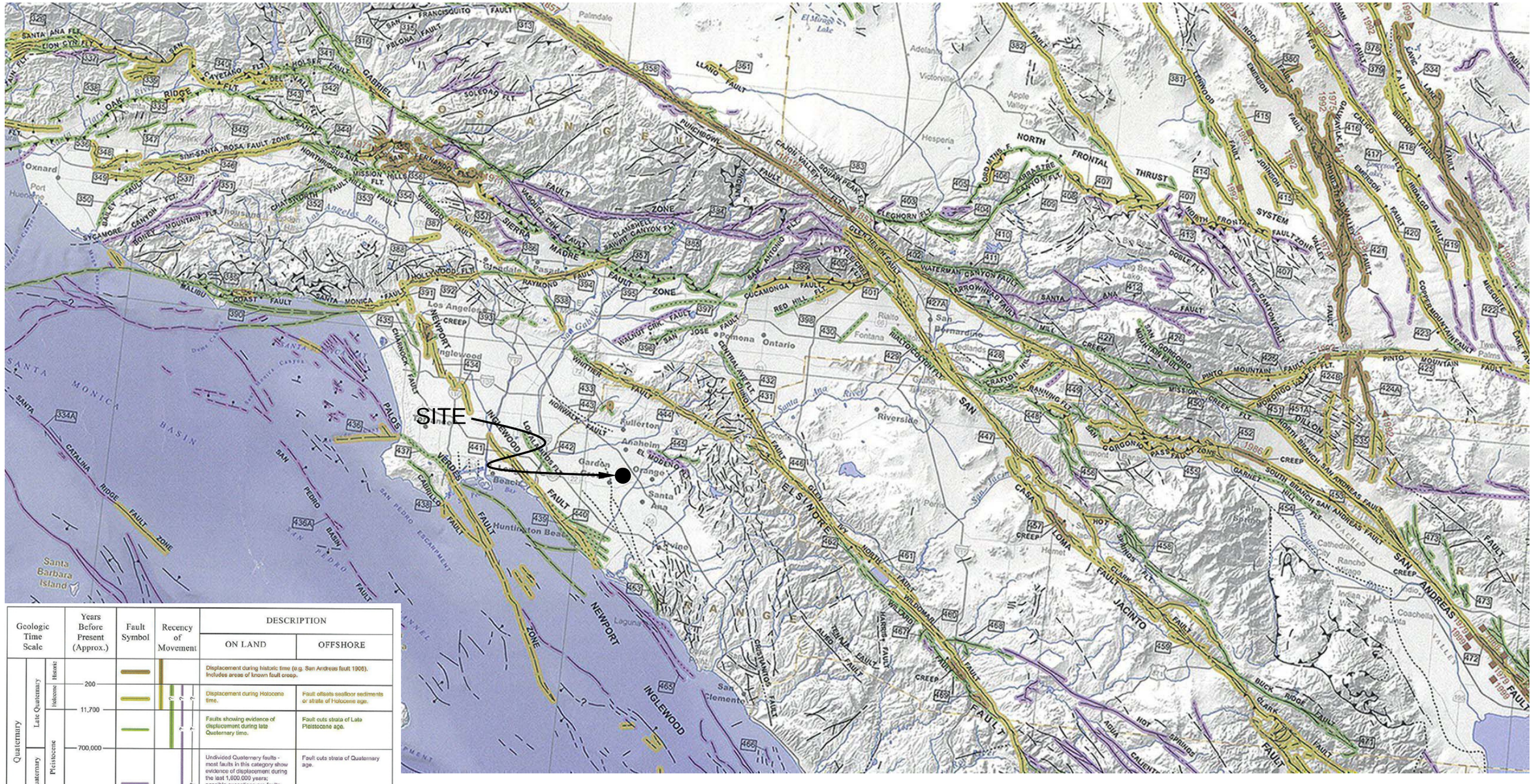
CROSS SECTIONS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 2B

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000*			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of Earth)				

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.8 Ma criterion.

N

0 12 24 Miles

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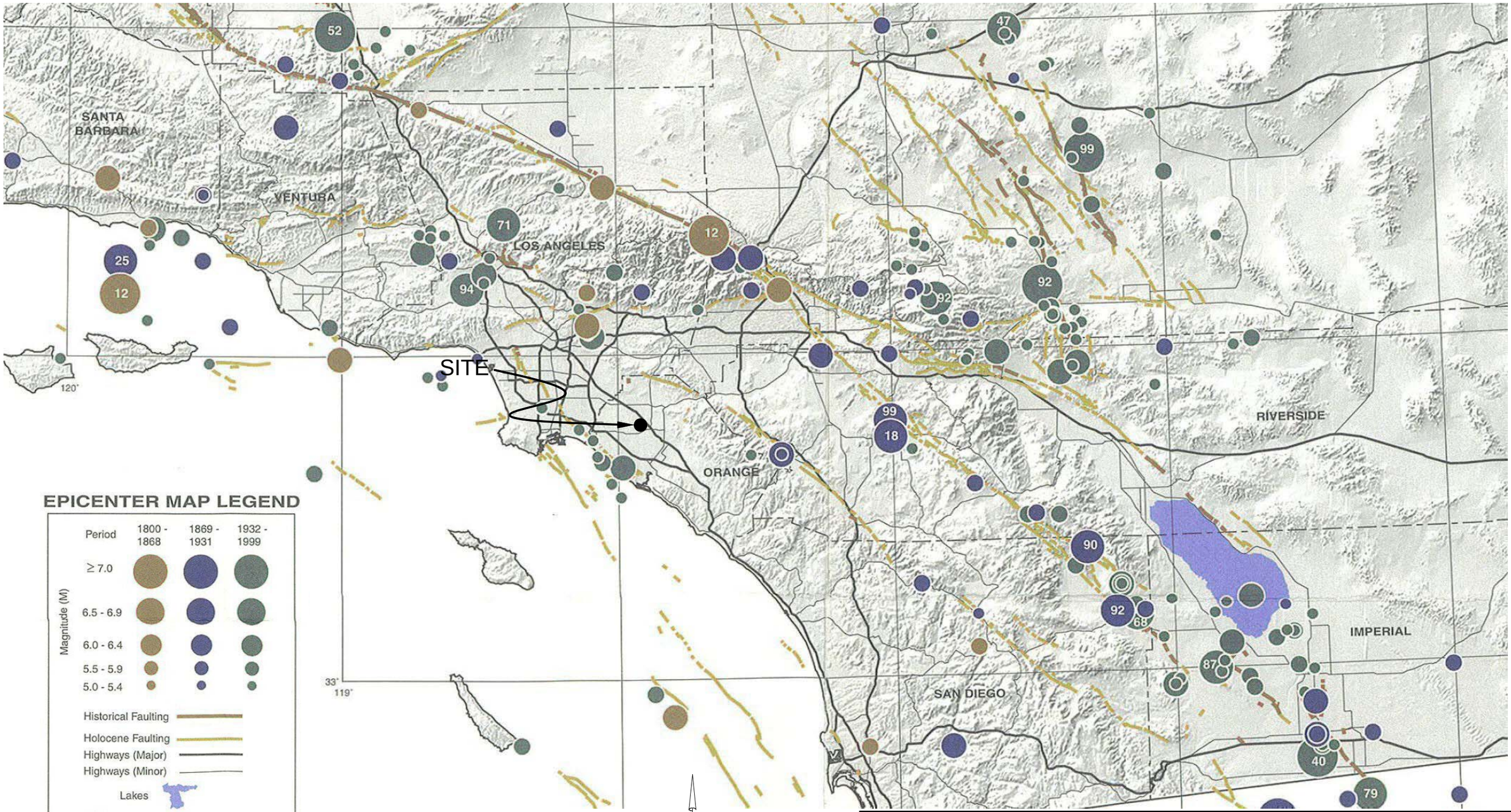
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REGIONAL FAULT MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 3



EPICENTER MAP LEGEND

Period	1800 - 1868	1869 - 1931	1932 - 1999
Magnitude (M) ≥ 7.0			
6.5 - 6.9			
6.0 - 6.4			
5.5 - 5.9			
5.0 - 5.4			

Historical Faulting

Holocene Faulting

Highways (Major)

Highways (Minor)

Lakes

65 Last two digits of M ≥ 6.5 earthquake year

Reference: Toppozada, T., Branum, D., Petersen, M., Hallstrom, C., Cramer, C., and Reichle, M., 2000, Epicenters and Areas Damaged by M≥5 California Earthquakes, 1800 - 1999, California Geological Survey, Map Sheet 49.

N

0 20 40 Miles

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REGIONAL SEISMICITY MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. 4

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
Peak Horiz. Acceleration PGA_M (g):	0.531
2/3 PGA_M (g):	0.354
Calculated Mag.Wtg.Factor:	0.724
Historic High Groundwater:	30.0
Groundwater Depth During Exploration:	62.5

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	113.7	0	7.0	7.5	1		54	1.700	15.4	113.7	0.168	0.998	0.166	--
2.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.993	0.166	--
3.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.989	0.165	--
4.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.984	0.164	--
5.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.979	0.163	--
6.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.975	0.163	--
7.0	113.7	0	7.0	7.5	1	24	54	1.681	19.6	113.7	0.214	0.970	0.162	--
8.0	113.7	0	7.0	7.5	1	24	54	1.565	18.6	113.7	0.202	0.966	0.161	--
9.0	113.7	0	7.0	7.5	1	24	54	1.470	17.7	113.7	0.193	0.961	0.160	--
10.0	105.1	0	7.0	7.5	1	24	54	1.393	17.0	105.1	0.185	0.957	0.160	--
11.0	105.1	0	7.0	7.5	1	24	54	1.330	16.5	105.1	0.179	0.952	0.159	--
12.0	105.1	0	7.0	7.5	1	24	54	1.274	15.9	105.1	0.174	0.947	0.158	--
13.0	105.1	0	18.0	12.5	1	53	80	1.225	35.5	105.1	Infin.	0.943	0.157	--
14.5	105.1	0	18.0	12.5	1	53	80	1.171	34.3	105.1	Infin.	0.937	0.156	--
15.0	104.3	0	14.0	17.5	1	3	66	1.151	23.8	104.3	0.266	0.933	0.156	--
16.0	104.3	0	14.0	17.5	1	3	66	1.106	22.9	104.3	0.253	0.929	0.155	--
17.0	104.3	0	14.0	17.5	1	3	66	1.074	22.2	104.3	0.244	0.925	0.154	--
18.0	104.3	0	14.0	17.5	1	3	66	1.044	21.6	104.3	0.237	0.920	0.153	--
19.0	110.0	0	14.0	17.5	1	3	66	1.016	21.0	110.0	0.230	0.915	0.153	--
20.5	110.0	0	14.0	17.5	1	3	66	0.983	20.3	110.0	0.222	0.910	0.152	--
21.0	106.3	0	11.0	22.5	1	40	55	0.971	24.1	106.3	0.266	0.905	0.151	--
22.0	106.3	0	11.0	22.5	1	40	55	0.943	23.6	106.3	0.258	0.902	0.150	--
23.0	106.3	0	11.0	22.5	1	40	55	0.923	23.2	106.3	0.253	0.897	0.150	--
24.0	106.3	0	22.0	27.5	1	40	73	0.903	40.6	106.3	Infin.	0.893	0.149	--
25.0	106.3	0	22.0	27.5	1	40	73	0.885	39.9	106.3	Infin.	0.888	0.148	--
26.0	106.3	0	22.0	27.5	1	40	73	0.868	39.3	106.3	Infin.	0.883	0.147	--
27.0	106.3	0	22.0	27.5	1	15	73	0.852	33.9	106.3	Infin.	0.879	0.147	--
28.0	106.3	0	22.0	27.5	1	15	73	0.837	33.4	106.3	Infin.	0.874	0.146	--
29.0	106.3	0	22.0	27.5	1	15	73	0.822	32.8	106.3	Infin.	0.870	0.145	--
30.0	110.0	1	17.0	32.5	1	4	62	0.808	23.7	47.6	0.248	0.865	0.146	1.70
31.0	110.0	1	17.0	32.5	1	4	62	0.794	23.3	47.6	0.243	0.861	0.148	1.64
32.0	110.0	1	17.0	32.5	1	4	62	0.782	22.9	47.6	0.238	0.856	0.150	1.59
33.0	110.0	1	17.0	32.5	1	4	62	0.769	22.6	47.6	0.233	0.851	0.151	1.54
34.0	110.0	1	17.0	32.5	1	4	62	0.758	22.2	47.6	0.229	0.847	0.153	1.50
35.0	108.0	1	17.0	32.5	1	4	62	0.746	21.9	45.6	0.225	0.842	0.155	1.45
36.0	108.0	1	17.0	32.5	1	5	62	0.736	21.6	45.6	0.222	0.838	0.156	1.42
37.0	108.0	1	16.0	37.5	1	5	59	0.726	20.1	45.6	0.202	0.833	0.158	1.28
38.0	108.0	1	16.0	37.5	1	5	59	0.716	19.8	45.6	0.199	0.829	0.159	1.25
39.0	108.0	1	16.0	37.5	1	5	59	0.707	19.6	45.6	0.196	0.824	0.160	1.23
40.0	127.9	1	29.0	40.0	1	0	79	0.697	34.9	65.5	Infin.	0.819	0.161	Non-Liq.
41.0	127.9	1	29.0	40.0	1	0	79	0.687	34.4	65.5	Infin.	0.815	0.162	Non-Liq.
42.5	127.9	1	29.0	40.0	1	0	79	0.675	33.8	65.5	Infin.	0.809	0.163	Non-Liq.
43.0	126.7	1	5.0	42.5	0	71		0.670	12.8	64.3	~	0.805	0.163	~
44.0	126.7	1	5.0	42.5	0	71		0.659	12.7	64.3	~	0.801	0.165	~
45.0	126.7	1	5.0	42.5	0	71		0.651	12.6	64.3	~	0.797	0.165	~
46.0	126.7	1	5.0	42.5	0	71		0.642	12.5	64.3	~	0.792	0.166	~
47.0	126.7	1	4.0	47.5	0	78		0.634	11.4	64.3	~	0.787	0.166	~
48.0	126.7	1	4.0	47.5	0	78		0.627	11.3	64.3	~	0.783	0.167	~
49.0	126.7	1	4.0	47.5	0	78		0.619	11.3	64.3	~	0.778	0.167	~
50.0	127.9	1	26.0	50.0	1	63	71	0.612	34.5	65.5	Infin.	0.774	0.168	Non-Liq.
51.0	127.9	1	26.0	50.0	1	63	71	0.605	34.2	65.5	Infin.	0.769	0.168	Non-Liq.
52.0	127.9	1	26.0	50.0	1	63	71	0.599	33.9	65.5	Infin.	0.765	0.168	Non-Liq.
53.0	121.0	1	4.0	52.5	0	98		0.592	11.1	58.6	~	0.760	0.168	~
54.0	121.0	1	4.0	52.5	0	98		0.587	11.0	58.6	~	0.755	0.168	~
55.0	121.0	1	4.0	52.5	0	98		0.581	11.0	58.6	~	0.751	0.169	~
56.0	121.0	1	4.0	52.5	0	98		0.575	11.0	58.6	~	0.746	0.169	~
57.5	121.0	1	4.0	52.5	0	98		0.568	10.9	58.6	~	0.741	0.169	~
58.0	121.0	1	7.0	57.5	1	95	35	0.566	13.8	58.6	0.131	0.736	0.168	0.78
59.0	121.0	1	7.0	57.5	1	95	35	0.559	13.8	58.6	0.130	0.733	0.169	0.77
60.0	127.9	1	16.0	62.5	1	95	52	0.554	22.3	65.5	0.210	0.728	0.169	1.24
61.0	127.9	1	16.0	62.5	1	95	52	0.549	22.2	65.5	0.208	0.723	0.168	1.24
62.0	127.9	1	16.0	62.5	1	78	52	0.544	22.0	65.5	0.207	0.719	0.168	1.23
63.0	127.9	1	16.0	62.5	1	78	52	0.540	21.9	65.5	0.205	0.714	0.168	1.22
64.0	127.9	1	16.0	62.5	1	78	52	0.538	21.8	65.5	0.205	0.710	0.168	1.22
65.0	126.6	1	16.0	62.5	1	78	52	0.536	21.8	64.2	0.204	0.705	0.167	1.22
66.0	126.6	1	16.0	62.5	1	78	52	0.533	21.7	64.2	0.203	0.701	0.167	1.22
67.0	126.6	1	16.0	62.5	1	78	52	0.531	21.7	64.2	0.203	0.696	0.167	1.21
68.0	137.8	1	59.0	67.5	1	0	98	0.528	53.8	75.4	Infin.	0.691	0.166	Non-Liq.
69.0	137.8	1	59.0	67.5	1	0	98	0.526	53.5	75.4	Infin.	0.687	0.166	Non-Liq.
70.0	137.8	1	59.0	67.5	1	0	98	0.523	53.2	75.4	Infin.	0.682	0.165	Non-Liq.
71.0	137.8	1	59.0	67.5	1	0	98	0.521	53.0	75.4	Infin.	0.678	0.165	Non-Liq.
72.0	137.8	1	59.0	72.5	1	0	96	0.518	52.7	75.4	Infin.	0.673	0.164	Non-Liq.
73.0	137.8	1	59.0	72.5	1	0	96	0.516	52.5	75.4	Infin.	0.669	0.164	Non-Liq.
74.0	137.8	1	59.0	72.5	1	0	96	0.513	52.2	75.4	Infin.	0.664	0.163	Non-Liq.
75.5	137.8	1	59.0	72.5	1	0	96	0.510	51.9	75.4	Infin.	0.658	0.162	Non-Liq.

Figure 5

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
PGAM (g):	0.531
2/3 PGAM (g):	0.35
Calculated Mag.Wtg.Factor:	0.724
Historic High Groundwater:	30.0
Groundwater @ Exploration:	62.5

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15} (%)	EQ. SETTLE. Pe (in.)
1.0	7	113.7182	0.028	0.028	54	15	0.230	--	0.00	0.00
2.0	7	113.7182	0.085	0.085	54	20	0.230	--	0.00	0.00
3.0	7	113.7182	0.142	0.142	54	20	0.230	--	0.00	0.00
4.0	7	113.7182	0.199	0.199	54	20	0.230	--	0.00	0.00
5.0	7	113.7182	0.256	0.256	54	20	0.230	--	0.00	0.00
6.0	7	113.7182	0.313	0.313	54	20	0.230	--	0.00	0.00
7.0	7	113.7182	0.370	0.370	54	20	0.230	--	0.00	0.00
8.0	7	113.7182	0.426	0.426	54	19	0.230	--	0.00	0.00
9.0	7	113.7182	0.483	0.483	54	18	0.230	--	0.00	0.00
10.0	7	105.135	0.538	0.538	54	17	0.230	--	0.00	0.00
11.0	7	105.135	0.591	0.591	54	16	0.230	--	0.00	0.00
12.0	7	105.135	0.643	0.643	54	16	0.230	--	0.00	0.00
13.0	18	105.135	0.696	0.696	80	36	0.230	--	0.00	0.00
14.5	18	105.135	0.761	0.761	80	34	0.230	--	0.00	0.00
15.0	14	104.3352	0.788	0.788	66	24	0.230	--	0.00	0.00
16.0	14	104.3352	0.853	0.853	66	23	0.230	--	0.00	0.00
17.0	14	104.3352	0.905	0.905	66	22	0.230	--	0.00	0.00
18.0	14	104.3352	0.957	0.957	66	22	0.230	--	0.00	0.00
19.0	14	109.9968	1.011	1.011	66	21	0.230	--	0.00	0.00
20.5	14	109.9968	1.079	1.079	66	20	0.230	--	0.00	0.00
21.0	11	106.287	1.107	1.107	55	24	0.230	--	0.00	0.00
22.0	11	106.287	1.173	1.173	55	24	0.230	--	0.00	0.00
23.0	11	106.287	1.226	1.226	55	23	0.230	--	0.00	0.00
24.0	22	106.287	1.279	1.279	73	41	0.230	--	0.00	0.00
25.0	22	106.287	1.332	1.332	73	40	0.230	--	0.00	0.00
26.0	22	106.287	1.386	1.386	73	39	0.230	--	0.00	0.00
27.0	22	106.287	1.439	1.439	73	34	0.230	--	0.00	0.00
28.0	22	106.287	1.492	1.492	73	33	0.230	--	0.00	0.00
29.0	22	106.287	1.545	1.545	73	33	0.230	--	0.00	0.00
30.0	17	109.9917	1.599	1.583	62	24	0.232	1.70	0.00	0.00
31.0	17	109.9917	1.654	1.607	62	23	0.237	1.64	0.00	0.00
32.0	17	109.9917	1.709	1.631	62	23	0.241	1.59	0.00	0.00
33.0	17	109.9917	1.764	1.655	62	23	0.245	1.54	0.00	0.00
34.0	17	109.9917	1.819	1.679	62	22	0.249	1.50	0.00	0.00
35.0	17	108.014	1.874	1.702	62	22	0.253	1.45	0.00	0.00
36.0	17	108.014	1.928	1.725	62	22	0.257	1.42	0.00	0.00
37.0	16	108.014	1.982	1.748	59	20	0.261	1.28	0.00	0.00
38.0	16	108.014	2.036	1.770	59	20	0.265	1.25	0.00	0.00
39.0	16	108.014	2.090	1.793	59	20	0.268	1.23	0.00	0.00
40.0	29	127.9157	2.149	1.821	79	35	0.272	Non-Liq.	0.00	0.00
41.0	29	127.9157	2.212	1.854	79	34	0.275	Non-Liq.	0.00	0.00
42.5	29	127.9157	2.292	1.895	79	34	0.279	Non-Liq.	0.00	0.00
43.0	5	126.741	2.324	1.911		13	0.280	~	0.00	0.00
44.0	5	126.741	2.403	1.951		13	0.284	~	0.00	0.00
45.0	5	126.741	2.467	1.983		13	0.286	~	0.00	0.00
46.0	5	126.741	2.530	2.015		13	0.289	~	0.00	0.00
47.0	4	126.741	2.594	2.048		11	0.292	~	0.00	0.00
48.0	4	126.741	2.657	2.080		11	0.294	~	0.00	0.00
49.0	4	126.741	2.720	2.112		11	0.297	~	0.00	0.00
50.0	26	127.8886	2.784	2.144	71	34	0.299	Non-Liq.	0.00	0.00
51.0	26	127.8886	2.848	2.177	71	34	0.301	Non-Liq.	0.00	0.00
52.0	26	127.8886	2.912	2.210	71	34	0.303	Non-Liq.	0.00	0.00
53.0	4	120.9667	2.974	2.241		11	0.306	~	0.00	0.00
54.0	4	120.9667	3.035	2.270		11	0.308	~	0.00	0.00
55.0	4	120.9667	3.095	2.299		11	0.310	~	0.00	0.00
56.0	4	120.9667	3.156	2.329		11	0.312	~	0.00	0.00
57.5	4	120.9667	3.231	2.365		11	0.314	~	0.00	0.00
58.0	7	120.9667	3.261	2.380	35	14	0.315	0.78	1.80	0.11
59.0	7	120.9667	3.337	2.417	35	14	0.318	0.77	1.80	0.22
60.0	16	127.908	3.399	2.448	52	22	0.320	1.24	0.00	0.00
61.0	16	127.908	3.463	2.480	52	22	0.321	1.24	0.00	0.00
62.0	16	127.908	3.527	2.513	52	22	0.323	1.23	0.00	0.00
63.0	16	127.908	3.591	2.546	52	22	0.325	1.22	0.00	0.00
64.0	16	127.908	3.655	2.579	52	22	0.326	1.22	0.00	0.00
65.0	16	126.592	3.719	2.611	52	22	0.328	1.22	0.00	0.00
66.0	16	126.592	3.782	2.643	52	22	0.329	1.22	0.00	0.00
67.0	16	126.592	3.845	2.675	52	22	0.331	1.21	0.00	0.00
68.0	59	137.8251	3.911	2.710	98	54	0.332	Non-Liq.	0.00	0.00
69.0	59	137.8251	3.980	2.748	98	54	0.333	Non-Liq.	0.00	0.00
70.0	59	137.8251	4.049	2.786	98	53	0.335	Non-Liq.	0.00	0.00
71.0	59	137.8251	4.118	2.823	98	53	0.336	Non-Liq.	0.00	0.00
72.0	59	137.8251	4.187	2.861	96	53	0.337	Non-Liq.	0.00	0.00
73.0	59	137.8251	4.256	2.899	96	52	0.338	Non-Liq.	0.00	0.00
74.0	59	137.8251	4.325	2.936	96	52	0.339	Non-Liq.	0.00	0.00
75.5	59	137.8251	4.411	2.984	96	52	0.340	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 0.3 INCHES

Figure 6

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.54
Peak Horiz. Acceleration PGA_M (g):	0.531
Calculated Mag.Wtg.Factor:	0.708
Historic High Groundwater:	30.0
Groundwater Depth During Exploration:	62.5

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.998	0.244	--
2.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.993	0.243	--
3.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.989	0.241	--
4.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.984	0.240	--
5.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.979	0.239	--
6.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.975	0.238	--
7.0	113.7	0	7.0	7.5	1	24	54	1.681	19.6	113.7	0.214	0.970	0.237	--
8.0	113.7	0	7.0	7.5	1	24	54	1.565	18.6	113.7	0.202	0.966	0.236	--
9.0	113.7	0	7.0	7.5	1	24	54	1.470	17.7	113.7	0.193	0.961	0.235	--
10.0	105.1	0	7.0	7.5	1	24	54	1.393	17.0	105.1	0.185	0.957	0.234	--
11.0	105.1	0	7.0	7.5	1	24	54	1.330	16.5	105.1	0.179	0.952	0.233	--
12.0	105.1	0	7.0	7.5	1	24	54	1.274	15.9	105.1	0.174	0.947	0.231	--
13.0	105.1	0	18.0	12.5	1	53	80	1.225	35.5	105.1	Infin.	0.943	0.230	--
14.5	105.1	0	18.0	12.5	1	53	80	1.171	34.3	105.1	Infin.	0.937	0.229	--
15.0	104.3	0	14.0	17.5	1	3	66	1.151	23.8	104.3	0.266	0.933	0.228	--
16.0	104.3	0	14.0	17.5	1	3	66	1.106	22.9	104.3	0.253	0.929	0.227	--
17.0	104.3	0	14.0	17.5	1	3	66	1.074	22.2	104.3	0.244	0.925	0.226	--
18.0	104.3	0	14.0	17.5	1	3	66	1.044	21.6	104.3	0.237	0.920	0.225	--
19.0	110.0	0	14.0	17.5	1	3	66	1.016	21.0	110.0	0.230	0.915	0.224	--
20.5	110.0	0	14.0	17.5	1	3	66	0.983	20.3	110.0	0.222	0.910	0.222	--
21.0	106.3	0	11.0	22.5	1	40	55	0.971	24.1	106.3	0.266	0.905	0.221	--
22.0	106.3	0	11.0	22.5	1	40	55	0.943	23.6	106.3	0.258	0.902	0.220	--
23.0	106.3	0	11.0	22.5	1	40	55	0.923	23.2	106.3	0.253	0.897	0.219	--
24.0	106.3	0	22.0	27.5	1	40	73	0.903	40.6	106.3	Infin.	0.893	0.218	--
25.0	106.3	0	22.0	27.5	1	40	73	0.885	39.9	106.3	Infin.	0.888	0.217	--
26.0	106.3	0	22.0	27.5	1	40	73	0.868	39.3	106.3	Infin.	0.883	0.216	--
27.0	106.3	0	22.0	27.5	1	15	73	0.852	33.9	106.3	Infin.	0.879	0.215	--
28.0	106.3	0	22.0	27.5	1	15	73	0.837	33.4	106.3	Infin.	0.874	0.214	--
29.0	106.3	0	22.0	27.5	1	15	73	0.822	32.8	106.3	Infin.	0.870	0.212	--
30.0	110.0	1	17.0	32.5	1	4	62	0.808	23.7	47.6	0.248	0.865	0.213	1.16
31.0	110.0	1	17.0	32.5	1	4	62	0.794	23.3	47.6	0.243	0.861	0.216	1.12
32.0	110.0	1	17.0	32.5	1	4	62	0.782	22.9	47.6	0.238	0.856	0.219	1.08
33.0	110.0	1	17.0	32.5	1	4	62	0.769	22.6	47.6	0.233	0.851	0.222	1.05
34.0	110.0	1	17.0	32.5	1	4	62	0.758	22.2	47.6	0.229	0.847	0.224	1.02
35.0	108.0	1	17.0	32.5	1	4	62	0.746	21.9	45.6	0.225	0.842	0.226	0.99
36.0	108.0	1	17.0	32.5	1	5	62	0.736	21.6	45.6	0.222	0.838	0.229	0.97
37.0	108.0	1	16.0	37.5	1	5	59	0.726	20.1	45.6	0.202	0.833	0.231	0.88
38.0	108.0	1	16.0	37.5	1	5	59	0.716	19.8	45.6	0.199	0.829	0.233	0.86
39.0	108.0	1	16.0	37.5	1	5	59	0.707	19.6	45.6	0.196	0.824	0.235	0.84
40.0	127.9	1	29.0	40.0	1		79	0.697	34.9	65.5	Infin.	0.819	0.236	Non-Liq.
41.0	127.9	1	29.0	40.0	1		79	0.687	34.4	65.5	Infin.	0.815	0.238	Non-Liq.
42.5	127.9	1	29.0	40.0	1		79	0.675	33.8	65.5	Infin.	0.809	0.239	Non-Liq.
43.0	126.7	1	5.0	42.5	0	71		0.670	12.8	64.3	~	0.805	0.239	~
44.0	126.7	1	5.0	42.5	0	71		0.659	12.7	64.3	~	0.801	0.241	~
45.0	126.7	1	5.0	42.5	0	71		0.651	12.6	64.3	~	0.797	0.242	~
46.0	126.7	1	5.0	42.5	0	71		0.642	12.5	64.3	~	0.792	0.243	~
47.0	126.7	1	4.0	47.5	0	78		0.634	11.4	64.3	~	0.787	0.244	~
48.0	126.7	1	4.0	47.5	0	78		0.627	11.3	64.3	~	0.783	0.244	~
49.0	126.7	1	4.0	47.5	0	78		0.619	11.3	64.3	~	0.778	0.245	~
50.0	127.9	1	26.0	50.0	1	63	71	0.612	34.5	65.5	Infin.	0.774	0.245	Non-Liq.
51.0	127.9	1	26.0	50.0	1	63	71	0.605	34.2	65.5	Infin.	0.769	0.246	Non-Liq.
52.0	127.9	1	26.0	50.0	1	63	71	0.599	33.9	65.5	Infin.	0.765	0.246	Non-Liq.
53.0	121.0	1	4.0	52.5	0	98		0.592	11.1	58.6	~	0.760	0.246	~
54.0	121.0	1	4.0	52.5	0	98		0.587	11.0	58.6	~	0.755	0.247	~
55.0	121.0	1	4.0	52.5	0	98		0.581	11.0	58.6	~	0.751	0.247	~
56.0	121.0	1	4.0	52.5	0	98		0.575	11.0	58.6	~	0.746	0.247	~
57.5	121.0	1	4.0	52.5	0	98		0.568	10.9	58.6	~	0.741	0.247	~
58.0	121.0	1	7.0	57.5	1	95	35	0.566	13.8	58.6	0.131	0.736	0.246	0.53
59.0	121.0	1	7.0	57.5	1	95	35	0.559	13.8	58.6	0.130	0.733	0.247	0.53
60.0	127.9	1	16.0	62.5	1	95	52	0.554	22.3	65.5	0.210	0.728	0.247	0.85
61.0	127.9	1	16.0	62.5	1	95	52	0.549	22.2	65.5	0.208	0.723	0.247	0.84
62.0	127.9	1	16.0	62.5	1	78	52	0.544	22.0	65.5	0.207	0.719	0.246	0.84
63.0	127.9	1	16.0	62.5	1	78	52	0.540	21.9	65.5	0.205	0.714	0.246	0.84
64.0	127.9	1	16.0	62.5	1	78	52	0.538	21.8	65.5	0.205	0.710	0.246	0.83
65.0	126.6	1	16.0	62.5	1	78	52	0.536	21.8	64.2	0.204	0.705	0.245	0.83
66.0	126.6	1	16.0	62.5	1	78	52	0.533	21.7	64.2	0.203	0.701	0.245	0.83
67.0	126.6	1	16.0	62.5	1	78	52	0.531	21.7	64.2	0.203	0.696	0.244	0.83
68.0	137.8	1	59.0	67.5	1		98	0.528	53.8	75.4	Infin.	0.691	0.244	Non-Liq.
69.0	137.8	1	59.0	67.5	1		98	0.526	53.5	75.4	Infin.	0.687	0.243	Non-Liq.
70.0	137.8	1	59.0	67.5	1		98	0.523	53.2	75.4	Infin.	0.682	0.242	Non-Liq.
71.0	137.8	1	59.0	67.5	1		98	0.521	53.0	75.4	Infin.	0.678	0.241	Non-Liq.
72.0	137.8	1	59.0	72.5	1		96	0.518	52.7	75.4	Infin.	0.673	0.241	Non-Liq.
73.0	137.8	1	59.0	72.5	1		96	0.516	52.5	75.4	Infin.	0.669	0.240	Non-Liq.
74.0	137.8	1	59.0	72.5	1		96	0.513	52.2	75.4	Infin.	0.664	0.239	Non-Liq.
75.5	137.8	1	59.0	72.5	1		96	0.510	51.9	75.4	Infin.	0.658	0.238	Non-Liq.

Figure 7

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.54
PGA_M (g):	0.531
Calculated Mag.Wtg.Factor:	0.708
Historic High Groundwater:	30.0
Groundwater @ Exploration:	62.5

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15] (%)	EQ. SETTLE. Pe (in.)
1.0	7	113.7182	0.028	0.028	54	20	0.345	--	0.00	0.00
2.0	7	113.7182	0.085	0.085	54	20	0.345	--	0.00	0.00
3.0	7	113.7182	0.142	0.142	54	20	0.345	--	0.00	0.00
4.0	7	113.7182	0.199	0.199	54	20	0.345	--	0.00	0.00
5.0	7	113.7182	0.256	0.256	54	20	0.345	--	0.00	0.00
6.0	7	113.7182	0.313	0.313	54	20	0.345	--	0.00	0.00
7.0	7	113.7182	0.370	0.370	54	20	0.345	--	0.00	0.00
8.0	7	113.7182	0.426	0.426	54	19	0.345	--	0.00	0.00
9.0	7	113.7182	0.483	0.483	54	18	0.345	--	0.00	0.00
10.0	7	105.135	0.538	0.538	54	17	0.345	--	0.00	0.00
11.0	7	105.135	0.591	0.591	54	16	0.345	--	0.00	0.00
12.0	7	105.135	0.643	0.643	54	16	0.345	--	0.00	0.00
13.0	18	105.135	0.696	0.696	80	36	0.345	--	0.00	0.00
14.5	18	105.135	0.761	0.761	80	34	0.345	--	0.00	0.00
15.0	14	104.3352	0.788	0.788	66	24	0.345	--	0.00	0.00
16.0	14	104.3352	0.853	0.853	66	23	0.345	--	0.00	0.00
17.0	14	104.3352	0.905	0.905	66	22	0.345	--	0.00	0.00
18.0	14	104.3352	0.957	0.957	66	22	0.345	--	0.00	0.00
19.0	14	109.9968	1.011	1.011	66	21	0.345	--	0.00	0.00
20.5	14	109.9968	1.079	1.079	66	20	0.345	--	0.00	0.00
21.0	11	106.287	1.107	1.107	55	24	0.345	--	0.00	0.00
22.0	11	106.287	1.173	1.173	55	24	0.345	--	0.00	0.00
23.0	11	106.287	1.226	1.226	55	23	0.345	--	0.00	0.00
24.0	22	106.287	1.279	1.279	73	41	0.345	--	0.00	0.00
25.0	22	106.287	1.332	1.332	73	40	0.345	--	0.00	0.00
26.0	22	106.287	1.386	1.386	73	39	0.345	--	0.00	0.00
27.0	22	106.287	1.439	1.439	73	34	0.345	--	0.00	0.00
28.0	22	106.287	1.492	1.492	73	33	0.345	--	0.00	0.00
29.0	22	106.287	1.545	1.545	73	33	0.345	--	0.00	0.00
30.0	17	109.9917	1.599	1.583	62	24	0.349	1.16	0.00	0.00
31.0	17	109.9917	1.654	1.607	62	23	0.355	1.12	0.00	0.00
32.0	17	109.9917	1.709	1.631	62	23	0.362	1.08	0.00	0.00
33.0	17	109.9917	1.764	1.655	62	23	0.368	1.05	0.00	0.00
34.0	17	109.9917	1.819	1.679	62	22	0.374	1.02	0.00	0.00
35.0	17	108.014	1.874	1.702	62	22	0.380	0.99	1.40	0.17
36.0	17	108.014	1.928	1.725	62	22	0.386	0.97	1.40	0.17
37.0	16	108.014	1.982	1.748	59	20	0.391	0.88	1.40	0.17
38.0	16	108.014	2.036	1.770	59	20	0.397	0.86	1.60	0.19
39.0	16	108.014	2.090	1.793	59	20	0.402	0.84	1.60	0.19
40.0	29	127.9157	2.149	1.821	79	35	0.407	Non-Liq.	0.00	0.00
41.0	29	127.9157	2.212	1.854	79	34	0.412	Non-Liq.	0.00	0.00
42.5	29	127.9157	2.292	1.895	79	34	0.418	Non-Liq.	0.00	0.00
43.0	5	126.741	2.324	1.911		13	0.420	~	0.00	0.00
44.0	5	126.741	2.403	1.951		13	0.425	~	0.00	0.00
45.0	5	126.741	2.467	1.983		13	0.429	~	0.00	0.00
46.0	5	126.741	2.530	2.015		13	0.433	~	0.00	0.00
47.0	4	126.741	2.594	2.048		11	0.437	~	0.00	0.00
48.0	4	126.741	2.657	2.080		11	0.441	~	0.00	0.00
49.0	4	126.741	2.720	2.112		11	0.445	~	0.00	0.00
50.0	26	127.8886	2.784	2.144	71	34	0.448	Non-Liq.	0.00	0.00
51.0	26	127.8886	2.848	2.177	71	34	0.451	Non-Liq.	0.00	0.00
52.0	26	127.8886	2.912	2.210	71	34	0.455	Non-Liq.	0.00	0.00
53.0	4	120.9667	2.974	2.241		11	0.458	~	0.00	0.00
54.0	4	120.9667	3.035	2.270		11	0.461	~	0.00	0.00
55.0	4	120.9667	3.095	2.299		11	0.465	~	0.00	0.00
56.0	4	120.9667	3.156	2.329		11	0.468	~	0.00	0.00
57.5	4	120.9667	3.231	2.365		11	0.471	~	0.00	0.00
58.0	7	120.9667	3.261	2.380	35	14	0.473	0.53	1.80	0.11
59.0	7	120.9667	3.337	2.417	35	14	0.477	0.53	1.80	0.22
60.0	16	127.908	3.399	2.448	52	22	0.479	0.85	1.40	0.17
61.0	16	127.908	3.463	2.480	52	22	0.482	0.84	1.40	0.17
62.0	16	127.908	3.527	2.513	52	22	0.484	0.84	1.40	0.17
63.0	16	127.908	3.591	2.546	52	22	0.487	0.84	1.40	0.17
64.0	16	127.908	3.655	2.579	52	22	0.489	0.83	1.40	0.17
65.0	16	126.592	3.719	2.611	52	22	0.492	0.83	1.40	0.17
66.0	16	126.592	3.782	2.643	52	22	0.494	0.83	1.40	0.17
67.0	16	126.592	3.845	2.675	52	22	0.496	0.83	1.40	0.17
68.0	59	137.8251	3.911	2.710	98	54	0.498	Non-Liq.	0.00	0.00
69.0	59	137.8251	3.980	2.748	98	54	0.500	Non-Liq.	0.00	0.00
70.0	59	137.8251	4.049	2.786	98	53	0.502	Non-Liq.	0.00	0.00
71.0	59	137.8251	4.118	2.823	98	53	0.503	Non-Liq.	0.00	0.00
72.0	59	137.8251	4.187	2.861	96	53	0.505	Non-Liq.	0.00	0.00
73.0	59	137.8251	4.256	2.899	96	52	0.507	Non-Liq.	0.00	0.00
74.0	59	137.8251	4.325	2.936	96	52	0.508	Non-Liq.	0.00	0.00
75.5	59	137.8251	4.411	2.984	96	52	0.510	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 2.6 INCHES

Figure 8

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
DESIGN EARTHQUAKE

DE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
Peak Horiz. Acceleration (g):	0.354

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15} (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	113.7	0.03	0.02	0.007	7	1.25	54.4	1.7	15.4	1.0	153.472	4.22E-05	6.00E-05	0.006	8.21E-03	7.9523	6.17E-03	0.00
2.0	1.0	1.5	113.7	0.09	0.06	0.020	7	1.25	54.4	1.7	19.8	1.0	289.104	6.59E-05	1.00E-04	0.010	1.01E-02	7.9523	7.60E-03	0.00
3.0	1.0	2.5	113.7	0.14	0.10	0.033	7	1.25	54.4	1.7	19.8	1.0	373.231	8.35E-05	1.60E-04	0.016	1.62E-02	7.9523	1.22E-02	0.00
4.0	1.0	3.5	113.7	0.20	0.13	0.046	7	1.25	54.4	1.7	19.8	1.0	441.613	9.68E-05	1.60E-04	0.016	1.62E-02	7.9523	1.22E-02	0.00
5.0	1.0	4.5	113.7	0.26	0.17	0.059	7	1.25	54.4	1.7	19.8	1.0	500.742	1.08E-04	1.70E-04	0.017	1.72E-02	7.9523	1.29E-02	0.00
6.0	1.0	5.5	113.7	0.31	0.21	0.072	7	1.25	54.4	1.7	19.8	1.0	553.591	1.17E-04	1.50E-04	0.015	1.52E-02	7.9523	1.14E-02	0.00
7.0	1.0	6.5	113.7	0.37	0.25	0.085	7	1.25	54.4	1.7	19.6	1.0	600.043	1.25E-04	1.50E-04	0.015	1.53E-02	7.9523	1.15E-02	0.00
8.0	1.0	7.5	113.7	0.43	0.29	0.098	7	1.25	54.4	1.6	18.6	1.0	632.835	1.34E-04	1.50E-04	0.015	1.64E-02	7.9523	1.23E-02	0.00
9.0	1.0	8.5	113.7	0.48	0.32	0.110	7	1.25	54.4	1.5	17.7	1.0	663.150	1.43E-04	1.50E-04	0.015	1.73E-02	7.9523	1.30E-02	0.00
10.0	1.0	9.5	105.1	0.54	0.36	0.123	7	1.25	54.4	1.4	17.0	1.0	690.412	1.50E-04	1.50E-04	0.015	1.82E-02	7.9523	1.37E-02	0.00
11.0	1.0	10.5	105.1	0.59	0.40	0.134	7	1.25	54.4	1.3	16.5	1.0	715.125	1.56E-04	1.50E-04	0.015	1.90E-02	7.9523	1.43E-02	0.00
12.0	1.0	11.5	105.1	0.64	0.43	0.146	7	1.25	54.4	1.3	15.9	0.9	738.595	1.61E-04	1.50E-04	0.015	1.97E-02	7.9523	1.48E-02	0.00
13.0	1.0	12.5	105.1	0.70	0.47	0.158	18	1.25	80.1	1.2	35.5	0.9	1003.262	1.26E-04	1.50E-04	0.015	7.53E-03	7.9523	5.66E-03	0.00
14.5	1.5	13.8	105.1	0.76	0.51	0.172	18	1.25	80.1	1.2	34.3	0.9	1037.027	1.31E-04	1.60E-04	0.016	8.38E-03	7.9523	6.30E-03	0.00
15.0	0.5	14.8	104.3	0.81	0.55	0.183	14	1.25	65.7	1.2	23.8	0.9	949.305	1.50E-04	1.60E-04	0.016	1.30E-02	7.9523	9.77E-03	0.00
16.0	1.0	15.5	104.3	0.85	0.57	0.192	14	1.25	65.7	1.1	22.9	0.9	959.056	1.53E-04	1.60E-04	0.016	1.36E-02	7.9523	1.02E-02	0.00
17.0	1.0	16.5	104.3	0.91	0.61	0.203	14	1.25	65.7	1.1	22.2	0.9	978.219	1.57E-04	1.60E-04	0.016	1.41E-02	7.9523	1.06E-02	0.00
18.0	1.0	17.5	104.3	0.96	0.64	0.214	14	1.25	65.7	1.0	21.6	0.9	996.659	1.60E-04	1.60E-04	0.016	1.46E-02	7.9523	1.10E-02	0.00
19.0	1.0	18.5	110.0	1.01	0.68	0.225	14	1.25	65.7	1.0	21.0	0.9	1014.915	1.63E-04	1.60E-04	0.016	1.51E-02	7.9523	1.13E-02	0.00
20.5	1.5	19.8	110.0	1.08	0.72	0.239	14	1.25	65.7	1.0	20.3	0.9	1037.416	1.67E-04	1.60E-04	0.016	1.57E-02	7.9523	1.18E-02	0.00
21.0	0.5	20.8	106.3	1.13	0.76	0.250	11	1.25	54.6	1.0	24.1	0.9	1125.519	1.59E-04	1.60E-04	0.016	1.28E-02	7.9523	9.62E-03	0.00
22.0	1.0	21.5	106.3	1.17	0.79	0.258	11	1.25	54.6	0.9	23.6	0.9	1137.289	1.61E-04	1.60E-04	0.016	1.31E-02	7.9523	9.86E-03	0.00
23.0	1.0	22.5	106.3	1.23	0.82	0.269	11	1.25	54.6	0.9	23.2	0.9	1156.738	1.63E-04	1.60E-04	0.016	1.34E-02	7.9523	1.00E-02	0.00
24.0	1.0	23.5	106.3	1.28	0.86	0.279	22	1.25	73.0	0.9	40.6	0.9	1422.559	1.36E-04	1.60E-04	0.016	6.85E-03	7.9523	5.15E-03	0.00
25.0	1.0	24.5	106.3	1.33	0.89	0.290	22	1.25	73.0	0.9	39.9	0.9	1443.670	1.37E-04	1.60E-04	0.016	6.99E-03	7.9523	5.25E-03	0.00
26.0	1.0	25.5	106.3	1.39	0.93	0.300	22	1.25	73.0	0.9	39.3	0.9	1464.278	1.38E-04	1.60E-04	0.016	7.12E-03	7.9523	5.35E-03	0.00
27.0	1.0	26.5	106.3	1.44	0.96	0.310	22	1.25	73.0	0.9	33.9	0.9	1421.445	1.46E-04	1.60E-04	0.016	8.48E-03	7.9523	6.38E-03	0.00
28.0	1.0	27.5	106.3	1.49	1.00	0.320	22	1.25	73.0	0.8	33.4	0.9	1439.307	1.47E-04	1.30E-04	0.013	7.03E-03	7.9523	5.29E-03	0.00
29.0	1.0	28.5	106.3	1.55	1.04	0.329	22	1.25	73.0	0.8	32.8	0.9	1456.767	1.48E-04	1.30E-04	0.013	7.17E-03	7.9523	5.39E-03	0.00
30.0	1.0	29.5	110.0	1.60	1.07	0.339	17	1.25	62.2	0.8	23.7	0.9	1329.370	1.65E-04	1.30E-04	0.013	1.06E-02	7.9523	7.97E-03	0.00
31.0	1.0	30.5	110.0	1.66	1.11	0.349	17	1.25	62.2	0.8	23.3	0.9	1344.423	1.66E-04	1.30E-04	0.013	1.08E-02	7.9523	8.14E-03	0.00
32.0	1.0	31.5	110.0	1.71	1.15	0.358	17	1.25	62.2	0.8	22.9	0.9	1359.147	1.68E-04	1.30E-04	0.013	1.10E-02	7.9523	8.30E-03	0.00
33.0	1.0	32.5	110.0	1.77	1.18	0.368	17	1.25	62.2	0.8	22.6	0.9	1373.558	1.69E-04	1.30E-04	0.013	1.13E-02	7.9523	8.46E-03	0.00
34.0	1.0	33.5	110.0	1.82	1.22	0.377	17	1.25	62.2	0.8	22.2	0.8	1387.673	1.69E-04	1.30E-04	0.013	1.15E-02	7.9523	8.61E-03	0.00
35.0	1.0	34.5	108.0	1.87	1.26	0.386	17	1.25	62.2	0.7	21.9	0.8	1401.384	1.70E-04	1.30E-04	0.013	1.17E-02	7.9523	8.77E-03	0.00
36.0	1.0	35.5	108.0	1.93	1.29	0.394	17	1.25	62.2	0.7	21.6	0.8	1415.729	1.71E-04	1.30E-04	0.013	1.18E-02	7.9523	8.89E-03	0.00
37.0	1.0	36.5	108.0	1.98	1.33	0.403	16	1.25	59.1	0.7	20.1	0.8	1400.312	1.75E-04	1.30E-04	0.013	1.29E-02	7.9523	9.72E-03	0.00
38.0	1.0	37.5	108.0	2.04	1.36	0.411	16	1.25	59.1	0.7	19.8	0.8	1412.924	1.76E-04	1.30E-04	0.013	1.31E-02	7.9523	9.88E-03	0.00
39.0	1.0	38.5	108.0	2.09	1.40	0.419	16	1.25	59.1	0.7	19.6	0.8	1425.316	1.76E-04	1.30E-04	0.013	1.34E-02	7.9523	1.00E-02	0.00
40.0	1.0	39.5	127.9	2.15	1.44	0.428	29	1.25	78.8	0.7	34.9	0.8	1752.607	1.45E-04	1.30E-04	0.013	6.67E-03	7.9523	5.01E-03	0.00
41.0	1.0	40.5	127.9	2.21	1.48	0.438	29	1.25	78.8	0.7	34.4	0.8	1769.814	1.46E-04	1.30E-04	0.013	6.79E-03	7.9523	5.10E-03	0.00
42.5	1.5	41.8	127.9	2.29	1.54	0.450	29	1.25	78.8	0.7	33.8	0.8	1790.864	1.47E-04	1.30E-04	0.013	6.94E-03	7.9523	5.21E-03	0.00
43.0	0.5	42.8	126.7	2.36	1.58	0.459	5	1.25	32.3	0.7	12.8	0.8	1313.433	2.03E-04	3.00E-04	0.030	5.13E-02	7.9523	3.86E-02	0.00
44.0	1.0	43.5	126.7	2.40	1.61	0.466	5	1.25	32.3	0.7	12.7	0.8	1323.275	2.03E-04	3.00E-04	0.030	5.18E-02	7.9523	3.89E-02	0.00
45.0	1.0	44.5	126.7	2.47	1.65	0.474	5	1.25	32.3	0.7	12.6	0.8	1338.003	2.03E-04	3.00E-04	0.030	5.22E-02	7.9523	3.92E-02	0.00
46.0	1.0	45.5	126.7	2.53	1.70	0.483	5	1.25	32.3	0.6	12.5	0.8	1352.532	2.04E-04	3.00E-04	0.030	5.25E-02	7.9523	3.95E-02	0.00
47.0	1.0	46.5	126.7	2.60	1.74	0.491	4	1.25	28.0	0.6	11.4	0.8	1325.661	2.10E-04	3.00E-04	0.030	5.90E-02	7.9523	4.44E-02	0.00
48.0	1.0	47.5	126.7	2.66	1.78	0.499	4	1.25	28.0	0.6	11.3	0.8	1339.682	2.10E-04	3.00E-04	0.030	5.94E-02	7.9523	4.46E-02	0.00
49.0	1.0	48.5	126.7	2.72	1.82	0.507	4	1.25	28.0	0.6	11.3	0.8	1353.531	2.10E-04	3.00E-04	0.030	5.97E-02	7.9523	4.49E-02	0.00
50.0	1.0	49.5	127.9	2.79	1.87	0.515	26	1.25	70.7	0.6	34.5	0.8	1987.231	1.44E-04	1.30E-04	0.013	6.77E-03	7.9523	5.09E-03	0.00

TOTAL SETTLEMENT = **0.07**

Figure 9

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
MAXIMUM CONSIDERED EARTHQUAKE

MCE EARTHQUAKE INFORMATION:

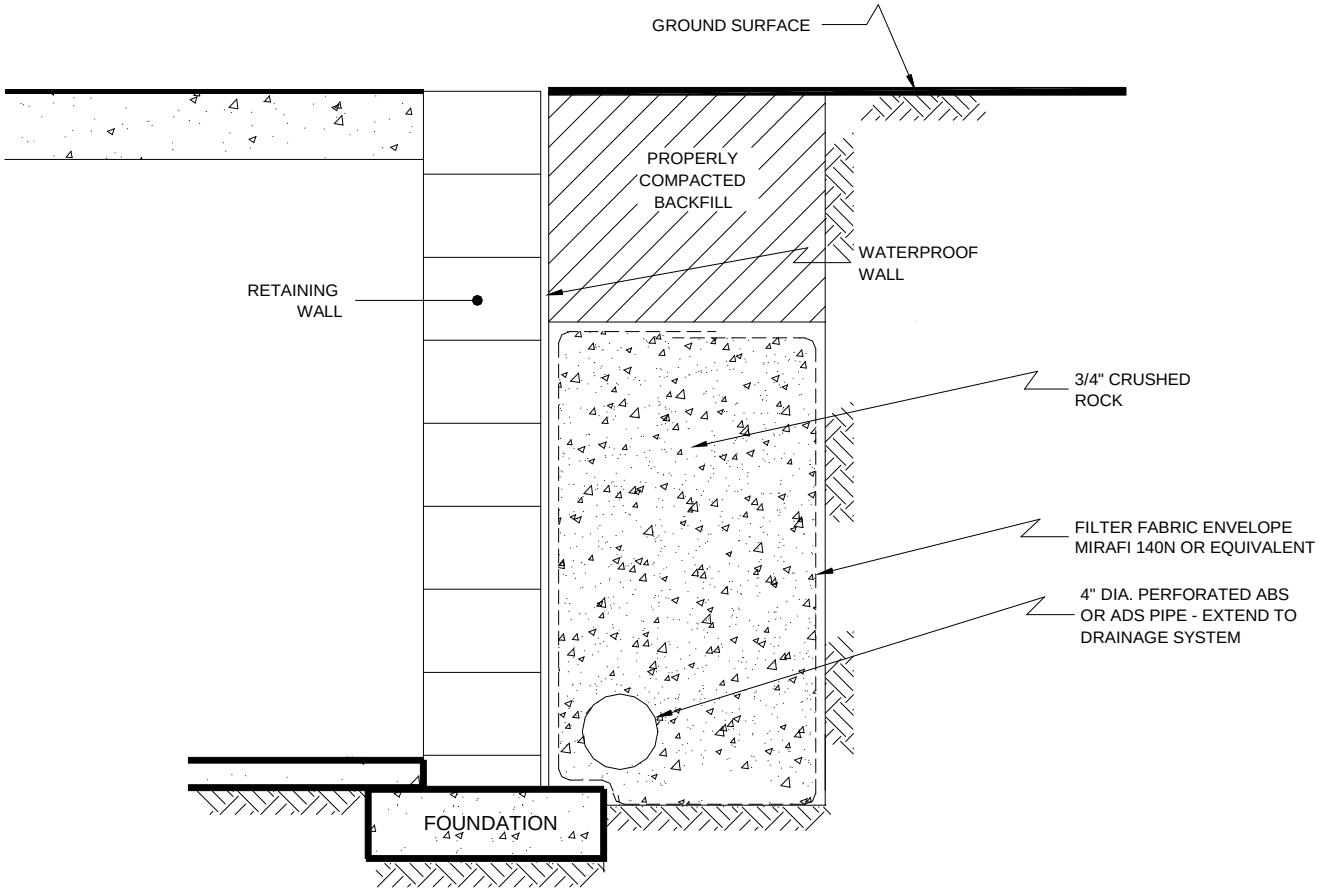
Earthquake Magnitude:	6.54
Peak Horiz. Acceleration (g):	0.531

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15} (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	113.7	0.03	0.02	0.010	7	1.25	54.4	1.7	19.8	1.0	166.914	5.82E-05	7.80E-05	0.008	7.89E-03	7.5594	5.80E-03	0.00
2.0	1.0	1.5	113.7	0.09	0.06	0.029	7	1.25	54.4	1.7	19.8	1.0	289.104	9.88E-05	1.90E-04	0.019	1.92E-02	7.5594	1.41E-02	0.00
3.0	1.0	2.5	113.7	0.14	0.10	0.049	7	1.25	54.4	1.7	19.8	1.0	373.231	1.25E-04	2.30E-04	0.023	2.33E-02	7.5594	1.71E-02	0.00
4.0	1.0	3.5	113.7	0.20	0.13	0.069	7	1.25	54.4	1.7	19.8	1.0	441.613	1.45E-04	1.70E-04	0.017	1.72E-02	7.5594	1.26E-02	0.00
5.0	1.0	4.5	113.7	0.26	0.17	0.088	7	1.25	54.4	1.7	19.8	1.0	500.742	1.62E-04	1.70E-04	0.017	1.72E-02	7.5594	1.26E-02	0.00
6.0	1.0	5.5	113.7	0.31	0.21	0.108	7	1.25	54.4	1.7	19.8	1.0	553.591	1.75E-04	1.50E-04	0.015	1.52E-02	7.5594	1.11E-02	0.00
7.0	1.0	6.5	113.7	0.37	0.25	0.127	7	1.25	54.4	1.7	19.6	1.0	600.043	1.87E-04	1.50E-04	0.015	1.53E-02	7.5594	1.13E-02	0.00
8.0	1.0	7.5	113.7	0.43	0.29	0.146	7	1.25	54.4	1.6	18.6	1.0	632.835	2.01E-04	4.50E-04	0.045	4.92E-02	7.5594	3.61E-02	0.01
9.0	1.0	8.5	113.7	0.48	0.32	0.166	7	1.25	54.4	1.5	17.7	1.0	663.150	2.14E-04	4.50E-04	0.045	5.20E-02	7.5594	3.82E-02	0.01
10.0	1.0	9.5	105.1	0.54	0.36	0.184	7	1.25	54.4	1.4	17.0	1.0	690.412	2.24E-04	4.50E-04	0.045	5.46E-02	7.5594	4.01E-02	0.01
11.0	1.0	10.5	105.1	0.59	0.40	0.202	7	1.25	54.4	1.3	16.5	1.0	715.125	2.33E-04	4.50E-04	0.045	5.69E-02	7.5594	4.18E-02	0.01
12.0	1.0	11.5	105.1	0.64	0.43	0.219	7	1.25	54.4	1.3	15.9	0.9	738.595	2.42E-04	4.50E-04	0.045	5.90E-02	7.5594	4.34E-02	0.01
13.0	1.0	12.5	105.1	0.70	0.47	0.236	18	1.25	80.1	1.2	35.5	0.9	1003.262	1.89E-04	1.50E-04	0.015	7.53E-03	7.5594	5.53E-03	0.00
14.5	1.5	13.8	105.1	0.76	0.51	0.258	18	1.25	80.1	1.2	34.3	0.9	1037.027	1.96E-04	1.60E-04	0.016	8.38E-03	7.5594	6.16E-03	0.00
15.0	0.5	14.8	104.3	0.81	0.55	0.275	14	1.25	65.7	1.2	23.8	0.9	949.305	2.25E-04	3.70E-04	0.037	3.00E-02	7.5594	2.21E-02	0.00
16.0	1.0	15.5	104.3	0.85	0.57	0.288	14	1.25	65.7	1.1	22.9	0.9	959.056	2.30E-04	3.70E-04	0.037	3.15E-02	7.5594	2.32E-02	0.01
17.0	1.0	16.5	104.3	0.91	0.61	0.304	14	1.25	65.7	1.1	22.2	0.9	978.219	2.35E-04	3.70E-04	0.037	3.27E-02	7.5594	2.40E-02	0.01
18.0	1.0	17.5	104.3	0.96	0.64	0.321	14	1.25	65.7	1.0	21.6	0.9	996.659	2.40E-04	3.70E-04	0.037	3.38E-02	7.5594	2.48E-02	0.01
19.0	1.0	18.5	110.0	1.01	0.68	0.337	14	1.25	65.7	1.0	21.0	0.9	1014.915	2.45E-04	3.70E-04	0.037	3.49E-02	7.5594	2.56E-02	0.01
20.5	1.5	19.8	110.0	1.08	0.72	0.359	14	1.25	65.7	1.0	20.3	0.9	1037.416	2.50E-04	3.70E-04	0.037	3.63E-02	7.5594	2.67E-02	0.01
21.0	0.5	20.8	106.3	1.13	0.76	0.375	11	1.25	54.6	1.0	24.1	0.9	1125.519	2.39E-04	3.70E-04	0.037	2.96E-02	7.5594	2.17E-02	0.00
22.0	1.0	21.5	106.3	1.17	0.79	0.387	11	1.25	54.6	0.9	23.6	0.9	1137.289	2.41E-04	3.70E-04	0.037	3.03E-02	7.5594	2.23E-02	0.01
23.0	1.0	22.5	106.3	1.23	0.82	0.403	11	1.25	54.6	0.9	23.2	0.9	1156.738	2.44E-04	3.70E-04	0.037	3.09E-02	7.5594	2.27E-02	0.01
24.0	1.0	23.5	106.3	1.28	0.86	0.419	22	1.25	73.0	0.9	40.6	0.9	1422.559	2.04E-04	3.70E-04	0.037	1.58E-02	7.5594	1.16E-02	0.00
25.0	1.0	24.5	106.3	1.33	0.89	0.434	22	1.25	73.0	0.9	39.9	0.9	1443.670	2.06E-04	3.70E-04	0.037	1.62E-02	7.5594	1.19E-02	0.00
26.0	1.0	25.5	106.3	1.39	0.93	0.449	22	1.25	73.0	0.9	39.3	0.9	1464.278	2.08E-04	3.70E-04	0.037	1.65E-02	7.5594	1.21E-02	0.00
27.0	1.0	26.5	106.3	1.44	0.96	0.464	22	1.25	73.0	0.9	33.9	0.9	1421.445	2.18E-04	3.70E-04	0.037	1.96E-02	7.5594	1.44E-02	0.00
28.0	1.0	27.5	106.3	1.49	1.00	0.479	22	1.25	73.0	0.8	33.4	0.9	1439.307	2.20E-04	3.00E-04	0.030	1.62E-02	7.5594	1.19E-02	0.00
29.0	1.0	28.5	106.3	1.55	1.04	0.494	22	1.25	73.0	0.8	32.8	0.9	1456.767	2.22E-04	3.00E-04	0.030	1.66E-02	7.5594	1.22E-02	0.00
30.0	1.0	29.5	110.0	1.60	1.07	0.508	17	1.25	62.2	0.8	23.7	0.9	1329.370	2.48E-04	3.00E-04	0.030	2.45E-02	7.5594	1.80E-02	0.00
31.0	1.0	30.5	110.0	1.66	1.11	0.523	17	1.25	62.2	0.8	23.3	0.9	1344.423	2.50E-04	3.00E-04	0.030	2.50E-02	7.5594	1.84E-02	0.00
32.0	1.0	31.5	110.0	1.71	1.15	0.537	17	1.25	62.2	0.8	22.9	0.9	1359.147	2.51E-04	3.00E-04	0.030	2.55E-02	7.5594	1.87E-02	0.00
33.0	1.0	32.5	110.0	1.77	1.18	0.551	17	1.25	62.2	0.8	22.6	0.9	1373.558	2.53E-04	3.00E-04	0.030	2.60E-02	7.5594	1.91E-02	0.00
34.0	1.0	33.5	110.0	1.82	1.22	0.565	17	1.25	62.2	0.8	22.2	0.8	1387.673	2.54E-04	3.00E-04	0.030	2.64E-02	7.5594	1.94E-02	0.00
35.0	1.0	34.5	108.0	1.87	1.26	0.578	17	1.25	62.2	0.7	21.9	0.8	1401.384	2.55E-04	3.00E-04	0.030	2.69E-02	7.5594	1.98E-02	0.00
36.0	1.0	35.5	108.0	1.93	1.29	0.591	17	1.25	62.2	0.7	21.6	0.8	1415.729	2.56E-04	3.00E-04	0.030	2.73E-02	7.5594	2.01E-02	0.00
37.0	1.0	36.5	108.0	1.98	1.33	0.604	16	1.25	59.1	0.7	20.1	0.8	1400.312	2.62E-04	3.00E-04	0.030	2.99E-02	7.5594	2.19E-02	0.00
38.0	1.0	37.5	108.0	2.04	1.36	0.616	16	1.25	59.1	0.7	19.8	0.8	1412.924	2.63E-04	3.00E-04	0.030	3.03E-02	7.5594	2.23E-02	0.00
39.0	1.0	38.5	108.0	2.09	1.40	0.628	16	1.25	59.1	0.7	19.6	0.8	1425.316	2.64E-04	3.00E-04	0.030	3.08E-02	7.5594	2.26E-02	0.00
40.0	1.0	39.5	127.9	2.15	1.44	0.642	29	1.25	78.8	0.7	34.9	0.8	1752.607	2.18E-04	3.00E-04	0.030	1.54E-02	7.5594	1.13E-02	0.00
41.0	1.0	40.5	127.9	2.21	1.48	0.656	29	1.25	78.8	0.7	34.4	0.8	1769.814	2.19E-04	3.00E-04	0.030	1.57E-02	7.5594	1.15E-02	0.00
42.5	1.5	41.8	127.9	2.29	1.54	0.674	29	1.25	78.8	0.7	33.8	0.8	1790.864	2.20E-04	3.00E-04	0.030	1.60E-02	7.5594	1.18E-02	0.00
43.0	0.5	42.8	126.7	2.36	1.58	0.688	5	1.25	32.3	0.7	12.8	0.8	1313.433	3.04E-04	5.20E-04	0.052	8.90E-02	7.5594	6.54E-02	0.00
44.0	1.0	43.5	126.7	2.40	1.61	0.698	5	1.25	32.3	0.7	12.7	0.8	1323.275	3.05E-04	5.20E-04	0.052	8.98E-02	7.5594	6.60E-02	0.00
45.0	1.0	44.5	126.7	2.47	1.65	0.711	5	1.25	32.3	0.7	12.6	0.8	1338.003	3.05E-04	5.20E-04	0.052	9.04E-02	7.5594	6.64E-02	0.00
46.0	1.0	45.5	126.7	2.53	1.70	0.724	5	1.25	32.3	0.6	12.5	0.8	1352.532	3.05E-04	5.20E-04	0.052	9.10E-02	7.5594	6.69E-02	0.00
47.0	1.0	46.5	126.7	2.60	1.74	0.736	4	1.25	28.0	0.6	11.4	0.8	1325.661	3.15E-04	5.20E-04	0.052	1.02E-01	7.5594	7.52E-02	0.00
48.0	1.0	47.5	126.7	2.66	1.78	0.749	4	1.25	28.0	0.6	11.3	0.8	1339.682	3.15E-04	5.20E-04	0.052	1.03E-01	7.5594	7.56E-02	0.00
49.0	1.0	48.5	126.7	2.72	1.82	0.761	4	1.25	28.0	0.6	11.3	0.8	1353.531	3.15E-04	5.20E-04	0.052	1.03E-01	7.5594	7.60E-02	0.00
50.0	1.0	49.5	127.9	2.79	1.87	0.772	26	1.25	70.7	0.6	34.5	0.8	1987.231	2.16E-04	3.00E-04	0.030	1.56E-02	7.5594	1.15E-02	0.00

TOTAL SETTLEMENT = **0.14**

Figure 10



NO SCALE

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

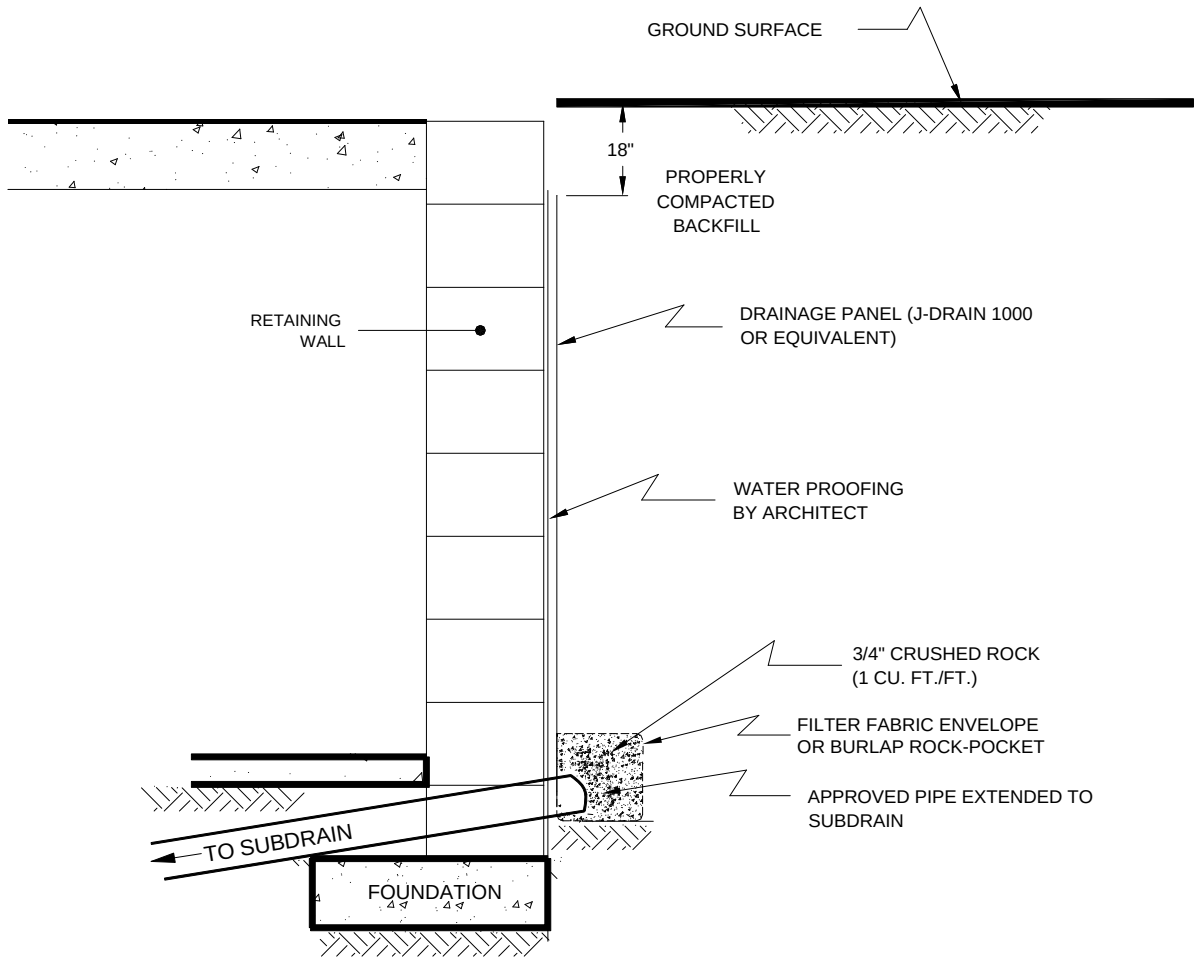
DRAFTED BY: PZ	CHECKED BY: JTA

RETAINING WALL DRAIN DETAIL

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 11



NO SCALE

GEOCON WEST, INC.

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GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 12

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was explored on July 20, 2018, by excavating three 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine. The borings were advanced to depths between approximately 40½ and 75½ feet below the existing ground surface. Representative and relatively undisturbed samples were obtained by driving a 3 inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch high by 2 3/8-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained. Standard Penetration Tests (SPTs) were performed in boring B1.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A3. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the boring logs were revised based on subsequent laboratory testing. The locations of the borings are shown on Figure 2.

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**ARTIFICIAL FILL** Silty Sand, medium dense, dry to slightly moist, brown, fine- to medium-grained, some fine to coarse gravel.			
2					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine-grained.			
4								
6	B1@5'			SM	- light brown	19	108.2	5.1
8	B1@7.5'				- loose	7	--	4.5
10	B1@10'					16	97.8	7.5
12	B1@12.5'			ML	Sandy Silt, stiff, slightly moist, brown, fine-grained.	18	--	15.8
14								
16	B1@15'			SW	Sand, well-graded, medium dense, slightly moist, light brown, fine- to coarse-grained.	25	103.2	1.1
18	B1@17.5'					14	--	1.1
20	B1@20'				- fine- to medium-grained	26	108.8	1.1
22	B1@22.5'			SM	Silty Sand, medium dense, slightly moist, dark brown, fine-grained. - decrease in silt content, brown	11	--	14.1
24								
26	B1@25'				- increase in silt content	34	107.4	11.3
28	B1@27.5'				- decrease in silt content	22	--	6.5
				SP	Sand, poorly-graded, dense, slightly moist, light brown, fine- to			

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1@30'				medium-grained.	57	107.1	2.7
32	B1@32.5'				- medium dense	17	--	2.5
34				SP				
36	B1@35'				- some coarse-grained	47	106.0	1.9
38	B1@37.5'				- increase in silt content, fine- to medium-grained	16	--	3.2
40	B1@40'			SM	Silty Sand, medium dense, slightly moist, dark brown, fine-grained.	52	113.3	12.9
42	B1@42.5'				Clay with Sand, soft, slightly moist, brown, very fine-grained sand.	5	--	23.6
44	B1@45'				- firm	13	101.8	24.5
46				CL				
48	B1@47.5'				- soft, grayish brown	4	--	23.1
50	B1@50'			ML	Sandy Silt, hard, slightly moist, brown, fine-grained.	48	109.4	16.9
52	B1@52.5'				Clay, soft, slightly moist, grayish brown.	4	--	33.4
54								
56	B1@55'			CL	- firm, trace fine-grained sand	16	93.7	29.1
58	B1@57.5'			ML	Silt, soft, slightly moist, grayish brown.	7	--	33.2

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B1@60'			ML	- hard	44	104.5	22.4
62	B1@62.5'		▼	ML	- stiff	16	--	29.7
64				ML				
66	B1@65'			ML		24	98.9	28.0
68	B1@67.5'			SM	Silty Sand, very dense, slightly moist, brown, fine-grained.	59	--	20.6
70	B1@70'			SM		46	--	--
72	B1@72.5'			SM	- moist to wet, decrease in silt content, fine- to coarse-grained - fine- to medium-grained	59	--	18.9
74	B1@75'			SM		50 (5")	117.9	16.9
					Total depth of boring: 75.5 feet. Fill to 1.5 feet. Groundwater encountered at 62.5 feet. Backfilled with cement bentonite grout. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 3 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. A9839-88-01

BORING 2

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			**ARTIFICIAL FILL**			
			Silty Sand, loose, dry to slightly moist, brown, fine-grained.			
2			**ALLUVIUM**			
			Silty Sand, medium dense, slightly moist, light brown, fine-grained.			
4						
	B2@5'	SM		23	102.6	3.4
6						
8						
			Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained.			
10	B2@10'			19	104.8	3.0
12						
14		SP				
	B2@15'		- fine- to medium-grained, trace coarse-grained	29	108.5	1.0
16						
18						
			Silty Sand, medium dense, slightly moist, dark brown, fine-grained.			
20	B2@20'	SM		24	111.2	9.1
			Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained, trace medium grained.			
22	B2@22'			23	101.0	4.4
24						
	B2@25'	SP		46	111.6	5.7
26						
	B2@37'		- dense, some silt, brown, fine-grained	55	111.4	6.5
28						

A9839-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9839-88-01

BORING 2

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2@30'			SP	- light brown, medium dense	49	101.9	2.5
32	B2@32'				- fine- to medium-grained	48	103.2	1.5
34								
	B2@35'					43	104.2	2.6
36								
38								
40	B2@40'			SM	Silty Sand, medium dense, slightly moist, brown, fine-grained.	23	108.7	19.9

Total depth of boring: 40.5 feet.
Fill to 1 foot.
No groundwater encountered.
Backfilled with soil cuttings and tamped.
Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.

A9839-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
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GEOCON

PROJECT NO. A9839-88-01

BORING 3

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine-grained.			
2			**ALLUVIUM** Silty Sand, loose, slightly moist, brown, fine- to medium-grained, trace coarse-grained.			
4						
6	B3@5'	SM		15	116.7	6.5
8						
10	B3@10'		Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained.	20	104.7	5.3
12						
14						
16	B3@15'	SP	- fine- to medium-grained - trace coarse-grained	28	103.2	2.4
18						
20	B3@20'		- fine- to coarse-grained	41	110.4	1.7
22	BULK 20-25' B3@22'	SM	Silty Sand, medium dense, slightly most, brown, fine-grained.	41	15.2	15.4
24			Sand, medium dense, slightly moist, light brown, fine-grained.			
26	B3@25'			47	111.0	9.9
28	B3@27'	SP	- dense, fine- to medium-grained	68	108.8	2.4

A9839-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9839-88-01

BORING 3

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3@30'			SP	- medium dense	32	105.5	7.3
32	B3@32'			SM	Silty Sand, medium dense, slightly moist, brown, fine-grained.	26	119.3	15.4
34					Sand, poorly graded, medium dense, slightly moist, light brown, fine-to medium-grained.			
36	B3@35'			SP		37	104.2	3.6
38								
40	B3@40'			ML	Sandy Silt, firm, slightly moist, brown, fine-grained.	14	96.2	29.6
					Total depth of boring: 40.5 feet. Fill to 2 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9839-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
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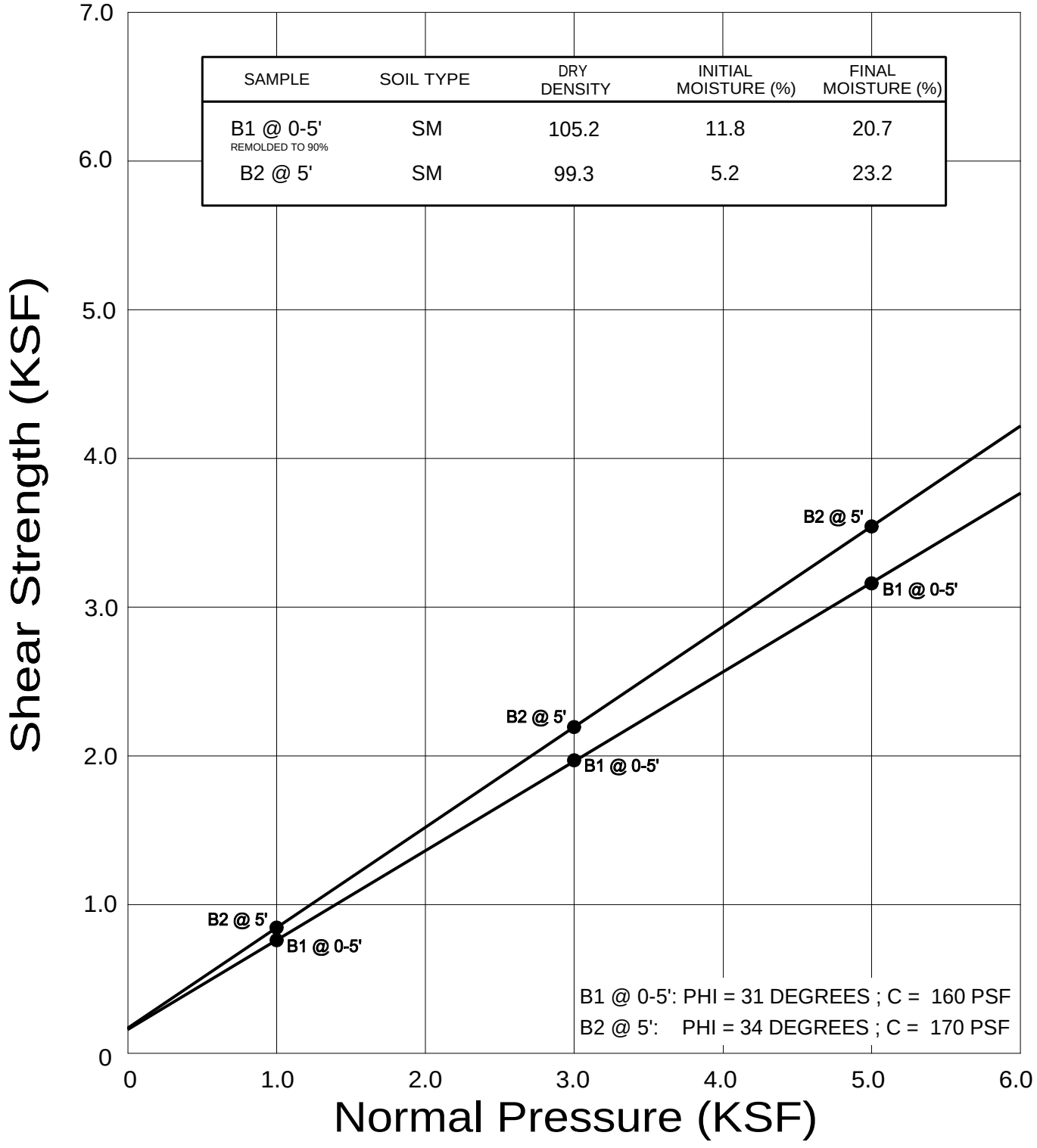
APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, plasticity indices, grain-size, corrosivity, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B11. The in-place dry density and moisture content of the samples tested are presented on the boring logs, Appendix A.

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 0-5' REMOLDED TO 90%	SM	105.2	11.8	20.7
B2 @ 5'	SM	99.3	5.2	23.2



● Direct Shear, Saturated

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

DRAFTED BY: JS	CHECKED BY: JTA

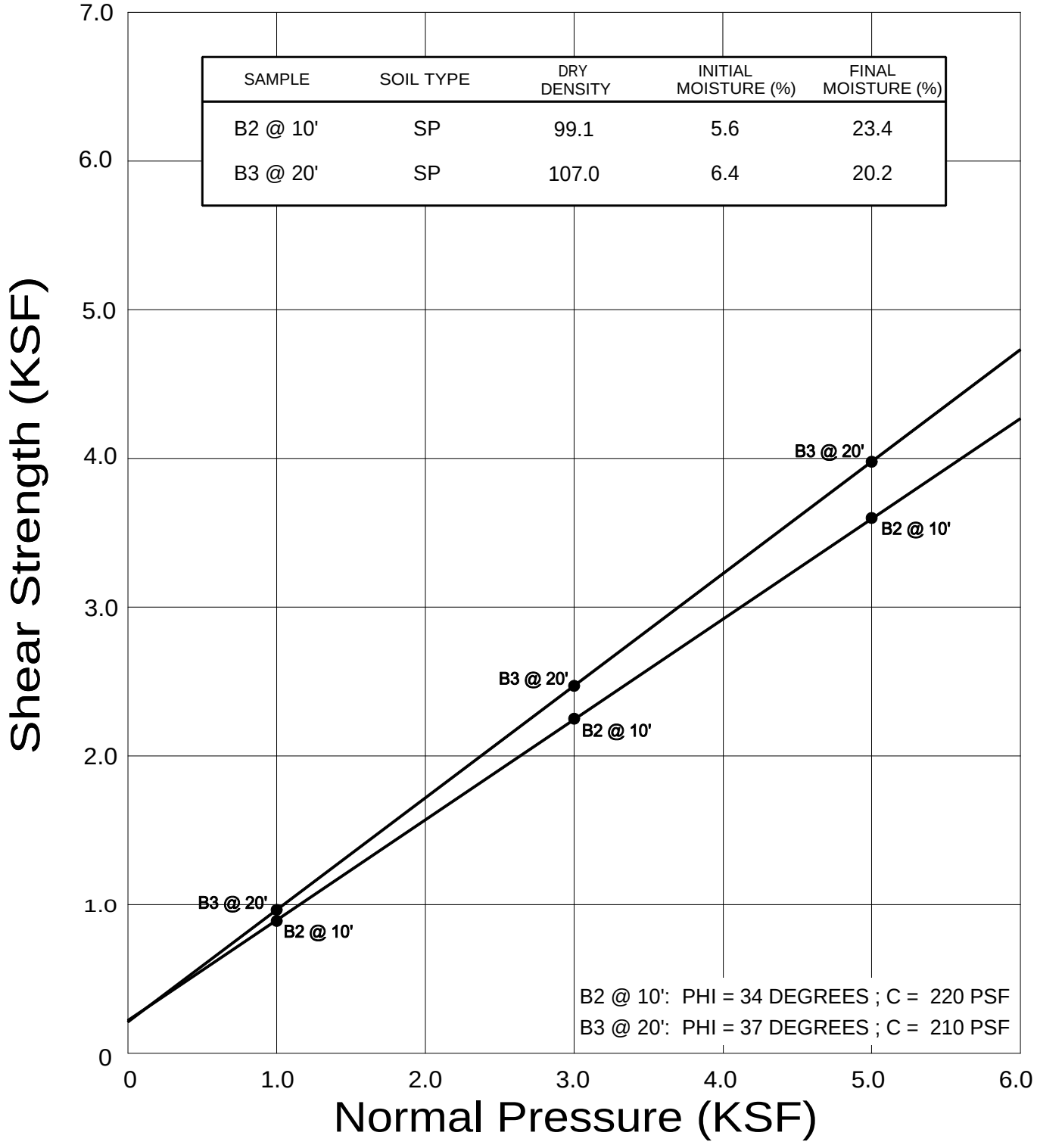
DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B1

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2 @ 10'	SP	99.1	5.6	23.4
B3 @ 20'	SP	107.0	6.4	20.2



● Direct Shear, Saturated

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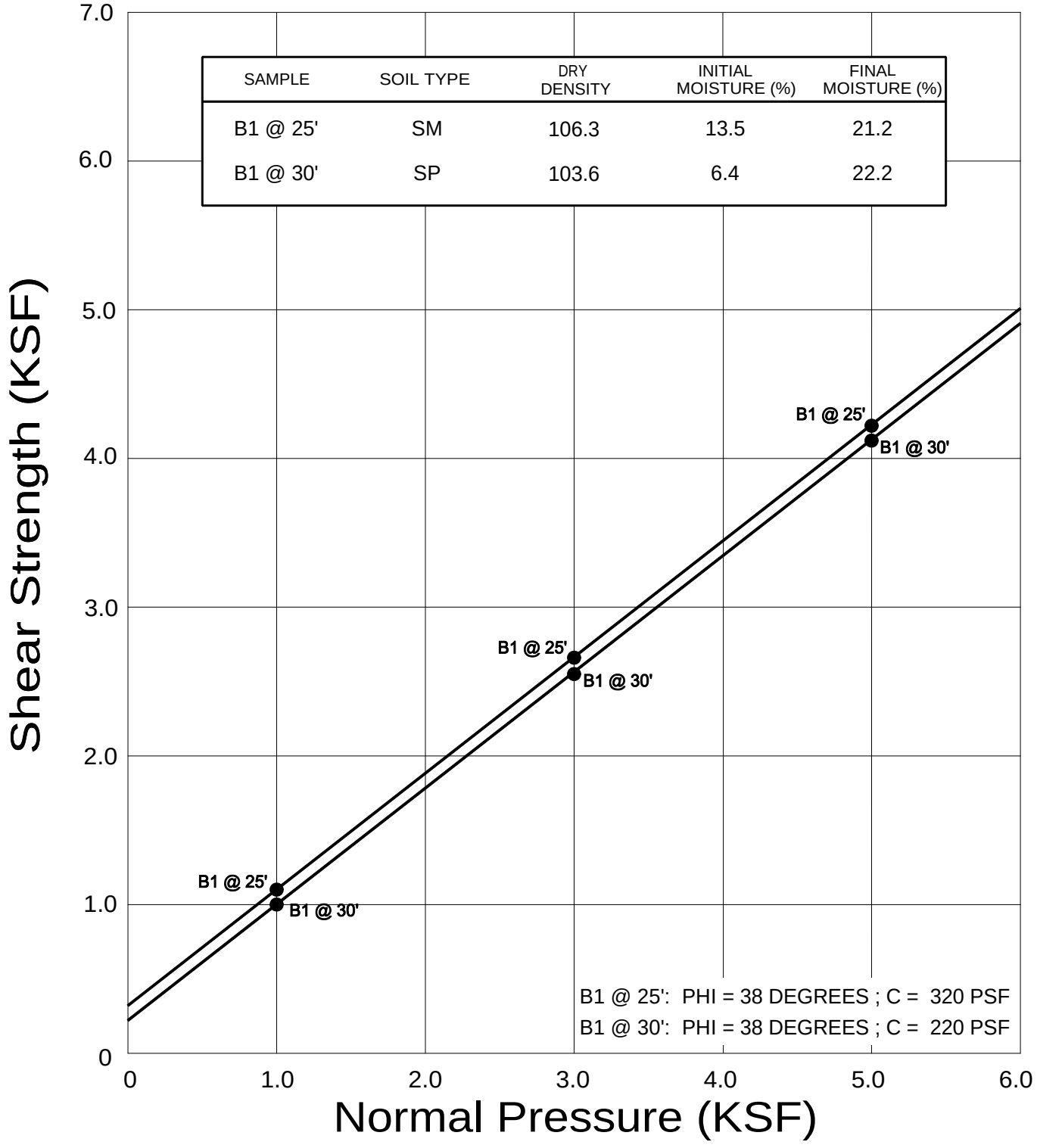
DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B2

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 25'	SM	106.3	13.5	21.2
B1 @ 30'	SP	103.6	6.4	22.2



● Direct Shear, Saturated

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PHONE (949) 491-6570

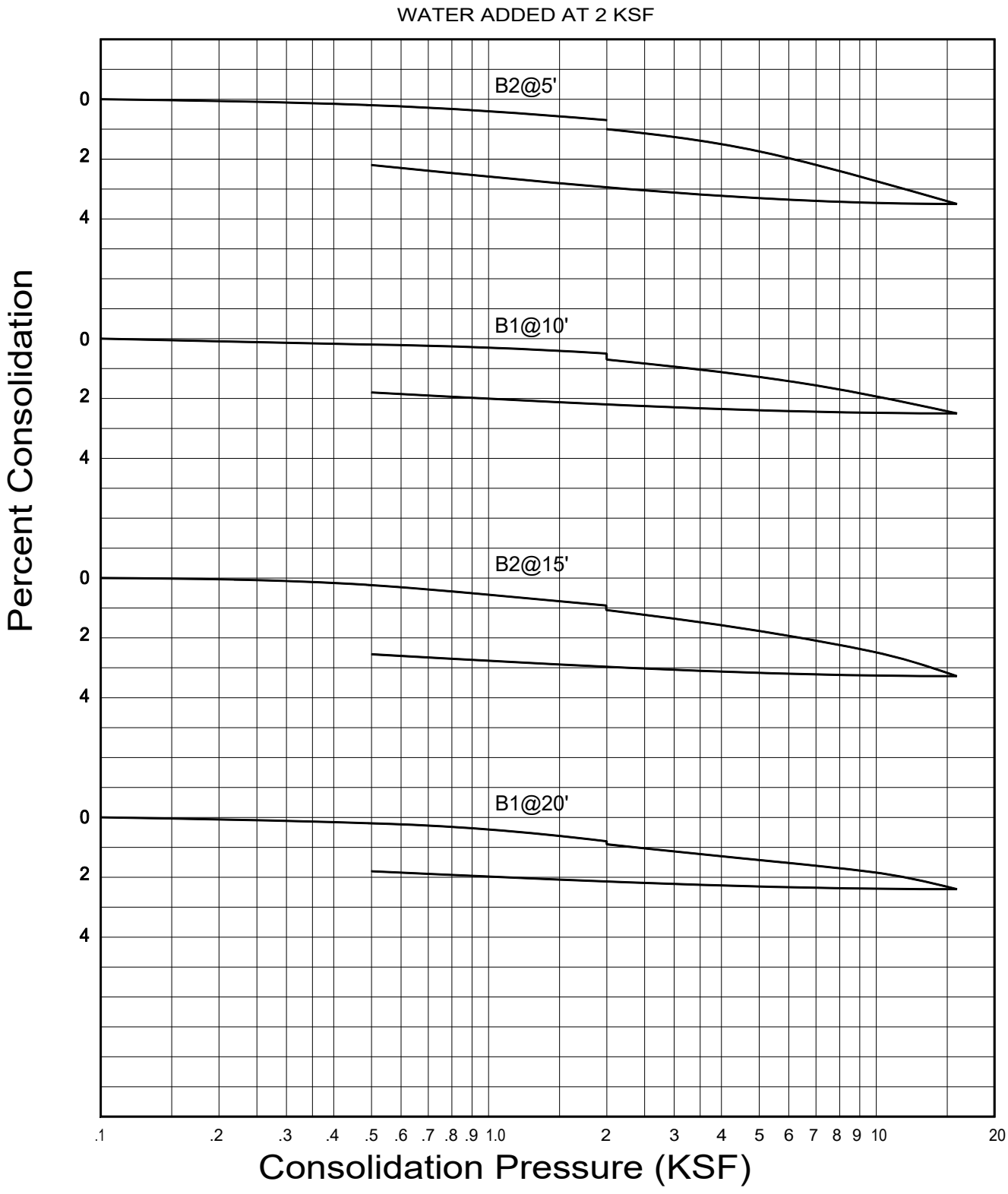
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DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B3



GEOCON
WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

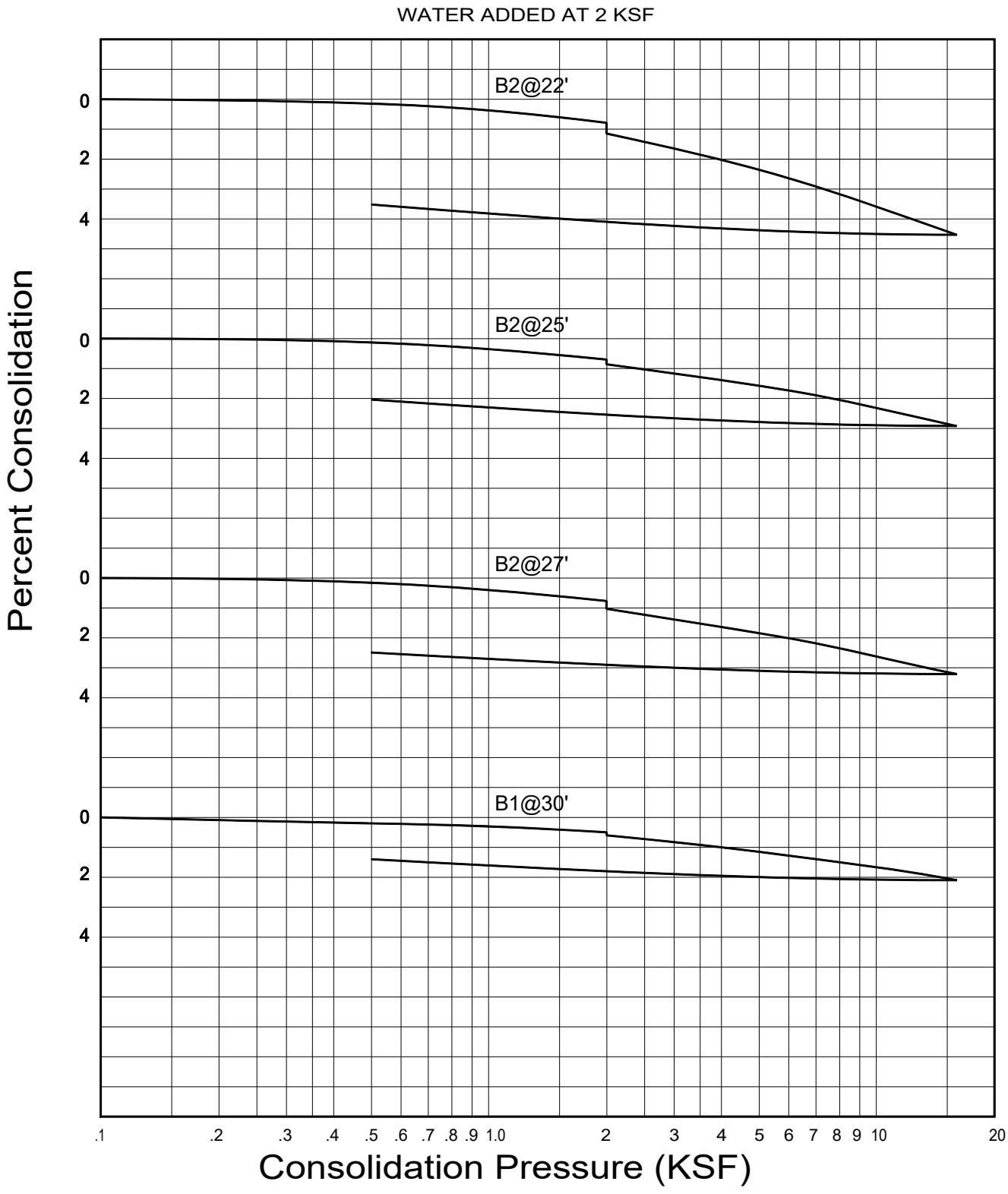
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B4



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WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

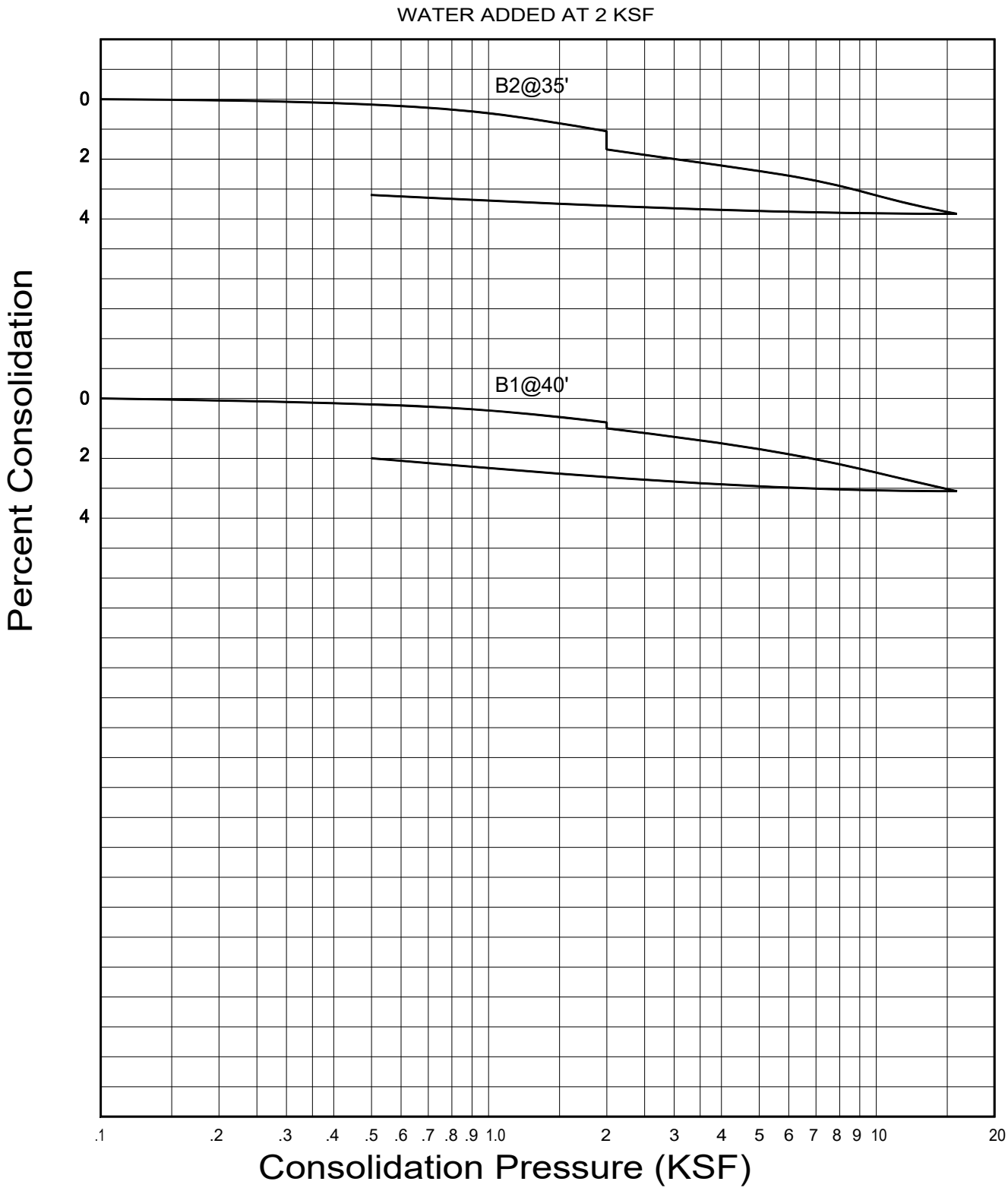
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B5



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WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
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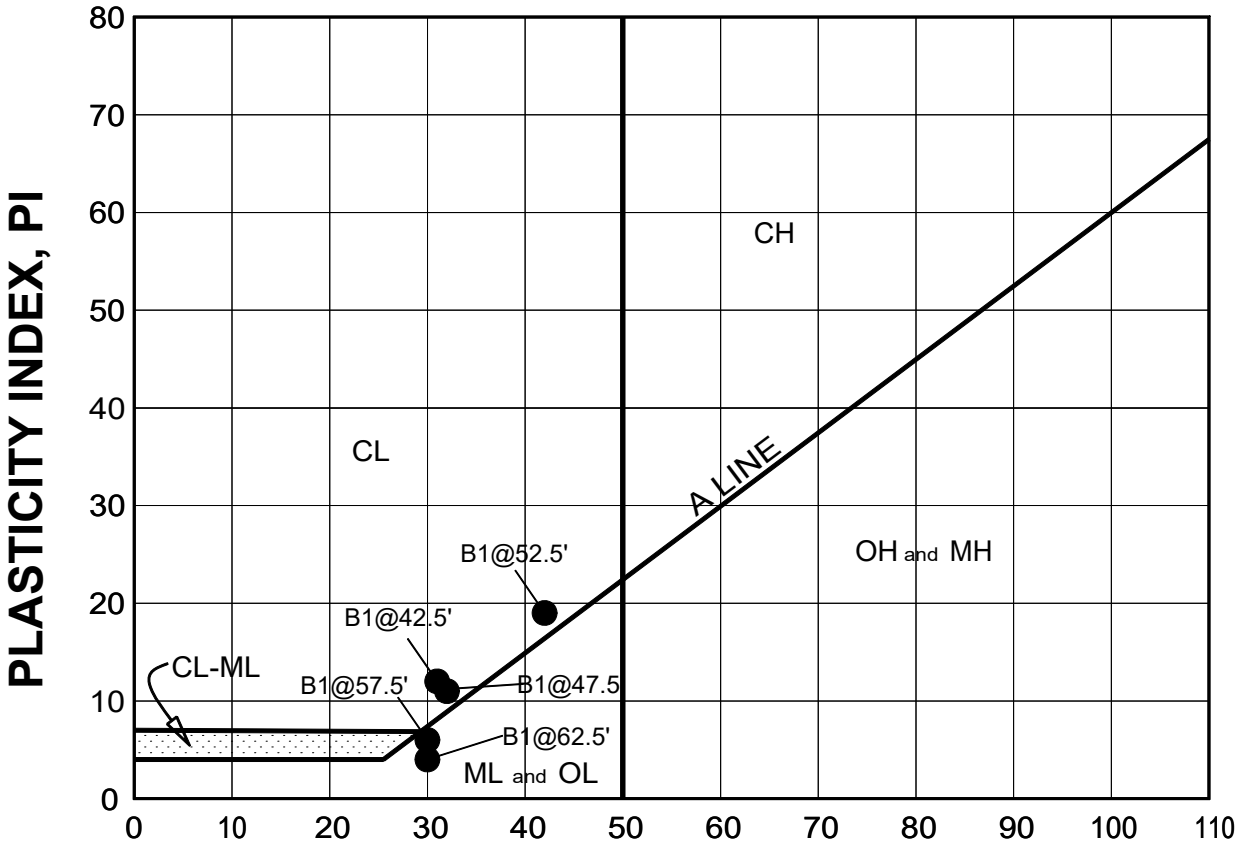
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B6



BORING NUMBER	DEPTH (FEET)	LL	PL	PI	MOISTURE CONTENT AT SATURATION	SOIL BEHAVIOR
B1	**42.5**	**31**	**19**	**12**	**24.6**	**CL**
B1	**47.5**	**32**	**21**	**11**	**24.6**	**CL**
B1	**52.5**	**42**	**23**	**19**	**31.5**	**CL**
B1	**57.5**	**30**	**24**	**6**	**--**	**ML**
B1	**62.5**	**30**	**26**	**4**	**--**	**ML**

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ATTERBERG LIMITS

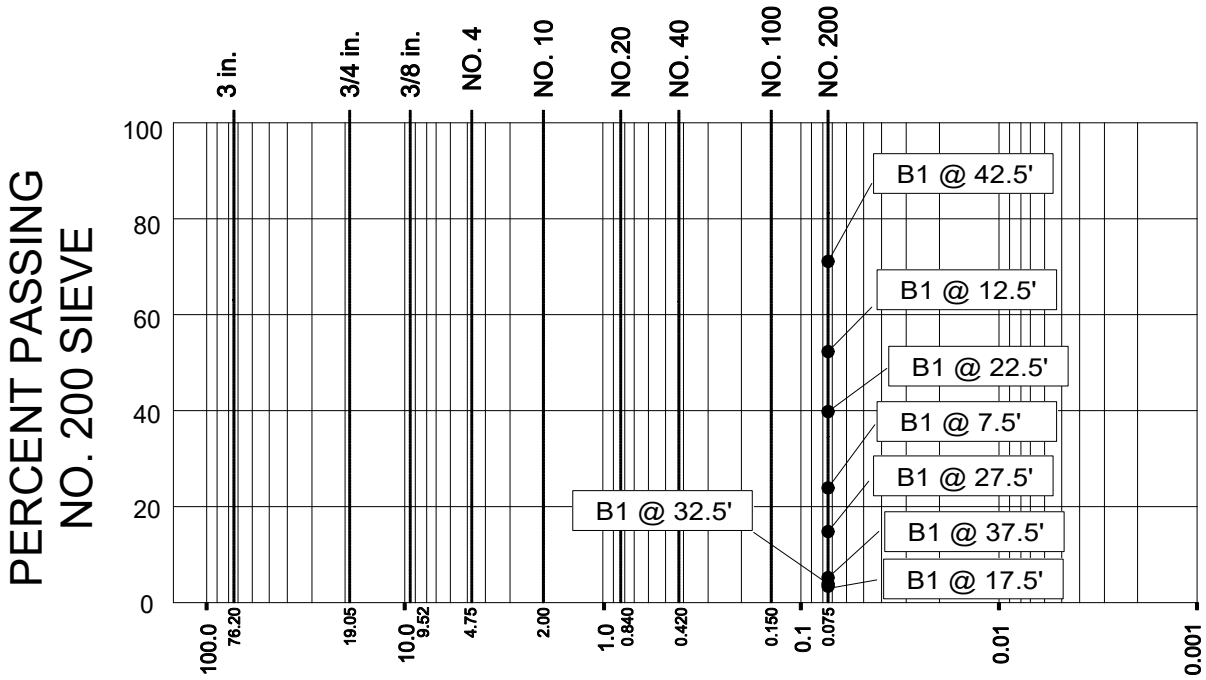
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B7

GRAVEL	SAND		SILT	CLAY
	MEDIUM TO COARSE	FINE		

U.S. STANDARD SIEVE SIZES



SAMPLE	PERCENT PASSING NO. 200 SIEVE
B1 @ 7.5'	23.9
B1 @ 12.5'	52.3
B1 @ 17.5'	3.4
B1 @ 22.5'	39.8
B1 @ 27.5'	14.8
B1 @ 32.5'	3.9
B1 @ 37.5'	5.2
B1 @ 42.5'	71.1

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PHONE (949) 491-6570

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GRAIN SIZE ANALYSIS

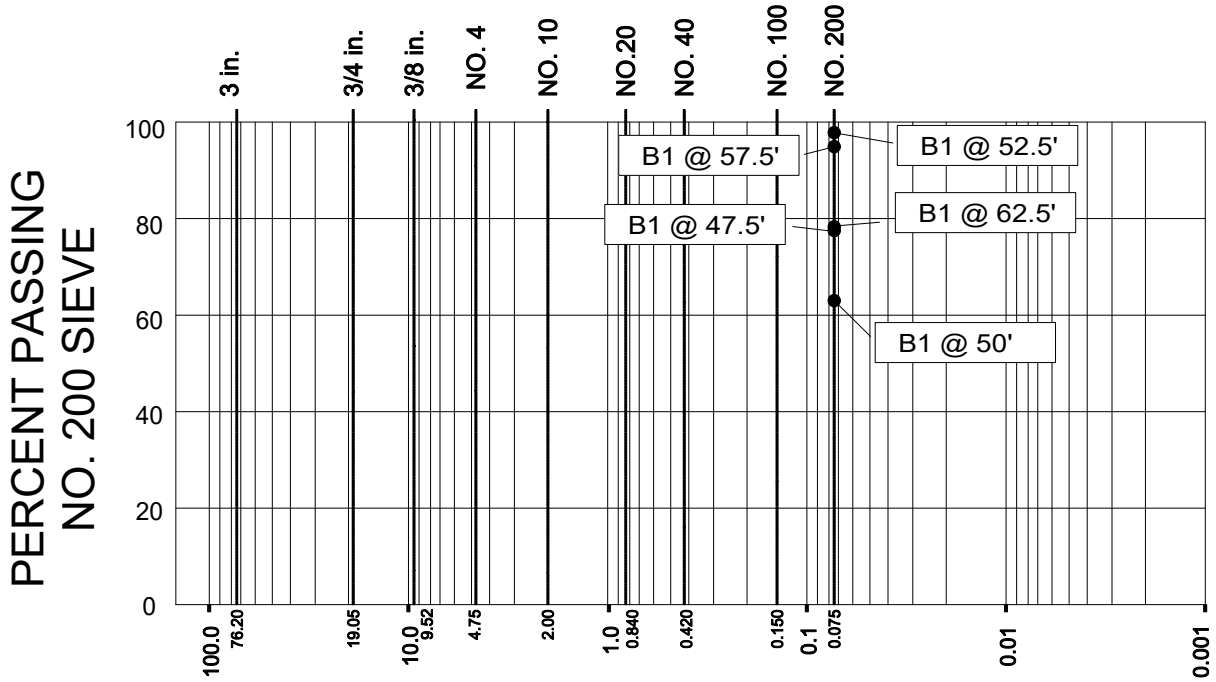
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B8

GRAVEL	SAND		SILT	CLAY
	MEDIUM TO COARSE	FINE		

U.S. STANDARD SIEVE SIZES



GRAIN DIAMETER (mm)

SAMPLE	PERCENT PASSING NO. 200 SIEVE
B1 @ 47.5'	77.5
B1 @ 50'	63.0
B1 @ 52.5'	97.8
B1 @ 57.5'	94.9
B1 @ 62.5'	78.3

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
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GRAIN SIZE ANALYSIS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B9

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B1 @ 0-5'	10.0	16.1	108.7	0	Very Low	Non-Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2016 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B1 @ 0-5'	Brown Silty Sand	118.7	10.2

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LABORATORY TEST RESULTS

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B10

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (ohm centimeters)
B1 @ 0-5'	8.36	3000 (Moderately Corrosive)
B3 @ 20-25'	8.75	6750 (Moderately Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B1 @ 0-5'	0.027
B3 @ 20-25'	0.018

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B1 @ 0-5'	0.002	Negligible
B3 @ 20-25'	0.000	Negligible

* Reference: 2016 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

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ENVIRONMENTAL GEOTECHNICAL MATERIALS
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CORROSIVITY TEST RESULTS

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B11

APPENDIX C

APPENDIX C

PRIOR REPORT

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental and Civil Engineering

June 14, 2005

Kam Sang Company
411 E. Huntington Drive
Suite 305
Arcadia, CA 91006

Attention: Mr. Michael Lee

Subject: **Report of Geotechnical Engineering Investigation**
Proposed Hotel Development
Corner of Harbor Boulevard and Twin Tree Avenue, Garden Grove. California
QCI Project Number: 05-136-003EL

Gentlemen:

In accordance with your request, Quartech Consultants (QCI) is pleased to submit this geotechnical engineering report for the proposed development at subject site. The purpose of this report was to evaluate the subsurface conditions and provide recommendations for foundation designs and other relevant parameters for the proposed construction.

Based on the findings of our field exploration, laboratory testing and engineering analysis, the proposed construction of the subject site for the intended use is feasible from the geotechnical engineering viewpoint, provided that specific recommendations set forth herein are followed.

This opportunity to be of service is sincerely appreciated. If you have any questions pertaining to this report, please call the undersigned.

Respectfully submitted,

Quartech Consultants (QCI)

REGISTERED PROFESSIONAL ENGINEER
JACK C. S. LEE
No. 2153
Exp. 3/07
GEOTECHNICAL
STATE OF CALIFORNIA

Jack C. Lee, GE 2153
Principal Engineer

Abe Kazemzadeh
Project Engineer

Dist: (4) Addressee

REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

Proposed Hotel Development
Corner of Harbor Boulevard and Twin Tree Avenue
Garden Grove, California

Prepared for

Kam Sang Company
411 E. Huntington Drive, #305
Arcadia, California

Prepared by

QUARTECH CONSULTSNTS
576 East Lambert Road
Brea, CA 91789

June 14, 2005

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1.0 INTRODUCTION

1.1 Purpose

This report presents a summary of our preliminary geotechnical engineering investigation for the proposed development at the subject site. The purposes of this investigation were to evaluate the subsurface conditions at the area of proposed construction and to provide recommendations pertinent to grading, foundation design and other relevant parameters.

1.2 Scope of Services

Our scope of services included:

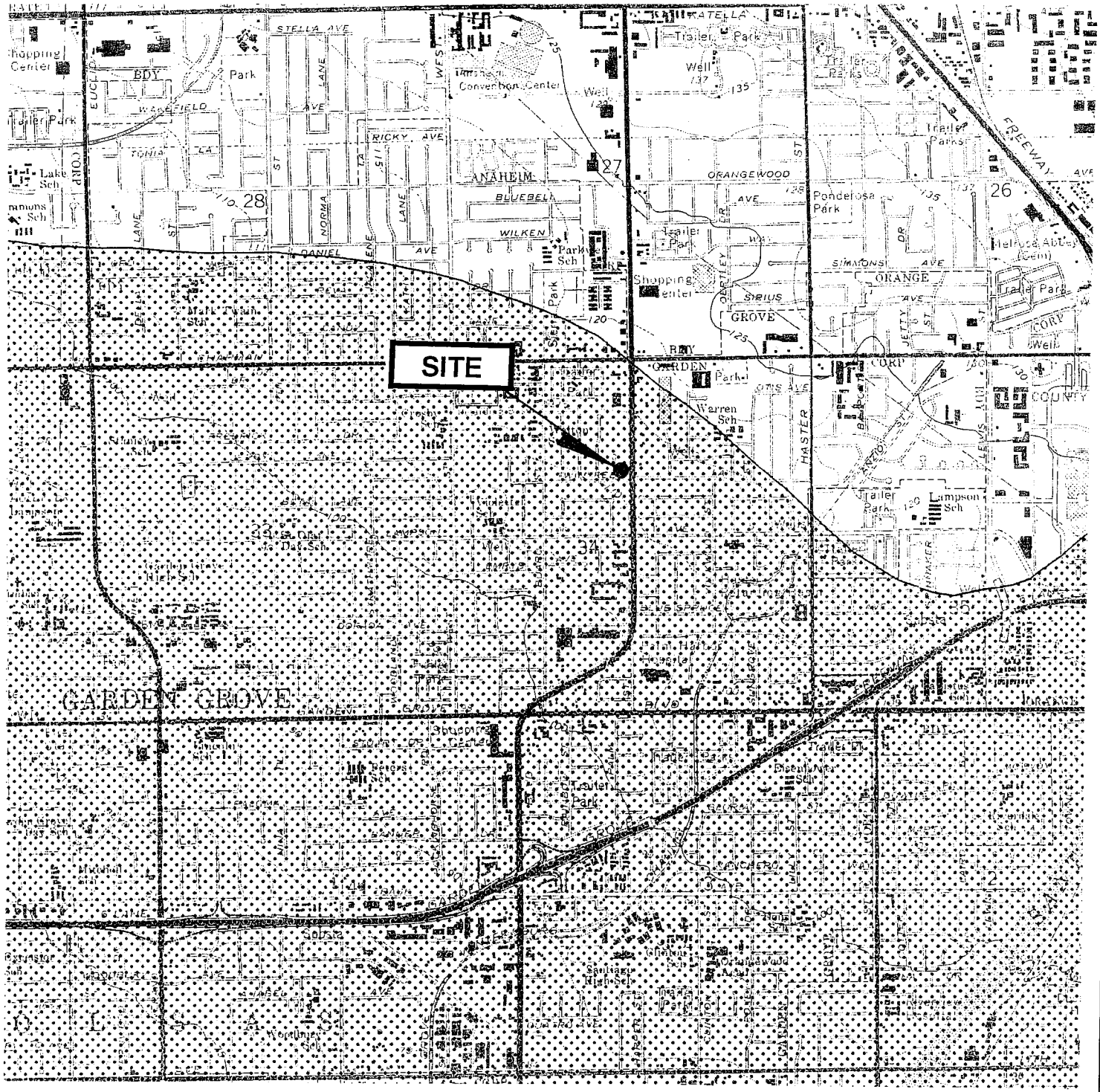
- Review of available soil and geologic data of the area.
- Logging and sampling of seven 8-inch diameter hollow stem-auger boring (subsurface exploration). The borings were extended to a maximum depth of 51.5 feet below the existing ground surface. Boring logs are presented in Appendix A (Field Investigation).
- Laboratory testing of representative samples collected from the proposed construction area to establish engineering characteristics of the on-site soils. The laboratory test results are presented in Appendix B (Laboratory Testing) and on the boring logs (Appendix A).
- Engineering analyses of the geotechnical data obtained from our background studies, field investigation, and laboratory testing.
- Preparation of this report presenting our findings, conclusions, and recommendations for the proposed development.

1.3 Proposed Construction

Based on the provided information, it is expected that the proposed construction consist of hotel buildings, parking structures, and associated improvements. The building is anticipated to be seven-story in height with slab-on-grade. Minor cut and fill grading operation will be necessary to achieve the final grades. No detailed design plans and structural loads were available at the time when this report was prepared. It is estimated that maximum column loads will be on the order of 550 kips.

1.4 Site Conditions

The subject site is located at northwest corner of Harbor Boulevard and Twintree Avenue in the City of Garden Grove, California. The approximate regional location is shown on the attached Site Location Map (Figure 1). The relatively flat subject site was vacant at the time of our subsurface investigation.



N

Scale 1" = 2000'

LEGEND:

Map modified from "Seismic Hazard Zones, Anaheim Quadrangle" by CDMG

Cal Land Engineering, Inc. dba Quartech Consultants Geotechnical, Environmental and Civil Engineering Services	Project Address: Harbor Blvd. & Twin Tree Ave. Garden Grove, California

SITE LOCATION MAP

4/05

FIGURE 1

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Subsurface Exploration

Our subsurface exploration consisted of drilling seven 8-inch-diameter hollow stem auger boring to a maximum depth of 51.5 feet below the existing ground surface. The borings were logged by a representative of our firm. Relatively undisturbed, bulk and Standard Penetration Tests (SPT) samples were collected during drilling for laboratory testing. The approximate locations of the boring are shown on the attached Site Plan (Figure 2). Boring logs are presented in Appendix A.

2.2 Laboratory Testing

Representative samples were tested for the following parameters: in-situ moisture content and density, consolidation, direct shear strength, grain size analysis, and corrosion potential of soils. The results of our laboratory testing along with a summary of the testing procedures are presented in Appendix B. In-situ moisture and density test results are provided on the boring logs (Appendix A).

3.0 SUMMARY OF GEOTECHNICAL CONDITIONS

3.1 Soil Conditions

In general, the natural soils underlain the site consist of loose to medium dense silty sand to the depth of about 4-5 feet. Underlying the surface soils consists of silty sand (SM) to fine grain sand (SP) to the depth of about 38-40 feet. Sandy clay to silty clay (CL) was encountered below the sand layer between 28 to 40 feet and clayey silt (ML) to the depth explored (51.5 feet). These soils exist in the stiff to medium dense and very moist conditions.

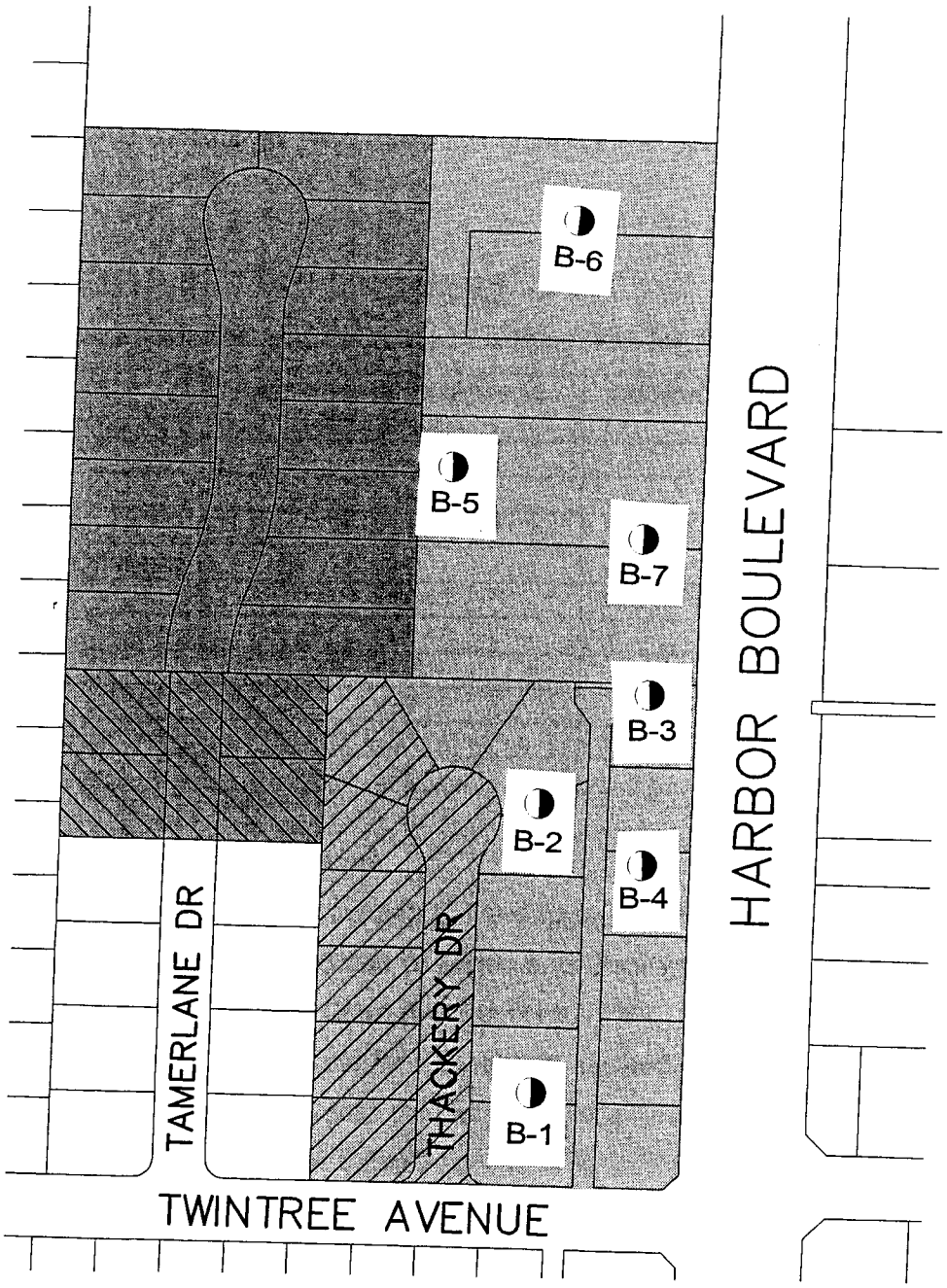
3.2 Groundwater

Static ground water levels were not encountered to the depth explored (51.5 feet below the existing ground surface) during our subsurface investigation. Based on our review of the "Historically Highest Groundwater Contours Map, Anaheim Quadrangle, CDMG Open File Seismic Hazard Zone Report 003", by California Department of Conservation, Division of Mines and Geology, the highest ground water table is estimated to be 17 feet below the ground surface.

4.0 FAULTING AND SEISMICITY

4.1 Seismicity

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distances to causative faults,



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LEGEND:

B-1 Approximate Boring Location

Cal Land Engineering, Inc. dba Quartech Consultants Geotechnical, Environmental and Civil Engineering Services.	Project Address: Harbor Blvd. & Twin Tree Ave. Garden Grove, California

SITE PLAN

4/05

FIGURE 2

the intensity, and the magnitude of the seismic event. Table 1 indicates the distances of the fault zones and the associated maximum credible earthquakes that can be produced by nearby seismic events. As indicated in Table 1, the Elysian Park fault zones which are located approximately 4 miles from the site is considered to have the most significant affect at the site from a design standpoint.

TABLE 1

Characteristics and Estimated Earthquakes for Regional Faults

Fault Name	Approximate Distance to Site (mile)	Maximum Credible Earthquake (MCE)
Elysian Park	4	6.7
Newport-Inglewood	9	6.9
Whittier	11	6.8
Newport-Inglewood (Offshore)	11	6.9
Chino-Central Ave.	14	6.7
San Jose	18	6.5
Palos Verdes Hills	19	7.1
Sierra Madre	25	6.7
Cucamonga	26	7.0
Raymond	26	6.5

4.2 Estimated Earthquake Ground Motions

In order to estimate the seismic ground motions at the subject site, QCI has utilized the seismic hazard map published by California Divisions of Mines and Geology (CDMG Open File Report 96-08) / U.S. Geological Survey (USGS Open File Report 97-706). According to this report, the peak ground acceleration at the subject site for a probability exceeding 10 percent in 50 years is about 0.37g. This report also indicates that the subject site is located within a seismic zone where the earthquake magnitude range is 6.5 to 7.0.

5.0 SEISMIC HAZARDS

5.1 Liquefaction Potential

Liquefaction is the transformation of a granular material from a solid to a liquid state as a result of increase pore-water pressure. The material will then loses strength and can flow if unrestrained, thus leading to ground failure. Liquefaction can be triggered in saturated cohesionless material by short-term cyclic loading, such as shaking due to an earthquake. Ground failure that results from liquefaction can be manifested as flow landsliding, lateral spread, loss of bearing capacity, or settlement.

At this site, the ground water table is located at least 50 feet below the existing ground surface. The potential for liquefaction at the site's sandy soil was evaluated using the procedures suggested by Loud, Idriss, and others (see References), based on data from Boring B-1 and B-6. The design earthquake (M =7.0) and ground acceleration of 0.37g are discussed in the previous Section. The total unit weight used for the onsite soils is 110 pcf. The ground water level imputed is arbitrary raised to the depth of 17 feet below the existing ground surface in accordance with CDMG report.

The analyses presented on the enclosed Appendix C indicate that the factor of safety of the onsite sandy soils at the depths between 17 to 22 feet for B-1 is below 1.25.

5.2 Liquefaction Induced Settlement

The sandy soils tend to settle and densify when they are subjected to earthquake shaking. Should the sand be saturated and there is no possibility for drainage so that constant volume conditions are maintained, the primary effect of the shaking is the generation of excess pore water pressures. Settlement then occurs as the excess pore pressures dissipate. The primary factors controlling seismic induced settlement are the cyclic stress ratio, maximum shear strain induced by earthquake, the strength and density of the sand, and the magnitude of the earthquake. Based on the procedures developed by Tokimatsu and Seed on 1987, it is estimated that liquefaction induced settlement is 0.60 inches for the potential liquefiable sandy soils at the site under the design earthquake.

5.3 Surface Manifestation of Liquefaction

One of the most dramatic causes of damage to structures during earthquakes has been the development of liquefaction in saturated sandy soils, manifested either by the formation of boils and mud-spouts at the ground surface, by seepage of water through ground cracks. Based on the procedures suggested by the Ishihara (1985), it is unlikely the surface manifestation would occur at the subject site under the design earthquake even.

5.4 Lurching

Soil lurching refers to the rolling motion on the surface due to the passage of seismic surface waves. Effects of this nature are not considered significant on the subject site where the thickness of alluvium does not vary appreciably under structures.

5.5 Surface Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. The potential for surface rupture on the subject site is considered negligible due to the absence of known active faults at the site.

5.6 Ground Shaking

Throughout southern California, ground shaking, as a result of earthquakes, is a constant potential hazard. The relative potential for damage from this hazard is a function of the type and magnitude of earthquake events and the distance of the subject site from the event. Accordingly, proposed structures should be designed and constructed in accordance with applicable portions of the building code.

6.0 CONCLUSIONS

Based on the results of our subsurface investigation, it is our opinion that the proposed residential development is feasible from a geotechnical standpoint, provided the recommendations contained herein are incorporated in the design and construction. The following is a summary of the geotechnical design and construction factors that may affect development of the site.

6.1 Seismicity

Based on our studies on seismicity, there are no known active faults crossing the property. However, the site is located in a seismically active region and is subject to seismically induced ground shaking from nearby and distant faults, which is a characteristic of all Southern California areas.

6.2 Liquefaction

Based on our liquefaction evaluation, it is concluded that the existing on-site loose to medium dense sandy soil is a potentially liquefiable soil under the design earthquake event. The estimated potential settlement induced by the underlying potentially liquefiable soils is about 0.60 inches for the potential liquefiable sandy soils.

6.3 Excavatability

Based on our subsurface investigation, excavation of the subsurface materials should be able to be accomplished with conventional earthwork equipment.

6.4 Surficial Soil Removal and Recompaction

Our field investigation data and laboratory test results indicated that the existing near surface materials are unsuitable for support of fills and structures as they presently exist and will require remedial grading as discussed herein.

6.5 Groundwater

Groundwater was not encountered to the depth explored (51.5 feet below surface). It is our opinion that the groundwater is not expected to be a significant constraint during future near surface construction.

7.0 RECOMMENDATIONS

7.1 Grading

7.1.1 Site Preparation

Prior to initiating grading operations, any existing vegetation, trash, debris, over-sized materials (greater than 6 inches), and other deleterious materials within construction areas should be removed from the site.

7.1.2 Surficial Soil Removals

It is recommended that the existing near surface soils within proposed building pad areas be removed to the depth of minimum of 3 feet below the existing ground surface. This removal should extend at least 5 feet beyond the proposed building lines. It is also recommended that the existing near surface soils be removed to a depth of about 2 feet below the existing ground and replaced with compacted fill within the drive area.

Locally deeper removals may be necessary to expose competent natural ground. The actual removal depths should be determined in the field as conditions are exposed. Visual inspection and/or testing may be used to define removal requirements.

7.1.3 Treatment of Removal Bottoms

Soils exposed within areas approved for fill placement should be scarified to a depth of 6 inches, conditioned to near optimum moisture content, then compacted in-place to project standards.

7.1.4 Structural Backfill

The onsite soils may be used as compacted fill, provided they are free of organic materials and debris. Fills should be placed in relatively thin lifts, brought to near optimum moisture content, then compacted to at least 90 percent relative compaction based on ASTM D-1557-00.

7.2 Foundation Design

7.2.1 Caisson foundation

Based on our subsurface investigation and laboratory testing, it is recommended that the proposed building be supported on drilled, cast-in-place caissons. Allowable downward capacities for caissons are presented in Figure 3. Allowable uplift capacities for these caissons may be assumed as one-half of downward capacity as shown on Figure 3. While caissons are spaced three (3) diameter apart, center to center, no reduction in caisson capacity is need for group action.

It is recommended that caissons be designed to resist the potential downdrag force due to the consolidating of potential liquefiable sandy layer at the depth of 17 to 22 feet below the existing ground. The estimated downdrag force for the caisson is presented below:

Caisson Diameter	12-inch	18-inch	24-inch
Downdrag force	8.5 kips	17.5 kips	28.0 kips

All caissons excavations should be free of any loose or disturbed soils. Drilling within the last 5 feet should be done slowly and carefully to minimize disturbance to the bearing layer. The excavation and installation of the caissons should be observed and approved by the project geotechnical consultants to verify the required depth. All applicable safety requirements should be followed during the construction.

7.2.2 Lateral Load Capacity

Lateral load analyses were made using the procedures described by NAVFAC Design Manual 7.02 and Matlock, Reese (1960) for the proposed caissons. The results of these analyses for free head and fixed head conditions are presented in the following table:

Free Head Conditions

Conditions	12-inch Diameter	24-inch Diameter
Ground Line Deflection for Applied Force (inches/kips)	0.0561	0.0185
Ground Line Deflection for Applied Moment (inches/ft-kips)	0.0111	0.00211

Fixed Head Conditions

Conditions	12-inch Diameter	24-inch Diameter
Ground Line Deflection for Applied Force (inches/kips)	0.0227	0.00749
Estimated Max. Moment (ft-kips/kips)	-3.23	-5.56

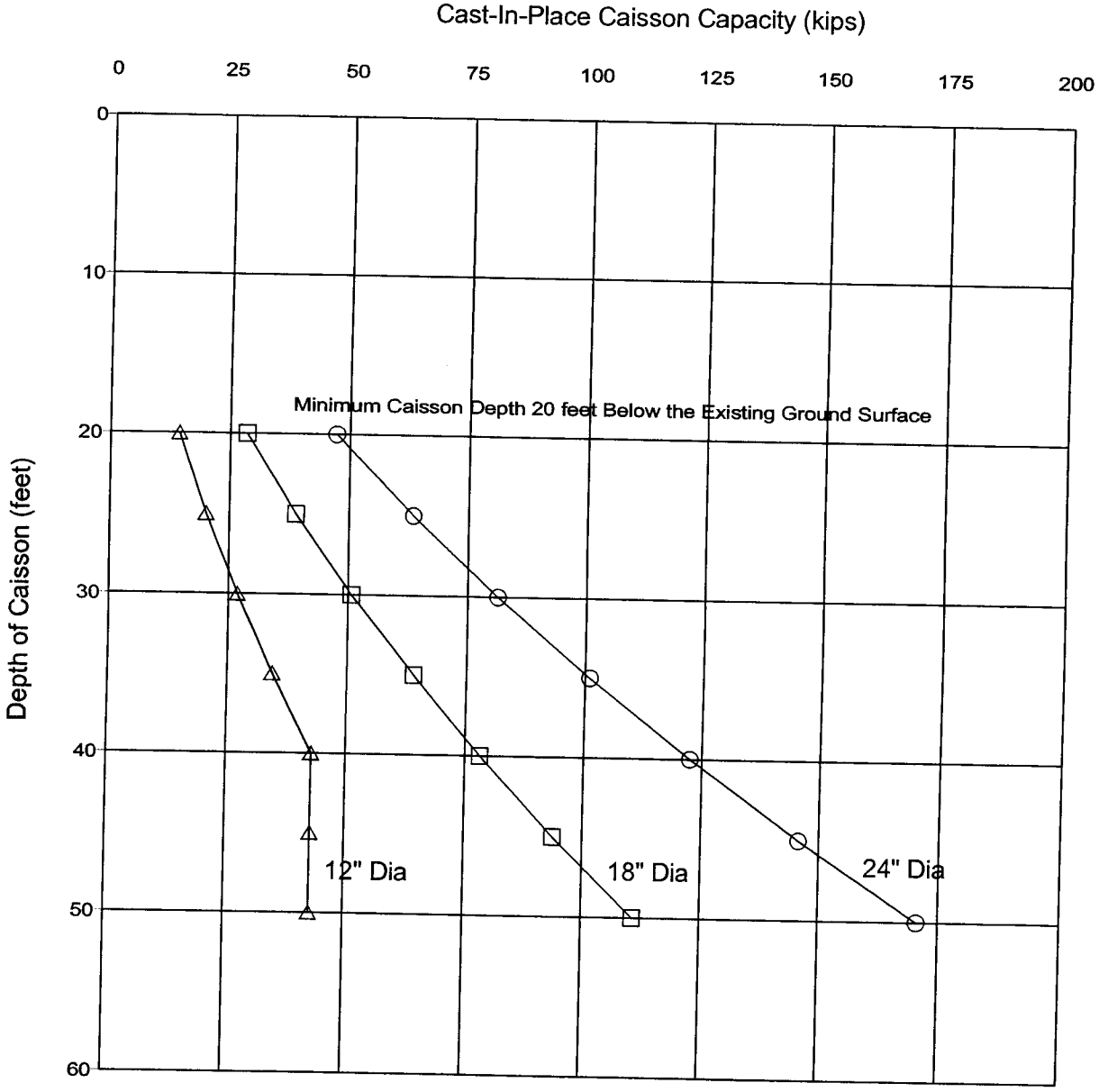
The point of fixity of the above caissons may be assumed at 4.2 feet for 12-inch diameter caisson and 7.3 feet for 24-inch diameter caissons, respectively.

The above recommended values are for a single caisson under a one-kip lateral load. Deflection and moment for large lateral loads may be obtained by multiplying these values by the loads. These estimated are applicable up to a ground line deflection of ¼ of an inch for a free head condition and of 1/10 of an inch for a fixed head condition. For greater deflection, each case should be evaluated by the project geotechnical engineer.

The results of the above lateral load analyses do not include a factor of safety. These values only represent our best estimate of ground line deflection under the load and caisson condition analyzed.

7.2.3 Miscellaneous Foundation

An allowable bearing value of 1500 pounds per square foot may be used for design of miscellaneous shallow continuous footings 12 inches wide and 18 inches deep, and shallow pad footings at least 24 square inch and 18 inches deep. This value may be increased by 200 pounds per square foot for each additional foot of depth or width to a maximum value of 2500 pounds per



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CAST-IN-PLACE CAISSON BEARING CAPACITY

06/05

FIGURE 3

square foot. This value may be increased by one-third when considering short duration seismic or wind loads.

7.2.4 Settlement

Settlement of the footings placed as recommended and subject to no more than allowable loads is not expected to exceed 3/4 inch. Differential settlement between adjacent columns is not anticipated to exceed 1/4 inch for the adjacent column spaced at a distance of about 30 feet. Additionally, the miscellaneous shallow foundation should also be designed to resist the potential liquefaction induced settlement of about 0.60 inches and differential settlement of about 0.39 inches, respectively.

7.2.5 Subgrade Reaction

The vertical subgrade reaction to be utilized for the slab designs may be computed as 160 tons per cubic foot. This value only represent our best estimate of ground line deflection under the load and condition analyzed.

7.2.6 Lateral Pressures

The active earth pressure to be utilized for cantilever retaining wall designs may be computed as an equivalent fluid having a density of 33 pounds per cubic foot when the slope of the backfill behind the wall is level.

Passive earth pressure may be computed as an equivalent fluid pressure of 300 pounds per cubic foot, with a maximum earth pressure of 2500 pounds per square foot. An allowable coefficient of friction between soil and concrete of 0.35 may be used with the dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one third (1/3).

7.2.7 Foundation Construction

All footings should be founded at a minimum depth of 18 inches below the lowest adjacent ground surface. All continuous footings should have at least two No. 4 reinforcing bars placed at the top and bottom of the footings.

Concrete slabs should be a minimum of 4-inch thick and reinforced with a minimum of No. 4 bars at 18-inches in center both way or its equivalent. All slab reinforcement should be supported to

ensure proper positioning during placement of concrete. Additional reinforcement may be required in the concentrated loading and/or traffic areas. Concrete slabs in moisture sensitive areas should be underlain with a vapor barrier consists of a minimum of 10 mil polyvinyl chloride membrane with all laps sealed. A minimum of one inch of sand should be placed over the membrane to aid in uniform curing of concrete.

7.3 Temporary Trench Excavation and Backfill

All trench excavations should conform to CAL-OSHA and local safety codes. All utilities trench backfill should be brought to near optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of ASTM D-1557-00.

8.0 SEISMIC DESIGN

Based on our studies on seismicity, there are no known active faults crossing the property. However, the subject site is located in southern California, which is a tectonically active area. The following UBC (Chapter 16A) seismic related values may be used:

Seismic Zone		4
Seismic Zone Factor (Z)		0.4
Soil Profile Type – Table 16-J		S_D
Seismic Coefficient	C_a (16-Q)	$0.44N_a$
	C_v (16-R)	$0.64N_v$
Near Source Factor	N_a (16-S)	1.0
	N_v (16-T)	1.0
Seismic Source Type (16-U)		B

Uniform Building Code design is intended to accommodate horizontal accelerations up to 0.4g for Seismic Zone 4. The proposed structures should be designed to accommodate this acceleration, at a minimum. However, the Project Structural Engineer should be aware of the information provided above to determine if any additional structural strengthening is warranted.

9.0 SULFATE CONTENT OF SOILS

Sulfate Content of Soils test was conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of potential sulfate attack on concrete by onsite soils. According to UBC Table 19-A-4, a "negligible" exposure to sulfate can be expected for concrete placed in contact with the onsite soil. Based on the testing results and

UBC, it is concluded that Type II cement may be used. Additional sulfate test of the near pad grade soil sample may be tested to verify the above recommendations.

10.0 INSPECTION

As a necessary requisite to the use of this report, the following inspection is recommended:

- Temporary excavations.
- Removal of surficial soils.
- Backfill placement and compaction.
- Foundation excavations.

The geotechnical engineer should be notified at least 1 day in advance of the start of construction. A joint meeting between the client, the contractor, and the geotechnical engineer is recommended prior to the start of construction to discuss specific procedures and scheduling.

11.0 INVESTIGATION LIMITATIONS

The materials encountered on the subject site and utilized in our laboratory testing program are believed to be representative of the area. However, soil may vary in characters between the exploratory borings. Since our investigation is based on the site materials observed, selected laboratory testing, and engineering analyses, the conclusions and recommendations are professional opinion. These opinions have been derived in accordance with current standard of practice, and no warranty is expressed or implied.

12.0 REFERENCES

1. Seed, H.B., Tokimatsu, K., Harder, L.F., and Chung, R.M., (1985), "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations," Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 111, No. GT12, pp. 1425-1445.

2. Tokimatsu, K., and Seed, H.B., (1987), "Evaluation of Settlements in Sands Due to Earthquake Shaking," Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 113, No. 8, pp. 861-878.

3. Ishihara, K. and Yoshimine, M., (1992), "Evaluation of Settlements in Sand Deposits Following Liquefaction During Earthquakes", Japanese Society of Soil Mechanics and Foundation Engineering, Vol. 32, No. 1, pp. 173-188

4. Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117, Adopted by California State Mining and Geology Board in accordance with the Seismic Hazards Mapping Act of 1990 in March 13, 1997.

5. T.Y. Loud, I.M. Idriss, and et. al. (2001), "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils",

Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 127, No. GT10, pp. 817-833.

APPENDIX A
FIELD INVESTIGATION

Subsurface conditions were explored by drilling seven 8-inch hollow stem auger boring to a maximum depth of 51.5 at approximate locations shown on the enclosed Site Plan (Figure 2). Upon completion of excavating, the boreholes were backfilled with onsite soils that were removed from the excavations.

The drilling of the test boring was supervised by a geotechnical engineer, who continuously logged the borings and visually classified the soils in accordance with the Unified Soil Classification System. Ring and SPT samples were taken at frequent intervals. These samples, taken by the hollow stem auger, were obtained by driving a ring and SPT sampler with successive blows of 140-pound hammer dropping from a height of 30 inches.

Representative undisturbed samples of the subsurface soils were retained in a series of brass rings, each having an inside diameter of 2.42 inches and a height of 1.00 inch. All ring samples were transported to our laboratory. Bulk surface soil samples were also collected for additional classification and testing.

Cal Land Engineering, Inc.
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BORING LOG B-1

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	5 8 8	SP/ SM	99.2	4.0	Sand and silty sand, medium grained, dark brown, slightly moist, loose to medium dense
5		S	4 5 5	SM			Silty sand, fine grained, light brown, slightly moist, medium dense
10		R	8 17 19	SM	108.7	3.2	Silty sand, fine grained, tan brown, slightly moist, medium dense
		S	13 14				
15		S	9 10 18	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 11 15	SP/ SM	111.7	2.9	Sand and silty sand, fine grained, light brown, slightly moist, medium dense to dense
		S	9 11				
25		S	11 13 16	SM			Silty sand, grayish brown, slightly moist, medium dense
30		R	10 19 23	SP	102.4	3.8	Sand, medium grained, grayish brown, slightly moist, dense
		S	14 18				
35		S	9 13 18	SM			Silty sand, grayish brown, slightly moist, dense

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BORING LOG B-1

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	8 14 20	SM			Silty sand, fine grained, light brown, very moist, dense
45		S	9 15 22	SM			Silty sand, fine grained, light brown, moist, dense
50		S	5 10 11	ML		24.0	Clayey silt, grayish brown, moist, very stiff
55							
60							
65							
70							
75							

Total depth 51.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
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BORING LOG B-2

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	3 6 6	SM			Silty sand, medium grained, light brown, slightly moist, loose to medium dense
5		R	7 12 18	SM	100.2	7.6	Silty sand, fine grained, light brown, moist, medium dense
10		S	2 4 7	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	8 17 25	SP	100.5	2.5	Sand, fine to medium grained, light brown, slightly moist, medium dense to dense
20		S	10 12 17	SP			Sand, coarse grained, light brown, slightly moist, medium dense
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-3

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	6 8 8	SM	115.5	11.5	Silty sand, fine grained, dark brown, moist, loose to medium dense
5		S	4 5 6	SM			Silty sand, fine grained, light brown, moist, medium dense
10		R	5 9 12	SM	104.4	12.1	Silty sand, fine grained, light brown, moist, medium dense
15		S	8 12 14	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 13 18	SP	98.8	3.2	Sand and silty sand, fine grained, light brown, slightly moist, medium dense to dense
25		S	12 17 18	SP/ SM			Sand and silty sand, light brown, moist, dense
30		S	9 14 19	SP			Sand, medium grained, light brown, moist, dense
35							Total depth 31.5 ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches

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BORING LOG B-4

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	4 3 2	SM			Silty sand, medium grained, light brown, slightly moist, very loose
5		R	5 11 17	SM	105.3	9.1	Silty sand, fine grained, dark brown, moist, medium dense
10		S	4 7 8	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	9 13 28	SP	102.4	1.2	Sand, coarse grained, light brown, slightly moist, medium dense to dense
20		S	8 14 14	SP			Sand, coarse grained, light brown, slightly moist, medium dense mixed with sandy silt
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-5

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
							Thin layer of asphalt concrete
		S	2/18"	SM			Silty sand, light brown, moist, very loose
5		R	5 8 13	SM	100.6	11.6	Silty sand, fine grained, dark brown, moist, medium dense
10		S	4 6 6	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	9 18 20	SP	98.3	3.2	Sand, coarse grained, light brown, slightly moist, medium dense
20		S	8 14 16	SP			Sand, coarse grained, light brown, slightly moist, medium dense
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-6

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
							4" Asphalt concrete
		R	4 6 8	SP	108.2	3.4	Sand, medium grained, dark brown, slightly moist, loose
5		S	4 5 6	SM			Silty sand, fine grained, grayish brown, slightly moist, medium dense
10		R	7 17 23	SM	109.0	7.9	Silty sand, fine grained, dark brown, moist, dense
		S	14 17				
15		S	7 8 9	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 17 24	SP/ SM	106.7	1.8	Sand and silty sand, fine grained, light brown, slightly moist, dense
		S	14 18				
25		S	10 17 18	SP/ SM			Sand and silty sand , tan brown, slightly moist, dense
30		S	13 16 25	SP/ SM			Sand and silty sand, medium grained, light brown, slightly moist, dense
35		S	9 13 50	SM			Silty sand, light brown, very moist, very dense

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-6

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	5 8 9	ML		23.3	Clayey silt, grayish brown, moist, very stiff
45		S	3 5 7	ML		24.1	Clayey silt, grayish brown, moist, stiff
50		S	4 7 16	ML		24.4	Clayey silt, grayish brown, moist, very stiff
55							Total depth 51.5ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
60							
65							
70							
75							

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-7

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	4 7 9	SM	107.9	7.0	Silty sand, fine grained, dark brown, moist, loose to medium dense
5		S	5 5 5	SM			Silty sand, fine grained, light brown, moist, medium dense
10		R	5 9 12	SP	97.0	4.5	Sand, fine grained, light brown, moist, medium dense
15		S	6 9 11	SM			Silty sand, fine grained, light brown, slightly moist, medium dense
20							Total depth 16.5 ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
25							
30							
35							

APPENDIX B

LABORATORY TESTING

During the subsurface exploration, QCI personnel collected relatively undisturbed ring samples and bulk samples. The following tests were performed on selected soil samples:

Moisture-Density

The moisture content and dry unit weight were determined for each relatively undisturbed soil sample obtained in the test borings in accordance with ASTM D2937 standard. The results of these tests are shown on the boring logs in Appendix A.

Shear Tests

Shear tests were performed in a direct shear machine of strain-control type in accordance with ASTM D3080 standard. The rate of deformation was 0.025 inch per minute. Selected samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: internal friction angle and cohesion. The shear test results are presented in the attached Figures.

Consolidation Tests

Consolidation tests were performed on selected undisturbed soil samples in accordance with ASTM D2435 standard. The consolidation apparatus is designed for a one-inch high soil filled brass ring. Loads are applied in several increments in a geometric progression and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. The samples were inundated with water at a load of one kilo-pounds (kips) per square foot, and the test results are shown on the attached Figures.

Corrosion Potential

Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. These tests are performed in accordance with California Test Method 417, 422, 532, and 643. The testing results are presented below:

Sample Location	PH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (ohm-cm)
B-1 @ 0' - 5'	7.95	80	0.052	2400

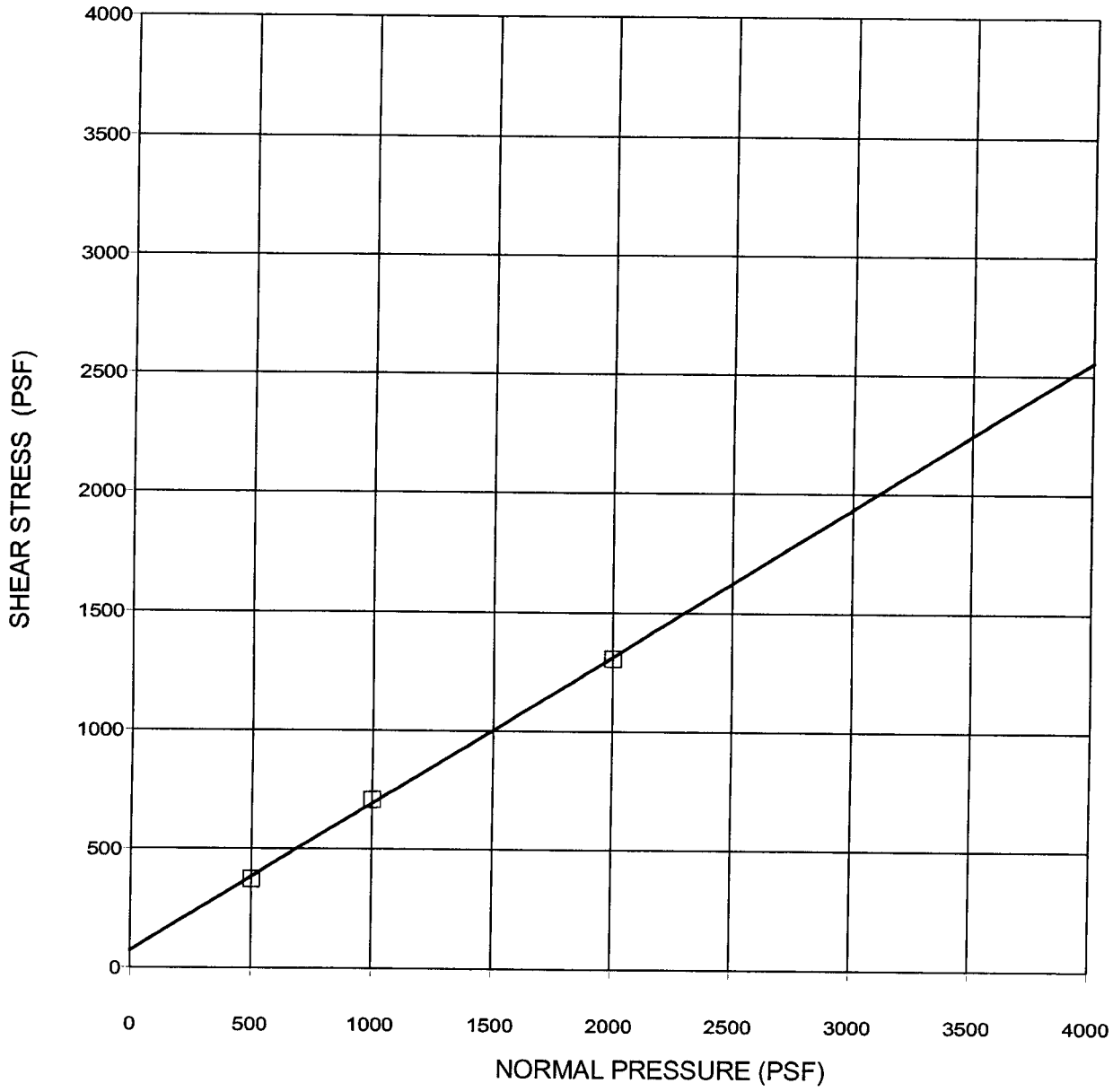
Grain Size Analysis

Grain size distribution was determined for selected soil samples in accordance with ASTM D422 standard. The test results are presented in the attached plate.

Percent of Fine

Percent of fine was determined for selected soil samples in accordance with ASTM D1140 standard. The test results are presented in the attached table.

Sample Location	Percent of Fine
B-1 @ 10'	25.2
B-1 @ 15'	3.7
B-1 @ 20'	11.1
B-1@ 25'	32.2
B-1 @ 35'	17.6
B-1 @ 45'	18.2
B-6 @ 15'	1.8
B-6 @ 20'	8.8
B-6 @ 25'	9.3
B-6@ 30'	5.7
B-6 @ 35'	16.2



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	2.0	RING	SP-SM	70	32

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	4.0	18.3
1000	4.0	18.0
2000	4.0	17.9

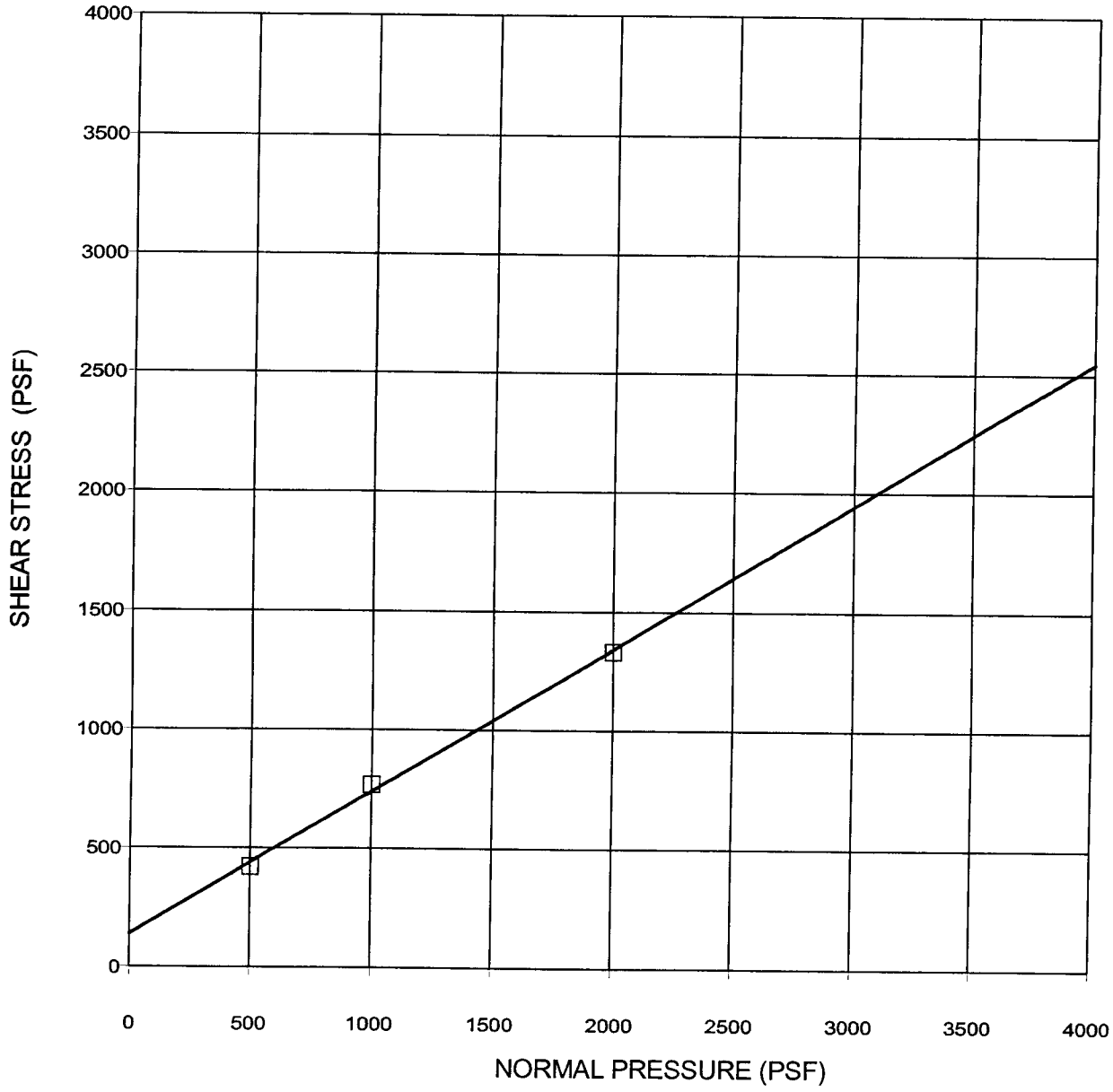
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Geotechnical, Environmental & Civil Engineering Services

Project Address:
Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-5	N/A	5.0	RING	SM	140	31

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	11.6	22.4
1000	11.6	21.2
2000	11.6	21.0

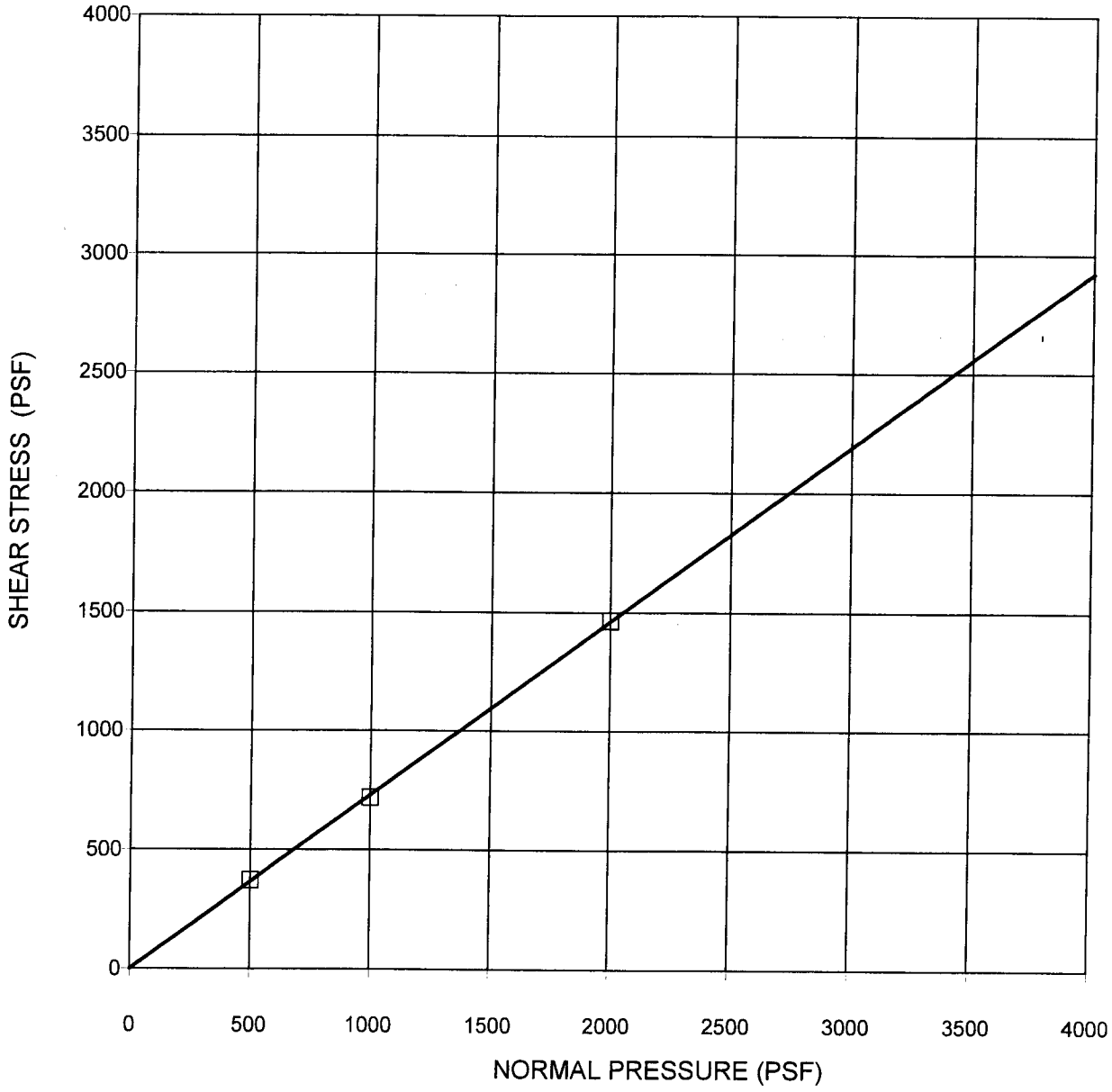
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DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	30.0	RING	SP	0	36

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	3.8	18.7
1000	3.8	18.3
2000	3.8	18.2

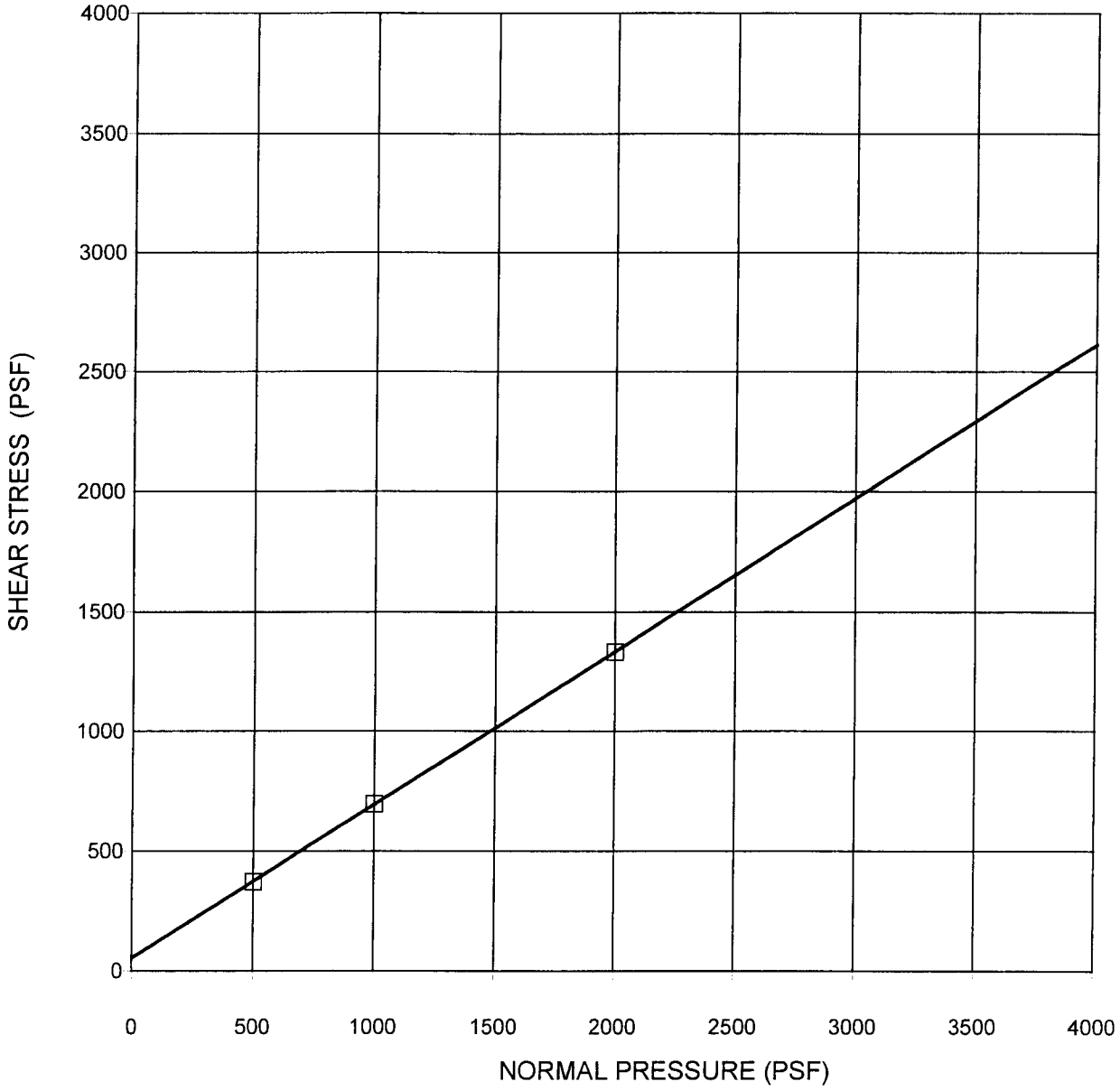
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DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-6	N/A	20.0	RING	SP-SM	50	33

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	1.8	17.7
1000	1.8	17.0
2000	1.8	16.9

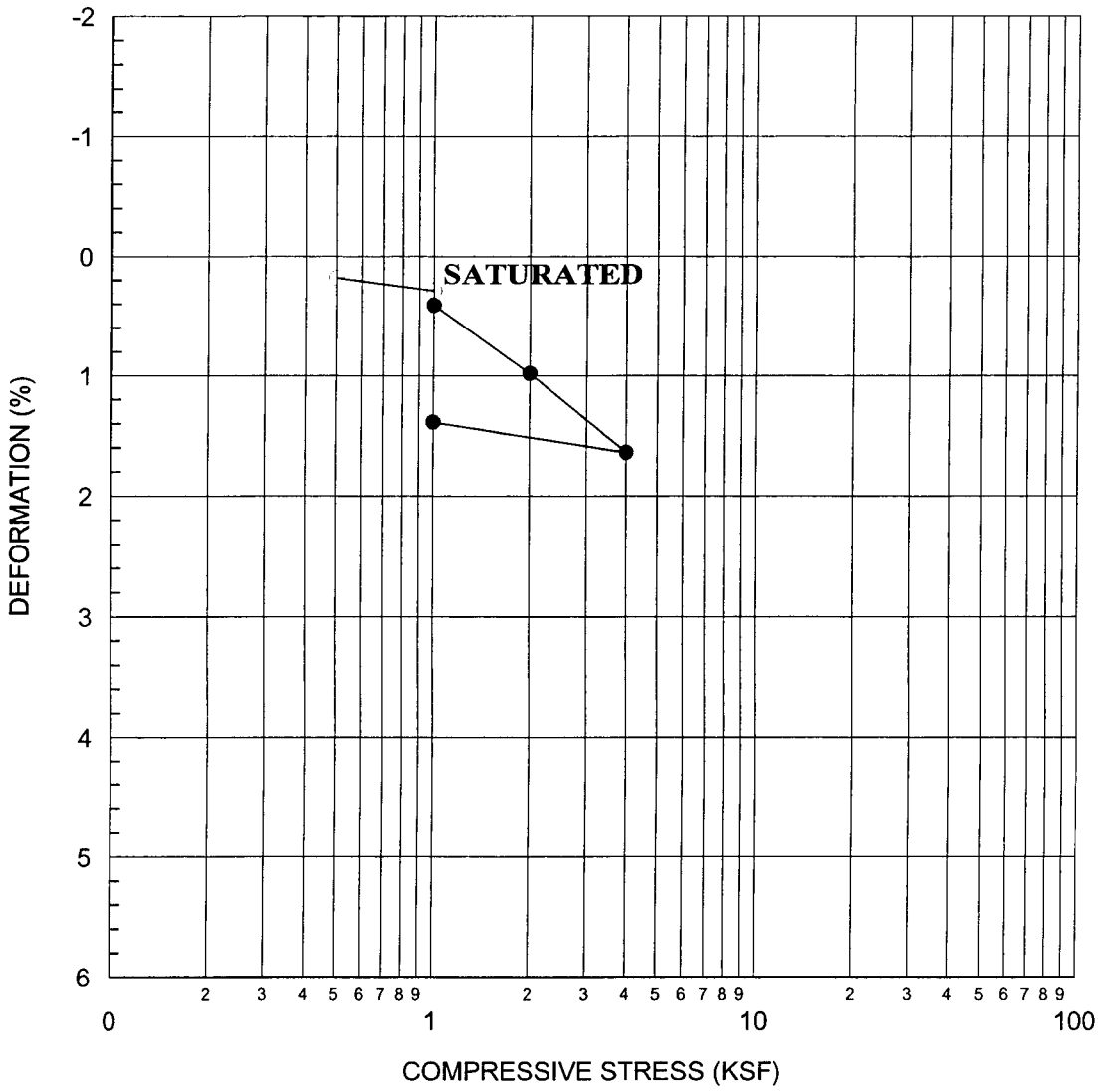
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DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	10.0	SM	3.2	108.9	0.547

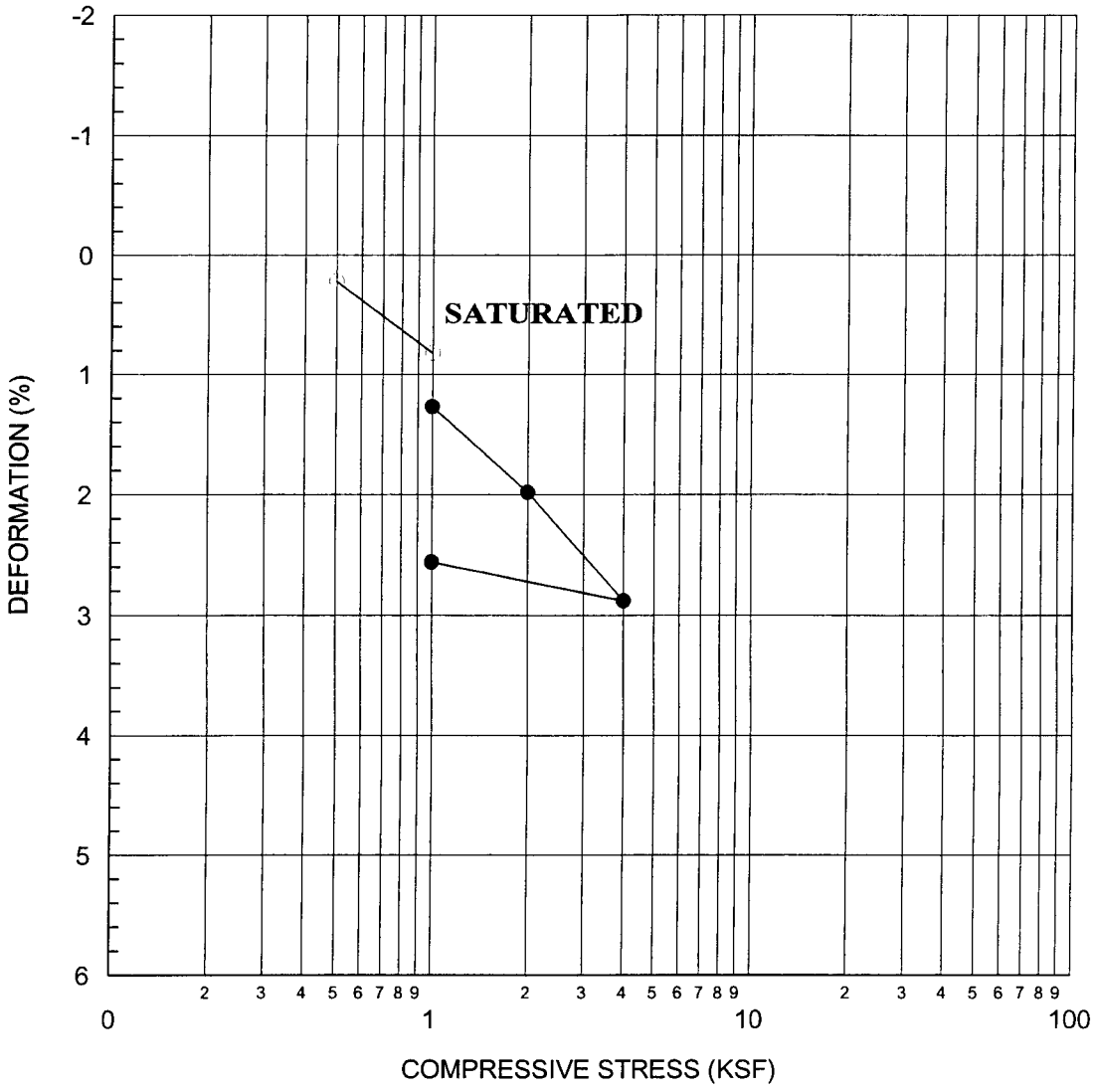
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Garden Grove, California

CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-2	N/A	5.0	SM	7.6	100.5	0.676

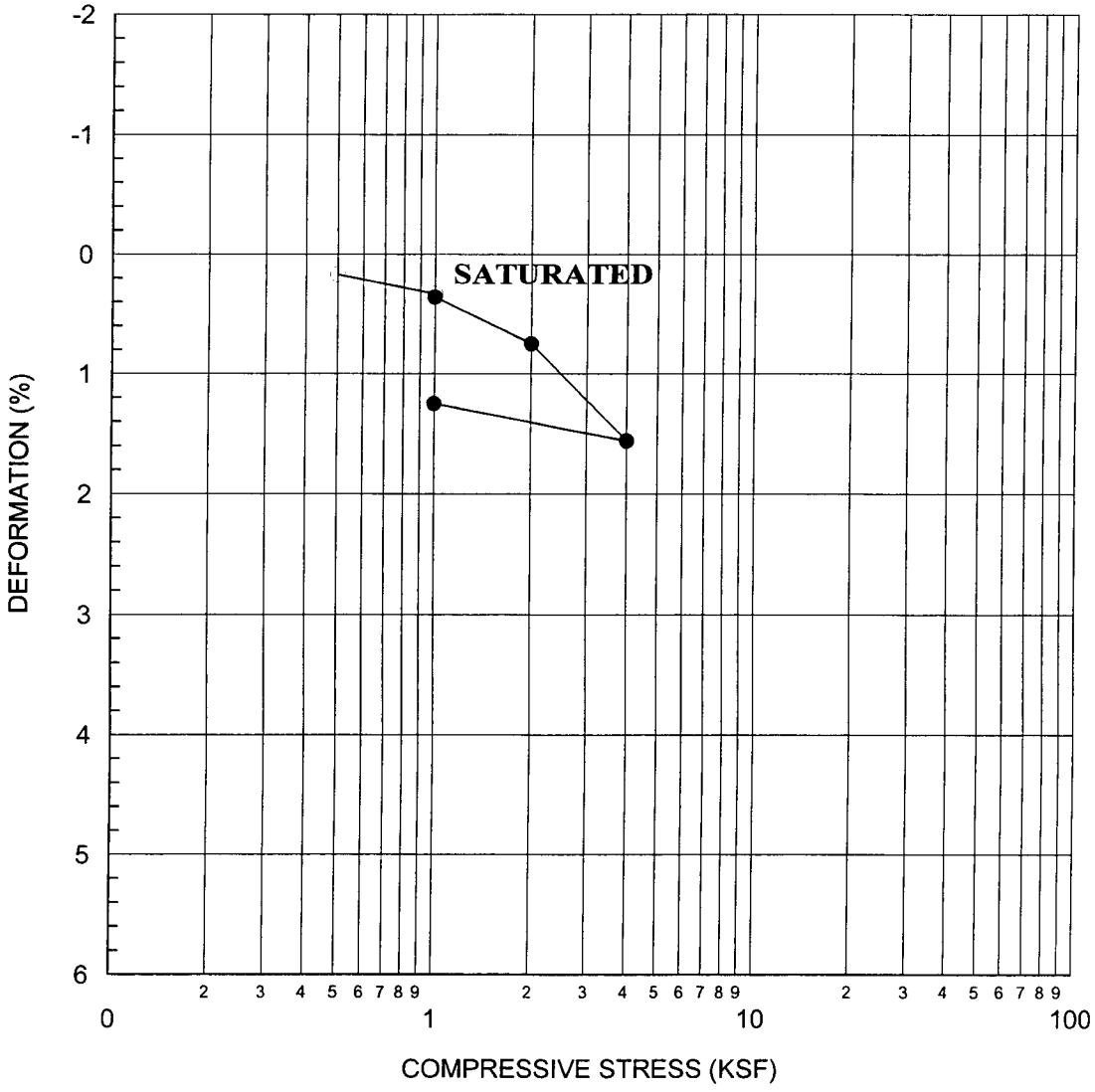
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Garden Grove, California

CONSOLIDATION
(ASTM D2435)

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FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-3	N/A	10.0	SM	12.1	104.6	0.611

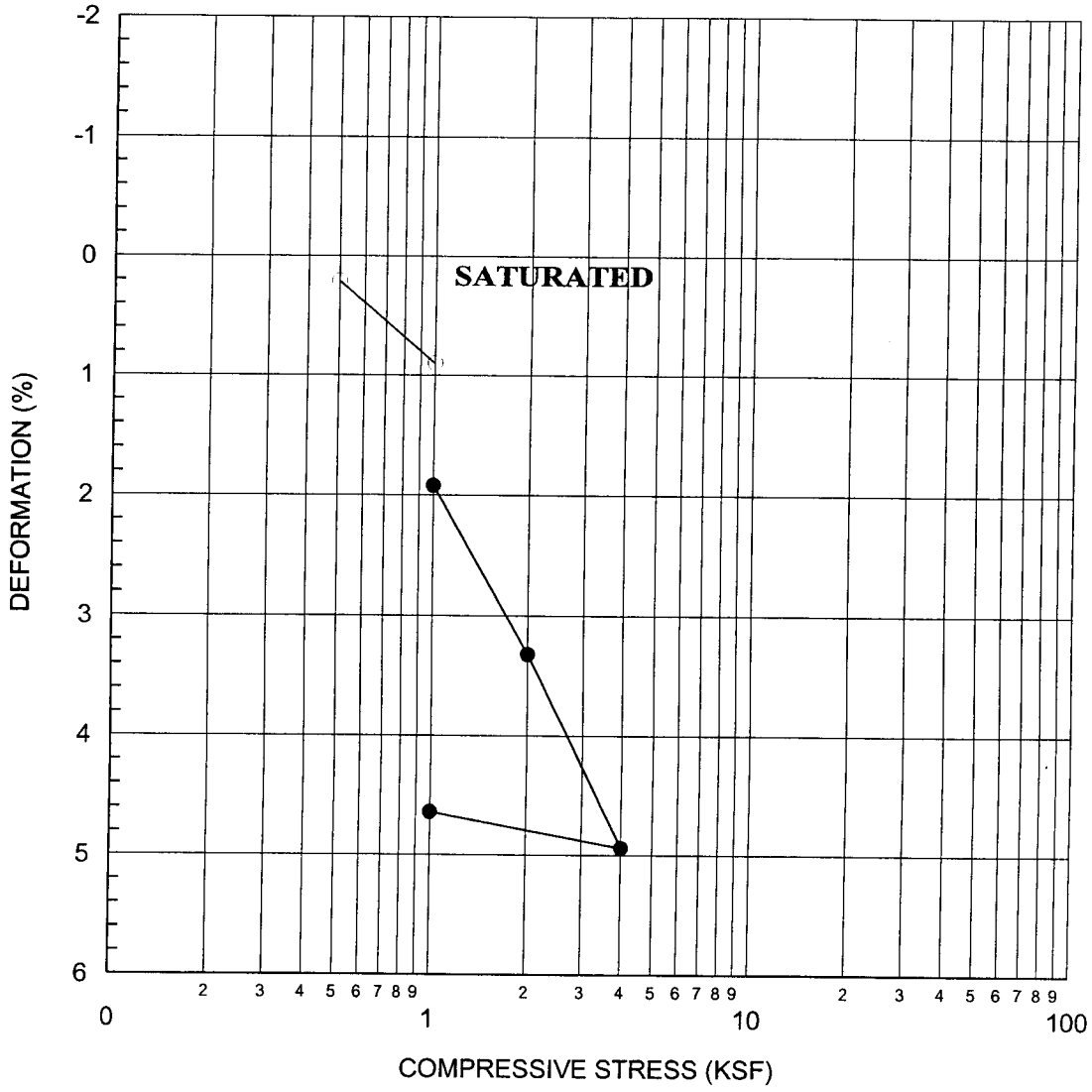
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-4	N/A	5.0	SM	9.1	105.7	0.594

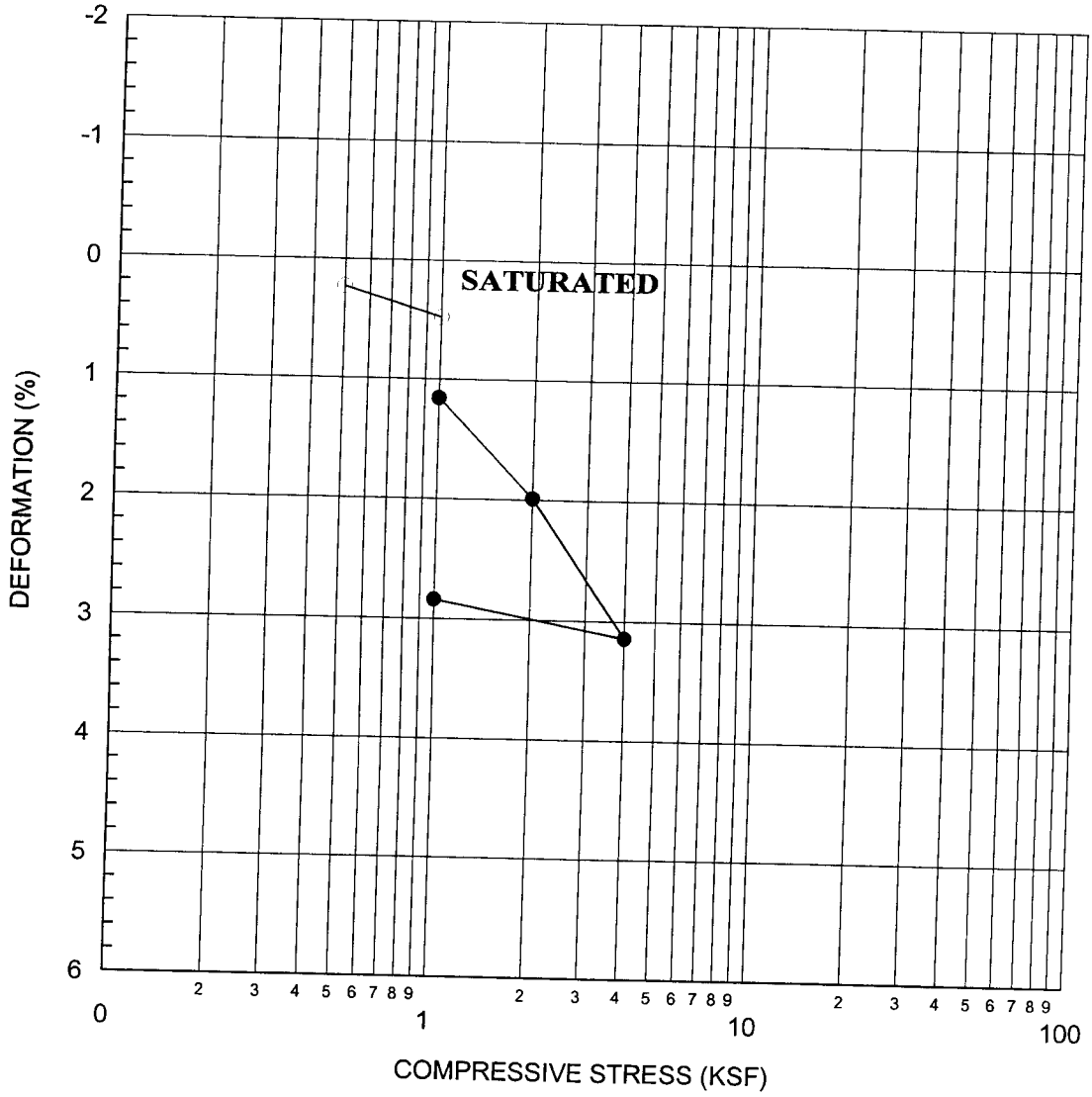
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(ASTM D2435)

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FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-5	N/A	5.0	SM	11.6	100.9	0.670

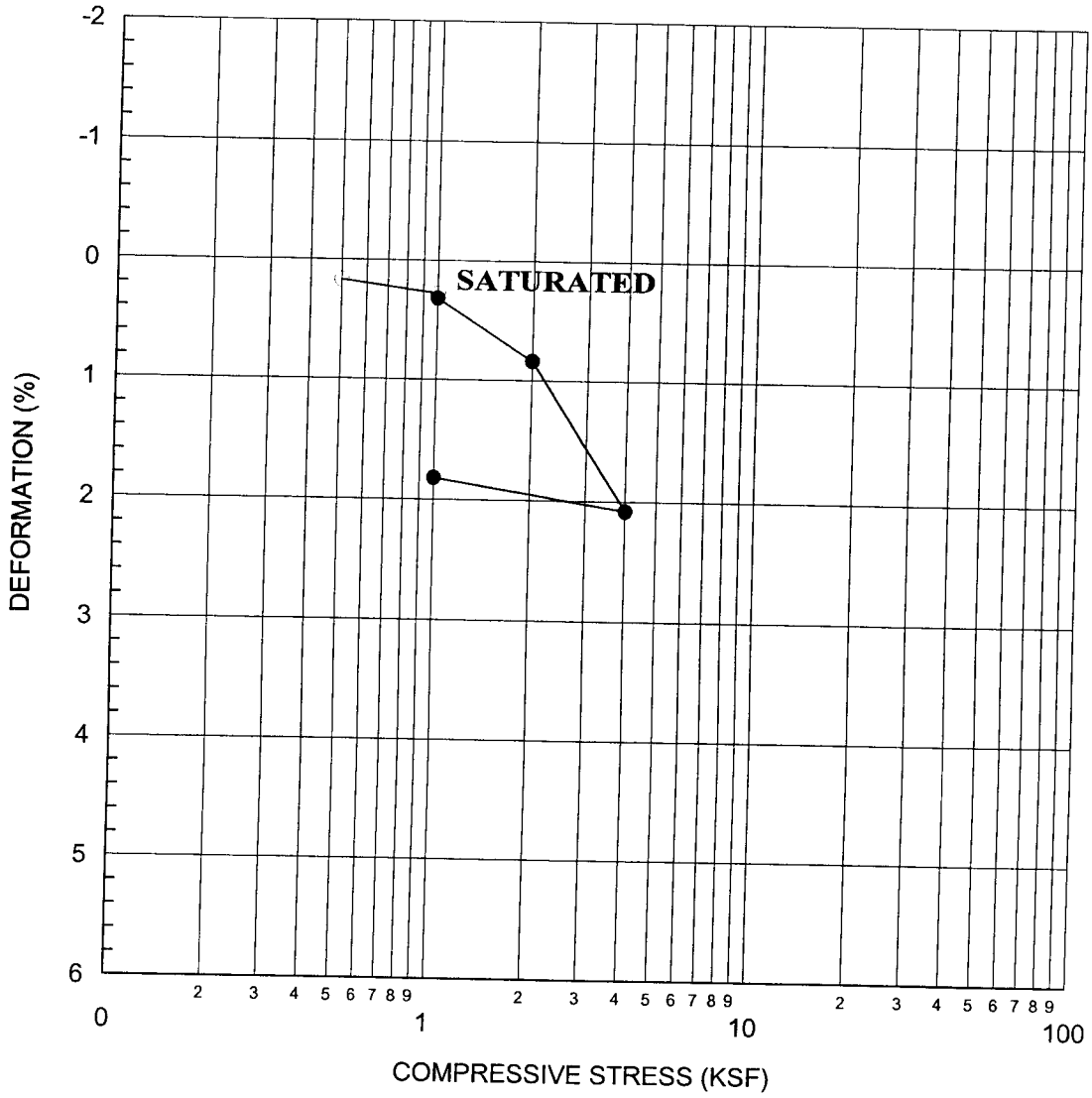
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Garden Grove, California

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(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-6	N/A	10.0	SM	7.9	102.1	0.650

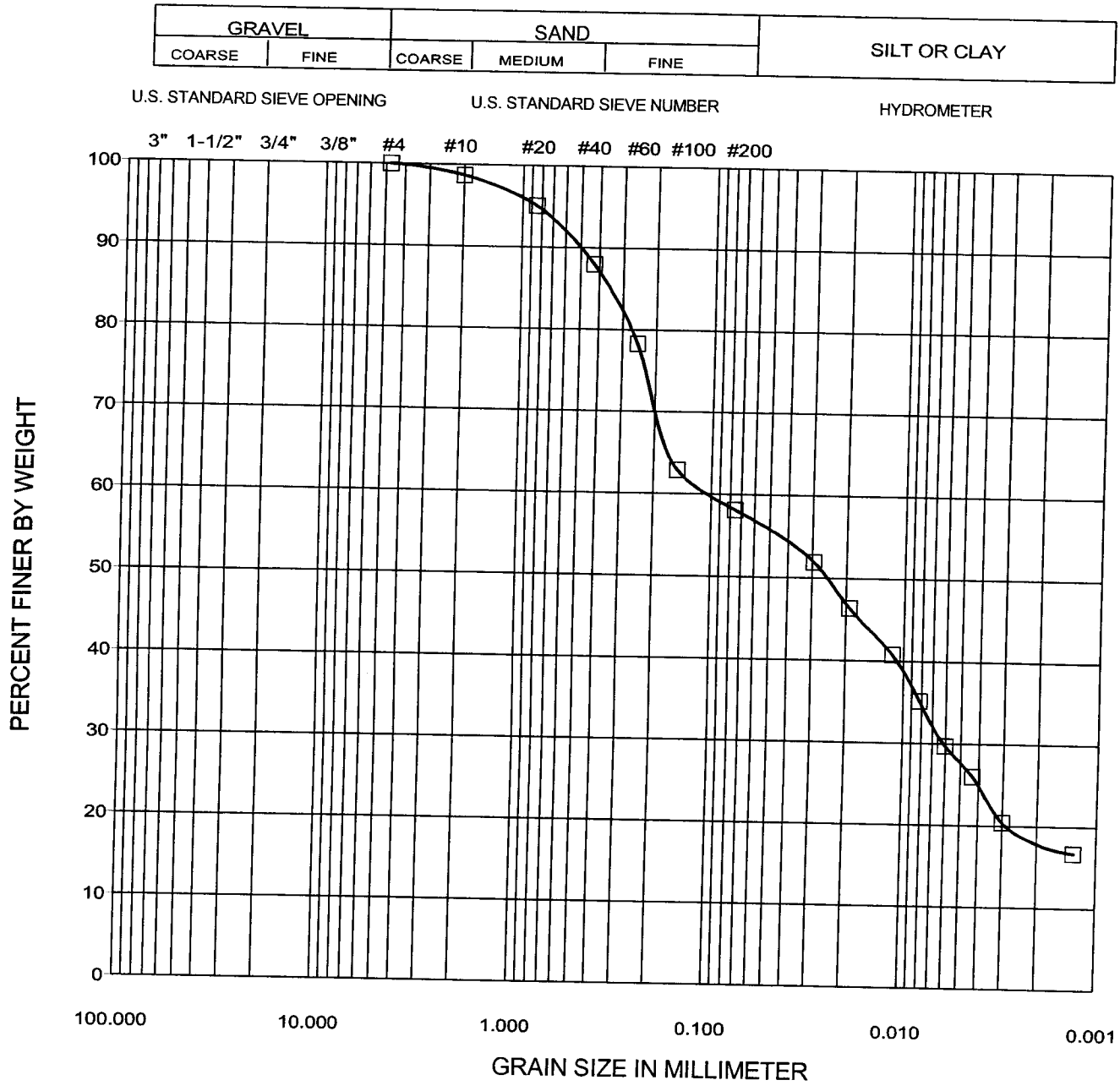
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Garden Grove, California

CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-1	50.0	BAG	ML	42	11

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Project Address:

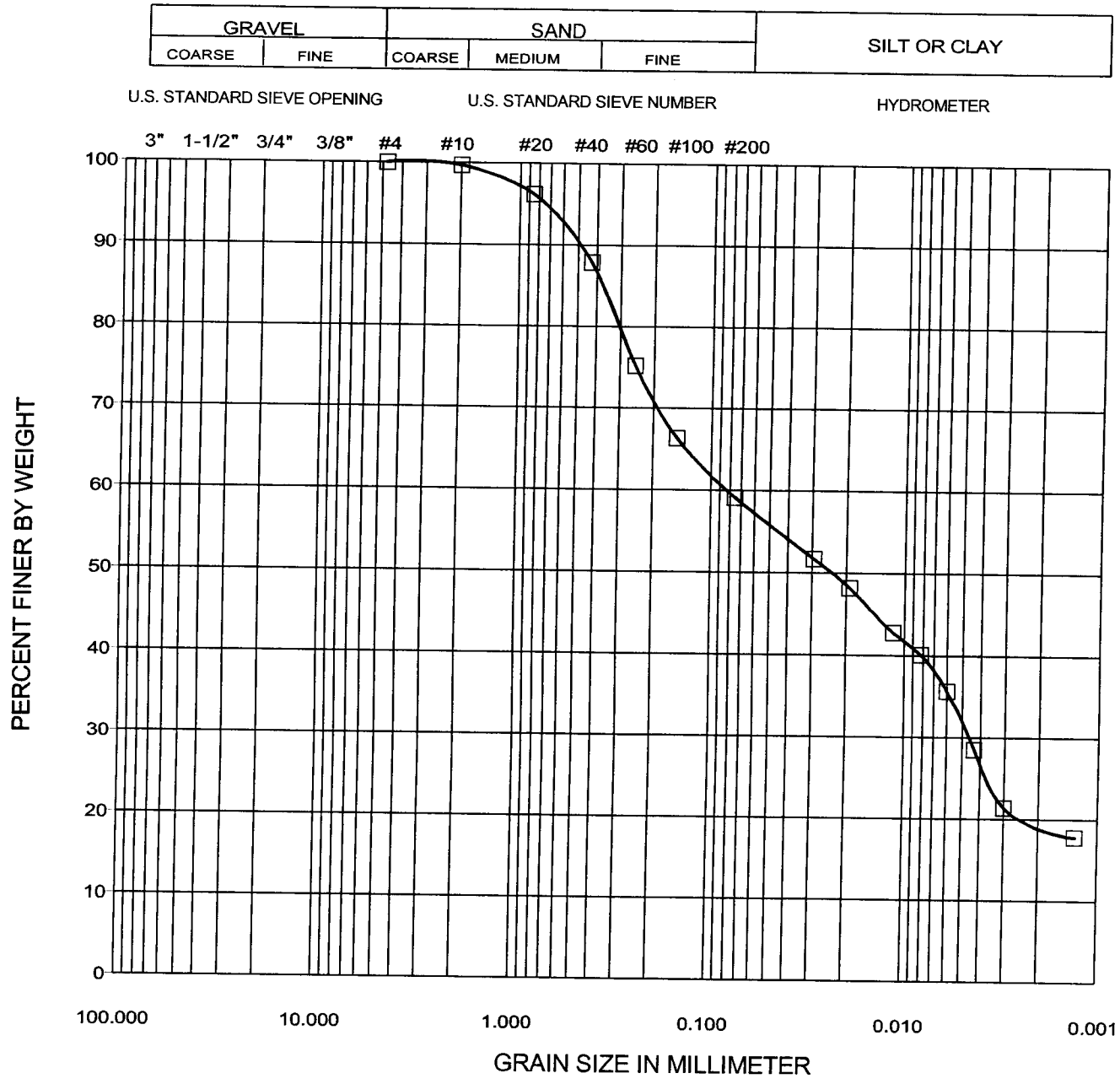
Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-6	40.0	BAG	ML	44	12

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Geotechnical, Environmental & Civil Engineering Services

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Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

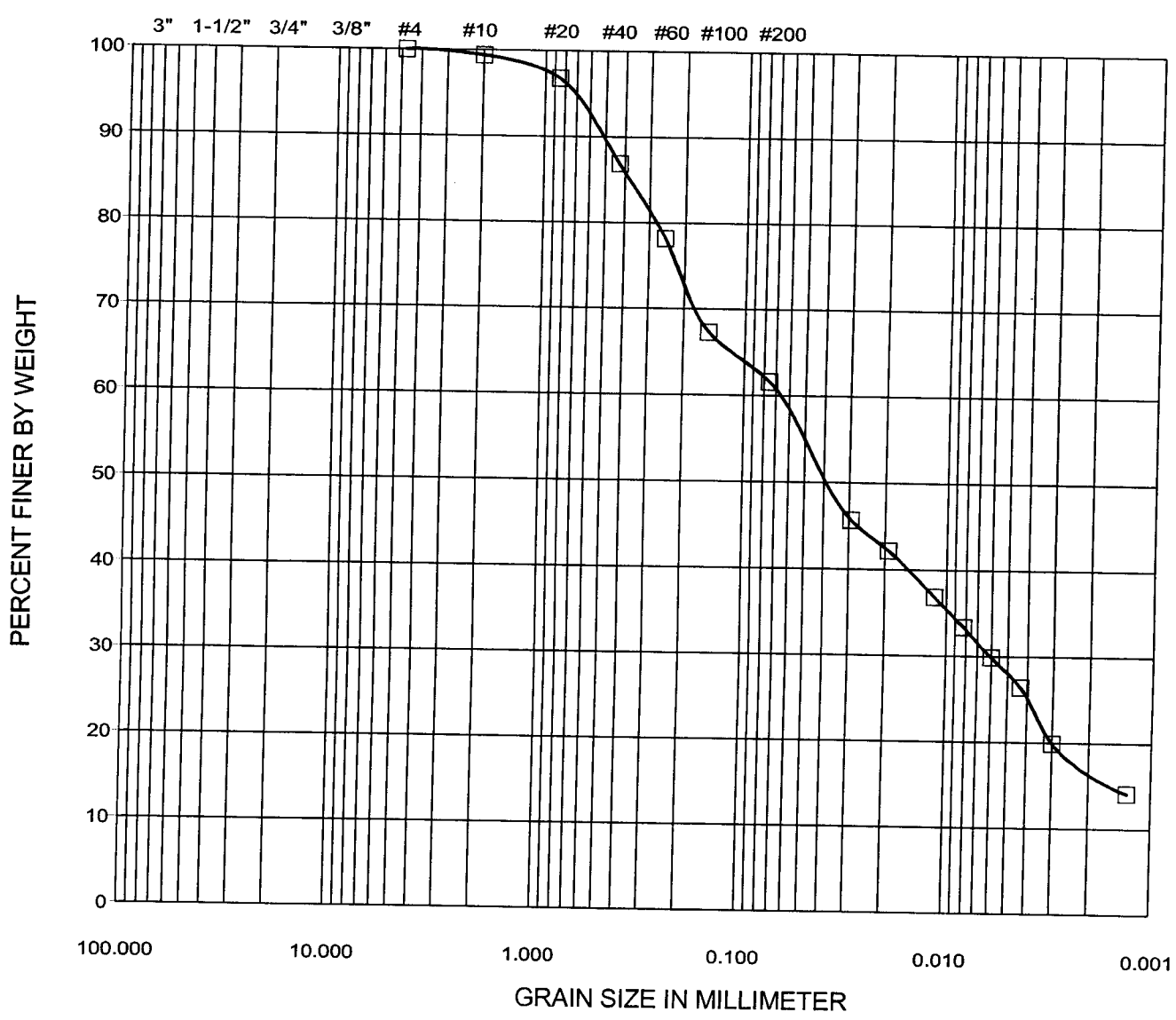
GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-6	45.0	BAG	ML	N/A	N/A

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Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE

APPENDIX C

RESULTS OF LIQUEFACTION ANALYSIS

Quartech Consultants, Inc.

Liquefaction Study

Magnitude of Earthquake M = 7.0

Design Ground Acceleration a = 0.37 g

Depth of Design Ground Water GW = 17.0 feet

Average Unit Weight of Soil r = 110.0 lbs

Bore Hole No. B-1

Base Depth (ft)	SPT Depth (ft)	Unit WT. (pcf)	Total Stress (tsf)	Effect. Stress (tsf)	Fine (%)	N	N'	Dr %	Stress Ratio Calcl's	Induced Stress Ratio	FS
17.0	15.0	110.0	0.83	0.83	4.0	28	30.4	93.2	-	0.233	-
22.0	20.0	110.0	1.10	1.01	11.0	20	21.7	71.3	0.238	0.252	1.13
27.0	25.0	110.0	1.38	1.13	32.0	29	37.0	80.8	*	0.277	>2.0
32.0	30.0	110.0	1.65	1.24	4.0	32	28.8	80.2	0.402	0.294	1.49
37.0	35.0	110.0	1.93	1.36	18.0	31	31.6	74.8	*	0.302	>2.0
42.0	40.0	110.0	2.20	1.48	18.0	34	33.0	74.5	*	0.304	>2.0
47.0	45.0	110.0	2.48	1.60	18.0	37	34.2	74.0	*	0.299	>2.0
50.0	50.0	110.0	2.75	1.72	58.0	21	24.0	53.2	----	----	----

Notes: - Soil Above Ground Water
---- Clayey or Silty Soil not susceptible to liquefaction
* Corrected SPT N60 > 30 and Not Susceptible to liquefaction

Relative Density was calculated in according to Meyerhof (1957)

Reference: Liquefaction Resistance of Soils: Summary Report from 1996 NNCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, by T.L. Loud, I.M. Idriss and others, ASCE Journal of Geotechnical and Geoenvironmental Engineering October, 2001, Vol.127, No. 10

LIQUEFACTION INDUCED SETTLEMENT

References:

1. "Evaluation of Settlement in Sands Due to Earthquake Shaking", Seed, et. al., ASCE Journal of Geotechnical Engineering, Page 861 – 878, Vol. 113, No. 8, August 1987

2. "Manual for Evaluation and Mitigation of Liquefaction Hazard for Foundation Design", Workshop on Seismic Hazards Mapping Act, Los Angeles, January 1998

Recommended Fine Correction (Ref 2)

Percent of Fine	N_{corr}(Blow/ft)
10	1
25	2
50	4
75	5

From Liquefaction Study: **B-1**

Soil Layer with FS < 1.25

From Reference 1: Earthquake Magnitude Correction
$r_m = 0.65/(0.1(M-1)) = 0.65/(0.1(7.0-1)) = 1.08$

Layer	Depth (feet)	τ/δ	Percent of Fine	(N1)60	N_{corr}	$(N1)_{60,\,corr}$	Volumetric Strain ε	Settlement (inch)
1	17-22	0.25	11	22	0	22	1.0%	0.60

Total Settlement: 0.60 inch

Differential Settlement
65% x total settlement = 0.65 x 0.60 = 0.39 Inch

Quartech Consultants, Inc.

Liquefaction Study

Magnitude of Earthquake M = 7.0

Design Ground Acceleration a = 0.37 g

Depth of Design Ground Water GW = 17.0 feet

Average Unit Weight of Soil r = 110.0 lbs

Bore Hole No. B-6

Base Depth (ft)	SPT Depth (ft)	Unit WT. (pcf)	Total Stress (tsf)	Effect. Stress (tsf)	Fine (%)	N	N'	Dr %	Stress Ratio Calcl's	Induced Stress Ratio	FS
17.0	15.0	110.0	0.83	0.83	2.0	17	18.5	72.6	-	0.233	-
22.0	20.0	110.0	1.10	1.01	9.0	32	33.0	90.2	*	0.252	>2.0
27.0	25.0	110.0	1.38	1.13	9.0	35	34.2	88.8	*	0.277	>2.0
32.0	30.0	110.0	1.65	1.24	6.0	40	36.2	89.7	*	0.294	>2.0
37.0	35.0	110.0	1.93	1.36	16.0	63	59.8	99.0	*	0.302	>2.0
42.0	40.0	110.0	2.20	1.48	59.0	17	21.7	52.6	----	----	----
47.0	45.0	110.0	2.48	1.60	62.0	12	16.3	42.1	----	----	----
50.0	50.0	110.0	2.75	1.72	59.0	23	25.8	55.7	----	----	----

Notes: - Soil Above Ground Water
---- Clayey or Silty Soil not susceptible to liquefaction
* Corrected SPT N60 > 30 and Not Susceptible to liquefaction

Relative Density was calculated in according to Meyerhof (1957)

Reference: Liquefaction Resistance of Soils: Summary Report from 1996 NNCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, by T.L. Loud, I.M. Idriss and others, ASCE Journal of Geotechnical and Geoenvironmental Engineering October, 2001, Vol.127, No. 10

Appendix F1
Preliminary Hydrology Report

PRELIMINARY HYDROLOGY REPORT

For:

Project Name:

GG-Site B-2

Lots 19-37 of Tract No. 2148
APN 231-471-06 through 231-471-24

Site Address:

12241 Harbor Boulevard

Garden Grove, CA 92840

Prepared for:

Kam Sang Company
411 East Huntington Drive
Arcadia, CA 91006
626.446.2988

Prepared by:

P S O M A S

February 7, 2022

5 Hutton Centre Drive, Suite 300
Santa Ana, California 92707
(714) 751-7373

TABLE OF CONTENTS

1. GENERAL DISCUSSION
- a. Project Description
- b. Site Condition Assessment
- c. Stormwater Design Volume Calculations
- d. Stormwater Quality Control measures

2. HYDROLOGY CALCULATIONS

3. HYDROLOGY MAPS
- a. Existing Hydrology Map
- b. Proposed Hydrology Map

1. GENERAL DISCUSSION

PROJECT DESCRIPTION

This report has been prepared for Kam Sang Company by Psomas for the project site at 12241 Harbor Blvd, Garden Grove, CA. The existing 3.72-acre site is currently undeveloped and is just south of the Sheraton Hotel. The project site consists of 19 lots currently zoned for residential. The proposed site includes a 500-key hotel and 528 parking spaces within the five-level (four levels below ground and one level above ground) parking structure.

SITE CONDITION ASSESSMENT

Existing Hydrology

The existing site is 3.72 acres which consists of 28% impervious area. The site is predominantly flat and drainage surface flows to Thackery Drive, then west onto Twintree Avenue, and south onto Buaro Street where it flows into a curb opening catch basin and enters the public storm drain system. The drainage ultimately flows through city and county owned facilities to Anaheim Bay.

The predominant soil type is B, and the percolation testing indicated an infiltration rate ranging from 0.2 to 5.3 inches/hour. Groundwater was not encountered in any of the borings drilled in the area of the proposed hotel during AECOM's investigation to a maximum depth of 25 feet.

Proposed Hydrology

The post development drainage is similar to the pre-development drainage. There is one drainage management areas (DMAs) and runoff flows in the southern direction in both the pre and post condition. According to the percolation report the project site soils have the adequate infiltration capacity to support the proposed low impact development and are considered suitable for infiltration through Best Management Practices. Therefore, for this project, bioretention BMPs with no underdrain are proposed. The proposed drainage will be collected using roof downspouts, and flow directly into the bioretention BMPs on the south side of the site. All flows beyond the full design capture volume will follow the pre-development drainage pattern to leave the site.

Existing drainage from the Sheraton Hotel property just north of the project site currently surface flows through a culvert onto Thackery Drive and ultimately leaves the project site flowing west onto Twintree Avenue. In the proposed condition this offsite drainage will be routed to the new drive aisle along the west property line and then continue to flow west onto Twintree Avenue to match the existing condition. These flows will not be mix with the runoff of the proposed development.

STORMWATER DESIGN VOLUME CALCULATIONS

The stormwater quality design volumes (DVC), uses the 2-year 1-hour rainfall intensity determined by exhibits found in the Orange County Technical Guidance Document (TGD). Calculations for the design flow rate for each drainage management area (DMA) was calculated using the North Orange County modified rational method provided in the TGD. Refer to Exhibit 4 for map. The summary of the calculations is shown in the following Table 1:

Table 1: DCV Summary Table				
Area ID	**Drainage Area (ac)**	**Impervious Area (ac)**	**DCV (cf)**	**85th % Storm Peak Flow (cfs)**
A-1	1.91	1.30	3,340	0.25
A-2	1.81	1.23	3,166	0.24

STORMWATER QUALITY CONTROL MEASURES

Low Impact Development (LID) Best Management Practices (BMPs) are required to reduce pollutants in stormwater discharges. LID BMPs for this project are treating the full design capture volume (DCV).

To meet North Orange County WQMP requirements the project proposes to implement the following in each DMA:

- Bioretention BMPs with no underdrain are proposed. The proposed drainage will be collected using roof downspouts, and flow directly into the bioretention BMPs. These bioretention BMPs will consist of a layer of mulch (3″), sandy loam (18″-36″), and gravel (12″). Once the stormwater passes through the planting material, the water will infiltrate into the site soils.

Existing vs. Proposed Imperviousness

The table below provides a comparison of the site pervious and impervious conditions prior to and following construction.

Table 3: Existing Area Impervious vs. Pervious				
	Area (ac)	**Pervious (ac)**	**Impervious (ac)**	**Impervious (%)**
Existing	3.72	2.67	1.05	28%
Proposed	3.72	1.19	2.53	68%

The site map depicting site boundaries, drainage patterns, and Storm Water Quality Control BMP's is provided in Section 4 – Proposed Hydrology Map.

2. HYDROLOGY CALCULATIONS

LID DESIGN SUMMARY						
DRAINAGE AREA	**AREA (AC)**	**IMPERVIOUS (AC)**	**C**	**24 HOUR, 85TH PERCENTILE RAINFALL (IN)**	**QDESIGN (CFS)**	**DCV (CF)**
A-1	1.91	1.55	0.66	0.73	0.25	3340
A-2	1.81	0.98	0.66	0.73	0.24	3166
				TOTAL	0.49	6506

FORMULAS

V=C*d*A*43560*1/12

Table 1.1 Proposed Volume-Based Biofiltration BMP Sizing Table

Drainage Management Area (DMA)	BMP Type	% Impervious = a_i x 100	C = (0.75 x ai) + 0.15	design capture storm depth, d	Drainage Area, A	Design Capture Volume, DCV	Subsurface Storage Depth, D_1	Avg Surface Ponding Depth, D_2	Biofiltration Rate, K_{design}	48-hour Ponding Depth, d_{48}	Effective Depth, $d_{effective}$	Required Infiltration Area, A	Total BMP Area Provided, A_{BMP}	BMP Storage Volume Provided, V_{BMP}
				(inches)	*(acres)*	*(ft^3)*	*(ft)*	*(ft)*	*(in/hr)*	*(ft)*	*(ft)*	*(ft^2)*	*(SF)*	*(ft^3)*
A-1	Bioretention with no underdrains	68%	0.66	0.73	1.91	**3,340**	3.5	0.50	2.5	10.00	1.90	1758	2,122	**4,032**
A-2	Bioretention with no underdrains	68%	0.66	0.73	1.81	**3,166**	3.5	0.50	2.5	10.00	1.90	1666	2,358	**4,480**

Note: Stormwater Quality Design Capture Volume (DCV or Vdesign) was determined using Method (I) outlined in the 2013 Orange County Model Water Quality Management Plan (WQMP) Technical Guidance Document

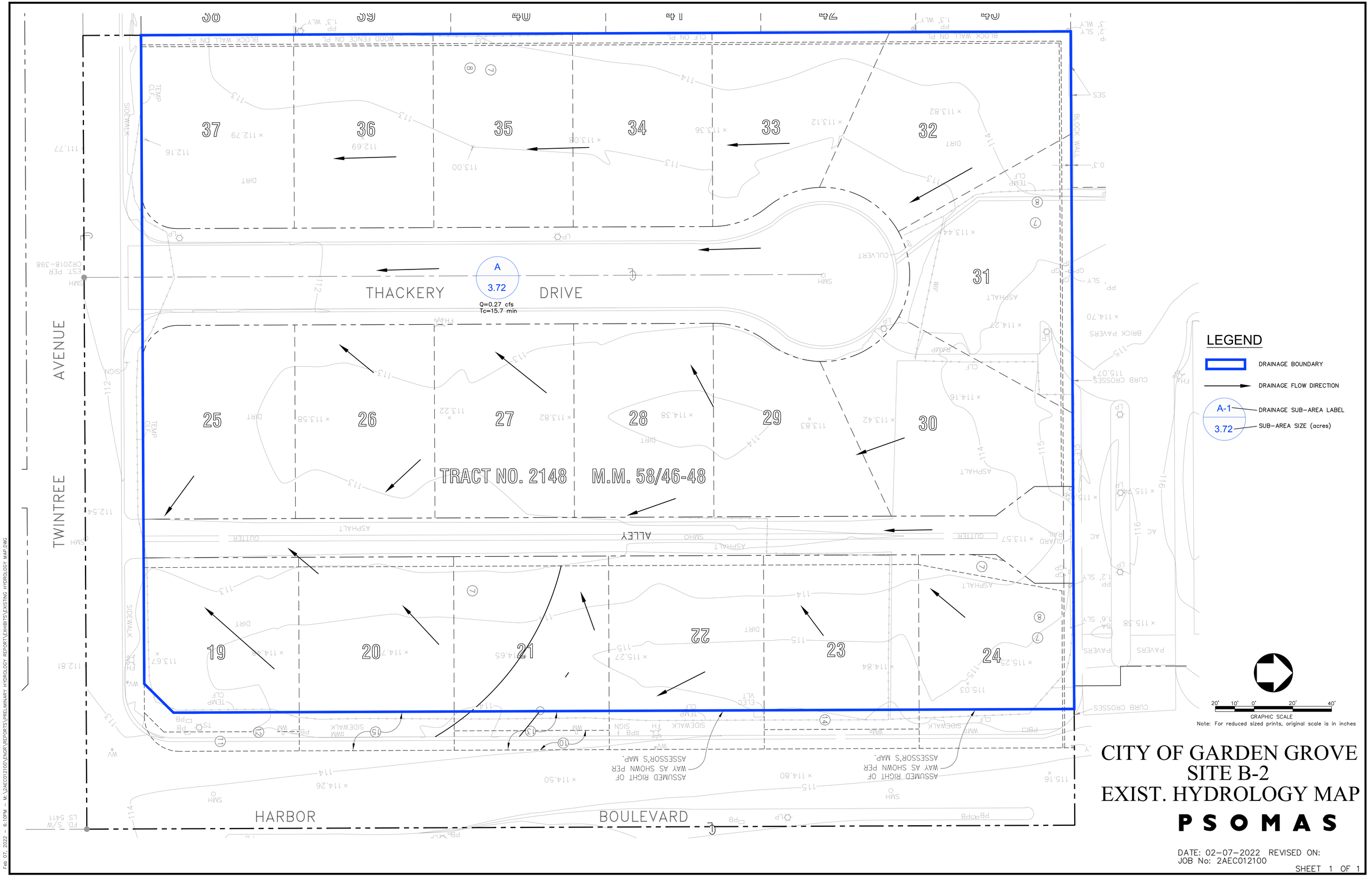
DCV = c x d x A x (1 ft/ 12in) x (43,560 ft^2 / acre), where d = 0.79 inches (depth of rainfall for 85th percentile, 24-hour storm event)

V_{BMP} = ((n x D_1) + D_2) x A_{BMP} where n is the porosity (% of voids) = 0.40 or 40%

Biofiltration Rate is based on the specified loamy sand planting material with a minimum infiltration rate of 5 in/hr and factor of safety of 2

3. HYDROLOGY MAPS

a. Existing Hydrology Map
b. Proposed Hydrology Map



CITY OF GARDEN GROVE
SITE B-2
EXIST. HYDROLOGY MAP

PSOMAS

DATE: 02-07-2022 REVISED ON:
JOB No: 2AEC012100

SHEET 1 OF 1

Feb 07, 2022 - 6:10PM - M:\2AEC012100\ENGR\REPORTS\PRELIMINARY HYDROLOGY REPORT\EXHIBITS\EXISTING HYDROLOGY MAP.DWG

8" WALL - 8'-0" HIGHT

8" WALL - 8'-0" HIGHT

THACKERY DRIVE

TRACT NO. 2148 M.M. 58/46-48

AVENUE

TWINTREE

HARBOR BOULEVARD

ALLEY

ELEV. LOBBY

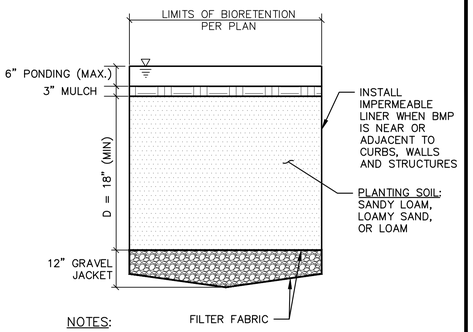
A-1
1.91
Q=0.25 cfs
Tc=9.8 min

A-2
1.81
Q=0.24 cfs
Tc=10.8 min

ASSUMED RIGHT OF WAY AS SHOWN PER ASSESSOR'S MAP.

ASSUMED RIGHT OF WAY AS SHOWN PER ASSESSOR'S MAP.

12'-0"



NOTES:

1. SEE CALIFORNIA STORMWATER BMP HANDBOOK BMP NO. TC-32 FOR MORE INFORMATION.

BIORETENTION W/ NO UNDERDRAIN DETAIL

NTS

LEGEND

- BIORETENTION AREAS
- DRAINAGE BOUNDARY
- DRAINAGE SUB-AREA BOUNDARY
- DRAINAGE FLOW DIRECTION
- A-1 — DRAINAGE SUB-AREA LABEL
- 3.72 — SUB-AREA SIZE (acres)

20' 10' 0' 20' 40'

GRAPHIC SCALE

Note: For reduced sized prints, original scale is in inches

CITY OF GARDEN GROVE
SITE B-2
PROP. HYDROLOGY MAP

PSOMAS

DATE: 02-07-2022 REVISED ON:
JOB No: 2AEC012100

SHEET 1 OF 1

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Appendix F2
Preliminary Water Quality Management Plan

City of Garden Grove, California

Preliminary Water Quality Management Plan

(pWQMP)

Project Name:

GG-Site B-2

Harbor Boulevard and Twintree Lane, Garden Grove, CA

(APN: 231-471-06 through 231-471-24)

Prepared By: Psomas



Preliminary Water Quality Management Plan (pWQMP)

Project Name:

GG-Site B-2

12241 Harbor Blvd, Garden Grove, CA 92840

Prepared for:

Kam Sang Company

411 East Huntington Drive

Arcadia, CA 91006

(626) 446-2988

Prepared by:

Psomas

Engineer Robert J. Talafus Registration No. 38832

5 Hutton Centre Drive, Suite 300

Santa Ana, CA 92707

(714) 751-7373

February 7, 2022

Project Owner's Certification			
Permit/Application No.	N/A	Grading Permit No.	N/A
Tract/Parcel Map No.	Tract No. 2148	Building Permit No.	N/A
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			231-471-24,Lots 19-37

This Preliminary Water Quality Management Plan (pWQMP) has been prepared for Kam Sang Company by Psomas. The pWQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan and with the requirements of the California Environmental Quality Act. The Preliminary WQMP is required by the California Environmental Quality Act (CEQA) as a support document to provide an adequate evaluation for environmental assessment of the project to develop mitigation requirements during the entitlement process. The Final WQMP may differ from the pWQMP as a result of final design and mitigation requirements.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of the Final plan and will ensure that the Final plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the Final WQMP. An appropriate number of approved and signed copies of the Final WQMP document shall be available on the subject site in perpetuity.

Each Final Project WQMP will be stored within the City's files and will continue with the property after the completion of the construction phase, and the City will require that the terms, conditions and requirements be recorded with the County Recorder's office by the property owner, or any successive owner as authorized by the Water Quality Ordinance. In lieu of recordation, the City will require the Final Project WQMP to include a Notice of Transfer Responsibility Form, which serves to notify the City that a change in ownership has occurred and notify the new owner of its responsibility to continue implementing the Final Project WQMP.

The final Project WQMP must include calculations to support the structural integrity of the selected LID or treatment control BMP as appropriate and be prepared by or under the direction of a California Registered Civil Engineer and affixed with their stamp.

Owner:			
Title			
Company			
Address			
Email			
Telephone #			
Signature		Date	

Contents

Page No.

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Section III Site Description 10
Section IV Best Management Practices (BMPs) 12
Section V Inspection/Maintenance Responsibility for BMPs 24
Section VI Site Plan and Drainage Plan 26
Section VII Educational Materials 27

Attachments

Attachment A . ..... Educational Materials
Attachment B . ..... Soils Report
Attachment C . ..... Infiltration/Percolation Report

Section I Discretionary Permit(s) and Water Quality Conditions

Provide discretionary permit and water quality information. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available from the Orange County Stormwater Program (ocwatersheds.com).*

Project Infomation			
Permit/Application No.		Tract/Parcel Map No.	Tract No. 2148
Additional Information/ Comments:	The Preliminary Water Quality Management Plan (pWQMP) is prepared to satisfy the requirements of the current Orange County Drainage Area Management Plan (DAMP) and the requirements of the California Environmental Quality Act (CEQA) for the entitlement processing of the project to determine impacts of the project and recommend mitigation to address the impacts during entitlement review. Approval of this preliminary plan does not imply final approval of the Final Project Water Quality Management Plan, nor the associated final grading plan for the project.		
Water Quality Conditions			
Water Quality Conditions (list verbatim)	Prior to the issuance of any grading or building permits or prior to recordation upon subdivision of land if determined applicable by the City Building Official, the applicant shall submit to the City for review and approval a Water Quality Management Plan that: • Addresses Site Design BMPs such as minimizing impervious areas, maximizing permeability, minimizing directly connected impervious areas, creating reduced or "zero discharge" areas, and conserving natural areas • Incorporates the applicable Routine Source Control BMPs as defined in the DAMP • Generally, describes the long-term operation and maintenance requirements for the Treatment Control BMPs • Identifies the entity that will be responsible for long-term operation and maintenance of the Treatment Control BMPs		

	• Describes the mechanism for funding the long-term operation and maintenance of the Treatment Control BMPs
Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	A Watershed Infiltration and Hydromodification Master Plan (WIHMP) is not complete for Anaheim Bay. There are no established TMDLs for Anaheim Bay according to the integrated 2016 California 303(d) List of Water Quality Limited Segments

Section II Project Description

II.1 Project Description

Description of Proposed Project				
Development Category (Verbatim from WQMP):	New 500-key Hotel			
Project Area (ft²): 161,933	Number of Dwelling Units: 500		SIC Code: 7011	
Narrative Project Description:	The existing 3.72 acre site is currently undeveloped and is just south of the Sheraton Hotel. The project site consists of 19 lots currently zoned for residential. The proposed site includes a 500-key hotel and 528 parking spaces within the five-level (four levels below ground and one level above ground) parking structure.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	116,326 sq ft	72%	45,607 sq ft	28%
Post-Project Conditions	51,711 sq ft	32%	110,222 sq ft	68%
Drainage Patterns/Connections	The existing site is flat and drainage surface flows to Thackery Drive, then west onto Twintree Avenue, and south onto Buaro Street where it flows into a curb opening catch basin and enters the public storm drain system. The drainage ultimately flows through city and county owned facilities to Anaheim Bay.			

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the TGD for guidance.*

Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E		Expected since landscaping exists on-site.
Nutrients	E		Expected since landscaping exists on-site.
Heavy Metals	E		Expected in parking lots.
Pathogens (Bacteria/Virus)	E		Bacterial indicators are routinely detected in pavement runoff.
Pesticides	E		Expected since landscaping exists on-site.
Oil and Grease	E		Expected in parking lots.
Toxic Organic Compounds	E		Expected in parking lots.
Trash and Debris	E		Expected in development.

II.3 Hydrologic Conditions of Concern

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the TGD.*

Based on Figure XVI-3c, Susceptibility Analysis Anaheim Bay, this project is not in the potential areas of erosion, habitat, and physical structure susceptibility.

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. Refer *to Section 2.2.4 in the TGD.*

According to the percolation report the project site soils have the adequate infiltration capacity to support the proposed low impact development and are considered suitable for infiltration through Best Management Practices. Therefore, for this project, bioretention BMPs with no underdrain are proposed. The proposed drainage will be collected using roof downspouts, and flow directly into the bioretention BMPs. These bioretention BMPs will consist of a layer of mulch (3"), sandy loam (18"-36"), and gravel (12"). Once the stormwater passes through the planting material, the water will infiltrate into the site soils. This project will meet the requirements of the Statewide Trash Amendment through implementation of the bioretention BMPs. Per the trash amendment requirements, the proposed treatment must trap all particles that are 5 mm or greater and the bioretention BMPs accomplish this task. Additionally, all onsite trash enclosures will be covered to reduce the amount of trash that will end up at the bioretention BMPs.

II.5 Property Ownership/Management

Describe property ownership/management. *Refer to Section 2.2.5 in the TGD.*

Lots 19 through 37 are owned by the City of Garden Grove. The lots are to be consolidated and transferred to the future owner. The future owner will be responsible for long term maintenance of the project's stormwater facilities.

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the TGD.*

Planning Area/ Community Name	N/A
Location/Address	Harbor Boulevard, Thackery Drive
	Garden Grove, California
Land Use	Residential
Zoning	R-1-7 (Single Family Residence) and PUD-141-01
Acreage	3.72 acres
Predominant Soil Type	B

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. Refer to Section 2.3.2 in the TGD.

Precipitation Zone	The site 24-hour, 85th percential rainfall is 0.73 inches per Figure XVI-1 Rainfall Zones in the Technical Guidance Document.
Topography	The existing site consists of undeveloped residential lots. The site is flat with drainage flowing to Thackery Drive and out to Twintree Avenue.
Drainage Patterns/Connections	The existing site is flat and drainage surface flows to Thackery Drive, then west onto Twintree Avenue, and south onto Buaro Street where it flows into a curb opening catch basin and enters the public storm drain system.
Soil Type, Geology, and Infiltration Properties	The predominant soil type is B, and the percolation testing indicated an infiltration rate ranging from 0.2 to 5.3 inches/hour.

Site Characteristics (continued)	
Hydrogeologic (Groundwater) Conditions	Groundwater was not encountered in any of the borings drilled in the area of the proposed hotel during AECOM's investigation to a maximum depth of 25 feet. Groundwater was encountered at 62.5 feet below ground surface in a previous boring drilled in the vicinity of this site during the July 2018 exploration performed by GEOCON (GEOCON, 2018).
Geotechnical Conditions (relevant to infiltration)	The ground surface within the project site is underlain by alluvial deposits. The soils encountered in the upper 10 feet consisted predominantly of fine- to medium-grained Silty Sand (SM). The soils were observed to be slightly moist to moist. Within this soil layer, silt was encountered in upper 3 feet, approximately 30-40% fines based on a visual field assessment. From about 10 to 25 ft below ground surface, soils encountered where generally well-graded medium dense clean sand.
Off-Site Drainage	Existing drainage from the Sheraton Hotel property just north of the project site currently surface flows through a culvert onto Thackery Drive and ultimately leaves the project site flowing west onto Twintree Avenue. In the proposed condition this offsite drainage will be routed to the new drive aisle along the west property line and then continue to flow west onto Twintree Avenue to match the existing condition. These flows will not be mix with the runoff of the proposed development.
Utility and Infrastructure Information	The proposed storm drain has been placed with the necessary clearances from existing utilities.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the TGD.*

Receiving Waters	Anaheim Bay
303(d) Listed Impairments	Nickel, PCBs, Toxicity
Applicable TMDLs	N/A
Pollutants of Concern for the Project	The pollutants of concern for the project are those listed in Section II.2 above.
Environmentally Sensitive and Special Biological Significant Areas	There are no Environmentally Sensitive Areas (ESAs) or Areas of Special Biological Significance (ASBSs) on or within 200 feet of the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?		YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	No		

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	The project is not within a Potential Area of Erosion, Habitat and Physical Structure Susceptibility per Figure XVI-3c in Section VI and in the Model WQMP TGD. Therefore, a Hydrologic Condition of Concern (HCOC) does not exist for this project. The Santa Ana River is a regularly maintained, engineered prismatic trapezoidal channel, with riprap and soil cement reinforcement along its banks, and drop structures and invert stabilizers along its base. Runoff from the site will be minimized by included large planting areas and detaining the runoff during storm events in filtration planters.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	1) Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). 2) A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration (ET) cannot be feasibly implemented for the full design capture volume. In this case, infiltration, harvest and use, and ET practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Since infiltration is feasible on this project, bioretention with no underdrains will be the stormwater BMPs used on the project
Calculate LID design storm capture volume for Project.	Proposed Condition: Vp = C x d x A x 43560 sf/ac x 1/12 in/ft Vp = (0.75 x 0.84 + 0.15) x 0.79 x 3.72 x 43560 x 1/12 Vp = 8,321 CF See Table 1.1 included in Section VI

IV.2. SITE DESIGN AND DRAINAGE PLAN

The first step in the LID BMP selection process is to consider HSCs. There are no significant HSCs proposed for this project.

The use of bioretention with no underdrains will be used to treat runoff and site drainage. Runoff from the building will be collected using roof downspouts that will either flow directly into the top of the bioretention BMPs or outlet at grade and surface flow to the bioretention BMPs, where it will be filtered, then infiltrated onsite. The landscaping shall include drought tolerant shrubs and trees in the interior and perimeter landscaping

This project will meet the requirements of the Statewide Trash Amendment through implementation of the bioretention BMPs. Per the trash amendment requirements, the proposed treatment must trap all particles that are 5 mm or greater and the bioretention BMPs accomplish this task. Additionally, all onsite trash enclosures will be covered to reduce the amount of trash that will end up at the bioretention BMPs.

The attached map in Section VI (WQMP Drainage/Site Plan) describes the stormwater drainage management area (DMA) and proposed BMPs. The BMP Sizing Table 1.1 in Section VI includes the Design Capture Volume (DCV) calculations. Please note the siting of any infiltration basins will need to observe the criteria found in TGD INF-3 recommendations

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the TGD for selecting LID BMPs and Section 2.4.3 in the TGD for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☒
Street trees (canopy interception)	☒
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met state why BMPs cannot be met

Name	Included?
Bioretention without underdrains	☒
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration BMPs. If not document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

See Table 1.1 in Section VI.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration, rainwater harvesting BMPs.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with evapotranspiration, rainwater harvesting BMPs in combination with infiltration BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

Harvest and reuse are not feasible due to the small size and remote location of the project, and the cost of implementing the system. Instead, the site roof and deck areas drain into biofiltration BMPs, where drainage will be treated and retained.

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. See Section 5 TGD. Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval.

Hydromodification Control BMPs	
BMP Name	**BMP Description**
Not applicable	

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs

Per Figure 7.II-7 of the model WQMP, if there is no approved regional BMP or Watershed Infiltration and Hydromodification Master Plan (WIHMP), the project site shall incorporate LID BMPs as the first priority. There is no regional BMP that this project drains into. For this project, LID BMPs are being implemented at the source.

IV.3.7 Treatment Control BMPs

Treatment control BMPs are not used since the full Design Storm Capture Volume is being treated with infiltration BMPs.

Treatment Control BMPs	
BMP Name	**BMP Description**
Not applicable	

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

Non-Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous waste
N6	Local Industrial Permit Compliance	☒	☐	
N7	Spill Contingency Plan	☐	☒	No storage is provided in project area
N8	Underground Storage Tank Compliance	☐	☒	No storage is provided in project area
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☒	☐	
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No retail gasoline outlet

The following non-structural BMPs are proposed for source control and reduction/elimination of pollutants: **(See WQMP Site Plan in Section VI)**

N1 Education for Property Owners, Tenants and Occupants: Practical informational materials are provided to occupants or tenants to increase the public's understanding of stormwater quality, sources of pollutants, and what they can do to reduce pollutants in stormwater. Educational materials available from the County of Orange can be downloaded here: http://ocwatersheds.com/publiced/resources/bussbrochure and are also located in Section VII of this report.

Explanation/Description: The owner will provide educational environmental awareness materials to all employees and contractors during the initial hiring and orientation process, and annually thereafter. Among other items, these educational materials will address specific chemicals (including household, commercial, industrial, automotive, and landscape types). The use of these chemicals should be limited to within the confines of the site (generally inside the building) where waste water drains directly into the public sanitary sewer system, with no discharge to gutters, paved areas, drainage devices and landscaped areas where drainage will be released from the site.

N2 Activity Restrictions:
The owner will provide restrictions to all employees, contractors, etc. on certain activities conducted on this property. The owner will provide a list of these activity restrictions to employees, contractors, etc. upon start date and annually thereafter. If violations occur, the owner will record the event and notify employees, contractors, etc. the owner will provide another list of these activity restrictions. If employees, contractors, etc. continue to violate these activity restrictions, City of Garden Grove Code Enforcement will be notified.

These restrictions include:
· Vehicle washing, maintenance or repair outside of designated areas
· Hosing down of paved areas
· Disposal of animal waste not in appropriate locations
· Use of chemicals, pesticides, toxins, etc. on paved or landscape areas
· Dumping of any waste into drainage facilities
· Blowing or sweeping of debris (leaf litter, grass clippings, litter, etc.) into drainage facilities
· Discharges of fertilizer or pesticides to drainage facilities
· Keeping dumpster lids open
· Washing kitchen wastes or kitchen equipment to storm water drainage features

The owner will inform employees, contractors, etc. that spills are to be swept or vacuumed.

N3 Common area landscape maintenance:
A licensed landscape maintenance crew will be provided by the owner to maintain area landscaping. This maintenance crew will utilize the following efficient landscape and irrigation practices:
· Weekly inspections will be scheduled to ensure proper functioning of the irrigation system.
· Poorly functioning heads, valves, etc. will be repaired or replaced.
· Proper functioning of the irrigation system will be confirmed prior to application of pesticides, herbicides, and fertilizers to avoid nuisance runoff and subsequent release of chemicals into the drainage system.
· Fertilizers will be worked into the soil to a depth of 4 to 6 inches to reduce the likelihood of their inadvertent runoff into downstream surface waters.
· All chemical applications will be carried out in strict accordance with the manufacturer's label and using the minimum effective quantity.
· Pesticides are to be used only after recommendation from a state-licensed pest control advisor.
· Pesticides are only to be applied by or under the direct supervision of a state licensed or certified pesticide applicator or by workers with equivalent training.
· Keep irrigation system at short repeat cycles to minimize runoff and erosion.
· Replenish wood mulches to reduce evaporation and frequency of watering.

N4 BMP maintenance: BMP implementation, operation, and maintenance is described with each BMP Narrative in this section and in Section V, Inspection and Responsibility for BMPs.

N11 Common Area Litter Control: The owner will be responsible for implementing trash management and litter control procedures in all areas of the site to reduce pollution of drainage water. The owner may employ a contractor (possibly the landscape maintenance crew) to implement these procedures on a regular basis. Essential tasks will include daily inspection of trash in paved and unpaved areas, and noting trash disposal violations by employees, contractors, etc. If violations occur, employees, contractors, etc. will be notified by the owner, and further education will be provided.

N12 Employee Training: Practical informational materials and/or training are provided to employees to increase their understanding of stormwater quality, sources of pollutants, and their responsibility for reducing pollutants in stormwater.

Explanation/Description: Education program (See N1) will be provided by the owner to employees to increase their understanding of stormwater quality and responsibility to reduce pollutant discharge into stormwater.

N14 On-site Catch Basin and Inlet Inspection: The area drain lines must be inspected and if necessary, cleaned (when over 40% full), repaired or replaced prior to the start of each rainy season (no later than October 15th of each year). Silt, debris, and any other obstruction are to be removed from the bottom of atrium inlets once every three months, within five days prior to October 15th and after every storm event. The owner may employ a contractor (possibly the landscape maintenance crew) to implement these procedures on a regular basis.

N15 Drive Aisle and Parking Area Sweeping: Drive aisles and parking areas will be swept clean every two weeks and once within five days prior to Oct. 15th. It is prohibited for street sweepers to sweep debris into storm drain inlets or vegetated swales.

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if Structural source controls were not used.

Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No slopes or channels
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	
S6	Dock areas	☒	☐	
S7	Maintenance bays	☐	☒	No maintenance bays
S8	Vehicle wash areas	☐	☒	No vehicle wash areas
S9	Outdoor processing areas	☐	☒	No outdoor processing areas
S10	Equipment wash areas	☐	☒	No equipment wash areas
S11	Fueling areas	☐	☒	No fueling areas
S12	Hillside landscaping	☐	☒	No hillsides
S13	Wash water control for food preparation areas	☐	☒	No food preparation areas
S14	Community car wash racks	☐	☒	No community car wash racks

The following structural BMPs are proposed for source control and reduction/elimination of pollutants: **(See WQMP Site Plan in Section VI)**

Provide storm drain system labeling and signage: Phrase "No Dumping – Drains to Ocean" or equally effective phrase to be labeled on grate and drain inlets to alert the public to the destination of pollutants discharged into storm water. The owner shall decide if the label will be painted stencil, concrete etching, thermoplastic, ceramic tile, metal plaques, or equally effective alternative. The owner will inspect all inlets every three months for legibility. The label shall be replaced if broken or illegible. Markers shall be re-stenciled at a minimum once every five years.

Use efficient irrigation systems & landscape design: The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the storm drain system. The following methods have been implemented to reduce excessive irrigation runoff:

• Employment of irrometer devices (moisture sensors) to prevent irrigation after precipitation.
• The use of flow sensors and master control valves to shut down valve when triggered by a pressure drop. This shut down will control water loss in the event of broken sprinkler heads or lines.
• The irrigation application method considered shall be a drip system. A drip irrigation system is buried under the soil, which eliminates runoff and wind misting and minimizes water loss due to evaporation.
• The timing of irrigation water shall be designed at short repeat cycles to further eliminate irrigation water runoff and to minimize erosion, due to saturated soil.
• Although no native or drought-tolerant plants will be used, the plants used have low to medium water requirements and are appropriate for the climate of the area.
• Mulch is used in planter areas to minimize sediment in runoff.

The procedures for irrigation system and landscape maintenance and inspection are described in Section V, Operations and Maintenance Plan (N3). The irrigation system shall be inspected weekly in conjunction with maintenance activities.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td>☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits
(if applicable)</td><td colspan="4">Not applicable</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

Not applicable

Section V Inspection/Maintenance Responsibility for BMPs

Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
INF-3: Biofiltration with no Underdrain	Property owner	Inspection of drainage inlets and swales for clogging and to ensure drainage system is working as designed. Accumulated litter and sediment shall be removed immediately.	Minimum quarterly per year, before and after rainy season.
N1: Education for Property Owners, Tenants and Occupants	Property owner	Miracle Mile Properties Inc. will provide employees and contractors with educational materials regarding water quality protection. All employees and contractors must be trained and aware of the Water Quality Management Plan. Each employee and contractor will sign off on a handbook receipt indicating they have read and are aware of the document.	Upon initial hiring and orientation of employees and contractors, and annually thereafter.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N2. Activity Restrictions	Property owner	Miracle Mile Properties will provide restrictions to all employees, contractors, tenants, etc. on activities that contribute to stormwater pollution. Property owners, employees, contractors, etc. must be trainedand aware of activity restrictions. Each property owner,employee contractor, etc. will sign off on a Handbook Receiptindicating they have read and are aware of the document.	Property owner, contractor, employees, etc. will receive a list of activity restrictions on start date and annually thereafter.
N3. Common Area Landscape Management	Property owner and their landscape maintenance crew	Manage landscaping in accordance with the State of California Conservation in Landscaping Act of 1990 (Model Water Efficient Landscape Ordinance), with management guidelines for use of fertilizers and pesticides (DAMP Appendix F), and with the IGCMP.	Weekly during regular maintenance.
N4. BMP Maintenance	Property owner and their landscape maintenance crew	This Matrix is BMP N4	
N11. Common Area Litter Control	Property owner and their landscape maintenance crew	Litter collection within landscape areas and outside walkways. Daily inspection of trash receptacles to ensure that lids are closed and any trash on the grounds	Daily
N12. Employee Training: See N1, apply to Employees	Property owner		

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N14. Common Area Catch Basin and Inlet Inspection	Property owner and their landscape maintenance crew	Inspect and clean to clean debris and silt in bottom of catch basins, inlets and pipes.	Once every three months; once within five days prior to October 15th (beginning of rainy season); and after every storm event.
N15. Street Sweeping Private Streets and Parking Lots	Property owner and their landscape maintenance crew	Stormwater pollution prevention includes street sweeping of streets and parking lots.	Every two weeks, and once within five days prior to October 15th
S1. Provide storm drain system stenciling and signage	Property owner and their landscape maintenance crew	Maintain the legibility of markers.	Inspected every three months for legibility. Markers will be restenciled at minimum once every five years.
S4. Common Area Efficient Irrigation	Property owner and their landscape maintenance crew	Design Landscaping and Irrigation to protect stormwater quality. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures.	Weekly in conjunction with maintenance activities.

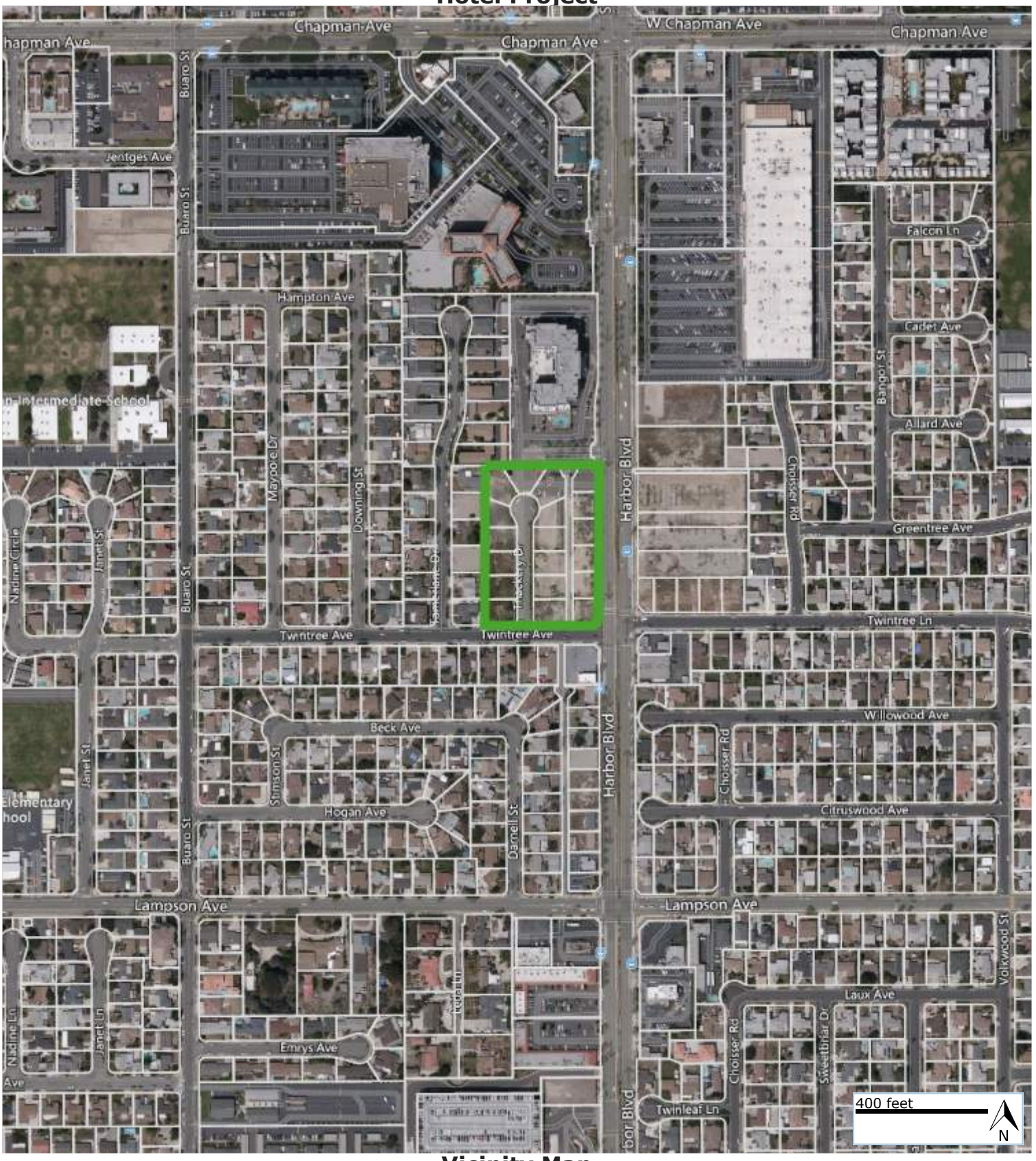
Section VI Site Plan and Drainage Plan

VI.1 SITE PLAN AND DRAINAGE PLAN

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Drainage connections
- BMP details

GG-SITE B-2
Hotel Project



Vicinity Map

PSOMAS

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SUBJECT TO FURTHER REVISION

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

LOS ANGELES COUNTY
ORANGE COUNTY

LEGEND

City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

P:\95226E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\95226E_FigureXVI-2a_HydroSoils_20110215.mxd

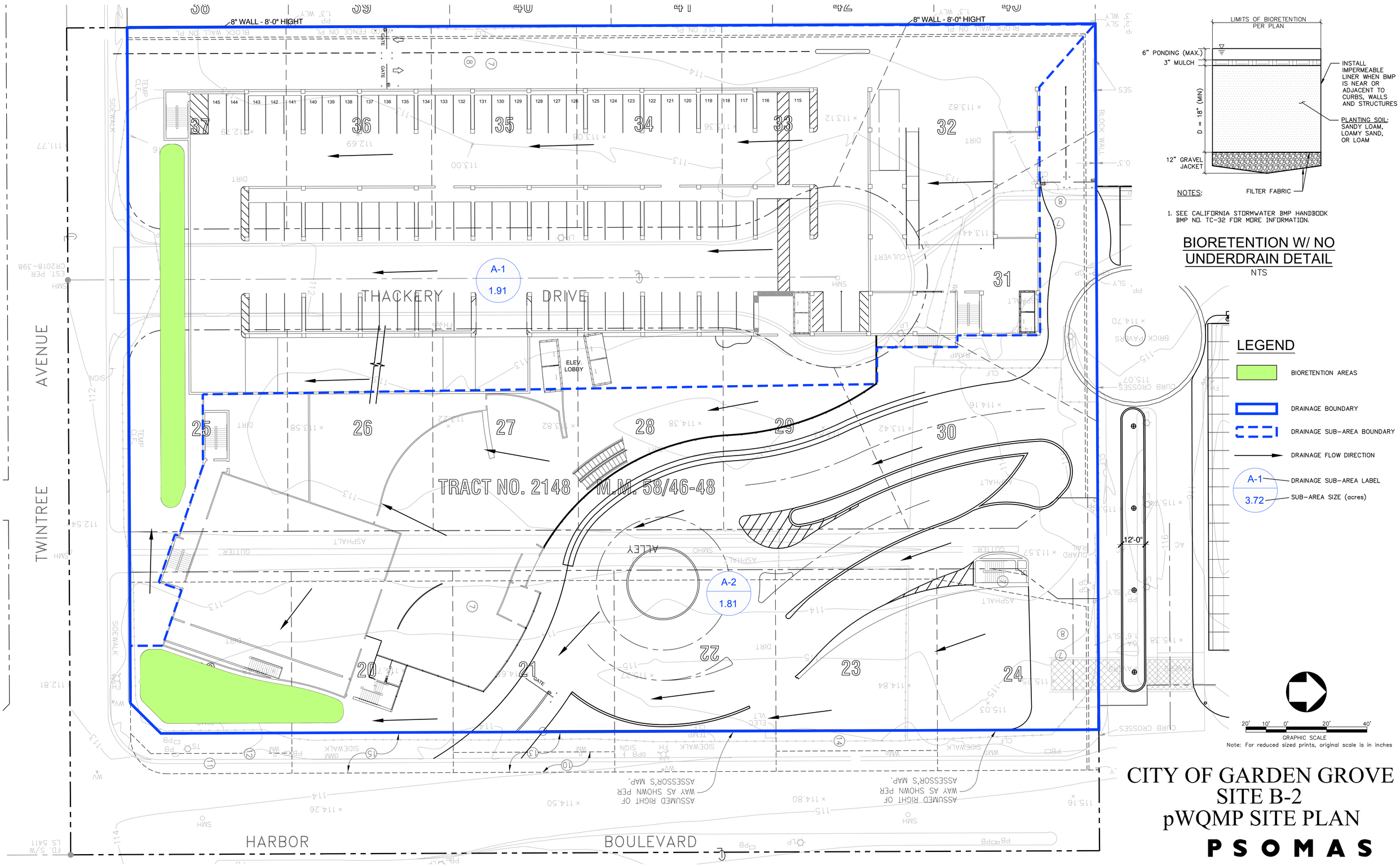
TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	95226-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a



NOTES:

1. SEE CALIFORNIA STORMWATER BMP HANDBOOK BMP NO. TC-32 FOR MORE INFORMATION.

BIORETENTION W/ NO UNDERDRAIN DETAIL

NTS

Note: For reduced sized prints, original scale is in inches

CITY OF GARDEN GROVE
SITE B-2
pWQMP SITE PLAN

PSOMAS

DATE: 02-07-2022 REVISED ON:
JOB No: 2AEC012100

SHEET 1 OF 1

Feb 07, 2022 - 6:13PM - M:\2AEC012100\ENGR\REPORTS\PRELIMINARY WQMP\EXHIBITS\WQMP SITE PLAN.DWG

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05 1.1

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

TITLE: RAINFALL ZONES

JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-1

P:\9526E\16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

Pacific Ocean

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

ORANGE COUNTY
INFILTRATION STUDY

JOB
ORANGE CO.

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

CA

PACE
Advanced Water Engineering

FIGURE
XVI-2d

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

- Earth (Unstable)
- Earth (Stabilized)
- Stabilized

Tidel Influence

- <= Mean High Water Line (4.28')

Water Body

- Basin
- Dam
- Lake
- Reservoir

Forest Areas

- Cleveland National Forest

Federal Lands

- Amarus Salt Marsh

San Gabriel-Coyote Creek Watershed

San Bernardino County

Riverside County

South Orange County

Newport Bay Watershed

AnaheimBay-HuntingtonHarbor Watershed

Carbon Canyon

Yorba Linda Reservoir

Miller Retarding Basin

Anaheim Lake

Warner Basin

Kraemer Basin

Olive Hills

Fletcher Retarding Basin

Walnut Canyon Reservoir

Villa Park Dam

Peters Canyon Reservoir

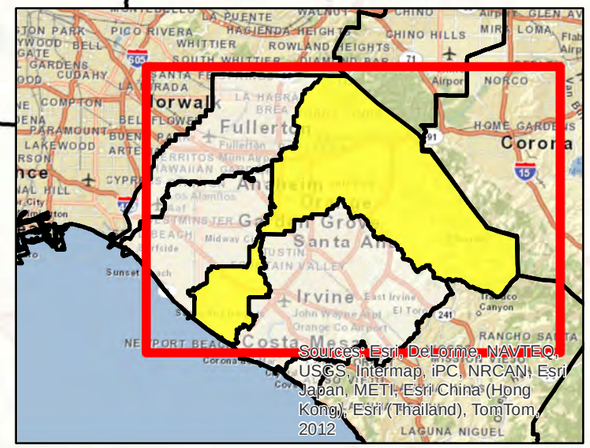
Irvine Lake

Cleveland National Forest

Stabilized by Grade Control Structure

SOUTHPARK PUMP STATION

Bartlett Retarding Basin



0 12,000 24,000 Feet

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

TITLE: SUSCEPTIBILITY ANALYIS SANTA ANA RIVER

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING ORANGE CO. CA

SCALE	DESIGNED	DRAWING	CHECKED	DATE	JOB NO.
1" = 12000'	TH	TH	BMP	04/30/10	9526-E

PACE Advanced Water Engineering

FIGURE 3

P:\9526E\6-GIS\Mxds\SuceptibilityMaps_20100505\9526E_SantaAnaRiverSuscepitibility_20100430.mxd

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

*Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in **Appendix XI.2**.*

BIO-1: Bioretention with Underdrains

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*



Bioretention
Source: Geosyntec Consultants

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. **Bioretention must be designed without an underdrain** in areas of high soil permeability.

Feasibility Screening Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), **bioinfiltration facilities**, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.

☐ The minimum soil depth is 2 feet (3 feet is preferred).

☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.

☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.

☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.

☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media

☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible

☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.

☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).

☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).

☐ An overflow device is required at the top of the bioretention area ponding depth.

☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.

☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/ft

Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [$((K_{MEDIA} \times T_{ROUTING})/12)$, d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See **Appendix III.3.3**) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

A = Design Volume / d_p

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf**
- SMC LID Manual (pp 68): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 7): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**

INF-5: Drywell

Also known as:

- *Soakaway Pits*
- *Infiltration Sumps*
- *Rock Sumps*
- *Underground Injection Controls*



Drywell
Source: K&A Enterprises

Drywells are similar to infiltration trenches in their design and function, but generally have a greater depth to footprint area ratio and can be installed at relatively large depths. A drywell is a subsurface storage facility designed to temporarily store and infiltrate runoff, primarily from rooftops or other impervious areas with low pollutant loading. A drywell may be either a small excavated pit filled with aggregate or a prefabricated storage chamber or pipe segment. Drywells can be used to reduce the volume of runoff from roofs and other relatively clean surfaces. While roofs are generally not a significant source of stormwater pollutants, they can be a major contributor of runoff volumes. Therefore, drywells can indirectly enhance water quality by reducing the water quality design volume that must be treated by other, downstream stormwater management facilities. *Note: A drywell is considered a "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program regulated in California by U.S. EPA Region 9. A UIC permit may be required (for details see http://www.epa.gov/region9/water/groundwater/uic-classv.html).*

Feasibility Screening Considerations

- Drywells shall pass infiltration infeasibility screening criteria (**TGD Section 2.4.2.4**) to be considered for use.
- Dry wells provide a more direct pathway for stormwater to groundwater, therefore pose a greater risk to groundwater quality than surface infiltration systems.

Opportunity Criteria

- Drywells may be used to infiltrate roof runoff, either directly or from the overflow from a cistern.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Space available for pretreatment (biotreatment or treatment control BMP as described below).
- The drywell must be located in native soil; over-excavated by at least one foot in depth and replaced uniformly without compaction.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.

OC-Specific Design Criteria and Considerations

☐ Must comply with local, state, and federal UIC regulations; a permit may be required.

☐ Minimum set-backs from foundations and slopes should be observed

- ☐ Infiltration should not cause geotechnical concerns related to slope stability, liquefaction, or erosion.
- ☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.
- ☐ Drywells should not receive untreated stormwater runoff, except rooftop runoff. Pretreatment of runoff from other surfaces is necessary to prevent premature failure that results from clogging with fine sediment, and to prevent potential groundwater contamination due to nutrients, salts, and hydrocarbons.
- ☐ Design infiltration rate should be determined with an infiltration test at each drywell location.
- ☐ Drywell should be encased by 1 foot of coarse (3/4" to 2 ½"), round river rock on sides and bottom of facility.
- ☐ Maximum facility depth is 25 feet with the approval of a geotechnical professional; preferred depth less than 10 feet does not require geotechnical approval.
- ☐ If inlet is an underground pipe, a fine mesh screen should be installed to prevent coarse solids from entering drywell.
- ☐ An overflow route must be installed for flows that overtop facility.

Sizing Criteria for Drywells

Drywell sizing is highly site-specific. Sizing calculations shall demonstrate via the methods described in **Appendix III** or via project-specific methods that the system captures and fully discharges the DCV within 48 hours following the end of precipitation, or captures and infiltrates 80 percent of average annual runoff volume.

Configuration for Use in a Treatment Train

- Drywells may be preceded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the drywell.
- Drywells treating any areas other than roof tops must be preceded by a robust biotreatment or conventional treatment capable of addressing all potentially generated pollutants.
- Drywells may be used in conjunction with other infiltration BMPs to increase the infiltration capacity of the entire treatment train system.

Additional References for Design Guidance

- Stormwater Management in Western Washington (Volume III: Hydrologic Analysis and Flow Control Design BMPs) **http://www.ecy.wa.gov/pubs/0510031.pdf**
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- City of Portland Stormwater Management Manual (Drywell, page 2-87) **http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883**
- San Diego County LID Handbook Appendix 4 (Factsheet 25): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**
- City of Santa Barbara Storm Water BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

Storm Drain Signage SD-13



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

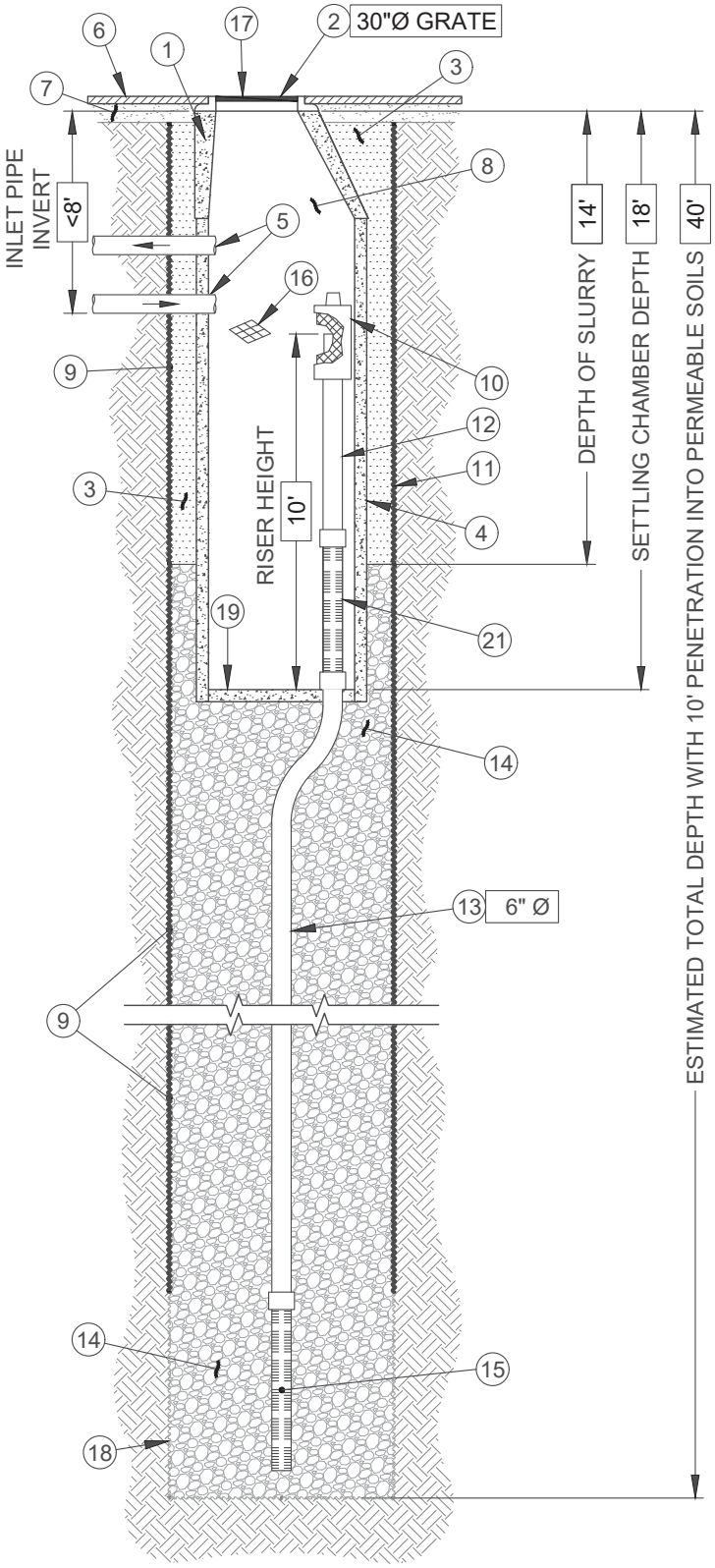
Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Luxury Apartments - DW1

Costa Mesa



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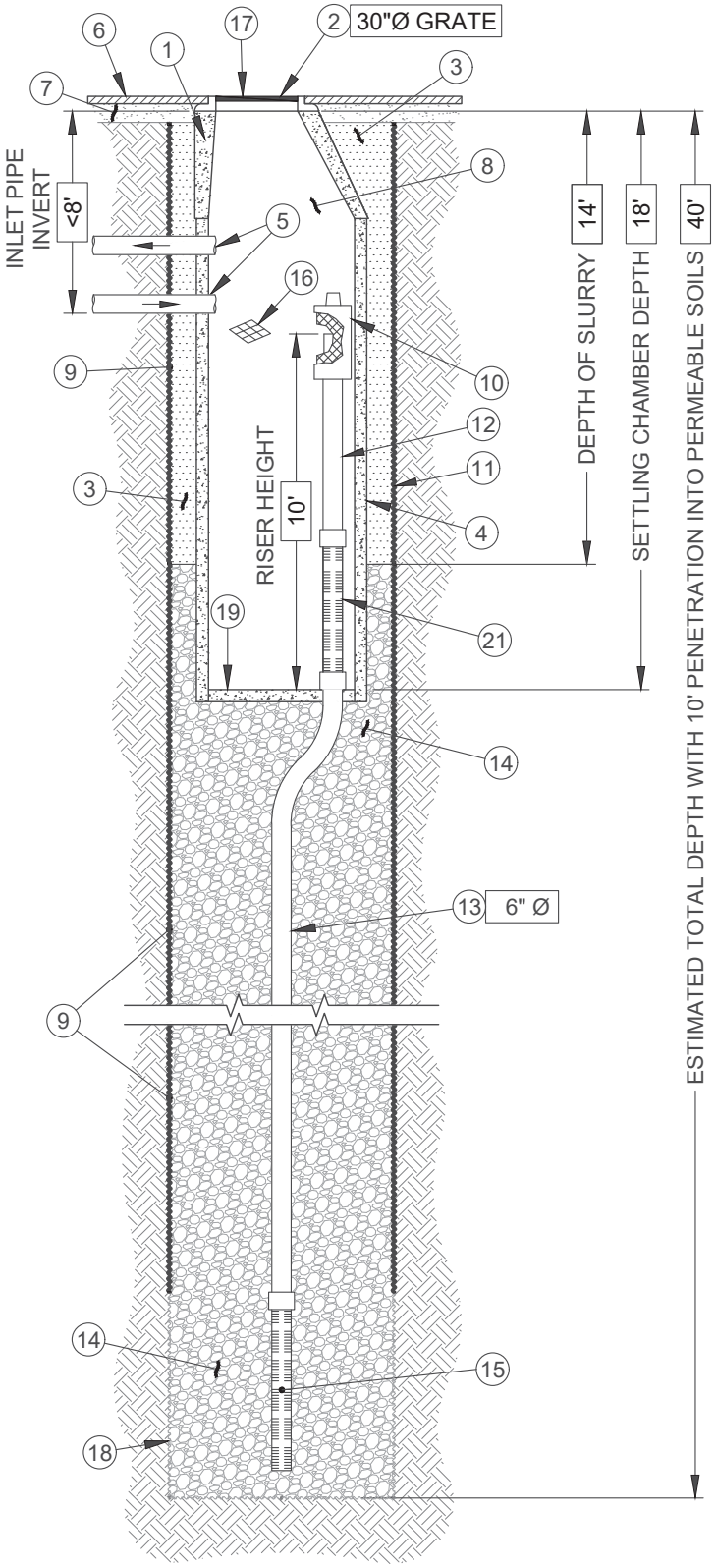
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DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Luxury Apartments - DW2

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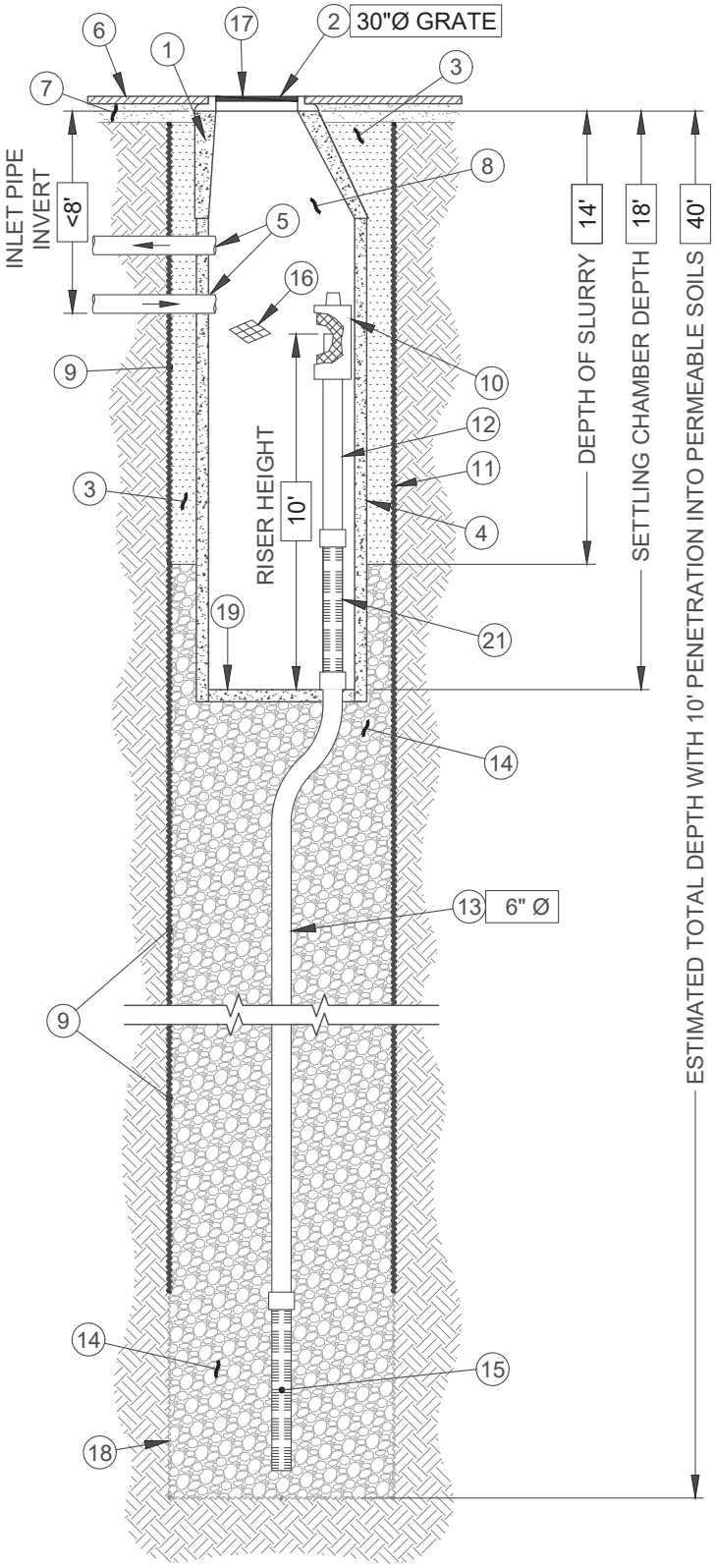
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The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Luxury Apartments - DW3

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Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. For the copy submitted to the Permittee, only attach the educational materials specifically applicable to the project. Other materials specific to the project may be included as well and must be attached.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☒		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☐		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

The Ocean Begins at Your Front Door



PROJECT Pollution PREVENTION

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.



For More Information

Orange County Stormwater Program

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form

w w w . o c w a t e r s h e d s . c o m



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Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

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Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

CENTRAL COUNTY

Used Oil Collection Centers

Balboa

Hill's Boat Service
814 E Bay Ave., Balboa, CA 92661
(949)675-0740( )
CIWMB#: 30-C-03538

Balboa Island

Island Marine Fuel
406 S Bay Front, Balboa Island, CA 92662
(949)673-1103( )
CIWMB#: 30-C-03728

Corona Del Mar

Corona Del Mar 76
2201 E. Pacific Coast Hwy., Corona Del Mar, CA 92625
(949)673-3320( )
CIWMB#: 30-C-06620

Corona Del Mar Chevron
2546 E. Coast Hwy., Corona Del Mar, CA 92625
(949)495-0774(14)
CIWMB#: 30-C-06424

Mobil (Harbor View)
2500 San Joaquin Hills Rd., Corona Del Mar, CA 92625
(949)640-4759( )
CIWMB#: 30-C-03363

Costa Mesa

AutoZone #5520
744 W. 19th St., Costa Mesa, CA 92627
(901)495-7159( )
CIWMB#: 30-C-05992

Big O Tires #5571
3181 Harbor Blvd., Costa Mesa, CA 92626
(949)443-4155( )
CIWMB#: 30-C-04676

Big O Tires #694
322 E. 17th St., Costa Mesa, CA 92627
(949)642-4131( )
CIWMB#: 30-C-05811

Coast General Performance
2855 Harbor Blvd., Costa Mesa, CA 92626
(714)540-5710( )
CIWMB#: 30-C-05916

Connell Chevrolet
2828 Harbor Blvd., Costa Mesa, CA 92626
(714)546-1200( )
CIWMB#: 30-C-06286

EZ Lube Inc #15
3599 Harbor Blvd., Costa Mesa, CA 92626
(714)966-1647( )
CIWMB#: 30-C-03137

EZ Lube Inc #46
400 E 17th St., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05779

EZ Lube Inc. #44
2248 Harbor Blvd., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05737

Firestone Store #71T7
475 E 17th St., Costa Mesa, CA 92627
(949)646-2444( )
CIWMB#: 30-C-02120

Jiffy Lube #1969
300 E 17th St., Costa Mesa, CA 92627
(949)548-2505( )
CIWMB#: 30-C-05553

Jiffy Lube #1970
2175 Newport Blvd., Costa Mesa, CA 92627
(949)548-4150( )
CIWMB#: 30-C-05554

Jiffy Lube #607
2255 Fairview Rd., Costa Mesa, CA 92627
(949)650-5823( )
CIWMB#: 30-C-05551

Jiffy Lube #861
375 Bristol St., Costa Mesa, CA 92626
(714)557-5823( )
CIWMB#: 30-C-05552

Kragen Auto Parts #0725
1739 Superior Ave., Costa Mesa, CA 92627
(949)642-3384( )
CIWMB#: 30-C-02624

Kragen Auto Parts #0796
1175 Baker Blvd., Unit E, Costa Mesa, CA 92626
(714)662-2005( )
CIWMB#: 30-C-02664

Nabers Cadillac
2600 Harbor Blvd., Costa Mesa, CA 92626
(714)444-5200( )
CIWMB#: 30-C-05051

Oil Stop Inc.
Oil Stop Inc. Costa Mesa, CA 92626
(714)434-8350( )
CIWMB#: 30-C-06293

Pep Boys #660
2946 Bristol St., Costa Mesa, CA 92626
(714)549-1533( )
CIWMB#: 30-C-03416

Plaza Chevron Service Center
3048 Bristol Costa Mesa, CA 92626
(714)545-4257( )
CIWMB#: 30-C-01123

Scher Tire Inc #15 dba Goodyear Tire
1596 Newport Blvd., Costa Mesa, CA 92627
(949)548-9384( )
CIWMB#: 30-C-03034

Fountain Valley

Firestone Store #7147
17975 Magnolia Ave., Fountain Valley, CA 92708
(714)842-3341( )
CIWMB#: 30-C-01219

Golden Shell
8520 Warner Ave., Fountain Valley, CA 92708
(714)842-7150( )
CIWMB#: 30-P-05002

Kragen Auto Parts #0734
9880 Warner Ave., Fountain Valley, CA 92708
(714)964-6427( )
CIWMB#: 30-C-02609

Kragen Auto Parts #1505
16147 Harbor Blvd., Fountain Valley, CA 92708
(714)531-8525( )
CIWMB#: 30-C-04125

Oil Can Henry's
9525 Warner Ave., Fountain Valley, CA 92708
(714)473-7705( )
CIWMB#: 30-C-05843

Purrfect Auto Service #10
16780 Harbor Blvd., Fountain Valley, CA 92708
(714)839-3899( )
CIWMB#: 30-C-01380

Huntington Beach

AutoZone #5528
6800 Warner Ave., Huntington Beach, CA 92647
(714)891-8211( )
CIWMB#: 30-C-04777

Bella Terra Car Wash
16061 Beach Blvd., Huntington Beach, CA 92647
(714)847-4924( )
CIWMB#: 30-C-06195

Big O Tires #553
19411 Beach Blvd., Huntington Beach, CA 92648
(714)536-7571( )
CIWMB#: 30-C-00970

Econo Lube N' Tune #26
19961 Beach Blvd., Huntington Beach, CA 92648
(714)536-6519( )
CIWMB#: 30-C-06117

Expertec Automotive
7680 Talbert Ave Suite A & B, Huntington Beach, CA 92648
(714)848-9222( )
CIWMB#: 30-C-05914

EZ Lube Inc #16
7361 Edinger Ave., Huntington Beach, CA 92647
(714)899-3600( )
CIWMB#: 30-C-03289

EZ Lube Inc. #79
9862 Adams St., Huntington Beach, CA 92647
(714)556-1312( )
CIWMB#: 30-C-06547

Firestone Store #71T5
16171 Beach Blvd., Huntington Beach, CA 92647
(714)847-6081( )
CIWMB#: 30-C-02118

Huntington Beach Car Wash
18971 Beach Blvd., Huntington Beach, CA 92648
(714)847-4924( )
CIWMB#: 30-C-05303

Jiffy Lube #1857
8971 Warner Ave., Huntington Beach, CA 92647
(714)596-7213( )
CIWMB#: 30-C-05053

Kragen Auto Parts #1468
10072 Adams Ave., Huntington Beach, CA 92646
(714)593-6156( )
CIWMB#: 30-C-04284

Kragen Auto Parts #1511
7171 Warner Ave., Huntington Beach, CA 92647
(714)842-4531( )
CIWMB#: 30-C-04129

Kragen Auto Parts #1633
18888 Beach Blvd., Huntington Beach, CA 92648
(714)965-2353( )
CIWMB#: 30-C-02645

Oilmax 10 Minute Lube/Wash
9862 Adams Ave., Huntington Beach, CA 92646
(714)964-7110( )
CIWMB#: 30-C-03219

Pep Boys #799
19122 Brookhurst St., Huntington Beach, CA 92646
(714)964-0777( )
CIWMB#: 30-C-03439

Quik Change Lube & Oil
5841 Warner Ave., Huntington Beach, CA 92649
(714)840-2331( )
CIWMB#: 30-C-03208

R Kids Tire and Service #6
5062 Warner Ave., Huntington Beach, CA 92647
(714)846-1189( )
CIWMB#: 30-C-05691

Saturn of Huntington Beach
18801 Beach Blvd., Huntington Beach, CA 92648
(714)841-5428( )
CIWMB#: 30-C-05221

USA Express Tire & Service Inc
7232 Edinger Ave., Huntington Beach, CA 92647
(714)842-0717( )
CIWMB#: 30-C-04429

Zito's Auto Care
19002 Magnolia St., Huntington Beach, CA 92646
(714)968-8788( )
CIWMB#: 30-C-03251

Irvine

Firestone Store #71W4
51 Auto Center Dr., Irvine, CA 92618
(949)829-8710( )
CIWMB#: 30-C-03689

Irvine City Auto Parts
14427 Culver Dr., Irvine, CA 92604
(949)551-5588( )
CIWMB#: 30-C-02186

Jiffy Lube #1856 Irvine Spectrum
8777 Irvine Center Dr., Irvine, CA 92618
(949)753-0485( )
CIWMB#: 30-C-06094

Jiffy Lube #1988
3080 Main St., Irvine, CA 92614
(714)961-5491(27)
CIWMB#: 30-C-04450

Kragen Auto Parts #4174
15315 Culver Dr., Ste.#170, Irvine, CA 92604
(602)631-7115( )
CIWMB#: 30-C-06417

Newport Beach

Jiffy Lube #2811
1520 W Coast Hwy., Newport Beach, CA 92663
(949)764-9255( )
CIWMB#: 30-C-05629

Newport Landing Fuel Dock
503 E Edgewater Newport Beach, CA 92661
(949)673-7878( )
CIWMB#: 30-C-03628

Orange

AutoZone #5942
1330 N. Glassell Orange, CA 92867
(714)538-4551( )
CIWMB#: 30-C-04553

Big O Tires #570
1825 E Katella Ave., Orange, CA 92867
(714)538-0016( )
CIWMB#: 30-C-00974

David Wilsons Ford of Orange
1350 W Katella Ave., Orange, CA 92867
(714)633-6731( )
CIWMB#: 30-C-02341

EZ Lube #74
3232 Chapman Ave. #E, Orange, CA 92869
(714)556-1312(106)
CIWMB#: 30-C-06627

Firestone Store #7185
1690 N Tustin Ave., Orange, CA 92867
(714)282-8144( )
CIWMB#: 30-C-0122

Jiffy Lube #1457
433 W. Katella Ave., Orange, CA 92867
(714)720-5757( )
CIWMB#: 30-C-06280

Kragen Auto Parts #1764
910 Tustin St., Orange, CA 92867
(714)771-3000( )
CIWMB#: 30-C-02625

Managed Mobile, Inc.
1030 N Batavia St., #B, Orange, CA 92867
(714)400-0250( )
CIWMB#: 30-C-05776

Pep Boys #806
215 E Katella Ave., Orange, CA 92867
(714)997-1540( )
CIWMB#: 30-C-01759

Santiago Hills Car Care
8544 East Chapman Ave., Orange, CA 92869
(714)919-1060( )
CIWMB#: 30-C-05622

Scher Tire #33
1821 E. Katella Ave., Orange, CA 92867
(909)343-3100( )
CIWMB#: 30-C-06324

Tabassi Shell Service Station
830 E Katella Ave., Orange, CA 92867
(714)771-6990( )
CIWMB#: 30-C-00552

The Tune-up Center
193 S Main St., Orange, CA 92868
(714)633-1876( )
CIWMB#: 30-C-02091

Tony's Fuel and Towing
1650 W La Veta Ave., Orange, CA 92868
(714)953-7676( )
CIWMB#: 30-C-00868

Truck Lubrication Company
143 S. Pixley Orange, CA 92868
(714)997-7730( )
CIWMB#: 30-C-06001

Santa Ana

All Phase Environmental
910 E. Fourth St., Santa Ana, CA 92701
(714)731-5995( )
CIWMB#: 30-C-06116

Archie's Tire & Towing
4518 Westminster Ave., Santa Ana, CA 92703
(714)636-4518( )
CIWMB#: 30-C-02058

AutoZone #3320
2007 S. Main St., Santa Ana, CA 92707
(901)495-7217( )
CIWMB#: 30-C-06508

AutoZone #5232
430 W 17th Santa Ana, CA 92706
(714)547-7003( )
CIWMB#: 30-C-04609

AutoZone #5538
1101 S Bristol Santa Ana, CA 92704
(714)241-0335( )
CIWMB#: 30-C-00829

Big O Tires
1211 W. Warner Ave., Santa Ana, CA 92707
(714)540-8646( )
CIWMB#: 30-C-04679

Big O Tires #712
1302 E. 17th St., Santa Ana, CA 92705
(714)541-6811( )
CIWMB#: 30-C-05813

Firestone Store #7175
3733 S Bristol Santa Ana, CA 92704
(714)549-4015( )
CIWMB#: 30-C-01223

Firestone Store #71TA
101 S Main St., Santa Ana, CA 92701
(714)542-8857( )
CIWMB#: 30-C-02123

Firestone Store #71W6
2005 N Tustin Ave., Ste A, Santa Ana, CA 92705
(714)541-7977( )
CIWMB#: 30-C-03688

Guaranty Chevrolet Motors Inc.
711 E 17th St., Santa Ana, CA 92701
(714)973-1711(277)
CIWMB#: 30-C-06506

Jiffy Lube #1303
2025 N. Tustin Santa Ana, CA 92701
(714)720-5757( )
CIWMB#: 30-C-06283

John's Mobil
1465 S Main St., Santa Ana, CA 92707
(714)835-3266( )
CIWMB#: 30-C-00578

Kragen Auto Parts #0736
1302 E 17th St., Santa Ana, CA 92705
(714)953-6061( )
CIWMB#: 30-C-02610

Kragen Auto Parts #1253
1400 W Edinger Ave., Santa Ana, CA 92704
(714)754-1432( )
CIWMB#: 30-C-02627

Kragen Auto Parts #1376
521 W 17th St., Santa Ana, CA 92706
(714)543-4492( )
CIWMB#: 30-C-03901

Kragen Auto Parts #1516
2337 S Bristol Ave., Santa Ana, CA 92704
(714)557-0787( )
CIWMB#: 30-C-04106

Kragen Auto Parts #1648
1015 S Main St., Santa Ana, CA 92701
(714)568-1570( )
CIWMB#: 30-C-05664

Pep Boys #609
120 E 1st St., Santa Ana, CA 92701
(714)547-7477( )
CIWMB#: 30-C-01738

Pep Boys #802
1107 S Harbor Blvd., Santa Ana, CA 92704
(714)775-0828( )
CIWMB#: 30-C-01739

Purrfect Auto Service
2519 S Main St., Santa Ana, CA 92707
(714)549-7900( )
CIWMB#: 30-C-02085

Saturn of Santa Ana
1350 Auto Mall Dr., Santa Ana, CA 92705
(714)648-2444( )
CIWMB#: 30-C-05222

Scher Tire #28
1805 N Grand Ave., Santa Ana, CA 92705
(714)558-8644( )
CIWMB#: 30-C-03225

Tustin

Big O Tires #555
131 E 1st St., Tustin, CA 92780
(714)544-9431( )
CIWMB#: 30-C-00972

EZ Lube #42
12972 Newport Ave., Tustin, CA 92780
(714)556-1312( )
CIWMB#: 30-C-06408

Jiffy Lube #1406
3087 Edinger Ave., Tustin, CA 92780
(949)651-8814( )
CIWMB#: 30-C-03778

Kragen Auto Parts #1533
502 B E 1st St., Tustin, CA 92780
(714)544-9249( )
CIWMB#: 30-C-04128

Scher Tire Inc #17 dba Goodyear Tire
14511 Redhill Ave., Tustin, CA 92780
(714)832-6011( )
CIWMB#: 30-C-03035

Villa Park

Phil's Villa Park 76
17771 Santiago Blvd., Villa Park, CA 92861
(714)637-0854( )
CIWMB#: 30-C-06579

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program
24 Hour Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health
(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board
Santa Ana Region (951) 782-4130
San Diego Region (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services
(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

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Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities



Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION

www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

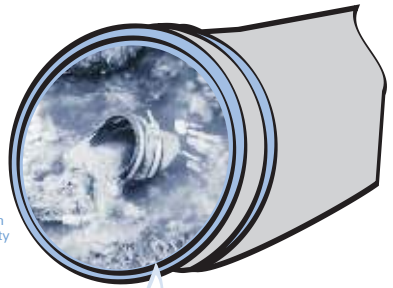
Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.



Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

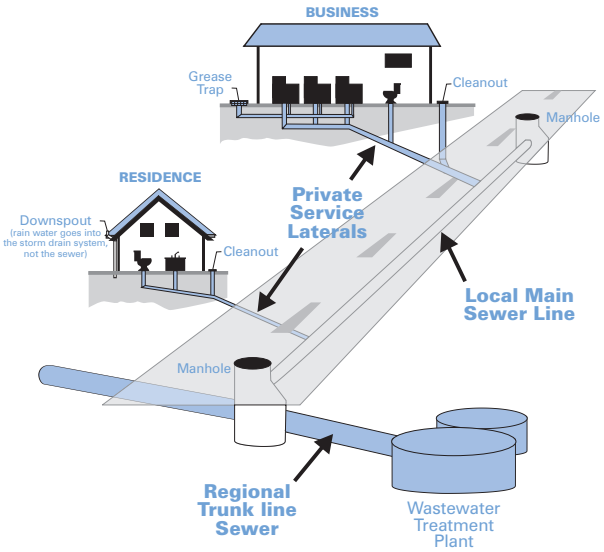
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1. **Never put grease down garbage disposals, drains or toilets.**
2. **Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
3. **Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**



Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.



Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550



Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455)**.**

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.



- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.



- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com



Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

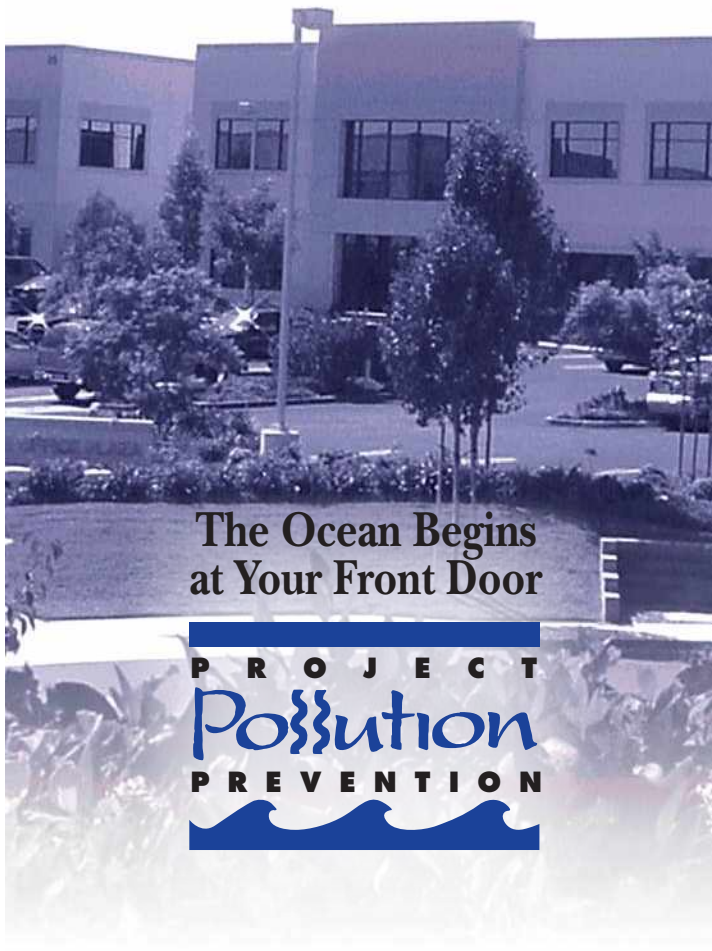
For emergencies, dial 911.

RECYCLE USED OIL

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Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

Never Dispose of Anything in the Storm Drain.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

GEOTECHNICAL INVESTIGATION

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND
TWINTREE LANE
GARDEN GROVE, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

KAM SANG COMPANY, INC.
ARCADIA, CALIFORNIA

PROJECT NO. A9839-88-01

AUGUST 15, 2018

Project No. A9839-88-01
August 15, 2018

Mr. John Hicks
Kam Sang Company, Inc.
411 East Huntington Drive, Suite 305
Arcadia, California 91006

Subject: GEOTECHNICAL INVESTIGATION
PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

Dear Mr. Hicks:

In accordance with your authorization of our revised proposal dated June 29, 2018, we have performed a geotechnical investigation for the proposed hotel development located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed, provided the recommendations of this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

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(EMAIL) Addressee

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed hotel development located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate subsurface soil and geologic conditions underlying the site and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included review of a previous geotechnical report, a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on July 20, 2018, by excavating three 8-inch diameter borings to depths of approximately 40½ and 75½ feet below the existing ground surface utilizing a truck-mounted hollow-stem auger drilling machine. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2A). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analyses of the data obtained during our investigation, as well as the data obtained during the previous investigations by Cal Land Engineering, Inc., and our experience with similar soil and geologic conditions. The prior investigation is summarized in Section 3, Background Review. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located northwest of Harbor Boulevard and Twintree Lane in the City of Garden Grove, California. The site is approximately 9.55 acres and currently consists of vacant land and a combination of single- and multi-family residential housing. The site is bounded by Harbor Boulevard to the east, two 7- to 8-story hotel structures and associated paved parking areas to the north, Twintree Lane to the south, and residential structures to the west. The site is relatively level. Surface water drainage at the site appears to be by sheet flow along the existing ground contours to the city streets. Vegetation is not present within the majority of the southern portion of the site. However, within the residential portion of the site, vegetation consists of grass, trees, and shrubs typical of residential landscaping.

Based on the information provided by the Client, It is our understanding that the proposed project consists of an 18-story hotel tower with a roof deck; a 16-story hotel tower; an 8-story timeshare tower; and parking structures. The proposed hotel complex will include on-grade structures and also two levels of subterranean space extending to depths of up to 25 feet below the ground surface. The proposed development is depicted on the Site Plan (see Figure 2A).

Based on the preliminary nature of the design at this time, wall and column loads were not available. It is estimated that wall loads may be up to 20 kips per linear foot and column loads may be up to 2,000 kips.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. BACKGROUND REVIEW

We reviewed a prior report for the existing Sheraton Hotel (see Site Plan, Figure 2A) provided to us by the Client:

1) *Geotechnical Report, Proposed Hotel Development, Corner of Harbor Boulevard and Twin Tree Avenue, Garden Grove, California*, prepared by Cal Land Engineering, Inc., dated June 14, 2005.

The prior geotechnical investigation prepared in 2005 by Cal Land Engineering, Inc. (Cal Land) included the excavation and logging of seven borings. The borings were excavated to a maximum depth of 51½ feet below the ground surface and encountered loose to medium dense silty sand to a depth of approximately 4 to 5 feet. These materials were underlain by medium dense, fine-grained silty sand and poorly graded sand to depths of approximately 38 to 40 feet that were in turn underlain by stiff clayey silt to the maximum depth explored. Groundwater was not encountered in the borings drilled as part of this investigation.

Geocon West, Inc. has reviewed the referenced report by Cal Land Engineering, Inc. and the recommendations presented herein are based on analysis of the subsurface and laboratory data obtained from these prior investigations as well as our own subsurface and laboratory data. Furthermore, we assume responsibility for the utilization of the exploration and laboratory data presented within the reports by Cal Land Engineering, Inc. A copy of the prior report is provided in Appendix C.

4. GEOLOGIC SETTING

The subject site is located within the south-central portion of the Orange County Coastal Plain, a relatively flat-lying alluviated surface with an average slope of less than 20 feet per mile. The lowland surface is bounded by hills and mountains on the north and east, and by the Pacific Ocean to the south and southwest (California Department of Water Resources [CDWR], 1967). Prominent structural features within the Orange County Coastal Plain include the central lowland plain, the northwest trending line of low hills and mesas along the coast underlain by the Newport-Inglewood Fault Zone, and the San Joaquin Hills to the southeast (CDWR, 1967). The northwest-trending Newport-Inglewood Fault Zone is located approximately 7.4 miles to the south-southwest (California Division of Mines and Geology [CDMG], 2012).

5. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and Holocene age alluvium (California Geological Survey [CGS], 2012). Detailed stratigraphic profiles of the materials encountered at the site are provided on the boring logs in Appendix A.

5.1 Artificial Fill

Artificial fill was encountered in our field explorations to a maximum depth of 2 feet below existing ground surface. The fill generally consists of brown silty sand and is characterized as fine-grained, dry to slightly moist and loose to medium dense. The fill is likely the result of past grading or construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

5.2 Alluvium

Holocene age alluvium was encountered beneath the fill to the maximum depth explored. The alluvium generally consists of interbedded poorly graded sand, sand with silt, silty sand, sandy silt, and silt. Clay was encountered below a depth of 42 feet beneath the existing ground surface. The alluvium is characterized as slightly moist to wet and loose to very dense or soft to hard.

6. GROUNDWATER

Based on a review of the Seismic Hazard Zone Report for the Anaheim and Newport Beach Quadrangles (CDMG, 1997, revised 2001), the historically highest groundwater level in the area is approximately 30 feet beneath the existing ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s.

Groundwater was encountered in boring B1 at a depth of 62.5 feet below the existing ground surface. Groundwater was not encountered in the previous borings drilled at the site by Cal Land in 2005 to a maximum depth of 51½ feet beneath the existing ground surface. Considering the historic high groundwater levels in the site vicinity, the depth to groundwater encountered in our boring and the borings adjacent to the site, and the depth of proposed construction, groundwater is neither expected to be encountered during construction, nor have a detrimental effect on the project. However, groundwater seepage may be encountered during construction. It is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed (especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall), groundwater seepage levels encountered during construction may be actually higher than those encountered during our investigation. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (See Section 8.26).

7. GEOLOGIC HAZARDS

7.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (CGS, 2018a). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 17,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a state-designated Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards (CGS, 2018b). No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults. The faults in the vicinity of the site are shown in Figure 3, Regional Fault Map.

Nearby active faults include the Newport-Inglewood Fault Zone, the Whittier Fault, the Chino Fault, the Elsinore Fault, and the Palos Verdes Fault (offshore segment) located approximately 7.4 miles south-southwest, 10½ miles northeast, 17 miles northeast, 18 miles east-northeast, and 19 miles southwest of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 42 miles northeast of the site (Ziony and Jones, 1989).

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin, including Orange County, at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3.0 kilometers. The October 1, 1987, M_w 5.9 Whittier Narrows earthquake and the January 17, 1994, M_w 6.7 Northridge earthquake were a result of movement on the Puente Hills Blind Thrust and the Northridge Thrust, respectively. The San Joaquin Hills Blind Thrust underlies the San Joaquin Hills and is located approximately 5 miles south-southeast of the site. This thrust fault and others in the Southern California area are not exposed at the surface and do not present a potential surface fault rupture hazard at the site; however, these deep thrust faults are considered active features capable of generating future earthquakes that could result in moderate to significant ground shaking at the site.

7.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 4, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto-Hemet area	April 21, 1918	6.8	53	E
Near Redlands	July 23, 1923	6.3	41	ENE
Long Beach	March 10, 1933	6.4	12	SSW
San Fernando	February 9, 1971	6.6	105	NW
Whittier Narrows	October 1, 1987	5.9	51	NW
Sierra Madre	June 28, 1991	5.8	21	NW
Landers	June 28, 1992	7.3	33	NNW
Big Bear	June 28, 1992	6.4	89	ENE
Northridge	January 17, 1994	6.7	69	ENE
Hector Mine	October 16, 1999	7.1	46	NW

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

7.3 Seismic Design Criteria

The following table summarizes summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the computer program *U.S. Seismic Design Maps*, provided by the USGS. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.474g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.537g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.0	Table 1613.3.3(1)
Site Coefficient, F_V	1.5	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.474g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.806g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.983g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.537g	Section 1613.3.4 (Eqn 16-40)

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10.

ASCE 7-10 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.531g	Figure 22-7
Site Coefficient, F_{PGA}	1.0	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.531g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2016 California Building Code and ASCE 7-10, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain "Life Safety" during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS online Unified Hazard Tool, 2008 Conterminous U.S. Dynamic edition. The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.54 magnitude event occurring at a hypocentral distance of 16.23 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.6 magnitude occurring at a hypocentral distance of 22.82 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California" and "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

The State of California Seismic Hazard Zone Map for the Anaheim Quadrangle (CDMG, 1998) indicates that the site is located in an area designated as having a potential for liquefaction. In addition, the City of Garden Grove Safety Element (2008) indicates that the site is located within an area identified as having a potential for liquefaction.

Liquefaction analysis of the soils underlying the site was performed using an updated version of the spreadsheet template LIQ2_30.WQ1 developed by Thomas F. Blake (1996). This program utilizes the 1996 NCEER method of analysis. This semi-empirical method is based on a correlation between values of Standard Penetration Test (SPT) resistance and field performance data.

Screening criteria developed by Bray and Sancio (2006) characterize fine-grained soils which are not susceptible to liquefaction as soils with a plasticity index (PI) that is greater than 18 or with a saturated moisture content that is less than 80 percent of the liquid limit. In order to apply the screening criteria, laboratory testing was performed to evaluate the Atterberg Limits and saturated moisture content of select soil samples. Laboratory test results used for the screening criteria are presented as Figure B7.

The liquefaction analysis was performed for a Design Earthquake level by using a historic high groundwater table of 30 feet below the ground surface, a magnitude 6.6 earthquake, and a peak horizontal acceleration of 0.354g ($⅔PGA_M$). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 0.3 inches of total settlement during Design Earthquake ground motion (see enclosed calculation sheets, Figures 5 and 6).

It is our understanding that the intent of the Building Code is to maintain "Life Safety" during Maximum Considered Earthquake level events. Therefore, additional analysis was performed to evaluate the potential for liquefaction during a MCE event. The structural engineer should evaluate the proposed structure for the anticipated MCE liquefaction induced settlements and verify that anticipated deformations would not cause the foundation system to lose the ability to support the gravity loads and/or cause collapse of the structure.

The liquefaction analysis was also performed for the Maximum Considered Earthquake level by using a historic high groundwater table of 30 feet below the ground surface, a magnitude 6.54 earthquake, and a peak horizontal acceleration of 0.531g (PGA_M). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 2.6 inches of total settlement during Maximum Considered Earthquake ground motion (see enclosed calculation sheets, Figures 7 and 8).

7.5 Seismically Induced Settlement

Dynamic compaction of dry and loose sands may occur during a major earthquake. Typically, settlements occur in thick beds of such soils. The seismically induced settlement calculations were performed in accordance with the American Society of Civil Engineers, Technical Engineering and Design Guides as adapted from the US Army Corps of Engineers, No. 9.

The calculations provided herein for boring B1 indicates that the soil above the historic high groundwater level of 30 feet could be susceptible to approximately 0.07 inches of settlement as a result of the Design Earthquake peak ground acceleration ($⅔PGA_M$).

The calculations provided herein for boring B1 indicates that the soil above the historic high groundwater level of 30 feet could be susceptible to approximately 0.14 inches of settlement as a result of the Maximum Considered Earthquake peak ground acceleration (PGA_M).

Calculation of the anticipated seismically-induced settlements is provided as Figures 9 and 10.

7.6 Slope Stability

The site is relatively level to gently sloping to the southeast. The site is not within an area identified by the City of Garden Grove (2008) or the County of Orange (2004) as having a potential for slope stability hazards. Additionally, the State of California Seismic Hazard Zone Map for the Anaheim Quadrangle (CDMG, 1998) indicates that the site is not located within a zone of required investigation for earthquake-induced landslides. There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for landslides to adversely impact the site is considered low.

7.7 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. Review of the Safety Element of the Orange County General Plan (2004) indicates that the site is located within the Prado Dam inundation boundary. However, this dam, as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design, construction practices, and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

7.8 Tsunamis, Seiches, and Flooding

The site is not located within a coastal area. Therefore, tsunamis are not considered a potential hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Therefore, flooding resulting from a seismically-induced seiche is considered unlikely.

According to the City of Garden Grove, the southern portion of the site is located within a 100-year flood zone (City of Garden Grove, 2008). However, more recent flood hazard maps by the Federal Emergency Management Agency (FEMA) indicate the site is located within a Flood Zone X, defined as an area with reduced flood risk due to levees (FEMA, 2009).

7.9 Oil Fields & Methane Potential

Based on a review of the California Division of Oil, Gas and Geothermal Resources (DOGGR) Well Finder Website, the site is not located within the limits of an oilfield and oil or gas wells are not located in the immediate site vicinity (DOGGR, 2018). However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the location map and undocumented wells could be encountered during construction. Any wells encountered during construction will need to be properly abandoned in accordance with the current requirements of the DOGGR.

Since the site is not located within the boundaries of a known oil field, the potential for the presence of methane or other volatile gases at the site is considered low. However, should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

7.10 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence. No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site or in the general site vicinity. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed development provided the recommendations presented herein are followed and implemented during design and construction. The geotechnical design parameters presented herein should be reviewed and updated once proposed building elevations are finalized and structural loads are available.

8.1.2 The purpose of this investigation was to evaluate subsurface soil and geologic conditions at the site and based on the conditions encountered, to provide initial recommendations pertaining to the geotechnical aspects of developing the property. While it is our opinion that neither soil nor geologic conditions would preclude the construction of the proposed project, additional site exploration and laboratory testing will be required prior to building permits to confirm the existing conditions throughout the site. The findings of the additional work should be incorporated into an updated geotechnical investigation report.

8.1.3 Up to 2 feet of existing artificial fill was encountered during the site investigation. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. Future demolition of the existing structures which occupy the site will likely disturb the upper few feet of soil. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the Grading section of this report are followed (see Section 8.4).

8.1.4 The enclosed liquefaction and seismically-induced settlement analyses indicate that the site soils could be susceptible to approximately 0.37 inches of total settlement as a result of the Design Earthquake peak ground acceleration ($⅔PGA_M$). Differential settlement at the ground surface is anticipated to be less than 0.19 inches over a distance of 30 feet. The foundation design recommendations presented herein are intended to minimize the effects of settlement on the proposed improvements.

8.1.5 Excavation for the subterranean portions of the structures is anticipated to penetrate through the existing artificial fill and expose undisturbed alluvial soils throughout the excavation bottom.

8.1.6 Groundwater was encountered during site exploration at a depth of approximately 62.5 feet below existing ground surface. Excavation for construction of the proposed subterranean level is anticipated to extend to depths of approximately 25 feet below the ground surface,

including foundation excavations. Based on these considerations, the current groundwater table is sufficiently deep that it not expected to be encountered during construction. However, local seepage could be encountered during excavation of the subterranean level, especially if conducted during the rainy season.

8.1.7 As a minimum, the upper 6 feet of existing site soils within the proposed on-grade footprint areas should be excavated and properly compacted for foundation and slab support. Excavation should be conducted as necessary to completely remove all artificial fill and any soft, unsuitable alluvium at the direction of the Geotechnical Engineer (a representative of Geocon). The excavation should extend laterally a minimum distance of 3 feet beyond the building footprint area or a distance equal to the depth of fill below the foundation, whichever is greater. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 8.4).

8.1.8 It is anticipated that the tower cores will be supported on reinforced concrete mat foundations, and that elsewhere conventional spread foundations may be used. Recommendations for mat foundations and conventional spread foundations are provided herein as Sections 8.5 through 8.7. All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.1.9 Once proposed building loads become available and elevations are established, additional analyses will be required to evaluate the anticipated total and differential settlements between the foundation elements to check if the settlements are within tolerance as evaluated by the project structural engineer or provide updated foundation design recommendations.

8.1.10 Excavations up to 25 feet in vertical height are anticipated for construction of the subterranean levels, including foundation depths. Due to the depth of the excavation and the proximity to the property lines, city streets and adjacent offsite structures and improvements, excavation of the proposed subterranean level will require sloping and/or shoring in order to provide a stable excavation. Where shoring is required it is recommended that a soldier pile shoring system be utilized. In addition, where the proposed excavation will be deeper than and adjacent to an offsite structure, the proposed shoring should be designed to resist the surcharge imposed by the adjacent offsite structure. Recommendations for shoring are provided in Section 8.20 of this report.

8.1.11 Due to the nature of the proposed design and intent for a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.1.12 Where new paving is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill and soft alluvial soils in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of subgrade soil should be scarified and properly compacted for paving support. Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 8.12).

8.1.13 Foundations for small outlying structures, such as block walls less than 6 feet in height, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, foundations may derive support directly in the competent undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

8.1.14 Once the foundation loading configuration and design elevations for the existing and proposed structures proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, as necessary. Based on the final foundation loading configurations and building elevations, the potential for settlement should be reevaluated by this office.

8.1.15 Any changes in the design, location or elevation, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

8.2 Soil and Excavation Characteristics

8.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Some caving should be anticipated in unshored excavations, especially where granular soils are encountered.

8.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of existing adjacent improvements.

8.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping or shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 8.19).

8.2.4 The upper 5 feet of existing site soils encountered during this investigation are considered to have a "very low" expansive potential (EI = 0); and are classified as "non-expansive" based on the 2016 California Building Code (CBC) Section 1803.5.3. Recommendations presented herein assume that the building foundations and slabs will derive support in these materials.

8.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

8.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "moderately corrosive" with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B11) and should be considered for design of underground structures.

8.3.2 Laboratory tests were performed on representative samples of the site materials to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B11) and indicate that the on-site materials possess "negligible" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-11 Sections 4.2 and 4.3.

8.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

8.4 Grading

8.4.1 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soil encountered during exploration is suitable for re-use as engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris are removed.

8.4.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer, geotechnical engineer, and building official in attendance. Special soil handling requirements can be discussed at that time.

8.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.4.4 All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.4.5 As a minimum, it is recommended that the upper 6 feet of existing site soils within the proposed on-grade building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavation should be conducted as necessary to completely remove all existing artificial fill or soft soil at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. The engineered fill blanket should extend at least 3 feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater.

8.4.6 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to optimum moisture content, and properly compacted to a minimum 90 percent of the maximum dry density in accordance with ASTM D 1557 (latest edition).

8.4.7. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 8.12).

8.4.8 Foundations for small outlying structures, such as block walls less than 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed building, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

8.4.9 Although not anticipated for this project, all imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. If necessary, import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B11).

8.4.10 Utility trenches should be properly backfilled in accordance with the requirements of the Green Book (latest edition). The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry is also acceptable as backfill. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

8.4.11 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, steel, gravel, or concrete.

8.5 Foundation Design

8.5.1 It is anticipated that the tower cores will be supported on reinforced concrete mat foundations, and that elsewhere conventional spread foundations may be used. All foundations should derive support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

8.5.2 Once proposed foundation depths and building loads are available, additional analyses may be required to evaluate the anticipated total and differential settlements between the foundation elements for verification that the settlements are within tolerance as evaluated by the project structural engineer. Updated foundation design recommendations will be provided as necessary in an addendum report.

8.5.3 No special subgrade presaturation is required prior to placement of concrete. However, the slab and foundation subgrade should be sprinkled as necessary; to maintain a moist condition as would be expected in any concrete placement.

8.5.4 Waterproofing of subterranean walls and slabs is recommended for this project for any portions of the structure that will be constructed below the groundwater table. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.5.5 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of the methane system, reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

8.5.6 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

8.6 Conventional Foundation Design

8.6.1 Continuous footings may be designed for an allowable bearing capacity of 3,000 pounds per square foot (psf), and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

8.6.2 Isolated spread foundations may be designed for an allowable bearing capacity of 3,500 psf, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

8.6.3 The allowable soil bearing pressure above may be increased by 250 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 5,000 psf. Higher bearing capacities are feasible; however, the use of higher bearing capacities will require coordination with the structural engineer on anticipated total and differential settlements.

8.6.4 The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

8.6.5 If depth increases are utilized for the perimeter foundations, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

8.6.6 Continuous footings should be reinforced with four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. Reinforcement for spread footings should be designed by the project structural engineer.

8.6.7 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.

8.7 Mat Foundation Design – Tower Core

8.7.1 It is anticipated that the mat foundations constructed for support of the towers will impart an average pressure of approximately 4,000 to 6,000 psf. The recommended maximum allowable bearing value is 6,000 psf. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.7.2 A vertical modulus of subgrade reaction of 150 pounds per cubic inch (pci) may be used in the design of mat foundations deriving support in newly placed engineered fill and/or competent alluvium found at or below a depth of 6 feet below the ground surface. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

8.7.3 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

8.7.4 For seismic design purposes, a coefficient of friction of 0.4 may be utilized between the concrete mat and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

8.8 Foundation Settlement

8.8.1 The enclosed liquefaction and seismically-induced settlement analyses indicate that the site soils could be susceptible to approximately 0.37 inches of total settlement as a result of the Design Earthquake peak ground acceleration (⅔PGA_M). The differential settlement at the ground surface is anticipated to be less than 0.19 inches over a distance of 30 feet. These settlements are in addition to the static settlements indicated below and must be considered in the structural design.

8.8.2 The maximum static settlement for conventional foundations deriving support at or near the ground surface in the recommended bearing materials and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than 1 inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is expected to be less than ½ inch over a distance of 20 feet. Based on seismic considerations, the proposed structure supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ¾ inch over a distance of 20 feet.

8.8.3 The maximum expected static settlement for an assumed 40-foot by 30-foot mat foundation deriving support at or near the ground surface in the recommended bearing material and utilizing a maximum allowable bearing pressure of 6,000 psf is estimated to be less than 3½ and occur below the central portion of the mat. The differential settlement between the center and corner of the mat is estimated to be less than 1 inch. Based on seismic considerations, the proposed structure supported on a reinforced concrete mat foundation should be designed for a combined static and seismically induced differential settlement of 2 inches over a distance of 20 feet.

8.8.4 The maximum static settlement for conventional foundations deriving support at or near the proposed subterranean depth of 25 feet in the recommended bearing materials and designed with a maximum bearing pressure of 5,000 psf is estimated to be less than ⅓ inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is expected to be less than ⅓ inch over a distance of 20 feet. Based on seismic considerations, the proposed structure supported on a spread foundation system should be designed for a combined static and seismically induced differential settlement of ⅔ inch over a distance of 20 feet.

8.8.5 Due to the various depths at which different portions of the structure will derive support, differential settlements across the stepped transitions needs to be carefully designed for. The recommended bearing pressures presented below are based on a preliminary plan set, as well as several assumptions. As the project progresses, Geocon should work closely with the project structural engineer to confirm the foundation loading configuration and anticipated total and differential settlement.

8.8.6 Differential settlement across the stepped transitions between the various building levels could be on the order of 1 inch or greater and will likely require a heavily reinforced structural connection, or a structural separation to account for the anticipated differential movements.

8.8.7 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

8.9 Lateral Design

8.9.1 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.4 may be used with the dead load forces in the competent alluvial soils or in properly compacted engineered fill.

8.9.2 Passive earth pressure for the sides of foundations and slabs poured against properly compacted engineered fill or competent alluvial soils may be computed as an equivalent fluid having a density of 250 pcf with a maximum earth pressure of 2,500 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

8.10 Miscellaneous Foundations

8.10.1 Foundations for small outlying structures, such as block walls less than 6 feet in height, planter walls or trash enclosures which will not be tied to the proposed structure may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12 inch embedment into the recommended bearing materials.

8.10.2 If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.10.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

8.11 Concrete Slabs-on-Grade

8.11.1 Concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Pavement Recommendations* section of this report (Section 8.12).

8.11.2 The project structural engineer may determine and design the necessary slab thickness and reinforcing for this structure. Unless specifically analyzed and designed by the project structural engineer, the slab-on-grade and ramp should be a minimum of 5 inches concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions and positioned vertically near the slab midpoint. The concrete slab-on-grade may bear directly on newly placed engineered fill or competent alluvial soils. Any disturbed soils should be properly compacted for slab support.

8.11.3 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning is recommended. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

8.11.4 Due to the nature of the proposed design and intent for a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete

walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.11.5 For seismic design purposes, a coefficient of friction of 0.4 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

8.11.6 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. The project structural engineer should design construction joints as necessary.

8.11.7 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.12 Preliminary Pavement Recommendations

8.12.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial materials be excavated and properly recompacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

8.12.2 The following pavement sections are based on an assumed R-Value of 35. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

8.12.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking And Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	3.5	9.0

8.12.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction"* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation"* (Caltrans). The use of Crushed Miscellaneous Base in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction"* (Green Book).

8.12.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction as determined by ASTM Test Method D 1557 (latest edition).

8.12.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

8.13 Retaining Walls Design

8.13.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 25 feet. In the event that walls significantly higher than 25 feet are planned, Geocon should be contacted for additional recommendations.

8.13.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* sections of this report (see Section 8.6).

8.13.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 36 pcf.

8.13.4 Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 57 pcf.

8.13.5 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 90 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

8.13.6 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils. If sloping techniques are to be utilized for construction of proposed walls, which would result in a wedge of engineered fill behind the retaining walls, revised earth pressures may be required. This should be evaluated once the use of sloping measures is established and once the geotechnical characteristics of the engineered backfill soils can be further evaluated.

8.13.7 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic, or adjacent structures. Recommendations for the incorporation of surcharges are provided in Section 8.25 of this report. Once the design becomes more finalized, an addendum letter can be prepared revising recommendations and addressing specific surcharge conditions throughout the project, if necessary.

8.13.8 In addition to the recommended earth pressure, the upper 10 feet of the subterranean wall adjacent to the street and parking lot should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the walls due to normal street traffic. If the traffic is kept back at least 10 feet from the subterranean walls, the traffic surcharge may be neglected.

8.13.9 Seismic lateral forces should be incorporated into the design as necessary, and recommendations for seismic lateral forces are presented below.

8.14 Dynamic (Seismic) Lateral Forces

8.14.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2016 CBC).

8.14.2 A seismic load of 10 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. The earth pressure is based on half of two thirds of PGA_M calculated from ASCE 7-10 Section 11.8.3.

8.15 Retaining Wall Drainage

8.15.1 Retaining walls should be provided with a drainage system. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 11). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

8.15.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 12). These vertical columns of drainage material would then be connected at the bottom of the wall to a collection panel or a 1-cubic-foot rock pocket drained by a 4-inch subdrain pipe.

8.15.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures. Drainage should not be allowed to flow uncontrolled over descending slopes.

8.15.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

8.16 Swimming Pool

8.16.1 The proposed swimming pools should be designed as free-standing structures, deriving support in the competent alluvial soils generally found at or below a depth of 2 feet below the ground surface and/or newly placed engineered fill.

8.16.2 Swimming pool foundations and walls may be designed in accordance with the foundation design recommendations below and *Retaining Wall Design* section of this report (see Section 8.13). The proposed pools should be constructed utilizing an expansive soils design, and a hydrostatic relief valve should be considered as part of the swimming pool design unless a gravity drain system can be placed beneath the pool shell.

8.16.3 A reinforced concrete mat foundation may be utilized for support of the proposed swimming pool. The mat foundation for the pool may derive support in the undisturbed alluvial soils generally found at or below a depth of 2 feet below the ground surface. Any soils unintentionally disturbed should be properly compacted for foundation support.

8.16.4 It is anticipated that the proposed mat foundation will impart an average pressure of less than 1,500 psf. The recommended maximum allowable bearing value is 1,500 psf. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

8.16.5 It is recommended that a modulus of subgrade reaction of 100 pci be utilized for the design of the mat foundation deriving support in newly placed engineered fill and/or competent alluvium found at or below a depth of 2 feet below the ground surface. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

8.16.6 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

8.16.7 Based on the soil overburden load that will be removed during excavation of the swimming pool, anticipated settlements are expected to be very small. We estimate the total settlements for a mat foundation to be less than ½ inch, with differential settlements on the order of ¼ inch over a horizontal distance of 40 feet.

8.16.8 Foundation excavations should be observed by Geocon, prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

8.17 Elevator Pit Design

8.17.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. As a minimum the slab-on-grade for the elevator pit bottom should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Elevator pit walls may be designed in accordance with the recommendations in the *Conventional Foundation Design* and *Retaining Wall Design* section of this report (see Section 8.6 and 8.13).

8.17.2 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent foundations and should be designed for each condition as the project progresses.

8.17.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 8.15).

8.17.4 It is suggested that the exterior walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

8.18 Elevator Piston

8.18.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation or shoring pile, or the drilled excavation could compromise the existing foundation or pile support, especially if the drilling is performed subsequent to the foundation or pile construction.

8.18.2 Caving is anticipated especially where granular soils are encountered. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.

8.18.3 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

8.19 Temporary Excavations

8.19.1 Excavations on the order of 25 feet in height are anticipated for excavation and construction of the proposed subterranean levels, including foundation excavations. The excavations are expected to expose artificial fill and alluvial soils, which may be subject to caving where granular soils are encountered. Vertical excavations up to 5 feet in height may be attempted where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.

8.19.2 Vertical excavations greater than 5 feet will require sloping and/or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter, up to a maximum of 12 feet in height. A uniform slope does not have a vertical portion. Where space is limited, shoring measures will be required. *Shoring* data is provided in Section 8.20 of this report.

8.19.3 Where temporary construction slopes are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary slopes are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

8.20 Shoring – Soldier Pile Design and Installation

8.20.1 The following information on the design and installation of shoring is preliminary. Review of the final shoring plans and specifications should be made by this office prior to bidding or negotiating with a shoring contractor.

8.20.2 One method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. The steel soldier piles may also be installed utilizing high frequency vibration. Where maximum excavation heights are less than 12 feet the soldier piles are typically designed as cantilevers. Where excavations exceed 12 feet or are surcharged, soldier piles may require lateral bracing utilizing drilled tie-back anchors or raker braces to maintain an economical steel beam size and prevent excessive deflection. The size of the steel beam, the need for lateral bracing, and the acceptable shoring deflection should be determined by the project shoring engineer.

8.20.3 The design embedment of the shoring pile toes must be maintained during excavation activities. The toes of the perimeter shoring piles should be deepened to take into account any required excavations necessary for foundations and/or adjacent drainage systems.

8.20.4 The proposed soldier piles may also be designed as permanent piles. The required pile depths, dimensions, and spacing should be determined and designed by the project structural and shoring engineers. All piles utilized for shoring can also be incorporated into a permanent retaining wall system (shotcrete wall) provided they are designed in accordance with the earth pressure provided in the *Retaining Wall Design* section of this report (see Section 8.13).

8.20.5 Drilled cast-in-place soldier piles should be placed no closer than three diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the soil. For design purposes, an allowable passive value for the soils below the bottom plane of excavation may be assumed to be 320 psf per. Where piles are installed by vibration techniques, the passive pressure may be assumed to mobilize across a width equal to the two times the dimension of the beam flange. The allowable passive value may be doubled for isolated piles spaced a minimum of three the pile diameter. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed soils.

8.20.6 Groundwater was encountered during site exploration at a depth of 62.5 feet below the ground surface; however, groundwater levels can fluctuate and may be different at the time of construction. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Therefore the contractor should be prepared for groundwater during pile installation should the need arise. If more than 6 inches of water is present in the bottom of the excavation, a tremie is required to place the concrete into the bottom of the hole. A tremie should consist of a rigid, water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube should be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie should be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end should be closed at the start of the work to prevent water entering the tube and should be entirely sealed at all times, except when the concrete is being placed. The tremie tube should be kept full of concrete. The flow should be continuous until the work is completed and the resulting concrete seal should be monolithic and homogeneous. The tip of the tremie tube should always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

8.20.7 A special concrete mix should be used for concrete to be placed below water. The design should provide for concrete with an unconfined compressive strength psi of 1,000 pounds per square inch (psi) over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste should be included. The slump should be commensurate to any research report for the admixture, provided that it should also be the minimum for a reasonable consistency for placing when water is present.

8.20.8 Caving is anticipated to occur where granular soils are encountered, and the contractor should have casing available prior to commencement of pile excavation. When casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

8.20.9 If a vibratory method of solider pile installation is utilized, predrilling may be performed prior to installation of the steel beams. If predrilling is performed, it is recommended that the bore diameter be at least 2 inches smaller than the largest dimension of the pile to prevent excessive loss in the frictional component of the pile capacity. Predrilling should not be conducted below the proposed excavation bottom.

8.20.10 If a vibratory method is utilized, the owner should be aware of the potential risks associated with vibratory efforts, which typically involve inducing settlement within the vicinity of the pile which could result in a potential for damage to existing improvements in the area.

8.20.11 The level of vibration that results from the installation of the piles should not exceed a threshold where occupants of nearby structures are disturbed, despite higher vibration tolerances that a building may endure without deformation or damage. The main parameter used for vibration assessment is peak particle velocity in units of inch per second (in/sec). The acceptable range of peak particle velocity should be evaluated based on the age and condition of adjacent structures, as well as the tolerance of human response to vibration.

8.20.12 Based on Table 19 of the *Transportation and Construction Induced Vibration Guidance Manual* (Caltrans 2013), a continuous source of vibrations (ex. vibratory pile driving) which generates a maximum peak particle velocity of 0.5 in/sec is considered tolerable for modern industrial/commercial buildings and new residential structures. The Client should be aware that a lower value may be necessary if older or fragile structures are in the immediate vicinity of the site.

8.20.13 Vibrations should be monitored and record with seismographs during pile installation to detect the magnitude of vibration and oscillation experienced by adjacent structures. If the vibrations exceed the acceptable range during installation, the shoring contractor should modify the installation procedure to reduce the values to within the acceptable range. Vibration monitoring is not the responsibility of the Geotechnical Engineer.

8.20.14 Geocon does not practice in the field of vibration monitoring. If construction techniques will be implemented, it is recommended that qualified consultant be retained to provide site specific recommendations for vibration thresholds and monitoring.

8.20.15 The frictional resistance between the soldier piles and retained soil may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.4 based on uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 610 psf.

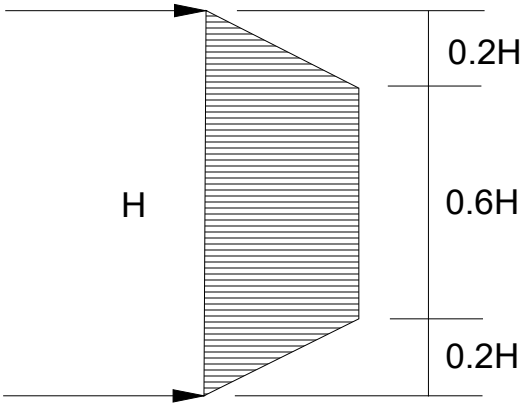
8.20.16 Due to the nature of the site soils, it is expected that continuous lagging between soldier piles will be required. However, it is recommended that the exposed soils be observed by the Geotechnical Engineer (a representative of Geocon West, Inc.), to verify the presence of any competent, cohesive soils and the areas where lagging may be omitted.

8.20.17 The time between lagging excavation and lagging placement should be as short as possible soldier piles should be designed for the full-anticipated pressures. Due to arching in the soils, the pressure on the lagging will be less. It is recommended that the lagging be designed for the full design pressure but be limited to a maximum of 400 psf.

8.20.18 For the design of shoring, it is recommended that an equivalent fluid pressure be utilized for design. A trapezoidal distribution of lateral earth pressure may be used where shoring will be restrained by bracing or tie backs. The recommended active and trapezoidal pressure are provided in the following table. A diagram depicting the trapezoidal pressure distribution of lateral earth pressure is provided below the table.

HEIGHT OF SHORING (FEET)	EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot) (ACTIVE PRESSURE)	EQUIVALENT FLUID PRESSURE (Pounds Per Square Foot per Foot) Active Trapezoidal (Where H is the height of the shoring in feet)
Up to 25	33	21H

Trapezoidal Distribution of Pressure



8.20.19 It is very important to note that active pressures can only be achieved when movement in the soil (earth wall) occurs. If movement in the soil is not acceptable, such as adjacent to an existing structure, an at-rest pressure of 54 pcf should be considered for design purposes.

8.20.20 Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure should be added for a surcharge condition due to slopes, vehicular traffic or adjacent structures and should be designed for each condition. The surcharge pressure should be evaluated in accordance with the recommendations in Section 8.25 of this report.

8.20.21 In addition to the recommended earth pressure, the upper 10 feet of the shoring adjacent to the street or driveway areas should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least 10 feet from the shoring, the traffic surcharge may be neglected.

8.20.22 It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is recommended that the deflection be minimized to prevent damage to existing structures and adjacent improvements. Where public rights-of-way are present or adjacent offsite structures do not surcharge the shoring excavation, the shoring deflection should be limited to less than 1 inch at the top of the shored embankment. Where offsite structures are within the shoring surcharge area it is recommended that the beam deflection be limited to less than ½ inch at the elevation of the adjacent offsite foundation, and no deflection at all if deflections will damage existing structures. The allowable deflection is dependent on many factors, such as the presence of structures and utilities near the top of the embankment, and will be assessed and designed by the project shoring engineer.

8.20.23 Some means of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles.

8.20.24 Due to the depth of the excavation and proximity to adjacent structures, it is suggested that prior to excavation the existing improvements be inspected to document the present condition. For documentation purposes, photographs should be taken of preconstruction distress conditions and level surveys of adjacent grade and pavement should be considered. During excavation activities, the adjacent structures and pavement should be periodically inspected for signs of distress. In the even that distress or settlement is noted, an investigation should be performed and corrective measures taken so that continued or worsened distress or settlement is mitigated. Documentation and monitoring of the offsite structures and improvements is not the responsibility of the geotechnical engineer.

8.21 Temporary Tie-Back Anchors

8.21.1 Temporary tie-back anchors may be used with the solider pile wall system to resist lateral loads. Post-grouted friction anchors are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge and to greater lengths if necessary to develop the desired capacities. The locations and depths of all offsite utilities should be thoroughly checked and incorporated into the drilling angle design for the tie-back anchors.

8.21.2 The capacities of the anchors should be determined by testing of the initial anchors as outlined in a following section. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Anchors should be placed at least 6 feet on center to be considered isolated. For preliminary design purposes, it is estimated that drilled friction anchors constructed without utilizing post-grouting techniques will develop average skin frictions as follows:

- 5 feet below the top of the excavation – 970 pounds per square foot
- 15 feet below the top of the excavation – 1,600 pounds per square foot

8.21.3 Depending on the techniques utilized, and the experience of the contractor performing the installation, a maximum allowable friction capacity of 3.0 kips per linear foot for post-grouted anchors (for a minimum 20-foot length beyond the active wedge) may be assumed for design purposes. Only the frictional resistance developed beyond the active wedge should be utilized in resisting lateral loads. Higher capacity assumptions may be acceptable, but must be verified by testing.

8.22 Anchor Installation

8.22.1 Tied-back anchors are typically installed between 20 and 40 degrees below the horizontal; however, occasionally alternative angles are necessary to avoid existing improvements and utilities. The locations and depths of all offsite utilities should be thoroughly checked prior to design and installation of the tie-back anchors. Caving of the anchor shafts, particularly within sand and gravel deposits or seepage zones, should be anticipated during installation and provisions should be implemented in order to minimize such caving. It is suggested that hollow-stem auger drilling equipment be used to install the anchors. The anchor shafts should be filled with concrete by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. In order to minimize the chances of caving, it is recommended that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill should be placed by pumping; the sand may contain a small amount of cement to facilitate pumping.

8.23 Anchor Testing

8.23.1 All of the anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches. The rate of creep under the 150 percent test load should not exceed 0.1 inch over a 15-minute period in order for the anchor to be approved for the design loading.

8.23.2 At least 10 percent of the anchors should be selected for "quick" 200 percent tests and three additional anchors should be selected for 24-hour 200 percent tests. The purpose of the 200 percent tests is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. These tests should be performed prior to installation of additional tiebacks. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

8.23.3 The total deflection during the 24-hour 200 percent test should not exceed 12 inches. During the 24-hour tests, the anchor deflection should not exceed 0.75 inches measured after the 200 percent test load is applied.

8.23.4 For the "quick" 200 percent tests, the 200 percent test load should be maintained for 30 minutes. The total deflection of the anchor during the 200 percent quick tests should not exceed 12 inches; the deflection after the 200 percent load has been applied should not exceed 0.25 inch during the 30-minute period.

8.23.5 After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within 10 percent of the design load. A representative of this firm should observe the installation and testing of the anchors.

8.24 Internal Bracing

8.24.1 Rakers may be utilized to brace the soldier piles in lieu of tieback anchors. The raker bracing could be supported laterally by temporary concrete footings (deadmen) or by the permanent, interior footings. For design of such temporary footings or deadmen, poured with the bearing surface normal to rakers inclined at 45 degrees, a bearing value of 2,000 psf may be used, provided the shallowest point of the footing is at least 1 foot below the lowest adjacent grade. The structural engineer should review the shoring plans to determine if raker footings conflict with the structural foundation system. The client should be aware that the utilization of rakers could significantly impact the construction schedule due to their intrusion into the construction site and potential interference with equipment.

8.25 Surcharge from Adjacent Structures and Improvements

8.25.1 Additional pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses.

8.25.2 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For\ {}^{x}/_{H} \leq 0.4$$

$$\sigma_H(z) = \frac{0.20 \times \left(\frac{z}{H}\right)}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^2} \times \frac{Q_L}{H}$$

and

$$For\ {}^{x}/_{H} > 0.4$$

$$\sigma_H(z) = \frac{1.28 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^2} \times \frac{Q_L}{H}$$

where x is the distance from the face of the excavation or wall to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation or wall, z is the depth at which the horizontal pressure is desired, Q_L is the vertical line-load and $\sigma_H(z)$ is the horizontal pressure at depth z.

8.25.3 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For\ {}^{x}/_{H} \leq 0.4$$

$$\sigma_H(z) = \frac{0.28 \times \left(\frac{z}{H}\right)^2}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_P}{H^2}$$

and

$$For\ {}^{x}/_{H} > 0.4$$

$$\sigma_H(z) = \frac{1.77 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_P}{H^2}$$

then

$$\sigma'_H(z) = \sigma_H(z) cos^2(1.1\theta)$$

where x is the distance from the face of the excavation/wall to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_P is the vertical point-load, $\sigma_H(z)$ is the horizontal pressure at depth z, θ is the angle between a line perpendicular to the excavation/wall and a line from the point-load to location on the excavation/wall where the surcharge is being evaluated, and $\sigma_H(z)$ is the horizontal pressure at depth z.

8.26 Surface Drainage

8.26.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

8.26.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within 5 feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within 5 feet of the building perimeter footings except when enclosed in protected planters.

8.26.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.

8.26.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

8.27 Plan Review

8.27.1 Grading, foundation, and shoring plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

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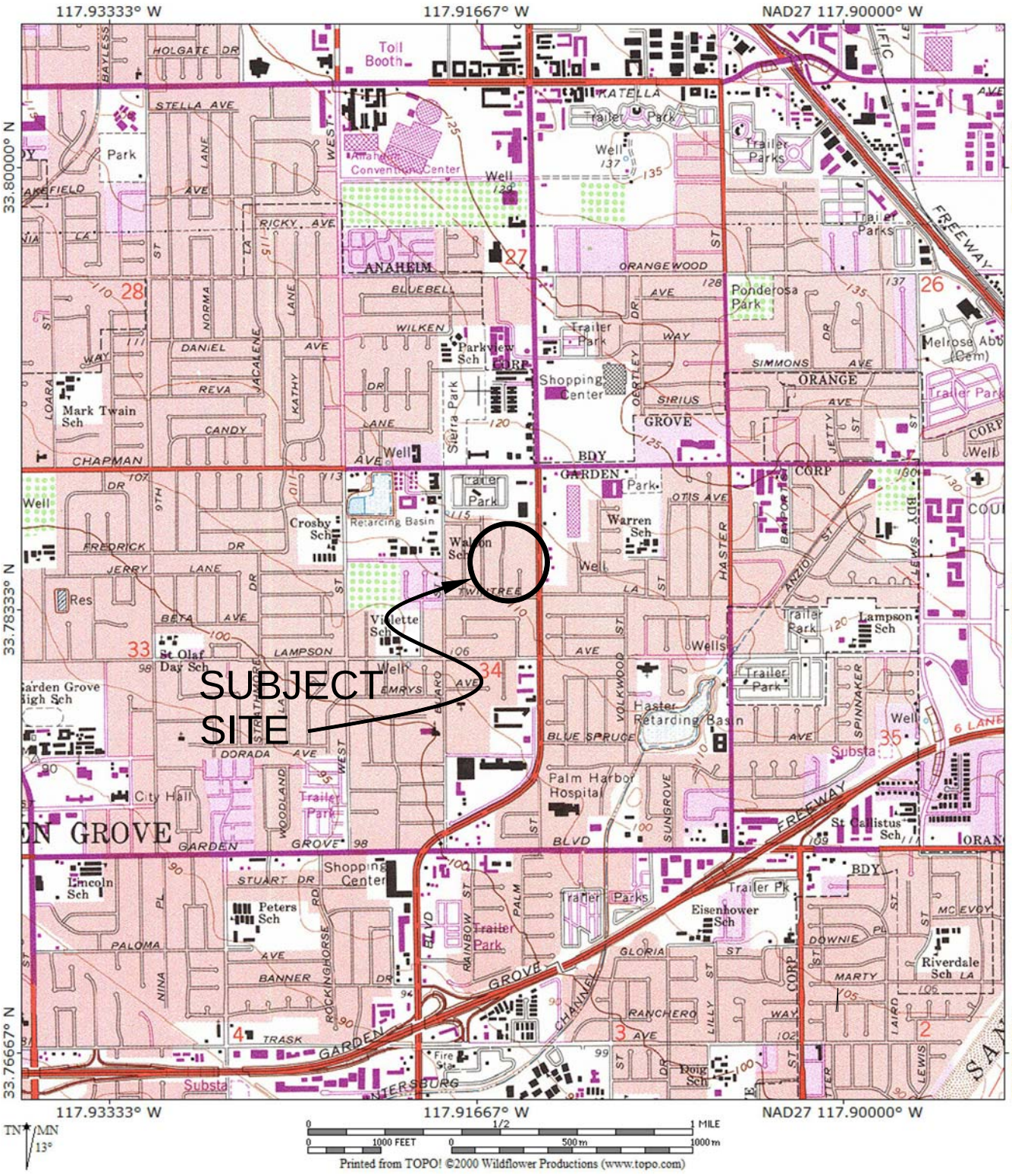
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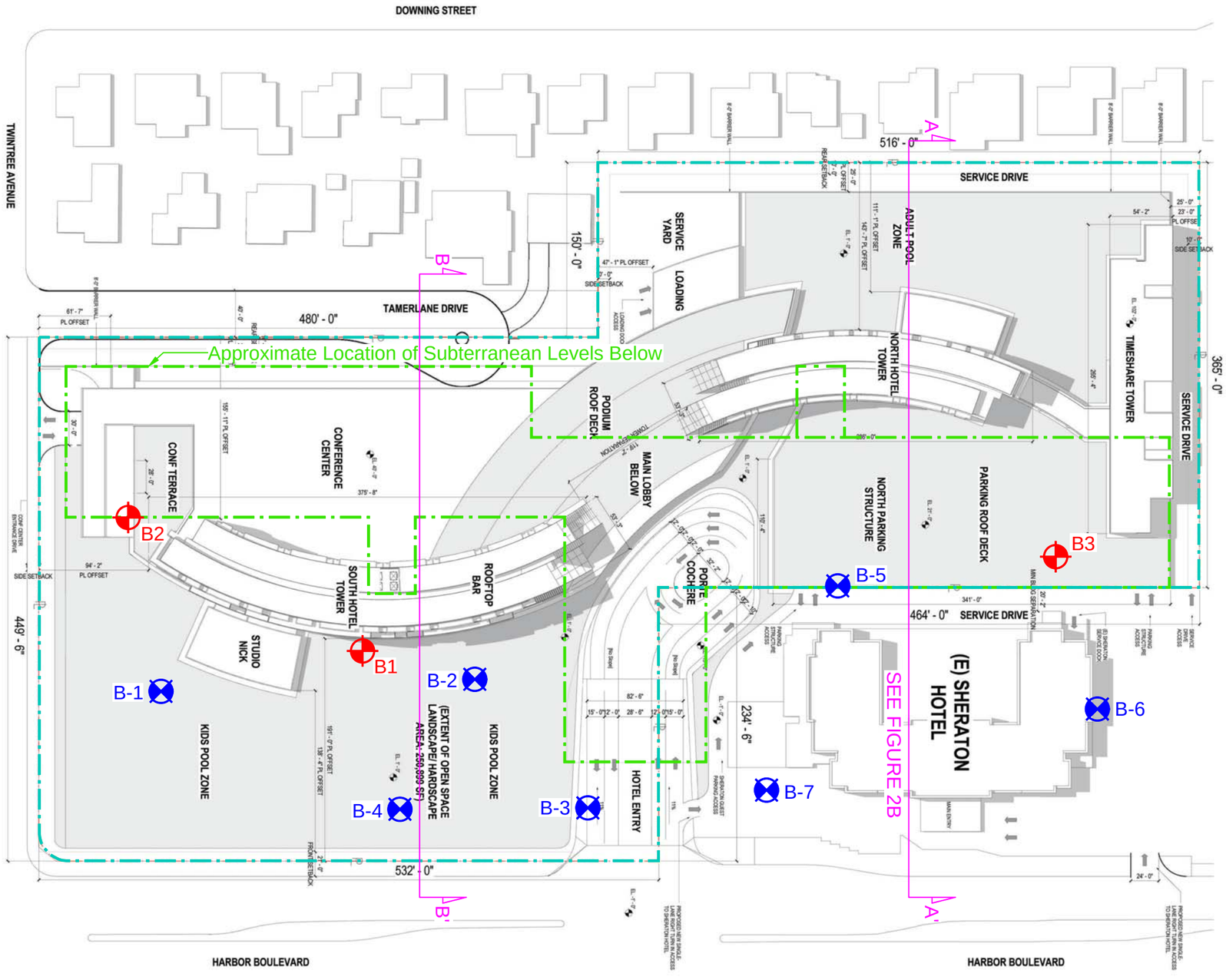
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VICINITY MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 1



LEGEND

- B3 — Approximate Location of Boring (Geocon, 2018)
- B1 — Approximate Location of Boring (CalLand, 2005)
- Approximate Location of Property Line

0 100' 200'

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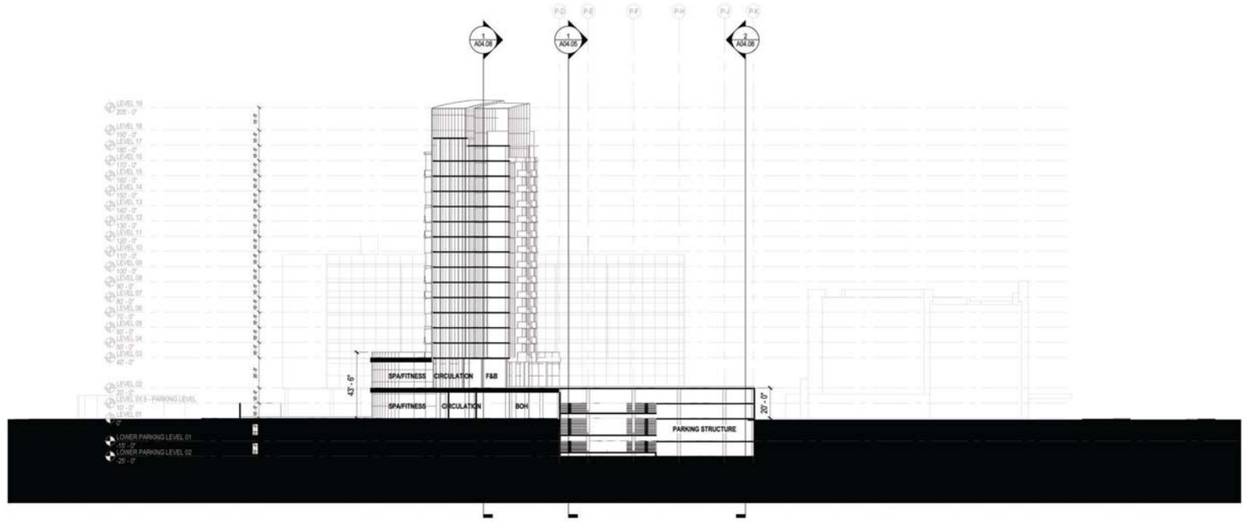
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SITE PLAN

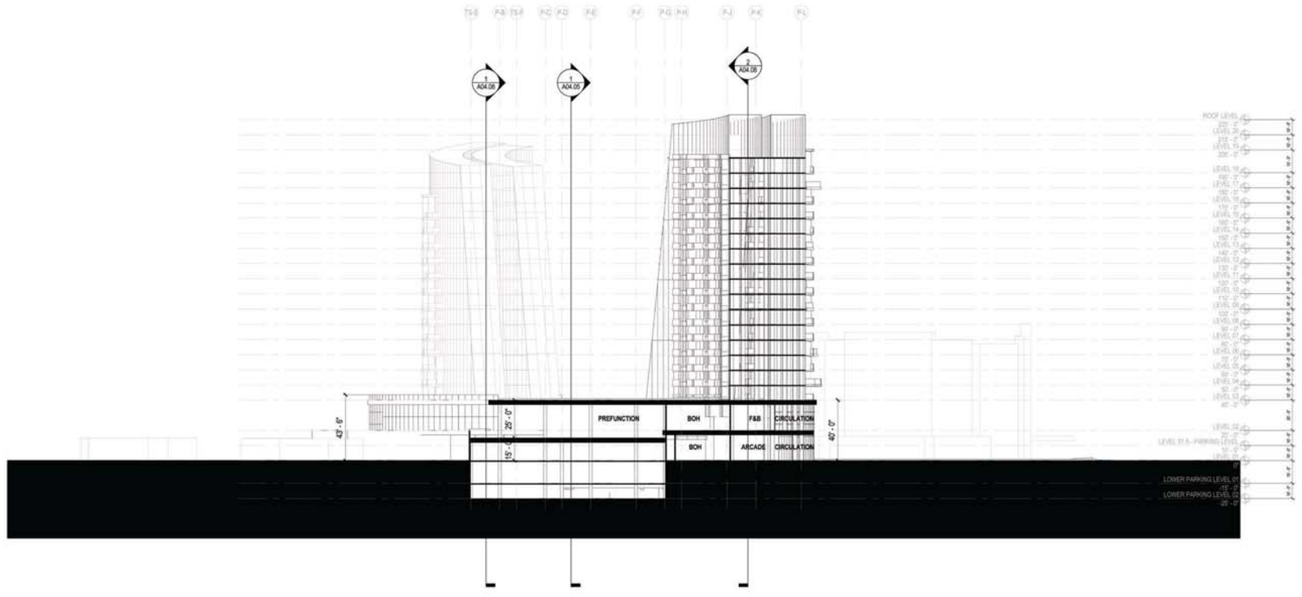
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 2A



SECTION A-A'



SECTION B-B'

0 100' 200'

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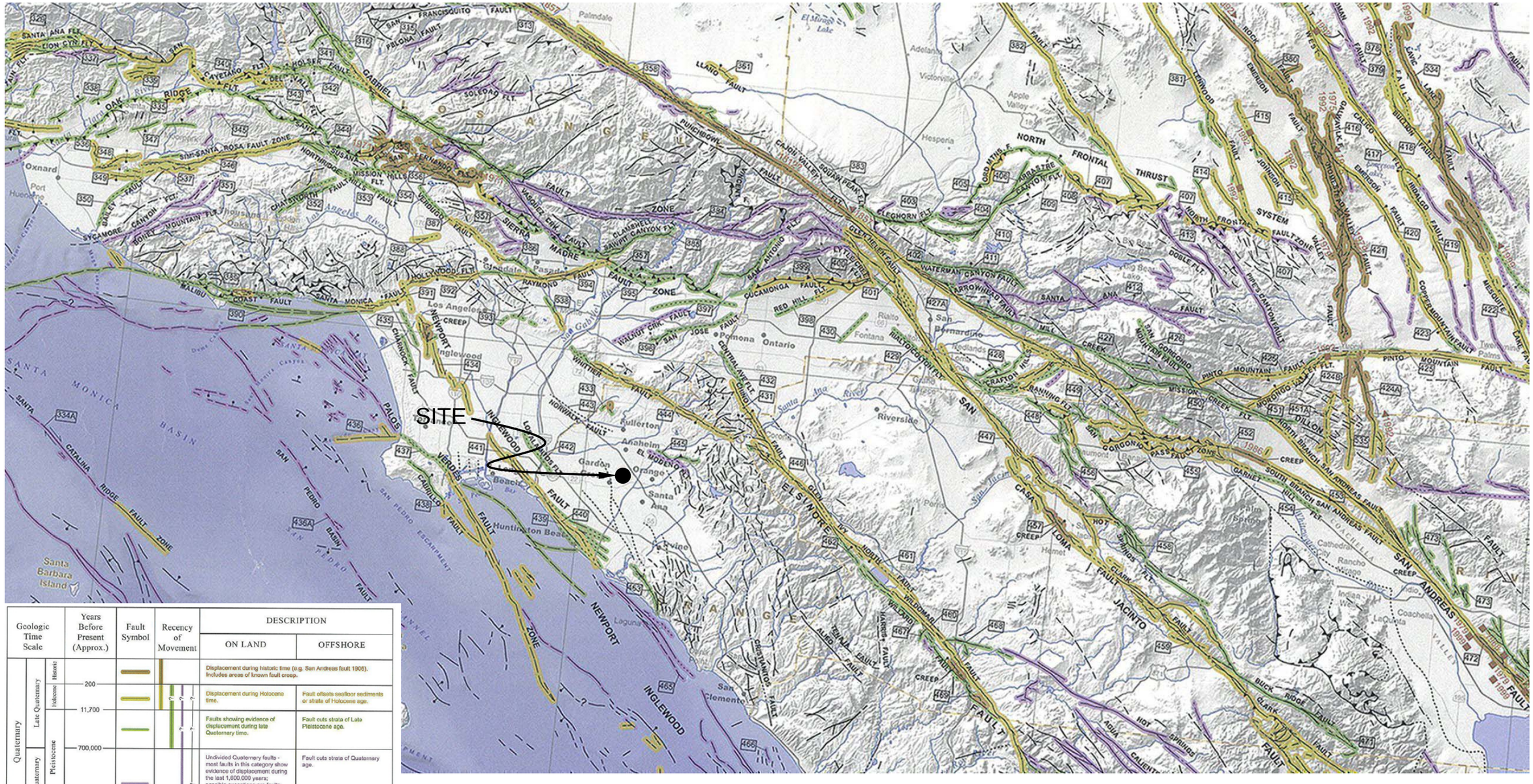
CROSS SECTIONS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 2B

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000*			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of Earth)				

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.8 Ma criterion.

N

0 12 24 Miles

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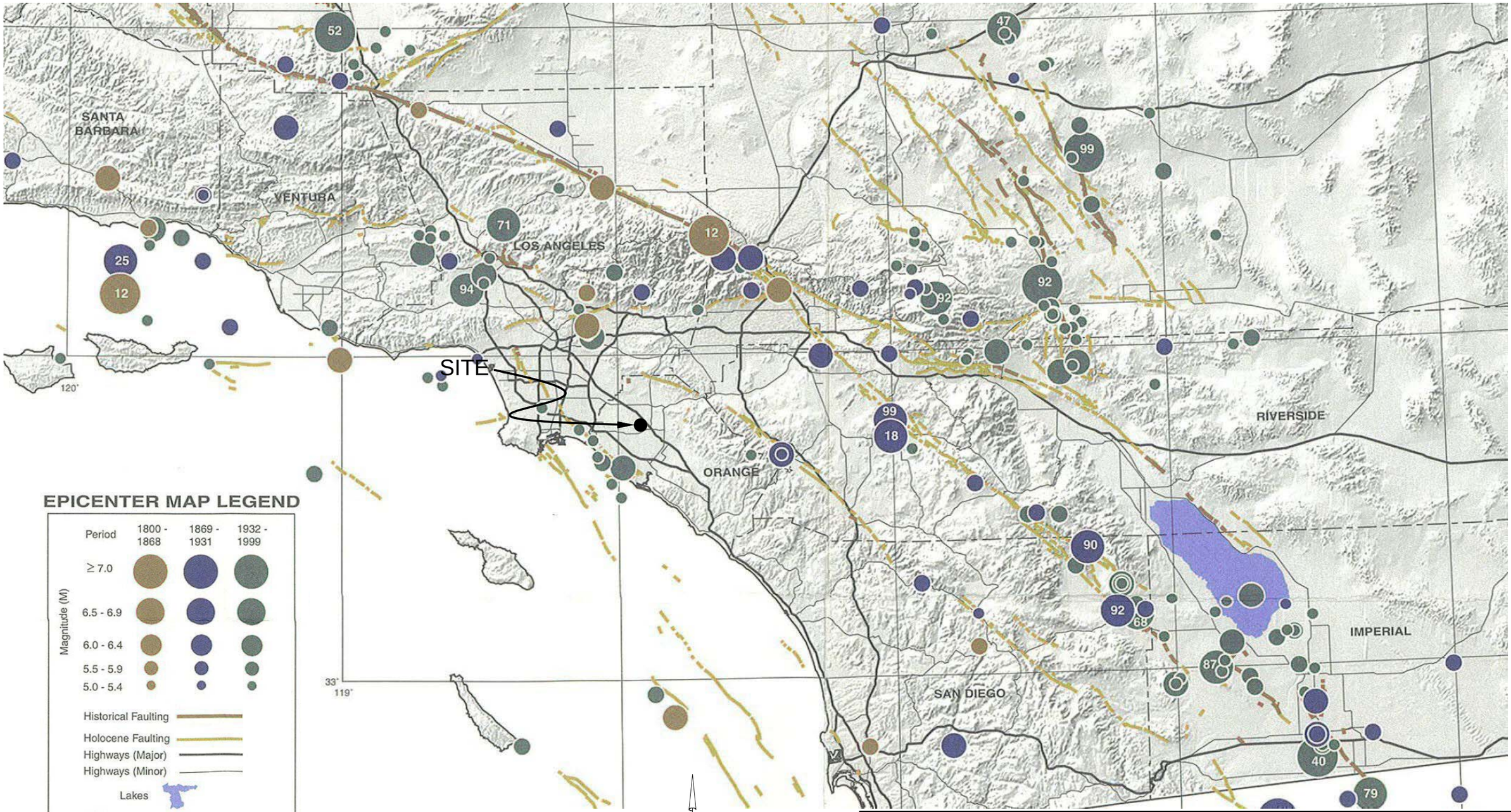
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REGIONAL FAULT MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 3



EPICENTER MAP LEGEND

Period	1800 - 1868	1869 - 1931	1932 - 1999
Magnitude (M) ≥ 7.0			
6.5 - 6.9			
6.0 - 6.4			
5.5 - 5.9			
5.0 - 5.4			

Historical Faulting

Holocene Faulting

Highways (Major)

Highways (Minor)

Lakes

65 Last two digits of M ≥ 6.5 earthquake year

Reference: Toppozada, T., Branum, D., Petersen, M., Hallstrom, C., Cramer, C., and Reichle, M., 2000, Epicenters and Areas Damaged by M≥5 California Earthquakes, 1800 - 1999, California Geological Survey, Map Sheet 49.

N

0 20 40 Miles

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REGIONAL SEISMICITY MAP

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. 4

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
Peak Horiz. Acceleration PGA_M (g):	0.531
2/3 PGA_M (g):	0.354
Calculated Mag.Wtg.Factor:	0.724
Historic High Groundwater:	30.0
Groundwater Depth During Exploration:	62.5

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	113.7	0	7.0	7.5	1		54	1.700	15.4	113.7	0.168	0.998	0.166	--
2.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.993	0.166	--
3.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.989	0.165	--
4.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.984	0.164	--
5.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.979	0.163	--
6.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.975	0.163	--
7.0	113.7	0	7.0	7.5	1	24	54	1.681	19.6	113.7	0.214	0.970	0.162	--
8.0	113.7	0	7.0	7.5	1	24	54	1.565	18.6	113.7	0.202	0.966	0.161	--
9.0	113.7	0	7.0	7.5	1	24	54	1.470	17.7	113.7	0.193	0.961	0.160	--
10.0	105.1	0	7.0	7.5	1	24	54	1.393	17.0	105.1	0.185	0.957	0.160	--
11.0	105.1	0	7.0	7.5	1	24	54	1.330	16.5	105.1	0.179	0.952	0.159	--
12.0	105.1	0	7.0	7.5	1	24	54	1.274	15.9	105.1	0.174	0.947	0.158	--
13.0	105.1	0	18.0	12.5	1	53	80	1.225	35.5	105.1	Infin.	0.943	0.157	--
14.5	105.1	0	18.0	12.5	1	53	80	1.171	34.3	105.1	Infin.	0.937	0.156	--
15.0	104.3	0	14.0	17.5	1	3	66	1.151	23.8	104.3	0.266	0.933	0.156	--
16.0	104.3	0	14.0	17.5	1	3	66	1.106	22.9	104.3	0.253	0.929	0.155	--
17.0	104.3	0	14.0	17.5	1	3	66	1.074	22.2	104.3	0.244	0.925	0.154	--
18.0	104.3	0	14.0	17.5	1	3	66	1.044	21.6	104.3	0.237	0.920	0.153	--
19.0	110.0	0	14.0	17.5	1	3	66	1.016	21.0	110.0	0.230	0.915	0.153	--
20.5	110.0	0	14.0	17.5	1	3	66	0.983	20.3	110.0	0.222	0.910	0.152	--
21.0	106.3	0	11.0	22.5	1	40	55	0.971	24.1	106.3	0.266	0.905	0.151	--
22.0	106.3	0	11.0	22.5	1	40	55	0.943	23.6	106.3	0.258	0.902	0.150	--
23.0	106.3	0	11.0	22.5	1	40	55	0.923	23.2	106.3	0.253	0.897	0.150	--
24.0	106.3	0	22.0	27.5	1	40	73	0.903	40.6	106.3	Infin.	0.893	0.149	--
25.0	106.3	0	22.0	27.5	1	40	73	0.885	39.9	106.3	Infin.	0.888	0.148	--
26.0	106.3	0	22.0	27.5	1	40	73	0.868	39.3	106.3	Infin.	0.883	0.147	--
27.0	106.3	0	22.0	27.5	1	15	73	0.852	33.9	106.3	Infin.	0.879	0.147	--
28.0	106.3	0	22.0	27.5	1	15	73	0.837	33.4	106.3	Infin.	0.874	0.146	--
29.0	106.3	0	22.0	27.5	1	15	73	0.822	32.8	106.3	Infin.	0.870	0.145	--
30.0	110.0	1	17.0	32.5	1	4	62	0.808	23.7	47.6	0.248	0.865	0.146	1.70
31.0	110.0	1	17.0	32.5	1	4	62	0.794	23.3	47.6	0.243	0.861	0.148	1.64
32.0	110.0	1	17.0	32.5	1	4	62	0.782	22.9	47.6	0.238	0.856	0.150	1.59
33.0	110.0	1	17.0	32.5	1	4	62	0.769	22.6	47.6	0.233	0.851	0.151	1.54
34.0	110.0	1	17.0	32.5	1	4	62	0.758	22.2	47.6	0.229	0.847	0.153	1.50
35.0	108.0	1	17.0	32.5	1	4	62	0.746	21.9	45.6	0.225	0.842	0.155	1.45
36.0	108.0	1	17.0	32.5	1	5	62	0.736	21.6	45.6	0.222	0.838	0.156	1.42
37.0	108.0	1	16.0	37.5	1	5	59	0.726	20.1	45.6	0.202	0.833	0.158	1.28
38.0	108.0	1	16.0	37.5	1	5	59	0.716	19.8	45.6	0.199	0.829	0.159	1.25
39.0	108.0	1	16.0	37.5	1	5	59	0.707	19.6	45.6	0.196	0.824	0.160	1.23
40.0	127.9	1	29.0	40.0	1	0	79	0.697	34.9	65.5	Infin.	0.819	0.161	Non-Liq.
41.0	127.9	1	29.0	40.0	1	0	79	0.687	34.4	65.5	Infin.	0.815	0.162	Non-Liq.
42.5	127.9	1	29.0	40.0	1	0	79	0.675	33.8	65.5	Infin.	0.809	0.163	Non-Liq.
43.0	126.7	1	5.0	42.5	0	71		0.670	12.8	64.3	~	0.805	0.163	~
44.0	126.7	1	5.0	42.5	0	71		0.659	12.7	64.3	~	0.801	0.165	~
45.0	126.7	1	5.0	42.5	0	71		0.651	12.6	64.3	~	0.797	0.165	~
46.0	126.7	1	5.0	42.5	0	71		0.642	12.5	64.3	~	0.792	0.166	~
47.0	126.7	1	4.0	47.5	0	78		0.634	11.4	64.3	~	0.787	0.166	~
48.0	126.7	1	4.0	47.5	0	78		0.627	11.3	64.3	~	0.783	0.167	~
49.0	126.7	1	4.0	47.5	0	78		0.619	11.3	64.3	~	0.778	0.167	~
50.0	127.9	1	26.0	50.0	1	63	71	0.612	34.5	65.5	Infin.	0.774	0.168	Non-Liq.
51.0	127.9	1	26.0	50.0	1	63	71	0.605	34.2	65.5	Infin.	0.769	0.168	Non-Liq.
52.0	127.9	1	26.0	50.0	1	63	71	0.599	33.9	65.5	Infin.	0.765	0.168	Non-Liq.
53.0	121.0	1	4.0	52.5	0	98		0.592	11.1	58.6	~	0.760	0.168	~
54.0	121.0	1	4.0	52.5	0	98		0.587	11.0	58.6	~	0.755	0.168	~
55.0	121.0	1	4.0	52.5	0	98		0.581	11.0	58.6	~	0.751	0.169	~
56.0	121.0	1	4.0	52.5	0	98		0.575	11.0	58.6	~	0.746	0.169	~
57.5	121.0	1	4.0	52.5	0	98		0.568	10.9	58.6	~	0.741	0.169	~
58.0	121.0	1	7.0	57.5	1	95	35	0.566	13.8	58.6	0.131	0.736	0.168	0.78
59.0	121.0	1	7.0	57.5	1	95	35	0.559	13.8	58.6	0.130	0.733	0.169	0.77
60.0	127.9	1	16.0	62.5	1	95	52	0.554	22.3	65.5	0.210	0.728	0.169	1.24
61.0	127.9	1	16.0	62.5	1	95	52	0.549	22.2	65.5	0.208	0.723	0.168	1.24
62.0	127.9	1	16.0	62.5	1	78	52	0.544	22.0	65.5	0.207	0.719	0.168	1.23
63.0	127.9	1	16.0	62.5	1	78	52	0.540	21.9	65.5	0.205	0.714	0.168	1.22
64.0	127.9	1	16.0	62.5	1	78	52	0.538	21.8	65.5	0.205	0.710	0.168	1.22
65.0	126.6	1	16.0	62.5	1	78	52	0.536	21.8	64.2	0.204	0.705	0.167	1.22
66.0	126.6	1	16.0	62.5	1	78	52	0.533	21.7	64.2	0.203	0.701	0.167	1.22
67.0	126.6	1	16.0	62.5	1	78	52	0.531	21.7	64.2	0.203	0.696	0.167	1.21
68.0	137.8	1	59.0	67.5	1	0	98	0.528	53.8	75.4	Infin.	0.691	0.166	Non-Liq.
69.0	137.8	1	59.0	67.5	1	0	98	0.526	53.5	75.4	Infin.	0.687	0.166	Non-Liq.
70.0	137.8	1	59.0	67.5	1	0	98	0.523	53.2	75.4	Infin.	0.682	0.165	Non-Liq.
71.0	137.8	1	59.0	67.5	1	0	98	0.521	53.0	75.4	Infin.	0.678	0.165	Non-Liq.
72.0	137.8	1	59.0	72.5	1	0	96	0.518	52.7	75.4	Infin.	0.673	0.164	Non-Liq.
73.0	137.8	1	59.0	72.5	1	0	96	0.516	52.5	75.4	Infin.	0.669	0.164	Non-Liq.
74.0	137.8	1	59.0	72.5	1	0	96	0.513	52.2	75.4	Infin.	0.664	0.163	Non-Liq.
75.5	137.8	1	59.0	72.5	1	0	96	0.510	51.9	75.4	Infin.	0.658	0.162	Non-Liq.

Figure 5

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
PGAM (g):	0.531
2/3 PGAM (g):	0.35
Calculated Mag.Wtg.Factor:	0.724
Historic High Groundwater:	30.0
Groundwater @ Exploration:	62.5

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15} (%)	EQ. SETTLE. Pe (in.)
1.0	7	113.7182	0.028	0.028	54	15	0.230	--	0.00	0.00
2.0	7	113.7182	0.085	0.085	54	20	0.230	--	0.00	0.00
3.0	7	113.7182	0.142	0.142	54	20	0.230	--	0.00	0.00
4.0	7	113.7182	0.199	0.199	54	20	0.230	--	0.00	0.00
5.0	7	113.7182	0.256	0.256	54	20	0.230	--	0.00	0.00
6.0	7	113.7182	0.313	0.313	54	20	0.230	--	0.00	0.00
7.0	7	113.7182	0.370	0.370	54	20	0.230	--	0.00	0.00
8.0	7	113.7182	0.426	0.426	54	19	0.230	--	0.00	0.00
9.0	7	113.7182	0.483	0.483	54	18	0.230	--	0.00	0.00
10.0	7	105.135	0.538	0.538	54	17	0.230	--	0.00	0.00
11.0	7	105.135	0.591	0.591	54	16	0.230	--	0.00	0.00
12.0	7	105.135	0.643	0.643	54	16	0.230	--	0.00	0.00
13.0	18	105.135	0.696	0.696	80	36	0.230	--	0.00	0.00
14.5	18	105.135	0.761	0.761	80	34	0.230	--	0.00	0.00
15.0	14	104.3352	0.788	0.788	66	24	0.230	--	0.00	0.00
16.0	14	104.3352	0.853	0.853	66	23	0.230	--	0.00	0.00
17.0	14	104.3352	0.905	0.905	66	22	0.230	--	0.00	0.00
18.0	14	104.3352	0.957	0.957	66	22	0.230	--	0.00	0.00
19.0	14	109.9968	1.011	1.011	66	21	0.230	--	0.00	0.00
20.5	14	109.9968	1.079	1.079	66	20	0.230	--	0.00	0.00
21.0	11	106.287	1.107	1.107	55	24	0.230	--	0.00	0.00
22.0	11	106.287	1.173	1.173	55	24	0.230	--	0.00	0.00
23.0	11	106.287	1.226	1.226	55	23	0.230	--	0.00	0.00
24.0	22	106.287	1.279	1.279	73	41	0.230	--	0.00	0.00
25.0	22	106.287	1.332	1.332	73	40	0.230	--	0.00	0.00
26.0	22	106.287	1.386	1.386	73	39	0.230	--	0.00	0.00
27.0	22	106.287	1.439	1.439	73	34	0.230	--	0.00	0.00
28.0	22	106.287	1.492	1.492	73	33	0.230	--	0.00	0.00
29.0	22	106.287	1.545	1.545	73	33	0.230	--	0.00	0.00
30.0	17	109.9917	1.599	1.583	62	24	0.232	1.70	0.00	0.00
31.0	17	109.9917	1.654	1.607	62	23	0.237	1.64	0.00	0.00
32.0	17	109.9917	1.709	1.631	62	23	0.241	1.59	0.00	0.00
33.0	17	109.9917	1.764	1.655	62	23	0.245	1.54	0.00	0.00
34.0	17	109.9917	1.819	1.679	62	22	0.249	1.50	0.00	0.00
35.0	17	108.014	1.874	1.702	62	22	0.253	1.45	0.00	0.00
36.0	17	108.014	1.928	1.725	62	22	0.257	1.42	0.00	0.00
37.0	16	108.014	1.982	1.748	59	20	0.261	1.28	0.00	0.00
38.0	16	108.014	2.036	1.770	59	20	0.265	1.25	0.00	0.00
39.0	16	108.014	2.090	1.793	59	20	0.268	1.23	0.00	0.00
40.0	29	127.9157	2.149	1.821	79	35	0.272	Non-Liq.	0.00	0.00
41.0	29	127.9157	2.212	1.854	79	34	0.275	Non-Liq.	0.00	0.00
42.5	29	127.9157	2.292	1.895	79	34	0.279	Non-Liq.	0.00	0.00
43.0	5	126.741	2.324	1.911		13	0.280	~	0.00	0.00
44.0	5	126.741	2.403	1.951		13	0.284	~	0.00	0.00
45.0	5	126.741	2.467	1.983		13	0.286	~	0.00	0.00
46.0	5	126.741	2.530	2.015		13	0.289	~	0.00	0.00
47.0	4	126.741	2.594	2.048		11	0.292	~	0.00	0.00
48.0	4	126.741	2.657	2.080		11	0.294	~	0.00	0.00
49.0	4	126.741	2.720	2.112		11	0.297	~	0.00	0.00
50.0	26	127.8886	2.784	2.144	71	34	0.299	Non-Liq.	0.00	0.00
51.0	26	127.8886	2.848	2.177	71	34	0.301	Non-Liq.	0.00	0.00
52.0	26	127.8886	2.912	2.210	71	34	0.303	Non-Liq.	0.00	0.00
53.0	4	120.9667	2.974	2.241		11	0.306	~	0.00	0.00
54.0	4	120.9667	3.035	2.270		11	0.308	~	0.00	0.00
55.0	4	120.9667	3.095	2.299		11	0.310	~	0.00	0.00
56.0	4	120.9667	3.156	2.329		11	0.312	~	0.00	0.00
57.5	4	120.9667	3.231	2.365		11	0.314	~	0.00	0.00
58.0	7	120.9667	3.261	2.380	35	14	0.315	0.78	1.80	0.11
59.0	7	120.9667	3.337	2.417	35	14	0.318	0.77	1.80	0.22
60.0	16	127.908	3.399	2.448	52	22	0.320	1.24	0.00	0.00
61.0	16	127.908	3.463	2.480	52	22	0.321	1.24	0.00	0.00
62.0	16	127.908	3.527	2.513	52	22	0.323	1.23	0.00	0.00
63.0	16	127.908	3.591	2.546	52	22	0.325	1.22	0.00	0.00
64.0	16	127.908	3.655	2.579	52	22	0.326	1.22	0.00	0.00
65.0	16	126.592	3.719	2.611	52	22	0.328	1.22	0.00	0.00
66.0	16	126.592	3.782	2.643	52	22	0.329	1.22	0.00	0.00
67.0	16	126.592	3.845	2.675	52	22	0.331	1.21	0.00	0.00
68.0	59	137.8251	3.911	2.710	98	54	0.332	Non-Liq.	0.00	0.00
69.0	59	137.8251	3.980	2.748	98	54	0.333	Non-Liq.	0.00	0.00
70.0	59	137.8251	4.049	2.786	98	53	0.335	Non-Liq.	0.00	0.00
71.0	59	137.8251	4.118	2.823	98	53	0.336	Non-Liq.	0.00	0.00
72.0	59	137.8251	4.187	2.861	96	53	0.337	Non-Liq.	0.00	0.00
73.0	59	137.8251	4.256	2.899	96	52	0.338	Non-Liq.	0.00	0.00
74.0	59	137.8251	4.325	2.936	96	52	0.339	Non-Liq.	0.00	0.00
75.5	59	137.8251	4.411	2.984	96	52	0.340	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 0.3 INCHES

Figure 6

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.54
Peak Horiz. Acceleration PGA_M (g):	0.531
Calculated Mag.Wtg.Factor:	0.708
Historic High Groundwater:	30.0
Groundwater Depth During Exploration:	62.5

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.15
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.998	0.244	--
2.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.993	0.243	--
3.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.989	0.241	--
4.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.984	0.240	--
5.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.979	0.239	--
6.0	113.7	0	7.0	7.5	1	24	54	1.700	19.8	113.7	0.216	0.975	0.238	--
7.0	113.7	0	7.0	7.5	1	24	54	1.681	19.6	113.7	0.214	0.970	0.237	--
8.0	113.7	0	7.0	7.5	1	24	54	1.565	18.6	113.7	0.202	0.966	0.236	--
9.0	113.7	0	7.0	7.5	1	24	54	1.470	17.7	113.7	0.193	0.961	0.235	--
10.0	105.1	0	7.0	7.5	1	24	54	1.393	17.0	105.1	0.185	0.957	0.234	--
11.0	105.1	0	7.0	7.5	1	24	54	1.330	16.5	105.1	0.179	0.952	0.233	--
12.0	105.1	0	7.0	7.5	1	24	54	1.274	15.9	105.1	0.174	0.947	0.231	--
13.0	105.1	0	18.0	12.5	1	53	80	1.225	35.5	105.1	Infin.	0.943	0.230	--
14.5	105.1	0	18.0	12.5	1	53	80	1.171	34.3	105.1	Infin.	0.937	0.229	--
15.0	104.3	0	14.0	17.5	1	3	66	1.151	23.8	104.3	0.266	0.933	0.228	--
16.0	104.3	0	14.0	17.5	1	3	66	1.106	22.9	104.3	0.253	0.929	0.227	--
17.0	104.3	0	14.0	17.5	1	3	66	1.074	22.2	104.3	0.244	0.925	0.226	--
18.0	104.3	0	14.0	17.5	1	3	66	1.044	21.6	104.3	0.237	0.920	0.225	--
19.0	110.0	0	14.0	17.5	1	3	66	1.016	21.0	110.0	0.230	0.915	0.224	--
20.5	110.0	0	14.0	17.5	1	3	66	0.983	20.3	110.0	0.222	0.910	0.222	--
21.0	106.3	0	11.0	22.5	1	40	55	0.971	24.1	106.3	0.266	0.905	0.221	--
22.0	106.3	0	11.0	22.5	1	40	55	0.943	23.6	106.3	0.258	0.902	0.220	--
23.0	106.3	0	11.0	22.5	1	40	55	0.923	23.2	106.3	0.253	0.897	0.219	--
24.0	106.3	0	22.0	27.5	1	40	73	0.903	40.6	106.3	Infin.	0.893	0.218	--
25.0	106.3	0	22.0	27.5	1	40	73	0.885	39.9	106.3	Infin.	0.888	0.217	--
26.0	106.3	0	22.0	27.5	1	40	73	0.868	39.3	106.3	Infin.	0.883	0.216	--
27.0	106.3	0	22.0	27.5	1	15	73	0.852	33.9	106.3	Infin.	0.879	0.215	--
28.0	106.3	0	22.0	27.5	1	15	73	0.837	33.4	106.3	Infin.	0.874	0.214	--
29.0	106.3	0	22.0	27.5	1	15	73	0.822	32.8	106.3	Infin.	0.870	0.212	--
30.0	110.0	1	17.0	32.5	1	4	62	0.808	23.7	47.6	0.248	0.865	0.213	1.16
31.0	110.0	1	17.0	32.5	1	4	62	0.794	23.3	47.6	0.243	0.861	0.216	1.12
32.0	110.0	1	17.0	32.5	1	4	62	0.782	22.9	47.6	0.238	0.856	0.219	1.08
33.0	110.0	1	17.0	32.5	1	4	62	0.769	22.6	47.6	0.233	0.851	0.222	1.05
34.0	110.0	1	17.0	32.5	1	4	62	0.758	22.2	47.6	0.229	0.847	0.224	1.02
35.0	108.0	1	17.0	32.5	1	4	62	0.746	21.9	45.6	0.225	0.842	0.226	0.99
36.0	108.0	1	17.0	32.5	1	5	62	0.736	21.6	45.6	0.222	0.838	0.229	0.97
37.0	108.0	1	16.0	37.5	1	5	59	0.726	20.1	45.6	0.202	0.833	0.231	0.88
38.0	108.0	1	16.0	37.5	1	5	59	0.716	19.8	45.6	0.199	0.829	0.233	0.86
39.0	108.0	1	16.0	37.5	1	5	59	0.707	19.6	45.6	0.196	0.824	0.235	0.84
40.0	127.9	1	29.0	40.0	1		79	0.697	34.9	65.5	Infin.	0.819	0.236	Non-Liq.
41.0	127.9	1	29.0	40.0	1		79	0.687	34.4	65.5	Infin.	0.815	0.238	Non-Liq.
42.5	127.9	1	29.0	40.0	1		79	0.675	33.8	65.5	Infin.	0.809	0.239	Non-Liq.
43.0	126.7	1	5.0	42.5	0	71		0.670	12.8	64.3	~	0.805	0.239	~
44.0	126.7	1	5.0	42.5	0	71		0.659	12.7	64.3	~	0.801	0.241	~
45.0	126.7	1	5.0	42.5	0	71		0.651	12.6	64.3	~	0.797	0.242	~
46.0	126.7	1	5.0	42.5	0	71		0.642	12.5	64.3	~	0.792	0.243	~
47.0	126.7	1	4.0	47.5	0	78		0.634	11.4	64.3	~	0.787	0.244	~
48.0	126.7	1	4.0	47.5	0	78		0.627	11.3	64.3	~	0.783	0.244	~
49.0	126.7	1	4.0	47.5	0	78		0.619	11.3	64.3	~	0.778	0.245	~
50.0	127.9	1	26.0	50.0	1	63	71	0.612	34.5	65.5	Infin.	0.774	0.245	Non-Liq.
51.0	127.9	1	26.0	50.0	1	63	71	0.605	34.2	65.5	Infin.	0.769	0.246	Non-Liq.
52.0	127.9	1	26.0	50.0	1	63	71	0.599	33.9	65.5	Infin.	0.765	0.246	Non-Liq.
53.0	121.0	1	4.0	52.5	0	98		0.592	11.1	58.6	~	0.760	0.246	~
54.0	121.0	1	4.0	52.5	0	98		0.587	11.0	58.6	~	0.755	0.247	~
55.0	121.0	1	4.0	52.5	0	98		0.581	11.0	58.6	~	0.751	0.247	~
56.0	121.0	1	4.0	52.5	0	98		0.575	11.0	58.6	~	0.746	0.247	~
57.5	121.0	1	4.0	52.5	0	98		0.568	10.9	58.6	~	0.741	0.247	~
58.0	121.0	1	7.0	57.5	1	95	35	0.566	13.8	58.6	0.131	0.736	0.246	0.53
59.0	121.0	1	7.0	57.5	1	95	35	0.559	13.8	58.6	0.130	0.733	0.247	0.53
60.0	127.9	1	16.0	62.5	1	95	52	0.554	22.3	65.5	0.210	0.728	0.247	0.85
61.0	127.9	1	16.0	62.5	1	95	52	0.549	22.2	65.5	0.208	0.723	0.247	0.84
62.0	127.9	1	16.0	62.5	1	78	52	0.544	22.0	65.5	0.207	0.719	0.246	0.84
63.0	127.9	1	16.0	62.5	1	78	52	0.540	21.9	65.5	0.205	0.714	0.246	0.84
64.0	127.9	1	16.0	62.5	1	78	52	0.538	21.8	65.5	0.205	0.710	0.246	0.83
65.0	126.6	1	16.0	62.5	1	78	52	0.536	21.8	64.2	0.204	0.705	0.245	0.83
66.0	126.6	1	16.0	62.5	1	78	52	0.533	21.7	64.2	0.203	0.701	0.245	0.83
67.0	126.6	1	16.0	62.5	1	78	52	0.531	21.7	64.2	0.203	0.696	0.244	0.83
68.0	137.8	1	59.0	67.5	1		98	0.528	53.8	75.4	Infin.	0.691	0.244	Non-Liq.
69.0	137.8	1	59.0	67.5	1		98	0.526	53.5	75.4	Infin.	0.687	0.243	Non-Liq.
70.0	137.8	1	59.0	67.5	1		98	0.523	53.2	75.4	Infin.	0.682	0.242	Non-Liq.
71.0	137.8	1	59.0	67.5	1		98	0.521	53.0	75.4	Infin.	0.678	0.241	Non-Liq.
72.0	137.8	1	59.0	72.5	1		96	0.518	52.7	75.4	Infin.	0.673	0.241	Non-Liq.
73.0	137.8	1	59.0	72.5	1		96	0.516	52.5	75.4	Infin.	0.669	0.240	Non-Liq.
74.0	137.8	1	59.0	72.5	1		96	0.513	52.2	75.4	Infin.	0.664	0.239	Non-Liq.
75.5	137.8	1	59.0	72.5	1		96	0.510	51.9	75.4	Infin.	0.658	0.238	Non-Liq.

Figure 7

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.54
PGA_M (g):	0.531
Calculated Mag.Wtg.Factor:	0.708
Historic High Groundwater:	30.0
Groundwater @ Exploration:	62.5

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e15] (%)	EQ. SETTLE. Pe (in.)
1.0	7	113.7182	0.028	0.028	54	20	0.345	--	0.00	0.00
2.0	7	113.7182	0.085	0.085	54	20	0.345	--	0.00	0.00
3.0	7	113.7182	0.142	0.142	54	20	0.345	--	0.00	0.00
4.0	7	113.7182	0.199	0.199	54	20	0.345	--	0.00	0.00
5.0	7	113.7182	0.256	0.256	54	20	0.345	--	0.00	0.00
6.0	7	113.7182	0.313	0.313	54	20	0.345	--	0.00	0.00
7.0	7	113.7182	0.370	0.370	54	20	0.345	--	0.00	0.00
8.0	7	113.7182	0.426	0.426	54	19	0.345	--	0.00	0.00
9.0	7	113.7182	0.483	0.483	54	18	0.345	--	0.00	0.00
10.0	7	105.135	0.538	0.538	54	17	0.345	--	0.00	0.00
11.0	7	105.135	0.591	0.591	54	16	0.345	--	0.00	0.00
12.0	7	105.135	0.643	0.643	54	16	0.345	--	0.00	0.00
13.0	18	105.135	0.696	0.696	80	36	0.345	--	0.00	0.00
14.5	18	105.135	0.761	0.761	80	34	0.345	--	0.00	0.00
15.0	14	104.3352	0.788	0.788	66	24	0.345	--	0.00	0.00
16.0	14	104.3352	0.853	0.853	66	23	0.345	--	0.00	0.00
17.0	14	104.3352	0.905	0.905	66	22	0.345	--	0.00	0.00
18.0	14	104.3352	0.957	0.957	66	22	0.345	--	0.00	0.00
19.0	14	109.9968	1.011	1.011	66	21	0.345	--	0.00	0.00
20.5	14	109.9968	1.079	1.079	66	20	0.345	--	0.00	0.00
21.0	11	106.287	1.107	1.107	55	24	0.345	--	0.00	0.00
22.0	11	106.287	1.173	1.173	55	24	0.345	--	0.00	0.00
23.0	11	106.287	1.226	1.226	55	23	0.345	--	0.00	0.00
24.0	22	106.287	1.279	1.279	73	41	0.345	--	0.00	0.00
25.0	22	106.287	1.332	1.332	73	40	0.345	--	0.00	0.00
26.0	22	106.287	1.386	1.386	73	39	0.345	--	0.00	0.00
27.0	22	106.287	1.439	1.439	73	34	0.345	--	0.00	0.00
28.0	22	106.287	1.492	1.492	73	33	0.345	--	0.00	0.00
29.0	22	106.287	1.545	1.545	73	33	0.345	--	0.00	0.00
30.0	17	109.9917	1.599	1.583	62	24	0.349	1.16	0.00	0.00
31.0	17	109.9917	1.654	1.607	62	23	0.355	1.12	0.00	0.00
32.0	17	109.9917	1.709	1.631	62	23	0.362	1.08	0.00	0.00
33.0	17	109.9917	1.764	1.655	62	23	0.368	1.05	0.00	0.00
34.0	17	109.9917	1.819	1.679	62	22	0.374	1.02	0.00	0.00
35.0	17	108.014	1.874	1.702	62	22	0.380	0.99	1.40	0.17
36.0	17	108.014	1.928	1.725	62	22	0.386	0.97	1.40	0.17
37.0	16	108.014	1.982	1.748	59	20	0.391	0.88	1.40	0.17
38.0	16	108.014	2.036	1.770	59	20	0.397	0.86	1.60	0.19
39.0	16	108.014	2.090	1.793	59	20	0.402	0.84	1.60	0.19
40.0	29	127.9157	2.149	1.821	79	35	0.407	Non-Liq.	0.00	0.00
41.0	29	127.9157	2.212	1.854	79	34	0.412	Non-Liq.	0.00	0.00
42.5	29	127.9157	2.292	1.895	79	34	0.418	Non-Liq.	0.00	0.00
43.0	5	126.741	2.324	1.911		13	0.420	~	0.00	0.00
44.0	5	126.741	2.403	1.951		13	0.425	~	0.00	0.00
45.0	5	126.741	2.467	1.983		13	0.429	~	0.00	0.00
46.0	5	126.741	2.530	2.015		13	0.433	~	0.00	0.00
47.0	4	126.741	2.594	2.048		11	0.437	~	0.00	0.00
48.0	4	126.741	2.657	2.080		11	0.441	~	0.00	0.00
49.0	4	126.741	2.720	2.112		11	0.445	~	0.00	0.00
50.0	26	127.8886	2.784	2.144	71	34	0.448	Non-Liq.	0.00	0.00
51.0	26	127.8886	2.848	2.177	71	34	0.451	Non-Liq.	0.00	0.00
52.0	26	127.8886	2.912	2.210	71	34	0.455	Non-Liq.	0.00	0.00
53.0	4	120.9667	2.974	2.241		11	0.458	~	0.00	0.00
54.0	4	120.9667	3.035	2.270		11	0.461	~	0.00	0.00
55.0	4	120.9667	3.095	2.299		11	0.465	~	0.00	0.00
56.0	4	120.9667	3.156	2.329		11	0.468	~	0.00	0.00
57.5	4	120.9667	3.231	2.365		11	0.471	~	0.00	0.00
58.0	7	120.9667	3.261	2.380	35	14	0.473	0.53	1.80	0.11
59.0	7	120.9667	3.337	2.417	35	14	0.477	0.53	1.80	0.22
60.0	16	127.908	3.399	2.448	52	22	0.479	0.85	1.40	0.17
61.0	16	127.908	3.463	2.480	52	22	0.482	0.84	1.40	0.17
62.0	16	127.908	3.527	2.513	52	22	0.484	0.84	1.40	0.17
63.0	16	127.908	3.591	2.546	52	22	0.487	0.84	1.40	0.17
64.0	16	127.908	3.655	2.579	52	22	0.489	0.83	1.40	0.17
65.0	16	126.592	3.719	2.611	52	22	0.492	0.83	1.40	0.17
66.0	16	126.592	3.782	2.643	52	22	0.494	0.83	1.40	0.17
67.0	16	126.592	3.845	2.675	52	22	0.496	0.83	1.40	0.17
68.0	59	137.8251	3.911	2.710	98	54	0.498	Non-Liq.	0.00	0.00
69.0	59	137.8251	3.980	2.748	98	54	0.500	Non-Liq.	0.00	0.00
70.0	59	137.8251	4.049	2.786	98	53	0.502	Non-Liq.	0.00	0.00
71.0	59	137.8251	4.118	2.823	98	53	0.503	Non-Liq.	0.00	0.00
72.0	59	137.8251	4.187	2.861	96	53	0.505	Non-Liq.	0.00	0.00
73.0	59	137.8251	4.256	2.899	96	52	0.507	Non-Liq.	0.00	0.00
74.0	59	137.8251	4.325	2.936	96	52	0.508	Non-Liq.	0.00	0.00
75.5	59	137.8251	4.411	2.984	96	52	0.510	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 2.6 INCHES

Figure 8

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
DESIGN EARTHQUAKE

DE EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.60
Peak Horiz. Acceleration (g):	0.354

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15} (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	113.7	0.03	0.02	0.007	7	1.25	54.4	1.7	15.4	1.0	153.472	4.22E-05	6.00E-05	0.006	8.21E-03	7.9523	6.17E-03	0.00
2.0	1.0	1.5	113.7	0.09	0.06	0.020	7	1.25	54.4	1.7	19.8	1.0	289.104	6.59E-05	1.00E-04	0.010	1.01E-02	7.9523	7.60E-03	0.00
3.0	1.0	2.5	113.7	0.14	0.10	0.033	7	1.25	54.4	1.7	19.8	1.0	373.231	8.35E-05	1.60E-04	0.016	1.62E-02	7.9523	1.22E-02	0.00
4.0	1.0	3.5	113.7	0.20	0.13	0.046	7	1.25	54.4	1.7	19.8	1.0	441.613	9.68E-05	1.60E-04	0.016	1.62E-02	7.9523	1.22E-02	0.00
5.0	1.0	4.5	113.7	0.26	0.17	0.059	7	1.25	54.4	1.7	19.8	1.0	500.742	1.08E-04	1.70E-04	0.017	1.72E-02	7.9523	1.29E-02	0.00
6.0	1.0	5.5	113.7	0.31	0.21	0.072	7	1.25	54.4	1.7	19.8	1.0	553.591	1.17E-04	1.50E-04	0.015	1.52E-02	7.9523	1.14E-02	0.00
7.0	1.0	6.5	113.7	0.37	0.25	0.085	7	1.25	54.4	1.7	19.6	1.0	600.043	1.25E-04	1.50E-04	0.015	1.53E-02	7.9523	1.15E-02	0.00
8.0	1.0	7.5	113.7	0.43	0.29	0.098	7	1.25	54.4	1.6	18.6	1.0	632.835	1.34E-04	1.50E-04	0.015	1.64E-02	7.9523	1.23E-02	0.00
9.0	1.0	8.5	113.7	0.48	0.32	0.110	7	1.25	54.4	1.5	17.7	1.0	663.150	1.43E-04	1.50E-04	0.015	1.73E-02	7.9523	1.30E-02	0.00
10.0	1.0	9.5	105.1	0.54	0.36	0.123	7	1.25	54.4	1.4	17.0	1.0	690.412	1.50E-04	1.50E-04	0.015	1.82E-02	7.9523	1.37E-02	0.00
11.0	1.0	10.5	105.1	0.59	0.40	0.134	7	1.25	54.4	1.3	16.5	1.0	715.125	1.56E-04	1.50E-04	0.015	1.90E-02	7.9523	1.43E-02	0.00
12.0	1.0	11.5	105.1	0.64	0.43	0.146	7	1.25	54.4	1.3	15.9	0.9	738.595	1.61E-04	1.50E-04	0.015	1.97E-02	7.9523	1.48E-02	0.00
13.0	1.0	12.5	105.1	0.70	0.47	0.158	18	1.25	80.1	1.2	35.5	0.9	1003.262	1.26E-04	1.50E-04	0.015	7.53E-03	7.9523	5.66E-03	0.00
14.5	1.5	13.8	105.1	0.76	0.51	0.172	18	1.25	80.1	1.2	34.3	0.9	1037.027	1.31E-04	1.60E-04	0.016	8.38E-03	7.9523	6.30E-03	0.00
15.0	0.5	14.8	104.3	0.81	0.55	0.183	14	1.25	65.7	1.2	23.8	0.9	949.305	1.50E-04	1.60E-04	0.016	1.30E-02	7.9523	9.77E-03	0.00
16.0	1.0	15.5	104.3	0.85	0.57	0.192	14	1.25	65.7	1.1	22.9	0.9	959.056	1.53E-04	1.60E-04	0.016	1.36E-02	7.9523	1.02E-02	0.00
17.0	1.0	16.5	104.3	0.91	0.61	0.203	14	1.25	65.7	1.1	22.2	0.9	978.219	1.57E-04	1.60E-04	0.016	1.41E-02	7.9523	1.06E-02	0.00
18.0	1.0	17.5	104.3	0.96	0.64	0.214	14	1.25	65.7	1.0	21.6	0.9	996.659	1.60E-04	1.60E-04	0.016	1.46E-02	7.9523	1.10E-02	0.00
19.0	1.0	18.5	110.0	1.01	0.68	0.225	14	1.25	65.7	1.0	21.0	0.9	1014.915	1.63E-04	1.60E-04	0.016	1.51E-02	7.9523	1.13E-02	0.00
20.5	1.5	19.8	110.0	1.08	0.72	0.239	14	1.25	65.7	1.0	20.3	0.9	1037.416	1.67E-04	1.60E-04	0.016	1.57E-02	7.9523	1.18E-02	0.00
21.0	0.5	20.8	106.3	1.13	0.76	0.250	11	1.25	54.6	1.0	24.1	0.9	1125.519	1.59E-04	1.60E-04	0.016	1.28E-02	7.9523	9.62E-03	0.00
22.0	1.0	21.5	106.3	1.17	0.79	0.258	11	1.25	54.6	0.9	23.6	0.9	1137.289	1.61E-04	1.60E-04	0.016	1.31E-02	7.9523	9.86E-03	0.00
23.0	1.0	22.5	106.3	1.23	0.82	0.269	11	1.25	54.6	0.9	23.2	0.9	1156.738	1.63E-04	1.60E-04	0.016	1.34E-02	7.9523	1.00E-02	0.00
24.0	1.0	23.5	106.3	1.28	0.86	0.279	22	1.25	73.0	0.9	40.6	0.9	1422.559	1.36E-04	1.60E-04	0.016	6.85E-03	7.9523	5.15E-03	0.00
25.0	1.0	24.5	106.3	1.33	0.89	0.290	22	1.25	73.0	0.9	39.9	0.9	1443.670	1.37E-04	1.60E-04	0.016	6.99E-03	7.9523	5.25E-03	0.00
26.0	1.0	25.5	106.3	1.39	0.93	0.300	22	1.25	73.0	0.9	39.3	0.9	1464.278	1.38E-04	1.60E-04	0.016	7.12E-03	7.9523	5.35E-03	0.00
27.0	1.0	26.5	106.3	1.44	0.96	0.310	22	1.25	73.0	0.9	33.9	0.9	1421.445	1.46E-04	1.60E-04	0.016	8.48E-03	7.9523	6.38E-03	0.00
28.0	1.0	27.5	106.3	1.49	1.00	0.320	22	1.25	73.0	0.8	33.4	0.9	1439.307	1.47E-04	1.30E-04	0.013	7.03E-03	7.9523	5.29E-03	0.00
29.0	1.0	28.5	106.3	1.55	1.04	0.329	22	1.25	73.0	0.8	32.8	0.9	1456.767	1.48E-04	1.30E-04	0.013	7.17E-03	7.9523	5.39E-03	0.00
30.0	1.0	29.5	110.0	1.60	1.07	0.339	17	1.25	62.2	0.8	23.7	0.9	1329.370	1.65E-04	1.30E-04	0.013	1.06E-02	7.9523	7.97E-03	0.00
31.0	1.0	30.5	110.0	1.66	1.11	0.349	17	1.25	62.2	0.8	23.3	0.9	1344.423	1.66E-04	1.30E-04	0.013	1.08E-02	7.9523	8.14E-03	0.00
32.0	1.0	31.5	110.0	1.71	1.15	0.358	17	1.25	62.2	0.8	22.9	0.9	1359.147	1.68E-04	1.30E-04	0.013	1.10E-02	7.9523	8.30E-03	0.00
33.0	1.0	32.5	110.0	1.77	1.18	0.368	17	1.25	62.2	0.8	22.6	0.9	1373.558	1.69E-04	1.30E-04	0.013	1.13E-02	7.9523	8.46E-03	0.00
34.0	1.0	33.5	110.0	1.82	1.22	0.377	17	1.25	62.2	0.8	22.2	0.8	1387.673	1.69E-04	1.30E-04	0.013	1.15E-02	7.9523	8.61E-03	0.00
35.0	1.0	34.5	108.0	1.87	1.26	0.386	17	1.25	62.2	0.7	21.9	0.8	1401.384	1.70E-04	1.30E-04	0.013	1.17E-02	7.9523	8.77E-03	0.00
36.0	1.0	35.5	108.0	1.93	1.29	0.394	17	1.25	62.2	0.7	21.6	0.8	1415.729	1.71E-04	1.30E-04	0.013	1.18E-02	7.9523	8.89E-03	0.00
37.0	1.0	36.5	108.0	1.98	1.33	0.403	16	1.25	59.1	0.7	20.1	0.8	1400.312	1.75E-04	1.30E-04	0.013	1.29E-02	7.9523	9.72E-03	0.00
38.0	1.0	37.5	108.0	2.04	1.36	0.411	16	1.25	59.1	0.7	19.8	0.8	1412.924	1.76E-04	1.30E-04	0.013	1.31E-02	7.9523	9.88E-03	0.00
39.0	1.0	38.5	108.0	2.09	1.40	0.419	16	1.25	59.1	0.7	19.6	0.8	1425.316	1.76E-04	1.30E-04	0.013	1.34E-02	7.9523	1.00E-02	0.00
40.0	1.0	39.5	127.9	2.15	1.44	0.428	29	1.25	78.8	0.7	34.9	0.8	1752.607	1.45E-04	1.30E-04	0.013	6.67E-03	7.9523	5.01E-03	0.00
41.0	1.0	40.5	127.9	2.21	1.48	0.438	29	1.25	78.8	0.7	34.4	0.8	1769.814	1.46E-04	1.30E-04	0.013	6.79E-03	7.9523	5.10E-03	0.00
42.5	1.5	41.8	127.9	2.29	1.54	0.450	29	1.25	78.8	0.7	33.8	0.8	1790.864	1.47E-04	1.30E-04	0.013	6.94E-03	7.9523	5.21E-03	0.00
43.0	0.5	42.8	126.7	2.36	1.58	0.459	5	1.25	32.3	0.7	12.8	0.8	1313.433	2.03E-04	3.00E-04	0.030	5.13E-02	7.9523	3.86E-02	0.00
44.0	1.0	43.5	126.7	2.40	1.61	0.466	5	1.25	32.3	0.7	12.7	0.8	1323.275	2.03E-04	3.00E-04	0.030	5.18E-02	7.9523	3.89E-02	0.00
45.0	1.0	44.5	126.7	2.47	1.65	0.474	5	1.25	32.3	0.7	12.6	0.8	1338.003	2.03E-04	3.00E-04	0.030	5.22E-02	7.9523	3.92E-02	0.00
46.0	1.0	45.5	126.7	2.53	1.70	0.483	5	1.25	32.3	0.6	12.5	0.8	1352.532	2.04E-04	3.00E-04	0.030	5.25E-02	7.9523	3.95E-02	0.00
47.0	1.0	46.5	126.7	2.60	1.74	0.491	4	1.25	28.0	0.6	11.4	0.8	1325.661	2.10E-04	3.00E-04	0.030	5.90E-02	7.9523	4.44E-02	0.00
48.0	1.0	47.5	126.7	2.66	1.78	0.499	4	1.25	28.0	0.6	11.3	0.8	1339.682	2.10E-04	3.00E-04	0.030	5.94E-02	7.9523	4.46E-02	0.00
49.0	1.0	48.5	126.7	2.72	1.82	0.507	4	1.25	28.0	0.6	11.3	0.8	1353.531	2.10E-04	3.00E-04	0.030	5.97E-02	7.9523	4.49E-02	0.00
50.0	1.0	49.5	127.9	2.79	1.87	0.515	26	1.25	70.7	0.6	34.5	0.8	1987.231	1.44E-04	1.30E-04	0.013	6.77E-03	7.9523	5.09E-03	0.00

TOTAL SETTLEMENT = **0.07**

Figure 9

GEOCON

Client : Garden Grove Hotel
File No. : A9839-88-01
Boring : 1

TECHNICAL ENGINEERING AND DESIGN GUIDES AS ADAPTED FROM THE US ARMY CORPS OF ENGINEERS, NO. 9
EVALUATION OF EARTHQUAKE-INDUCED SETTLEMENTS IN DRY SANDY SOILS
MAXIMUM CONSIDERED EARTHQUAKE

MCE EARTHQUAKE INFORMATION:

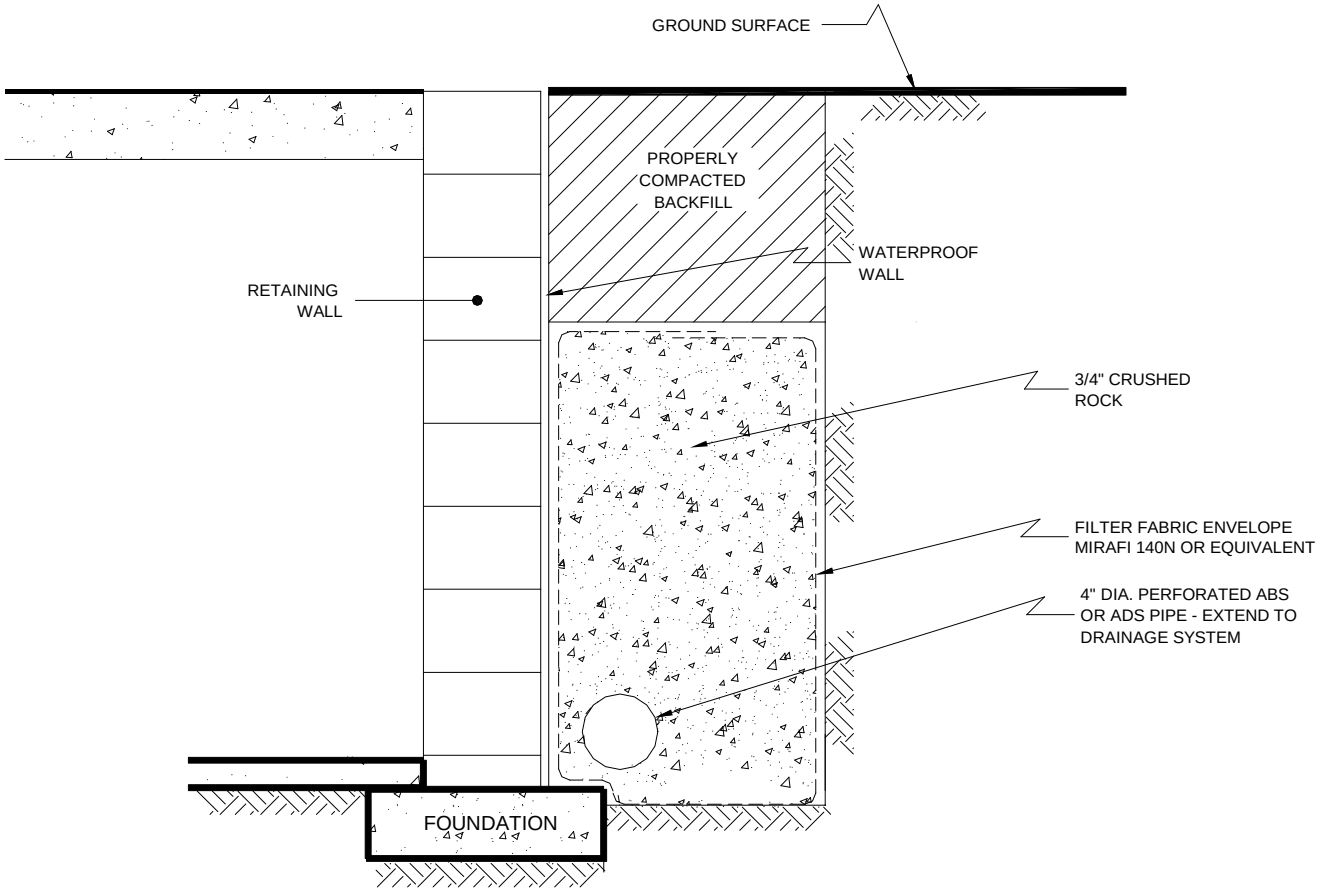
Earthquake Magnitude:	6.54
Peak Horiz. Acceleration (g):	0.531

Fig 4.1 Fig 4.2 Fig 4.4

Depth of Base of Strata (ft)	Thickness of Layer (ft)	Depth of Mid-point of Layer (ft)	Soil Unit Weight (pcf)	Overburden Pressure at Mid-point (tsf)	Mean Effective Pressure at Mid-point (tsf)	Average Cyclic Shear Stress [Tav]	Field SPT [N]	Correction Factor [Cer]	Relative Density [Dr] (%)	Correction Factor [Cn]	Corrected [N1]60	rd Factor	Maximum Shear Mod. [Gmax] (tsf)	[yeff]*[Geff] [Gmax]	yeff Shear Strain	[yeff]*100%	Volumetric Strain M7.5 [E15} (%)	Number of Strain Cycles [Nc]	Corrected Vol. Strains [Ec]	Estimated Settlement [S] (inches)
1.0	1.0	0.5	113.7	0.03	0.02	0.010	7	1.25	54.4	1.7	19.8	1.0	166.914	5.82E-05	7.80E-05	0.008	7.89E-03	7.5594	5.80E-03	0.00
2.0	1.0	1.5	113.7	0.09	0.06	0.029	7	1.25	54.4	1.7	19.8	1.0	289.104	9.88E-05	1.90E-04	0.019	1.92E-02	7.5594	1.41E-02	0.00
3.0	1.0	2.5	113.7	0.14	0.10	0.049	7	1.25	54.4	1.7	19.8	1.0	373.231	1.25E-04	2.30E-04	0.023	2.33E-02	7.5594	1.71E-02	0.00
4.0	1.0	3.5	113.7	0.20	0.13	0.069	7	1.25	54.4	1.7	19.8	1.0	441.613	1.45E-04	1.70E-04	0.017	1.72E-02	7.5594	1.26E-02	0.00
5.0	1.0	4.5	113.7	0.26	0.17	0.088	7	1.25	54.4	1.7	19.8	1.0	500.742	1.62E-04	1.70E-04	0.017	1.72E-02	7.5594	1.26E-02	0.00
6.0	1.0	5.5	113.7	0.31	0.21	0.108	7	1.25	54.4	1.7	19.8	1.0	553.591	1.75E-04	1.50E-04	0.015	1.52E-02	7.5594	1.11E-02	0.00
7.0	1.0	6.5	113.7	0.37	0.25	0.127	7	1.25	54.4	1.7	19.6	1.0	600.043	1.87E-04	1.50E-04	0.015	1.53E-02	7.5594	1.13E-02	0.00
8.0	1.0	7.5	113.7	0.43	0.29	0.146	7	1.25	54.4	1.6	18.6	1.0	632.835	2.01E-04	4.50E-04	0.045	4.92E-02	7.5594	3.61E-02	0.01
9.0	1.0	8.5	113.7	0.48	0.32	0.166	7	1.25	54.4	1.5	17.7	1.0	663.150	2.14E-04	4.50E-04	0.045	5.20E-02	7.5594	3.82E-02	0.01
10.0	1.0	9.5	105.1	0.54	0.36	0.184	7	1.25	54.4	1.4	17.0	1.0	690.412	2.24E-04	4.50E-04	0.045	5.46E-02	7.5594	4.01E-02	0.01
11.0	1.0	10.5	105.1	0.59	0.40	0.202	7	1.25	54.4	1.3	16.5	1.0	715.125	2.33E-04	4.50E-04	0.045	5.69E-02	7.5594	4.18E-02	0.01
12.0	1.0	11.5	105.1	0.64	0.43	0.219	7	1.25	54.4	1.3	15.9	0.9	738.595	2.42E-04	4.50E-04	0.045	5.90E-02	7.5594	4.34E-02	0.01
13.0	1.0	12.5	105.1	0.70	0.47	0.236	18	1.25	80.1	1.2	35.5	0.9	1003.262	1.89E-04	1.50E-04	0.015	7.53E-03	7.5594	5.53E-03	0.00
14.5	1.5	13.8	105.1	0.76	0.51	0.258	18	1.25	80.1	1.2	34.3	0.9	1037.027	1.96E-04	1.60E-04	0.016	8.38E-03	7.5594	6.16E-03	0.00
15.0	0.5	14.8	104.3	0.81	0.55	0.275	14	1.25	65.7	1.2	23.8	0.9	949.305	2.25E-04	3.70E-04	0.037	3.00E-02	7.5594	2.21E-02	0.00
16.0	1.0	15.5	104.3	0.85	0.57	0.288	14	1.25	65.7	1.1	22.9	0.9	959.056	2.30E-04	3.70E-04	0.037	3.15E-02	7.5594	2.32E-02	0.01
17.0	1.0	16.5	104.3	0.91	0.61	0.304	14	1.25	65.7	1.1	22.2	0.9	978.219	2.35E-04	3.70E-04	0.037	3.27E-02	7.5594	2.40E-02	0.01
18.0	1.0	17.5	104.3	0.96	0.64	0.321	14	1.25	65.7	1.0	21.6	0.9	996.659	2.40E-04	3.70E-04	0.037	3.38E-02	7.5594	2.48E-02	0.01
19.0	1.0	18.5	110.0	1.01	0.68	0.337	14	1.25	65.7	1.0	21.0	0.9	1014.915	2.45E-04	3.70E-04	0.037	3.49E-02	7.5594	2.56E-02	0.01
20.5	1.5	19.8	110.0	1.08	0.72	0.359	14	1.25	65.7	1.0	20.3	0.9	1037.416	2.50E-04	3.70E-04	0.037	3.63E-02	7.5594	2.67E-02	0.01
21.0	0.5	20.8	106.3	1.13	0.76	0.375	11	1.25	54.6	1.0	24.1	0.9	1125.519	2.39E-04	3.70E-04	0.037	2.96E-02	7.5594	2.17E-02	0.00
22.0	1.0	21.5	106.3	1.17	0.79	0.387	11	1.25	54.6	0.9	23.6	0.9	1137.289	2.41E-04	3.70E-04	0.037	3.03E-02	7.5594	2.23E-02	0.01
23.0	1.0	22.5	106.3	1.23	0.82	0.403	11	1.25	54.6	0.9	23.2	0.9	1156.738	2.44E-04	3.70E-04	0.037	3.09E-02	7.5594	2.27E-02	0.01
24.0	1.0	23.5	106.3	1.28	0.86	0.419	22	1.25	73.0	0.9	40.6	0.9	1422.559	2.04E-04	3.70E-04	0.037	1.58E-02	7.5594	1.16E-02	0.00
25.0	1.0	24.5	106.3	1.33	0.89	0.434	22	1.25	73.0	0.9	39.9	0.9	1443.670	2.06E-04	3.70E-04	0.037	1.62E-02	7.5594	1.19E-02	0.00
26.0	1.0	25.5	106.3	1.39	0.93	0.449	22	1.25	73.0	0.9	39.3	0.9	1464.278	2.08E-04	3.70E-04	0.037	1.65E-02	7.5594	1.21E-02	0.00
27.0	1.0	26.5	106.3	1.44	0.96	0.464	22	1.25	73.0	0.9	33.9	0.9	1421.445	2.18E-04	3.70E-04	0.037	1.96E-02	7.5594	1.44E-02	0.00
28.0	1.0	27.5	106.3	1.49	1.00	0.479	22	1.25	73.0	0.8	33.4	0.9	1439.307	2.20E-04	3.00E-04	0.030	1.62E-02	7.5594	1.19E-02	0.00
29.0	1.0	28.5	106.3	1.55	1.04	0.494	22	1.25	73.0	0.8	32.8	0.9	1456.767	2.22E-04	3.00E-04	0.030	1.66E-02	7.5594	1.22E-02	0.00
30.0	1.0	29.5	110.0	1.60	1.07	0.508	17	1.25	62.2	0.8	23.7	0.9	1329.370	2.48E-04	3.00E-04	0.030	2.45E-02	7.5594	1.80E-02	0.00
31.0	1.0	30.5	110.0	1.66	1.11	0.523	17	1.25	62.2	0.8	23.3	0.9	1344.423	2.50E-04	3.00E-04	0.030	2.50E-02	7.5594	1.84E-02	0.00
32.0	1.0	31.5	110.0	1.71	1.15	0.537	17	1.25	62.2	0.8	22.9	0.9	1359.147	2.51E-04	3.00E-04	0.030	2.55E-02	7.5594	1.87E-02	0.00
33.0	1.0	32.5	110.0	1.77	1.18	0.551	17	1.25	62.2	0.8	22.6	0.9	1373.558	2.53E-04	3.00E-04	0.030	2.60E-02	7.5594	1.91E-02	0.00
34.0	1.0	33.5	110.0	1.82	1.22	0.565	17	1.25	62.2	0.8	22.2	0.8	1387.673	2.54E-04	3.00E-04	0.030	2.64E-02	7.5594	1.94E-02	0.00
35.0	1.0	34.5	108.0	1.87	1.26	0.578	17	1.25	62.2	0.7	21.9	0.8	1401.384	2.55E-04	3.00E-04	0.030	2.69E-02	7.5594	1.98E-02	0.00
36.0	1.0	35.5	108.0	1.93	1.29	0.591	17	1.25	62.2	0.7	21.6	0.8	1415.729	2.56E-04	3.00E-04	0.030	2.73E-02	7.5594	2.01E-02	0.00
37.0	1.0	36.5	108.0	1.98	1.33	0.604	16	1.25	59.1	0.7	20.1	0.8	1400.312	2.62E-04	3.00E-04	0.030	2.99E-02	7.5594	2.19E-02	0.00
38.0	1.0	37.5	108.0	2.04	1.36	0.616	16	1.25	59.1	0.7	19.8	0.8	1412.924	2.63E-04	3.00E-04	0.030	3.03E-02	7.5594	2.23E-02	0.00
39.0	1.0	38.5	108.0	2.09	1.40	0.628	16	1.25	59.1	0.7	19.6	0.8	1425.316	2.64E-04	3.00E-04	0.030	3.08E-02	7.5594	2.26E-02	0.00
40.0	1.0	39.5	127.9	2.15	1.44	0.642	29	1.25	78.8	0.7	34.9	0.8	1752.607	2.18E-04	3.00E-04	0.030	1.54E-02	7.5594	1.13E-02	0.00
41.0	1.0	40.5	127.9	2.21	1.48	0.656	29	1.25	78.8	0.7	34.4	0.8	1769.814	2.19E-04	3.00E-04	0.030	1.57E-02	7.5594	1.15E-02	0.00
42.5	1.5	41.8	127.9	2.29	1.54	0.674	29	1.25	78.8	0.7	33.8	0.8	1790.864	2.20E-04	3.00E-04	0.030	1.60E-02	7.5594	1.18E-02	0.00
43.0	0.5	42.8	126.7	2.36	1.58	0.688	5	1.25	32.3	0.7	12.8	0.8	1313.433	3.04E-04	5.20E-04	0.052	8.90E-02	7.5594	6.54E-02	0.00
44.0	1.0	43.5	126.7	2.40	1.61	0.698	5	1.25	32.3	0.7	12.7	0.8	1323.275	3.05E-04	5.20E-04	0.052	8.98E-02	7.5594	6.60E-02	0.00
45.0	1.0	44.5	126.7	2.47	1.65	0.711	5	1.25	32.3	0.7	12.6	0.8	1338.003	3.05E-04	5.20E-04	0.052	9.04E-02	7.5594	6.64E-02	0.00
46.0	1.0	45.5	126.7	2.53	1.70	0.724	5	1.25	32.3	0.6	12.5	0.8	1352.532	3.05E-04	5.20E-04	0.052	9.10E-02	7.5594	6.69E-02	0.00
47.0	1.0	46.5	126.7	2.60	1.74	0.736	4	1.25	28.0	0.6	11.4	0.8	1325.661	3.15E-04	5.20E-04	0.052	1.02E-01	7.5594	7.52E-02	0.00
48.0	1.0	47.5	126.7	2.66	1.78	0.749	4	1.25	28.0	0.6	11.3	0.8	1339.682	3.15E-04	5.20E-04	0.052	1.03E-01	7.5594	7.56E-02	0.00
49.0	1.0	48.5	126.7	2.72	1.82	0.761	4	1.25	28.0	0.6	11.3	0.8	1353.531	3.15E-04	5.20E-04	0.052	1.03E-01	7.5594	7.60E-02	0.00
50.0	1.0	49.5	127.9	2.79	1.87	0.772	26	1.25	70.7	0.6	34.5	0.8	1987.231	2.16E-04	3.00E-04	0.030	1.56E-02	7.5594	1.15E-02	0.00

TOTAL SETTLEMENT = **0.14**

Figure 10



NO SCALE

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

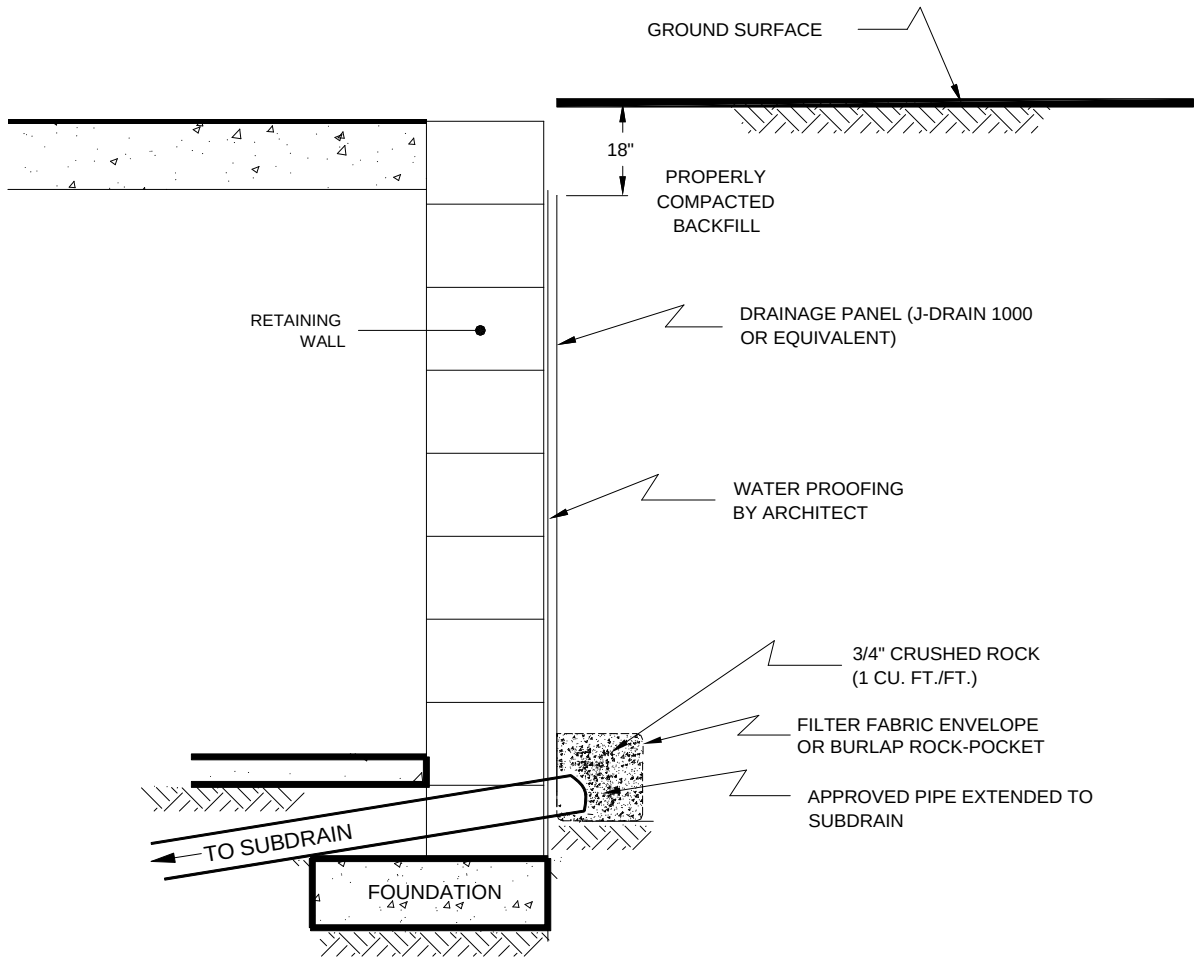
DRAFTED BY: PZ	CHECKED BY: JTA

RETAINING WALL DRAIN DETAIL

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 11



NO SCALE

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

DRAFTED BY: PZ	CHECKED BY: JTA

RETAINING WALL DRAIN DETAIL

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. 12

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was explored on July 20, 2018, by excavating three 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine. The borings were advanced to depths between approximately 40½ and 75½ feet below the existing ground surface. Representative and relatively undisturbed samples were obtained by driving a 3 inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch high by 2 3/8-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained. Standard Penetration Tests (SPTs) were performed in boring B1.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A3. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the boring logs were revised based on subsequent laboratory testing. The locations of the borings are shown on Figure 2.

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**ARTIFICIAL FILL** Silty Sand, medium dense, dry to slightly moist, brown, fine- to medium-grained, some fine to coarse gravel.			
2					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine-grained.			
4								
6	B1@5'			SM	- light brown	19	108.2	5.1
8	B1@7.5'				- loose	7	--	4.5
10	B1@10'					16	97.8	7.5
12	B1@12.5'			ML	Sandy Silt, stiff, slightly moist, brown, fine-grained.	18	--	15.8
14								
16	B1@15'			SW	Sand, well-graded, medium dense, slightly moist, light brown, fine- to coarse-grained.	25	103.2	1.1
18	B1@17.5'					14	--	1.1
20	B1@20'				- fine- to medium-grained	26	108.8	1.1
22	B1@22.5'			SM	Silty Sand, medium dense, slightly moist, dark brown, fine-grained. - decrease in silt content, brown	11	--	14.1
24								
26	B1@25'				- increase in silt content	34	107.4	11.3
28	B1@27.5'				- decrease in silt content	22	--	6.5
				SP	Sand, poorly-graded, dense, slightly moist, light brown, fine- to			

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1@30'				medium-grained.	57	107.1	2.7
32	B1@32.5'				- medium dense	17	--	2.5
34				SP				
36	B1@35'				- some coarse-grained	47	106.0	1.9
38	B1@37.5'				- increase in silt content, fine- to medium-grained	16	--	3.2
40	B1@40'			SM	Silty Sand, medium dense, slightly moist, dark brown, fine-grained.	52	113.3	12.9
42	B1@42.5'				Clay with Sand, soft, slightly moist, brown, very fine-grained sand.	5	--	23.6
44	B1@45'				- firm	13	101.8	24.5
46				CL				
48	B1@47.5'				- soft, grayish brown	4	--	23.1
50	B1@50'			ML	Sandy Silt, hard, slightly moist, brown, fine-grained.	48	109.4	16.9
52	B1@52.5'				Clay, soft, slightly moist, grayish brown.	4	--	33.4
54								
56	B1@55'			CL	- firm, trace fine-grained sand	16	93.7	29.1
58	B1@57.5'			ML	Silt, soft, slightly moist, grayish brown.	7	--	33.2

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 2 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
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- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9839-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B1@60'			ML	- hard	44	104.5	22.4
62	B1@62.5'		▼	ML	- stiff	16	--	29.7
64				ML				
66	B1@65'			ML		24	98.9	28.0
68	B1@67.5'			SM	Silty Sand, very dense, slightly moist, brown, fine-grained.	59	--	20.6
70	B1@70'			SM		46	--	--
72	B1@72.5'			SM	- moist to wet, decrease in silt content, fine- to coarse-grained - fine- to medium-grained	59	--	18.9
74	B1@75'			SM		50 (5")	117.9	16.9
					Total depth of boring: 75.5 feet. Fill to 1.5 feet. Groundwater encountered at 62.5 feet. Backfilled with cement bentonite grout. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9839-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 3 of 3

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9839-88-01

BORING 2

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			**ARTIFICIAL FILL**			
			Silty Sand, loose, dry to slightly moist, brown, fine-grained.			
2			**ALLUVIUM**			
			Silty Sand, medium dense, slightly moist, light brown, fine-grained.			
4						
	B2@5'	SM		23	102.6	3.4
6						
8						
			Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained.			
10	B2@10'			19	104.8	3.0
12						
14		SP				
	B2@15'		- fine- to medium-grained, trace coarse-grained	29	108.5	1.0
16						
18						
			Silty Sand, medium dense, slightly moist, dark brown, fine-grained.			
20	B2@20'	SM		24	111.2	9.1
			Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained, trace medium grained.			
22	B2@22'			23	101.0	4.4
24						
	B2@25'	SP		46	111.6	5.7
26						
	B2@37'		- dense, some silt, brown, fine-grained	55	111.4	6.5
28						

A9839-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9839-88-01

BORING 2

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2@30'			SP	- light brown, medium dense	49	101.9	2.5
32	B2@32'				- fine- to medium-grained	48	103.2	1.5
34								
	B2@35'					43	104.2	2.6
36								
38								
40	B2@40'			SM	Silty Sand, medium dense, slightly moist, brown, fine-grained.	23	108.7	19.9

Total depth of boring: 40.5 feet.
Fill to 1 foot.
No groundwater encountered.
Backfilled with soil cuttings and tamped.
Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.

A9839-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9839-88-01

BORING 3

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine-grained.			
2			**ALLUVIUM** Silty Sand, loose, slightly moist, brown, fine- to medium-grained, trace coarse-grained.			
4						
6	B3@5'	SM		15	116.7	6.5
8						
10	B3@10'		Sand, poorly graded, medium dense, slightly moist, light brown, fine-grained.	20	104.7	5.3
12						
14						
16	B3@15'	SP	- fine- to medium-grained - trace coarse-grained	28	103.2	2.4
18						
20	B3@20'		- fine- to coarse-grained	41	110.4	1.7
22	BULK 20-25' B3@22'	SM	Silty Sand, medium dense, slightly most, brown, fine-grained.	41	15.2	15.4
24			Sand, medium dense, slightly moist, light brown, fine-grained.			
26	B3@25'			47	111.0	9.9
28	B3@27'	SP	- dense, fine- to medium-grained	68	108.8	2.4

A9839-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. A9839-88-01

BORING 3

ELEV. (MSL.) _____ DATE COMPLETED **07/20/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3@30'			SP	- medium dense	32	105.5	7.3
32	B3@32'			SM	Silty Sand, medium dense, slightly moist, brown, fine-grained.	26	119.3	15.4
34					Sand, poorly graded, medium dense, slightly moist, light brown, fine-to medium-grained.			
36	B3@35'			SP		37	104.2	3.6
38								
40	B3@40'			ML	Sandy Silt, firm, slightly moist, brown, fine-grained.	14	96.2	29.6
					Total depth of boring: 40.5 feet. Fill to 2 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9839-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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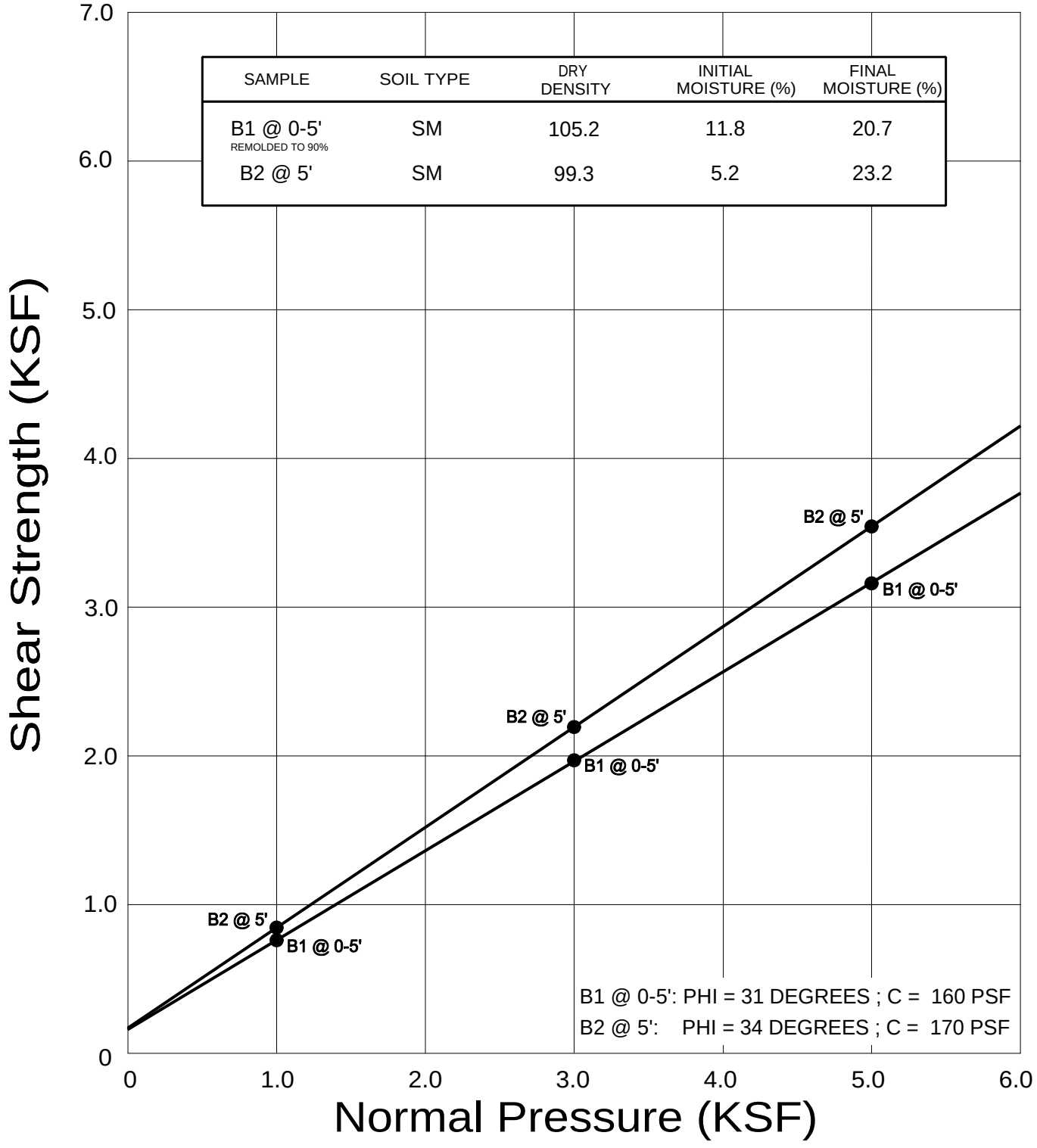
APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, plasticity indices, grain-size, corrosivity, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B11. The in-place dry density and moisture content of the samples tested are presented on the boring logs, Appendix A.

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 0-5' REMOLDED TO 90%	SM	105.2	11.8	20.7
B2 @ 5'	SM	99.3	5.2	23.2



● Direct Shear, Saturated

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ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

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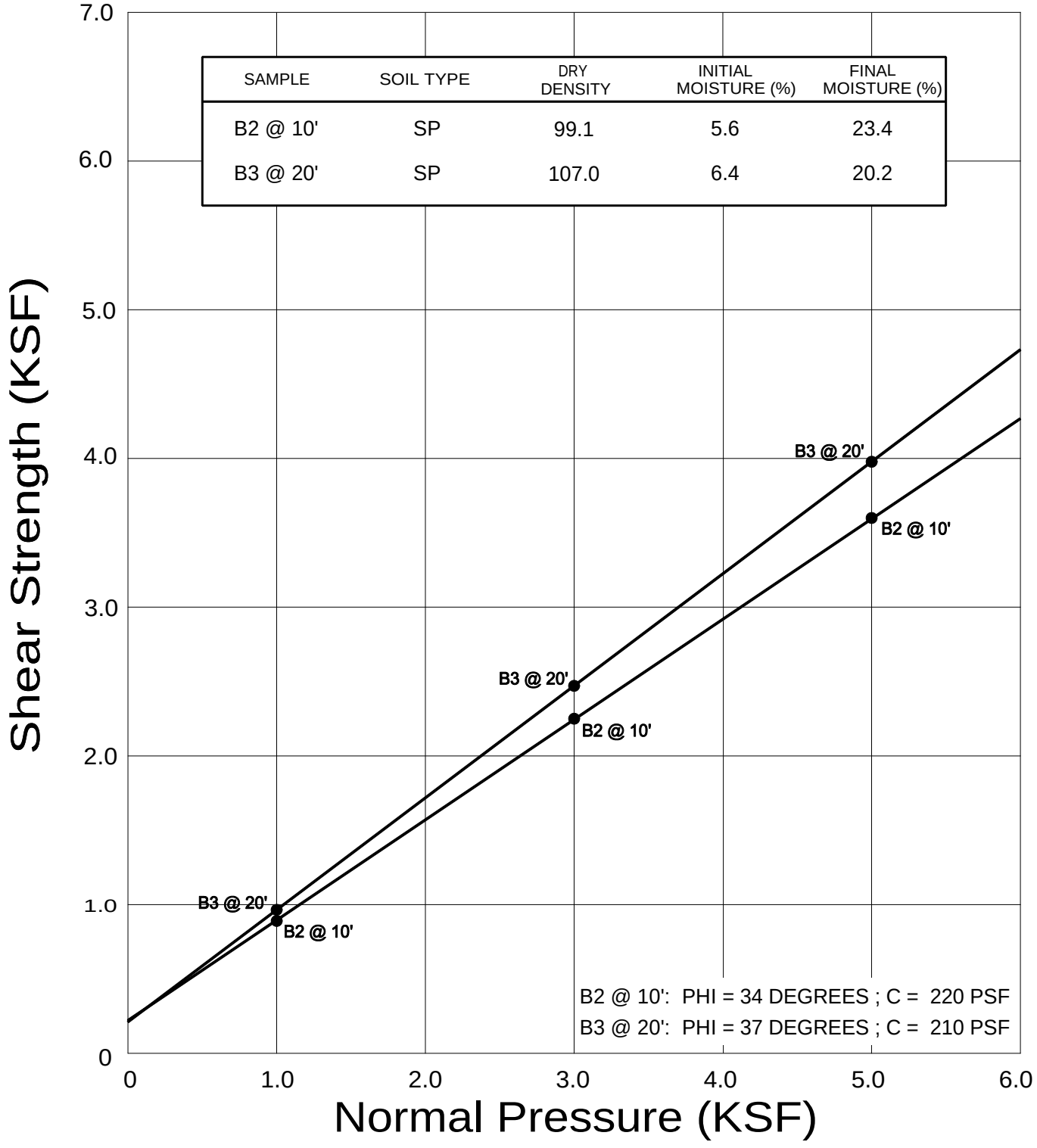
DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B1

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2 @ 10'	SP	99.1	5.6	23.4
B3 @ 20'	SP	107.0	6.4	20.2



● Direct Shear, Saturated

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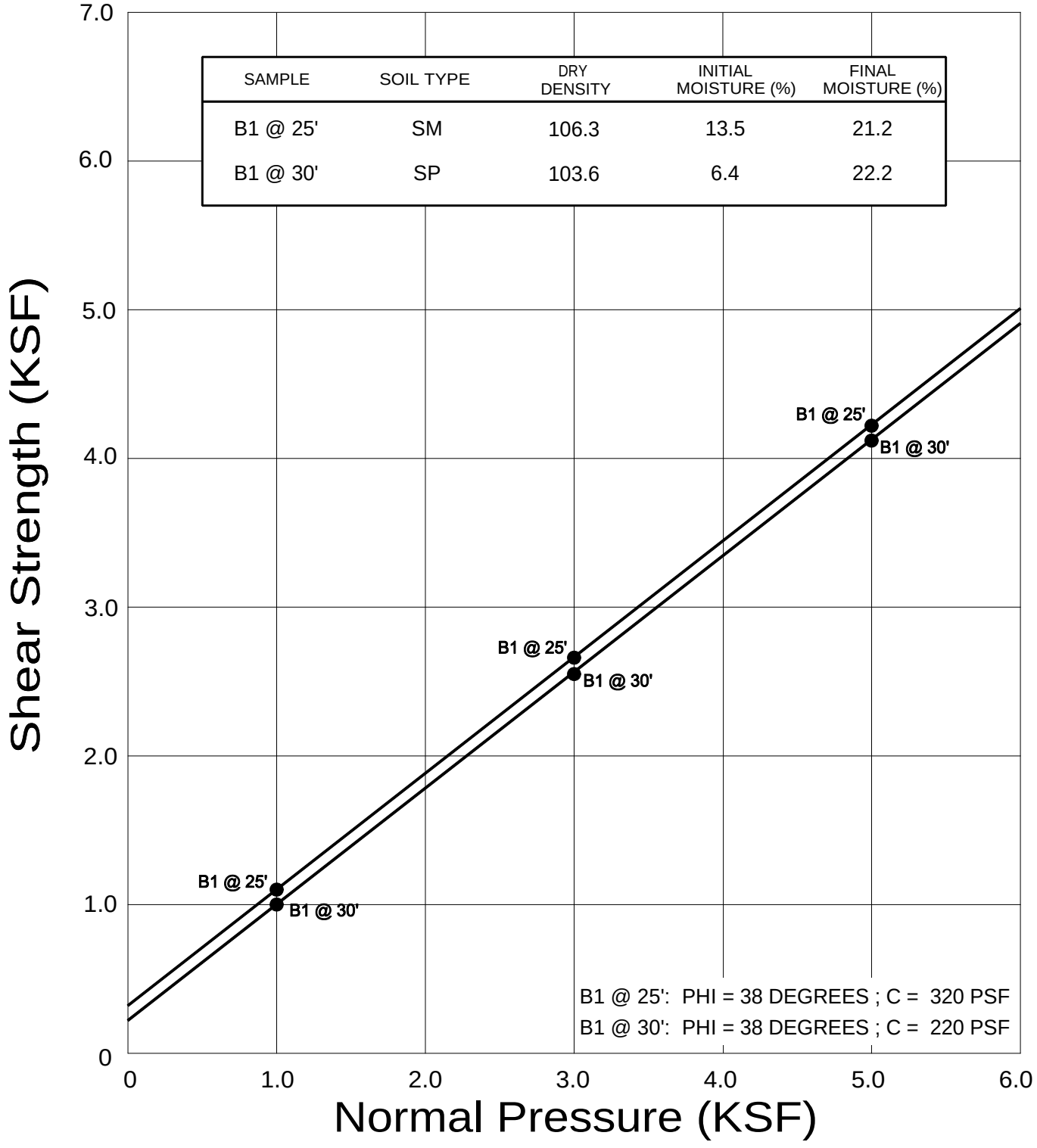
DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B2

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 25'	SM	106.3	13.5	21.2
B1 @ 30'	SP	103.6	6.4	22.2



● Direct Shear, Saturated

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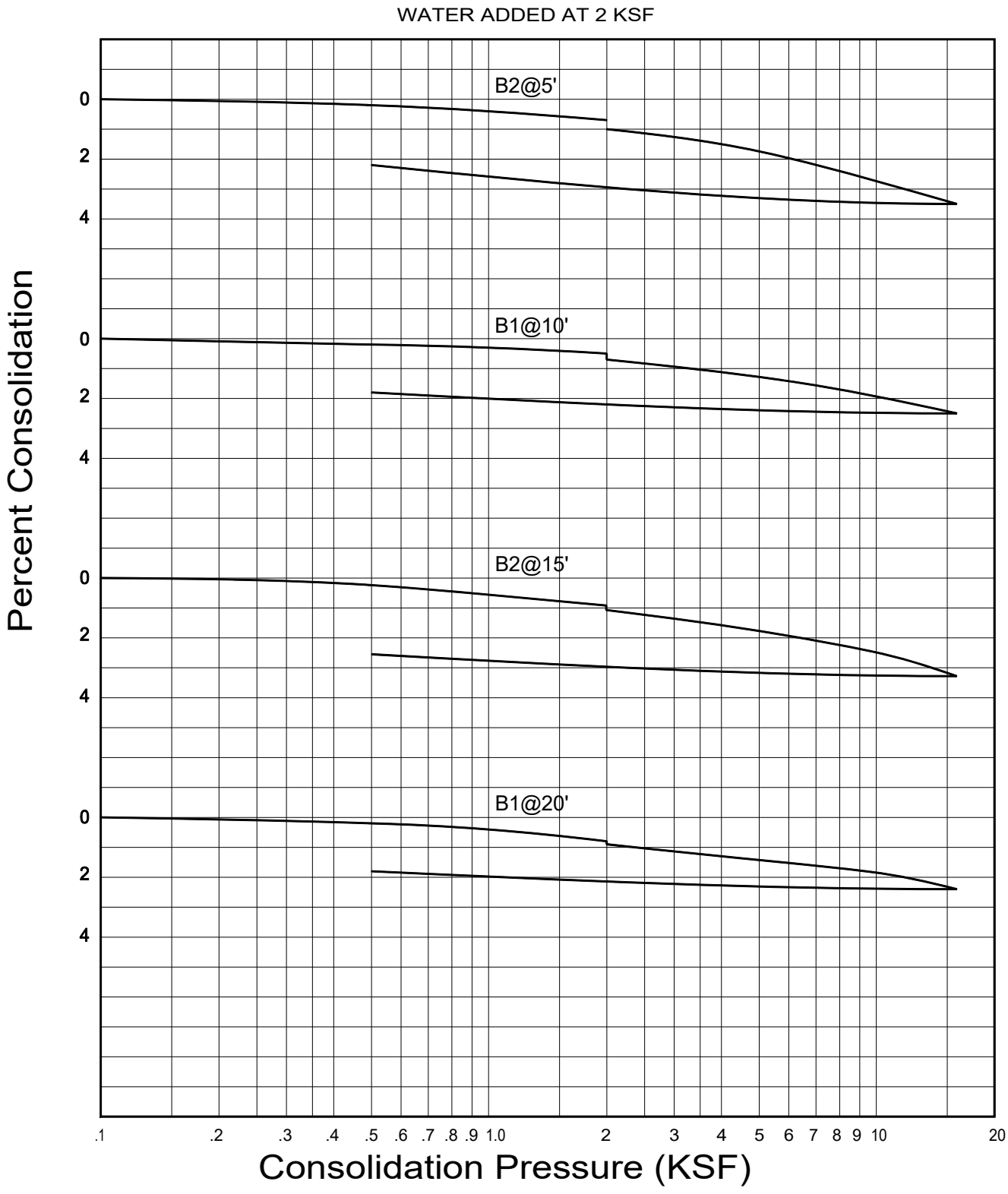
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DIRECT SHEAR TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B3



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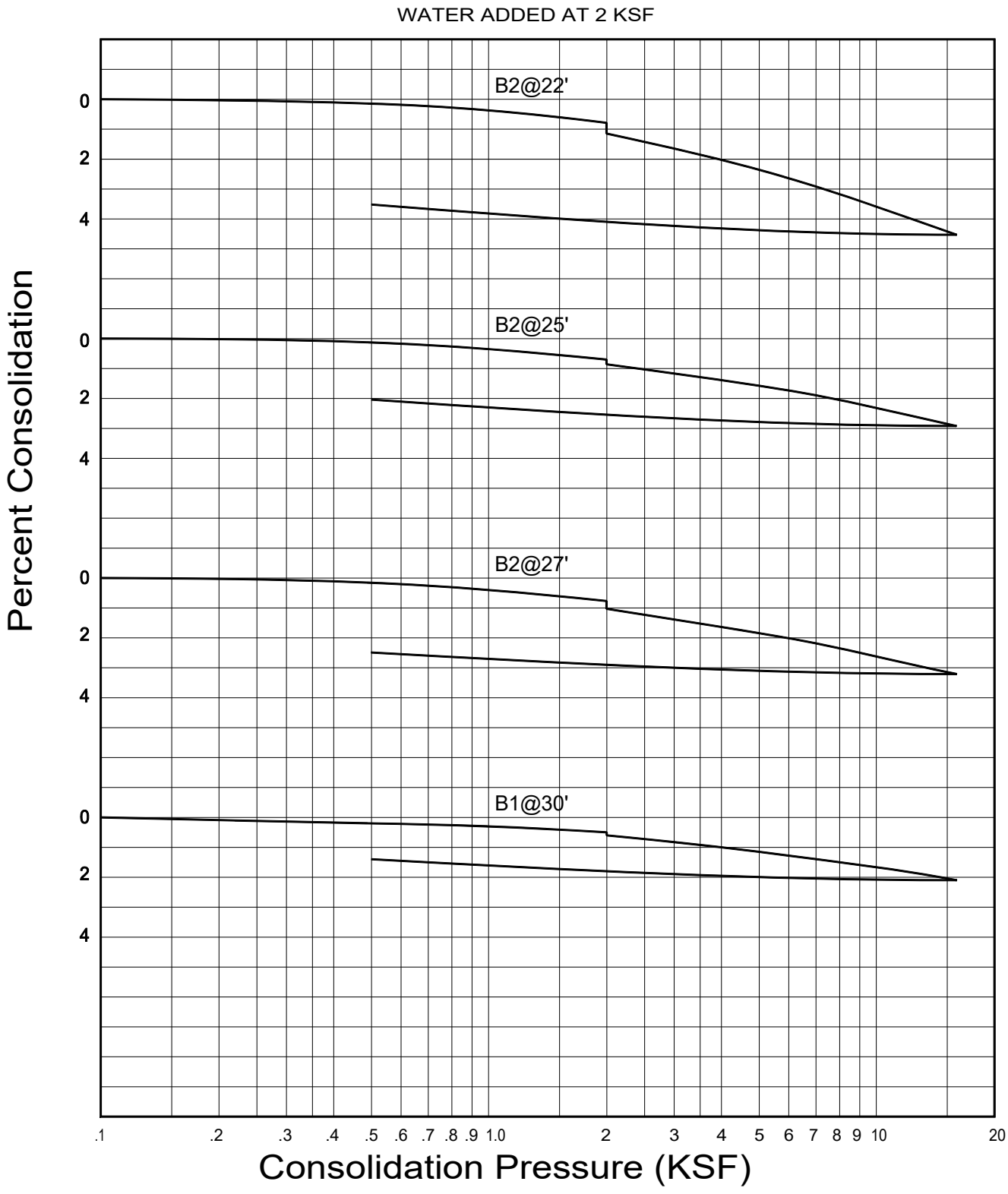
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B4



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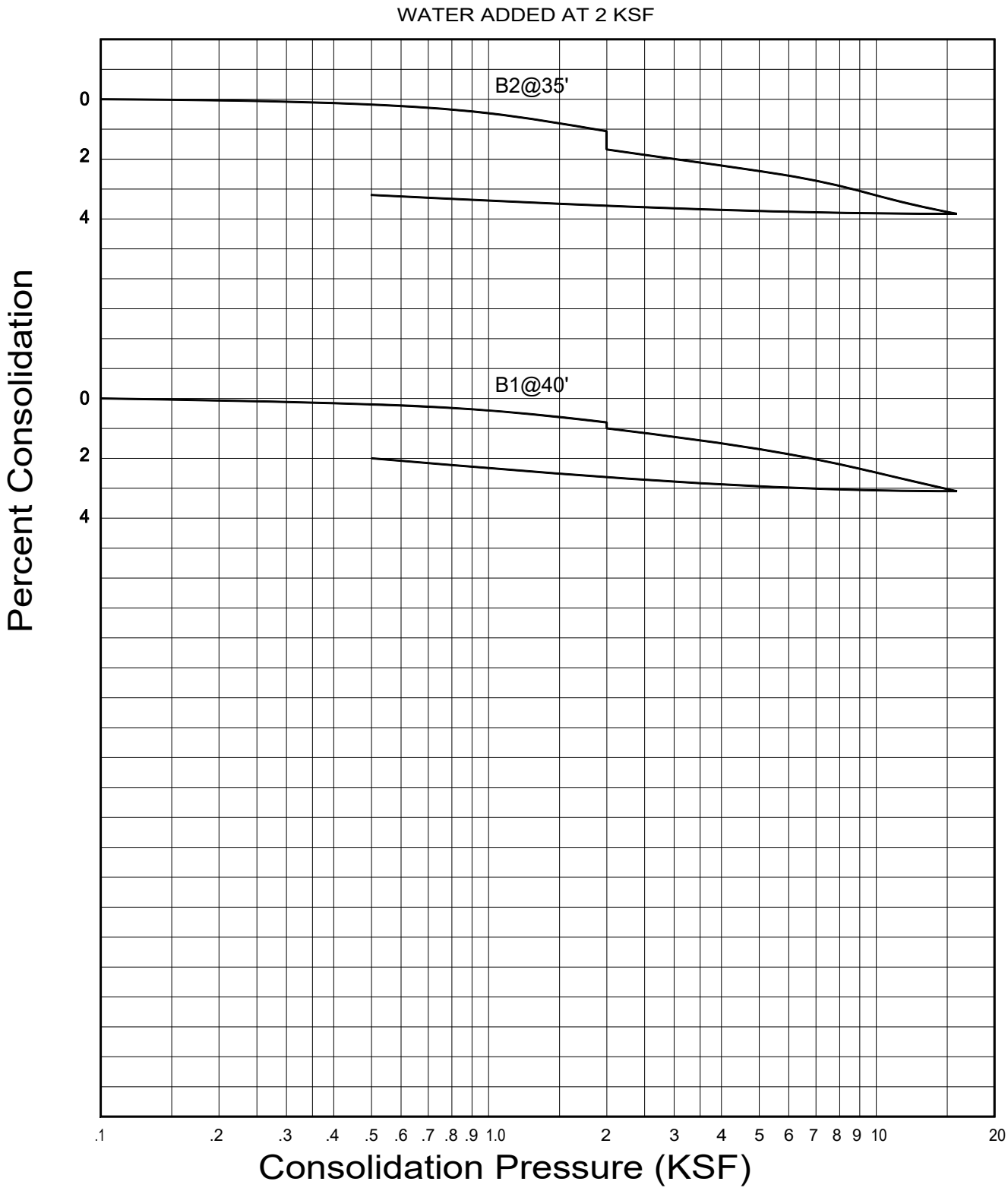
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B5



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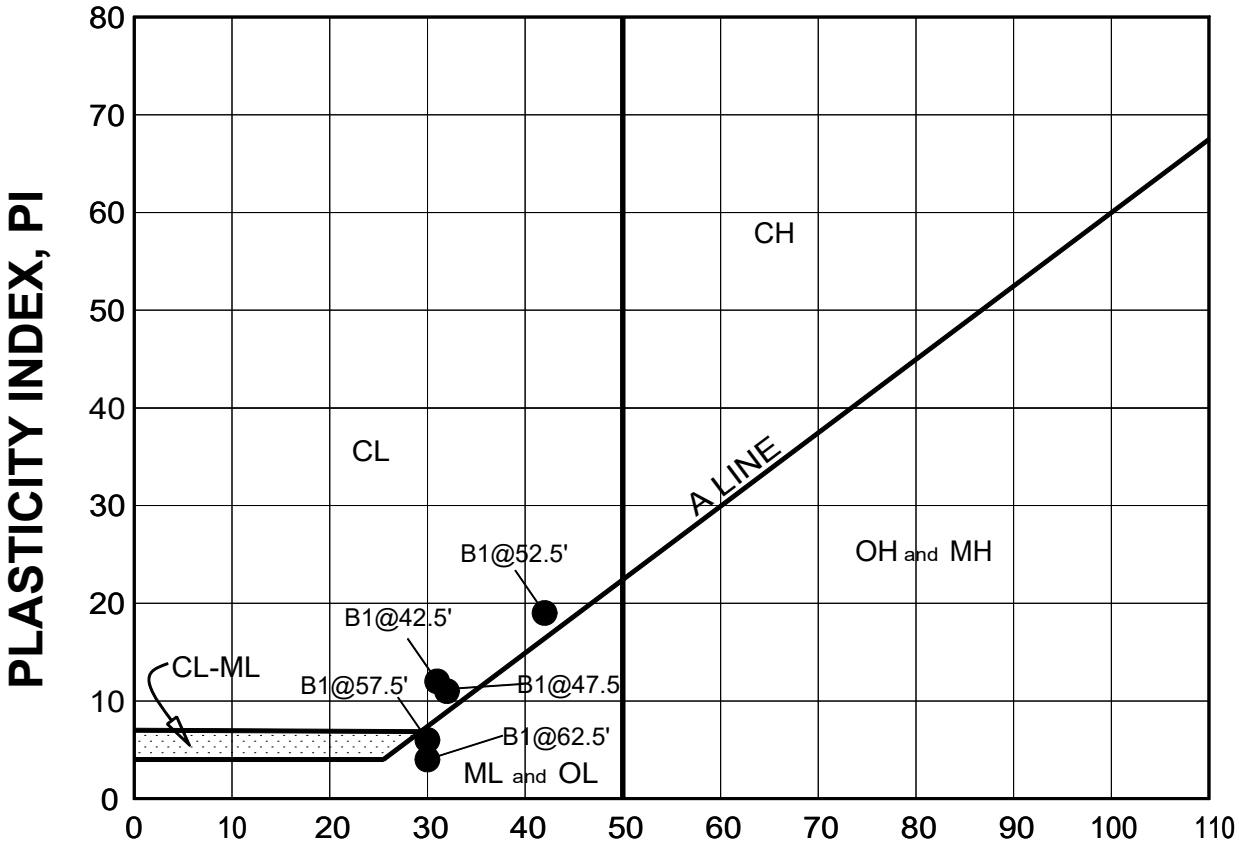
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CONSOLIDATION TEST RESULTS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B6



BORING NUMBER	DEPTH (FEET)	LL	PL	PI	MOISTURE CONTENT AT SATURATION	SOIL BEHAVIOR
B1	**42.5**	**31**	**19**	**12**	**24.6**	**CL**
B1	**47.5**	**32**	**21**	**11**	**24.6**	**CL**
B1	**52.5**	**42**	**23**	**19**	**31.5**	**CL**
B1	**57.5**	**30**	**24**	**6**	**--**	**ML**
B1	**62.5**	**30**	**26**	**4**	**--**	**ML**

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ATTERBERG LIMITS

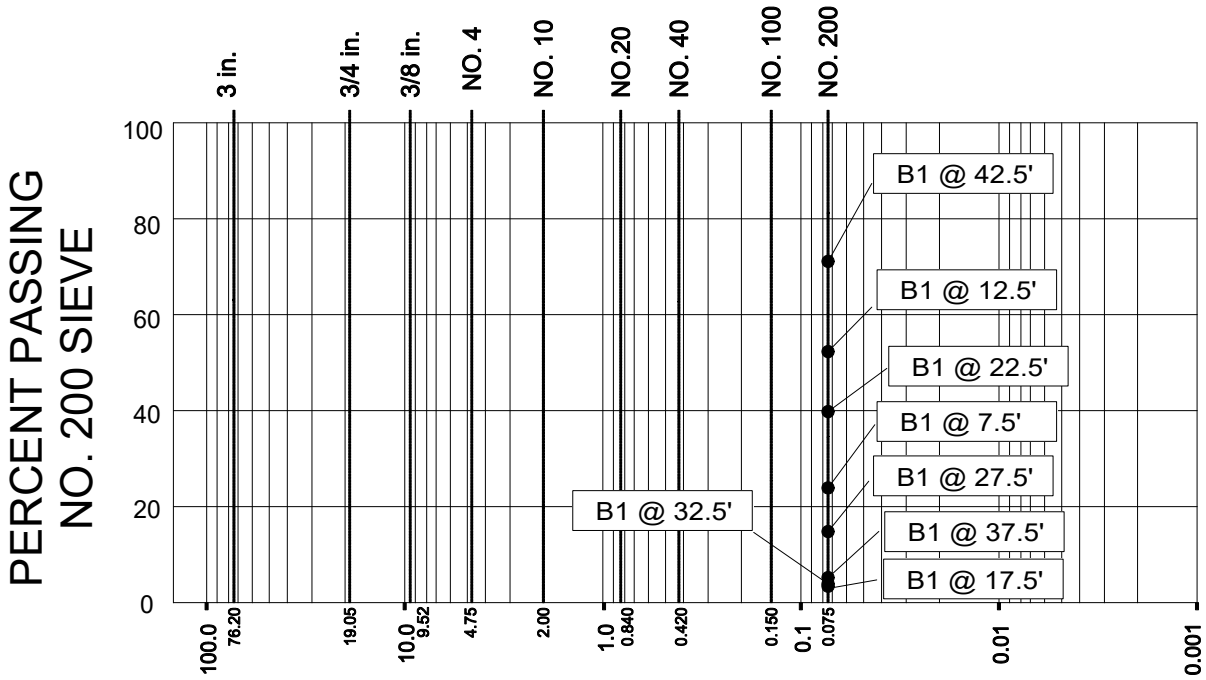
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B7

GRAVEL	SAND		SILT	CLAY
	MEDIUM TO COARSE	FINE		

U.S. STANDARD SIEVE SIZES



SAMPLE	PERCENT PASSING NO. 200 SIEVE
B1 @ 7.5'	23.9
B1 @ 12.5'	52.3
B1 @ 17.5'	3.4
B1 @ 22.5'	39.8
B1 @ 27.5'	14.8
B1 @ 32.5'	3.9
B1 @ 37.5'	5.2
B1 @ 42.5'	71.1

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ENVIRONMENTAL GEOTECHNICAL MATERIALS
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DRAFTED BY: JS	CHECKED BY: JTA

GRAIN SIZE ANALYSIS

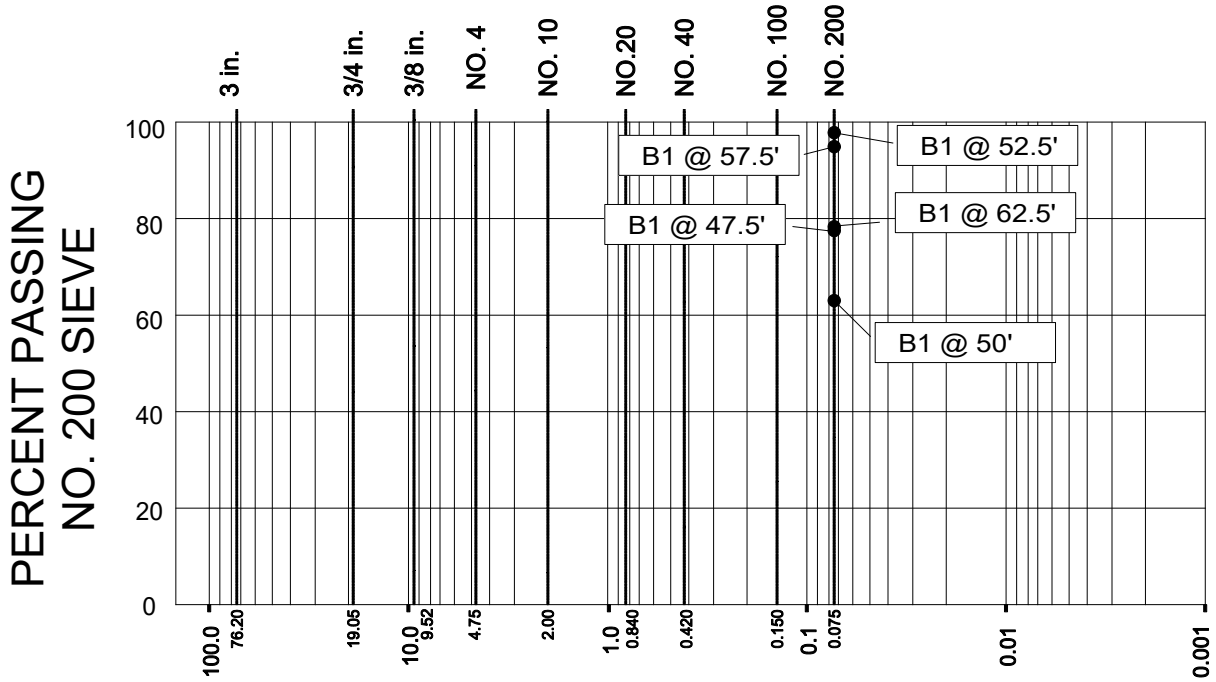
PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B8

GRAVEL	SAND		SILT	CLAY
	MEDIUM TO COARSE	FINE		

U.S. STANDARD SIEVE SIZES



GRAIN DIAMETER (mm)

SAMPLE	PERCENT PASSING NO. 200 SIEVE
B1 @ 47.5'	77.5
B1 @ 50'	63.0
B1 @ 52.5'	97.8
B1 @ 57.5'	94.9
B1 @ 62.5'	78.3

GEOCON WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
15520 ROCKFIELD BOULEVARD, SUITE J, IRVINE, CA 92618
PHONE (949) 491-6570

DRAFTED BY: JS	CHECKED BY: JTA

GRAIN SIZE ANALYSIS

PROPOSED HOTEL DEVELOPMENT

NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018	PROJECT NO. A9839-88-01	FIG. B9

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B1 @ 0-5'	10.0	16.1	108.7	0	Very Low	Non-Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2016 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B1 @ 0-5'	Brown Silty Sand	118.7	10.2

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LABORATORY TEST RESULTS

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B10

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (ohm centimeters)
B1 @ 0-5'	8.36	3000 (Moderately Corrosive)
B3 @ 20-25'	8.75	6750 (Moderately Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B1 @ 0-5'	0.027
B3 @ 20-25'	0.018

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B1 @ 0-5'	0.002	Negligible
B3 @ 20-25'	0.000	Negligible

* Reference: 2016 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

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CORROSIVITY TEST RESULTS

PROPOSED HOTEL DEVELOPMENT
NORTHWEST CORNER OF
HARBOR BOULEVARD AND TWINTREE LANE
GARDEN GROVE, CALIFORNIA

AUG 2018 | PROJECT NO. A9839-88-01 | FIG. B11

APPENDIX C

APPENDIX C

PRIOR REPORT

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental and Civil Engineering

June 14, 2005

Kam Sang Company
411 E. Huntington Drive
Suite 305
Arcadia, CA 91006

Attention: Mr. Michael Lee

Subject: **Report of Geotechnical Engineering Investigation**
Proposed Hotel Development
Corner of Harbor Boulevard and Twin Tree Avenue, Garden Grove. California
QCI Project Number: 05-136-003EL

Gentlemen:

In accordance with your request, Quartech Consultants (QCI) is pleased to submit this geotechnical engineering report for the proposed development at subject site. The purpose of this report was to evaluate the subsurface conditions and provide recommendations for foundation designs and other relevant parameters for the proposed construction.

Based on the findings of our field exploration, laboratory testing and engineering analysis, the proposed construction of the subject site for the intended use is feasible from the geotechnical engineering viewpoint, provided that specific recommendations set forth herein are followed.

This opportunity to be of service is sincerely appreciated. If you have any questions pertaining to this report, please call the undersigned.

Respectfully submitted,

Quartech Consultants (QCI)

REGISTERED PROFESSIONAL ENGINEER
JACK C. S. LEE
No. 2153
Exp. 3/07
GEOTECHNICAL
STATE OF CALIFORNIA

Jack C. Lee, GE 2153
Principal Engineer

Abe Kazemzadeh
Project Engineer

Dist: (4) Addressee

REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

Proposed Hotel Development
Corner of Harbor Boulevard and Twin Tree Avenue
Garden Grove, California

Prepared for

Kam Sang Company
411 E. Huntington Drive, #305
Arcadia, California

Prepared by

QUARTECH CONSULTSNTS
576 East Lambert Road
Brea, CA 91789

June 14, 2005

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1.0 INTRODUCTION

1.1 Purpose

This report presents a summary of our preliminary geotechnical engineering investigation for the proposed development at the subject site. The purposes of this investigation were to evaluate the subsurface conditions at the area of proposed construction and to provide recommendations pertinent to grading, foundation design and other relevant parameters.

1.2 Scope of Services

Our scope of services included:

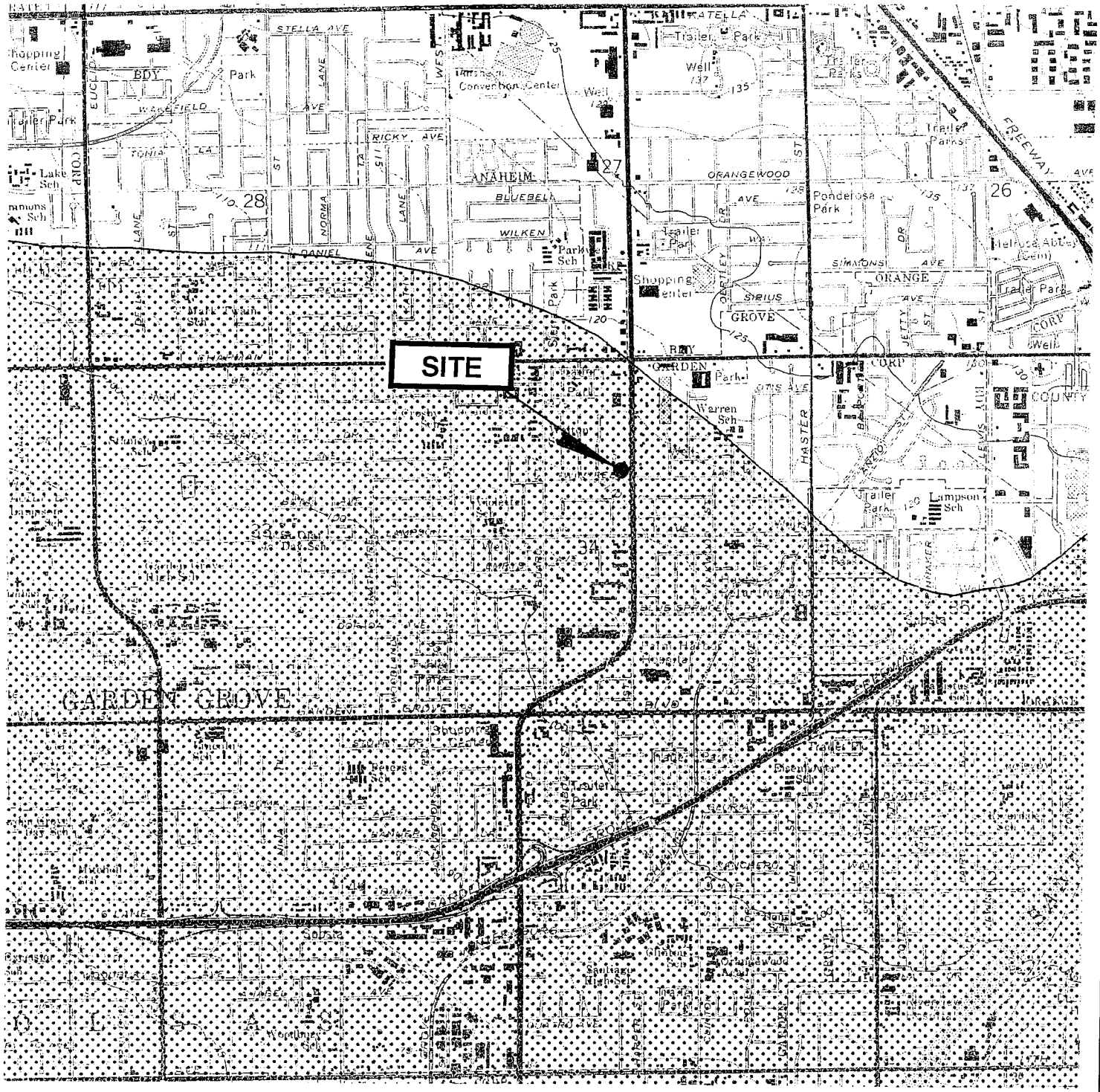
- Review of available soil and geologic data of the area.
- Logging and sampling of seven 8-inch diameter hollow stem-auger boring (subsurface exploration). The borings were extended to a maximum depth of 51.5 feet below the existing ground surface. Boring logs are presented in Appendix A (Field Investigation).
- Laboratory testing of representative samples collected from the proposed construction area to establish engineering characteristics of the on-site soils. The laboratory test results are presented in Appendix B (Laboratory Testing) and on the boring logs (Appendix A).
- Engineering analyses of the geotechnical data obtained from our background studies, field investigation, and laboratory testing.
- Preparation of this report presenting our findings, conclusions, and recommendations for the proposed development.

1.3 Proposed Construction

Based on the provided information, it is expected that the proposed construction consist of hotel buildings, parking structures, and associated improvements. The building is anticipated to be seven-story in height with slab-on-grade. Minor cut and fill grading operation will be necessary to achieve the final grades. No detailed design plans and structural loads were available at the time when this report was prepared. It is estimated that maximum column loads will be on the order of 550 kips.

1.4 Site Conditions

The subject site is located at northwest corner of Harbor Boulevard and Twintree Avenue in the City of Garden Grove, California. The approximate regional location is shown on the attached Site Location Map (Figure 1). The relatively flat subject site was vacant at the time of our subsurface investigation.



N

Scale 1" = 2000'

LEGEND:

Map modified from "Seismic Hazard Zones, Anaheim Quadrangle" by CDMG

Cal Land Engineering, Inc. dba Quartech Consultants Geotechnical, Environmental and Civil Engineering Services	Project Address: Harbor Blvd. & Twin Tree Ave. Garden Grove, California

SITE LOCATION MAP

4/05

FIGURE 1

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Subsurface Exploration

Our subsurface exploration consisted of drilling seven 8-inch-diameter hollow stem auger boring to a maximum depth of 51.5 feet below the existing ground surface. The borings were logged by a representative of our firm. Relatively undisturbed, bulk and Standard Penetration Tests (SPT) samples were collected during drilling for laboratory testing. The approximate locations of the boring are shown on the attached Site Plan (Figure 2). Boring logs are presented in Appendix A.

2.2 Laboratory Testing

Representative samples were tested for the following parameters: in-situ moisture content and density, consolidation, direct shear strength, grain size analysis, and corrosion potential of soils. The results of our laboratory testing along with a summary of the testing procedures are presented in Appendix B. In-situ moisture and density test results are provided on the boring logs (Appendix A).

3.0 SUMMARY OF GEOTECHNICAL CONDITIONS

3.1 Soil Conditions

In general, the natural soils underlain the site consist of loose to medium dense silty sand to the depth of about 4-5 feet. Underlying the surface soils consists of silty sand (SM) to fine grain sand (SP) to the depth of about 38-40 feet. Sandy clay to silty clay (CL) was encountered below the sand layer between 28 to 40 feet and clayey silt (ML) to the depth explored (51.5 feet). These soils exist in the stiff to medium dense and very moist conditions.

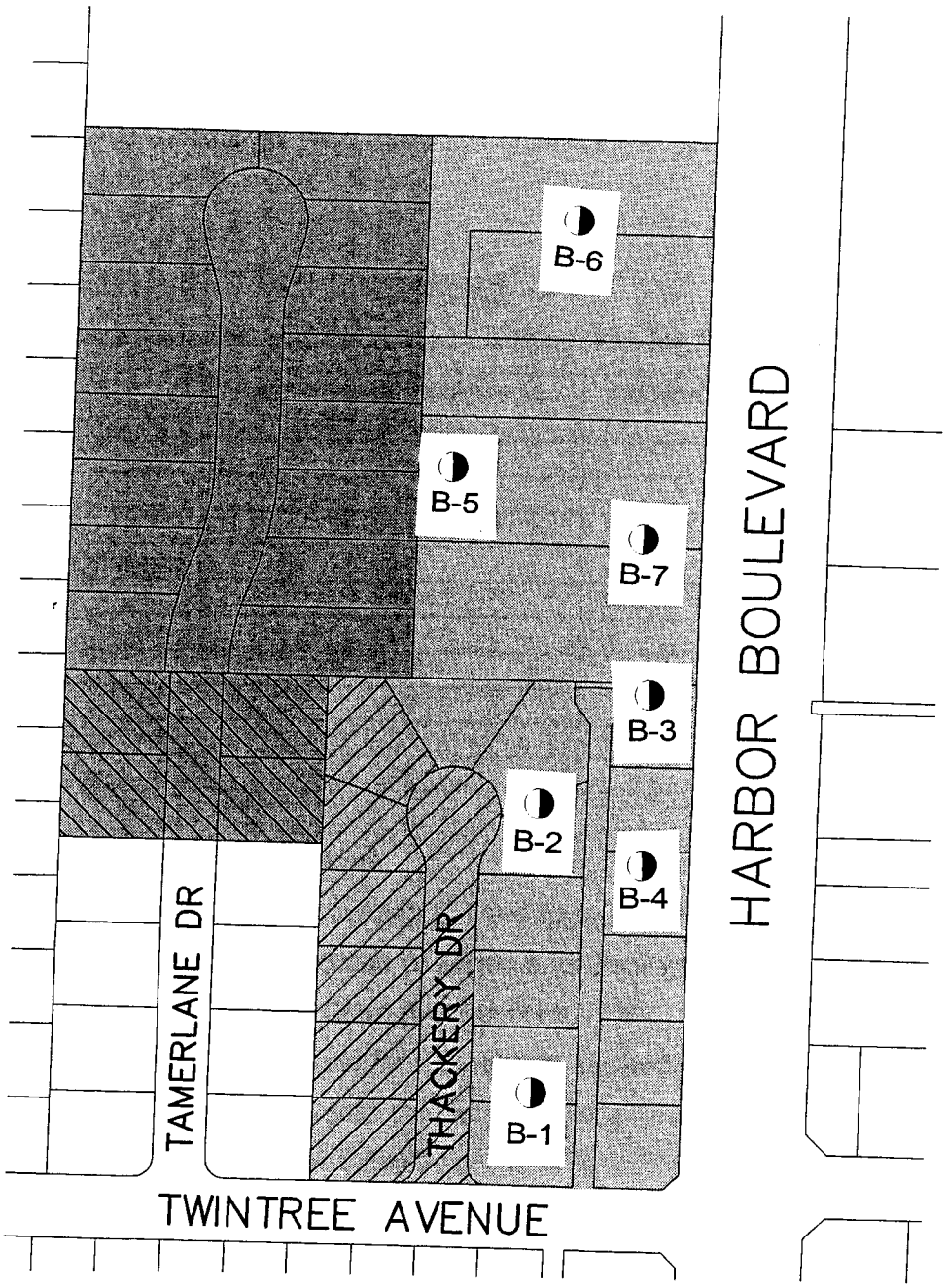
3.2 Groundwater

Static ground water levels were not encountered to the depth explored (51.5 feet below the existing ground surface) during our subsurface investigation. Based on our review of the "Historically Highest Groundwater Contours Map, Anaheim Quadrangle, CDMG Open File Seismic Hazard Zone Report 003", by California Department of Conservation, Division of Mines and Geology, the highest ground water table is estimated to be 17 feet below the ground surface.

4.0 FAULTING AND SEISMICITY

4.1 Seismicity

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distances to causative faults,



N

LEGEND:

B-1 Approximate Boring Location

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SITE PLAN

4/05

FIGURE 2

the intensity, and the magnitude of the seismic event. Table 1 indicates the distances of the fault zones and the associated maximum credible earthquakes that can be produced by nearby seismic events. As indicated in Table 1, the Elysian Park fault zones which are located approximately 4 miles from the site is considered to have the most significant affect at the site from a design standpoint.

TABLE 1

Characteristics and Estimated Earthquakes for Regional Faults

Fault Name	Approximate Distance to Site (mile)	Maximum Credible Earthquake (MCE)
Elysian Park	4	6.7
Newport-Inglewood	9	6.9
Whittier	11	6.8
Newport-Inglewood (Offshore)	11	6.9
Chino-Central Ave.	14	6.7
San Jose	18	6.5
Palos Verdes Hills	19	7.1
Sierra Madre	25	6.7
Cucamonga	26	7.0
Raymond	26	6.5

4.2 Estimated Earthquake Ground Motions

In order to estimate the seismic ground motions at the subject site, QCI has utilized the seismic hazard map published by California Divisions of Mines and Geology (CDMG Open File Report 96-08) / U.S. Geological Survey (USGS Open File Report 97-706). According to this report, the peak ground acceleration at the subject site for a probability exceeding 10 percent in 50 years is about 0.37g. This report also indicates that the subject site is located within a seismic zone where the earthquake magnitude range is 6.5 to 7.0.

5.0 SEISMIC HAZARDS

5.1 Liquefaction Potential

Liquefaction is the transformation of a granular material from a solid to a liquid state as a result of increase pore-water pressure. The material will then loses strength and can flow if unrestrained, thus leading to ground failure. Liquefaction can be triggered in saturated cohesionless material by short-term cyclic loading, such as shaking due to an earthquake. Ground failure that results from liquefaction can be manifested as flow landsliding, lateral spread, loss of bearing capacity, or settlement.

At this site, the ground water table is located at least 50 feet below the existing ground surface. The potential for liquefaction at the site's sandy soil was evaluated using the procedures suggested by Loud, Idriss, and others (see References), based on data from Boring B-1 and B-6. The design earthquake (M =7.0) and ground acceleration of 0.37g are discussed in the previous Section. The total unit weight used for the onsite soils is 110 pcf. The ground water level imputed is arbitrary raised to the depth of 17 feet below the existing ground surface in accordance with CDMG report.

The analyses presented on the enclosed Appendix C indicate that the factor of safety of the onsite sandy soils at the depths between 17 to 22 feet for B-1 is below 1.25.

5.2 Liquefaction Induced Settlement

The sandy soils tend to settle and densify when they are subjected to earthquake shaking. Should the sand be saturated and there is no possibility for drainage so that constant volume conditions are maintained, the primary effect of the shaking is the generation of excess pore water pressures. Settlement then occurs as the excess pore pressures dissipate. The primary factors controlling seismic induced settlement are the cyclic stress ratio, maximum shear strain induced by earthquake, the strength and density of the sand, and the magnitude of the earthquake. Based on the procedures developed by Tokimatsu and Seed on 1987, it is estimated that liquefaction induced settlement is 0.60 inches for the potential liquefiable sandy soils at the site under the design earthquake.

5.3 Surface Manifestation of Liquefaction

One of the most dramatic causes of damage to structures during earthquakes has been the development of liquefaction in saturated sandy soils, manifested either by the formation of boils and mud-spouts at the ground surface, by seepage of water through ground cracks. Based on the procedures suggested by the Ishihara (1985), it is unlikely the surface manifestation would occur at the subject site under the design earthquake even.

5.4 Lurching

Soil lurching refers to the rolling motion on the surface due to the passage of seismic surface waves. Effects of this nature are not considered significant on the subject site where the thickness of alluvium does not vary appreciably under structures.

5.5 Surface Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. The potential for surface rupture on the subject site is considered negligible due to the absence of known active faults at the site.

5.6 Ground Shaking

Throughout southern California, ground shaking, as a result of earthquakes, is a constant potential hazard. The relative potential for damage from this hazard is a function of the type and magnitude of earthquake events and the distance of the subject site from the event. Accordingly, proposed structures should be designed and constructed in accordance with applicable portions of the building code.

6.0 CONCLUSIONS

Based on the results of our subsurface investigation, it is our opinion that the proposed residential development is feasible from a geotechnical standpoint, provided the recommendations contained herein are incorporated in the design and construction. The following is a summary of the geotechnical design and construction factors that may affect development of the site.

6.1 Seismicity

Based on our studies on seismicity, there are no known active faults crossing the property. However, the site is located in a seismically active region and is subject to seismically induced ground shaking from nearby and distant faults, which is a characteristic of all Southern California areas.

6.2 Liquefaction

Based on our liquefaction evaluation, it is concluded that the existing on-site loose to medium dense sandy soil is a potentially liquefiable soil under the design earthquake event. The estimated potential settlement induced by the underlying potentially liquefiable soils is about 0.60 inches for the potential liquefiable sandy soils.

6.3 Excavatability

Based on our subsurface investigation, excavation of the subsurface materials should be able to be accomplished with conventional earthwork equipment.

6.4 Surficial Soil Removal and Recompaction

Our field investigation data and laboratory test results indicated that the existing near surface materials are unsuitable for support of fills and structures as they presently exist and will require remedial grading as discussed herein.

6.5 Groundwater

Groundwater was not encountered to the depth explored (51.5 feet below surface). It is our opinion that the groundwater is not expected to be a significant constraint during future near surface construction.

7.0 RECOMMENDATIONS

7.1 Grading

7.1.1 Site Preparation

Prior to initiating grading operations, any existing vegetation, trash, debris, over-sized materials (greater than 6 inches), and other deleterious materials within construction areas should be removed from the site.

7.1.2 Surficial Soil Removals

It is recommended that the existing near surface soils within proposed building pad areas be removed to the depth of minimum of 3 feet below the existing ground surface. This removal should extend at least 5 feet beyond the proposed building lines. It is also recommended that the existing near surface soils be removed to a depth of about 2 feet below the existing ground and replaced with compacted fill within the drive area.

Locally deeper removals may be necessary to expose competent natural ground. The actual removal depths should be determined in the field as conditions are exposed. Visual inspection and/or testing may be used to define removal requirements.

7.1.3 Treatment of Removal Bottoms

Soils exposed within areas approved for fill placement should be scarified to a depth of 6 inches, conditioned to near optimum moisture content, then compacted in-place to project standards.

7.1.4 Structural Backfill

The onsite soils may be used as compacted fill, provided they are free of organic materials and debris. Fills should be placed in relatively thin lifts, brought to near optimum moisture content, then compacted to at least 90 percent relative compaction based on ASTM D-1557-00.

7.2 Foundation Design

7.2.1 Caisson foundation

Based on our subsurface investigation and laboratory testing, it is recommended that the proposed building be supported on drilled, cast-in-place caissons. Allowable downward capacities for caissons are presented in Figure 3. Allowable uplift capacities for these caissons may be assumed as one-half of downward capacity as shown on Figure 3. While caissons are spaced three (3) diameter apart, center to center, no reduction in caisson capacity is need for group action.

It is recommended that caissons be designed to resist the potential downdrag force due to the consolidating of potential liquefiable sandy layer at the depth of 17 to 22 feet below the existing ground. The estimated downdrag force for the caisson is presented below:

Caisson Diameter	12-inch	18-inch	24-inch
Downdrag force	8.5 kips	17.5 kips	28.0 kips

All caissons excavations should be free of any loose or disturbed soils. Drilling within the last 5 feet should be done slowly and carefully to minimize disturbance to the bearing layer. The excavation and installation of the caissons should be observed and approved by the project geotechnical consultants to verify the required depth. All applicable safety requirements should be followed during the construction.

7.2.2 Lateral Load Capacity

Lateral load analyses were made using the procedures described by NAVFAC Design Manual 7.02 and Matlock, Reese (1960) for the proposed caissons. The results of these analyses for free head and fixed head conditions are presented in the following table:

Free Head Conditions

Conditions	12-inch Diameter	24-inch Diameter
Ground Line Deflection for Applied Force (inches/kips)	0.0561	0.0185
Ground Line Deflection for Applied Moment (inches/ft-kips)	0.0111	0.00211

Fixed Head Conditions

Conditions	12-inch Diameter	24-inch Diameter
Ground Line Deflection for Applied Force (inches/kips)	0.0227	0.00749
Estimated Max. Moment (ft-kips/kips)	-3.23	-5.56

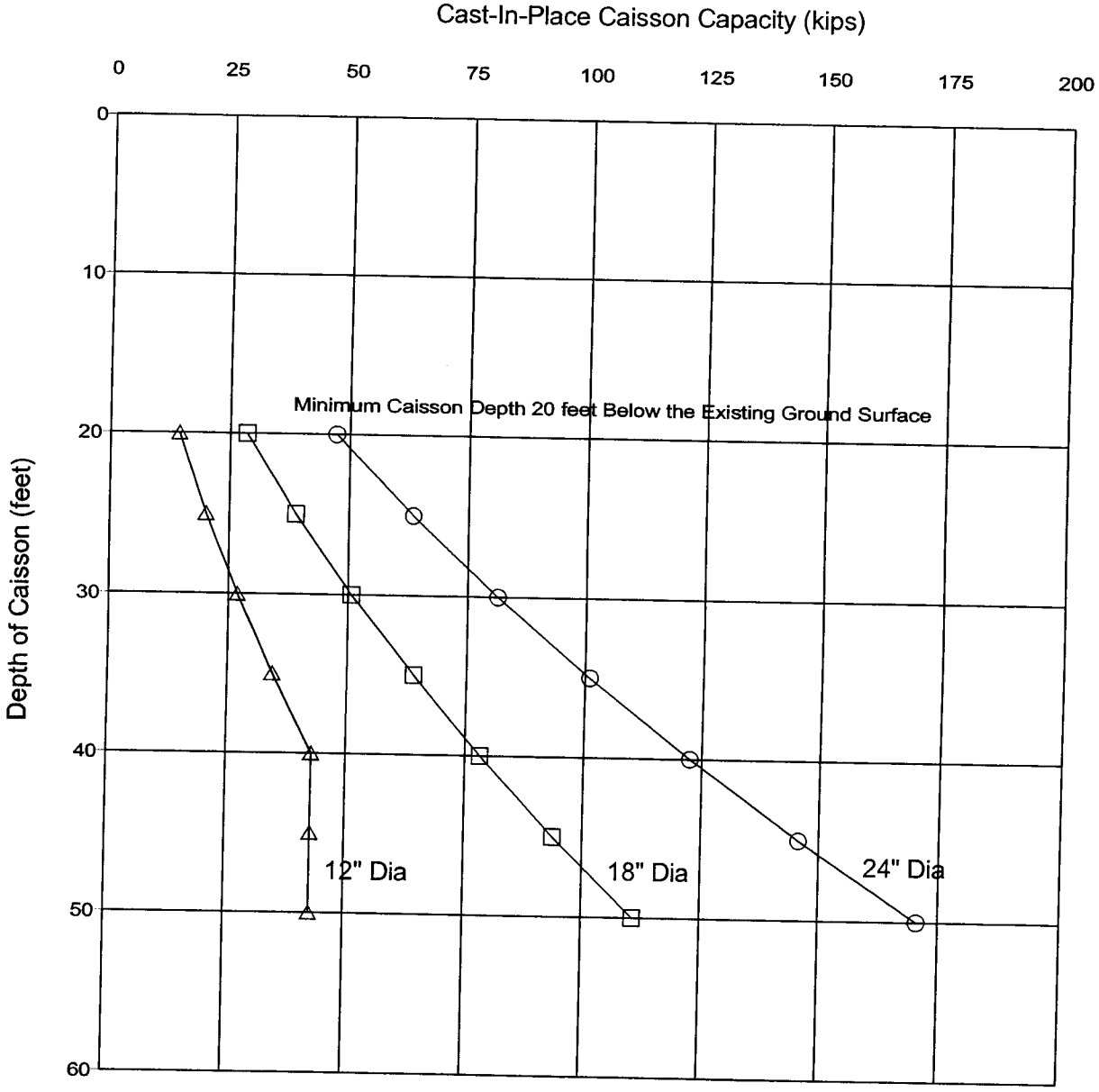
The point of fixity of the above caissons may be assumed at 4.2 feet for 12-inch diameter caisson and 7.3 feet for 24-inch diameter caissons, respectively.

The above recommended values are for a single caisson under a one-kip lateral load. Deflection and moment for large lateral loads may be obtained by multiplying these values by the loads. These estimated are applicable up to a ground line deflection of ¼ of an inch for a free head condition and of 1/10 of an inch for a fixed head condition. For greater deflection, each case should be evaluated by the project geotechnical engineer.

The results of the above lateral load analyses do not include a factor of safety. These values only represent our best estimate of ground line deflection under the load and caisson condition analyzed.

7.2.3 Miscellaneous Foundation

An allowable bearing value of 1500 pounds per square foot may be used for design of miscellaneous shallow continuous footings 12 inches wide and 18 inches deep, and shallow pad footings at least 24 square inch and 18 inches deep. This value may be increased by 200 pounds per square foot for each additional foot of depth or width to a maximum value of 2500 pounds per



Cal Land Engineering, Inc. dba Quartech Consultants Geotechnical, Environmental & Civil Engineering Services	Project Address: Twintree Hotel Garden Grove, California

CAST-IN-PLACE CAISSON BEARING CAPACITY

06/05

FIGURE 3

square foot. This value may be increased by one-third when considering short duration seismic or wind loads.

7.2.4 Settlement

Settlement of the footings placed as recommended and subject to no more than allowable loads is not expected to exceed 3/4 inch. Differential settlement between adjacent columns is not anticipated to exceed 1/4 inch for the adjacent column spaced at a distance of about 30 feet. Additionally, the miscellaneous shallow foundation should also be designed to resist the potential liquefaction induced settlement of about 0.60 inches and differential settlement of about 0.39 inches, respectively.

7.2.5 Subgrade Reaction

The vertical subgrade reaction to be utilized for the slab designs may be computed as 160 tons per cubic foot. This value only represent our best estimate of ground line deflection under the load and condition analyzed.

7.2.6 Lateral Pressures

The active earth pressure to be utilized for cantilever retaining wall designs may be computed as an equivalent fluid having a density of 33 pounds per cubic foot when the slope of the backfill behind the wall is level.

Passive earth pressure may be computed as an equivalent fluid pressure of 300 pounds per cubic foot, with a maximum earth pressure of 2500 pounds per square foot. An allowable coefficient of friction between soil and concrete of 0.35 may be used with the dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one third (1/3).

7.2.7 Foundation Construction

All footings should be founded at a minimum depth of 18 inches below the lowest adjacent ground surface. All continuous footings should have at least two No. 4 reinforcing bars placed at the top and bottom of the footings.

Concrete slabs should be a minimum of 4-inch thick and reinforced with a minimum of No. 4 bars at 18-inches in center both way or its equivalent. All slab reinforcement should be supported to

ensure proper positioning during placement of concrete. Additional reinforcement may be required in the concentrated loading and/or traffic areas. Concrete slabs in moisture sensitive areas should be underlain with a vapor barrier consists of a minimum of 10 mil polyvinyl chloride membrane with all laps sealed. A minimum of one inch of sand should be placed over the membrane to aid in uniform curing of concrete.

7.3 Temporary Trench Excavation and Backfill

All trench excavations should conform to CAL-OSHA and local safety codes. All utilities trench backfill should be brought to near optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of ASTM D-1557-00.

8.0 SEISMIC DESIGN

Based on our studies on seismicity, there are no known active faults crossing the property. However, the subject site is located in southern California, which is a tectonically active area. The following UBC (Chapter 16A) seismic related values may be used:

Seismic Zone		4
Seismic Zone Factor (Z)		0.4
Soil Profile Type – Table 16-J		S_D
Seismic Coefficient	C_a (16-Q)	$0.44N_a$
	C_v (16-R)	$0.64N_v$
Near Source Factor	N_a (16-S)	1.0
	N_v (16-T)	1.0
Seismic Source Type (16-U)		B

Uniform Building Code design is intended to accommodate horizontal accelerations up to 0.4g for Seismic Zone 4. The proposed structures should be designed to accommodate this acceleration, at a minimum. However, the Project Structural Engineer should be aware of the information provided above to determine if any additional structural strengthening is warranted.

9.0 SULFATE CONTENT OF SOILS

Sulfate Content of Soils test was conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of potential sulfate attack on concrete by onsite soils. According to UBC Table 19-A-4, a "negligible" exposure to sulfate can be expected for concrete placed in contact with the onsite soil. Based on the testing results and

UBC, it is concluded that Type II cement may be used. Additional sulfate test of the near pad grade soil sample may be tested to verify the above recommendations.

10.0 INSPECTION

As a necessary requisite to the use of this report, the following inspection is recommended:

- Temporary excavations.
- Removal of surficial soils.
- Backfill placement and compaction.
- Foundation excavations.

The geotechnical engineer should be notified at least 1 day in advance of the start of construction. A joint meeting between the client, the contractor, and the geotechnical engineer is recommended prior to the start of construction to discuss specific procedures and scheduling.

11.0 INVESTIGATION LIMITATIONS

The materials encountered on the subject site and utilized in our laboratory testing program are believed to be representative of the area. However, soil may vary in characters between the exploratory borings. Since our investigation is based on the site materials observed, selected laboratory testing, and engineering analyses, the conclusions and recommendations are professional opinion. These opinions have been derived in accordance with current standard of practice, and no warranty is expressed or implied.

12.0 REFERENCES

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3. Ishihara, K. and Yoshimine, M., (1992), "Evaluation of Settlements in Sand Deposits Following Liquefaction During Earthquakes", Japanese Society of Soil Mechanics and Foundation Engineering, Vol. 32, No. 1, pp. 173-188

4. Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117, Adopted by California State Mining and Geology Board in accordance with the Seismic Hazards Mapping Act of 1990 in March 13, 1997.

5. T.Y. Loud, I.M. Idriss, and et. al. (2001), "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils",

Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 127, No. GT10, pp. 817-833.

APPENDIX A
FIELD INVESTIGATION

Subsurface conditions were explored by drilling seven 8-inch hollow stem auger boring to a maximum depth of 51.5 at approximate locations shown on the enclosed Site Plan (Figure 2). Upon completion of excavating, the boreholes were backfilled with onsite soils that were removed from the excavations.

The drilling of the test boring was supervised by a geotechnical engineer, who continuously logged the borings and visually classified the soils in accordance with the Unified Soil Classification System. Ring and SPT samples were taken at frequent intervals. These samples, taken by the hollow stem auger, were obtained by driving a ring and SPT sampler with successive blows of 140-pound hammer dropping from a height of 30 inches.

Representative undisturbed samples of the subsurface soils were retained in a series of brass rings, each having an inside diameter of 2.42 inches and a height of 1.00 inch. All ring samples were transported to our laboratory. Bulk surface soil samples were also collected for additional classification and testing.

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-1

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	5 8 8	SP/ SM	99.2	4.0	Sand and silty sand, medium grained, dark brown, slightly moist, loose to medium dense
5		S	4 5 5	SM			Silty sand, fine grained, light brown, slightly moist, medium dense
10		R	8 17 19	SM	108.7	3.2	Silty sand, fine grained, tan brown, slightly moist, medium dense
		S	13 14				
15		S	9 10 18	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 11 15	SP/ SM	111.7	2.9	Sand and silty sand, fine grained, light brown, slightly moist, medium dense to dense
		S	9 11				
25		S	11 13 16	SM			Silty sand, grayish brown, slightly moist, medium dense
30		R	10 19 23	SP	102.4	3.8	Sand, medium grained, grayish brown, slightly moist, dense
		S	14 18				
35		S	9 13 18	SM			Silty sand, grayish brown, slightly moist, dense

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BORING LOG B-1

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	8 14 20	SM			Silty sand, fine grained, light brown, very moist, dense
45		S	9 15 22	SM			Silty sand, fine grained, light brown, moist, dense
50		S	5 10 11	ML		24.0	Clayey silt, grayish brown, moist, very stiff
55							
60							
65							
70							
75							

Total depth 51.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-2

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	3 6 6	SM			Silty sand, medium grained, light brown, slightly moist, loose to medium dense
5		R	7 12 18	SM	100.2	7.6	Silty sand, fine grained, light brown, moist, medium dense
10		S	2 4 7	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	8 17 25	SP	100.5	2.5	Sand, fine to medium grained, light brown, slightly moist, medium dense to dense
20		S	10 12 17	SP			Sand, coarse grained, light brown, slightly moist, medium dense
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-3

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	6 8 8	SM	115.5	11.5	Silty sand, fine grained, dark brown, moist, loose to medium dense
5		S	4 5 6	SM			Silty sand, fine grained, light brown, moist, medium dense
10		R	5 9 12	SM	104.4	12.1	Silty sand, fine grained, light brown, moist, medium dense
15		S	8 12 14	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 13 18	SP	98.8	3.2	Sand and silty sand, fine grained, light brown, slightly moist, medium dense to dense
25		S	12 17 18	SP/ SM			Sand and silty sand, light brown, moist, dense
30		S	9 14 19	SP			Sand, medium grained, light brown, moist, dense
35							Total depth 31.5 ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-4

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	4 3 2	SM			Silty sand, medium grained, light brown, slightly moist, very loose
5		R	5 11 17	SM	105.3	9.1	Silty sand, fine grained, dark brown, moist, medium dense
10		S	4 7 8	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	9 13 28	SP	102.4	1.2	Sand, coarse grained, light brown, slightly moist, medium dense to dense
20		S	8 14 14	SP			Sand, coarse grained, light brown, slightly moist, medium dense mixed with sandy silt
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-5

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
							Thin layer of asphalt concrete
		S	2/18"	SM			Silty sand, light brown, moist, very loose
5		R	5 8 13	SM	100.6	11.6	Silty sand, fine grained, dark brown, moist, medium dense
10		S	4 6 6	SM			Silty sand, fine grained, light brown, moist, medium dense
15		R	9 18 20	SP	98.3	3.2	Sand, coarse grained, light brown, slightly moist, medium dense
20		S	8 14 16	SP			Sand, coarse grained, light brown, slightly moist, medium dense
25							
30							
35							

Total depth 21.5 ft.
No groundwater
Hole backfilled

Hammer Driving Weight: 140 lbs
Hammer Driving Height: 30 inches

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dba Quartech Consultants

BORING LOG B-6

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
							4" Asphalt concrete
		R	4 6 8	SP	108.2	3.4	Sand, medium grained, dark brown, slightly moist, loose
5		S	4 5 6	SM			Silty sand, fine grained, grayish brown, slightly moist, medium dense
10		R	7 17 23	SM	109.0	7.9	Silty sand, fine grained, dark brown, moist, dense
		S	14 17				
15		S	7 8 9	SP			Sand, fine grained, light brown, slightly moist, medium dense
20		R	10 17 24	SP/ SM	106.7	1.8	Sand and silty sand, fine grained, light brown, slightly moist, dense
		S	14 18				
25		S	10 17 18	SP/ SM			Sand and silty sand , tan brown, slightly moist, dense
30		S	13 16 25	SP/ SM			Sand and silty sand, medium grained, light brown, slightly moist, dense
35		S	9 13 50	SM			Silty sand, light brown, very moist, very dense

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-6

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		S	5 8 9	ML		23.3	Clayey silt, grayish brown, moist, very stiff
45		S	3 5 7	ML		24.1	Clayey silt, grayish brown, moist, stiff
50		S	4 7 16	ML		24.4	Clayey silt, grayish brown, moist, very stiff
55							Total depth 51.5ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
60							
65							
70							
75							

Cal Land Engineering, Inc.
dba Quartech Consultants

BORING LOG B-7

PROJECT LOCATION: Harbor Blvd. and Twin Tree Ave., Garden Grove, CA

PROJECT NO: 05-136-003

DATE DRILLIED: 4-06-05

SAMPLE METHOD: Hollow Stem

ELEVATION: N/A

LOGGED BY: JR

S: Standard Penetration Test

R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
		R	4 7 9	SM	107.9	7.0	Silty sand, fine grained, dark brown, moist, loose to medium dense
5		S	5 5 5	SM			Silty sand, fine grained, light brown, moist, medium dense
10		R	5 9 12	SP	97.0	4.5	Sand, fine grained, light brown, moist, medium dense
15		S	6 9 11	SM			Silty sand, fine grained, light brown, slightly moist, medium dense
20							Total depth 16.5 ft. No groundwater Hole backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
25							
30							
35							

APPENDIX B

LABORATORY TESTING

During the subsurface exploration, QCI personnel collected relatively undisturbed ring samples and bulk samples. The following tests were performed on selected soil samples:

Moisture-Density

The moisture content and dry unit weight were determined for each relatively undisturbed soil sample obtained in the test borings in accordance with ASTM D2937 standard. The results of these tests are shown on the boring logs in Appendix A.

Shear Tests

Shear tests were performed in a direct shear machine of strain-control type in accordance with ASTM D3080 standard. The rate of deformation was 0.025 inch per minute. Selected samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: internal friction angle and cohesion. The shear test results are presented in the attached Figures.

Consolidation Tests

Consolidation tests were performed on selected undisturbed soil samples in accordance with ASTM D2435 standard. The consolidation apparatus is designed for a one-inch high soil filled brass ring. Loads are applied in several increments in a geometric progression and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. The samples were inundated with water at a load of one kilo-pounds (kips) per square foot, and the test results are shown on the attached Figures.

Corrosion Potential

Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. These tests are performed in accordance with California Test Method 417, 422, 532, and 643. The testing results are presented below:

Sample Location	PH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (ohm-cm)
B-1 @ 0' - 5'	7.95	80	0.052	2400

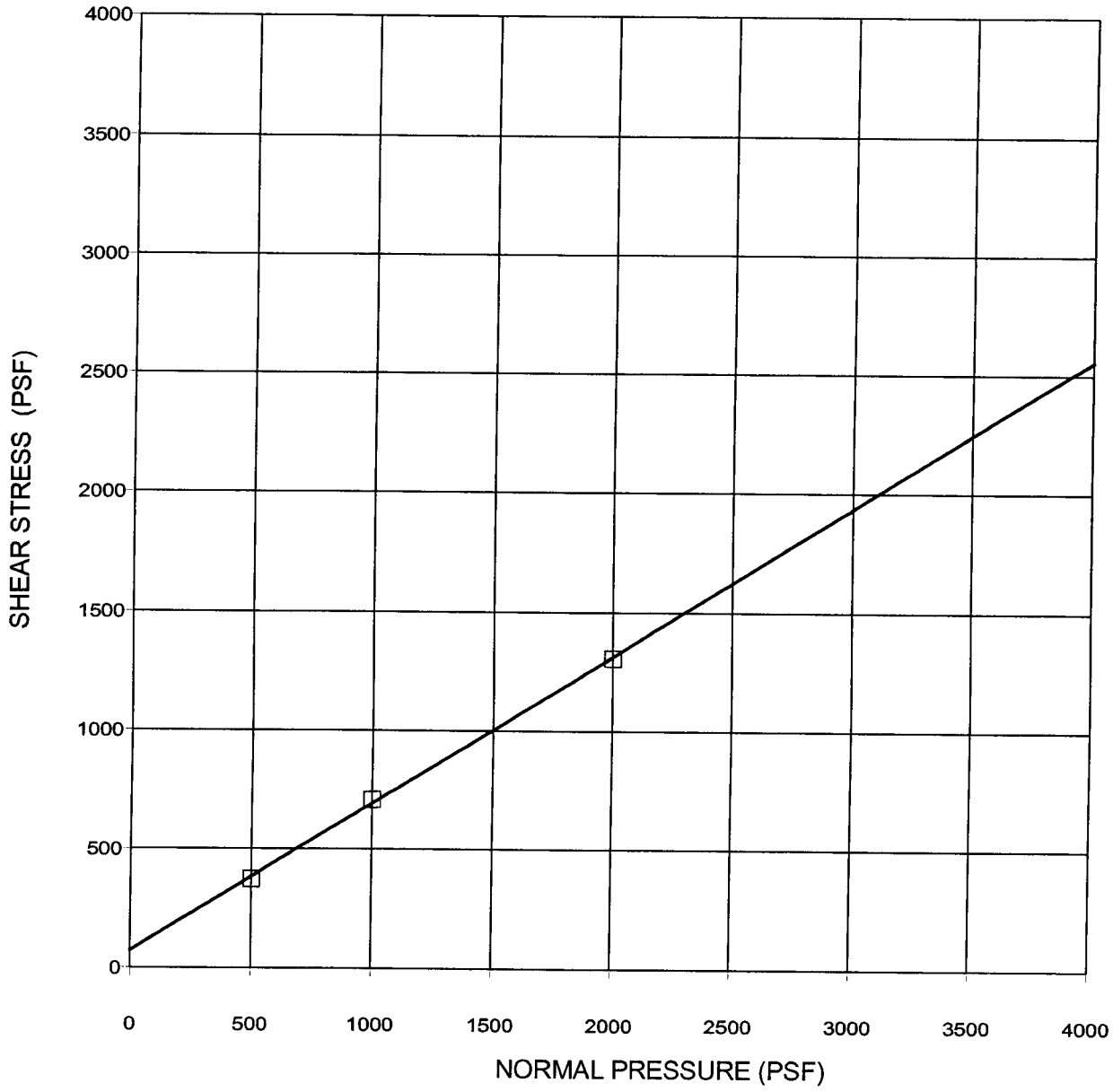
Grain Size Analysis

Grain size distribution was determined for selected soil samples in accordance with ASTM D422 standard. The test results are presented in the attached plate.

Percent of Fine

Percent of fine was determined for selected soil samples in accordance with ASTM D1140 standard. The test results are presented in the attached table.

Sample Location	Percent of Fine
B-1 @ 10'	25.2
B-1 @ 15'	3.7
B-1 @ 20'	11.1
B-1@ 25'	32.2
B-1 @ 35'	17.6
B-1 @ 45'	18.2
B-6 @ 15'	1.8
B-6 @ 20'	8.8
B-6 @ 25'	9.3
B-6@ 30'	5.7
B-6 @ 35'	16.2



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	2.0	RING	SP-SM	70	32

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	4.0	18.3
1000	4.0	18.0
2000	4.0	17.9

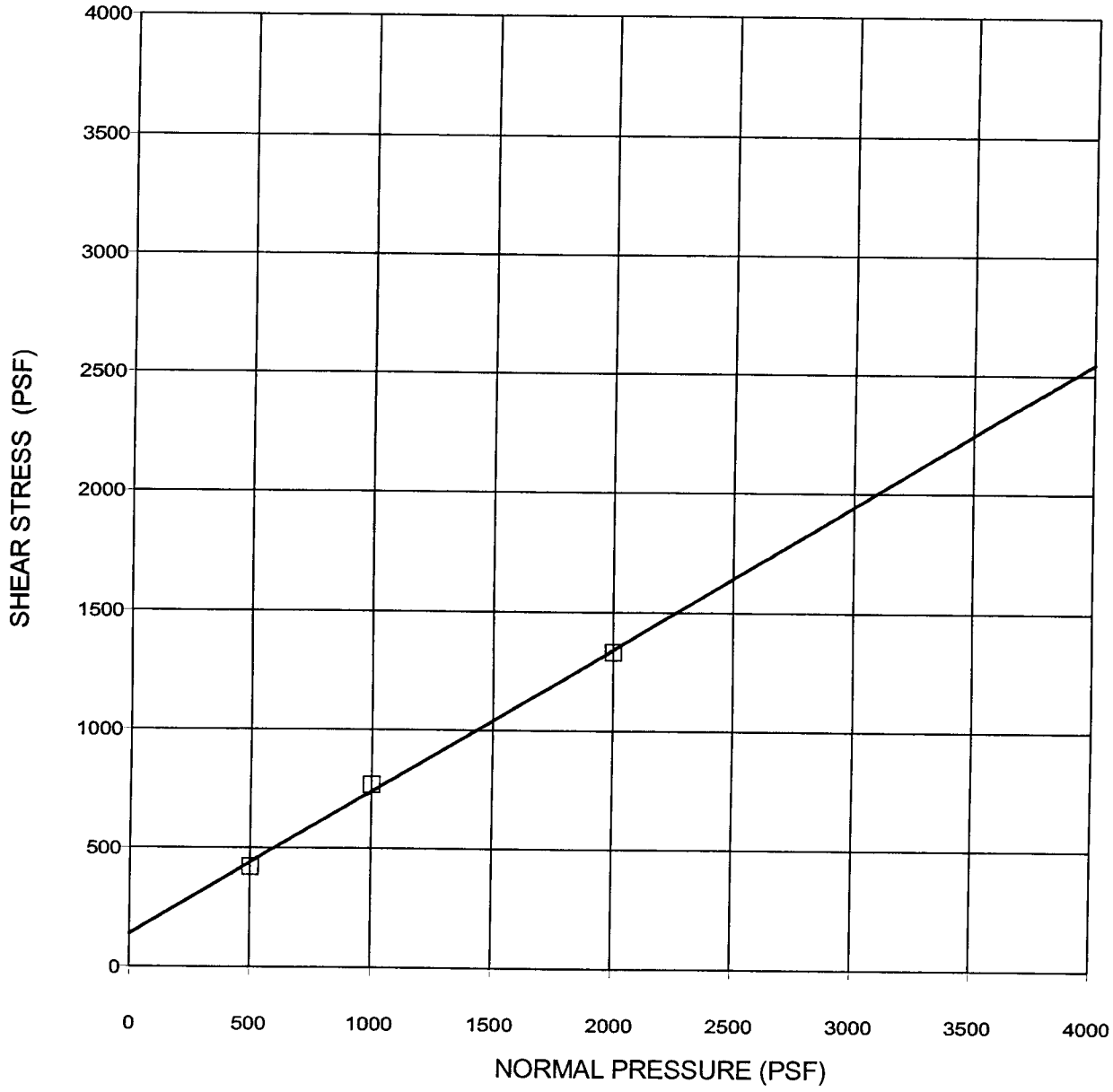
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Project Address:
Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-5	N/A	5.0	RING	SM	140	31

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	11.6	22.4
1000	11.6	21.2
2000	11.6	21.0

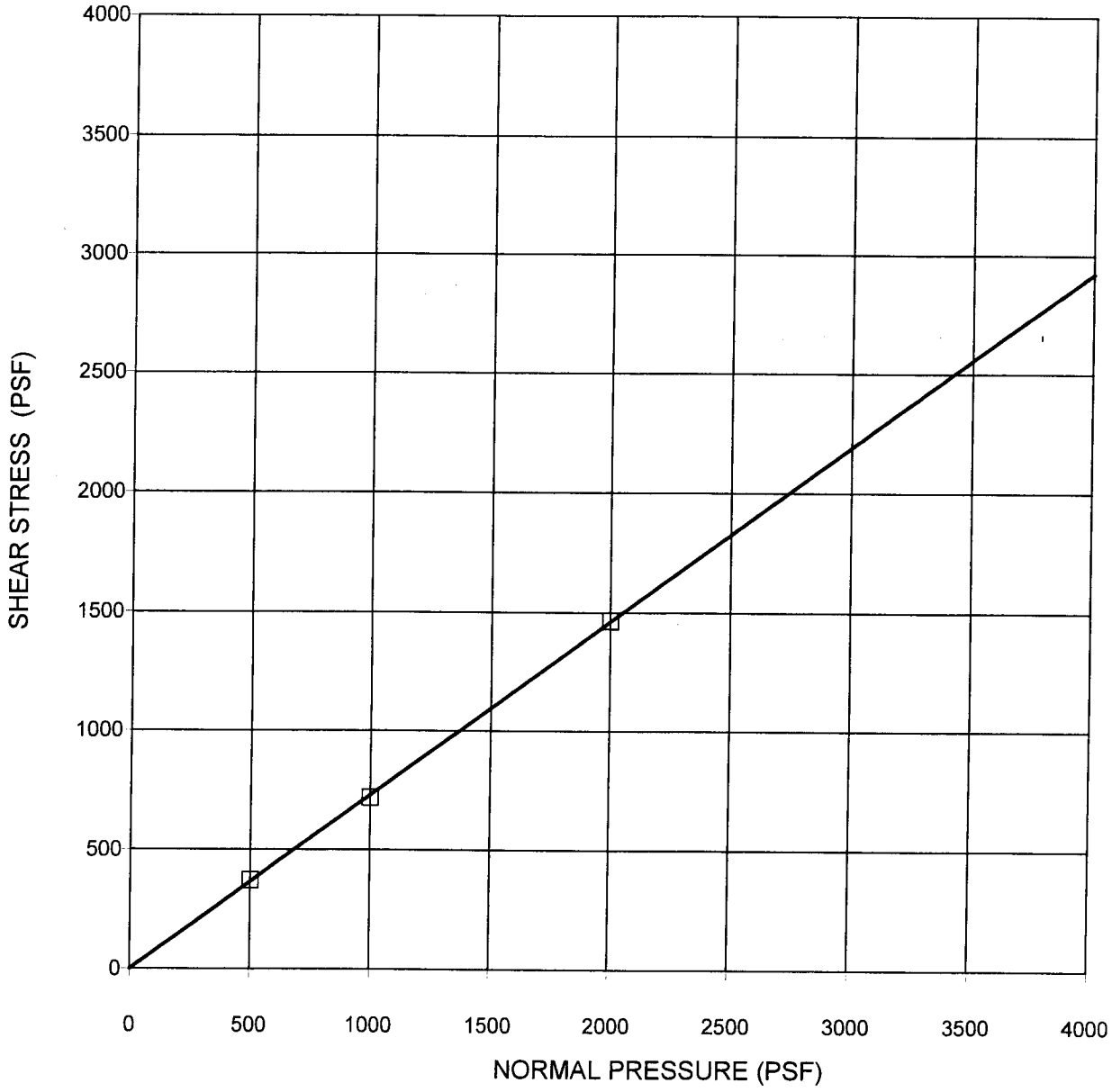
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DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	30.0	RING	SP	0	36

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	3.8	18.7
1000	3.8	18.3
2000	3.8	18.2

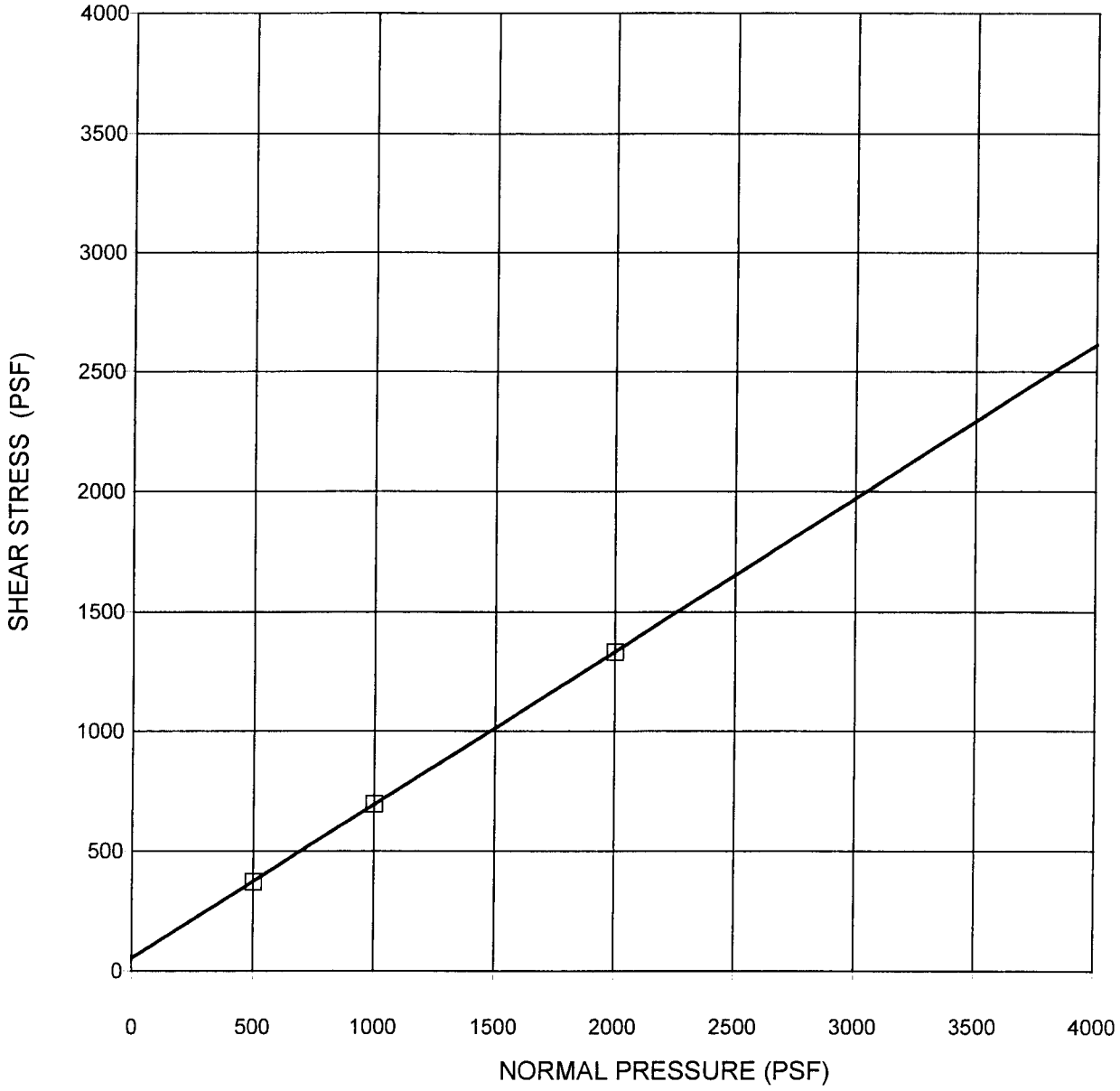
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DIRECT SHEAR
(ASTM D3080)

4/05

FIGURE



SYMBOL	BOREHOLE NUMBER	SAMPLE NUMBER	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-6	N/A	20.0	RING	SP-SM	50	33

Vertical Loads (PSF)	Moisture Content Before Test(%)	Moisture Content After test (%)
500	1.8	17.7
1000	1.8	17.0
2000	1.8	16.9

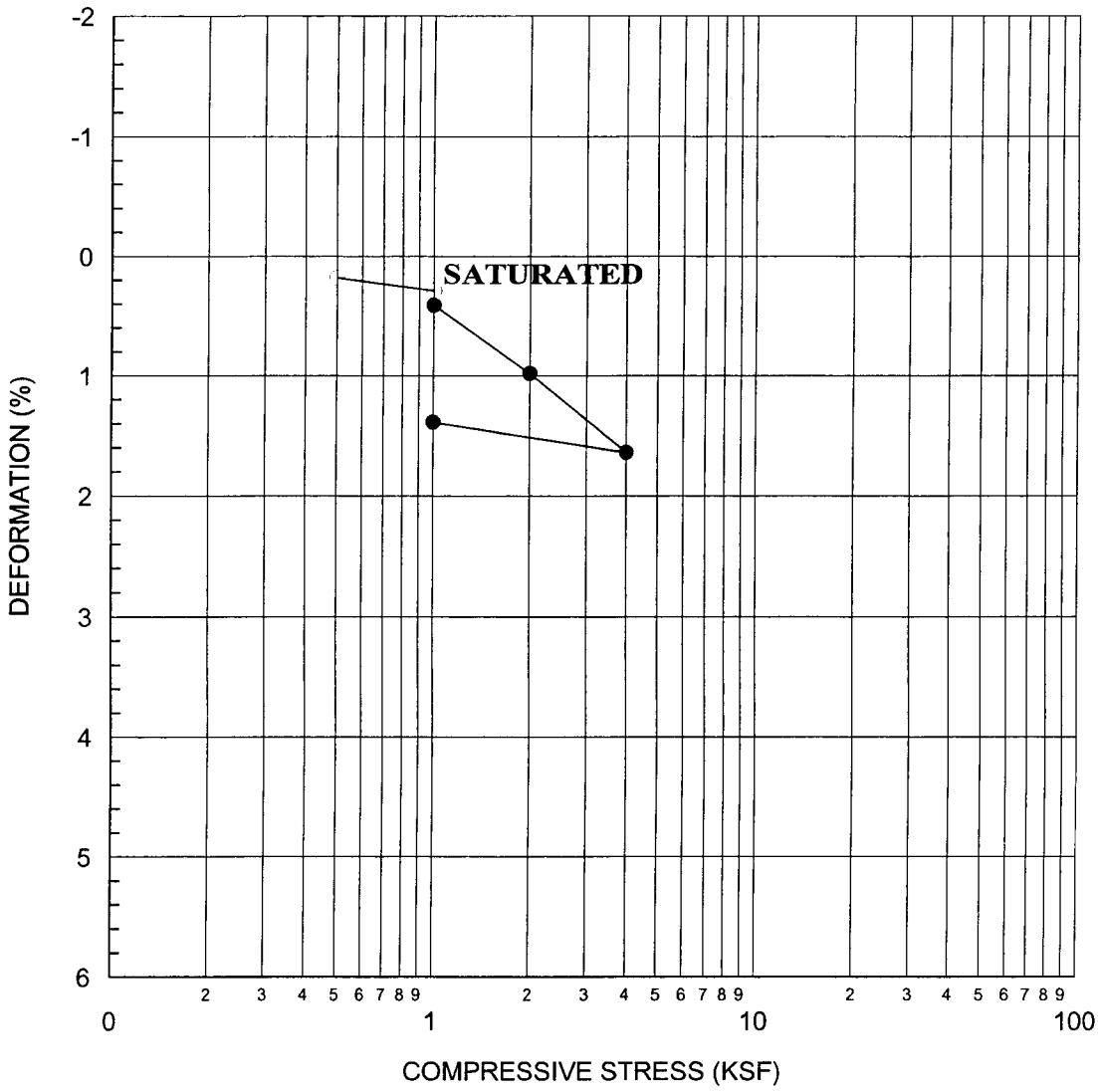
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DIRECT SHEAR
(ASTM D3080)

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FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	10.0	SM	3.2	108.9	0.547

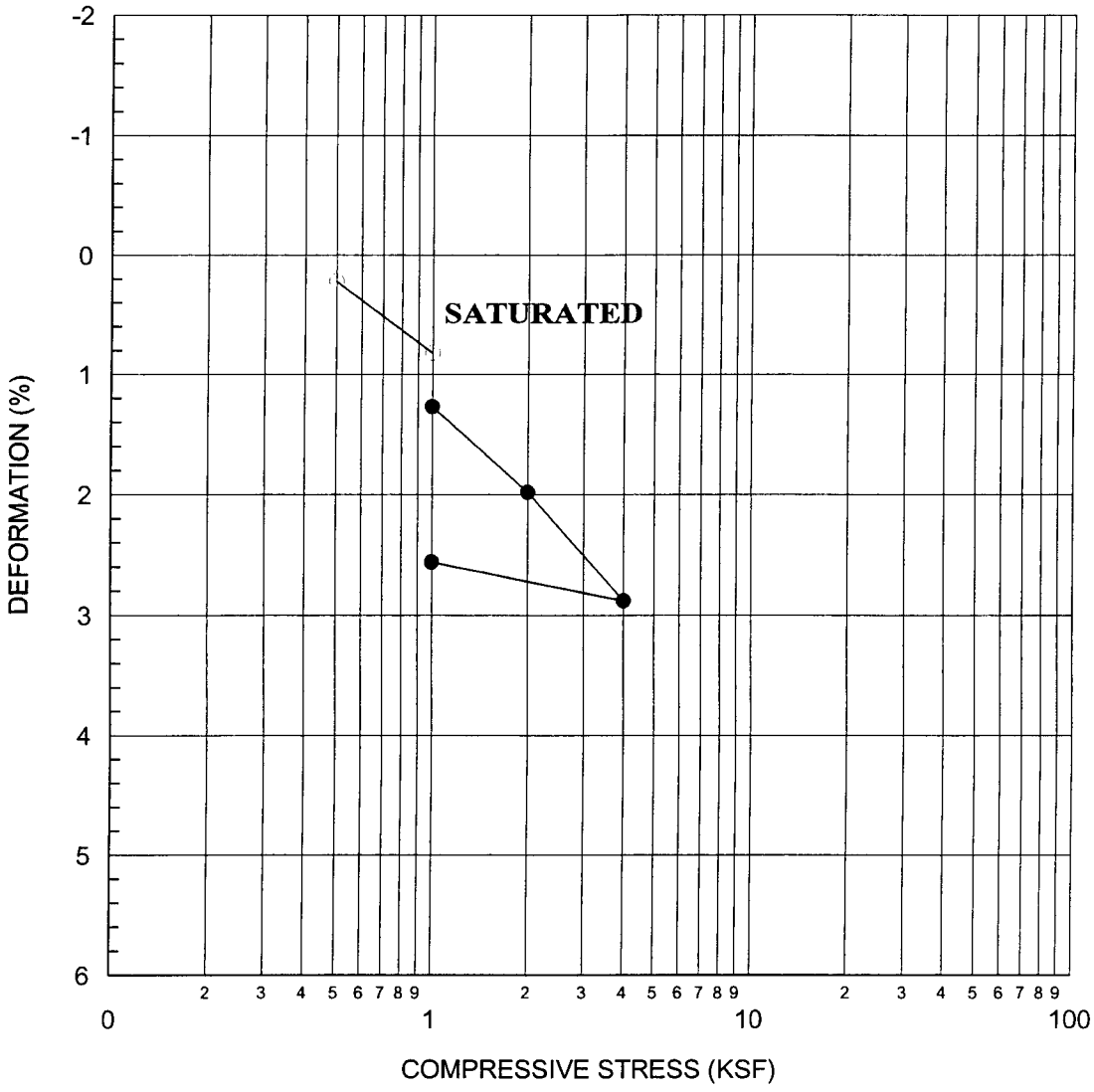
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-2	N/A	5.0	SM	7.6	100.5	0.676

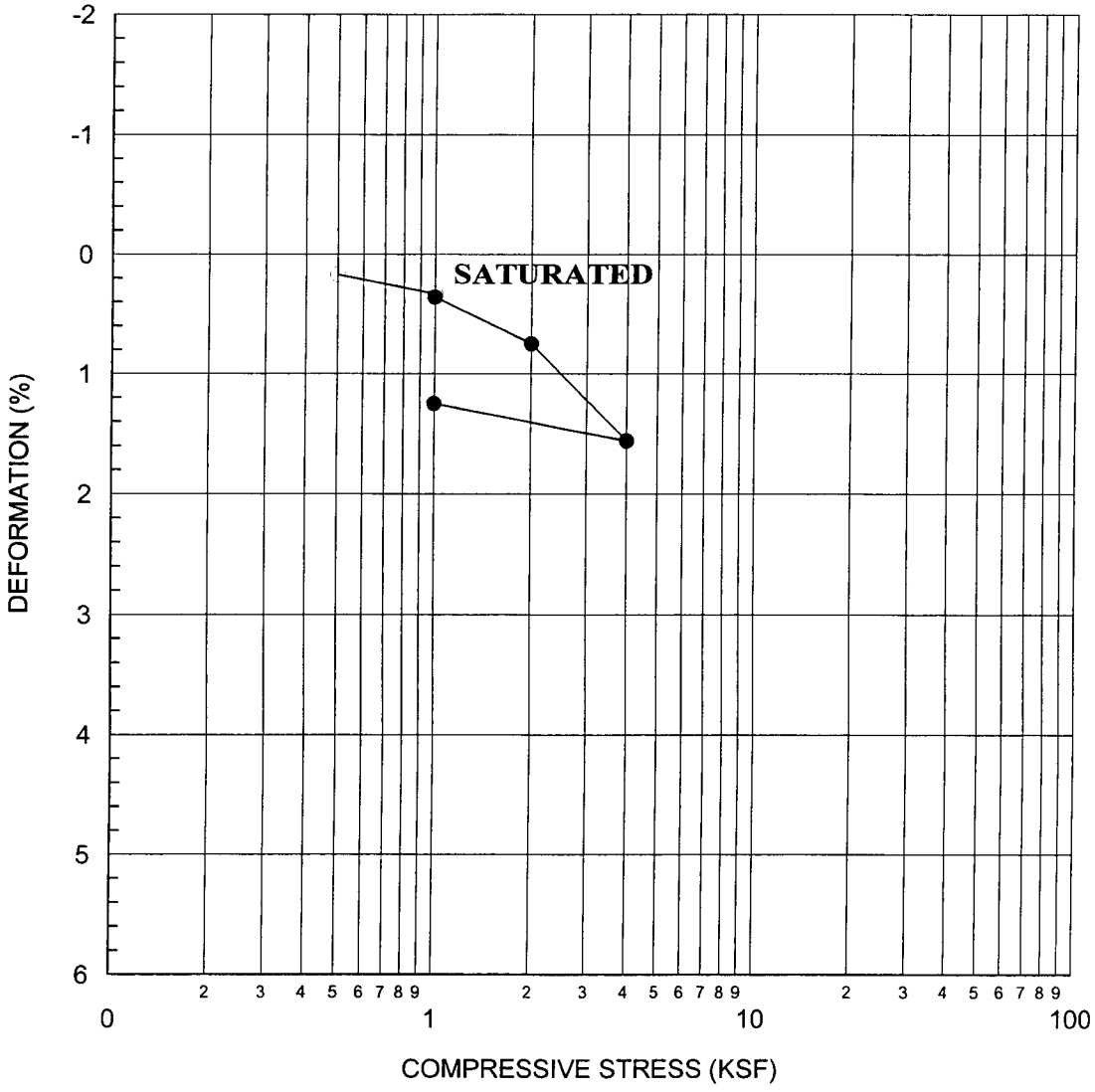
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-3	N/A	10.0	SM	12.1	104.6	0.611

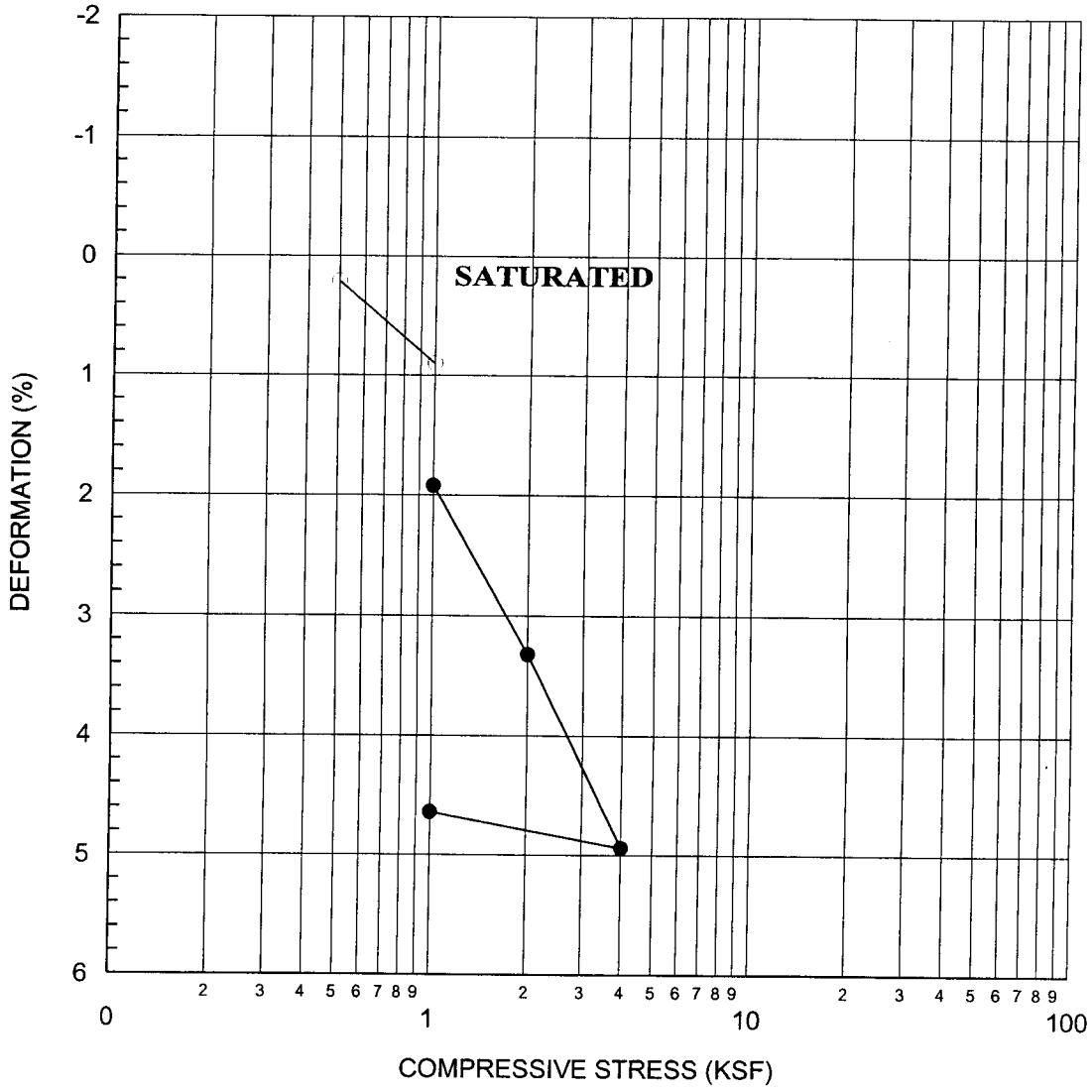
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-4	N/A	5.0	SM	9.1	105.7	0.594

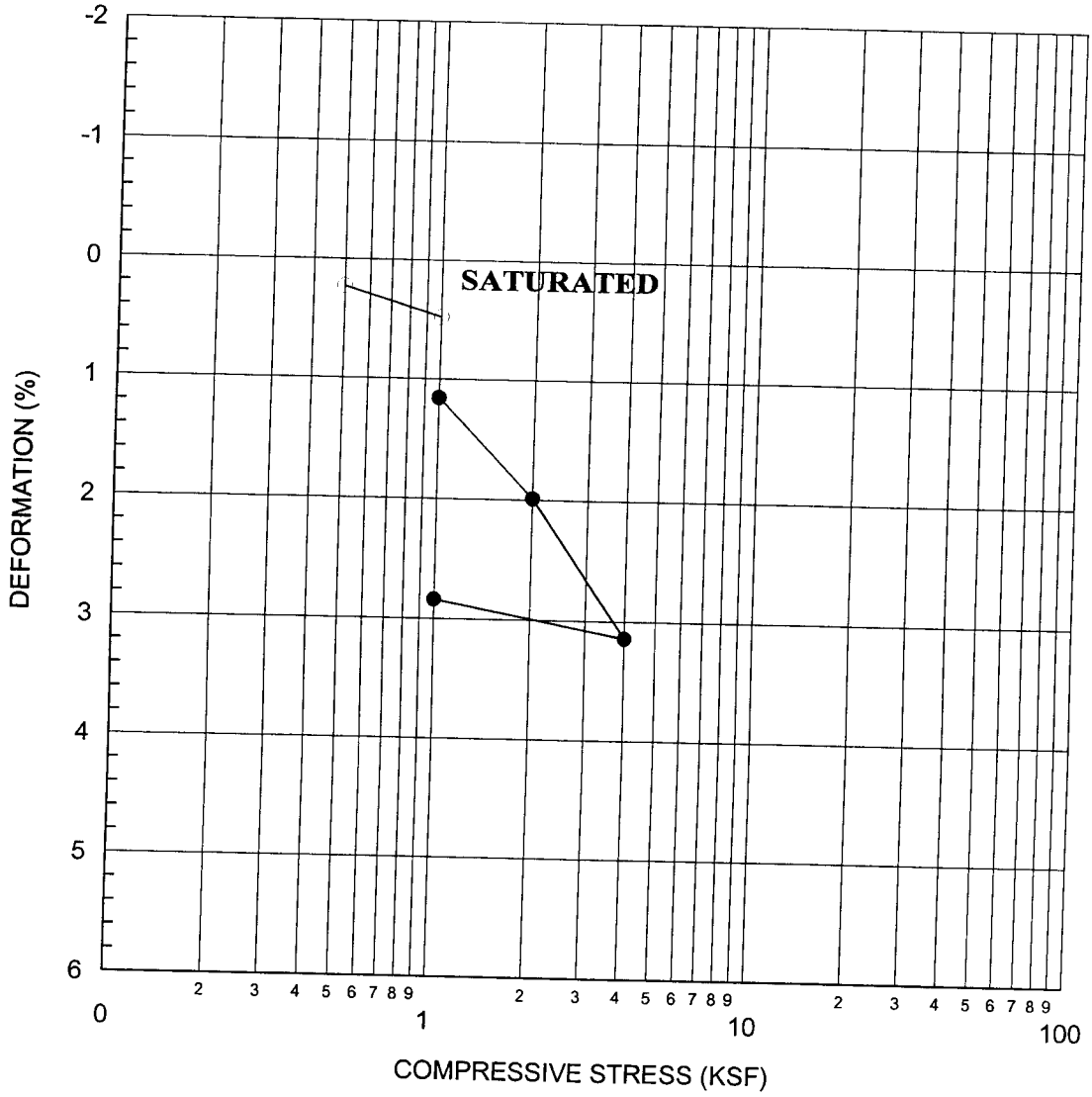
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-5	N/A	5.0	SM	11.6	100.9	0.670

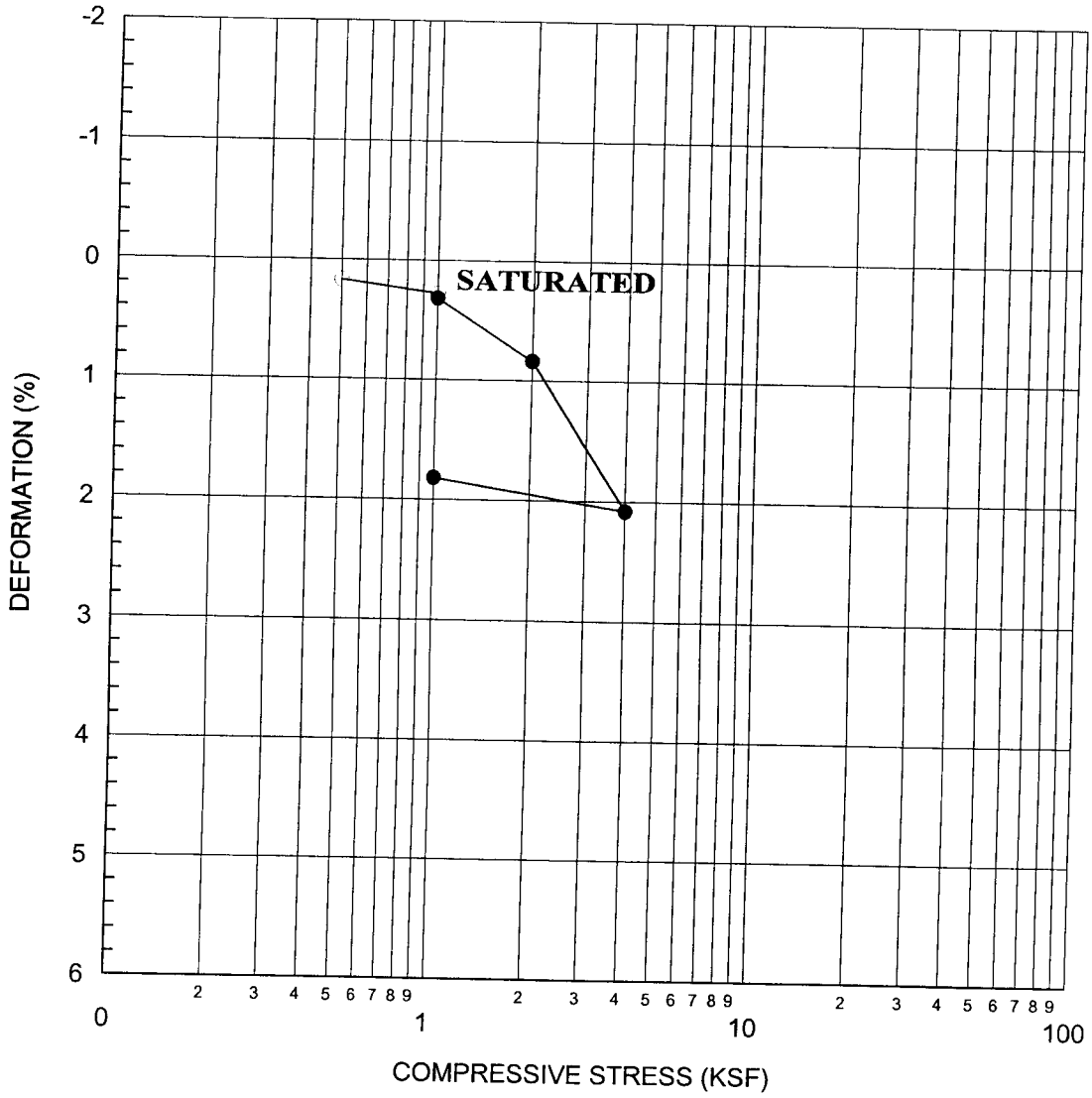
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	BORING NO	SAMPLE NO	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-6	N/A	10.0	SM	7.9	102.1	0.650

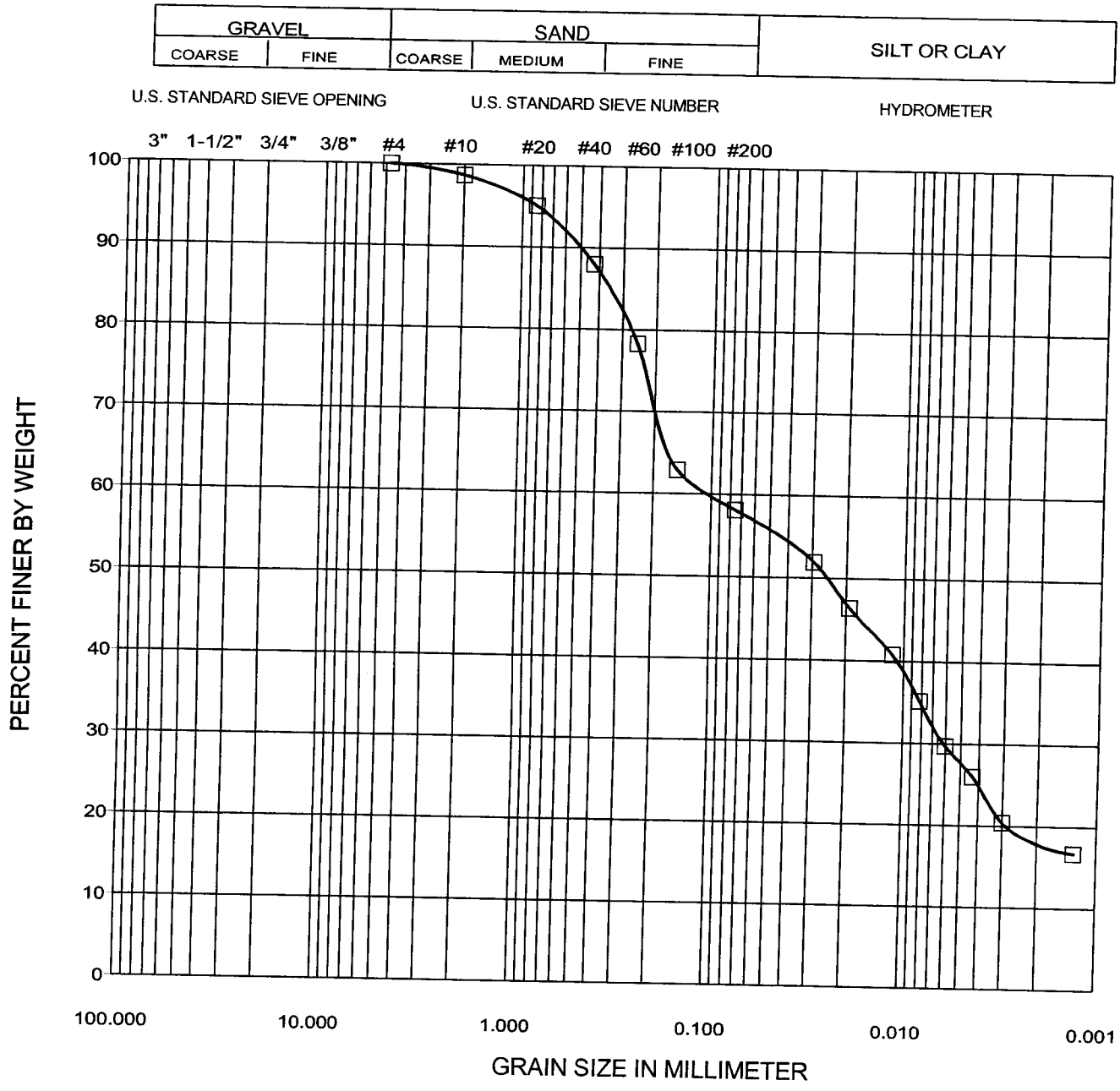
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CONSOLIDATION
(ASTM D2435)

4/05

FIGURE



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-1	50.0	BAG	ML	42	11

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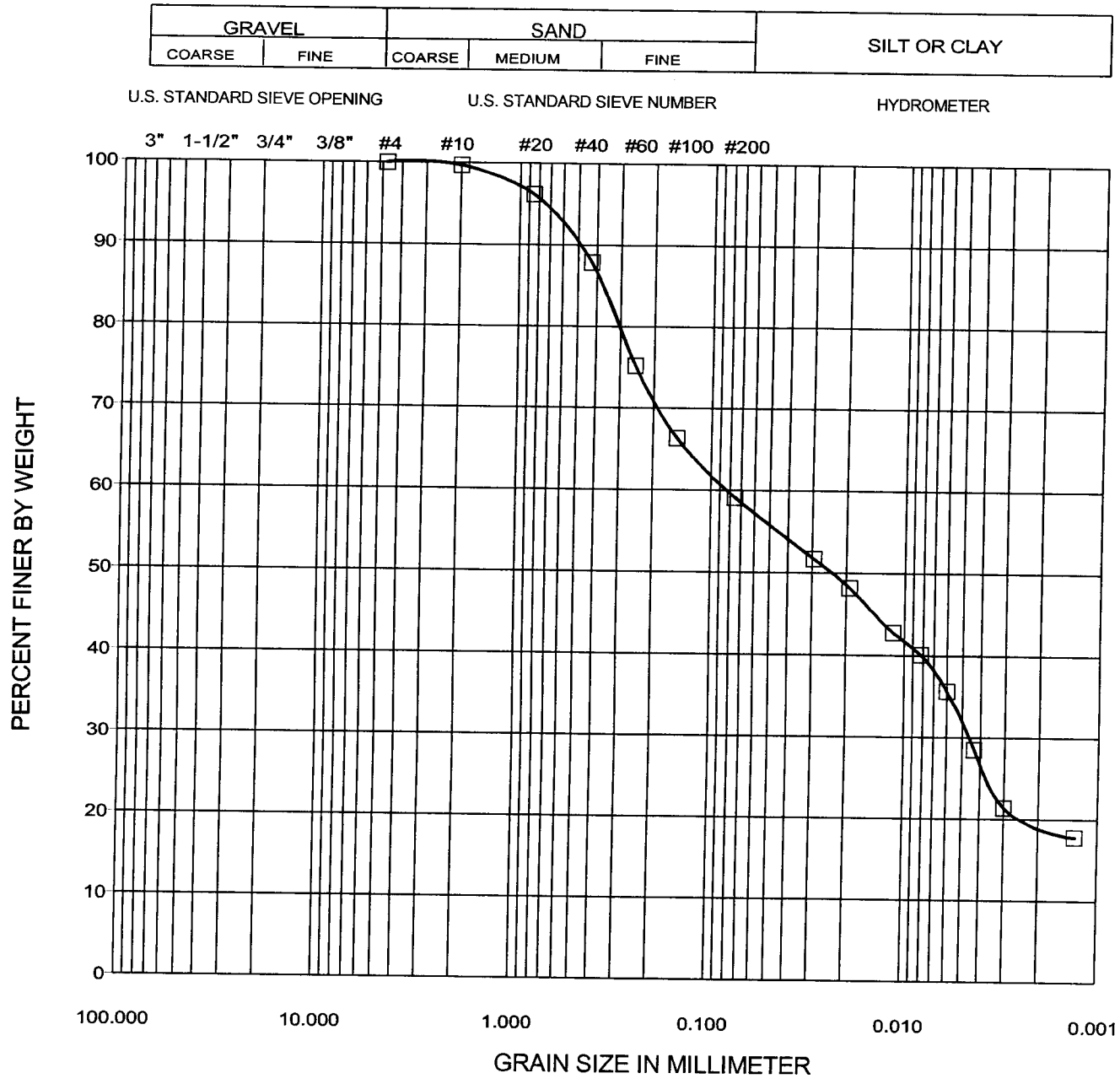
Harbor Blvd. & Twin Tree Ave.
Garden Grove, California

GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-6	40.0	BAG	ML	44	12

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Garden Grove, California

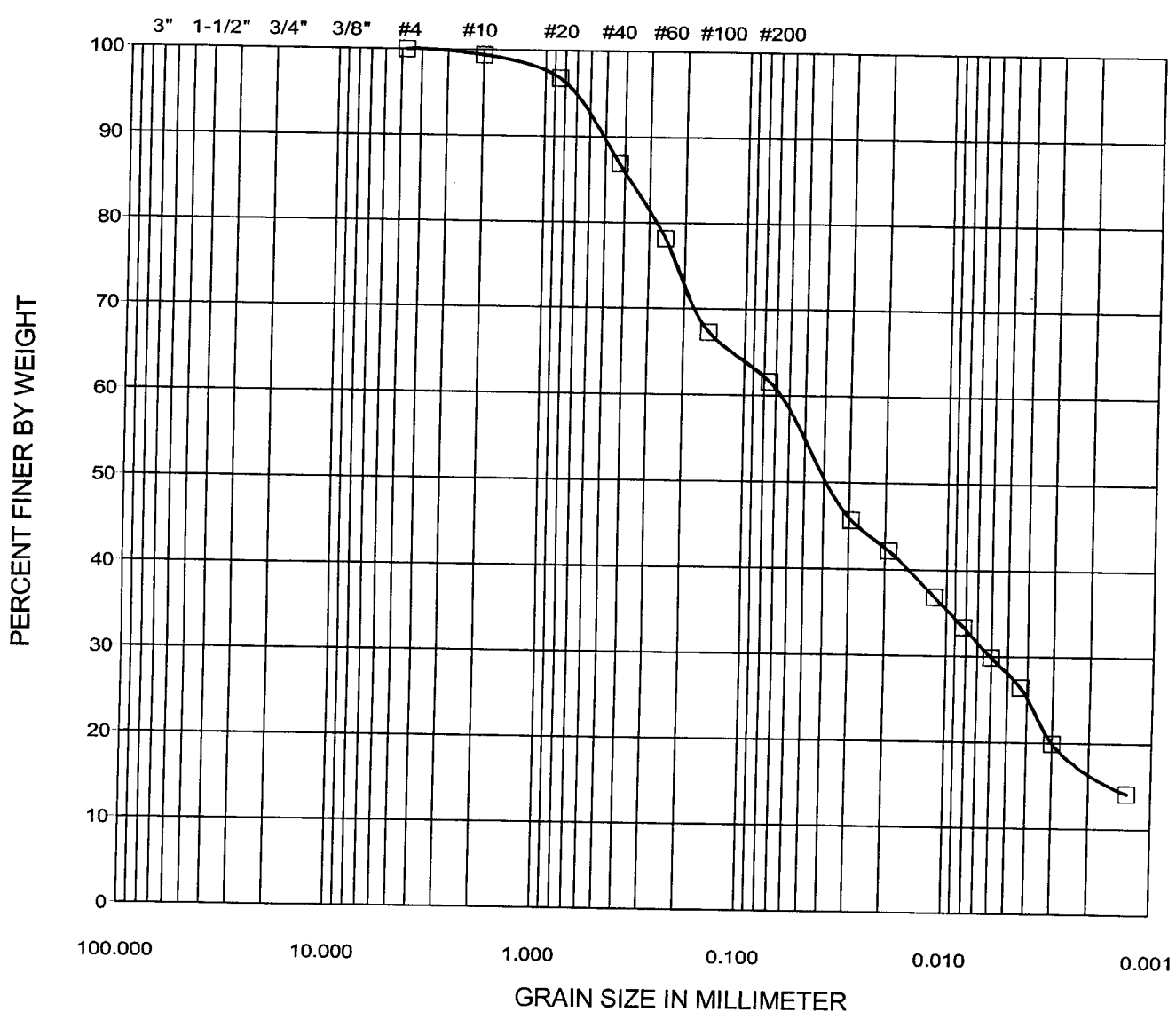
GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	B-6	45.0	BAG	ML	N/A	N/A

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GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

4/05

FIGURE

APPENDIX C

RESULTS OF LIQUEFACTION ANALYSIS

Quartech Consultants, Inc.

Liquefaction Study

Magnitude of Earthquake M = 7.0

Design Ground Acceleration a = 0.37 g

Depth of Design Ground Water GW = 17.0 feet

Average Unit Weight of Soil r = 110.0 lbs

Bore Hole No. B-1

Base Depth (ft)	SPT Depth (ft)	Unit WT. (pcf)	Total Stress (tsf)	Effect. Stress (tsf)	Fine (%)	N	N'	Dr %	Stress Ratio Calcl's	Induced Stress Ratio	FS
17.0	15.0	110.0	0.83	0.83	4.0	28	30.4	93.2	-	0.233	-
22.0	20.0	110.0	1.10	1.01	11.0	20	21.7	71.3	0.238	0.252	1.13
27.0	25.0	110.0	1.38	1.13	32.0	29	37.0	80.8	*	0.277	>2.0
32.0	30.0	110.0	1.65	1.24	4.0	32	28.8	80.2	0.402	0.294	1.49
37.0	35.0	110.0	1.93	1.36	18.0	31	31.6	74.8	*	0.302	>2.0
42.0	40.0	110.0	2.20	1.48	18.0	34	33.0	74.5	*	0.304	>2.0
47.0	45.0	110.0	2.48	1.60	18.0	37	34.2	74.0	*	0.299	>2.0
50.0	50.0	110.0	2.75	1.72	58.0	21	24.0	53.2	----	----	----

Notes: - Soil Above Ground Water
---- Clayey or Silty Soil not susceptible to liquefaction
* Corrected SPT N60 > 30 and Not Susceptible to liquefaction

Relative Density was calculated in according to Meyerhof (1957)

Reference: Liquefaction Resistance of Soils: Summary Report from 1996 NNCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, by T.L. Loud, I.M. Idriss and others, ASCE Journal of Geotechnical and Geoenvironmental Engineering October, 2001, Vol.127, No. 10

LIQUEFACTION INDUCED SETTLEMENT

References:

1. "Evaluation of Settlement in Sands Due to Earthquake Shaking", Seed, et. al., ASCE Journal of Geotechnical Engineering, Page 861 – 878, Vol. 113, No. 8, August 1987

2. "Manual for Evaluation and Mitigation of Liquefaction Hazard for Foundation Design", Workshop on Seismic Hazards Mapping Act, Los Angeles, January 1998

Recommended Fine Correction (Ref 2)

Percent of Fine	N_{corr}(Blow/ft)
10	1
25	2
50	4
75	5

From Liquefaction Study: **B-1**

Soil Layer with FS < 1.25

From Reference 1: Earthquake Magnitude Correction
$r_m = 0.65/(0.1(M-1)) = 0.65/(0.1(7.0-1)) = 1.08$

Layer	Depth (feet)	τ/δ	Percent of Fine	(N1)60	N_{corr}	$(N1)_{60,\,corr}$	Volumetric Strain ε	Settlement (inch)
1	17-22	0.25	11	22	0	22	1.0%	0.60

Total Settlement: 0.60 inch

Differential Settlement
65% x total settlement = 0.65 x 0.60 = 0.39 Inch

Quartech Consultants, Inc.

Liquefaction Study

Magnitude of Earthquake M = 7.0

Design Ground Acceleration a = 0.37 g

Depth of Design Ground Water GW = 17.0 feet

Average Unit Weight of Soil r = 110.0 lbs

Bore Hole No. B-6

Base Depth (ft)	SPT Depth (ft)	Unit WT. (pcf)	Total Stress (tsf)	Effect. Stress (tsf)	Fine (%)	N	N'	Dr %	Stress Ratio Calcl's	Induced Stress Ratio	FS
17.0	15.0	110.0	0.83	0.83	2.0	17	18.5	72.6	-	0.233	-
22.0	20.0	110.0	1.10	1.01	9.0	32	33.0	90.2	*	0.252	>2.0
27.0	25.0	110.0	1.38	1.13	9.0	35	34.2	88.8	*	0.277	>2.0
32.0	30.0	110.0	1.65	1.24	6.0	40	36.2	89.7	*	0.294	>2.0
37.0	35.0	110.0	1.93	1.36	16.0	63	59.8	99.0	*	0.302	>2.0
42.0	40.0	110.0	2.20	1.48	59.0	17	21.7	52.6	----	----	----
47.0	45.0	110.0	2.48	1.60	62.0	12	16.3	42.1	----	----	----
50.0	50.0	110.0	2.75	1.72	59.0	23	25.8	55.7	----	----	----

Notes: - Soil Above Ground Water
---- Clayey or Silty Soil not susceptible to liquefaction
* Corrected SPT N60 > 30 and Not Susceptible to liquefaction

Relative Density was calculated in according to Meyerhof (1957)

Reference: Liquefaction Resistance of Soils: Summary Report from 1996 NNCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, by T.L. Loud, I.M. Idriss and others, ASCE Journal of Geotechnical and Geoenvironmental Engineering October, 2001, Vol.127, No. 10

PERCOLATION STUDY REPORT FOR THE SITE B-2 HOTEL PROJECT

Prepared for

City of Garden Grove
11222 Acacia Parkway
Garden Grove, CA 92842

AECOM Project No. 60658490

March 17, 2022

Prepared by

AECOM

999 Town and Country Road

Orange, California 92868-4713
Tel: 714-567-2400

AECOM

March 17, 2022

Ms. Monica L. Covarrubias
Office of Economic Development
City of Garden Grove
11222 Acacia Parkway
Garden Grove, CA 92842

Subject: **Percolation Study Report**
Site B-2 Hotel Project
City of Garden Grove, California

Ms. Covarrubias:

AECOM is pleased to present the results of our geotechnical investigation and percolation study for the Site B-2 Hotel Project (proposed project) located at the northwest corner of Harbor Boulevard and Twintree Avenue in the City of Garden Grove, CA. The main purpose of this Percolation Study Report (Report) is to provide infiltration parameters that will assist with the preparation of the Water Quality Management Plan based on State Water Resources Control Board requirements.

This work was performed in general accordance with the scope of services outlined in our proposal dated April 1, 2021. This Report presents the results of our field investigation, discusses subsurface conditions, percolation testing results, and infiltration rates for the proposed project.

Please contact the undersigned at (714) 567- 2492, if you have any questions.

Sincerely,
AECOM





Praveen K. Yerra, P.E.
Senior Geotechnical Engineer
PE 81209 Exp. 9/30/23

Paul Salter, C.E.G.
Certified Engineering Geologist
CEG 2298 Exp. 01/31/23

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APPENDICES

APPENDIX A BORING LOGS
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1.0 Introduction

1.1 Background

The City of Garden Grove is planning the development of the Site B-2 Hotel Project (proposed project) on the northwest corner of Harbor Boulevard and Twintree Avenue. Proposed amenities include a pool with a lazy river, event space, retail space, entertainment, and other supporting uses. In addition, the 3.72-acre project site will also include construction of 500 guest suites and a 5-level parking structure (four levels above grade and one level below grade) with a total of 528 parking structures.

1.2 Objective

The main purpose of this Percolation Study Report (Report) is to provide infiltration rates for Low Impact Development design and to assist with the preparation of a Water Quality Management Plan (WQMP) in compliance with State Water Resources Control Board requirements. This Report presents the results of our geotechnical investigation and percolation tests performed within the project site. The report includes sections on site geological conditions, subsurface exploration, percolation test results, and calculated design infiltration rates.

2.0 Site Location and Geologic Setting

2.1 Site Location

The City of Garden Grove (City) is located within the south-central portion of the Los Angeles Basin, on essentially flat to very gently sloping land at an elevation of approximately 115 feet MSL, approximately 1.5 miles northwest of the Santa Ana River.

The proposed project will be situated on an undeveloped 3.72-acre lot west of Harbor Boulevard and north of Twintree Avenue. See attached Site Vicinity Map (Figure 1). The location and footprint of the proposed project is shown on the attached plan, Figure 2. The existing topography within the project site is mostly level.

Land use in the area is a mix of residential/light commercial, with several existing hotels and pockets of mixed industrial facilities. Overall, the City sits between the Santa Ana River towards the southeast and the San Gabriel River to the northwest. Haster Retarding Basin and pump station, a small lake/flood control basin designed to manage 100-year flood inflows is about 2,500 ft to the southeast of the project site.

2.2 Geologic Setting

The project site is located within the Los Angeles Basin, which is located at the juncture between the Peninsular Ranges and Transverse Ranges Geomorphic Provinces. The physiographic Los Angeles basin is a lowland coastal plain about 50 miles long and 20 miles wide that slopes gently to the southwest (or seaward). It is bounded on the east and southeast by the Santa Ana Mountains and the San Joaquin Hills and on the north by the Santa Monica Mountains. Beneath the surface the Los Angeles Basin is an elongate northwest trending, sediment filled structural trough that began to take its present shape by subsidence between the right-oblique Whittier and Palos Verdes faults, and the left oblique Santa Monica fault system (Wright, 1991). The basin has been the site of subsidence and predominantly marine sedimentary deposition since Middle Miocene times (Yerkes and others, 1965). As sediments collected in the down-warped basin, areas around the margins were uplifted, exposing more material to weathering and erosional processes. From mid-Miocene time until the end of Pliocene time the basin became shallower as it filled with sediment. In upper Pleistocene to Recent (Holocene) time, floods of fine to coarse sediment debris derived from the San Gabriel, Santa Ana, and Santa Monica Mountains pushed the retreating shoreline southward and westward. Non-marine, predominantly alluvial sediments consisting of gravel, sand, silt, and clay were deposited by river floods and streams migrating back and forth across this coastal plain.

The project site, like most of California, is within a seismically active region that will be subjected to future seismic shaking during earthquakes generated by any one of several surrounding active faults. Significant larger historical earthquakes that have occurred in the general area, range from the 1933 Long Beach earthquake (Magnitude 6.4) on the Newport-Inglewood fault south of Huntington Beach through to the 1994 Northridge earthquake (Magnitude 6.7), which occurred on a previously undiscovered fault, now known as the Northridge Blind Thrust Fault. The nearest Late Quaternary-age mapped faults within the Los Angeles basin include the Peralta Hills fault (mapped about 5 miles to the northeast), the San Joaquin Hills thrust, the Newport-Inglewood-Rose Canyon fault zone, and

the Los Alamitos fault (all within about 10 miles of the site), in addition to others in the surrounding area (USGS, 2021).

Based on regional data, the first groundwater may be in the order of about 30 feet below ground level (Orange County Water District, 2015). Groundwater is an important resource within the region. From the early 20th Century increased pumping rates and surface sealing that reduced recharge resulted in a general decline of groundwater water levels in the Los Angeles Basin. This trend has been reversed in places due to improved water conservation measures, localized groundwater recharge, and injection which, in some cases, is required to limit further seawater intrusion into coastal aquifers impacted by previous over-pumping.

Federal Emergency Management Agency (FEMA) Flood Maps available online indicate the project site is an "Area with a reduced flood risk due to levee, Zone X" (FEMA, 2009).

2.3 Published Geology

The USGS published geologic map for the area (Morton and Millar, 2006) indicates the project site is underlain by Holocene- and Late Pleistocene-age young alluvial-fan deposits which are described as typically unconsolidated to moderately consolidated silt, sand, pebbly cobbly sand and boulder alluvial fan deposits.

Current California Geological Survey (CGS) mapping does not identify the project site as having an active fault on, or being within an Earthquake Zone of Required Investigation, per the Alquist-Priolo Earthquake Fault Zone Act (1972) (CGS, 2021). However, CGS Hazard Zone mapping does identify liquefaction as a seismic hazard across the project site.

3.0 Geotechnical Investigations

3.1 Previous Geotechnical Investigations

Cal Land Engineering Inc. performed a subsurface investigation at and near the project site in 2005 (Cal Land, 2005). This investigation consisted of 7 HSA borings (B-1 through B-7) drilled to maximum depth of 51.5 ft below ground surface. Soils encountered in the upper 10ft below ground surface were typically silty sand, and below this depth were typically poorly graded sand, poorly graded sand with silt, and silty sand. One hole (B-1) reported clayey silt at depths greater than 45 feet below ground surface, and another hole (B-7, located outside the project area) reported clayey silt at depths greater than 35 feet below ground surface. Groundwater was not encountered in any of the borings.

GEOCON West Inc. performed a geotechnical investigation in 2018 for proposed development on B-2 site (GEOCON, 2018). The subsurface investigation consisted of 3 Hollow Stem Auger (HSA) borings advanced to 40.5 to 75.5 feet below ground surface. Soils encountered where alluvium consisting of poorly graded sand, well graded sand, silty sand, and sandy silt. Artificial fill was also encountered in the top 1 to 2 feet, with fill soils consisting of dry, loose to medium dense fine sand with silt. Groundwater was encountered at 62.5 feet below ground surface in Boring 1, the deepest of the 3 borings, located in the center of the vacant lot (groundwater was not encountered in the other 2 borings advanced to about 40 feet below ground surface).

3.2 2021 Subsurface Exploration

AECOM's subsurface exploration within the project site involved drilling five borings to a depth of 20 to 25 feet below the existing ground surface. The borings were drilled using a truck-mounted CME-85 drill rig, equipped with 8-inch diameter hollow-stem-auger drilling equipment, by our subcontractor, Yellow Jacket Drilling of Rancho Cucamonga. Earth materials encountered within the exploratory borings were classified and logged in accordance with the visual-manual procedures of the Unified Soil Classification System. Approximate locations of the borings are shown on Figure 3 and descriptive logs are presented in Appendix A of this Report.

Soil samples were recovered approximately at 5 feet vertical intervals with a SPT Soil Sampler. Soil samples were driven with successive 30-inch drops of a 140-pound automatic hammer. Furthermore, bulk samples were taken from the upper 5 feet of each boring. Samples were placed in sealed containers and transported to our laboratory.

Following drilling and sampling, a 2-inch diameter slotted PVC well casing was installed to a depth of approximately 20 feet below the existing ground surface, in Borings B-1, B-4, and B-5, and 25 feet below ground surface, in borings B-2 and B-3, for percolation testing. Percolation test results are presented in Appendix B.

3.3 Subsurface Conditions

The project site is underlain by alluvial deposits, with minor amounts of fill in the upper few feet. The fill soils in the upper approximately 3 feet consist of silty sand or sandy silt. Below this fill, alluvial soils to a depth of approximately 10 feet below ground surface consist predominantly of loose, fine- to medium-grained silty sand (SM). From about 10 to 25 feet below ground surface, soils encountered were generally medium dense, fine- to medium-grained, poorly graded clean sand (SP), with only trace to few fines present. At depths of about 20 to 25 feet below ground surface, silty sand (SM) was encountered in several borings. In AECOM boring B-5, a layer of sandy silt (ML) was encountered at about 20 feet below ground surface with a relatively low SPT blow count of 7 blows/ft.

3.4 Groundwater

Groundwater was not encountered in any of the borings drilled in the area of the proposed hotel during AECOM's current investigation, to a maximum depth of 25 feet below ground surface, or in previous borings drilled (by others) on and around the site to a maximum depth of 51.5 ft below ground surface in 2008 (Cal Land 2005). Groundwater was encountered at 62.5 feet below ground surface in a previous boring drilled in the vicinity of this site during the July 2018 exploration performed by GEOCON (GEOCON, 2018).

Historically highest groundwater in the area is reported to be about 30 feet below ground surface (OCWD 2015), although localized fluctuations are possible. Groundwater levels at the project site are also likely to be influenced by seasonal fluctuations. It should be noted that groundwater depth varies depending on local environmental factors, and our borings were advanced towards the end of the dry season in a multi-year drought and may not be representative of the range of groundwater depths. Additionally, perched water or seepage may be encountered at shallower depths depending on local environmental factors or seasonal variations.

3.5 Review of USDA Soil Survey Data

Data from United States Department of Agriculture (USDA) soil survey maps and survey tables for the site were reviewed. The data for the subject site references Map Unit for Orange County, CA. Within the database, the soil data pertaining to infiltration/ percolation rates are available for surficial soils extending to a depth of approximately 5 feet. Based on available data, site soils have Hydrological Groups A and B, soils (in the upper 5 feet) are anticipated to have a moderate to high infiltration rate when thoroughly wet.

A summary of USDA soil survey data in presented in Table 1.

Table 1. Summary of USDA Soil Survey Data

Soil Property	Value/ Description	
	Hydrological Group A Soil	**Hydrological Group B Soil**
USDA Texture	Fine Sandy Loam/ Stratified sand to Silt loam	Loamy Sand/ Stratified sand to fine sandy loam
United Soil Classification	SM	SM
Saturated Hydraulic Conductivity	3.96 in./hr.	1.27 in./hr.
Rapid infiltration disposal of wastewater	Somewhat Limited	Very Limited

3.6 Percolation Testing

Field percolation tests were conducted in Borings B-1 through B-5 to evaluate in-situ permeability characteristics. The deep percolation testing method was performed following guidelines set forth by the "OC Infiltration Rate Evaluation Protocol" within the Technical Guidance Document for Water Quality Management Plans (Orange County Technical Guidance Document, 2013).

Prior to performing the percolation tests, all borings were pre-soaked by filling the borings with clean water. Following an approximately 2-hour pre-soak for sandy soils, the test borings were refilled with water to a depth of about 3 feet below the existing ground surface. A water hose connected to CME-85 Drill Rig was utilized to provide a continuous supply of water. From a fixed reference point, the drop in the water level was then measured at approximately 10-minute intervals.

For testing performed in all borings, the drop in the water level exceeded 6" for two consecutive measurements within a 25-minute period. Therefore, this test was continued over a period of 1-hour with water level readings taken at 10-minute intervals in accordance with technical guidance documents.

In boring B-5 (20-feet depth), the drop in the water level was significant during the initial 25-minute test intervals, with water levels dropping 30 inches in 2 minutes. Due to rapid percolation in this borehole and a limited water supply, recharging the hole and retesting was not practical. So, while the apparent percolation was the highest observed during initial testing, it exceeded the capacity of available water for following the required test method and the percolation rate is likely to be higher than the largest measured test hole rate.

A summary of the results of percolation tests is presented in the Table 2.

Table 2 – Summary of Infiltration Test Results

Boring Number	Total Depth (ft.)	Time Interval Between Readings (minutes)	Measured Percolation Rate (minute per inch)	Estimated Infiltration Rate (inch per hour)
B-1	20	10	0.28	2.02
B-2	25	10	2.78	0.19
B-3	25	10	2.08	0.26
B-4	20	10	0.18	5.31
B-5	20	10	See Note 1	See Note 1

Note 1: Rapid drop in water level in this boring prevented completion of percolation test per Orange County percolation test guidelines. Infiltration rate was not calculated.

4.0 Infiltration Rate Recommendations

Based on the results of AECOM's percolation testing in 4 borings, infiltration rates ranging between 0.2 to rates exceeding 5.3 inch/hour were estimated. A fifth boring drained too quickly to allow completion of testing but is expected to have an infiltration rate near or greater than the highest infiltration rate measured in the other borings at this site. Based on the percolation test results and the type of soils encountered in the test holes, infiltration rates in the order of 2.0 to 5.3 inch/hour are judged to be representative for the site. The test results from borings B-2 and B-3 that indicate low infiltration rates (<0.3 inch per hour), in our opinion, do not reflect the rates representative of the material encountered through the borings performed at the project site and were discarded.

Overall, the infiltration rates obtained, despite ranging over at least one order of magnitude, indicate the project site soils have adequate infiltration capacity to support the proposed low impact development and are considered suitable for infiltration through Best Management Practices.

The design infiltration rate and performance of the infiltration system depends on various factors such as the frequency at which the water will be discharged into the system, rate of inflow, duration of each discharge, degree of maintenance of the system e.g. maintaining the base of the proposed system, removal of sediments and/or blockage in the infiltration pad on a regular basis to allow free drainage, etc. The proposed low impact development system should be designed accounting for all the aforementioned factors.

5.0 Limitations

AECOM has observed only a small portion of the pertinent subsurface conditions. Conclusions and recommendations made herein are based on the assumption that the soil and geologic conditions do not deviate appreciably from those found during our subsurface investigation. In the event that the locations, configurations, layout, loadings, or features of the proposed structures are modified, the recommendations presented in this report may not be applicable. It is the responsibility of the Owner to bring any such changes to the proposed structures as well as any differences between the subsurface conditions described in this report and the subsurface conditions encountered during construction to the attention of the Geotechnical Engineer. In this way, supplemental recommendations, if required, can be made without delay to the project.

Geotechnical engineering and the geologic sciences are characterized by uncertainty. Professional judgments presented herein are based on an evaluation of the technical information gathered, our understanding of the proposed construction, and on our general experience in the practice of geotechnical engineering. Our engineering work and judgments rendered meet current professional standards at this time; we do not guarantee the performance of the project in any respect.
Our recommendations for this project may not be used for other projects.

Any person using this report for bidding or construction purposes should perform such independent investigations as they deem necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

6.0 References

Cal Land 2005, Geotechnical Report for Hotel Development Garden Grove, CA, Cal Land Engineering Inc. dba Quartech Consultants, dated 14 June, 2005.

FEMA 2009, Federal Emergency Management Agency Flood Map, Effective 3 December 2009, https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-117.9393349363999,33.78205217574049,-117.89779288317617,33.799885049229495

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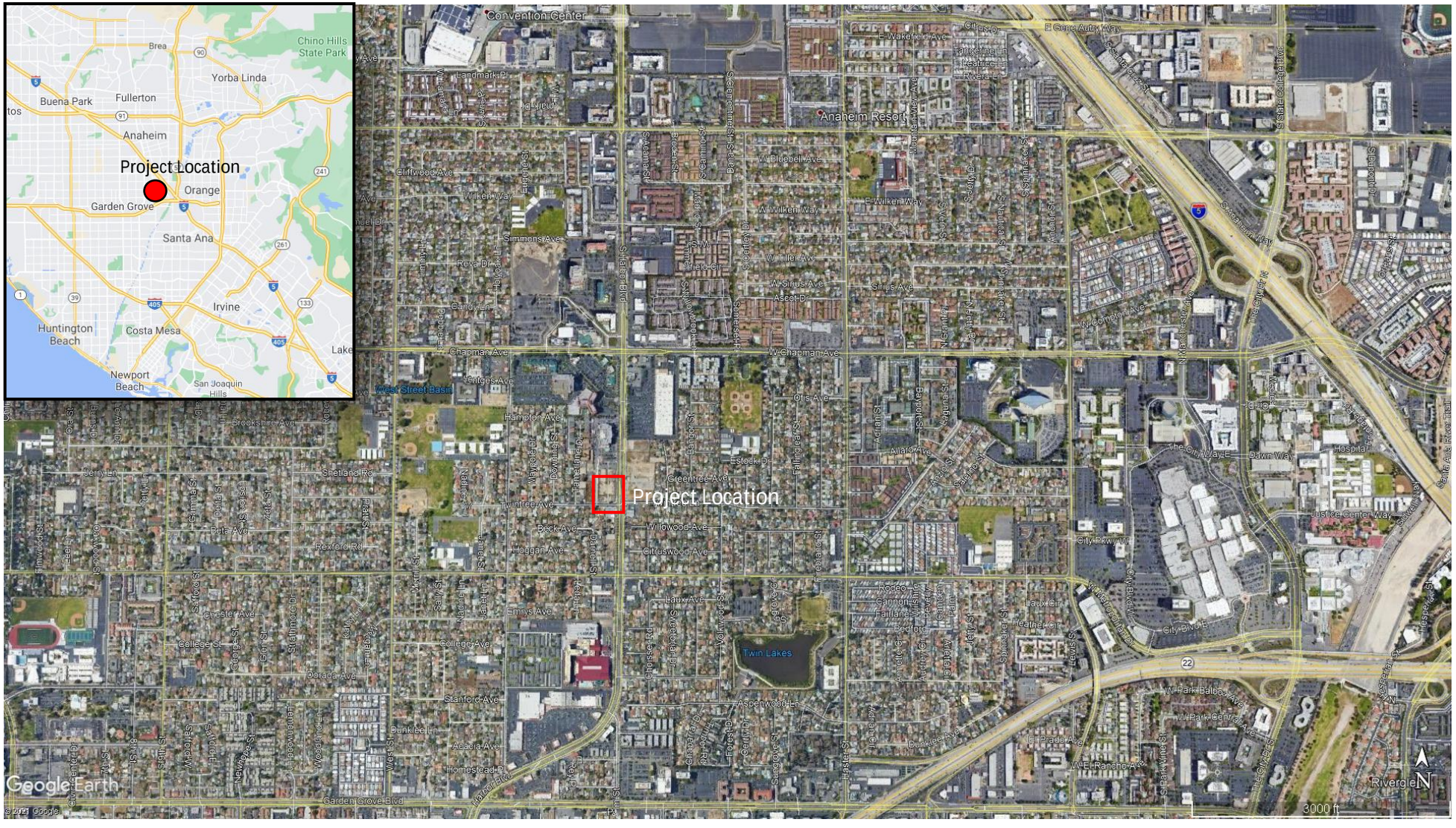
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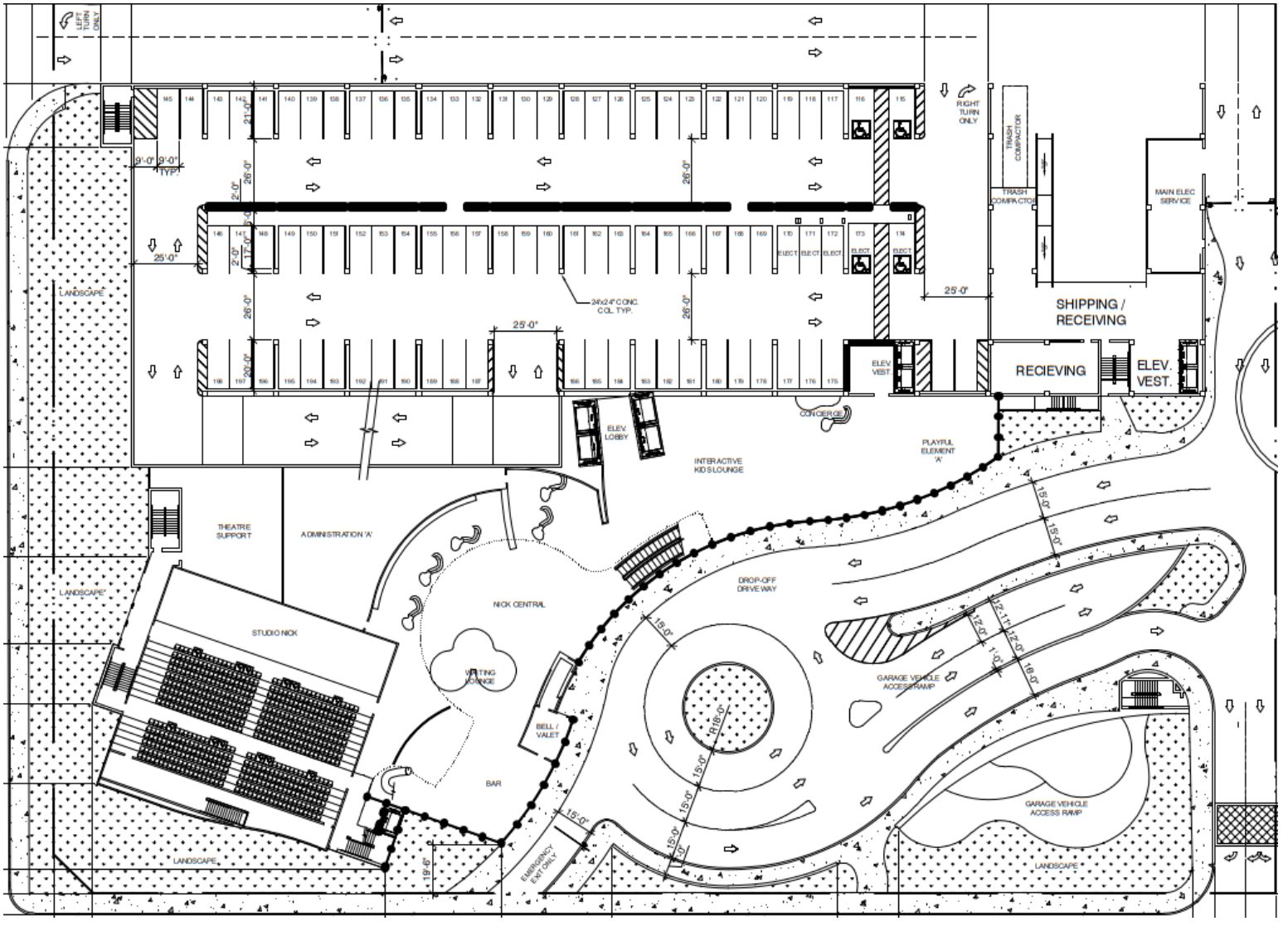
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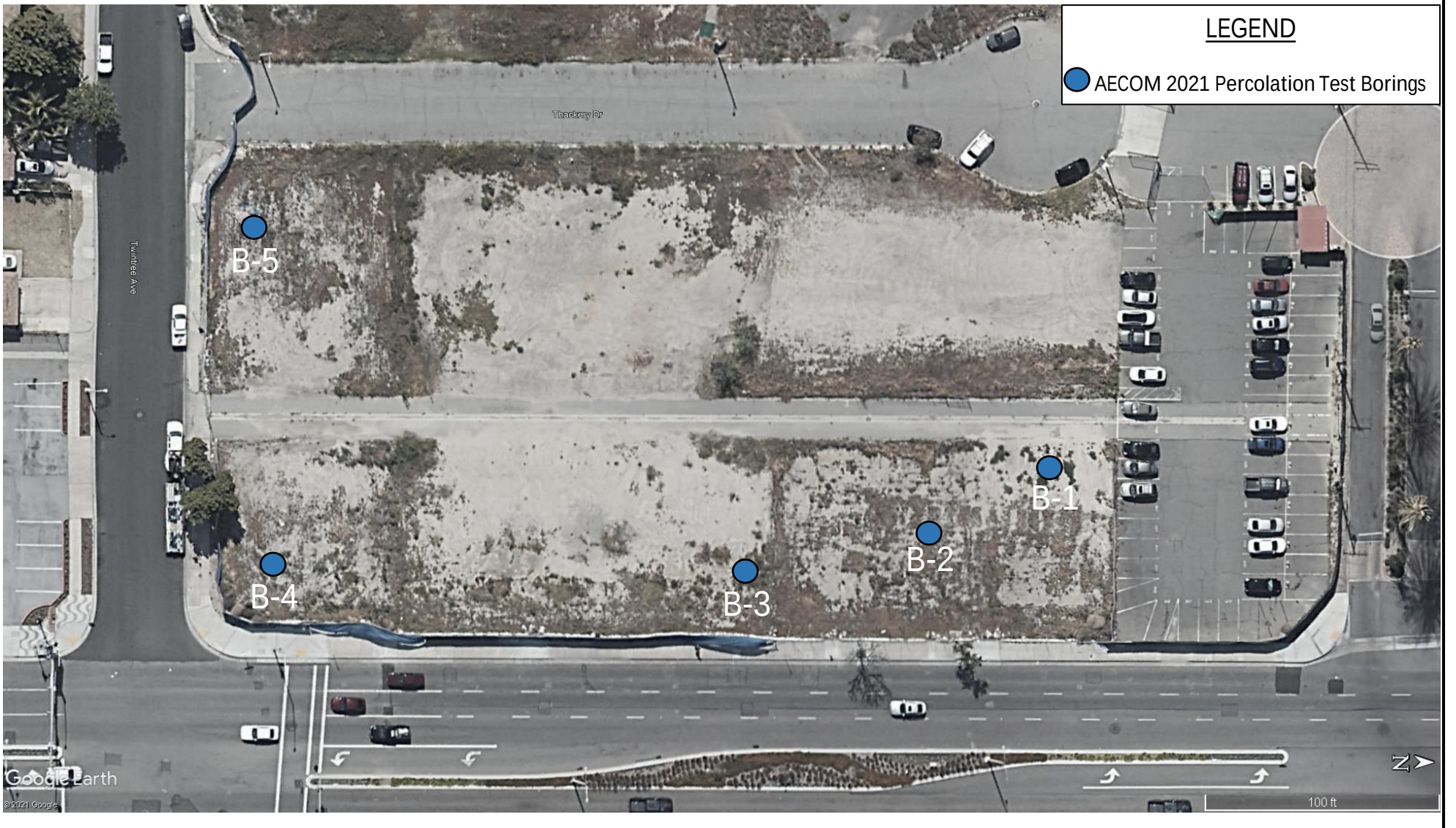
Figures



AECOM	Site B-2 Hotel Project Percolation Testing	Vicinity Map	Figure 1
City of Garden Grove	Project No: 60658490	Date: March 2022	



AECOM	Site B-2 Hotel Project Percolation Testing		Hotel Site Plan
City of Garden Grove	Project No: 60658490	Date: March 2022	Figure 2



AECOM	Site B-2 Hotel Project Percolation Testing		Boring Plan	Figure 3
City of Garden Grove	Project No: 60658490	Date: March 2022		

Appendix A Boring Logs

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Key to Logs

Sheet 1

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES:	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number. Unnumbered sample indicates no sample recovery.

5 **Blows per foot:** Number of blows required to advance driven sampler 12 inches beyond first 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop.

6 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

7 **Material Description:** Description of material encountered; may include relative density/consistency, moisture, color, particle size; texture, weathering, and strength of formation material.

8 **Water Content:** Water content of soil sample measured in laboratory, expressed as percentage of dry weight of specimen.

9 **Dry Unit Weight:** Dry density of soil sample measured in laboratory, in pounds per cubic foot.

10 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel.

WC	Water content
UW	Unit weight
PI	Plasticity Index
LL	Liquid Limit
SA	Sieve Analysis
WA	% Fines (#200 wash)
DS	Direct Shear
Consol.	Consolidation
Comp.	Compaction

TYPICAL MATERIAL GRAPHIC SYMBOLS

Sandy Silt

Silty SAND (SM)

Clayey SAND (SC)

Poorly graded SAND (SP)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Standard Penetration samper

Bulk Sample

OTHER GRAPHIC SYMBOLS

First water encountered at time of drilling and sampling (ATD)

Water level measured at specified time after completion of drilling and sampling

Minor change in material properties within a stratum

Inferred or gradational contact between strata

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.

2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Log of Boring B-1

Sheet 1 of 1

Date(s) Drilled	**6/7/2021**	Logged By	**N. Rueda**	Checked By	**P. Salter**
Drilling Method	**HSA**	Drill Bit Size/Type	**8-inch**	Total Depth of Borehole	**20.0 feet**
Drill Rig Type	**CME-85**	Drilling Contractor	**Yellow Jacket Drilling**	Approximate Surface Elevation	**~ 115 feet**
Water Level Depth	**not encountered**	Sampling Method(s)	**SPT / Bulk**	Hammer Data	**Automatic (140 lbs./30 in.)**
Borehole Completion	**Tamped Cuttings**	Location	**Northwest corner of lot**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Silty SAND (SM), Brown, Moist, Some fines.			
			B-1			**ALLUVIUM** Silty SAND (SM), Brown , Moist, Loose, Little fines.			
	5		S-1	8					
	10		S-2	20		SAND (SP), Grey, Moist, Medium Dense, Trace fines.			
	15		S-3	19		← Few fines.			
						Silty SAND (SM), Brown, Moist, Medium Dense, Some fines			
	20		S-4	10		Bottom of boring at 20 feet below ground surface			
	25								
	30								

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Log of Boring B-2

Sheet 1 of 1

Date(s) Drilled	**6/7/2021**	Logged By	**N. Rueda**	Checked By	**P. Salter**
Drilling Method	**HSA**	Drill Bit Size/Type	**8-inch**	Total Depth of Borehole	**25.0 feet**
Drill Rig Type	**CME-85**	Drilling Contractor	**Yellow Jacket Drilling**	Approximate Surface Elevation	**~ 115 feet**
Water Level Depth	**not encountered**	Sampling Method(s)	**SPT / Bulk**	Hammer Data	**Automatic (140 lbs./30 in.)**
Borehole Completion	**Tamped Cuttings**	Location	**Center of lot east of access road**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Silty SAND (SM), Brown, Moist, Some fines.			
			B-1			**ALLUVIUM** Silty SAND (SM), Brown , Moist, Loose, Little fines.			
	5		S-1	8					
	10		S-2	12		SAND (SP), Grey, Moist, Medium Dense, Little fines.			
	15		S-3	17		Trace fines.			
	20		S-4	21		No fines.			
						Silty SAND (SM), Brown greyish , Moist, Medium Dense, Some fines.			
	25		S-5	23		Bottom of boring at 25 feet below ground surface			
	30								

Report: GEO_10_SNA; File: GG LOGS_031521.GPJ; 6/29/2021 B-2

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Log of Boring B-3

Sheet 1 of 1

Date(s) Drilled	**6/7/2021**	Logged By	**N. Rueda**	Checked By	**P. Salter**
Drilling Method	**HSA**	Drill Bit Size/Type	**8-inch**	Total Depth of Borehole	**25.0 feet**
Drill Rig Type	**CME-85**	Drilling Contractor	**Yellow Jacket Drilling**	Approximate Surface Elevation	**~ 115 feet**
Water Level Depth	**not encountered**	Sampling Method(s)	**SPT / Bulk**	Hammer Data	**Automatic (140 lbs./30 in.)**
Borehole Completion	**Tamped Cuttings**	Location	**Center of lot adjacent to Harbor Blvd.**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Silty SAND (SM), Brown, Moist, Some fines.			
			B-1			**ALLUVIUM** Silty SAND (SM), Brown, Moist, Loose, Little fines.			
	5		S-1	6					
	10		S-2	13		SAND (SP), Yellow, Moist, Medium Dense, Few fines.			
	15		S-3	14		← Changes Color to white, Few fines.			
	20		S-4	18		← Trace fines.			
	25		S-5	12		Silty SAND (SM), White , Moist, Medium Dense, Some fines. Bottom of boring at 25 feet below ground surface			
	30								

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Log of Boring B-4

Sheet 1 of 1

Date(s) Drilled	**6/7/2021**	Logged By	**N. Rueda**	Checked By	**P. Salter**
Drilling Method	**HSA**	Drill Bit Size/Type	**8-inch**	Total Depth of Borehole	**20.0 feet**
Drill Rig Type	**CME-85**	Drilling Contractor	**Yellow Jacket Drilling**	Approximate Surface Elevation	**~ 115 feet**
Water Level Depth	**not encountered**	Sampling Method(s)	**SPT / Bulk**	Hammer Data	**Automatic (140 lbs./30 in.)**
Borehole Completion	**Tamped Cuttings**	Location	**Southeast corner of lot**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Sandy SILT(ML), Brown, Moist, Some Sand.			
			B-1			**ALLUVIUM** Silty SAND (SM), Brown , Moist, Loose, Some fines.			
	5		S-1	5					
	10		S-2	24		SAND (SP), Yellow, Moist, Medium Dense, Few fines.			
	15		S-3	19		← Trace fines.			
						← Little fines.			
	20		S-4	13		Bottom of boring at 20 feet below ground surface			
	25								
	30								

Project: Site B-2 Hotel Project Percolation Testing
Project Location: Garden Grove, California
Project Number: 60658490

Log of Boring B-5

Sheet 1 of 1

Date(s) Drilled	**6/7/2021**	Logged By	**N. Rueda**	Checked By	**P. Salter**
Drilling Method	**HSA**	Drill Bit Size/Type	**8-inch**	Total Depth of Borehole	**20.0 feet**
Drill Rig Type	**CME-85**	Drilling Contractor	**Yellow Jacket Drilling**	Approximate Surface Elevation	**~ 115 feet**
Water Level Depth	**not encountered**	Sampling Method(s)	**SPT / Bulk**	Hammer Data	**Automatic (140 lbs./30 in.)**
Borehole Completion	**Tamped Cuttings**	Location	**Southwest corner of lot**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Dry Density, pcf	Dry Density, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Sandy SILT(ML), Brown, Moist, Some Sand.			
			B-1			**ALLUVIUM** Sandy SILT (ML), Brown , Moist, Loose, Some Sand.			
	5		S-1	6					
	10		S-2	12		SAND (SP), Yellow, Moist, Medium Dense, Few fines.			
	15		S-3	18		Some fines.			
						Sandy SILT (ML), Brown , Moist, Loose, Some Sand.			
	20		S-4	7		Bottom of boring at 20 feet below ground surface			
	25								
	30								

Report: GEO_10_SNA; File: GG LOGS_031521.GPJ; 6/29/2021 B-5

Appendix B Percolation Testing

AECOM

Boring/Excavation Percolation Testing Field Log

Date 6/8/2021

Project Location	Garden Grove	**Boring/Test Number**	B1		
Earth Description	SW/SP to SM	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	Nicolas Rueda	**Depth of Boring (ft)**	20		
Liquid Description	Water	**Depth to Invert of BMP (in)**	0		
Measurement Method	Water Level Meter	**Depth to Initial Water Depth (in) (d_1)**	48		
		Depth to Water Table	N\A		
Time Interval Standard					
Pre-Soak Period	9:10:00 AM - 11:10 AM	**Water Remaining In Boring (Y/N)**	N		
Standard Period	2 Hr	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Depth to Water: Initial / Final (in.)	Water Drop During Standard Time Interval Δd (in)	Percolation Rate for Reading (min/in)	Infiltration Rate (in/hr)	Soil Description/Notes/Comments
Trial 1	11:15 AM	4	48.0	18.0	0.22	9.15	Greater than 6 in. Sandy Soil Criteria
	11:19 AM		66.0				
Trial 2	11:19 AM	6	66.0	22.8	0.26	5.74	Greater than 6 in. Sandy Soil Criteria
	11:25 AM		88.8				
1	11:25 AM	10	88.0	111.4	0.09	9.18	
	11:35 AM		199.4				
2	11:35 AM	10	199.4	16.0	0.63	0.91	
	11:45 AM		215.4				
3	11:45 AM	10	215.4	15.6	0.64	0.83	
	11:55 AM		231.0				
4	12:00 PM	10	111.6	68.9	0.15	5.58	
	12:10 PM		180.5				
5	12:10 PM	10	180.5	12.2	0.82	0.78	
	12:20 PM		192.7				
6	12:20 PM	10	192.7	35.9	0.28	2.02	
	12:30 PM		228.6				

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)
r = Radius of boring (in.)
H_{avg} = Average head height over the time interval (in.)
ΔH = Change in height over the time interval (in.)
Δt = time interval (min.)

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2 \; H_{avg})}$$

Tested Infiltration Rate = 2.02 in/hr

AECOM

Boring/Excavation Percolation Testing Field Log

Date 6/8/2021

Project Location	Garden Grove	**Boring/Test Number**	B2		
Earth Description	SW/SP to SM	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	Nicolas Rueda	**Depth of Boring (ft)**	25		
Liquid Description	Water	**Depth to Invert of BMP (in)**	0		
Measurement Method	Water Level Meter	**Depth to Initial Water Depth (in) (d_1)**	48		
		Depth to Water Table	N\A		
Time Interval Standard					
Pre-Soak Period	7:30:00 AM - 9:30 AM	**Water Remaining In Boring (Y/N)**	N		
Standard Period	2 Hr	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Depth to Water: Initial / Final (in.)	Water Drop During Standard Time Interval Δd (in)	Percolation Rate for Reading (min/in)	Infiltration Rate (in/hr)	Soil Description/Notes/Comments
Trial 1	9:50 AM	6	48.0	30.0	0.20	9.23	Greater than 6 in. Sandy Soil Criteria
	9:56 AM		78.0				
Trial 2	9:56 AM	9	78.0	36.0	0.25	4.90	Greater than 6 in. Sandy Soil Criteria
	10:05 AM		114.0				
1	10:05 AM	10	114.0	69.5	0.14	5.53	
	10:15 AM		183.5				
2	10:15 AM	10	183.5	27.0	0.37	1.63	
	10:25 AM		210.5				
3	10:25 AM	10	210.5	4.9	2.03	0.27	
	10:35 AM		215.4				
4	10:35 AM	10	215.4	7.2	1.39	0.39	
	10:45 AM		222.6				
5	10:45 AM	10	222.6	6.0	1.67	0.32	
	10:55 AM		228.6				
6	10:55 AM	10	228.6	3.6	2.78	0.19	
	11:05 AM		232.2				

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)
r = Radius of boring (in.)
H_{avg} = Average head height over the time interval (in.)
ΔH = Change in height over the time interval (in.)
Δt = time interval (min.)

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2 \; H_{avg})}$$

Tested Infiltration Rate = 0.19 in/hr

AECOM

Boring/Excavation Percolation Testing Field Log

Date 6/8/2021

Project Location	Garden Grove	**Boring/Test Number**	B3		
Earth Description	SW/SP to SM	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	Vladimir Bautista	**Depth of Boring (ft)**	25		
Liquid Description	Water	**Depth to Invert of BMP (in)**	0		
Measurement Method	Water Level Meter	**Depth to Initial Water Depth (in) (d_1)**	84		
		Depth to Water Table	N\A		
Time Interval Standard					
Pre-Soak Period	11:00:00 AM - 1:00 PM	**Water Remaining In Boring (Y/N)**	N		
Standard Period	2 Hr	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Depth to Water: Initial / Final (in.)	Water Drop During Standard Time Interval Δd (in)	Percolation Rate for Reading (min/in)	Infiltration Rate (in/hr)	Soil Description/Notes/Comments
Trial 1	1:14 PM	2	84.0	6.0	0.33	4.04	Greater than 6 in. Sandy Soil Criteria
	1:16 PM		90.0				
Trial 2	1:16 PM	2	90.0	6.0	0.33	3.79	Greater than 6 in. Sandy Soil Criteria
	1:18 PM		96.0				
1	1:19 PM	10	120.0	39.6	0.25	3.35	
	1:29 PM		159.6				
2	1:30 PM	10	162.0	18.0	0.56	1.25	
	1:40 PM		180.0				
3	1:43 PM	10	182.4	12.0	0.83	0.76	
	1:53 PM		194.4				
4	1:54 PM	10	195.6	8.4	1.19	0.50	
	2:04 AM		204.0				
5	2:07 PM	10	205.2	6.6	1.52	0.38	
	2:17 PM		211.8				
6	2:21 PM	10	213.6	4.8	2.08	0.26	
	2:31 PM		218.4				

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)
r = Radius of boring (in.)
H_{avg} = Average head height over the time interval (in.)
ΔH = Change in height over the time interval (in.)
Δt = time interval (min.)

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2 \; H_{avg})}$$

Tested Infiltration Rate = 0.26 in/hr

AECOM

Boring/Excavation Percolation Testing Field Log

Date 6/8/2021

Project Location	Garden Grove	**Boring/Test Number**	B4		
Earth Description	SW/SP to SM	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	Nicolas Rueda	**Depth of Boring (ft)**	20		
Liquid Description	Water	**Depth to Invert of BMP (in)**	0		
Measurement Method	Water Level Meter	**Depth to Initial Water Depth (in) (d_1)**	48		
		Depth to Water Table	N\A		
Time Interval Standard					
Pre-Soak Period	2:00:00 PM - 4:00 PM	**Water Remaining In Boring (Y/N)**	N		
Standard Period	2 Hr	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Depth to Water: Initial / Final (in.)	Water Drop During Standard Time Interval Δd (in)	Percolation Rate for Reading (min/in)	Infiltration Rate (in/hr)	Soil Description/Notes/Comments
Trial 1	7:50 AM	5	48.0	12.0	0.42	5.14	Greater than 6 in. Sandy Soil Criteria
	7:55 AM		60.0				
Trial 2	7:55 AM	5	60.0	8.6	0.58	3.13	Greater than 6 in. Sandy Soil Criteria
	8:00 AM		68.6				
1	8:00 AM	10	68.6	92.8	0.11	9.51	
	8:10 AM		161.4				
2	8:10 AM	10	161.4	24.0	0.42	1.64	
	8:20 AM		185.4				
3	8:20 AM	10	185.4	14.4	0.69	0.89	
	8:30 AM		199.8				
4	8:30 AM	10	199.8	12.7	0.79	0.73	
	8:40 AM		212.5				
5	8:40 AM	10	212.5	15.2	0.66	0.82	
	8:50 AM		227.8				
6	9:10 AM	10	97.8	56.6	0.18	5.31	
	9:20 AM		154.4				

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)
r = Radius of boring (in.)
H_{avg} = Average head height over the time interval (in.)
ΔH = Change in height over the time interval (in.)
Δt = time interval (min.)

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2 \; H_{avg})}$$

Tested Infiltration Rate = 5.31 in/hr

AECOM

Boring/Excavation Percolation Testing Field Log

Date 6/8/2021

Project Location	Garden Grove	**Boring/Test Number**	B5		
Earth Description	SW/SP to SM	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	Nicolas Rueda	**Depth of Boring (ft)**	20		
Liquid Description	Water	**Depth to Invert of BMP (in)**	0		
Measurement Method	Water Level Meter	**Depth to Initial Water Depth (in) (d_1)**	48		
		Depth to Water Table	N\A		
Time Interval Standard					
Pre-Soak Period	11:30:00 AM - 1:30 PM	**Water Remaining In Boring (Y/N)**	N		
Standard Period	2 Hr	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Depth to Water: Initial / Final (in.)	Water Drop During Standard Time Interval Δd (in)	Percolation Rate for Reading (min/in)	Infiltration Rate (in/hr)	Soil Description/Notes/Comments
Trial 1	2:30 PM	2	48.0	30.0	0.07	27.69	Greater than 6 in. Sandy Soil Criteria
	2:35 PM		78.0				
Trial 2	2:35 PM	5	78.0	30.0	0.17	7.58	Greater than 6 in. Sandy Soil Criteria
	2:40 PM		108.0				
1	2:40 PM	10	108.0	105.6	0.09	7.78	
	2:50 PM		213.6				
2	3:00 PM	10	66.0	146.4	0.07	12.44	
	3:10 PM		212.4				
3	3:15 AM	10	50.4	148.8	0.07	14.08	
	3:25 AM		199.2				
4							
5							
6							

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)
r = Radius of boring (in.)
H_{avg} = Average head height over the time interval (in.)
ΔH = Change in height over the time interval (in.)
Δt = time interval (min.)

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2 \; H_{avg})}$$

Tested Infiltration Rate =

Appendix G
Water Supply Assessment

SITE B-2 HOTEL

WATER SUPPLY ASSESSMENT

March 2022

Prepared for:

AECOM

and

CITY OF GARDEN GROVE



Prepared by:

PSOMAS

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Project No. 2AEC012100

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ABBREVIATIONS/ACRONYMS

AB	Assembly Bill
ADU	Accessory Dwelling Unit
AF	Acre-feet
AFY	Acre-feet per year
AWWA	American Waterworks Association
BEA	Basin Equity Assessment
BPP	Basin Production Percentage
CDR	Center for Demographic Research, California State University Fullerton
cfs	Cubic feet per second
CII	Commercial, Industrial and Institutional
CRA	Colorado River Aqueduct
CVP	Central Valley Project
DDW	California State Department of Drinking Water
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ESA	Endangered Species Act
FY	Fiscal Year
GAP	Green Acres Project
GMP	Groundwater Management Plan
gpcd	Gallons per capita per day
gpd	Gallons per day
Gpm	Gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWRS	Groundwater Replenishment System
HGL	Hydraulic grade line
IID	Imperial Irrigation District
IRP	Integrated Resources Planning
ksf	Thousand square feet
LACDPW	Los Angeles County Department of Public Works
M&I	Municipal and Industrial
MAF	Million acre-feet
Metropolitan, MWD	Metropolitan Water District of Southern California
MF	Microfiltration
MGD	Million gallons per day
MWDOC	Municipal Water District of Orange County
OC San	Orange County Sanitation District
OCWD	Orange County Water District
PFAS	Per- and polyfluoroalkyl substances

PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfanate
RA	Replenishment Assessment
RO	Reverse Osmosis
SAR	Santa Ana River
SARCCUP	Santa Ana River Conservation and Conjunctive Use Program
SB	Senate Bill
SCWD	South Coast Water District
SDCWA	San Diego County Water Authority
sf	Square feet
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
SWRCB	State Water Resources Control Board
UV	Ultraviolet
UWMP	Urban Water Management Plan
WRD	Water Replenishment District
WSA	Water Supply Assessment
WSDM	Water Surplus and Drought Management

EXECUTIVE SUMMARY

This Water Supply Assessment (WSA) has been prepared for the City of Garden Grove Site B-2 Hotel Project (the "Proposed Project") in accordance with applicable sections of the Public Resources Code and California Water Code as referenced in Senate Bill 610. The Proposed Project includes a 500 guest suites hotel with ancillary restaurant, retail and meeting space uses on approximately 3.72 acres located in an urbanized area in the City of Garden Grove (City), Orange County. The project site is entirely surrounded by development, which consists of commercial, residential, and retail uses.

The purpose of this WSA is to provide information to verify that there is sufficient water supply to the City to provide for the Proposed Project now and into the future. This WSA evaluates whether the City can supply the water demands from the development of the Proposed Project as well as the remainder of the demands within its water service area after the Project is completed and 20 years into the future.

Water Demand

In 2019/20, the City's water demand was 21,979 acre-feet (AF), as reported in the City's 2020 Urban Water Management Plan (UWMP), which was approved by the City Council on June 22, 2021. This total includes non-revenue water or water losses. In response to drought orders and water conservation, water use within the City's service area has decreased from a five-year average of 25,163 AF (FY 2010/11 to 2014/15) to the last five-year average of 22,272 AF (FY 2015/16 to 2019/20). During the last five-year period water use ranged from 21,491 to 23,372 acre-feet per year (AFY).

In FY 2019/20, approximately 64.8% of the City's water supply went to supply residential (single and multi-family combined). Commercial, industrial and institutional (CII) accounted for 14.4%, 4.2% and 5.9% of total water supply, respectively. Large landscape (irrigation) accounted for about 3%, while non-revenue water constituted about 7.4% of total water production or supply.

At the end of the 20-year planning period for this WSA, as required by SB 610, City water use for 2045 is projected to be approximately 22,792 AFY. This projection in future use for the City's water service area is assumed to include the supply needed for the Proposed Project.

The total water demand for the Proposed Project is 93.5 AFY for the proposed hotel and ancillary uses on the project site, without water losses or non-revenue water, and is projected to require a total supply of 99.4 AFY, allowing for non-revenue water at 5.95 percent of total production, consistent with the City's most recently adopted UWMP. Non-revenue water occurs due to meter inaccuracies, fire suppression, fire flow testing, hydrant and pipe flushing, pipeline breaks, etc. The Project's water demand as projected in this WSA was accounted for in the demand projections of the City's 2020 UWMP.

Supply Projections

The City's sources of supply consist of groundwater and imported surface water. In the recent past the City has received, on average, about 70 percent of its water supply from its groundwater wells that access the Orange County Groundwater Basin and 30 percent from imported water from the Metropolitan Water District of Southern California (Metropolitan). In FY 2020, the City received approximately 50 percent groundwater and 50 percent imported water, due to numerous groundwater wells that were out of service due to water quality issues that will be discussed further in this WSA. By 2025 and going forward, future projections include ramping up to 85 percent groundwater and using only 15 percent imported water.

Analysis of water supply projections for the City demonstrates that projected supplies will meet demand through FY 2045. These projections consider water development programs and projects as well as water conservation, as described in the City's 2020 UWMP and Section 5 of this WSA. The City's groundwater and imported water supplies are anticipated to remain stable based on studies and reports from the Orange County Water District (OCWD) and Metropolitan, respectively. Statewide water planning is also considering current dry conditions and Bay Delta pumping scenarios, which are also discussed in Section 5.

Based on the expected long-term average Basin Production Percentage (BPP), the City's water supply projection assumes that up to 85 percent will be groundwater, and the remaining 15 percent will be imported during normal, single-dry, and multiple dry years, consistent with OCWD conservative planning estimates. Both the imported water and groundwater sources have been confirmed as reliable by Metropolitan and OCWD, respectively. Additionally, analyses of normal, single-dry, and multiple-dry year scenarios also demonstrate the City's ability to meet demand during the 20-year analysis period.

Moreover, should extraordinary circumstances require it, the City can meet its water demand by (1) increasing production of groundwater beyond the BPP up to the basin safe yield, (2) increasing imported water purchases from available storage programs, and/or (3) decreasing demand through water conservation measures. The later method has been proven effective in reducing citywide demands well below 10 percent as demonstrated by the previous Water Allocation Plan enacted by Metropolitan during previously declared drought conditions and passed through to the City by the Municipal Water District of Orange County (MWDOC), the City's imported water wholesaler and Metropolitan member agency.

Reliability of future water supplies to the region will be ensured through continued implementation of the OCWD Groundwater Management Plan, OCWD's Long Term Facilities Plan, local agency programs, and the combined efforts and programs among member agencies of Metropolitan and cooperative agencies. These agencies include all water wholesalers and retailers, the Orange County Sanitation District, the Santa Ana Regional Water Quality Control Board, and the Santa Ana Watershed Project Authority.

Conclusion

The information included in this water supply assessment identifies a sufficient and reliable water supply for the City, now and into the future, including a sufficient water supply for the Proposed Project in normal, single-dry, and multiple dry years during a 20-year projection. These supplies are also sufficient to provide for overall City-wide growth at the rate projected in the City's 2020 UWMP. (Water Code § 10910(c)(4).)

Existing infrastructure is adequate to provide the estimated water demand to the Project. However, private on-site service laterals, fire lines and hydrants would be needed to provide potable and firefighting capability to all structures located on the parcel.

1.0 INTRODUCTION

1.1 Site B-2 Hotel – General Description/Location

The Site B-2 Hotel (Proposed Project or Project) is a proposed 500-guest suites, high-rise resort hotel with ancillary restaurant, retail and meeting space uses interior to the hotel to be constructed on an approximately 3.72-acre site on the northwest corner of Harbor Boulevard and Twintree Avenue. The Proposed Project will serve as a resort hotel serving visitors to Orange County and southern California and include a themed pool experience with lazy river, event space, commercial and amenity space. The event space will include a 600-person maximum occupancy "Nick Studio", one grand ballroom, two meeting rooms, and a variety of food and beverage opportunities. Themed amenities are a major component to the program including the Nick Arcade and the Project intends to provide a four-star guest level of service with a spa and fitness center. The Project also includes a five-level, 528-space parking garage to serve the 500 suites, event space, commercial and retail uses, food and beverage needs, as well as hotel amenities and spa services.

The Project site currently includes nineteen assessor parcels owned by the City of Garden Grove (City) located on the northwest corner of Harbor Boulevard and Twintree Avenue between Chapman Avenue and Lampson Avenue. Regional access to the Project site is via Harbor Boulevard from State Route 22 approximately 1.1 miles to the south and from Interstate 5 approximately 2 miles to the north. The Project site is approximately 1.1 miles south of the Disneyland Resort and is surrounded by existing development, which consists of commercial, residential, and retail uses.

1.2 Purpose of this Water Supply Assessment (WSA)

The purpose of this WSA is to provide information to ascertain if there is sufficient water supply available to the City to provide for the Proposed Project now and in the future. This WSA evaluates the additional water demands that will need to be served by the City as a result of the Project. This additional demand is then added to the other projected demands on the City over the next 20 years and compared to available supplies.

2.0 LEGISLATION

Senate Bill (SB) 610 requires the preparation of a water supply assessment for a proposed hotel with more than 500 rooms. Because of the size of the Proposed Project, SB 610 requires that a WSA be completed to evaluate the potential effects of the proposed development on current and future water supplies. Prior to recordation of a final tract or parcel map, a Water Supply Verification in accordance with SB 221 may also be required. The following outlines the requirements of SB 610.

2.1 SB 610 – Costa – Water Supply Planning

SB 610 was adopted into law on October 9, 2001. It mandates that a city or county approving certain projects subject to the California Environmental Quality Act (i) identify any public water system that may supply water for the project, and (ii) request the public water system to prepare a specified water supply assessment. The assessment is to include the following:

1. A discussion of whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing.
2. The identification of existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project and water received in prior years pursuant to those entitlements, rights, and contracts.
3. A description of the quantities of water received in prior years by the public water system under the existing water supply entitlements, water rights, or water service contracts.
4. A demonstration of water supply entitlements, water rights, or water service contracts by the following means:
    a. Written contracts or other proof of entitlement to an identified water supply.
    b. Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.
    c. Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.
    d. Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

5. The identification of other public water systems or water service contract holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system.
6. If groundwater is included for the supply for a proposed project, the following additional information is required:
    a. Review of any information contained in the Urban Water Management Plan (UWMP) relevant to the identified water supply for the proposed project.
    b. Description of any groundwater basin(s) from which the proposed project will be supplied. Adjudicated basins must have a copy of the court order or decree adopted and a description of the amount of groundwater the public water system has the legal right to pump. For non-adjudicated basins, information on whether the DWR has identified the basin as over-drafted or has projected that the basin will become over-drafted if present management conditions continue, in the most current bulletin of DWR that characterizes the condition of the basin, and a detailed description of the efforts being undertaken in the basin to eliminate the long-term overdraft condition.
    c. Description and analysis of the amount and location of groundwater pumped by the public water system for the past five years from any groundwater basin which the proposed project will be supplied. Analysis should be based on information that is reasonably available, including, but not limited to, historic use records.
    d. Description and analysis of the amount and location of groundwater projected to be pumped by the public water system from any groundwater basin by which the proposed project will be supplied. Analysis should be based on information that is reasonably available, including, but not limited to, historic use records.
    e. Analysis of the sufficiency of the groundwater from the basin(s) from which the proposed project will be supplied.

The WSA shall be included in any environmental documentation prepared for the project. The WSA may include an evaluation of any information included in that environmental documentation. A determination shall be made whether the projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and planned future uses.

Additionally, SB 610 requires new information to be included as part of an UWMP if groundwater is identified as a source of water available to the supplier. Information must include a description of all water supply projects and programs that may be undertaken to meet total projected water use. SB 610 prohibits eligibility for funds from specified bond acts until the plan is submitted to the State.

3.0 THE SITE B-2 HOTEL

3.1 Proposed Project Description

The project site is located in an urbanized area in the City of Garden Grove, Orange County. *Figure 3.1* shows the Proposed Project's regional location, with the conceptual site plan shown on *Figure 3.2*. The Proposed Project includes a 500-guest suites hotel; 22,296 sf of restaurant/food and beverage; 8,225 sf of meeting/conference rooms; a 9,490 sf Ballroom; a Nick Studio and Studio Hall entertainment venues; a pool/lazy river with pool deck and a full-service spa. All of the ancillary uses above, with the exception of half of the restaurant/food and beverage (11,148 sf) and the meeting and ballroom uses would be for hotel guests only. The Proposed Project would also house a five-level parking structure with 528 spaces.

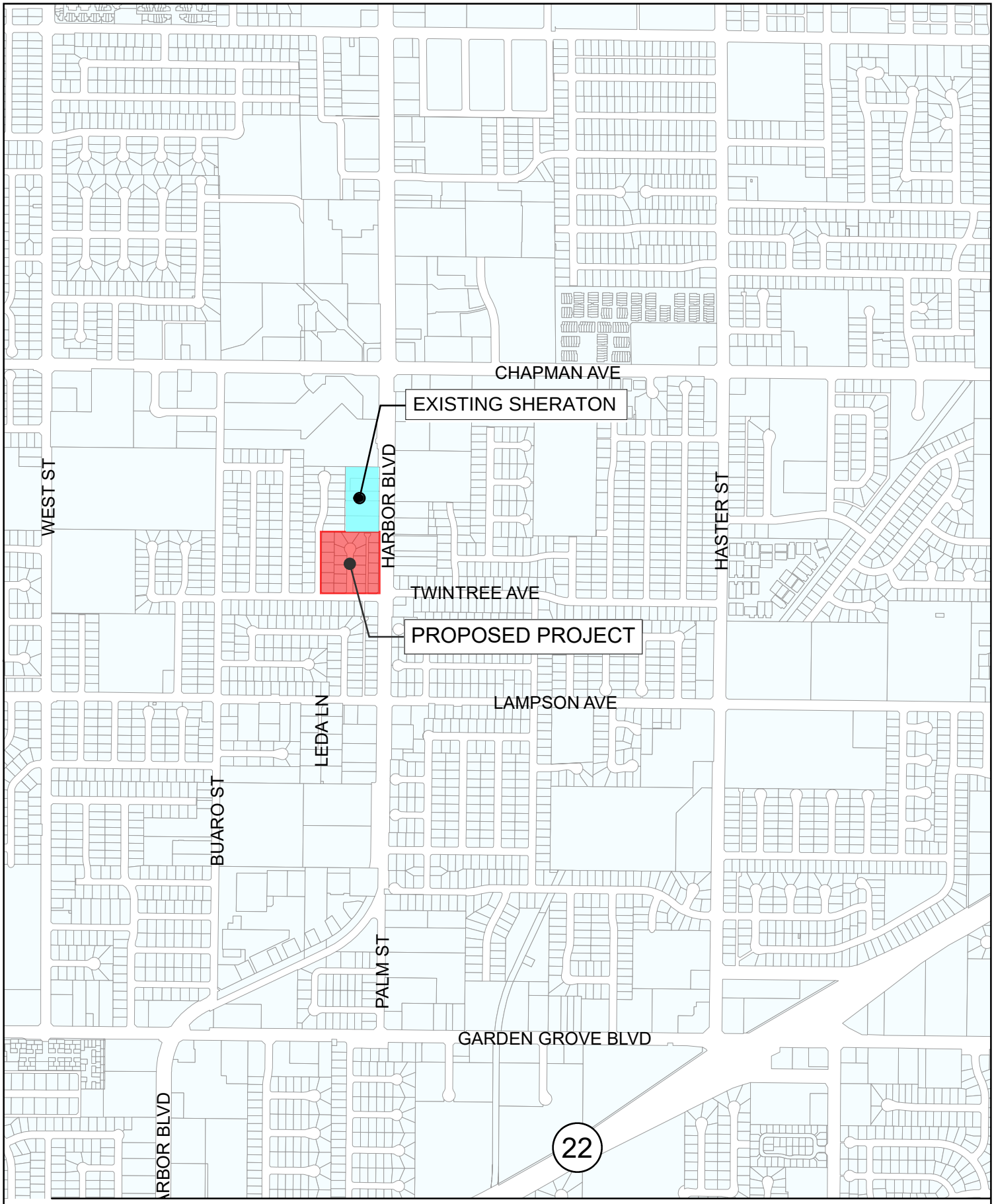
As mentioned previously, the Project site consists of nineteen existing assessor parcels, all currently under ownership of the City, as well as the right-of-way for a short existing street, Thackery Drive. The Project site sits immediately south of the existing Sheraton Hotel and fronts on Harbor Boulevard to the east and Twintree Avenue to the south. Access to the Project site will come from a shared access off Harbor Boulevard on the south end of the existing Sheraton Hotel site and from Twintree Avenue.

The Proposed Project anticipates groundbreaking in November 2022 with a construction schedule of approximately 30 months. As a result, opening would be in Summer 2025 and all proposed water demands on-site are assumed to be realized by that time. The first full year of demands would thus occur in FY 2025/26.

3.2 Proposed Project Water Demands

The Proposed Project's water demand estimate is detailed in Table 3.1. When the total demand for all the uses (except for the non-revenue water) of 83,455 gallons per day (gpd) is divided by the total room count of 500, a unit demand of 167 gpd per room is generated.

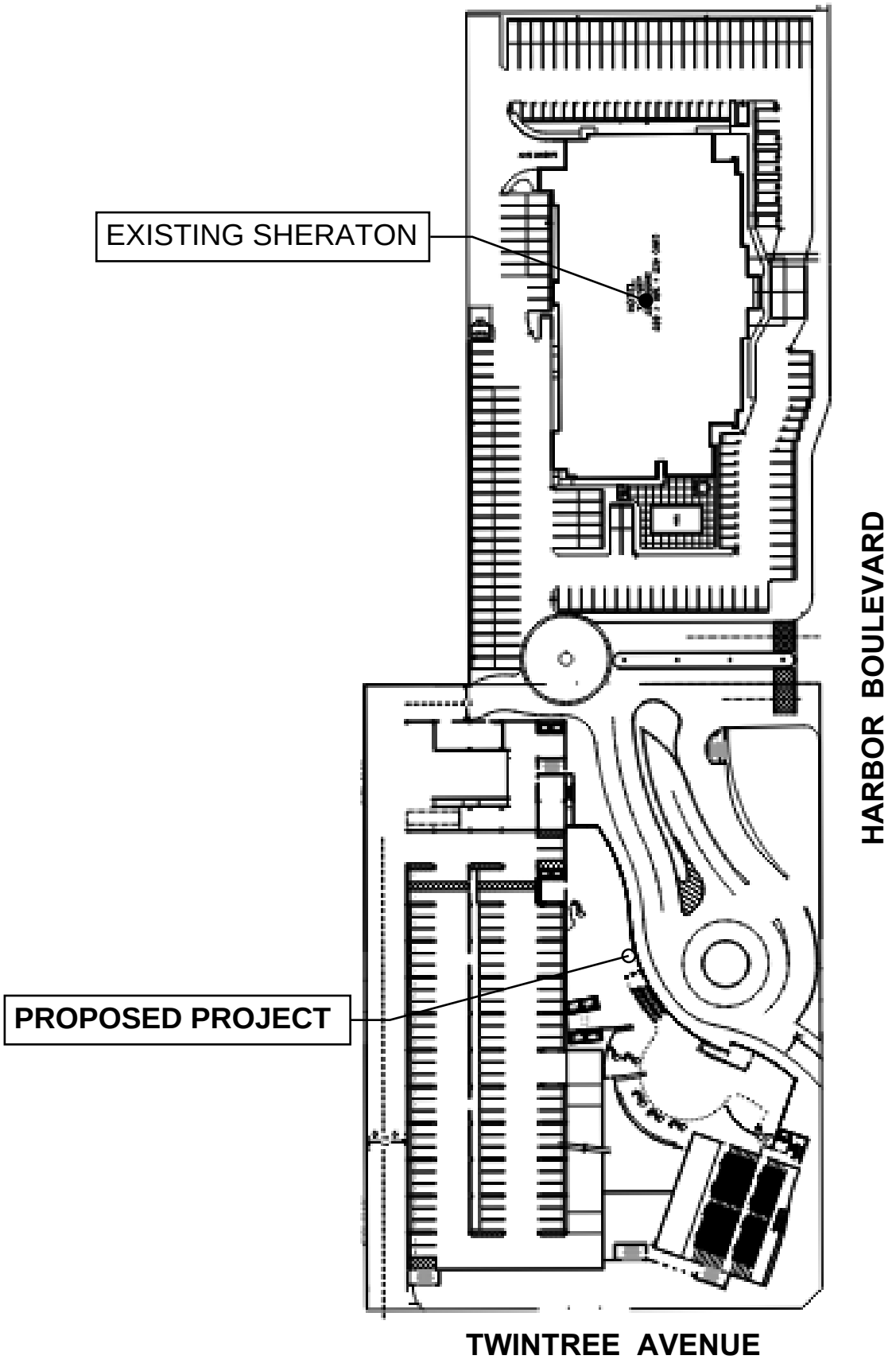
In order to test the reasonableness of this demand estimate, water use data was gathered from three hotels in Anaheim from meter reads that were averaged over a five-year period totaling 2,350 rooms. These hotels averaged 167 gallons per day per room with one hotel having a significant amount of conference room and banquet space. This particular hotel had an 11% higher demand per room than the next highest hotel with more nominal ancillary uses so it is logical to assume the more typical hotels would average about 10% less or 150 gallons per room per day. Due to the potential additional demand from the entertainment venues of the Proposed Project, this demand estimate seems reasonable.



PSOMAS

GARDEN GROVE

CITY OF GARDEN GROVE
SITE B-2 HOTEL WSA
REGIONAL LOCATION
FIGURE 3.1



PSOMAS

GARDEN GROVE

CITY OF GARDEN GROVE
SITE B-2 HOTEL WSA
SITE PLAN
FIGURE 3.2

Table 3.1
Proposed Water Demand and Supply Requirement

	Rooms	Area (sf)	Demand Factor[1]	Units	Demand (gpd)	Demand (AFY)
Hotel Rooms	500		125	gpd/room	62,500	70.0
Restaurants/Food & Beverage[2]		22,296	800	gpd/ksf	8,918	10.0
Spa/Fitness		8,532	-	-	0	0.0
Ballroom		9,490	350	gpd/ksf	3,322	3.7
Meeting Rooms		8,225	350	gpd/ksf	2,879	3.2
Nick Studio		7,039	-	-	0	0.0
Studio Hall		6,448	-	-	0	0.0
Nick Arcade		7,000	-	-	0	0.0
Subtotal Buildings	500				77,619	86.9
Pools + Lazy River[3]		24,980	0.25	inches/day	3,872	4.3
Landscaping[4]		51,711			1,964	2.2
Subtotal Pool & Landscaping					5,836	6.5
Subtotal Water Demands					83,455	93.5
Non-Revenue Water (5.95%)[5]					5,274	5.9
Total Proposed Project Supply Requirement					**88,729**	**99.4**

1) Average demand factor estimates in gallons per day (gpd) per room for hotel rooms, gpd per thousand square feet (ksf) for food and beverage and Ballroom and Meeting Rooms. All other hotel services and amenities listed with zero demand are planned to be 100% guest occupancy and included in demand factor per room.

2) Restaurants/Food & Beverage square footage is half dedicated to guests and half to non-guests, so demand factor is multiplied times half of total (11,148 sf).

3) Pool demand based on losses of 0.25 inches/day including evaporative losses, bather splash, filter backwashing and general maintenance.

4) Landscaping irrigation demand conservatively based on Maximum Applied Water Allowance (MAWA) for non-residential land use (0.45 times evapotranspiration adjustment factor (ETAF). Once detailed landscaping plans are prepared, detailed Plant Factors (PF) and Irrigation Efficiencies (IE) will be used to calculate Estimated Applied Water Use (EAWU), which by ordinance is required to be less than the MAWA.

5) Non-Revenue allowance to account for water losses at 1.0632 times water sales to arrive at approximate 5.95% non-revenue water per *2020 City of Garden Grove UWMP*, June 2021, Arcadis.

The assumption has been made that the demands for the Proposed Project were included in the City's 2020 UWMP approved by the Garden Grove City Council in June 2021. This assumption is based on the fact that the demand increase due to the Proposed Project is 93.5 AFY (without an allowance for non-revenue water) and the incremental increase in Commercial demand (without non-revenue water) between 2020 and 2030 from the 2020 UWMP is 501 AFY. Therefore, this Commercial demand increase included in the 2020 UWMP (where hotels are included) would

accommodate the proposed increase due to the Proposed Project, which would come on-line in the sixth year of this ten-year period. Additionally, active and passive conservation is proposed to continue so that existing Commercial demands should decrease which would accommodate an additional incremental increase for new development.[1] Finally, the Harbor Corridor is specifically mentioned in the 2020 UWMP in Section 3.5.2-Projected Land Uses, as hotels planned to accommodate tourists; and being one of the three categories for future development within the water service area along with other Focus Areas and Accessory Dwelling Units (ADUs).

Existing infrastructure is adequate to provide the estimated water demand to the Project, However, an internal (on-site) fire water system will be constructed to provide adequate firefighting capability to all locations on the parcel, along with potable and irrigation water service laterals, meters and backflow devices.

[1] Difference between 2030 and 2020 Commercial water demand projections from 2020 UWMP is 501 AFY, obtained from subtracting 3,170 AFY from Table 4-1 of 2020 UWMP (2020 actual Commercial water use) from 3,671 AFY from Table 4-2 (projected 2030 Commercial water demand), and if continued conservation reduces existing (2020) water use, this 501 AFY difference would increase.

4.0 CITY OF GARDEN GROVE WATER SUPPLY AND DEMAND

4.1 Overview of Supply and Demand

The City currently obtains water from the following primary water sources: (1) naturally and artificially recharged local groundwater from the Orange County Groundwater Basin (Basin), and (2) imported water from Metropolitan supplied by the City's Metropolitan member agency, Municipal Water District of Orange County (MWDOC). In addition, the City of Garden Grove Water Services Division maintains eight emergency interconnections with adjacent water retailers that can be temporarily utilized on an as-needed basis.

The Basin is managed by the OCWD. Current and planned improvements, as discussed in Section 6 of the City's 2020 UWMP, will increase the efficient and reliable use of both water sources. Each of the sources of water for the City are briefly discussed in this section and more fully discussed in the subsequent sections of this Water Supply Assessment.

Water use within the City's service area has been relatively stable in the past decade at an annual average of 23,717 AF with a slight downward trend in the second half of the decade. In FY 2020, the City's water use was 21,979 AF (groundwater and imported). There is currently no recycled water use within the City's service area. However, all of the wastewater generated within the service area is collected by the City, discharged to Orange County Sanitation District (OC San) interceptor sewers, then treated by OC San and OCWD's joint Groundwater Replenishment System (GWRS) project for beneficial use in the Green Acres Project, for injection in seawater barriers or indirect potable reuse by recharging the Basin.

In FY 2020 the City's water use profile was comprised of 64.8 percent residential use, 24.5 percent CII, 2.9 percent large landscape/irrigation, with non-revenue water comprising the remaining 7.7 percent. The City's service area is almost completely built out and is projected to increase about 2.8 percent over the next five years. In the longer term, water demand is projected to increase only 0.9 percent from 2025 through 2045. The low projected increase is primarily due to assumed continued water conservation savings. The projected water use for 2045 is 22,792 AF. The passive savings are anticipated to continue for the next 25 years and are considered in the water use projections.

4.1.1 Population Growth

According to the Center for Demographic Research (CDR), California State University Fullerton, the City's service area had a 2020 population of 176,635, a slight increase from the 2015 population of 176,467. Overall, the population is estimated to increase by a growth rate of 4.8 percent over the 25-year period from 2020 to 2045. The projected growth is slightly higher in the first ten years until 2030 and then tapers off. Most growth is projected to be from densification of existing communities and new, multi-storied multi-family residential units. Based on CDR projections, only 274 new single family residential units are projected within the water service area between 2020 and 2045 versus 1,971 new multi-family units over that same timeframe. Table

4.1 shows the population projections in five-year increments out to 2045 within the City's water service area.

Table 4.1
Water Service Area Population – Current and Projected

Year	2020	2025	2030	2035	2040	2045
City of Garden Grove	176,635	181,717	184,520	185,516	185,599	185,120

4.1.2 Water Demand

Population increases alone are not necessarily a good representation of increasing water demand. Non-residential growth adds water demand without increasing population. Also, future water conservation can reduce per capita demand factors and, in turn, demand. From 2010 to 2020, population increased modestly by 1,017 for a 0.6% increase but water production decreased substantially, by over 3,840 AFY (almost a 15% decrease). Some of this was due to water conservation efforts of the City (park irrigation reductions) and its residents initiated due to MWDOC's and Metropolitan's water allocation program, which was in effect starting in 2014 for about a year and a half and triggered long-term water conservation among the City's customers.

Water demand projections from the recently adopted City of Garden Grove 2020 UWMP are presented in Table 4.2. This table shows the 2020 (existing/actual) demand and projections broken down by sector. The demand projections are from a joint study conducted by CDM Smith for MWDOC and OCWD. The methodology is described in detail in Section 4.3.1 of the City's 2020 UWMP but in short it uses the population projections shown in Table 4.1 and declining per capita usage based on continued water conservation plus a 0.5 percent annual increase in CII demands.

Table 4.2 Water Demand Projections, including Project (AFY)

	2020 (Actual)	2025	2030	2035	2040	2045
Single Family	9,936	10,149	9,952	9,767	9,575	9,585
Multi-Family	4,305	4,774	4,719	4,674	4,578	4,613
CII	5,461	5,638	6,238	6,395	6,555	6,555
Landscape	650	684	684	684	684	684
Losses (Non-Revenue)	1,627	1,343	1,365	1,360	1,352	1,355
Total Production	21,979	22,588	22,958	22,880	22,744	22,792

Notes: CII includes Commercial, Industrial, and Institutional/Government (also includes Other for 2020). Hotel uses are included in Commercial land use in UWMP or CII in this table.

2020 data from Table 4-1 of 2020 UWMP; 2025 – 2045 data from Table 4-3 of UWMP.

Table 4.2 shows historic and projected sales by sector (Single and Multi-family Residential, CII, Landscape) which corresponds to water demand or sales. Water demand is satisfied from groundwater and imported water. The variance between the Water Supply or Production and Water Sales or Demand figures is the result of system losses or non-revenue water. For 2020, non-revenue water was about 7.4 percent of total production but over the past five years it has averaged 5.95 percent, so this is what is used in future projections. This non-revenue water occurs due to meter inaccuracies, fire suppression, fire flow testing, hydrant and pipe flushing, pipeline breaks, etc. The American Waterworks Association (AWWA) states that the average non-revenue water is approximately 10 percent.

Separating the Proposed Project from the demands shown in Table 4.2 results in the breakdown by sector shown in Table 4.3. Since the Proposed Project is not scheduled for opening until summer of 2025, full demands (rounded up to 94 AFY to match the whole number presented in the UWMP) would not actually be experienced until FY 2025/26 so the Proposed Project demands are not shown separated out until the 2030 five-year period and beyond.

Table 4.3
City & Proposed Project Demand Estimates (AFY)

	2020 (Actual)	2025	2030	2035	2040	2045
Single Family	9,936	10,149	9,952	9,767	9,575	9,585
Multi-Family	4,305	4,774	4,719	4,674	4,578	4,613
CII (without Project)	5,461	5,638	6,146	6,303	6,463	6,463
Landscape (without Project)	650	684	682	682	682	682
Proposed Project (including Landscape)	0	0	94	94	94	94
Losses (Non-Revenue)	1,627	1,343	1,365	1,360	1,352	1,355
Total Production	21,979	22,588	22,958	22,880	22,744	22,792

Notes: CII includes Commercial, Industrial, and Institutional/Government (also includes Other for 2020) and separates out the 92 AFY of non-landscape demand for the Project

Landscape demand separates the 2 AFY of Project landscape demand

2020 data from Table 4-1 of 2020 UWMP; 2025 – 2045 data from Table 4-3 of UWMP

4.1.3 Demand and Supply Comparison

Table 4.4 shows the projected water demand and supply for the City for a normal year utilizing the projections above. The Proposed Project demand is shown separately (rounded up to 94 AFY to match the whole number presented in the UWMP) along with the Total City (water service area) Demand, excluding the Project. Supply projections are based on groundwater production equal to 85% of the projected water demand and imported water supplying the remaining 15% demand. These supply projections are discussed in Section 5.4 of this report and do not represent the total

supply capacity, but rather the projected supply needed to meet projected demands, as regional water suppliers to the City including Metropolitan and MWDOC show surplus water supplies will be available in their 2020 UWMPs. This is why supply matches demand in Table 4.4 – for consistency with UWMP.

Table 4.4
Projected Water Demand and Supply
City of Garden Grove, including the Proposed Project
(AFY)

Water Sources	2025	2030	2035	2040	2045
SUPPLY					
Imported	3,388	3,444	3,432	3,412	3,419
Groundwater	19,200	19,514	19,448	19,332	19,373
Total Potable Supply	**22,588**	**22,958**	**22,880**	**22,744**	**22,792**
DEMAND					
Total City Demand (excluding Project)	22,588	22,864	22,786	22,650	22,698
Proposed Project Demand	0	94	94	94	94
Total Demand	**22,588**	**22,958**	**22,880**	**22,744**	**22,792**

4.2 Groundwater

The information in this section is intended to furnish the information required by Water Code section 10910(f). Compliance with the requirements of section 10910 (f), by subsection, can be found in this and other referenced documents as follows below:

(1) Relevant information from the UWMP – Sections 4.2 and 5.2.
(2) DWR basin prioritization status – Section 4.2 (immediately below) and Section 5.2 re: basin not being overdrafted, now or in future.
(3) Table 6-4 of City of Garden Grove 2020 UWMP for amount of groundwater pumped from basin over previous five (5) years.
(4) Table 4.4, above, for amount of groundwater projected to be pumped from the basin over the next 20-plus years.
(5) Section 5.2 (specifically 5.2.2 and 5.2.3) relative to the sufficiency of the basin to supply the City with the quantities of water projected to meet their demands, including those of the Project.

The primary source of water for the City is the Basin. The unadjudicated Basin is managed by OCWD, underlies the north half of Orange County beneath broad lowlands, and is classified by DWR as a medium priority basin. A description of the Coastal Plain of the Basin or DWR's

Groundwater Basin Number 8-1, dated September 2001, states that the Basin underlies a coastal alluvial plain in the northwestern portion of Orange County. The Basin covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, the Pacific Ocean to the southwest, and terminates at the Orange County line to the northwest, where its aquifer systems continue into the Central Basin of Los Angeles County.[2]

The Basin is dominated by a deep structural depression containing a thick accumulation of fresh water-bearing imbedded marine and continental sand, silt and clay deposits. The sediments containing easily recoverable fresh water extend to approximately 2,000 feet in depth. Although water bearing aquifers exist below that level, reduced water quality and pumping make these materials economically unviable at present. Upper, middle and lower aquifer systems are recognized in the Basin with well production yields ranging from 500 to 4,500 gallons per minute, but are generally 2,000 to 3,000 gallons per minute.[3]

The aquifers comprising the Basin form a complex series of interconnected sand and gravel deposits. The Basin holds millions of acre feet of water, of which about 1.25 to 1.5 million AF is available for use.[4] To ensure that the Basin is not overdrawn, OCWD recharges the Basin with local and imported water. Groundwater conditions in the Basin are influenced by the natural hydrologic conditions. The Basin is recharged primarily by four sources: (1) local rainfall, which varies due to the extent of the annual seasonal precipitation; (2) storm and base flows from the Santa Ana River, which includes recycled wastewater from treatment plants in Riverside and San Bernardino Counties; (3) imported water; and (4) highly treated recycled wastewater. The Basin generally operates as a reservoir in which the net amount of water stored is increased in wet years to allow for manageable overdrafts in dry years. According to OCWD's Engineer's Report for fiscal year 2019/20, total groundwater production from the Basin in OCWD's jurisdiction was 286,498 AF (including in-lieu program), which was a 5.6% decrease from the previous year.

The production capability of the Basin has increased as a result of wastewater reclamation and the blending of waters of different qualities to produce high-quality potable water for public distribution.

The most recent example of a highly successful OCWD wastewater reclamation project is the construction and operation of OCWD's new water-purification plant, which is designed to turn wastewater into drinking water. The Groundwater Replenishment System (GWRS) receives secondary treated wastewater from OC San and purifies it to levels that meet and exceed all state and federal drinking water standards. For a more detailed description of the GWRS, see Section 4.5.

[2] DWR's Bulletin 118-1 Basin Description for Coastal Plain of Orange County Groundwater Basin Number 8-1. September 5, 2001.
[3] DWR's Bulletin 118-1 Basin Description for Coastal Plain of Orange County Groundwater Basin Number 8-1. September 5, 2001.
[4] DWR's Bulletin 118-1 Basin Description for Coastal Plain of Orange County Groundwater Basin Number 8-1. September 5, 2001.

As stated, the Basin is managed by the OCWD, a special district created by the State Legislature in 1933 pursuant to the OCWD Act, an un-codified statutory scheme set forth in the State's Water Code. The Basin is unadjudicated. All pumpers within the basin are permitted to pump from the Basin, but OCWD is charged with managing the groundwater basin. OCWD manages the Basin largely through the Basin Production Percentage (BPP) that it establishes each water year.

The BPP is set based on groundwater conditions, availability of imported water supplies, ideal precipitation, Santa Ana River runoff, and basin management objectives. In essence, the BPP represents a set percentage identifying the amount of groundwater all pumpers in the basin can pump without paying a high "pumping tax" or Basin Equity Assessment to OCWD (described below). Thus, for example, if OCWD establishes a BPP of 85%, all pumpers within the Basin, including the City, can supply 85% of their water needs from groundwater supplies at a cost significantly less than the cost of imported water. The BPP is a major factor for the City in determining the cost of groundwater production. Groundwater production equal to or less than the BPP pays a replenishment assessment (RA). Funds collected by OCWD through RA payments made by all producers in the basin are used to fund groundwater replenishment and recharge programs aimed at ensuring the long-term viability and stability of the Basin.

If groundwater production greater than the BPP occurs, a Basin Equity Assessment (BEA) is charged against the producer on the amount of groundwater extracted beyond the BPP. The BEA is an additional fee (i.e., a higher "pumping tax") paid on each AF of water pumped above the BPP, making the total cost of that water to Garden Grove equal to the cost of Tier 2 imported water from Metropolitan, plus well production costs.[5] Thus, the BPP creates pricing incentives to ensure that groundwater producers pump within the framework established by the BPP.

Like funds collected by OCWD through the RA, funds collected by OCWD through the BEA are also used to fund groundwater replenishment, and recharge and recycling programs aimed at ensuring the long-term viability and stability of the Basin. The programs funded by the RA and the BEA include all of the groundwater replenishment, recharge, and recycling programs discussed above.

Basin recharge occurs largely in the following recharge basins: (i) Warner Basin, a 50-foot deep recharge basin located next to the Santa Ana River (SAR) at the intersection of the 55 and 91 freeways; (ii) Burris Pit, located between Lincoln Avenue and Ball Road; (iii) Kraemer Basin, located adjacent to Burris Pit, and (iv) Santiago Creek. A large portion of the recharge of the OCWD groundwater basin comes from water flowing in the Santa Ana River (SAR) south of the Prado Dam, which is located in San Bernardino County, just east of the Orange County jurisdictional boundary. With the exception of contractual rights conveyed to Bryant Ranch landowners in east Yorba Linda which have contractual rights to approximately 2,800 AFY of SAR water, OCWD has the legal rights to all of the SAR flow south of the Prado Dam. (See OCWD v. City of Chino, et al, (Civ. Case No. 117628), Judgment and Settlement Documents.)

[5] Metropolitan charges a Tier 1 water rate to recover the cost of maintaining a reliable amount of supply and a Tier 2 rate to include the cost of developing additional supply to encourage efficient use of local resources. As an example, Metropolitan's Tier 1 rate for treated water as of January 1, 2021 is $1,104 per acre-foot and the Tier 2 rate for treated water is $1,146 per acre-foot.

As set forth in DWR Bulletin 118 and in the 2019-20 OCWD Engineer's Report, the Basin is a managed basin and not in a state of overdraft. The Basin is one of the richest and most plentiful sources of groundwater in the entire State, containing approximately 1.25 to 1.5 million AF of water available for use at the present time, and millions of acre-feet that could possibly be produced in the future.

As part of its Basin management function, OCWD operates an extensive groundwater monitoring program whereby OCWD routinely tests all groundwater production wells located within the Basin in compliance with Title 22 of the California Administrative Code. OCWD maintains a sophisticated laboratory whereby chemists test the well water for traces of pollution, hydrocarbons, pesticides, and other chemical components. OCWD's laboratories process tens of thousands of samples a year, and perform hundreds of thousands of analyses a year. As part of its monitoring and management duties, OCWD has developed and adopted a Groundwater Management Plan which is a program to increase water supplies and increase monitoring and groundwater contamination cleanup.

The City pumps groundwater for potable use from 13 existing wells located throughout the City as set forth in Section 5. Pumping limitations set by the BPP and the pumping capacity of the wells are the only constraints affecting the groundwater supply to the City. The City's existing wells range in depth from 900 to 1,100 feet, with production varying from 1,000 gpm to 4,500 gpm. Groundwater produced at these wells is easily accessible to City water distribution and storage facilities. For the location of each of the City's wells, refer to Section 5, *Figure 5.3*.

Section 5 of this WSA sets forth various groundwater production scenarios as required by the Water Code (Single Dry Year and Multiple Dry Years), and these latter tables and accompanying text should be reviewed for an understanding of how groundwater production by the City may be affected by hypothetical future conditions. This additional information set forth in Section 5 will furnish some of the additional information pertaining to the sufficiency of the groundwater basin in various pumping scenarios as required by Water Code section 10910(f)(5).

4.3 Imported Water (Surface Water) - Metropolitan

The information in this section is intended to furnish the information required by Water Code section 10910(d). Compliance with the requirements of section 10910 (d), by subsection, can be found in this and other referenced documents as follows below:

> (1), (2) and (3) MWDOC's and MWD's 2020 UWMP for quantities of imported water received in previous years and entitlements through MWDOC, the City's MWD member agency as well as Section 4.3 and 4.4, below and Section 5.1 of this WSA.

Metropolitan provides imported water supplies to the City through the City's Metropolitan member agency, MWDOC. Metropolitan is the wholesale water agency that serves supplemental imported water from northern California through the State Water Project (SWP) and the Colorado River to 26 member agencies located in portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties, of which MWDOC is one.

The construction of the SWP was authorized by the State Legislature in 1951. Eight years later, the Legislature passed the Burns-Porter Act, which provided a mechanism for bonds to be issued to pay for the construction of certain portions of the SWP facilities. The DWR has entered into contracts with water districts and regional agencies (SWP Contractors) specifying the amount of SWP water to be delivered to each SWP Contractor. Each SWP Contractor was provided with a contract amount and capacity rights to the SWP aqueduct and storage system in return for payments intended to cover operation and maintenance, bondholder obligations, and repayment of moneys loaned from the California Water Fund. DWR water supply contracts contemplate that the SWP would deliver 4.2 million AFY to 29 SWP Contractors. However, the SWP is not fully constructed and cannot yet deliver the full 4.2 million AFY in all years. Kern County Water Agency and Metropolitan are the largest Contractors with DWR for SWP water.[6]

From a statewide perspective, the maximum capacity of the overall SWP transportation system is generally limited by the capacity of the system pumps. The capacity of the California Aqueduct is 10,300 cubic feet per second (cfs) at its northern end, and 4,480 cfs below the Edmonston pumping plant (1,000 cfs equates to approximately 82.6 acre-feet per hour, 1,980 acre-feet per day and 725,000 AFY). If these transportation rates were maintained for a full year, they would result in the transport of approximately 7.2 million acre-feet near the Delta and 3.2 million acre-feet to users in Southern California.[7]

Demand can have a significant effect upon the reliability of a water system. For example, if the demand occurs only three months in the summer, a water system with a sufficient annual supply but insufficient water storage may not be able to reliably meet the demand. If, however, the same amount of demand is distributed over the year, the system could more easily meet the demand because the need for water storage is reduced. Because the City of Garden Grove overlies the Basin and can utilize the Basin to smooth out seasonal peaks, its imported water reliability is enhanced.

Metropolitan's SWP imported water is stored at Castaic Lake on the western side of its service area and at Silverwood Lake near San Bernardino. Metropolitan water imported from the Colorado River via the Colorado River Aqueduct (CRA) is stored at Diamond Valley Lake and Lake Mathews in Riverside County.

Through its 1996 Integrated Resources Plan (IRP) and subsequent updates including its latest draft 2020 IRP Update, Metropolitan has worked toward identifying and developing water supplies to provide 100 percent reliability. Due to competing needs and uses for all of the water sources and regional water operation issues, Metropolitan undertook a number of planning processes: the IRP Process, the Water Surplus and Drought Management (WSDM) Plan, the Strategic Planning Process, the Urban Water Management Plan, and the Report on Metropolitan Water Supplies: A Blueprint for Water Reliability. Combined, these documents provide a framework and guidelines for optimum water planning into the future. Reliability of Metropolitan's supply is further discussed in Section 5.0, Reliability of Water Supplies.

[6] See, generally Bulletin No. 132-06 and later supplements to Bulletin No. 132.
[7] DWR, Bulletin No. 132-05, December 2006.

Since 1980, retail water demands varied from 2.9 million acre-feet (MAF) in 1983 to nearly 4.2 MAF in 2007. Following record demand in 1990 of over 3.9 MAF, due to the economic recession, drought impacts, conservation, and mandatory water use restrictions, demands declined to 3.1 MAF in 1991. Demand remained below the historic peak level as a result of continuing effects from the recession and drought, coupled with a number of wet years and ongoing conservation efforts. In 2000, retail demands once again reached 3.9 MAF, reaching the early peak level for the first time in a decade. Since 2000, retail demands reached a new peak level in 2007 with nearly 4.2 MAF. Calendar year 2007 was the driest year since 1989, with precipitation measured at 5.66 inches in downtown Los Angeles. Since the peak retail demand in 2007, a decrease in demand was observed during the economic recession of 2008-2012. Starting in 2012, the severe drought in California led to a massive conservation campaign and water use restrictions by the State, Metropolitan, and local water agencies resulting in a decrease in demand in 2015. Demands remain low even after the mandatory restriction was lifted in the spring of 2017. [8]

In 2020, about 96 percent of retail demands were used for municipal and industrial (M&I) purposes and 4 percent for agricultural purposes. The relative share of agricultural water use has declined due to urbanization and market factors, including the price of water. Agricultural water use accounted for 19 percent of total regional water demand in 1970, 12 percent in 1980, 10 percent in 1990, and 4 percent in 2010.[9]

Total M&I water use is projected to grow from its current level of 3.1 MAF in 2020 to a projected 3.5 MAF in 2045.[10] This projection accounts for conservation due to existing active (through 2020), code-based, price-effect and pre-1990 conservation. Metropolitan's demand projections for Orange County are shown in Table 4.5.

Table 4.5
Total Retail Water Demand in Metropolitan's Service Area for Orange County - Includes Municipal and Industrial, and Agriculture (AF)

Actual			Projected					
2005	2010	2015	2020	2025	2030	2035	2040	2045
631,000	533,000	510,000	541,000	543,000	545,000	547,000	548,000	547,000

Source: Urban Water Management Plan for the Metropolitan Water District of Southern California, Appendix A.1-5, June 2021 (includes conservation).

[8] Metropolitan Water District of Southern California, *Urban Water Management Plan*, June 2021.
[9] Metropolitan Water District of Southern California, *Urban Water Management Plan*, June 2021.
[10] Metropolitan Water District of Southern California, *Urban Water Management Plan*, June 2021.

4.4 Municipal Water District of Orange County

The City obtains its access to Metropolitan water through MWDOC.

MWDOC supplies the City with treated water conveyed through four (4) metered connections, with a total capacity of 22,500 gallons per minute (gpm). In addition, the City has seven (7) emergency inter-agency connections with adjacent agencies with the ability to transfer a total of approximately 11,400 gpm into the City's distribution system. All of the infrastructure and programs are in place and no further regulatory permits are required to permit MWDOC to convey imported water to these facilities for use by the City. A description of the amount of imported Metropolitan water delivered to the City in the past and anticipated to be delivered to the City in the future under a variety of scenarios is set forth in Section 5 of this WSA.

MWDOC was formed by Orange County voters in 1951 under the Municipal Water District Act of 1911 to provide imported water to inland areas of Orange County. MWDOC is the third largest member agency of Metropolitan based on assessed valuation. Today, MWDOC manages all of Orange County's imported water supply except for water imported to the cities of Anaheim, Fullerton, and Santa Ana. It serves more than 2.34 million residents in 600 square miles of service area.

Approximately 33 percent of the water requirement in Orange County depends on imported water coming from two sources: The Colorado River Aqueduct and the State Water Project. The other 67 percent is from various other sources, including groundwater from the OC Basin, groundwater from other smaller basins and recycled water. Historical retail water usage in the MWDOC service area was increasing over time to a high of 0.530 MAF in 2006/07 (excluding basin replenishment but including agricultural, recycled water and non-potable water use), primarily due to growth within the service area. In recent years, retail water usage in the MWDOC service area has dropped. In 2013/14, due to the drought, water usage began to trend downward. FY 2015/16 was the first year that water use in the MWDOC service area dropped below 0.4 MAF due to large-scale water efficiency efforts undertaken by MWDOC and its member agencies.

4.5 Recycled Water

In the 2020 UWMP, the City did not expect to have any direct recycled water projects within the City's service area for the next 25 years because of the lack of a source of reclaimed wastewater. The City currently does not own or operate wastewater treatment facilities. Wastewater generated in Garden Grove is transported via large trunk sewer mains approximately 5 miles to OC San facilities located in the cities of Fountain Valley and Huntington Beach. Indirectly, the City is part of a reclamation program by participating in the reclamation projects of OCWD and the OC San. OCWD currently utilizes recycled water generated from the OC San wastewater treatment facilities, treats it further and uses it for regional recycled water projects, sea water intrusion barriers, and groundwater recharge. These regional recycled water projects include the Green Acres Project (GAP) and the Groundwater Replenishment System (GWRS).

4.5.1 OCWD Green Acres Project

OCWD owns and operates the GAP, a water recycling system that provides up to 8,400 AFY of recycled water for irrigation and industrial uses. GAP provides an alternate source of water that is mainly delivered to parks, golf courses, greenbelts, cemeteries, and nurseries in the cities of Costa Mesa, Fountain Valley, Newport Beach, and Santa Ana. Approximately 100 sites use GAP water with major customers including Mile Square Park and golf courses in Fountain Valley, Costa Mesa Country Club, Chroma Systems carpet dyeing, Kaiser Permanente, and Caltrans, but the City does not receive any GAP water.

4.5.2 OCWD Groundwater Replenishment System

OCWD's GWRS allows Southern California to decrease its dependency on imported water and creates a local and reliable source of water. OCWD's GWRS purifies secondary treated wastewater from OC San to levels that meet and exceed all state and federal drinking water standards. The GWRS Phase 1 plant has been operational since January 2008 and uses a three-step, advanced treatment process consisting of microfiltration (MF), reverse osmosis (RO), and ultraviolet (UV) light with hydrogen peroxide. A portion of the treated water is injected into the seawater barrier to prevent seawater intrusion into the basin. The other portion is pumped to ponds where the water percolates into deep aquifers and becomes part of the basin water supply, which provides about 72 percent of the potable water supply for north and central Orange County.

The GWRS began operating in 2008 producing 70 million gallons of water per day (MGD) and in 2015 it underwent a 30 MGD expansion. The design and construction of the original GWRS project was jointly funded by OCWD and OC San and the Phase 2 expansion was funded solely by OCWD. The final expansion of the GWRS is currently underway and when completed in 2023, the plant will produce 130 MGD. To produce 130 MGD, additional treated wastewater from OC San is required. This additional supply will come from OC San's Treatment Plant 2, which is in the City of Huntington Beach approximately 3.5 miles south of the GWRS plant. This final expansion will entail expanding the GWRS treatment facilities, constructing new conveyance facilities at OC San Plant 2 and rehabilitating an existing pipeline between OC San's Plant 2 and the GWRS Plant. Once completed, the GWRS will recycle 100 percent of OC San's reclaimable sources and produce enough water to meet the needs of over one million people.

5.0 RELIABILITY OF WATER SUPPLIES

This section provides a description of Metropolitan's, MWDOC's, OCWD's, and the City's efforts in securing adequate water supply as well as reliability of the region and the City's normal, single dry year, and multiple dry year water supplies.

The Southern California region faces a challenge in satisfying its water requirements and securing its firm water supplies. Increased environmental regulations and the competition for water from outside the region have resulted in reduced supplies of imported water. Continued population and economic growth correspond to increased water demands within the region, putting an even larger burden on local supplies.

Reliability is a measure of a water system's expected success in managing water shortages. Reliability planning requires information about the following: (1) expected frequency and severity of shortages; (2) how additional water management measures are likely to affect the frequency and severity of shortages; and (3) how available contingency measures can reduce the impact of shortages when they occur. The reliability of the City's water supply is currently dependent on the reliability of both groundwater managed by OCWD and imported water supplies managed and delivered by MWDOC. Despite the ongoing water supply challenges within the region, the goal and statutory mission of these agencies are to identify and develop projects to meet the water demands in the region. Sections 5.1 and 5.2 discuss these agencies, their roles in water supply reliability, and the near and long-term efforts they are involved with to ensure future reliability of water supplies to the City and the region as a whole.

5.1 Metropolitan Water District of Southern California

Metropolitan was formed in the late 1920's. Collectively, charter members recognized the limited water supplies available within the region and realized that continued prosperity and economic development of Southern California depended upon the acquisition and careful management of an adequate supplemental water supply. This foresight made the continued development of Southern California possible.

Metropolitan acquires water from Northern California via the State Water Project (SWP) and from the Colorado River to supply water to most of Southern California. As discussed above, as a wholesaler, Metropolitan has no retail customers, and distributes treated and untreated water directly to its 26 member agencies. One such member agency is the MWDOC, of which the City of Garden Grove is one of its 30 member agencies.

Through the 1996 Integrated Resources Plan and subsequent updates, Metropolitan has worked toward identifying and developing water supplies to provide 100 percent reliability. Due to competing needs and uses for all of the water sources and regional water operational issues, Metropolitan undertook a number of planning processes: the Integrated Resources Planning (IRP) Process, the WSDM Plan, the Strategic Planning Process, the Report on Metropolitan Water Supplies: A Blueprint for Water Reliability, and most recently, the 2020 Urban Water Management

Plan. Combined, these documents provide a framework and guidelines for optimum water planning into the future.

The reliability and operational issues related to Metropolitan's various sources of supply are discussed in detail by major source in the subsequent sections. It should be noted that some of the recent issues surrounding operational limitations in supply related to species protection and Delta issues are considered by Metropolitan to be somewhat short-term in nature and are not affecting the overall 20-year planning period that is being considered in this WSA document.

5.1.1 State Water Project

The SWP is owned and operated by the California Department of Water Resources (DWR). The reliability of the SWP impacts Metropolitan's member agencies' ability to plan for future growth and supply. On an annual basis, each of the 29 SWP contractors, including Metropolitan, request an amount of SWP water based on their anticipated yearly demand. In most cases, Metropolitan's requested supply is equivalent to its full Table A Amount,[11] currently at 1,911,500 AFY, and in certain wetter years additional supply may be made available. The full Table A amount is defined as the maximum amount of imported water to be delivered and is specified in the contract between the DWR and the contractor. After receiving the requests, DWR assesses the amount of water supply available based on precipitation, snowpack on northern California watersheds, volume of water in storage, projected carry over storage, and Sacramento-San Joaquin Bay Delta regulatory requirements. Due to the uncertainty in water supply, contractors are not typically guaranteed their full Table A Amount, but instead a percentage of that amount based on the available supply. Once the percentage is set early in the water year, the agency can count on that amount of supply or more in the coming year. The percentage is typically set conservative and then held or adjusted upwards later in the year based on a reassessment of precipitation, snow pack, etc.

The Delta is key to the SWP's ability to deliver water to its agricultural and urban contractors. All but five (5) of the 29 SWP contractors receive water deliveries below the Delta (pumped via the Harvey O. Banks or Barker Sough pumping plants). However, the Delta faces many challenges concerning its long-term sustainability such as climate change posing a threat of increased variability in floods and droughts. Sea level rise complicates efforts in managing salinity levels and preserving water quality in the Delta to ensure a suitable water supply for urban agricultural use. Furthermore, other challenges include continued subsidence of Delta islands, many of which are below sea level, and related threat of a catastrophic levee failure as the water pressure increases, or as a result of a major seismic event.

DWR bi-annually prepares a report on the current and future for SWP water supply conditions, if no significant improvements are made to convey water past the Sacramento-San Joaquin Delta

[11] Two types of deliveries are assumed for the SWP contractors: Table A and Article 21. Table A Amount is the contractual amount of allocated SWP supply, set by percentage amount annually by DWR; it is scheduled and uninterruptible. Article 21 water refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows area available in the Delta (i.e., Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the later winter.

(Delta) or to store the more variable run-off that is expected with climate change. The latest 2019 State Water Project Delivery Capability Report (2019 Report) is the most current of these reports dated August 2020. The 2019 Report shows, on average, deliveries are approximately 60 percent of Table A amounts.

SWP contractors may receive Article 21 water on a short-term basis in addition to Table A water, if requested. Article 21 of the SWP contracts allows contractors to receive additional water deliveries only under specific conditions, generally during wet months of the year (December through March). Because a SWP contractor must have an immediate use for Article 21 supply or a place to store it outside the SWP, only Metropolitan and a few other contractors can typically access such supplies.

Carryover water is SWP water allocated to an SWP contractor and approved for delivery to the contractor in a given year, but not used by the end of that year. The unused water is stored in the SWP's share of San Luis Reservoir, when space if available, for use in the following year.

Turnback pool water is Table A water that has been allocated to SWP contractors that has exceeded their demands. This water can then be purchased by another contractor depending on its availability.

Estimated average annual Delta exports and SWP Table A water deliveries have generally decreased since 2005, when Delta export regulations affecting SWP pumping operations became more restrictive due to the federal biological opinions (Biops). The Biops protect species listed as threatened or endangered under the federal and state Endangered Species Acts (ESAs) and affect the SWP's water delivery capability because they restrict SWP exports in the Delta and include Delta outflow requirements during certain times of the year, thus reducing the available supply for export or storage.

Before being updated by the 2019 Long-Term Operations Plan, the prior 2008 and 2009 Biops resulted in an estimated reduction in SWP deliveries of 0.3 MAF during critically dry years to 1.3 MAF in above normal water years as compared to the previous baseline. However, the 2019 Long-Term Operations Plan and Biops are expected to increase SWP deliveries by an average of 20,000 AF as compared to 2017, mainly due to the 2018 Coordinated Operation Agreement (COA) Addendum and increase in the end of September storage target for Lake Oroville. Other factors that also affected deliveries included changes in regulations associated with the incidental Take Permit (ITP) and the Re-initiation of Consultation for Long-Term Operations (RoC on LTO), a shift in Table A to Article 21 deliveries which occurred due to higher storage in San Luis Reservoir, and other operational updates to the SWP and federal Central Valley Project (CVP)[12]. Since 2005, there are similar decreasing trends for both the average annual Delta exports and the average annual Table A deliveries, with Metropolitan annual exports shown on Table 5.1.

[12] DWR, 2019 State Water Project Delivery Capability Report, August 2020

Table 5.1
Metropolitan SWP Deliveries

Year	Annual Delta Exports (MAF)	Annual Table A Delivery (MAF)
2005	2.96	2.82
2013	2.61	2.55
2019	2.52	2.41
Percent Change*	-14.8%	-14.3

*Percent Change from 2005 to 2019

Ongoing regulatory restrictions, such as those imposed by the Biops on the effects of SWP and the CVP operations on certain marine life, also contribute to the challenge of determining the SWP's water delivery reliability. In dry below-normal conditions, Metropolitan has increased the supplies delivered through the California Aqueduct by developing flexible CVP/SWP storage and transfer programs. The goal of these programs is to develop additional dry-year supplies that can be conveyed through the available pumping plants to maximize deliveries through the California Aqueduct during dry hydrologic conditions and regulatory restrictions. In addition, the State Water Resources Control Board (SWRCB) has set water quality objectives that must be met by the SWP including minimum Delta outflows, limits on SWP and CVP Delta exports and maximum allowable salinity levels.

The following factors affect the ability to estimate existing and future water delivery reliability:

- **Water availability at the source.** Availability can be highly variable and depends on the amount and timing of rain and snow fall in any given year. Generally during a single-dry year or two, surface and groundwater storage can supply most water deliveries, but multiple-dry years can result in critically low water reserves. Fisheries issues can also restrict the operations of the export pumps even when water supplies are available.
- **Water rights with priority over the SWP.** Water users with prior water rights are assigned higher priority in SWR's modeling of the SWP's water delivery reliability, even ahead of SWP Table A water.
- **Climate change.** Mean temperatures are predicted to vary more significantly than previously expected. This change in climate is anticipated to bring warmer winter storms that result in less snowfall at lower elevations, reducing total snowpack. From historical data, DWR projects that by 2050, the Sierra snowpack will be reduced from its historical average by 25 to 40 percent. Increased precipitation as rain could result in a larger number of "rain-on-snow" events, causing snow to melt earlier in the year and over fewer days than historically, affecting the availability of water for pumping by the SWP during summer. Furthermore, water quality may be adversely affected due to the anticipated increase in wildfires. Rising sea levels may result in potential pumping cutbacks on the SWP and CVP.
- **Regulatory restrictions on SWP Delta exports.** The Biops protect special-status species such as delta smelt and spring- and winter-run Chinook salmon and imposed substantial constraints on Delta water supply operations through requirements for Delta inflow and outflow and export pumping restrictions. Restrictions on SWP operations imposed by state and federal agencies contribute substantially to the challenge of accurately determining the SWP's water delivery reliability in any given year.

- **Ongoing environmental and policy planning efforts.** Governor Gavin Newsom ended California WaterFix in May 2019 and announced a new approach to modernize Delta Conveyance through a single tunnel alternative. The EcoRestore Program aims to restore at least 30,000 acres of Delta habitat, with the near-term goal of making significant strides toward that objective by 2020.
- **Delta levee failure.** The levees are vulnerable to failure because most original levees were simply built with soils dredged from nearby channels and were not engineered. A breach of one or more levees and island flooding could affect Delta water quality and SWP operations for several months. When islands are flooded, DWR may need to drastically decrease or even cease SWP Delta exports to evaluate damage caused by salinity in the Delta.

Operational constraints will likely continue until a long-term solution to the problems in the Bay-Delta is identified and implemented. New Biops for listed species under the Federal ESA or by the California Department of Fish and Game's issuance of incidental take authorizations under the Federal ESA and California ESA might further adversely affect SWP and CVP operations. Additionally, new litigation, listings of additional species or new regulatory requirements could further adversely affect SWP operations in the future by requiring additional export reductions, releases of additional water from storage or other operational changes impacting water supply operations.

Future Programs/Plans

Metropolitan's Board approved a Delta Action Plan in June 2007 that provides a framework for staff to pursue actions with other agencies and stakeholders to build a sustainable Delta and reduce conflicts between water supply conveyance and the environment. The Delta Action Plan aims to prioritize immediate short-term actions to stabilize the Delta while a long-term solution is implemented. Currently, Metropolitan is working towards addressing four elements: Delta ecosystem restoration, water supply conveyance, flood control protection, and storage development.

As discussed above, Governor Newsom's new approach is to modernize the Delta Conveyance through a single tunnel alternative. He also released Executive Order 10-19 directing state agencies to inventory and assess new planning for the project. DWR then withdrew all project approvals and permit applications for California WaterFix, effectively ending the project. The Delta Conveyance Project (DCP) has several project objectives. In proposing to make physical improvement to the SWP Delta conveyance system, the project objectives are:

- To address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events.
- To minimize the potential for public health and safety impacts from reduced quantity and quality of SWP water deliveries, and potentially CVP water deliveries, south of the Delta resulting from a major earthquake that causes breaching of Delta levees and inundation of brackish water into the areas in which existing pumping plants operate.
- To protect the ability of the SWP, and potentially the CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts, consistent with state and federal law.

- To provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further constraints on project operations.

5.1.2 Colorado River Supplies

Background

The Colorado River was Metropolitan's original source of water after Metropolitan's establishment in 1928. Metropolitan has a legal entitlement to receive water from the Colorado River under a permanent service contract with the Secretary of the Interior. Water from the Colorado River or its tributaries is also available to other users in California, as well as to users in the states of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming (the "Colorado River Basin States"), resulting in both competition and the need for cooperation among these holders of Colorado River entitlements.

The Colorado River Aqueduct, which is owned and operated by Metropolitan, transports water from the Colorado River approximately 242 miles to its terminus at Lake Mathews in Riverside County. After deducting for conveyance losses and considering maintenance requirements, up to 1.2 million acre-feet of water a year may be conveyed through the Colorado River Aqueduct to Metropolitan's member agencies, subject to availability of Colorado River water for delivery to Metropolitan.

California is apportioned the use of 4.4 million acre-feet of water from the Colorado River each year plus one-half of any surplus that may be available for use collectively in Arizona, California and Nevada. In addition, California has historically been allowed to use Colorado River water apportioned to, but not used by, Arizona and Nevada when such supplies have been requested for use in California. Under the 1931 priority system that has formed the basis for the distribution of Colorado River water made available to California, Metropolitan holds the fourth priority right to 550,000 acre-feet per year. This is the last priority within California's basic apportionment of 4.4 million acre-feet. In addition, Metropolitan holds the fifth priority right to 662,000 acre-feet of water, which is in excess of California's basic apportionment when the following conditions exist: Water is unused by the California holders of priorities 1 through 3.

- Water is saved by the Palo Verde land management, crop rotation and water supply program.
- When the U. S. Secretary of the Interior makes available either one or both of the following:
    - Surplus water.
    - Colorado River water that is apportioned to but unused by Arizona and/or Nevada.

Current Conditions of Supply

Metropolitan has not received surplus water for a number of years. The Colorado River supply faces current and future imbalances between water supply and demand in the Colorado River Basin due to long-term drought conditions. Analysis of historical records suggests a potential change in the relationship between precipitation and runoff in the Colorado River Basin. The past 21 years (1999-2020) have seen an overall drying trend, even though the period included several wet or

average years. The river basin has substantial storage capacity, but the significant reduction in system reservoir storage in the last two decades is great enough to consider the period a drought[13]. At the close of 2020, system storage was at or near its lowest since 2000, so there is very little buffer to avoid a shortage from any future period of reduced precipitation and runoff. [14] Looking ahead, the long-term imbalance in the Colorado River Basin's future supply and demand is projected to be approximately 3.2 MAF by the year 2060.[15]

Over the years, Metropolitan has helped fund and implement various programs to improve Colorado River supply reliability and help resolve the imbalance between supply and demand. Implementation of such programs have contributed to achievements like achieving a record low diversion of the Colorado River in 2019, a level not seen since the 1950s. Colorado River water management programs include the following (for details on these programs and the amount of water saved see Metropolitan's 2020 UWMP):

- Imperial Irrigation District (IID)/Metropolitan Conservation Program.
- Palo Verde Land Management, Crop Rotation, and Water Supply Program
- Bard Seasonal Fallowing Program
- Management of Metropolitan-owned Land in Palo Verde
- Southern Nevada Water Authority (SMWA) and Metropolitan Storage and Interstate Release Agreement
- Lower Colorado Water Supply Projects
- Exchange Programs with USBR and San Diego County Water Authority (SDCWA)
- Lake Mead Storage Program
- Quagga Mussel Control Program
- Lower Basin Drought Contingency Plan

Future Programs/Plans

The Colorado River faces long-term challenges of water demands exceeding available supply with additional uncertainties due to climate change. Climate change impacts expected in the Basin include the following:

- More frequent, more intense, and longer lasting droughts, which will result in water deficits.
- Continued dryness in the Basin, which will increase the likelihood of triggering a first-ever shortage in the Lower Basin.
- Increased temperatures, which will affect the percentage of precipitation that falls as rain or snow as well as the amount and timing of mountain snowpack.

Acknowledging the various uncertainties regarding reliability, Metropolitan plans to continue ongoing programs such as those listed earlier in this section. Additionally, Metropolitan supports increasing water recycling in the Colorado River Basin and is in the process of developing additional transfer programs for the future.[16]

[13] DWR *California's Most Significant Droughts: Comparing Historical and Recent Conditions,* January 2020.
[14] Metropolitan Water District of Southern California, *2020 Urban Water Management Plan*, June 2021.
[15] United States Bureau of Reclamation (USBR) *Colorado River Basin Water Supply and Demand Study: Study Report*, December 2012
[16] Metropolitan Water District of Southern California, *2020 Urban Water Management Plan,* June 2021.

5.1.3 Storage

Storage is a major component of Metropolitan's dry year resource management strategy. Metropolitan's likelihood of having adequate water supply capability to meet projected demands, without implementing its Water Supply Allocation Plan (WSAP), is dependent on its storage resources. Due to the pattern of generally drier hydrology, the groundwater basins and local reservoirs have dropped to low operating levels and remain below healthy storage levels. For example, the Colorado River Basin's system storage at the close of 2020 was at or near its lowest since 2000, so there is very little buffer to avoid a shortage from any future period of reduced precipitation and runoff.[17]

Metropolitan endeavors to increase the reliability of water supplies through the development of flexible storage and transfer programs including groundwater storage.[18] These include (for details see Metropolitan's 2020 UWMP):

- Lake Mead Storage Program
- Semitropic Storage Program
- Arvin-Edison Storage Program
- Antelope Valley-East Kern Water Agency Exchange and Storage Programs
- High Desert Water Bank Program
- Kern-Delta Water District Storage Program
- Mojave Storage Program

5.1.4 Planned Future Sources

Beyond the programs highlighted above, Metropolitan continues to invest in efforts to meet its goal of long-term water supply reliability, focusing on the following:

- Continuing water conservation
- Developing water supply management programs outside the region
- Developing storage programs related to the Colorado River and SWP
- Developing storage and groundwater management programs within the Southern California region
- Increasing water recycling, groundwater recovery, stormwater and seawater desalination
- Pursuing long-term solutions for the ecosystem, regulatory and water supply issues in the California Bay-Delta[19]

5.2 Orange County Water District

As has been discussed previously throughout this WSA, the primary source of water for the City is the Basin. OCWD is responsible for the protection of water rights to the Santa Ana River in Orange County as well as the management and replenishment of the Basin.[20] OCWD replenishes

[17] Metropolitan Water District of Southern California, *2020 Urban Water Management Plan,* June 2021.
[18] Metropolitan Water District of Southern California, *2020 Urban Water Management Plan,* June 2021.
[19] Metropolitan Water District of Southern California, *2020 Urban Water Management Plan,* June 2021.
[20] OCWD, *OCWD Groundwater Management Plan 2015 Update*, June 2015.

and maintains the Basin at safe levels while significantly increasing the Basin's annual yield by utilization of the best available technology. Other than recycled water, OCWD primarily recharges the Basin with water from the Santa Ana River and to a lesser extent with imported raw water purchased from Metropolitan.

The following is a summary of groundwater conditions from the 2019/20 OCWD Engineer's Report for the Basin for the 2019/20 water year[21]:

1. Groundwater production (including In-Lieu Program water) totaled 286,498 AF.
2. Groundwater stored increased by 36,000 AF.
3. Accumulated Overdraft on June 30, 2020 was 200,000 AF.
4. Average Overdraft was 91,300 AF for 2019/20.
5. Average Annual Overdraft for the immediate past five years (2015/16 to 2019/20) was 124,300 AF
6. Projected Annual Overdraft for the current 2020/21 year is 98,000 AF.
7. Projected Annual Overdraft for the ensuing 2021/22 year is 69,000 AF.
8. Projected Accumulated Overdraft on June 30, 2021 is 198,000 AF.[22]
9. Replenishment Assessment (RA) could be equal to an amount necessary to purchase up to 144,000 AF of replenishment water.

As discussed previously, OCWD establishes the BPP each water year. The BPP is set based on groundwater conditions, availability of imported water supplies, anticipated precipitation, Santa Ana River runoff, and basin management objectives. The BPP was initially established in 1969 and has ranged from 62 to 89 percent. The average BPP over its approximately 50-year history is in the low- to mid- 70s in terms of percent of total potable water supply.

As discussed previously, the BPP is a major factor for the City in determining the cost of groundwater production. For groundwater production equal to or less than the BPP, groundwater producers, including Garden Grove, pay a replenishment assessment. If groundwater production greater than the BPP occurs, a Basin Equity Assessment (BEA) will be assessed. The BEA is an additional fee paid on each acre foot (AF) of water pumped above the BPP, making the total cost of that water to Garden Grove equal to the cost of Tier 2 imported water from Metropolitan.

Total water demand within OCWD was 397,419 AF for the 2019/20 water year (beginning July 1, 2019 and ending June 30, 2020)[23]. In the same period, groundwater production (including In-lieu Program water, but excluding groundwater production used to supply the Talbert Barrier) for the water year totaled 286,498 AF.[24]

Since the formation of OCWD in 1933, OCWD has made substantial investment in facilities, basin management and water rights protection, resulting in the elimination and prevention of adverse long-term "mining" overdraft conditions. OCWD continues to develop new replenishment

[21] OCWD, *2019/20 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization in the OCWD*, February 2021.
[22] Actual value won't be known until 2020-2021 Engineer's Report is available in February 2022.
[23] Orange County Water District, *2019-2020 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District,* February 2021.
[24] Orange County Water District, *2019-2020 Engineer's Report,* February 2021.

supplies, recharge capacity and basin protection measures to meet projected production from the basin during average/normal rainfall and drought periods.[25] OCWD has invested in seawater intrusion control (injection barriers), recharge facilities, laboratories and basin monitoring to effectively manage the basin. Some of these programs include:

Recharge Facilities - OCWD currently owns and operates approximately 1,000 acres of recharge spreading facilities located in Cities of Anaheim and Orange adjacent to the SAR and Santiago Creek. OCWD has built a recharge system that provides the majority of water supplied by the District. The major facilities in the Anaheim/Orange area are grouped into four major components: the Main River System, the Off-River System, the Deep Basin System, and the Burris Pit/Santiago System. Each system has a series of percolation spreading basins, either shallow or deep, whose sidewalls and bottoms allow for percolation into the underlying aquifer.

Seawater Intrusion Barriers - OCWD's Talbert Barrier is composed of a series of injection wells that span the 2.5-mile-wide Talbert Gap between the Newport and Huntington mesas. The Talbert Barrier wells can inject approximately 42 mgd of water into four aquifer zones. Injecting water through the wells forms a hydraulic barrier to seawater that would otherwise migrate inland toward areas of groundwater production.

The Alamitos seawater intrusion barrier is composed of a series of injection wells that span the Los Angeles/Orange County line in the Seal Beach-Long Beach area. It is operated by the Los Angeles County Department of Public Works (LACDPW) in cooperation with OCWD and the Water Replenishment District (WRD). The source of this water is a blend of purified wastewater from WRD and potable supplies from Metropolitan. Also, the Alamitos Barrier System includes four extraction wells located seaward of the injection barrier to create a pumping trough to remove the degraded brackish groundwater.

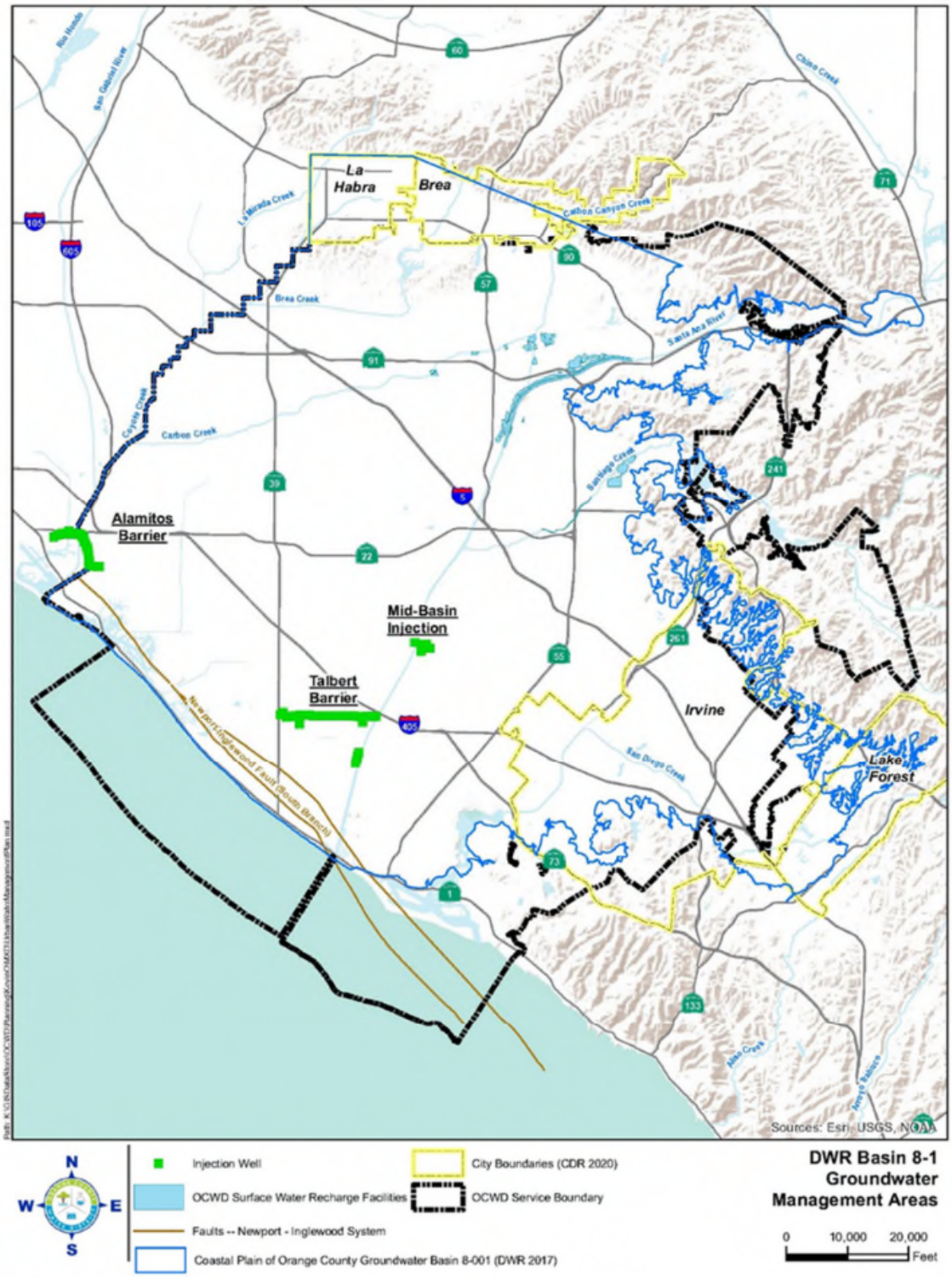
Groundwater Monitoring – OCWD operates the Advanced Water Quality Assurance Laboratory at its Fountain Valley campus and has one of the most sophisticated groundwater monitoring programs in the country. The District runs more than 400,000 analyses of approximately 20,000 water samples taken each water year. In addition to groundwater quality monitoring, the laboratory supports the extensive water quality testing requirements for the GWRS.

5.2.1 Basin Characteristics

The Orange County Basin underlies the northerly half of Orange County beneath broad lowlands and covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, and the Pacific Ocean to the southwest. Its boundary extends to the Orange County-Los Angeles County line to the northwest, where groundwater flows across the county line into the Central Groundwater Basin of Los Angeles County. A map of the Basin is shown in *Figure 5.1*. The total thickness of sedimentary rocks in the Basin is over 20,000 feet, with only the upper 2,000 to 4,000 feet containing fresh water and holding a total volume when full of approximately 66 MAF.

[25] Orange County Water District, *2019-2020 Engineer's Report,* February 2021.

Figure 5.1 Map of Orange County Basin



There are three major aquifer systems that have been subdivided by OCWD, the Shallow Aquifer System, the Principal Aquifer System, and the Deep Aquifer System. These three systems are hydraulically connected as groundwater is able to flow between each other through intervening aquitards or discontinuities in the aquitards. The Shallow Aquifer System occurs from the surface to approximately 250 feet below ground surface (bgs). Most of the groundwater from this aquifer system is pumped by small water systems for industrial or agricultural use. The Principal Aquifer System occurs at depths between 200 and 1,300 feet bgs. Over 90 percent of groundwater production is from wells that are screened within the Principal Aquifer System. Only a minor amount of groundwater is pumped from the Deep Aquifer System, which underlies the Principal Aquifer System and is up to 2,000 feet deep in the center of the Orange County Basin.

Per- and polyfluoroalkyl substances (PFAS) are a group of thousands of manmade chemicals that include Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfanate (PFOS). PFAS compounds were once commonly used in many products including, among many others, stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams. Beginning in the summer of 2019, the California State Division of Drinking Water (DDW) began requiring testing for PFAS compounds in some groundwater production wells in the OCWD area.

Groundwater production in 2019/20 was expected to be approximately 325,000 AF but declined to 286,500 AF, primarily due to impacted wells being shut down around February 2020. OCWD expects groundwater production to be in the area of 253,000 AF in 2020/21 and 250,000 AF in 2021/22 due to the currently idled wells and additional wells being impacted by PFAS.[26] As PFAS treatment systems are constructed, OCWD expects total annual groundwater production to slowly increase back to normal levels of 310,000 to 330,000 AFY.

5.2.2 Sustainable Groundwater Management Act

In 2014, the State of California adopted the Sustainable Groundwater Management Act (SGMA) to help manage its groundwater sustainably and limit adverse effects such as significant groundwater-level declines, land subsidence, and water quality degradation. SGMA requires all high- and medium-priority basins, as designated by DWR, be sustainably managed. DWR designated the non-adjudicated Coastal Plain of the Orange County Basin ("Basin 8-1" or "Basin") as a medium-priority basin, primarily due to heavy reliance on the Basin's groundwater as a source of water supply. Compliance with SGMA can be achieved in one of two ways:

1. A Groundwater Sustainability Agency (GSA) is formed and a Groundwater Sustainability Plan (GSP) is adopted, or
2. Special Act Districts created by statute, such as OCWD, and other agencies may prepare and submit an Alternative to a GSP (City of La Habra et al., 2017, 2022 Update).

The agencies within Basin 8-1, led by OCWD collaborated to submit an Alternative to a GSP in 2017, titled "Basin 8-1 Alternative" to meet SGMA compliance. This document is required to be

[26] Orange County Water District, *2019-2020 Engineer's Report,* February 2021.

updated every five years. The current (2022) version, dated January 2022, can be accessed on-line via the following link: basin-8-1-final-draft-2022-alternative-update.pdf (ocwd.com)

5.2.3 OCWD Basin Production Percentage

The Orange County Basin is not adjudicated and as such, groundwater production is managed through a process that uses financial incentives to encourage producers to pump a sustainable amount of water. The framework for the financial incentives is based on establishing the BPP, the percentage of each producer's total potable water supply that comes from groundwater pumped from the Basin. Groundwater production at or below the BPP is assessed the Replenishment Assessment (RA). While there is no legal limit to how much an agency pumps from the Basin, there is a financial disincentive to pump above the BPP. The BPP is set uniformly for all producers by OCWD on an annual basis. Agencies that pump above the BPP are charged the RA plus the Basin Equity Assessment (BEA). The BEA is presently calculated so that the cost of groundwater production is equivalent to the cost of importing potable water supplies. This approach serves to discourage, but not eliminate, production above the BPP, and the BEA can be increased to discourage production above the BPP if necessary.

The BPP is set based on groundwater conditions, availability of imported water supplies, and Basin management objectives. The supplies available for recharge must be estimated for a given year. The supplies of recharge water that go into this estimate are (1) Santa Ana River stormflow, (2) natural incidental recharge, (3) Santa Ana River baseflow, (4) GWRS supplies, and (5) other supplies such as imported water and recycled water purchased for the Alamitos Barrier. The BPP is a major factor in determining the cost of groundwater production from the Basin for a particular year.

OCWD has established management guidelines to determine future BPPs. Adjusting the BPP on an annual basis allows OCWD to manage the amount of pumping from the Basin in a sustainable range to avoid adverse impacts to the Basin. OCWD seeks to maintain some available storage space in the Basin to maximize surface water recharge when such supplies are available, especially in relatively wet years. By keeping the Basin relatively full during wet years, and for as long as possible in years with near-normal recharge, the maximum amount of groundwater could be maintained in storage to support pumping future drought conditions. During dry hydrologic years when less water would be available for recharge, the BPP could be lowered to maintain groundwater storage levels. A component of OCWD's BPP policy is to manage the groundwater basin so that the BPP will not fluctuate more than 5 percent from year to year.

Based on most recent modeling of water supplies available for groundwater recharge and water demand forecasts, OCWD anticipates being able to sustain the BPP at 85 percent starting in 2025. The primary reasons for the higher BPP are the expected completion of the final expansion of the GWRS in 2023 and the relatively low water demands of approximately 400,000 AFY projected within the Basin. These modeling projections are based on average hydrologic conditions which smooth the dynamic and unpredictable local hydrology.

5.3 Future Potential Regional Supplies

5.3.1 Seawater Desalination Projects

As technology progresses, additional water supplies and facilities are likely to be brought on line to further assure water supply reliability well into the future.

Huntington Beach Seawater Desalination Project

One recent example is the proposal by Poseidon Resources, Inc. to build a 50 million gallon per day (50 MGD) (56,000 AFY) seawater desalination project in Huntington Beach called the Huntington Beach Sea Water Desalination Facility. This volume would supply approximately 10 percent of Orange County's water supply needs. Poseidon Resources is working with local and state agencies to obtain the required permits to ensure proper safeguards to the community and environment.

Over the past several years, Poseidon has been working with OCWD on the general terms and conditions for selling the water to OCWD. OCWD and MWDOC have proposed a few distribution options to agencies in Orange County. The northern option proposes the water be distributed to the northern agencies closer to the plant within OCWD's service area with the possibility of recharging/injecting a portion of the product water into the OC Basin. The southern option builds on the northern option by delivering a portion of the water through the existing OC-44 pipeline for conveyance to the south Orange County water agencies. A third option is also being explored, which includes all of the product water being recharged into the OC Basin. Currently, a combination of these options could be pursued.

The Huntington Beach Seawater Desalination project plant capacity of 56,000 AFY would be the single largest source of new, local drinking water available to the region. In addition to offsetting imported demand, water from this project could provide OCWD with management flexibility in the Basin by augmenting supplies into the Talbert Seawater Barrier to prevent seawater intrusion.

In May 2015, OCWD and Poseidon entered into a non-binding Term Sheet that provided the overall partner structure in order to advance the project. Based on the initial Term Sheet, which was updated in 2018, Poseidon would be responsible for permitting, financing, design, construction, and operation of the treatment plant while OCWD would purchase the production volume, assuming the product water quality and quantity meet specific contract parameters and criteria. Furthermore, OCWD would then distribute the water in Orange County using one of the proposed distribution options described above.

Doheny Desalination Project

Another potential regional supply would be the Doheny Desalination Project being proposed by South Coast Water District (SCWD). SCWD intends to construct this project in Dana Point with an initial capacity of up to 5 MGD. This initial capacity would be available for SCWD and potential partnering water agencies to provide high quality, locally controlled, drought-proof water supply. The facility would also provide emergency backup water supplies, should an earthquake, system shutdown, or other event disrupt the delivery of imported water to the area. The project would

consist of a subsurface slant well intake system (constructed within Doheny Beach State Park), raw seawater conveyance to the desalination facility site (located on SCWD-owned property), a seawater reverse osmosis facility, brine disposal through an existing wastewater ocean outfall, solids handling facilities, storage, and potable water conveyance interties to adjacent local and regional distribution infrastructure.

The Doheny Ocean Desalination Project has been determined as the best water supply option to meet reliability needs of SCWD and south Orange County. SCWD is pursuing the project to ensure it meets the water use needs of its customers and the region by providing a drought-proof potable water supply, which diversifies SCWD's supply portfolio and protects against long-term imported water emergency outages and supply shortfalls that could have significant impact to the community, public health, and the local economy.

On June 27, 2019, SCWD certified the final EIR and approved the project. The final EIR included considerable additional information provided at the request of the Coastal Commission and the Regional Board, including an updated coastal hazard analysis, updated brine discharge modeling, updated groundwater modeling, and updated hydrology analysis. The approval of the project also included a commitment to 100 percent offset of emissions through the expansion of project mitigation and use of renewable energy sources. SCWD is currently in the permitting process and finalizing additional due diligence studies. If implemented, SCWD anticipates an online date of 2025.

5.3.2 Other Regional Supply Projects

There are other potential Countywide regional initiatives in various stages of planning and development that should increase supply reliability to the region, as listed below. For more detail on these initiatives refer to Section 6.9.2 of the City's 2020 UWMP.

- San Juan Watershed Project
- Cadiz Water Bank
- South Orange County Emergency Interconnection Expansion
- Santa Ana River Conservation and Conjunctive Use Project (SARCCUP)
- Moulton Niguel Water District/OCWD Pilot Storage Program

Under guidance provided by DWR, the supplies from the projects/programs described in Section 5.3 above are not included in regional water supply projections due to their current status within the criteria established by DWR's 2020 UWMP Guidebook. This assumption provides a level of conservativeness to the supply reliability conclusions of this Water Supply Assessment, consistent with the regional wholesale agencies' and the City's 2020 UWMPs.

5.4 City of Garden Grove

5.4.1 Water System

Today, the City of Garden Grove's Water Services Division provides water service to approximately 176,600 persons within its 18.2-square mile service area. The service area and City boundary are generally contiguous, except for small areas within the City of Stanton that are within the water service area. A map of the City's service area is shown in *Figure 5.2*. The City's 34,080 water service connections include single family residential, multi-family residential and general services (i.e., commercial, industrial, municipal, and institutional consumers).

Today the Water Services Division has 436 miles of transmission and distribution mains, eight (8) reservoirs at five (5) sites with a capacity of 53 million gallons, 13 groundwater wells (including two (2) on standby and four (4) inactive), five (5) booster pumping stations located at each of the five reservoir sites with a combined pumping capacity of 46,500 gallons per minute (gpm), 2 pressure regulating stations, and 4 imported water connections, where the City receives water from MWDOC. A distribution map from the City's 2020 Water Master Plan Update showing key transmission mains, wells, reservoirs, and pumping stations is also shown in *Figure 5.3*.

The water system service area has elevations ranging from 25 feet above mean sea level (MSL) in the west portion of the City to 130 feet above MSL. In order to provide appropriate operation pressures for this range of elevations, the water system is divided into two pressure zones. The lowest pressure zone operates at a static hydraulic grade line (HGL) elevation of 200 feet above MSL and the highest pressure zone has a static HGL elevation of 220 feet above MSL.

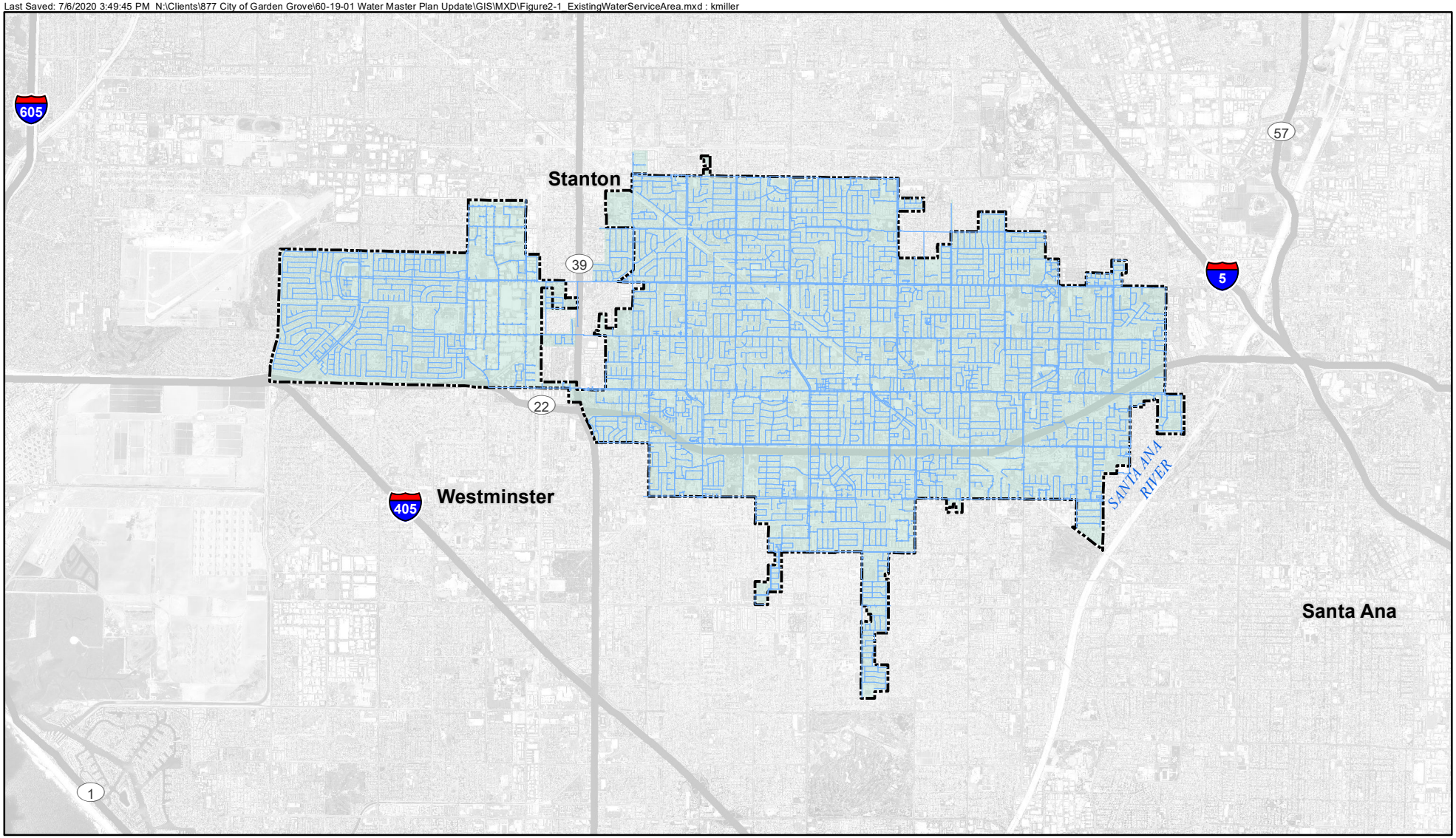
5.4.2 Past and Current City Efforts

Reliability is a measure of a water system's expected success in managing water shortages. The City has strategies to manage water demand with respect to frequency and magnitude of supply deficiencies. The City recognizes water conservation as a priority in its water use planning. The long-term goal of the City's water conservation program is to achieve and maintain water use efficiency in the City water service area. Specific objectives for achieving this goal include the following:

- Elimination of wasteful practices in water use;
- Continued development of information on both current and potential water conservation practices; and
- Ongoing implementation of conservation practices

The City participates in a number of conservation activities in southern California on a regional level. MWDOC implements regional conservation programs, such as school education programs, on behalf of the City.

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Symbology

- Pipeline
- City Water Service Area
- City Limits

N

0 3,500 7,000

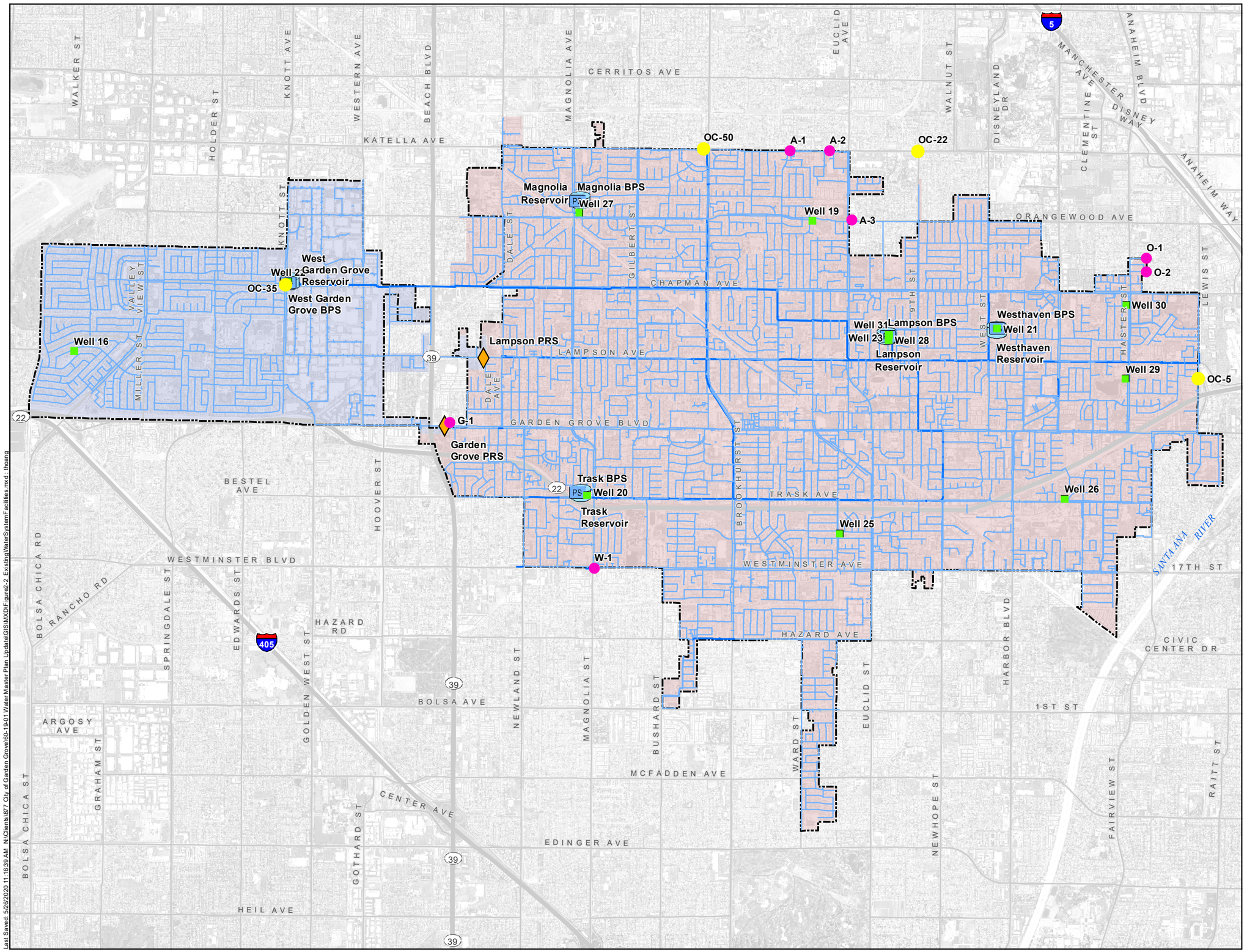
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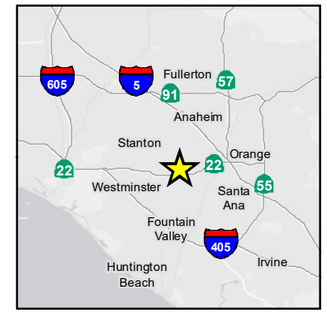
GARDEN GROVE

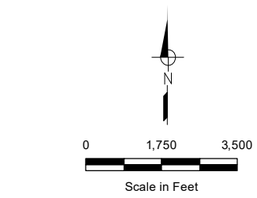
WEST YOST ASSOCIATES

Figure 5.2
Existing Water Service Area

City of Garden Grove
2020 Water Master Plan Update







Symbology

- Well
- MWD Connection
- Emergency Intertie
- Pressure Regulating Station
- Booster Pump Station
- Reservoir
- Distribution Pipeline (≤ 12" diameter)
- Transmission Pipeline (> 12" diameter)
- East Zone
- West Zone
- City Limits

GARDEN GROVE

WEST YOST ASSOCIATES

Figure 5.3

Existing Water System Facilities

City of Garden Grove
2020 Water Master Plan Update

Last Saved: 5/26/2020 11:16:39 AM N:\Clients\977 City of Garden Grove\60-19.01 Water Master Plan Update\GIS\MXD\Figure5-2_ExistingWaterSystemFacilities.mxd : lhoang

The City's SBx7-7 2020 compliance goal was established at 142 gallons per capita per day (GPCD) and the actual achieved consumption for FY 2020 reported in the City's 2020 UWMP was 93 GPCD. This demonstrates the City's commitment to water conservation within the service area. The City is also a member of the Orange County 20x2020 Regional Alliance formed by MWDOC, its wholesaler. In the region the weighted average 2020 goal was 159 GPCD and the actual 2020 water use in the region was 109 GPCD, therefore the region also met its goal.

The City anticipates water demand in the City to remain relatively constant over the next 25 years. The projects that have been identified by the City to improve the City's water supply reliability and enhance operations include replacement of water meters, fire hydrants, and electrical equipment; and various routine mechanical, structural, and electrical rehabilitation of wells. The major projects identified in the FY 2020/21 Capital Improvement 10-Year Plan are described below. For the full Capital Improvement Plan, refer to the City's 2020 Water Master Plan Update (West Yost Associates, 2020).

- Wellhead Treatment – Individual wellhead treatment will be installed at well sites in response to PFAS detection. Treatment facilities are being installed at Well 21, Well 29, and Well 30, and at Lampson Reservoir with installation expected to be completed in June 2022. These PFAS treatment facilities are not part of the City's CIP list as they are being funded by OCWD.
- Well Replacements (as needed) – Wells 16, 19 and 25 have reached the end of their useful life. A study will determine which wells require replacement versus rehabilitation. Two well replacement projects are currently budgeted, one in the 2026 to 2030 timeframe and one in the 2036 to 2040 timeframe, each with location to be determined.

5.4.3 Water Supply-Demand Comparison

City water service area demands were estimated previously in Table 4.3, including the Proposed Project, and are based on current and anticipated on-going passive and active conservation. Based on the supply projections documented in the City's 2020 UWMP as reliable for normal, single-dry and multiple dry years, a comparison of supply and demand is shown for each of these three conditions on Table 5.2, Table 5.3 and Table 5.4, respectively. It should be noted that, consistent with the City's 2020 UWMP assumptions, single-dry year demands are increased by 6 percent and a multiple-dry year condition lasting five years also shows demands increased by 6 percent for each of the five consecutive years.

The Proposed Project demands are broken out separately starting in FY 2025/26 (when Project occupancy is anticipated) in each of these supply and demand comparison tables, but as documented previously are assumed to be included in the demand projections included in the City's 2020 UWMP. It should also be noted that while Proposed Project demands are increased by 6 percent in dry years in the tables, they would likely not increase to that extent in dry years as landscaping is a much lower percentage of Project demands than the majority of City uses, which are primarily residential, where a larger portion of the demand is irrigation.

Table 5.2
Normal Year Supply and Demand Comparison (AFY)

Water Sources	2025	2030	2035	2040	2045
SUPPLY					
Imported	3,388	3,444	3,432	3,412	3,419
Groundwater	19,200	19,514	19,448	19,332	19,373
Total Potable Supply	**22,588**	**22,958**	**22,880**	**22,744**	**22,792**
DEMAND					
City Demand (excluding Project)	22,588	22,864	22,786	22,650	22,698
Proposed Project Demand	0	94	94	94	94
Total City Demand	**22,588**	**22,958**	**22,880**	**22,744**	**22,792**

Table 5.3
Single-Dry Year Supply and Demand Comparison (AFY)

Water Sources	2025	2030	2035	2040	2045
SUPPLY					
Imported	3,591	3,650	3,638	3,616	3,624
Groundwater	20,352	20,685	20,615	20,492	20,535
Total Potable Supply	**23,943**	**24,335**	**24,253**	**24,109**	**24,159**
DEMAND					
City Demand (excluding Project)	23,943	24,235	24,153	24,009	24,059
Proposed Project Demand	0	100	100	100	100
Total City Demand	**23,943**	**24,335**	**24,253**	**24,109**	**24,159**

Table 5.4
Multiple-Dry Year Supply and Demand Comparison (AFY)

		2025	2030	2035	2040	2045
First Year	**Supply Totals**	**23,427**	**24,022**	**24,319**	**24,224**	**24,119**
	Demand (excl. Project)	23,427	23,922	24,219	24,124	24,019
	Project Demand	0	100	100	100	100
	Total City Demand	**23,427**	**24,022**	**24,319**	**24,224**	**24,119**
Second Year	**Supply Totals**	**23,556**	**24,100**	**24,302**	**24,195**	**24,129**
	Demand (excl. Project)	23,556	24,000	24,202	24,095	24,029
	Project Demand	0	100	100	100	100
	Total City Demand	**23,556**	**24,100**	**24,302**	**24,195**	**24,129**
Third Year	**Supply Totals**	23,685	24,179	24,286	24,166	24,139
	Demand (excl. Project)	23,685	24,079	24,186	24,066	24,039
	Project Demand	0	100	100	100	100
	Total City Demand	**23,685**	**24,179**	**24,286**	**24,166**	**24,139**
Fourth Year	**Supply Totals**	**23,814**	**24,257**	**24,269**	**24,138**	**24,149**
	Demand (excl. Project)	23,814	24,157	24,169	24,038	24,049
	Project Demand	0	100	100	100	100
	Total City Demand	**23,814**	**24,257**	**24,269**	**24,138**	**24,149**
Fifth Year	**Supply Totals**	**23,943**	**24,335**	**24,253**	**24,109**	**24,159**
	Demand (excl. Project)	23,943	24,235	24,153	24,009	24,059
	Project Demand	0	100	100	100	100
	Total City Demand	**23,943**	**24,335**	**24,253**	**24,109**	**24,159**

Supply is not broken down between Groundwater and Import as in Normal and Single-Dry Year tables as it would add two additional lines for each of the five years and is anticipated to be split in the same ratio as the Single Dry Year Comparison on the previous table per the City's 2020 UWMP. The BPP could potentially be reduced slightly below assumed 85 percent toward end of five-year dry period. However, Metropolitan supplies have been shown to be reliable per its2020 UWMP and City could purchase more Metropolitan water through MWDOC beyond 15 percent of supply and/or pump above BPP.

It is conservatively assumed that a five consecutive dry year scenario is a repeat of the single-dry year (106 percent of normal demands) for each year per 2020 UWMP. For instance, the 2025 column above assesses supply and demand for FY 2020/21 (First Year) through FY2024/25 (Fifth Year), and so forth so that the Fifth Year in the 2045 column ends in FY 2044/45.

Consistent with the City's 2020 UWMP, groundwater supply is set at 85 percent of total supply with imported water making up the remaining 15 percent, in Table 5.2 and 5.3 for Normal Year and Single-Dry Year Supply and Demand Comparison, respectively, for consistency with the City's 2020 UWMP. It is assumed groundwater to import split would be similar to the preceding two tables with an 85/15 percent split. However, Metropolitan's supply has been shown to be reliable with a substantial surplus, even without potential water supply projects, in all years as shown in its 2020 UWMP. So, during multiple dry years if the BPP were reduced slightly below 85 percent, additional imported water would be available from Metropolitan through MWDOC. Or the City could also pump groundwater beyond the BPP, if necessary. More likely, demand would be reduced in the later years of a drought period as has been demonstrated during the 2014-2016 drought when City demands were reduced (instead of the conservative assumption that demand would be at 106 percent of normal).

6.0 CONCLUSION

In 2019/20, the City's water demand was approximately 21,979 AFY. This total includes non-revenue water or water losses. In response to drought orders and water conservation, water use within the City's service area has decreased from a five-year average of 25,163 AF (FY 2011 to FY 2015) to the last five-year average of 22,272 AF (FY 2016 to FY 2020). During the last five-year period water use ranged from a low of 21,491 to a high of 23,372 AFY.

The total normal year water demand for the Proposed Project is 93.5 AFY for the Site B-2 Hotel and ancillary uses on the Project site, without water losses or non-revenue water, and is projected to require a total supply of 99.4 AFY, allowing for non-revenue water at 5.95 percent of total production, consistent with the City's 2020 UWMP. The 93.5 AFY of demand equates to approximately 167 gallons per day per hotel room, which is a reasonable estimate per industry standards.

These demands were included in the projections utilized in the City's 2020 UWMP, approved by the City Council in June 2021. This assumption is based on the fact that the demand increase due to the Proposed Project is only about 18 percent of the projected incremental increase in Commercial demand of 501 AFY between 2020 and 2030 from the 2020 UWMP. Therefore, this increase allows for the increase due to the Proposed Project, which would come on-line in the sixth year of this ten-year period. Additionally, active and passive conservation is proposed to continue so that existing Commercial demands should decrease allowing for even more incremental increase for new development (than the 501 AFY calculated by subtracting the two values from the 2020 UWMP projections). Additionally, the Harbor Corridor is specifically mentioned in the 2020 UWMP in Section 3.5.2-Projected Land Uses, as planned for hotels to accommodate tourists; and being one of the three categories for future development within the water service area along with other Focus Areas and Accessory Dwelling Units (ADUs).

Existing infrastructure is adequate to provide the estimated water demand to the Project, However, an internal (on-site) fire water system will be constructed to provide adequate firefighting capability to all locations on the parcel, along with potable and irrigation water service laterals, meters and backflow devices.

Since the Proposed Project was a part of the Focus Area A (Harbor Boulevard Development Area), which was included in the land use and water demand projections of the 2020 Water Master Plan Update[27] it can be considered included in these projections.

The Proposed Project's estimated net additional demand of 94 AFY can then be subtracted from the 22,958 AFY projected in the UWMP for year 2030, generating a total 2030 demand without the Proposed Project of 22,864 AFY. It should be noted that the additional net demand for the Proposed Project is approximately 0.4 percent of the total projected Citywide demand at the end of the 20-year planning period required to be analyzed for WSA purposes.

Analysis of water supply projections for the City demonstrates that projected supplies will meet demands through fiscal year 2045. These projections consider water development programs and

[27] City of Garden Grove, *Water Master Plan Update,* West Yost, August 2020.

projects as well as water conservation, as described in the City's 2020 UWMP, June 2021; MWDOC's 2020 UWMP, June 2021; and Metropolitan's 2020 UWMP, June 2021. Metropolitan's 2020 UWMP projects surplus supply conditions in all normal, single dry, and multiple dry year scenarios. The City's groundwater and imported water supplies are anticipated to remain stable based on OCWD, MWDOC and Metropolitan studies and reports.

The City's water supply projection is based on utilizing 85 percent groundwater (normal, single-dry and multiple-dry years) based on an expected average long-term Basin Production Percentage, and its share of imported water is confirmed reliable by Metropolitan. Analysis of normal, single-dry, and multiple-dry year scenarios also demonstrate the City's ability to meet demand during the 20-year planning period.

Additionally, if extraordinary circumstances require, the City can meet its water demand by (1) increasing production of groundwater beyond the BPP up to the basin safe yield, (2) increasing imported water purchases, and/or (3) decreasing demand through water conservation measures, which has proved to be extremely effective in previous drought-declared years.

Reliability of future water supplies to the region will be ensured through continued implementation of the OCWD Groundwater Management Plan, OCWD's Long Term Facilities Plan, local agency programs, and the combined efforts and programs among member and cooperative agencies of Metropolitan. These agencies include all water wholesalers and retailers, the OC San, the Santa Ana Regional Water Quality Control Board, and the Santa Ana Watershed Project Authority.

Collectively, the information included in this WSA identifies a sufficient and reliable water supply for the City, now and into the future, including a sufficient water supply for the Proposed Project.

7.0 REFERENCES

The following documents were used, in conjunction with discussions with the City of Garden Grove staff, in preparing this water supply assessment:

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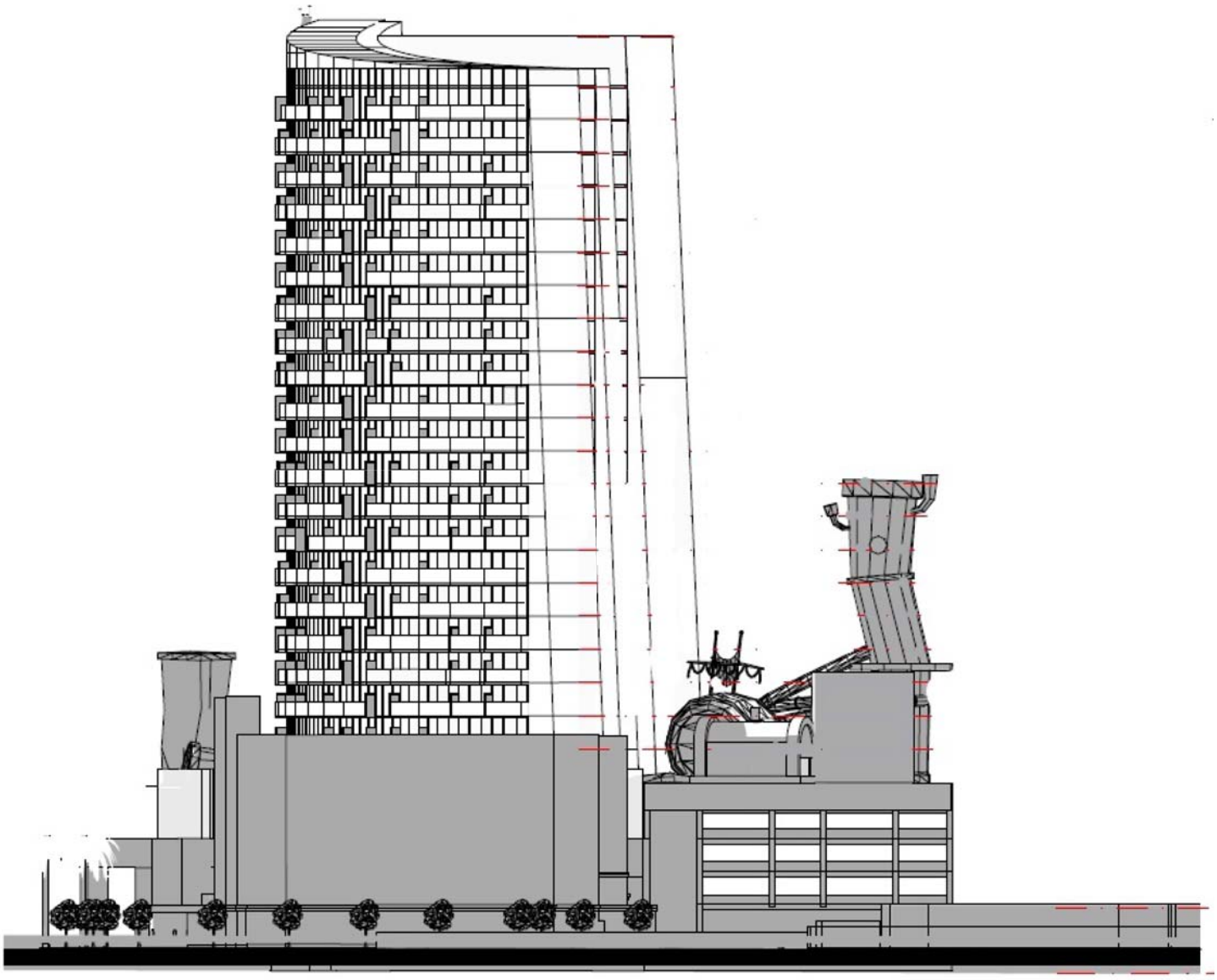
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Appendix H
Noise Impact Study

GARDEN GROVE HOTEL SITE B-2
NOISE IMPACT STUDY
City of Garden Grove



GARDEN GROVE HOTEL SITE B-2
NOISE IMPACT STUDY
City of Garden Grove, California

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

The purpose of this report is to evaluate the potential noise impacts from the proposed Garden Grove Hotel Site B-2 (project) and provide recommendations, if necessary, to minimize any project noise impacts.

The assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000, et seq.) and the standards and methodology follow the City of Garden Grove Municipal Code and General Plan requirements.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- Identification of the regulatory setting and applicable noise standards
- Analysis of the existing noise environment
- Analysis of the project's operational noise impact to adjacent receptors
- Analysis of the project's construction noise and vibration impacts to adjacent sensitive receptors
- Summary of recommended mitigation measures and project design features to reduce noise level impacts.

1.2 Site Location

The project site is located at the northwest corner of Harbor Boulevard and Twintree Avenue, in the City of Garden Grove. The project site is located approximately 110 feet above sea level and the topography is generally flat.

The project site location map is provided in Exhibit A.

Several noise sensitive land uses are present surrounding the project site and include the following:

- Existing residential properties located along Tamerlane Drive immediately adjacent to the western property line of the site.

- Existing residential properties (apartments) located along Tamerlane Drive, immediately adjacent to the northwest property line of the project site.

- Existing residential properties located approximately 55 feet to the south of the project site, along the south side of Twintree Avenue.

- The existing Sheraton Hotel located to the north of the site, approximately 100 feet from the project site to the nearest building façade.

- Harbor Boulevard is immediately east of the project site. Further to the east of the project site is an empty lot which has been approved for development as a hotel.

1.3 Project Description

The project consists of the construction and operation of a 500 room high-rise resort hotel with a 5-level parking garage (4 levels above grade, 1 level below grade) and several on-site guest amenities. The project site is approximately 3.72 acres. The site plan used for this analysis is illustrated in Exhibit B.

Table 1 lists the proposed land uses for the project.

Table 1
Land Use Summary

Project Land Use	CalEEMod Land Use Category	Amount	Metric
Resort Hotel[1]	Hotel	500 379,366[1]	Rooms Square Feet
Parking Structure	Enclosed Parking with Elevator	528 249,480	Spaces Square Feet
Hotel Themed Pool	Recreational Swimming Pool	24,980	Square Feet
Hotel Theater	Movie Theater (No Matinee)	7,039	Square Feet
Food and Beverage	Quality Restaurant	22,296	Square Feet
Spa / Fitness	Health Club	8,532	Square Feet
Total Building Area		**691,693**	**Square Feet**
Total Project Site Area		**3.72**	**Acres**

[1] Resort Hotel land use includes ancillary land uses such as ball rooms/meeting rooms, lobby, studio hall, arcade, amenities, office, back of house retail, retail, and storage.

This report analyzes the short-term noise impacts associated with construction activities and long-term noise impacts associated with the day-to-day operation of the project, including parking lot/structure noise, outdoor speaker noise, pool activity noise. The project will include an outdoor themed pool experience located on the sixth (6th) floor of the building, approximately 60 feet above ground level, and surrounds the building on all sides. The outdoor pool deck will include multiple pools, a lazy river, water slides, outdoor dining, and lounge areas. Water slides will reach up to 100 feet high above the pool deck.

All mechanical equipment, including the HVAC, emergency generators, pool equipment and central plant equipment will be located within the building structure. The project also includes the construction of an eight (8) foot noise barrier wall along the western and northwestern property lines.

1.4 Summary of Analysis Results

Table 2 provides a summary of the noise analysis results, per the CEQA initial checklist. With the implementation of the recommended mitigation measures, the project is would not result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Table 2
CEQA Noise Impact Criteria

Noise Impact Criteria	Potentially Significant	Potentially Significant Unless Mitigated	Less Than Significant Impact	No Impact
Would the project result in?				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		X		
b) Generation of excessive groundborne vibration or groundborne noise levels?			X	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X

1.5 Recommended Mitigations Measures (MM)

The following recommended mitigation measures are provided to help ensure the project's construction noise levels do not adversely impact the adjacent noise sensitive land uses:

Construction Mitigation Measures:

MM-1 Prepare and submit a construction management plan to the City of Garden Grove prior to starting construction. The construction management plan shall ensure all contractors implement construction best management practices to reduce construction noise levels. Best management practices shall include, but not be limited to, the following:

- All construction equipment shall be equipped with mufflers and other suitable noise attenuation devices (e.g., engine shields).
- Where feasible, electric hook-ups shall be provided to avoid the use of generators. If electric service is determined to be infeasible for the site, only whisper-quiet generators shall be used (i.e., inverter generators capable of providing variable load.)
- Use electric air compressors and similar power tools rather than diesel equipment, where feasible.
- Locate staging area, generators areas, and stationary construction equipment as far from the adjacent residential homes, as feasible.
- Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.
- Provide notifications and signage in readily visible locations along the perimeter of construction sites that indicate the dates and duration of construction activities, as well as provide a telephone number where neighbors can inquire about the construction process and register complaints to a designated construction noise disturbance coordinator.

- All construction activities shall take place during daytime hours, between 7:00 a.m. to 8:00 p.m., per the requirements of the City of Garden Grove conditions of approval.

- No impact pile driving or blasting activities shall be permitted on the project site during construction.

MM-2 Construct the eight (8) foot high masonry block noise barrier wall along the western and northwestern property lines during the first phase of construction, prior to performing any excavation or grading activities.

MM-3 Install a temporary noise barrier wall along the northern and southern property lines of the project site to shield adjacent sensitive receptors from construction noise. The temporary barrier should be installed at the first phase of construction, prior to performing any excavation or grading activities and shall remain till the construction is completed. The temporary noise barrier shall be a minimum of six (6) feet high and present a solid face area such as by installing sound absorptive material or blankets which can be installed in multiple layers for improved noise insulation.

1.6 Project Design Features (DF)

The following project design features include standard rules and requirements, best practices and recognized design features for reducing noise levels. Design features are assumed to be part of the conditions of approval for the project and are integrated into the project design.

DF-1 The project must install an eight (8) foot high masonry block noise barrier wall along the western and northwestern property line. The property line wall will be constructed using masonry block and the barrier's weight must be at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) must be filled with grout or caulking to avoid flanking.

DF-2 All central plant HVAC equipment, mechanical pumps and pool equipment must be fully enclosed inside the building structure.

DF-3 The hotel themed pool attraction and outdoor pool deck operation will be open only during daytime hours (7 a.m. – 10 p.m.).

DF-4 A minimum (8) foot high noise barrier shielding wall should be installed and maintained along all sides of the perimeter of the outdoor patio and pool deck area on level six (6) to shield noise associated with pool activities. The barrier's weight should be at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) should be filled with grout or caulking to avoid flanking. Noise control barrier may be constructed using one, or any combination of the following materials:

- Masonry block;
- Stucco veneer over wood framing (or foam core), or 1-inch thick tongue and groove wood of sufficient weight per square foot;
- Transparent glass (5/8 inch thick), acrylic, polycarbonate, or other transparent material with sufficient weight per square foot.

DF-5 The project should provide one row of vegetation along the north, west, and south sides of the interior pool deck wall on level six (6) by planting evergreen trees/shrubs. A dense vegetation barrier can help provide some sound absorption and visual screening to further help reduce noise levels impacting the adjacent residential homes surrounding the project site. Vegetation should be at least as high as the wall (8 feet).

DF-6 Outdoor speakers on the pool deck must be predominantly located and concealed within the landscape. All outdoor speakers must be located not greater than eight (8) feet high above the pool deck and directed inwards towards the pool or lazy river area.

DF-7 The project access on Twintree Avenue must be restricted to emergency access, maintenance vehicles, trash, and delivery trucks only. All employee and guest access to the site, including tourist buses and shuttles, must be via Harbor Boulevard.

DF-8 Delivery, loading/unloading activity, and trash pick-up hours shall be limited to daytime hours (7 a.m. – 10 p.m.) only, per the requirements of Garden Grove Municipal Code Section 8.47.060(I). Signage should be posted in the designated loading areas reflecting these hour restrictions.

DF-9 Engine idling time for all delivery vehicles and trucks must be limited to 5 minutes or less. Signage should be posted in the designated loading areas reflecting the idling restrictions.

DF-10 A 4-foot high noise shielding wall must be installed on the perimeter of each floor of the parking structure facing the residential neighborhood to the west, north and south.

DF-11 The drive aisle surfaces within the parking structure must have a textured finish or treatment that helps minimize tire squeal.

DF-12 The exterior façade of the parking structure must include louvered or perforated wall paneling to help conceal parking structure activities and reduce noise levels. Paneling should cover the entire upper portions of the parking structure openings of each floor facing the west, north and south.

DF-13 The project must comply with the California Title 24 Sound Transmissions requirements for exterior walls, roofs and common separating assemblies (e.g. floor/ceiling assemblies and demising walls).

a. Walls, partitions, and floor-ceiling assemblies separating sleeping units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50, or not less than 45 if field tested.

b. Floor-ceiling assemblies between sleeping units shall have an impact insulation class (IIC) rating of not less than 50, or not less than 45 if field tested.

c. Interior noise levels due to exterior sources shall not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

DF-14 For proper acoustical performance, the project must utilize standard building practices to ensure all exterior windows, doors, and sliding glass doors have a positive seal and leaks/cracks are kept to a minimum.

2.0 Fundamentals of Noise

This section of the report provides basic information about noise and vibration and presents some of the terms used in the report.

2.1 Sound, Noise, and Acoustics

The sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. The sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases, as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (μPa). One μPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels and abbreviated as dB.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two (2) sounds of equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3dB increase.

If two (2) sounds differ by approximately 10 dB the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels[1]

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, (A-weighted scale) and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighing is typically reported in terms of A-weighted decibel (dBA). Typically, the human ear can barely perceive the change in the noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway), would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant, while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels. Following are the most commonly used noise descriptors along with brief definitions.

A-Weighted Sound Level

The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high-frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level

The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

[1] Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

Community Noise Equivalent Level (CNEL)

The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB)

A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A)

A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ)

The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room

Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms, and similar spaces.

L(n)

The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly, L50, L90, and L99, etc.

Noise

Any unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Percent Noise Levels

See L(n).

Sound Level (Noise Level)

The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter

An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL)

The dBA level which, if it lasted for one (1) second, would produce the same A-weighted sound energy as the actual event.

2.7 Sound Propagation

As sound propagates from a source it spreads geometrically. The sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

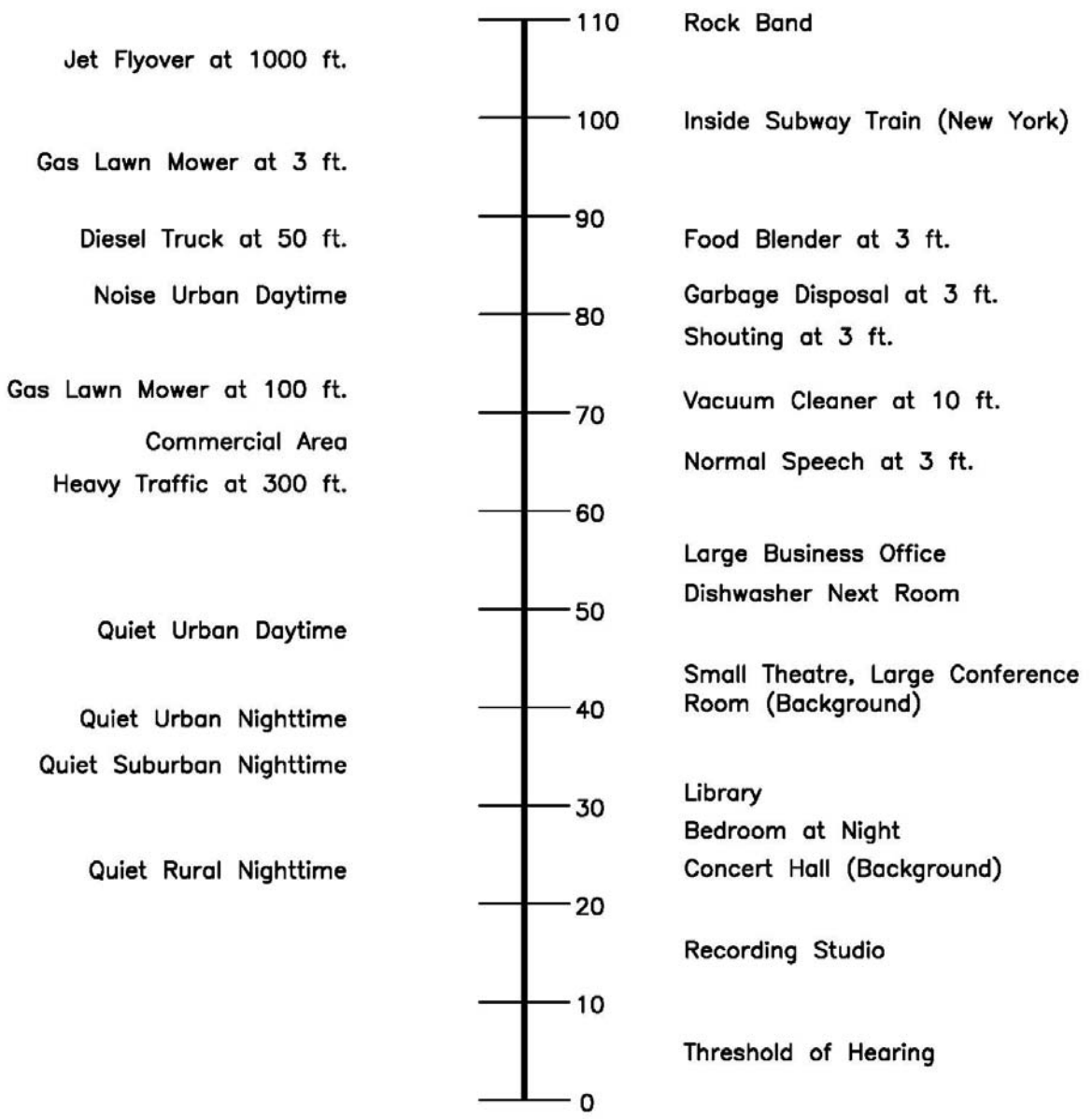
As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use the hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at an additional rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 6.0 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet and greater from a noise source. Wind, temperature, air humidity, and turbulence can further impact how far sound can travel.

Figure 1 shows typical sound levels from indoor and outdoor noise sources.

Figure 1[2]

TYPICAL SOUND LEVELS FROM
INDOOR AND OUTDOOR NOISE SOURCES



[2] Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

2.8 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV

Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS

Known as the root mean squared (RMS) can be used to denote vibration amplitude.

VdB

A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

2.9 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts.

2.10 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

2.11 Construction Related Vibration Level Prediction[3]

Operational activities are separated into two different categories. The vibration can be transient or continuous in nature. Each category can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the project area site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. The thresholds from Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, in the table below provide general guidelines as to the maximum vibration limits for when vibration becomes potentially annoying.

[3] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020

Table 3
Vibration Annoyance Potential Criteria

Human Response	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts. The table below provides general vibration damage potential thresholds:

Table 4
Vibration Damage Potential Threshold Criteria

Structure and Condition	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings ruin ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Soil conditions have an impact on how vibration propagates through the ground. The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides suggested "n" values based on soil class. The table below outlines the manual's suggested values and description.

Table 5
Suggested "n" Values Based on Soil Classes

Soil Class	Description of Soil Material	Suggested Value of "n"
I	Weak or soft soils: loose soils, dry or partially saturated peat and muck, mud, loose beach sand, and dune sand.	1.4
II	Most sands, sandy clays, silty clays, gravel, silts, weathered rock.	1.3
III	Hard soils: densely compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock.	1.1
IV	Hard, component rock: bedrock, freshly exposed hard rock.	1.0

3.0 Regulatory Setting

The project is located in the City of Garden Grove and will be evaluated pursuant to applicable noise regulations adopted by various federal, state, and local government agencies. These agencies are discussed below.

3.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three (3) purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was originally tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers.

The Federal government and the State advocate that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

3.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regulatory tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix." The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as a part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Noise insulation design standards have been established by the State of California Uniform Building Code (UBC) Chapter 12, Division II and by the Title 24 noise insulation standards of the California Administrative Code. The City may enact stricter noise standards throughout the City or on a case-by-case basis if deemed necessary. In brief, the Title 24 noise standards require the following for allowable interior noise levels:

1. Walls, partitions, and floor-ceiling assemblies separating sleeping units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50, or not less than 45 if field tested.

2. Floor-ceiling assemblies between sleeping units shall have an impact insulation class (IIC) rating of not less than 50, or not less than 45 if field tested.

3. Interior noise levels due to exterior sources shall not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

3.3 City of Garden Grove Noise Regulations

The project is required to comply with the noise standards and thresholds established in the City of Garden Grove General Plan and Municipal Code.

3.3.1 City of Garden Grove General Plan

The City of Garden Grove establishes planning criteria for determining a development's noise/land use compatibility based on the community noise equivalent level (CNEL).

Table 6 summarizes the City's Noise/Land Use Compatibility guidelines for land uses applicable to this project:

Table 6
Noise/Land Use Compatibility Guidelines

Land Use	Noise Limit (CNEL)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Transient Lodging - Motel, Hotels	50 - 65	60 – 70	70 – 80	>80

Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable: New construction or development should generally not be undertaken.

3.3.2 City of Garden Grove Municipal Code Noise Standards

The City of Garden Grove Municipal Code Noise Ordinance requires that a project shall not create loud, unnecessary, or unusual noise that disturbs the peace or quiet of any neighborhood, or that causes discomfort or annoyance to any person of normal sensitiveness. Noise standards are defined in Chapter 8.47 Noise Control of the Municipal Code and are applicable to the project site and surrounding noise sensitive uses.

Table 7 shows the exterior noise standards from the City of Garden Grove Municipal Code Chapter 8.47 Noise Control Section 8.47.040 Ambient Base Noise Levels for the project site and surrounding land uses.

Table 7
City of Garden Grove Municipal Code Exterior Noise Standards

Use Categories	Exterior Noise Standard	Time Period
Residential Use	55 dB (A)	7:00 AM – 10:00 PM
	50 dB (A)	10:00 PM – 7:00 AM
Hotel & Motels	65 dB (A)	Any Time

It shall be unlawful for any person at any location to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level:

1. The noise standard for a cumulative period of more than 30 minutes in any hour;

2. The noise standard plus 5 dB for a cumulative period of more than 15 minutes in any hour;

3. The noise standard plus 10 dB for a cumulative period of more than 5 minutes in any hour;

4. The noise standard plus 15 dB for a cumulative period of more than 1 minute in any hour;

5. The noise standard plus 20 dB for any period of time.

3.3.3 Construction Noise Regulation

Construction and grading shall comply with the noise limitation provisions set forth in the City of Garden Grove's Noise Ordinance, Garden Grove Municipal Code Sections 8.47.040 to 8.47.060, except that permitted hours and days of construction and grading shall be as follows:

- Monday through Saturday - not before 7:00 a.m. and not after 8:00 p.m. (of the same day).

- Sunday and Federal Holidays – may work the same hours, but be subject to the restrictions as stipulated in Sections 8.47.040 to 8.47.060 of the Municipal Code.

4.0 Study Method and Procedures

The following section describes the measurement procedures, measurement locations, and noise modeling procedures and assumptions used in the noise analysis.

4.1 Measurement Procedures and Criteria

Generally, noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

RK conducted the sound level measurements in accordance with Caltrans technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters.

A Piccolo-II Type 2 integrating-averaging level meter was used to conduct long-term (24-hour) noise measurements at the project site and property boundaries.

The Leq, Lmin, Lmax, L2, L8, L25, and L50 statistical data were recorded over the measurement time period intervals and the information was utilized to define the noise characteristics for the project. The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed approximately five (5) feet above the ground.
- Sound level meters were calibrated before and after each measurement.
- Following the calibration of equipment, a windscreen was placed over the microphone.
- Frequency weighting was set on "A" and slow response.
- Results of the noise measurements were recorded on field data sheets.
- Temperature and sky conditions were observed and documented.

Appendix B includes photos, field sheets, and measured noise data.

4.2 Stationary Noise Modeling

The proposed on-site stationary noise sources were analyzed using SoundPLAN™ noise modeling software. SoundPLAN™ is a standards-based program that incorporates more than twenty national and international noise modeling guidelines. This project includes both parking lot noise and stationary noise sources which are classified under industrial sources.

Projected noise levels from SoundPLAN™ are based on the following key parameters:

- Developing three-dimensional noise models of the project,
- Predicting the project noise levels at the selected community locations and
- Comparing the predicted noise with the existing community ambient noise levels at the receptor locations.

The sides of the buildings, walls, etc. were modeled as reflective surfaces and also as diffractive bodies. The noise sources are shown as red spheres (point sources) and red surfaces (area sources). A light blue line outlines the perimeter of each operation. The surrounding roads are displayed as grey surfaces.

Most of the ground within the project site and adjacent areas are covered with paved surfaces and field grass and were analyzed as a hard site to be conservative (Ground Factor=0). The Effective Flow Resistivity for field grass is SoundPLAN default. The elevation profile for the project site is derived from Google Earth and all the receptors were placed at 5 foot above the ground level, as is standard practice.

To estimate the future noise levels during typical operational conditions, referenced noise levels are input into SoundPLAN and projected to the nearest sensitive receptor locations. Referenced noise levels represent similar noise sources operating under similar conditions as would be found on the project site. Adjusted noise levels are based on the distance of the receptor location relative to the noise source, local topography and physical barriers including buildings and sound walls.

Sound Power and Sound Pressure Level

Sound power level is the acoustic energy emitted by a source which produces a sound pressure level at some distance. While the sound power level of a source is fixed, the sound

pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located.

SoundPLAN requires that the source noise level be input using sound power level and which must be back calculated based on a measured sound pressure level. The sound power level is calculated using SoundPLAN software by calibrating the source noise level to equal the sound pressure level at an equal distance from the source in which the referenced measurement was taken.

4.2.1 Parking Structure Noise

Parking structure noise would occur from vehicles and trucks entering and exiting the site, idling, exhaust, loading and delivery activities, doors slamming, tires squealing, people talking, and the occasional horn honking. Parking structure noise is assessed by using referenced noise levels collected by RK.

Table 8 indicates the referenced noise levels for the parking structure. The noise measurement data indicates the distance the microphone was placed from the noise source and the statistical data.

Table 8
Parking Structure Referenced Noise Levels[1]

Source[1]	Distance from Source (feet)	Noise Levels (dBA)
		L_{eq}
Parking Structure	10.0	59.0

[1] Referenced noise levels measured by RK over a 10-minute period.

The noise study assumes that the parking activities will occur continuously during both daytime and nighttime hours, when in reality they will likely only occur intermittently throughout daily operations.

4.2.2 Hotel Themed Pool Deck Noise

Noise would occur from the outdoor themed pool and pool deck area on level six (6) of the hotel building, approximately 60 feet above ground level, and surrounds the building on all sides. The themed pool will include attractions such as pools, slides, a lazy river, lounge areas, and food and beverage service. The maximum height of the main water slide on the western side of the pool deck will reach 100 feet high above pool deck level and is located approximately 25 feet from the western edge of the pool deck. The slide will be enclosed with

internal stairs and enclosed tunnel slides. Noise from the slide would mainly include patrons screaming as they exit the slide at the bottom and splash into the pool. The themed pool noise is assessed by using the reference noise levels within the SoundPLAN emissions library. Table 9 indicates the referenced noise levels for on-site hotel themed pool deck. The SoundPLAN reference noise level sheet is shown in Appendix C.

Table 9
Hotel Themed Pool Deck Referenced Noise Levels[1]

Source[1]	Noise Levels (dBA) L_{eq}
Pool Deck	88.0 dBA
Outdoor Speakers	82.0 dBA
Water Slides	89.0 dBA

[1] Referenced noise levels from SoundPLAN.

According to the applicant, the Hotel Themed Pool will be open during daytime hours (7 a.m. to 10 p.m.) only, and therefore the noise study does not analyze nighttime noise impacts associated from the Hotel Themed Pool.

4.2.3 Loading Dock Noise

Typical noise associated with loading dock activities would include engine noise from delivery trucks, lift gate operation, backup alarms, load drops, forklifts/pallet jacks, and personnel. Loading dock activity would occur near the northwestern corner of the project site and is assessed by using the referenced noise levels within the SoundPLAN emissions library. Table 10 indicates the referenced noise levels for on-site loading deck. The SoundPLAN reference noise level sheet is shown in Appendix C.

Table 10
Loading Dock Referenced Noise Levels[1]

Source	Noise Levels (dBA) L_{eq}
Loading Dock	80.0

[1] Referenced noise levels from SoundPLAN.

The noise study assumed that the loading dock area will be in operation continuously during daytime hours (7 a.m. to 10 p.m.) only. The loading dock will be prohibited from operating

during nighttime hours (10 p.m. to 7 a.m.), per Garden Grove Municipal Code Section 8.47.060(I).

4.3 Construction Noise Modeling

The construction noise analysis utilized the Federal Highway Administration (FHWA) Roadway Construction Noise Model, together with several key construction parameters. Key inputs include distance to the sensitive receptor, equipment usage, and baseline parameters for the project site. This study evaluates the potential exterior noise impacts during each phase of construction. Noise levels were projected at an average distance of 100 feet for equipment operating over an 8-hour period to the nearest sensitive receptor property line. While some construction noise activity may occur closer than 100 feet from the property line, not all equipment will be operating full-time along the property lines, and the use of an average equipment distance is common industry practice.

- Construction phasing and equipment usage assumptions are referenced from the Garden Grove Hotel Site B-2 Air Quality and GHG Impact Study, April 2022, RK Engineering Group.

4.4 Construction Vibration Modeling

The construction vibration assessment is based on the methodology set-forth within the Caltrans Transportation and Construction Induced Vibration Guidance Manual. The vibration impacts from vibratory rollers and compactors, heavy truck loading and bulldozer activities are analyzed. All vibratory activity is analyzed as a continuous and/or frequent event and is required to comply with the applicable guidance thresholds criteria. It is expected that vibration levels will be highest during paving phase. According to the applicant, no impact pile driving is expected as part of this project.

Vibratory impacts were calculated from the site area property line to the closest sensitive receptors and structures using the reference vibration levels, soil conditions and the reference equation *PPV= PPV ref (25/D)^n (in/sec)* (from Caltrans Manual) where:

PPV = reference measurement at 25 feet from vibration source
D = distance from equipment to property line
n= vibration attenuation rate through ground (n=1.1 was utilized for this study)

5.0 Existing Noise Environment

The existing noise environment for the project site and surrounding areas has been established based on noise measurement data collected by RK. Noise measurement data indicates that the ambient noise environment is primarily influenced by traffic noise propagating from Harbor Boulevard, as well as activities from the surrounding properties.

5.1 Long-Term (24-Hour) Noise Measurement Results

To determine the existing noise level environment, RK conducted two (2) 24-hour noise measurements at the project study area.

Noise levels were measured on June 16, 2021 using a Piccolo-II Type 2 integrating-averaging sound level meter. The information was utilized to establish the noise characteristics of the existing ambient environment. Noise measurements were conducted during the COVID pandemic, which may have resulted in slightly lower ambient noise levels due to the lower-than-average traffic volume along surrounding roadways. As a result, the noise analysis is conservative as it considers a quieter baseline against which project impacts are compared.

The noise monitoring locations were selected based on the proximity and location to adjacent sensitive receptors. Exhibit C graphically illustrates the location of the long-term measurements.

- Long-term noise monitoring location one (LT-1) was taken at approximately 25 feet from the southern property line and approximately 105 feet from the western property line of the project site.

- Long-term noise monitoring location two (LT-2) was taken along the western property line of the project site, approximately 180 feet from the southern property line.

Long term noise monitoring locations represent the existing noise levels near the adjacent noise sensitive land uses. Long-term noise measurement results are summarized in Tables 11 and 12.

Exhibit C shows the noise monitoring locations.

Appendix B includes photographs, field sheets and measured noise data.

Table 11
24 Noise Measurement Results LT-1[1]

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	54.0	12:00 PM	58.8
1:00 AM	66.8	1:00 PM	55.7
2:00 AM	53.6	2:00 PM	55.9
3:00 AM	52.4	3:00 PM	56.6
4:00 AM	55.2	4:00 PM	57.5
5:00 AM	59.9	5:00 PM	57.3
6:00 AM	62.3	6:00 PM	60.2
7:00 AM	63.0	7:00 PM	59.6
8:00 AM	57.5	8:00 PM	58.2
9:00 AM	58.3	9:00 PM	57.3
10:00 AM	61.2	10:00 PM	56.4
11:00 AM	54.0	11:00 PM	56.4
24-Hour CNEL			66.6

[1] LT-1 was recorded on 06/16/2021.

Table 12
24 Noise Measurement Results, LT-2[1]

Time	Leq (dBA)	Time	Leq (dBA)
12:00 AM	49.1	12:00 PM	55.0
1:00 AM	64.6	1:00 PM	54.2
2:00 AM	51.3	2:00 PM	53.4
3:00 AM	49.5	3:00 PM	53.8
4:00 AM	50.3	4:00 PM	55.3
5:00 AM	55.3	5:00 PM	56.0
6:00 AM	56.8	6:00 PM	56.8
7:00 AM	56.2	7:00 PM	55.8
8:00 AM	54.8	8:00 PM	54.0
9:00 AM	55.4	9:00 PM	53.7
10:00 AM	54.2	10:00 PM	52.7
11:00 AM	53.1	11:00 PM	52.6
24-Hour CNEL			**63.3**

[1] LT-2 was recorded on 06/16/2021.

6.0 Operational Noise Impacts

This assessment analyzes the anticipated noise levels generated by the project and impacts caused by changes to the ambient environment. The main sources of noise generated by the project would include on-site operational activities from vehicular traffic noise circulating within the parking structure, loading dock noise, and outdoor noise from the rooftop themed pool experience. Noise level impacts are compared to the City of Garden Grove noise standards.

The project must demonstrate that noise levels generated by the project site would not be in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

6.1 Stationary Source Noise Impacts

On-site stationary noise impacts are assessed at the surrounding sensitive receptors surrounding the project site. Project operational activities are analyzed for long-term noise impacts associated with the day-to-day operation of the project.

The noise analysis takes into account the eight (8) foot high noise barrier wall along the western property line and northwestern property line included in the project's design.

Daytime Stationary Source Noise Impacts

The daytime noise analysis considers all project noise sources operating simultaneously during daytime (7 a.m. to 10 p.m.) hours at the nearest adjacent property lines.

The daytime noise standard for all surrounding residential land uses is 55 dBA. The noise standard for the adjacent hotel land use is 65 dBA.

The results of the daytime noise impact analysis are shown in the Table 13 and are graphically illustrated on Exhibit E.

Noise levels generated by the project are not expected to exceed the City's daytime noise standards at the adjacent property lines.

The change in existing ambient daytime noise levels as a result of the project would range from approximately 0.2 dBA to 1.1 dBA during daytime hours.

The FHWA Highway Traffic Noise Analysis and Abatement Policy and Guidance indicates that a change in noise level of 3 dBA is considered barely perceptible and a change in noise level of 5 dBA is considered readily perceptible to the human ear. Therefore, for purposes of this analysis, and consistent with common practice in the City of Garden Grove, the following threshold of significance is utilized:

1) An individual stationary noise source exceeds the City's noise criteria, without the combined effect of existing ambient noise, or

2) The existing ambient noise level is below the City's noise level criteria and the combined effect of stationary noise results in a 3 dBA increase or more, or

3) The existing ambient noise level is above the City's noise level criteria and the combined effect of stationary noise results in a 3 dB increase or more.

Hence, the project is not expected to cause a significant permanent increase in noise.

Nighttime Stationary Source Noise Impacts

The nighttime noise analysis considers all project noise sources operating simultaneously during nighttime hours (10 p.m. to 7 a.m.) at the nearest adjacent property lines. In accordance with the project description and Garden Grove Municipal Code requirements, pool deck operations and loading/delivery activity will be prohibited during nighttime hours. Hence, these noise sources are not included in the analysis of nighttime noise impacts.

The nighttime noise standard for all surrounding residential land uses is 50 dBA. The noise standard for the adjacent hotel land use is 65 dBA.

The results of the nighttime noise impact analysis are shown in the Tables 14 and are graphically illustrated on Exhibit F.

Noise levels generated by the project are not expected to exceed the City's nighttime noise standards at the adjacent property lines.

The change in existing ambient nighttime noise levels as a result of the project would range from approximately 0.2 dBA to 1.3 dBA during nighttime hours.

As described above, for purposes of this analysis, and consistent with common practice in the City of Garden Grove, the following threshold of significance is utilized:

1) An individual stationary noise source exceeds the City's noise criteria, without the combined effect of existing ambient noise, or

2) The existing ambient noise level is below the City's noise level criteria and the combined effect of stationary noise results in a 3 dBA increase or more, or

3) The existing ambient noise level is above the City's noise level criteria and the combined effect of stationary noise results in a 3 dB increase or more.

Hence, the project is not expected to cause a significant permanent increase in noise.

TABLE 13

Garden Grove Site B-2 Hotel
Daytime Noise Impact Analysis (dBA)

Receptor Land Use	Location	Daytime Exterior Noise Level dBA						
		Project Noise Contribution (Leq)	City of Garden Grove Noise Level Criteria (Leq)	Noise Level Exceeds Standard (?)	Existing Hourly Ambient Measurement (Leq)[1]	Combined Noise Level Existing Plus Project (Leq)	Change in Noise Level as a Result of Project (dBA)[2]	Significant Impact (?)
Hotel	North	40.1	65.0	No	54.0	54.2	0.2	No
Residential	Northwest	48.7	55.0	No	54.0	55.1	1.1	No
Residential	South	45.4		No	52.7	53.4	0.7	No
Residential	South	43.3		No	52.7	53.2	0.5	No
Residential	West	42.6		No	54.0	54.3	0.3	No
Residential	West	42.8		No	54.0	54.3	0.3	No
Residential	West	45.6		No	54.0	54.6	0.6	No

[1] Lowest Daytime Measured Leq

[2] A significant impact would result if any of the following occur;

1) An individual stationary noise source exceeds the City's noise criteria, without the combined effect of existing ambient noise, or

2) The existing ambient noise level is below the City's noise level criteria and the combined effect of stationary noise results in a 3 dBA increase or more, or

3) The existing ambient noise level is above the City's noise level criteria and the combined effect of stationary noise results in a 3 dB increase or more.

TABLE 14

Garden Grove Site B-2 Hotel
Nighttime Noise Impact Analysis (dBA)

Receptor Land Use	Location	Nighttime Exterior Noise Level dBA						
		Project Noise Contribution (Leq)	City of Garden Grove Noise Level Criteria (Leq)	Noise Level Exceeds Standard (?)	Existing Hourly Ambient Measurement (Leq)[1]	Combined Noise Level Existing Plus Project (Leq)	Change in Noise Level as a Result of Project (dBA)[2]	Significant Impact (?)
Hotel	North	39.4	65.0	No	52.4	52.6	0.2	No
Residential	Northwest	47.6	50.0	No	52.4	53.6	1.2	No
Residential	South	44.6		No	49.1	50.4	1.3	No
Residential	South	41.8		No	49.1	49.8	0.7	No
Residential	West	42.0		No	52.4	52.8	0.4	No
Residential	West	41.9		No	52.4	52.8	0.4	No
Residential	West	43.8		No	52.4	53.0	0.6	No

[1] Lowest Nighttime Measured Leq

[2] A significant impact would result if any of the following occur;

1) An individual stationary noise source exceeds the City's noise criteria, without the combined effect of existing ambient noise, or

2) The existing ambient noise level is below the City's noise level criteria and the combined effect of stationary noise results in a 3 dBA increase or more, or

3) The existing ambient noise level is above the City's noise level criteria and the combined effect of stationary noise results in a 3 dB increase or more.

Future Roadway Noise Levels

The project is not expected to cause a substantial increase in ambient noise levels in the vicinity of the site as a result of increased traffic volume along adjacent roadways.

Typically, it takes a doubling of traffic volume along a roadway to cause a significant increase in ambient noise levels of more than 3 dBA. The project is expected to generate approximately 5,122 average daily trips (ADT). The current ADT along Harbor Boulevard is approximately 27,585. Hence, the project will not double the amount of traffic volume along Harbor Boulevard and would therefore not cause a significant increase in roadway noise.

The project is also restricting access to the site along Twintree Avenue to emergency vehicles, maintenance, and trash/delivery trucks. The project would not cause a doubling of traffic along Twintree Avenue. Daily truck deliveries are expected to be less than 20 trucks per day whereas existing ADT along Twintree Avenue, west of Harbor Boulevard, is approximately 2,000 vehicles per day. Therefore, the project's traffic noise contribution to Twintree Avenue will be less than significant and would not cause a significant increase in roadway noise.

6.3 Noise/Land Use Compatibility

The project's noise/land use compatibility setting is reviewed to determine future noise levels to exterior and interior areas on the project site. This section of the analysis is intended to satisfy the City of Garden Grove General Plan Noise Element Objectives and Policies which helps ensure hotel operations can meet the required Building Code Noise Insulation Standards.

The project's noise/land use compatibility is not typically considered within the scope of CEQA, as recent court rulings have indicated that CEQA is primarily concerned with the project's impact on the environment, not the environment's impact on a project.

Based on the City of Garden Grove General Plan Chapter 7 – Noise Element, Exhibit N-1B, the project site is expected to experience future noise levels ranging from 60 dBA to 70 dBA CNEL and falls within normally acceptable to conditionally accepted noise and land use zone.

The City's future noise level projections are consistent with the existing ambient noise levels measured on the site which range from 63.3 to 66.6 dBA CNEL.

Table 15 shows the future traffic noise levels impacting the project site.

Table 15
Future Noise Levels[1]

Roadway	Land Use Category	Exterior Noise Level (dBA CNEL)[2]	Noise and Land Use Compatibility
Harbor Boulevard	Transient Lodging - Motel, Hotels	60 - 70	Normally Acceptable to Conditionally Accepted

[1] Source: City of Garden Grove General Plan - Noise Element, Future Noise Contours.
[2] Does not include noise reduction from property line wall.

The project will be required to demonstrate compliance with the interior noise standards in order to be considered compatible with the proposed land use. Interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

Project Design Features (DF)

The following recommended project design features include standard rules and requirements, best practices and recognized design features for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into its design.

DF-1 The project must install an eight (8) foot high masonry block noise barrier wall along the western and northwestern property line. The property line wall will be constructed using masonry block and the barrier's weight must be at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) must be filled with grout or caulking to avoid flanking.

DF-2 All central plant HVAC equipment, mechanical pumps and pool equipment must be fully enclosed inside the building structure.

DF-3 The hotel themed pool attraction and outdoor pool deck operation will be open only during daytime hours (7 a.m. – 10 p.m.).

DF-4 A minimum (8) foot high noise barrier shielding wall should be installed and maintained along all sides of the perimeter of the outdoor patio and pool deck area on level six (6) to shield noise associated with pool activities. The

barrier's weight should be at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) should be filled with grout or caulking to avoid flanking. Noise control barrier may be constructed using one, or any combination of the following materials:

- Masonry block;
- Stucco veneer over wood framing (or foam core), or 1-inch thick tongue and groove wood of sufficient weight per square foot;
- Transparent glass (5/8 inch thick), acrylic, polycarbonate, or other transparent material with sufficient weight per square foot.

DF-5 The project should provide one row of vegetation along the north, west, and south sides of the interior pool deck wall on level six (6) by planting evergreen trees/shrubs. A dense vegetation barrier can help provide some sound absorption and visual screening to further help reduce noise levels impacting the adjacent residential homes surrounding the project site. Vegetation should be at least as high as the wall (8 feet).

DF-6 Outdoor speakers on the pool deck must be predominantly located and concealed within the landscape. All outdoor speakers must be located not greater than eight (8) feet high above the pool deck and directed inwards towards the pool or lazy river area.

DF-7 The project access on Twintree Avenue must be restricted to emergency access, maintenance vehicles, trash, and delivery trucks only. All employee and guest access to the site, including tourist buses and shuttles, must be via Harbor Boulevard.

DF-8 Delivery, loading/unloading activity, and trash pick-up hours shall be limited to daytime hours (7 a.m. – 10 p.m.) only, per the requirements of Garden Grove Municipal Code Section 8.47.060(I). Signage should be posted in the designated loading areas reflecting these hour restrictions.

DF-9 Engine idling time for all delivery vehicles and trucks must be limited to 5 minutes or less. Signage should be posted in the designated loading areas reflecting the idling restrictions.

DF-10 A 4-foot high noise shielding wall must be installed on the perimeter of each floor of the parking structure facing the residential neighborhood to the west, north and south.

DF-11 The drive aisle surfaces within the parking structure must have a textured finish or treatment that helps minimize tire squeal.

DF-12 The exterior façade of the parking structure must include louvered or perforated wall paneling to help conceal parking structure activities and reduce noise levels. Paneling should cover the entire upper portions of the parking structure openings of each floor facing the west, north and south.

DF-13 The project must comply with the California Title 24 Sound Transmissions requirements for exterior walls, roofs and common separating assemblies (e.g. floor/ceiling assemblies and demising walls).

a. Walls, partitions, and floor-ceiling assemblies separating sleeping units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50, or not less than 45 if field tested.

b. Floor-ceiling assemblies between sleeping units shall have an impact insulation class (IIC) rating of not less than 50, or not less than 45 if field tested.

c. Interior noise levels due to exterior sources shall not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

DF-14 For proper acoustical performance, the project must utilize standard building practices to ensure all exterior windows, doors, and sliding glass doors have a positive seal and leaks/cracks are kept to a minimum.

7.0 Construction Noise and Vibration Impacts

Temporary construction noise and vibration impacts have been assessed from the project site to the surrounding adjacent land uses. The degree of construction noise will vary depending on the type of construction activity taking place and the location of the activity relative to the surrounding properties.

Construction and grading shall comply with the noise limitation provisions set forth in the City of Garden Grove's Noise Ordinance, Garden Grove Municipal Code Sections 8.47.040 to 8.47.060, except that permitted hours and days of construction and grading shall be as follows:

- Monday through Saturday - not before 7:00 a.m. and not after 8:00 p.m. (of the same day).

- Sunday and Federal Holidays – may work the same hours, but be subject to the restrictions as stipulated in Sections 8.47.040 to 8.47.060 of the Municipal Code.

Although construction activity between the hours of 8:00 p.m. and 7:00 a.m. is exempt from the noise standards in the City's Municipal Code, CEQA requires that potential noise impacts still be disclosed for informational purposes. For purposes of this analysis, the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (2006) criteria will be used. The FTA provides reasonable criteria for assessing construction noise impacts based on the potential for adverse community reaction. For residential uses, the daytime noise threshold is 80 dBA Leq for an 8-hour period. Mitigation Measure MM-1 requires that all construction activity shall occur during the daytime hours (7 a.m. to 8 p.m.) only. Hence, nighttime construction is prohibited.

7.1 Typical Construction Noise Levels

Table 16 shows typical construction noise levels compiled by the Environmental Protection Agency (EPA) for common types of construction equipment. Typical construction noise levels are used to estimate potential project construction noise levels at the adjacent sensitive receptors.

Table 16
Typical Construction Noise Levels[1]

Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86
Impact Equipment	
Pneumatic Wrenches	82 - 87
Jack Hammers, Rock Drills	80 - 99
Pile Drivers (Peak)	95-105
Other	
Vibrators	68 - 82
Saws	71 - 82

[1] Referenced Noise Levels from the Environmental Protection Agency (EPA)

7.2 Construction Noise Impact Analysis

This assessment analyzes potential noise impacts during all expected phases of construction, including site preparation, grading, building construction, paving, and architectural coating. Noise levels are calculated based on an average distance of equipment over an 8-hour period to the nearest adjacent property. The project's estimated construction noise levels have been calculated using the Federal Highway Administration Roadway Construction Noise Model Version 1.1. Table 17 shows the noise level impacts at 100 feet Construction noise calculation worksheets are provided in Appendix D.

Table 17
Project Construction Noise Levels – at 100 Feet

Phase	Equipment	Quantity	Equipment Noise Level at 100ft (dBA Leq)	Combined Noise Level (dBA Leq)
Site Preparation	Rubber Tired Dozers	3	71.7	81.6
	Tractors/Loaders/Backhoes	4	74.0	
Grading	Excavators	2	70.7	81.6
	Graders	1	75.0	
	Rubber Tired Dozers	1	71.7	
	Tractors/Loaders/Backhoes	3	74.0	
Building Construction	Cranes	1	66.6	80.8
	Forklifts	3	65.0	
	Generator Sets	1	71.6	
	Tractors/Loaders/Backhoes	3	74.0	
	Caisson Drilling	1	71.3	
	Welders	1	64.0	
Paving	Cement and Mortar Mixers	2	68.8	78.5
	Pavers	1	68.2	
	Paving Equipment	2	68.2	
	Rollers	2	67.0	
	Tractors/Loaders/Backhoes	1	74.0	
Architectural Coating	Air Compressors	1	67.7	67.7
Worst Case Construction Phase Noise Level - Leq (dBA) - **Unmitigated**				81.6
FTA Construction Noise Criteria (Detailed Assessment: 8-Hour Leq)				80.0
Worst Case Construction Phase Noise Level - Leq (dBA) - **Mitigated**				75.9
Noise level exceeds FTA criteria?				NO

As shown in Table 17, project's unmitigated construction noise levels have the potential to exceed the recommended 8-hour construction noise threshold provided by the FTA. However, with the help of the mitigation measures mentioned below the construction noise levels are expected to be below the recommended 8-hour construction noise threshold provided by the FTA for adverse community reaction at the residential uses.

The following mitigation measures are recommended to reduce construction noise impacts to the surrounding sensitive land uses:

Construction Mitigation Measures:

MM-1 Prepare and submit a construction management plan to the City of Garden Grove prior to starting construction. The construction management plan shall ensure all contractors implement construction best management practices to reduce construction noise levels. Best management practices shall include, but not be limited to, the following:

- All construction equipment shall be equipped with mufflers and other suitable noise attenuation devices (e.g., engine shields).
- Where feasible, electric hook-ups shall be provided to avoid the use of generators. If electric service is determined to be infeasible for the site, only whisper-quiet generators shall be used (i.e., inverter generators capable of providing variable load.)
- Use electric air compressors and similar power tools rather than diesel equipment, where feasible.
- Locate staging area, generators areas, and stationary construction equipment as far from the adjacent residential homes, as feasible.
- Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.
- Provide notifications and signage in readily visible locations along the perimeter of construction sites that indicate the dates and duration of construction activities, as well as provide a telephone number where neighbors can inquire about the construction process and register complaints to a designated construction noise disturbance coordinator.
- All construction activities shall take place during daytime hours, between 7:00 a.m. to 8:00 p.m., per the requirements of the City of Garden Grove conditions of approval.

- No impact pile driving or blasting activities shall be permitted on the project site during construction.

MM-2 Construct the eight (8) foot high masonry block noise barrier wall along the western and northwestern property lines during the first phase of construction, prior to performing any excavation or grading activities.

MM-3 Install a temporary noise barrier wall along the northern and southern property lines of the project site to shield adjacent sensitive receptors from construction noise. The temporary barrier should be installed at the first phase of construction, prior to performing any excavation or grading activities and shall remain till the construction is completed. The temporary noise barrier shall be a minimum of six (6) feet high and present a solid face area such as by installing sound absorptive material or blankets which can be installed in multiple layers for improved noise insulation.

7.3 Construction Vibration Analysis

To determine the vibratory impacts during construction, reference construction equipment vibration levels were utilized and then extrapolated to the façade of the nearest adjacent structures. The nearest sensitive receptors are the residential structures located adjacent to the western property line. All structures surrounding the project site are "new residential structures". No historical or fragile buildings are known to be located within the vicinity of the site.

The use of substantial vibration inducing equipment or activities, such as pile drivers or blasting, is prohibited. The main sources of vibration impacts during construction of the project would be the operation of equipment such as bulldozer activity during site preparation, loading trucks during grading and excavation, vibratory rollers during paving and caisson drilling.

The construction vibration assessment utilizes the referenced vibration levels and methodology set-forth within the Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, September 2018.

Table 18 shows the FTA referenced vibration levels.

Table 18
Typical Construction Vibration Levels[1]

Equipment	Peak Particle Velocity (PPV) (inches/second) at 25 feet	Approximate Vibration Level (LV) at 25 feet
Piledriver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Piledriver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, September 2018.

Table 19 shows the project's construction-related vibration analysis at the nearest structures to the project construction area. Construction impacts are assessed from the closest area on the project site to the nearest adjacent structure.

Table 19
Construction Vibration Impact Analysis

Construction Activity	Distance to Nearest Structure (ft)	Duration	Calculated Vibration Level - PPV (in/sec)	Damage Potential Level
Large Bulldozer	25	Continuous/Frequent	0.089	Extremely Fragile Buildings, Ruins Ancient Monuments
Vibratory Roller	25	Continuous/Frequent	0.210	Fragile Buildings
Loaded Trucks	25	Continuous/Frequent	0.076	No Impacts
Caisson Drilling	25	Continuous/Frequent	0.089	Extremely Fragile Buildings, Ruins Ancient Monuments

All structures surrounding the project site are "new residential structures". No historical or fragile buildings are known to be located within the vicinity of the site. As shown in Table 19, project related construction activity is not expected to cause any potential damage to the nearest structures.

Construction vibration calculation worksheets are shown in Appendix D.

Based on the results of this noise impact study, the proposed project is expected to result in less than significant environmental noise impacts with the inclusion of mitigation measures and project design features intended to reduce construction and operational noise levels. For a complete list of the recommended project mitigation and project design features, please refer to Section 1.5 and Section 1.6.

Exhibits

Exhibit A

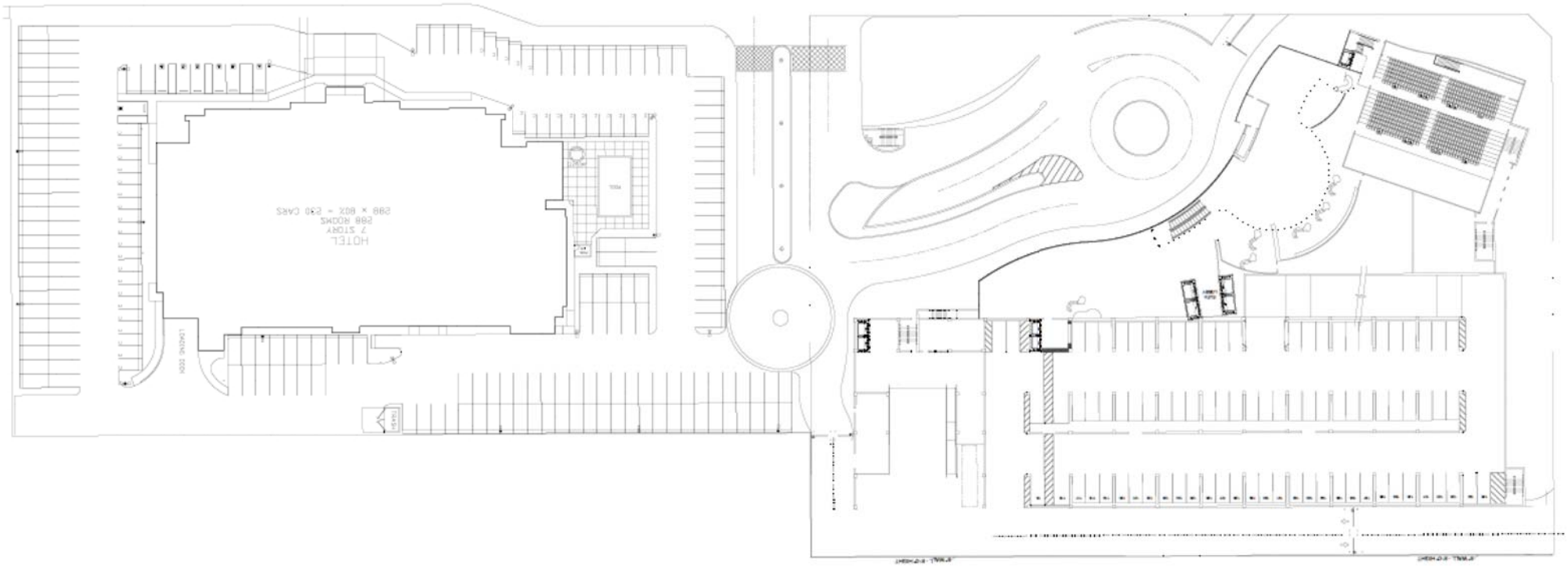
Location Map



N

RK engineering group, inc.

Exhibit B
Site Plan



N

Exhibit C

Noise Monitoring Locations



N

SoundPLAN Project Noise Level Results

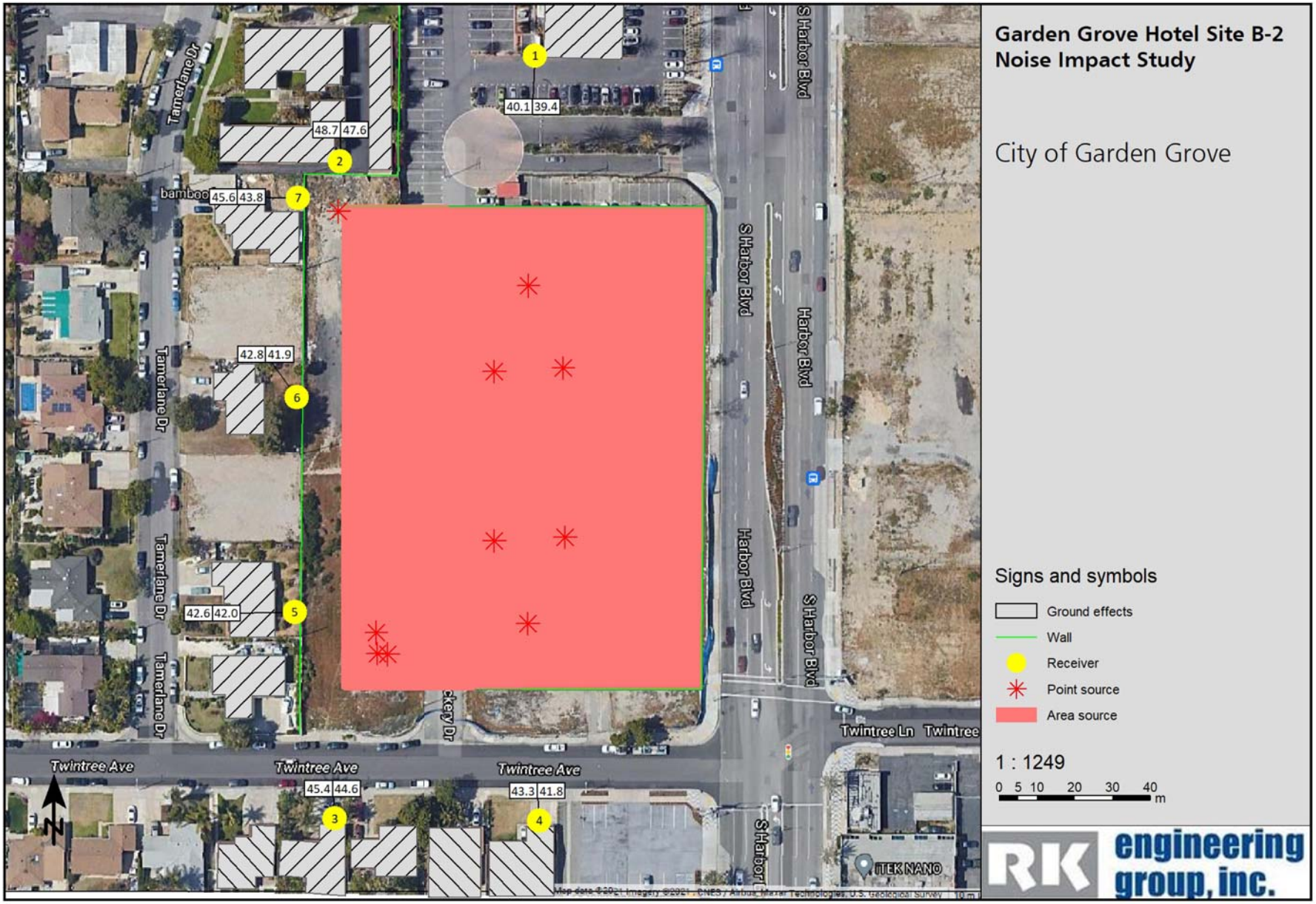
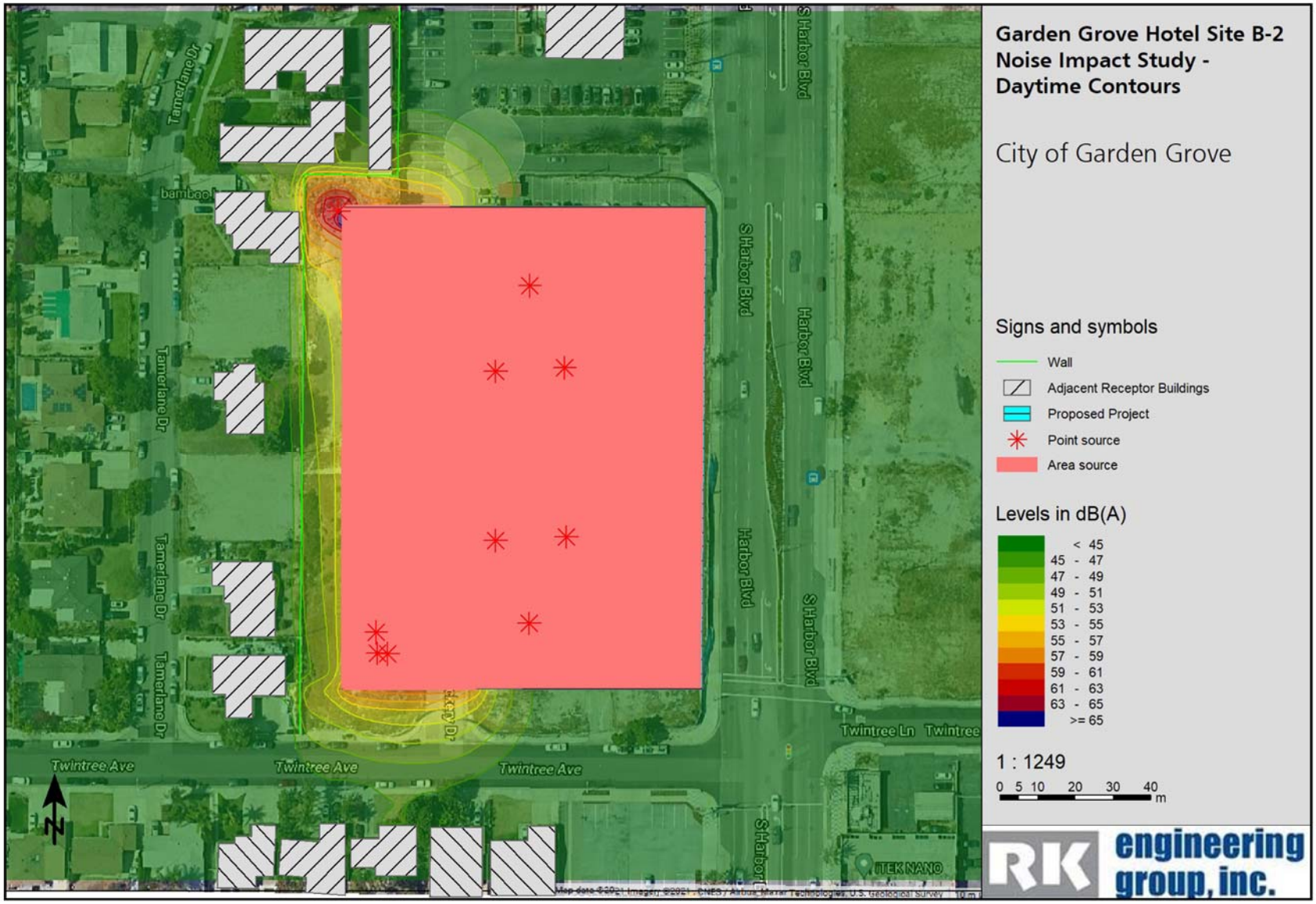
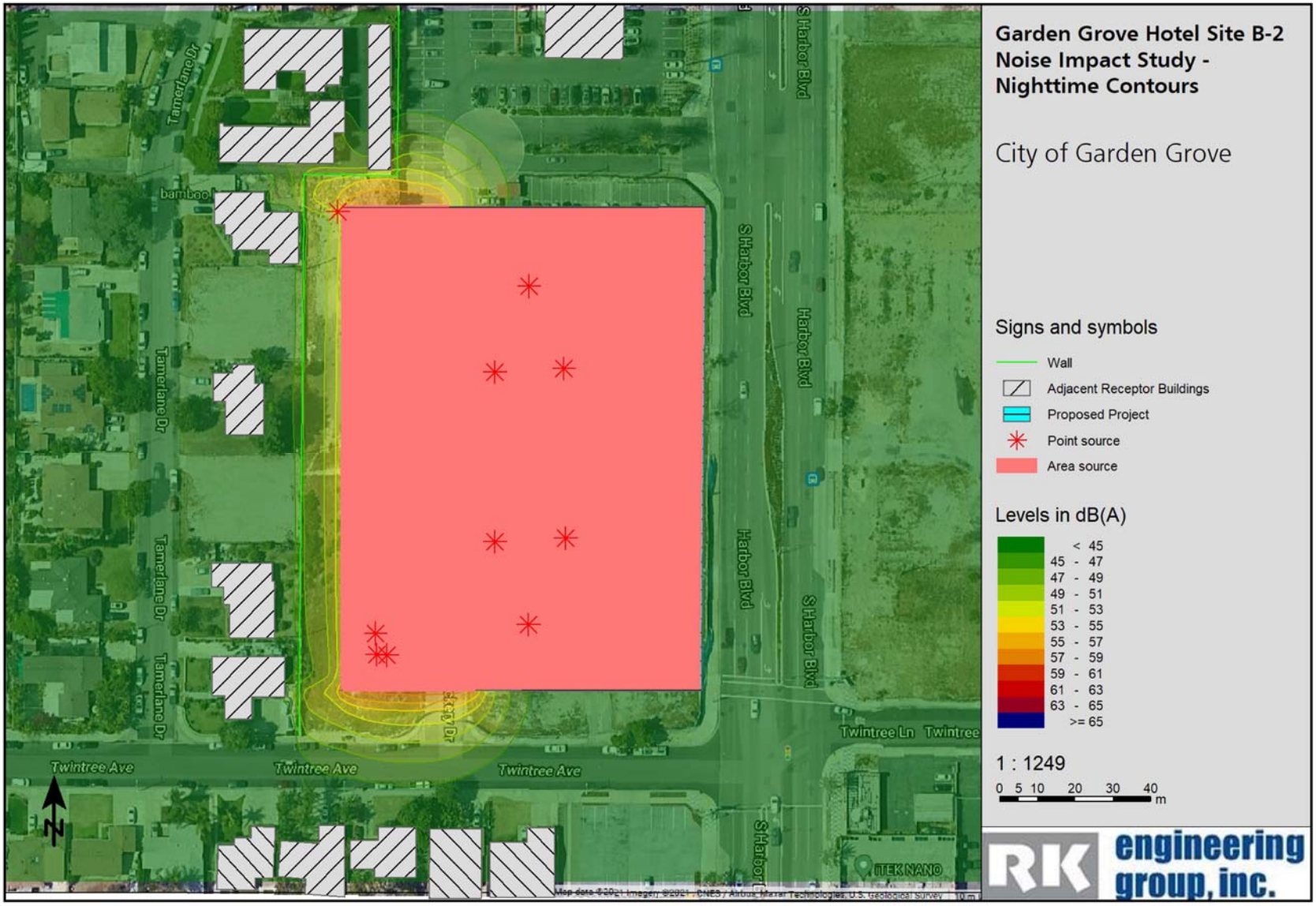


Exhibit E

Project Noise Level Contours - Daytime



Project Noise Level Contours - Nighttime



Appendices

Appendix A

City of Garden Grove
General Plan Noise Element and
Municipal Code Noise Control

CHAPTER 7

NOISE ELEMENT

CHAPTER 7

NOISE ELEMENT



7.1 INTRODUCTION

The Noise Element of the General Plan examines noise sources in the City to identify and appraise the potential for noise conflicts and problems, and to identify ways to reduce existing and potential noise impacts. Existing and future noise environments and the compatibility of land uses are considered in the Element, as well as sensitive receptors and generators of stationary noise. The Element identifies projected noise levels, and contains policies and programs to achieve and maintain noise levels compatible with various types of land uses, as well as prevent high noise levels in sensitive areas. It is important to note that the Element addresses noise that affects the community at large, rather than noise associated with site-specific conditions. The regulatory framework, background information, and existing and future conditions can be found in the General Plan EIR.

7.2 AUTHORITY FOR ELEMENT

Government Code Section 65302(f) requires that a General Plan include:

> *"... a noise element which shall identify and appraise noise problems in the community. The Noise Element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health Services and shall analyze and quantify...current and projected noise levels for all of the following sources: (1) highways and freeways; (2) primary arterials and major local streets; (3) passenger and freight on-line railroad operations and ground rapid transit systems; (4) commercial, general aviation, heliport, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation; (5) local industrial plants, including but not limited to, railroad classification yards; (6) other ground stationary noise sources identified by local agencies as contributing to the community noise environment."*

7.3 NOISE DEFINITIONS

Noise often is defined as annoying or unwanted sound. Health studies have shown that excessive noise can cause adverse psychological or physiological effects on human beings.

Defining noise problems and establishing a regulatory scheme to deal with noise that is both fair and effective requires an understanding of some of the basic characteristics of sound and how it affects people and their activities. While sound levels can be easily measured, the variability in subjective and physical responses to sound complicates the analysis of its impact on people. Sound is created when an object vibrates and radiates part of its energy as acoustic pressure waves through a medium such as air, water, or a solid. The ear, the hearing mechanism of humans and most animals, receives these sound pressure waves and converts them to neurological impulses which are transmitted to the brain for interpretation. The interpretation by the auditory system and the brain depends on the characteristics of the sound and on the characteristics of the person hearing it.

STANDARD UNIT OF MEASUREMENT

Sound is described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by differentiating among frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound ten dBA higher than another is perceived to be twice as loud, and 20 dBA higher is perceived to be four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Various methods have been developed for evaluating community noise to account for, among other things:

- The variation of noise levels over time;
- The influence of periodic individual loud events; and
- The community response to changes in the community noise environment.

NOISE SCALES AND DEFINITIONS

Sound pressure level is a measure of the sound pressure of a given noise source relative to a standard reference value. The reference pressure is typical of the quietest sound that a young person with good hearing is able to detect. Sound pressure levels are measured in decibels (dB). Decibels are logarithmic quantities, relating the sound pressure level of a noise source to the reference pressure level.

An important characteristic of sound is frequency. This is the rate of repetition of sound pressure oscillations (waves) as they reach our ears; frequency is expressed in hertz (Hz). When analyzing the total noise of any source, the frequency components are sometimes analyzed to determine the relative amounts of low-frequency, middle-frequency, and high-frequency noise. This breakdown is important for two reasons:

- Our ear is better equipped to hear mid- and high-range frequencies than lower frequencies. Thus, we find mid- and high-frequency noise to be more annoying. High-frequency noise is also more capable of producing hearing loss.

- Engineering solutions to a noise problem are different for different frequency ranges. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low frequency of about 20 Hz to a high frequency of about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, typically around 1,000 to 2,000 Hz. Several filters have been developed that match the sensitivity of our ear and thus help us to judge the relative loudness of various sounds made up of many different frequencies. The so-called "A" filter is the best measure for most environmental noise sources. Sound pressure levels measured through this filter are referred to as A-weighted levels, and are measured in A-weighted decibels or (dBA).

The A-weighted filter significantly de-emphasizes those parts of the total noise that occur at lower frequencies (those below about 500 Hz) and also those at very high frequencies (above 10,000 Hz) the frequencies that we do not hear as well. The filter has very little effect, or is nearly "flat," in the middle range of frequencies (between 500 and 10,000 Hz), where our ears are most sensitive. Because this filter generally matches our ears' sensitivity, sounds having a higher A-weighted sound level are usually judged to be louder than those with lower A-weighted sound levels, a relationship that otherwise might not be true.

Community Noise Equivalent Level (CNEL)

Cumulative noise metrics were developed to assess community response to noise. They are useful because they attempt to take into account the loudness and duration of the noise, the total number of noise events, and the time of day these events occur in one single-number rating scale. They are designed to account for the known health effects of noise on people. The community noise equivalent level (CNEL) is a 24-hour, time-weighted energy-average noise level based on dBA that measures the overall noise during an entire day. Noise that occurs during certain sensitive time periods is penalized for occurring at these times (by adding decibels to its Leq measurement). On the CNEL scale, noise between 7:00 a.m. and 10:00 p.m. is penalized by approximately five dB, to account for the greater potential for noise to interfere during these hours, as well as the typically lower ambient (background) noise levels during these hours. Noise during the night (from 10:00 p.m. to 7:00 a.m.) is penalized by 10 dB to attempt to account for our higher sensitivity to noise in the nighttime and the expected further decrease in ambient noise levels that typically occur in the night.

Equivalent Noise Level (L_{EQ})

The equivalent sound level, abbreviated Leq, is a measure of the exposure resulting from the accumulation of A-weighted sound levels over a particular time period (e.g., 1 hour, 8 hour, a school day, nighttime, or a full 24-hour day). However, because the length of the period can be different depending on the time frame of interest, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example, "Leq (24)".

Conceptually, Leq may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual time-varying sound level with its normal peaks and valleys. It is important to realize, however, that the two signals (the constant one and the time-varying one) would sound very different from each other if compared in real life. Variations in the "average" sound level suggested by Leq is not an arithmetic value, but a logarithmic ("energy-averaged") sound level. Thus, loud events clearly dominate any noise environment described by the metric.

Day Night Average (Ldn)

Another commonly used noise metric is the day/night average noise level (Ldn). The Ldn is a measure of the 24-hour average noise level at a given location. It was adopted by the EPA for developing criteria to evaluate community noise exposure. Ldn is based on a measure of the average noise level over a given time period. The Ldn is calculated by averaging the Leq for each hour of the day at a given location after penalizing the sleeping hours (from 10:00 p.m. to 7:00 a.m.) by 10 dBA to take into account the increased sensitivity of people to noises that occur at night. The sound level exceeded over a specified time frame can be expressed as Ln (i.e., L90, L50, L10, etc.). L50 equals the level exceeded 50 percent of the time; L10, 10 percent of the time; etc.

Other Noise Matrices

As previously mentioned, people tend to respond to changes in sound pressure in a logarithmic manner. In general, a 1 dBA change in the sound pressure levels of a given sound is detectable only under laboratory conditions. A 3 dBA change in sound pressure level is considered a detectable difference in most situations. A 5 dBA change is readily noticeable and a 10 dBA change is considered a doubling (or halving) of the subjective loudness. It should be noted that a 3 dBA increase or decrease in the average traffic noise level is realized by a doubling or halving of the traffic volume; or by about a 7 mile per hour (mph) increase or decrease in speed.

For each doubling of distance from a point noise source, the sound level will decrease by 6 dBA. In other words, if a person is 100 feet from a machine, and moves to 200 feet from that source, sound levels will drop approximately 6 dBA. For each doubling of distance from a line source, like a roadway, noise levels are reduced by 3 to 5 decibels, depending on the ground cover between the source and the receiver.

Noise barriers can provide approximately a 5 dBA CNEL noise reduction (additional reduction may be provided with a barrier of appropriate height, material, location and length). A row of buildings provides up to 5 dBA CNEL noise reduction with a 1.5 dBA CNEL reduction for each additional row up to a maximum reduction of approximately 10 dBA. The exact degree of noise attenuation depends on the nature and orientation of the structure and intervening barriers.

7.4 KEY THEMES AND VISION FOR GENERAL PLAN

It is the general objective of the City to regulate and control unnecessary, excessive, and annoying sounds emanating from uses and activities within the City, and to prohibit such sounds that are detrimental to the public health, welfare, and safety of its residents. With the objective, the City is focused on maintaining or improving the quality of life for both existing and future residents. The Land Use Element proposes a variety of mixed use development types along major arterials in the City. The Noise Element will ensure that the residential and non-residential uses within the mixed use development meet established noise standards.

AMBIENT NOISE

Ambient noise is described as the all-encompassing background noise associated with a given environment, usually being a composite of sounds from many sources near and far.

Garden Grove's noise environment is dominated by vehicular traffic noise along State Route 22 (SR-22) as well as major and primary arterials. The major arterials that serve the City are Valley View Street, Brookhurst Street, Harbor Boulevard, Bolsa Avenue, Westminster Avenue, Fairview

Road, and Knott Avenue. The primary arterials that serve the City are Magnolia Street, Euclid Street, Haster Street, Chapman Avenue, Garden Grove Boulevard, and Westminster Boulevard,. In addition, Katella Avenue, Harbor Boulevard, Bolsa Avenue, and Valley View Streets are designated as Smart Streets.

NOISE SENSITIVE RECEPTORS

Human response to noise varies widely depending on the type of noise, time of day, and sensitivity of the receptor. The effects of noise on humans can range from temporary or permanent hearing loss to mild stress and annoyance due to such things as speech interference and sleep deprivation. Prolonged stress, regardless of the cause, is known to contribute to a variety of health disorders. The sensitive receptors located within the City are listed in Appendix D, Air Quality Data, of the General Plan EIR.[1]

NOISE AND LAND USE COMPATIBLITY MATRIX

The State of California Office of Planning and Research (OPR) Noise Element Guidelines include recommended interior and exterior level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The OPR Guidelines describe the compatibility of various land uses with a range of environmental noise levels in terms of dBA CNEL (Community Noise Equivalent Level).

A noise environment of 50 dBA CNEL to 60 dBA CNEL is considered to be "normally acceptable" for residential uses. The State indicates that locating residential units, parks, and institutions (such as churches, schools, libraries, and hospitals) in areas where exterior ambient noise levels exceed 65 dBA CNEL is undesirable. The OPR recommendations also note that, under certain conditions, more restrictive standards than the maximum levels cited may be appropriate. As an example, the standards for quiet suburban and rural communities may be reduced by 5 to 10 dB to reflect their lower existing outdoor noise levels in comparison with urban environments.

In addition, *Title 25, Section 1092 of the California Code of Regulations,* sets forth requirements for the insulation of multiple-family residential dwelling units from excessive and potentially harmful noise. Whenever multiple-family residential dwelling units are proposed in areas with excessive noise exposure, the developer must incorporate construction features into the building's design that reduce interior noise levels to 45 dBA CNEL.

Table 7-1, Noise and Land Use Compatibility Matrix, illustrates the State guidelines established by the State Department of Health Services for acceptable noise levels for each county and city. These standards and criteria are incorporated into the land use planning process to reduce future noise and land use incompatibilities. This table is the primary tool that allows the City to ensure integrated planning for compatibility between land uses and outdoor noise.

CITY OF GARDEN GROVE NOISE STANDARDS

The City of Garden Grove maintains a comprehensive Noise Ordinance within its Municipal Code that establishes citywide interior and exterior noise level standards. The City has adopted a number of policies that are directed at controlling or mitigating environmental noise effects. The City's Noise Ordinance (Municipal Code Section 8.47, Noise Control,) establishes daytime and nighttime noise standards; refer to *Table 7-2, Garden Grove Noise Ordinance Standards*. The ordinance is designed to control unnecessary, excessive and annoying sounds generated

[1] Similar uses are sensitive to both air quality and noise impacts. Therefore, the sensitive receptor list for both issue areas is the same.

from a stationary source impacting an adjacent property. It differentiates between environmental and nuisance noise. Environmental noise is measured under a time average period while nuisance noise cannot exceed the established Noise Ordinance levels at any time. At the boundary line between a residential property and a commercial and manufacturing property, the noise level of the quieter zone is required to be used.

Table 7-1
Noise and Land Use Compatibility Matrix

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential - Low Density, Single-Family, Duplex, Mobile Homes	50 - 60	55 - 70	70-75	75-85
Residential - Multiple Family	50 - 65	60 - 70	70 - 75	70 – 85
Transient Lodging - Motel, Hotels	50 - 65	60 - 70	70 - 80	80 – 85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 - 70	60 - 70	70 - 80	80 – 85
Auditoriums, Concert Halls, Amphitheaters	NA	50 - 70	NA	65 – 85
Sports Arenas, Outdoor Spectator Sports	NA	50 - 75	NA	70 – 85
Playgrounds, Neighborhood Parks	50 - 70	NA	67.5 - 75	72.5 – 85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 70	NA	70 - 80	80 – 85
Office Buildings, Business Commercial and Professional	50 - 70	67.5 - 77.5	75 - 85	NA
Industrial, Manufacturing, Utilities, Agriculture	50 - 75	70 - 80	75 - 85	NA
NA: Not Applicable				
Source: Office of Planning and Research, California, *General Plan Guidelines*, October 2003.				
Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. Conditionally Acceptable – New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice. Normally Unacceptable – New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Clearly Unacceptable – New construction or development should generally not be undertaken.				

Table 7-2
Garden Grove Noise Ordinance Standards

Land Use Designation		Ambient Base Noise Level	Time Of Day
Sensitive Uses	Residential Use	55 dBA	7:00 AM – 10:00 PM
		50 dBA	10:00 PM – 7:00 AM
Conditionally Sensitive Uses	Institutional Use	65 dBA	Any Time
	Office-Professional Use	65 dBA	Any Time
	Hotels and Motels	65 dBA	Any Time
Non-Sensitive Uses	Commercial Uses	70 dBA	Any Time
	Commercial/Industrial Uses within 150 feet of Residential Uses	65 dBA	7:00 AM – 10:00 PM
		50 dBA	10:00 PM – 7:00 AM
	Industrial Uses	70 dBA	Any Time
Source: City of Garden Grove, *Municipal Code, Section 8.47, Noise Control*, 2005.			

Municipal Code Section 8.47.060, Special Noise Sources, also includes the following provisions for construction and maintenance activities:

> *(d) Construction of Buildings and Projects. It shall be unlawful for any person within a residential area, or within a radius of 500 feet there from, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects, or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction type device between the hour of 10:00 p.m. of one day and 7:00 a.m. of the next day in such a manner that a person of normal sensitiveness, as determined utilizing the criteria established in Section 8.47.050(a), is caused discomfort or annoyance unless such operations are of an emergency nature.*

MINIMIZE COMMUNITY EXPOSURE TO NOISE

The primary goal with regard to community noise is to minimize the exposure of new residential development, schools, hospitals and similar noise-sensitive uses to excessive or unhealthy noise levels to the greatest extent possible. Toward this end, this Element establishes the noise/land use compatibility guidelines set forth in *Table 7-1* for outdoor noise. The compatibility guidelines recognize and respond to the many different noise environments in Garden Grove.

The City supports new residential development within already urbanized areas where ambient noise levels may be higher than those experienced in neighborhoods located on the urban periphery. This is in an effort to promote "smart growth," mixed use development, making more efficient use of land and resources.

Interior noise levels for new residential development, regardless of location within the City will be required to comply with standards set forth in Title 24 of the State Health and Safety Code. New construction may need to incorporate special insulation, windows, and sealants in order to ensure that interior noise levels meet Title 24 standards.

The City will utilize the noise/land use compatibility guidelines outlined in *Table 7-1* and *Table 7-2* in making land use decisions. These compatibility guidelines show a range of noise standards for various land use categories. Depending on the ambient environment of a particular community, these basic guidelines may be tailored to reflect existing noise and land use characteristics. The matrix defines noise in terms of Community Noise Equivalent Level (CNEL) and expressed in dB that measure sound intensity. Noise levels occurring during nighttime hours are weighted more heavily than during the daytime.

7.5 GOALS, POLICIES, AND IMPLEMENTATION PROGRAMS

This Element is organized into goals, policies, and implementation programs. A description of each is provided in Chapter 1, Introduction. It is important to note that the implementation programs are specific actions to carry out all of the preceding goals and policies.

Goal N-1	**Noise considerations must be incorporated into land use planning decisions.**
Policy N-1.1	Require all new residential construction in areas with an exterior noise level greater than 55 dBA to include sound attenuation measures.
Policy N-1.2	Incorporate a noise assessment study into the environmental review process, when needed for a specific project for the purposes of identifying potential noise impacts and noise abatement procedures.

Policy N-1.3	Require noise reduction techniques in site planning, architectural design, and construction, where noise reduction is necessary consistent with the standards in Tables 7-1 and 7-2, Title 24 of the California Code of Regulations, and Section 8.47 of the Municipal Code.
Policy N-1.4	Ensure acceptable noise levels are maintained near schools, hospitals, convalescent homes, churches, and other noise sensitive areas.
Policy N-1.5	Require the design of mixed use structures to incorporate techniques to prevent the transfer of noise and vibration from the commercial to residential use.
Policy N-1.6	Encourage commercial uses in mixed use developments that are not noise intensive.
Policy N-1.7	Avoid locating noise-sensitive land use in existing and noise-impacted areas.
N-IMP-1A	Maintain a technical resource for builders, developers, and operators of construction equipment that discusses a variety of sound attenuation measures (e.g., temporary noise attenuation fences, preferential location of equipment, use of current technology and types of noise suppression equipment), the amount of noise reduction each produces, and how to combine them to meet City requirements.
N-IMP-1B	Require that new commercial, industrial, any redevelopment project, or any proposed development near existing residential land use demonstrate compliance with the City's Noise Ordinance prior to approval of the project.
N-IMP-1C	Implement noise mitigation by placing conditions of approval on development projects, and require a clear description of mitigation on subdivision maps, site plans, and building plans for inspection purposes.
N-IMP-1D	Require construction activity to comply with the limits established in the City's Noise Ordinance.
N-IMP-1E	Require buffers or appropriate mitigation of potential noise sources on noise sensitive areas.
N-IMP-1F	Require that vehicle access to commercial properties that are located adjacent to residential parcels or other noise sensitive uses be located at the maximum practical distance from these uses.
N-IMP-1G	Encourage truck deliveries to commercial or industrial properties abutting residential or noise sensitive uses after 7:00 AM and before 10:00 PM.
N-IMP-1H	Orient residential units away from major noise sources, particularly in mixed use projects.
N-IMP-1I	Encourage the location of balconies and operable windows of residential units in mixed use projects away from arterials and other major noise sources.

N-IMP-1J	Review the noise performance standards in the Zoning Code to determine if additional or modified standards are necessary to address mixed use development, particularly along major arterial roadways, or address and mitigate noise-generating land uses.
N-IMP-1K	Enforce the Noise Ordinance to ensure that stationary noise and noise emanating from construction activities, private development, and/or special events are minimized.
N-IMP-1L	Continue to enforce noise abatement and control measures.

Goal N-2	**Maximized efficiency in noise abatement efforts through clear and effective policies and ordinances.**

Policy N-2.1	Incorporate noise considerations into land use planning decisions by establishing acceptable limits of noise for various land uses throughout the community.
Policy N-2.2	Fully integrate noise considerations into land use planning decisions to prevent new noise/land use conflicts.
Policy N-2.3	Incorporate noise reduction features for items such as but not limited to parking and loading areas, ingress/egress point, and refuse collection areas, during site planning to mitigate anticipated noise impacts on affected noise sensitive land uses.
Policy N-2.4	Permit only those new development or redevelopment projects that have incorporated appropriate mitigation measures, so that standards contained in the Noise Element or adopted ordinance are met.
Policy N-2.5	Ensure the effective enforcement of City, State, and Federal noise levels by all appropriate City Divisions.
N-IMP-2A	Require a noise impact evaluation for projects, if determined necessary through the environmental review process. Should noise abatement be necessary, the City shall require the implementation of mitigation measures based on a technical study prepared by a qualified acoustical professional.
N-IMP-2B	Consider establishing a periodic noise monitoring program to identify progress in achieving noise abatement and to perform necessary updating of the Noise Element and community noise standards.
N-IMP-2C	Amend, and combine if deemed appropriate, ordinances and policies relating to noise control. The amended ordinance(s) shall more clearly address mitigation of noise conflicts between adjacent uses, construction noise, noise associated with maintenance equipment (e.g., leaf blowers, street sweepers, etc), hours of operation of construction or maintenance equipment, noise standards, abatement, enforcement, procedures, and other like issues.

N-IMP-2D	Use code enforcement to enforce the appropriate noise standards in the City's noise ordinance(s).
N-IMP-2E	Use the Police unit to enforce the appropriate noise standards in the State's motor vehicle code.
N-IMP-2F	Require that new equipment purchased by the City of Garden Grove comply with noise performance standards.
N-IMP-2G	Disseminate information to the public regarding City noise regulations and programs, the health effects of high noise levels, means of mitigating such levels, as well as abatement and enforcement procedures.
N-IMP-2H	Coordinate with California Occupational Safety and Health Administration (Cal-OSHA) to provide information on occupational noise requirements within the City.
N-IMP-2I	Examine the potential to establish a Violators Fee for persons requiring a second call/visit for violating the noise ordinance(s).

Goal N-3	**Minimized noise impacts from freeways, ensuring that City and State interior and exterior noise standards are not exceeded.**

Policy N-3.1	Encourage Caltrans to meet the State standard of 65 dBA CNEL for exterior noise levels for the Garden Grove Freeway (SR-22) and the San Diego Freeway (I-405).
Policy N-3.2	Encourage Caltrans to keep the interior residential noise levels below the State standard of 45 dBA CNEL, where appropriate and feasible.
N-IMP-3A	Continue to work with Caltrans to ensure that similar soundwalls or other appropriate mitigations to those installed along the Garden Grove Freeway (SR-22) be provided where the San Diego Freeway (I-405) abuts residential areas or areas with sensitive receptors within the City.
N-IMP-3B	Encourage Caltrans to develop a range of sound attenuation alternatives to mitigate noise impacts from the San Diego Freeway (I-405).

Goal N-4	**Minimize noise impacts for residential uses and noise sensitive receptors along the City's arterial streets, ensuring that City and State interior and exterior noise levels are not exceeded.**

Policy N-4.1	Examine the feasibility of implementing sound attenuation measures along the City's arterial streets. Prioritize the areas in need of sound attenuation based on degree of sensitivity, excess of maximum allowable standards, length of time the noise impact has existed, and the number or residential uses or sensitive receptors impacted.
Policy N-4.2	Minimize potential transportation noise through proper design of street circulation, coordination of routing, and other traffic control measures (e.g., shifting travel lanes away from impacted units, adding bike ways, etc.)

Policy N-4.3	Discourage through traffic on residential local streets to reduce noise.
N-IMP-4A	Install sound attenuation measures, including but not limited to, retrofitting existing residential units or sensitive receptors with double-glazed windows and sound insulation; construction of sound walls and landscaping, use of low walls and landscaped berms, enclose courtyards, rubberized asphalt, or relocation of driveways.
N-IMP-4B	Develop a streamlined process to expedite approval of noise reducing techniques identified in the noise ordinance(s).
N-IMP-4C	Ensure the inclusion of noise mitigation measures in the design of new roadway projects in the City of Garden Grove.
N-IMP-4D	Provide for continued evaluation of truck movements and routes in the City to provide effective separation from residential or other noise sensitive land uses.
N-IMP-4E	Conduct periodic noise monitoring and abatement to identify sound levels on residential local streets that may be affected by increased traffic volumes and speed limits.

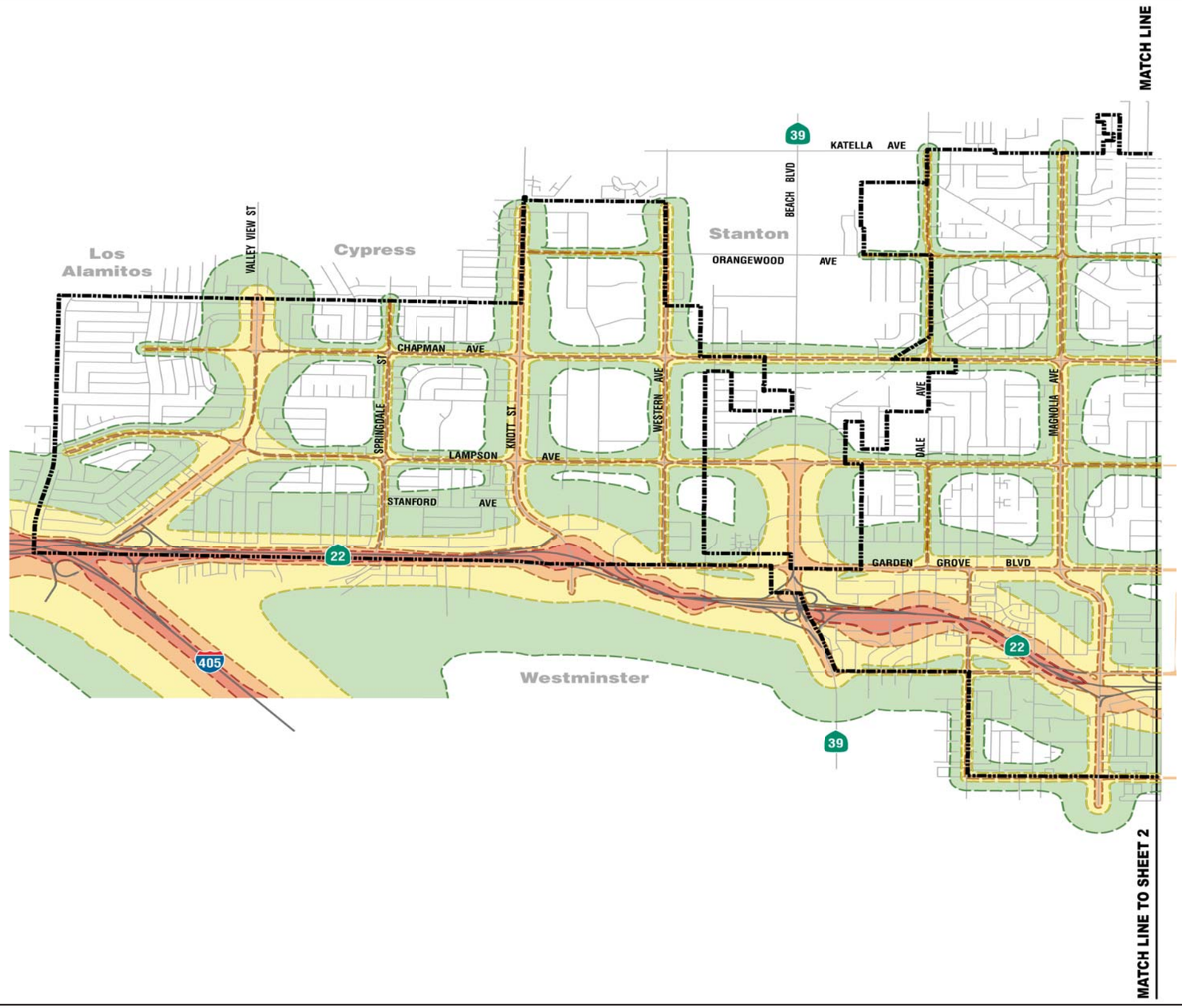
Goal N-5	**Minimize noise impacts on residential areas from rail and/or transit operations.**

Policy N-5.1	Continue to encourage the Southern Pacific Transportation Company to schedule trains during the daylight hours, when possible.
Policy N-5.2	Require noise attenuation measures for residential construction in areas affected by the 65 dBA CNEL railroad noise contour. Sound attenuation measures shall reduce interior noise to a maximum of 45 dBA CNEL. These measures shall be applicable to all residential construction in a railroad noise impact area, both for new structures and for renovations, remodels, and building additions.
Policy N-5.3	Work with the Orange County Transit Authority (OCTA) in the development of the OCTA right-of-way or other rail/transit lines to ensure that noise attenuation measures are addressed in the selection of the rail or vehicle technology for use along the right-of-way or rail/transit line, and in the siting, design, and construction of stations.
N-IMP-5A	Require the Orange County Transit Authority (OCTA) to comprehensively analyze and mitigate the noise impacts associated with transit development of the OCTA right-of-way or other rail/transit lines.

Goal N-6	**Maintain or work to reduce noise levels associated with the Joint Forces Training Base (JFTB) Los Alamitos.**

Policy N-6.1	Coordinate with the Airport Land Use Commission to monitor any expansion plans and/or increased activities at the Joint Forces Training Base (JFTB) Los Alamitos.

N-IMP-6A	Support development at the Joint Forces Training Base (JFTB) Los Alamitos that adheres to the Airport Environs Land Use Plan (AELUP) and the City of Garden Grove and State noise requirements or ordinances.



General Plan 2030

LEGEND

- Major Streets
- Freeway
- City Boundary
- Existing 75 CNEL
- Existing 70 CNEL
- Existing 65 CNEL
- Existing 60 CNEL

0 2250'
APPROXIMATE

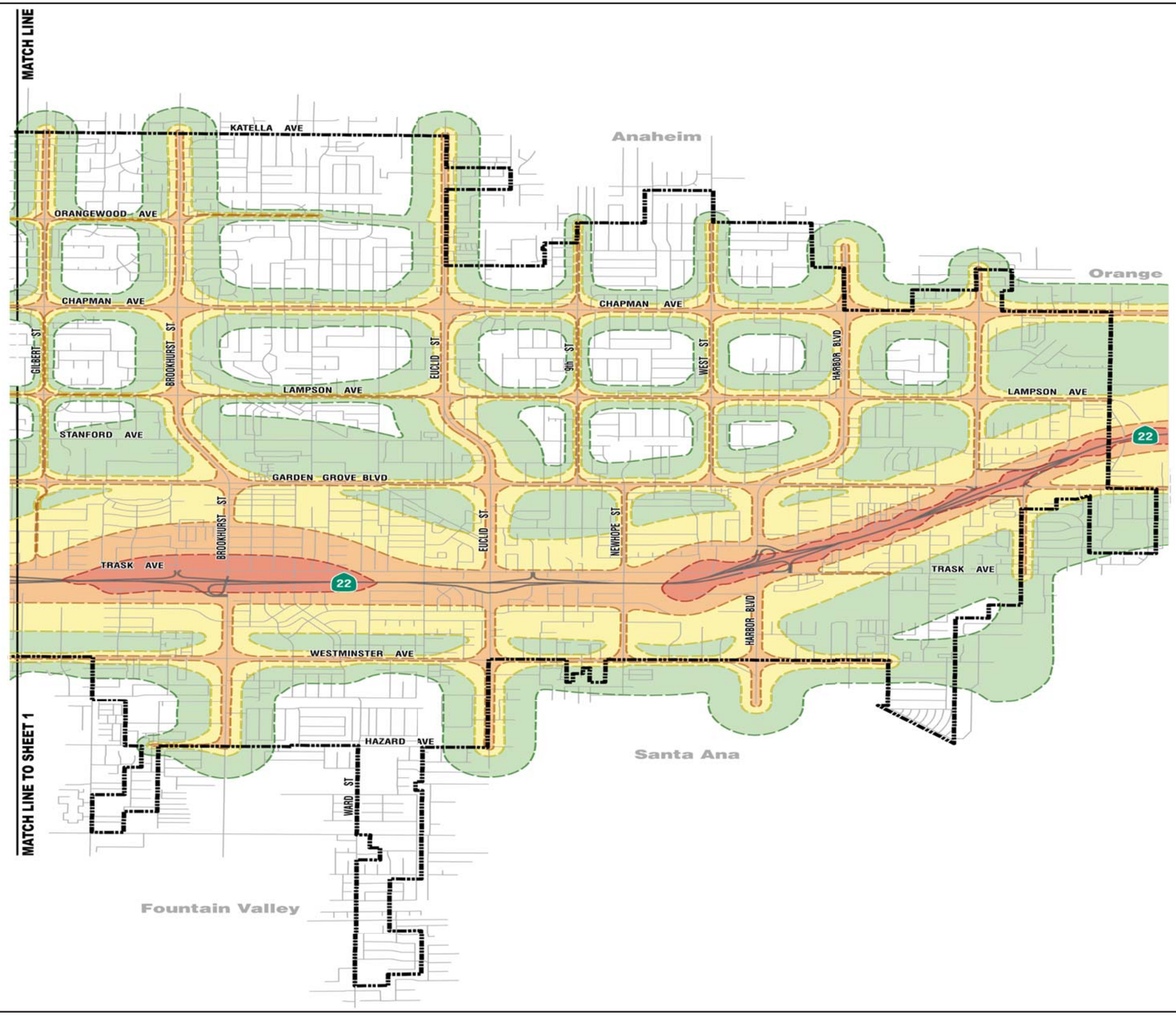
SOURCE: RBF Consulting, May 2008.

RBF CONSULTING

05/08 • JN 10-104660

Existing Noise Contours • West

EXHIBIT N-1A



General Plan 2030

LEGEND

- Major Streets
- Freeway
- City Boundary
- Existing 75 CNEL
- Existing 70 CNEL
- Existing 65 CNEL
- Existing 60 CNEL

0 2250'
APPROXIMATE

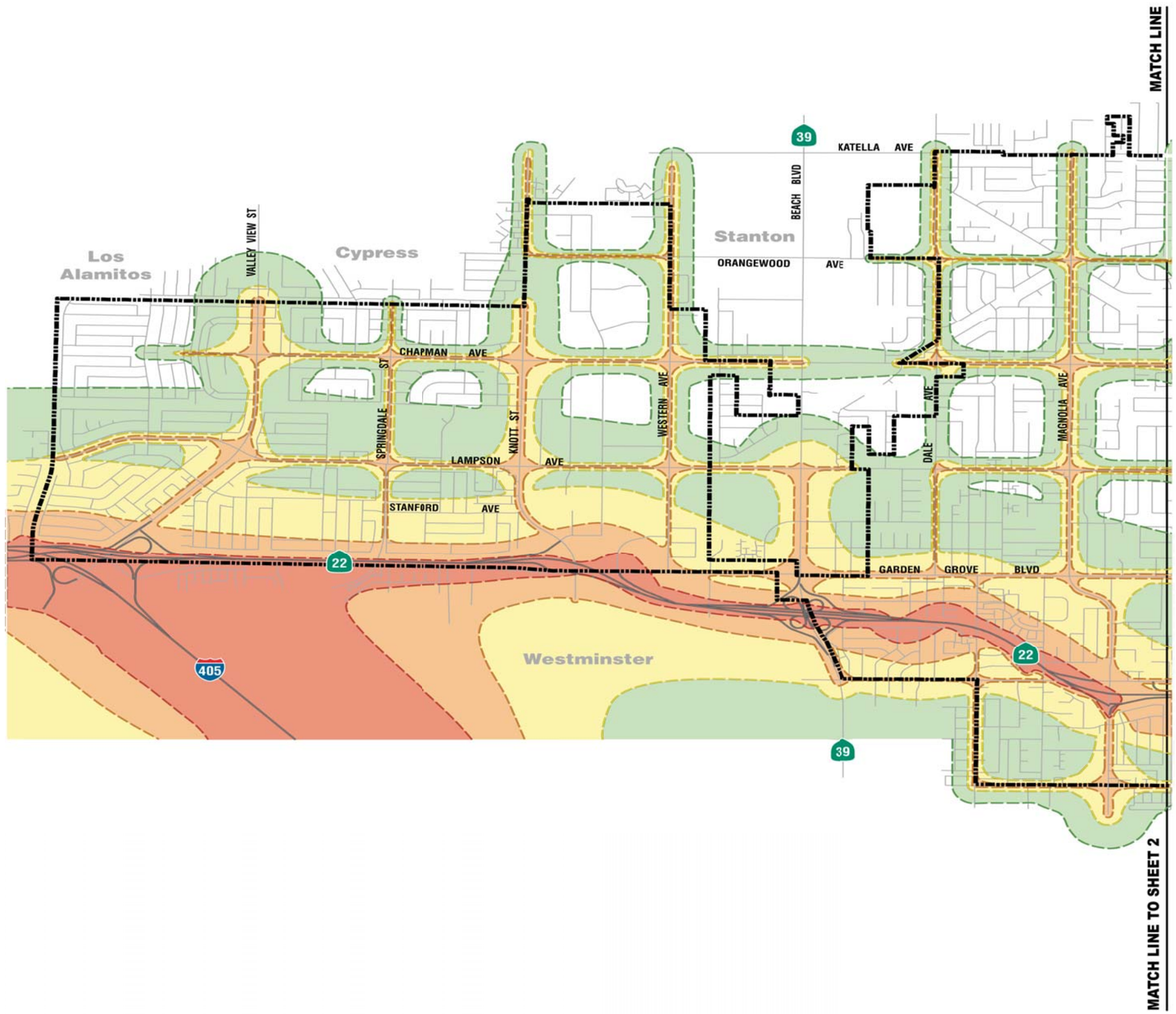
SOURCE: RBF Consulting.

RBF CONSULTING

05/08 • JN 10-104660

Existing Noise Contours • East

EXHIBIT N-1B



General Plan 2030

LEGEND

- Major Streets
- Freeway
- City Boundary
- Existing 75 CNEL
- Existing 70 CNEL
- Existing 65 CNEL
- Existing 60 CNEL

0 2250'
APPROXIMATE

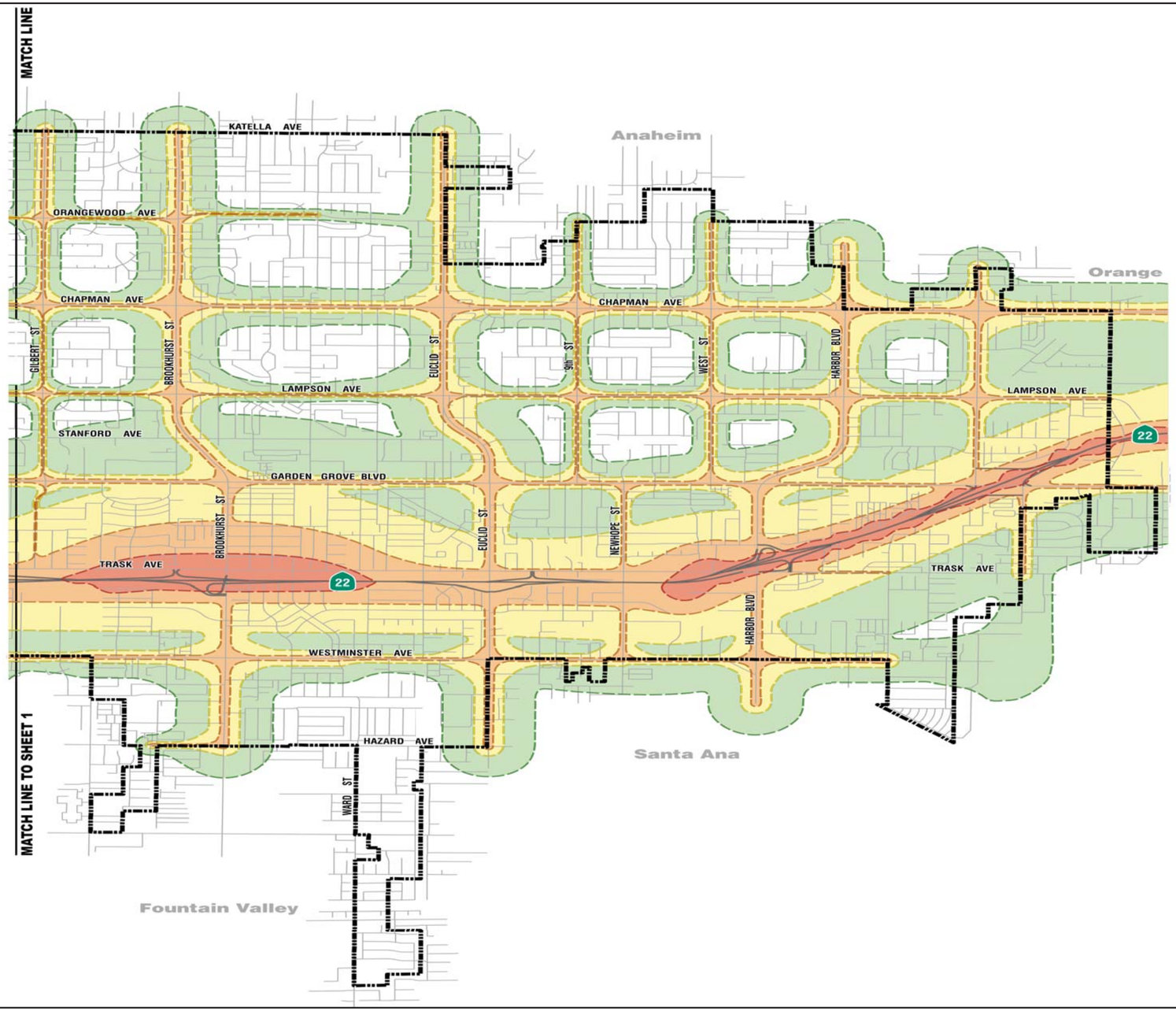
SOURCE: RBF Consulting, May 2008.

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05/08 • JN 10-104660

FUTURE NOISE CONTOURS • WEST

EXHIBIT N-2A



General Plan 2030

LEGEND

- Major Streets
- Freeway
- City Boundary
- Existing 75 CNEL
- Existing 70 CNEL
- Existing 65 CNEL
- Existing 60 CNEL

0 2250'
APPROXIMATE

SOURCE: RBF Consulting.

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05/08 • JN 10-104660

Future Noise Contours • East

EXHIBIT N-2B

Chapter 8.47 NOISE CONTROL

Note

* **Prior ordinance history**: Ord. Nos. 1949, 1950, and 2258.

8.47.020 Definitions

The following words, phrases, and terms as used in this chapter shall have the meaning as indicated below:

"Actual measured ambient noise level" shall mean that noise level existing in the general area of the noise problem, excluding the noise generated by the noise source being evaluated.

"Ambient base noise level" shall mean the maximum loudness level normally found to be acceptable for given land uses and that serves as the basis for determining loudness noise violations pursuant to the provisions of Section 8.48.040 of this chapter.

"Ambient noise level" shall mean the all-encompassing background noise associated with a given environment, being usually a composite of sounds from many sources near and far.

"Commercial use" shall mean any enterprise whose principal endeavor is the sale of goods and/or services.

"Decibel (dB)" shall mean a unit that denotes the ratio between two quantities that are proportional to power: the number of decibels corresponding to the ratio of two amounts of power is 10 times the logarithm to the base 10 of this ratio. The commonly used unit for measuring sound pressure levels.

"Emergency" means operations made necessary to restore property to a safe condition following a public calamity, or work required to protect persons or property from an imminent exposure to danger or work by private or public utilities when restoring utility service.

"Industrial use" means any facility or operations involved in the manufacturing, repairing, testing, processing, warehousing, wholesaling, researching, and treatment of products.

"Institutional use" means an establishment maintained and operated by a society, church, corporation, individual, foundation, or public agency for the purpose of providing religious, charitable, social, educational, fraternal, or similar services.

"Noise" means any sound that exceeds the appropriate actual or presumed ambient noise level, that annoys or tends to disturb humans, or that causes or tends to cause an adverse psychological or physiological effect on humans of normal sensitiveness.

"Office-professional use" means any enterprise engaged in providing business or professional services.

"Residential use" means any structure utilized principally for human habitation, excluding hotels, motels, and recreational vehicle parks.

"Sound amplifying equipment" means any device for the amplification of the human voice, music, or any other sound and does not include standard automobile radios when used and heard only by the occupants of the vehicle in which the automobile radio is installed or devices on authorized emergency vehicles or horns or other warning devices on any vehicle used only for traffic safety purposes.

"Sound level in decibels (dB)" means the sound measured utilizing the A-weighting scale and the slow needle response by a sound level meter.

"Sound level meter" means an instrument meeting American National Standard Institutes Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an equivalent standard. (2802 § 1, 2011; 2660 § 2, 2005)

8.47.030 Noise Level Measurement

All noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in Section 8.47.020, using a fast needle response, utilizing the dB(A) scale. (2802 § 1, 2011; 2660 § 2, 2005)

8.47.040 Ambient Base Noise Levels

The ambient base noise levels contained in the following chart shall be utilized as the basis for determining noise levels in excess of those allowed by this chapter unless the actual measured ambient noise level occurring at the same time as the noise under review is being investigated exceeds the ambient base noise level contained in the chart. When the actual measured ambient noise level exceeds the ambient base noise level, the actual measured ambient noise level shall be utilized as the basis for determining whether or not the subject noise exceeds the level allowed by this section. In situations where two adjoining properties exist within two different use designations, the most restrictive ambient base noise level will apply. This section permits any noise level that does not exceed either the ambient base noise level or the actual measured ambient noise level by 5 dB(A), as measured at the property line of the noise generation property.

USE CATEGORIES	USE DESIGNATIONS	AMBIENT BASE NOISE LEVELS	TIME OF DAY
Sensitive	Residential Use	55 dB(A)	7:00 a.m.—10:00 p.m.
		50 dB(A)	10:00 p.m.—7:00 a.m.
Conditionally Sensitive	Institutional Use	65 dB(A)	Any Time
	Office-Professional Use	65 dB(A)	Any Time
	Hotels & Motels	65 dB(A)	Any Time
Non-Sensitive	Commercial Uses	70 dB(A)	Any Time
	Commercial/ Industrial Uses within 150 feet of Residential	65 dB(A)	7:00 a.m.—10:00 p.m.
		50 dB(A)	10:00 p.m.—7:00 a.m.
	Industrial Use	70 dB(A)	Any Time

(2802 § 1, 2011; 2660 § 2, 2005)

8.47.050 General Noise Regulation

A. NOISE DISTURBANCE CRITERIA. It shall be unlawful for any person to willfully make, continue, or cause to be made or continued, any loud, unnecessary, or unusual noise that disturbs the peace or quiet of any neighborhood, or that causes discomfort or annoyance to any person of normal sensitiveness.

B. The criteria that shall be utilized in determining whether a violation of the provisions of this section exists shall include, but not be limited to, the following:

1. The level of the noise.
2. The frequency of occurrence of the noise.
3. Whether the nature of the noise is usual or unusual.
4. The level and intensity of the background noise, if any.
5. The proximity of the noise to residential sleeping facilities.
6. The nature and zoning of the area within which the noise emanates.
7. The density of the inhabitation of the area within which the noise is received.
8. The time of day or night the noise occurs.
9. The duration of the noise.

C. DURATION OF NOISE. The following criteria shall be used whenever the noise level exceeds:

1. The noise standard for a cumulative period of more than 30 minutes in any hour;
2. The noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour;
3. The noise standard plus 10 dB(A) for a cumulative period of more than five minutes in any hour;
4. The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour; or
5. The noise standard plus 20 dB(A) for any period of time.

D. In the event the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level. (2802 § 1, 2011; 2660 § 2, 2005)

8.47.060 Special Noise Sources

A. RADIOS, TELEVISION SETS, AND SIMILAR DEVICES.

1. USE RESTRICTED. It shall be unlawful for any person within any residential area of the City to use or operate any radio receiving set, musical instrument, stereo equipment, television set, or other machine or device for the producing or reproducing of sound between the hours of 10:00 p.m. of one day and 7:00 a.m. of the following day in such a manner as to disturb the peace, quiet, and comfort of any person of normal sensitiveness residing in the area, as determined utilizing the criteria established in Section 8.47.050(A).

2. PRIMA FACIE VIOLATION. Any noise level exceeding the ambient base level at the property line of any property (or, if a condominium or apartment house, within any adjoining apartment) by more than five decibels shall be deemed to be prima facie evidence of a violation of the provisions of this section.

B. MUSICAL INSTRUMENTS—USE RESTRICTED. It shall be unlawful for any person to use any drum or other instrument or device of any kind for the purpose of attracting attention by the creation of noise within the City. This section shall not apply to any person who is a participant in a duly licensed parade or who has been otherwise duly authorized to engage in such conduct.

C. MACHINERY, EQUIPMENT, FANS, AND AIR CONDITIONING. It shall be unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise that would cause the noise level at the property line of any property to exceed either the ambient base noise level or the actual measured ambient noise level by more than five decibels.

D. CONSTRUCTION OF BUILDINGS AND PROJECTS. It shall be unlawful for any person within a residential area, or within a radius of 500 feet therefrom, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects, or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction type device between the hours of 10:00 p.m. of one day and 7:00 a.m. of the next day in such a manner that a person of normal sensitiveness, as determined utilizing the criteria established in Section 8.47.050(B), is caused discomfort or annoyance unless such operations are of an emergency nature.

E. VEHICLE REPAIRS. It shall be unlawful for any person within any residential area of the City to repair, rebuild, or test any motor vehicle in such a manner that a person of normal sensitiveness residing in the area is caused discomfort or annoyance, as determined utilizing the criteria established in Section 8.47.050, unless such operations are of an emergency nature.

F. MOTOR DRIVEN VEHICLES. It shall be unlawful for any person to operate any motor driven vehicle within the City in such a manner that a person of normal sensitiveness residing in the area is caused discomfort or annoyance, as determined utilizing the criteria established in Section 8.47.050(B), unless such operations are of an emergency nature; provided, however, any such vehicle that is operated upon any public highway, street, or right-of-way shall be excluded from the provisions of this section.

G. AMPLIFIED SOUND.

1. PURPOSE. While recognizing the constitutional rights of freedom of speech and assembly, the City nevertheless feels obligated to reasonably regulate the use of sound amplifying equipment in order to protect the rights of the citizens of the City to privacy and freedom from excessively loud and unnecessary noise.

2. REGISTRATION. It shall be unlawful for any person, other than personnel of law enforcement or governmental agencies, to install, use, or operate within the City a loudspeaker or sound amplifying equipment mounted upon any vehicle for the purposes of warnings, giving instructions, directions, talks, addresses, lectures, or transmitting music to any persons or assemblages of persons without first filing a registration statement at least seven days prior to the date on which the sound amplifying equipment is intended to be used and obtaining approval from the Zoning Administrator.

3. APPROVAL. The Zoning Administrator shall return to the applicant an approved copy of the registration statement unless he or she finds that:

a. The conditions of the motor vehicle movement are such that use of the equipment would constitute a detriment to traffic safety; or

b. The conditions of pedestrian movement are such that use of the equipment would constitute a detriment to traffic safety.

4. DISAPPROVAL. In the event the registration statement is disapproved, the Zoning Administrator shall endorse upon the statement the reason for disapproval and return it to the applicant.

5. APPEALS. Any decision by the Zoning Administrator may be appealed to the City Council within seven days of action of the Zoning Administrator by filing a notice of appeal with the City Clerk.

H. WASTE HAULERS/COMMERCIAL SWEEPERS AND LEAF BLOWERS. It shall be unlawful for any person within any commercial, industrial, or office complex area of the City to operate any refuse compacting, processing or collection vehicle, parking lot sweeper or leaf blower within 150 feet of residential property between the hours of 10:00 p.m. of one day and 7:00 a.m. of the following day.

I. LOADING/UNLOADING. It shall be unlawful for any person in any commercial or industrial area of the City that abuts or is located adjacent to any residential property between the hours of 10:00 p.m. of one day and 7:00 a.m. of the following day to load or unload any vehicle, or operate any dollies, carts, forklifts, or other wheeled equipment that causes any noise that disturbs the peace or quiet of the residential neighborhood. (2802 § 1, 2011; 2660 § 2, 2005)

8.47.070 Exemptions

A. EMERGENCY ACTIVITIES. The provisions of this chapter shall not preclude the operation, maintenance, and repair of equipment, apparatus, or facilities of essential public services, including those of governmental agencies and public utilities providing those activities are of an emergency nature or are necessary to maintain the health, safety, and welfare of the citizenry.

B. COMMUNITY ACTIVITIES. Community events, as described in Section 8.08.060 of the Municipal Code, outdoor gatherings, school bands, dances, shows, and athletic events are hereby exempted from the provisions of this chapter provided such activities are conducted pursuant to a duly authorized license or permit.

C. STATE AND FEDERAL PREEMPTIONS. Motor vehicle and aircraft operations and any other activity whose regulation has been preempted by state or federal law is hereby exempted from the provisions of this chapter. (2802 § 1, 2011; 2660 § 2, 2005)

8.47.080 Abatement

The City Manager or his or her designee and his or her duly authorized representatives are hereby directed to enforce the provisions of this chapter by requiring that the alleged offender correct violations and achieve compliance with the provisions of this chapter within a reasonable period of time.

A. The City Manager or his or her designee shall have the power and duty to enforce the following noise control provisions of this Code: Section 8.47.050, Section 8.47.060(A)(2), (C), (H), and (I).

B. The Police Department shall have the power and duty to enforce the following noise control provisions of this Code: Section 8.47.060 (A)(1), (B), (E), (F), (G)(1) and (2).

C. The Building Official shall have the power and duty to enforce the following noise control provisions of this Code: Section 8.47.060(D). (2802 § 1, 2011; 2660 § 2, 2005)

View the mobile version.

Appendix B

Field Data and Photos

Field Sheet

Project: Garden Grove Hotel Site B-2 **Engineer:** D. Shivaiah

Date: 6/16/2021
JN: 2250-2020-03

Measurement Address: **City:** Garden Grove
Northwest corner of Harbor Boulevard and Twintree Avenue

Site No.: 1

Sound Level Meter:
Piccolo II
Serial # P0218042101
Serial # P0218092808
Serial # P0221010801
Serial # P0221010802

Calibrator:
CA114 Sound Calibrator
Serial # 500732

Calibration Record:

	Input, dB/	Reading, dB/	Offset, dB/	Time
1	94.0			
2	94.0			3:48 PM
3	94.0			
4	94.0			3:56 PM

Notes:

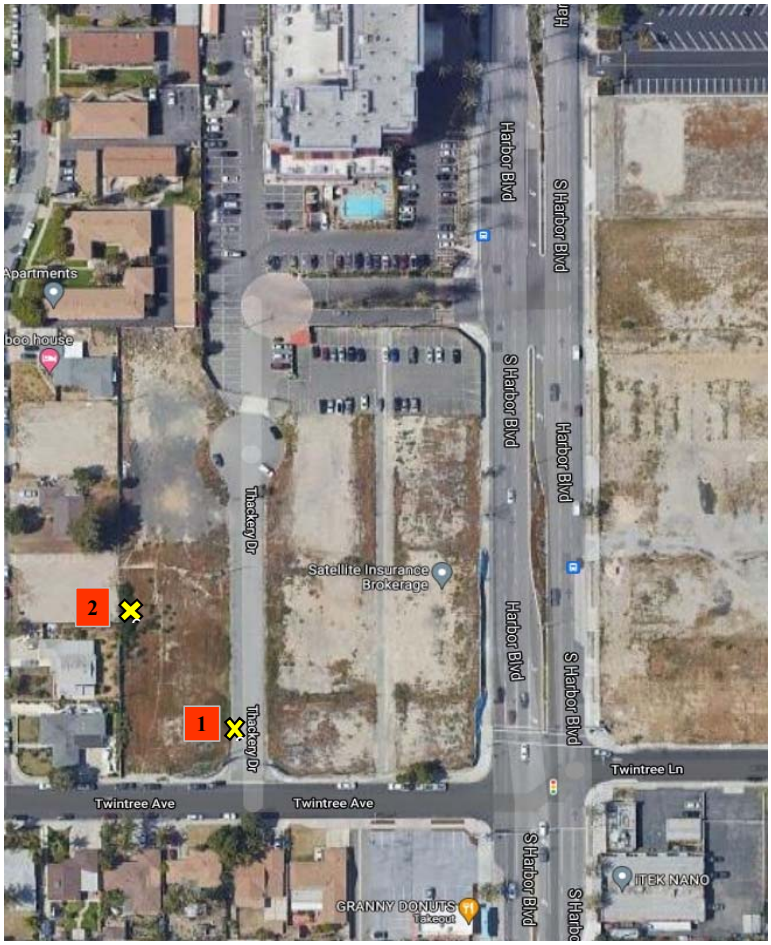
Temp: 77
Windspeed: 5 MPH
Direction: SW
Skies: Clear
Camera:
Photo Nos.

Meter Settings:

☒ A-WTD ☐ LINEAR ☒ SLOW ☐ 1/1 OCT ☒ INTERVALS ___60____- MINUTE
☐ C-WTD ☐ IMPULSE ☐ FAST ☐ 1/3 OCT ☒ L_N PERCENTILE VALUES

Notes:

Measurement Type:
Long-term X
Short-term



RK engineering group, inc.

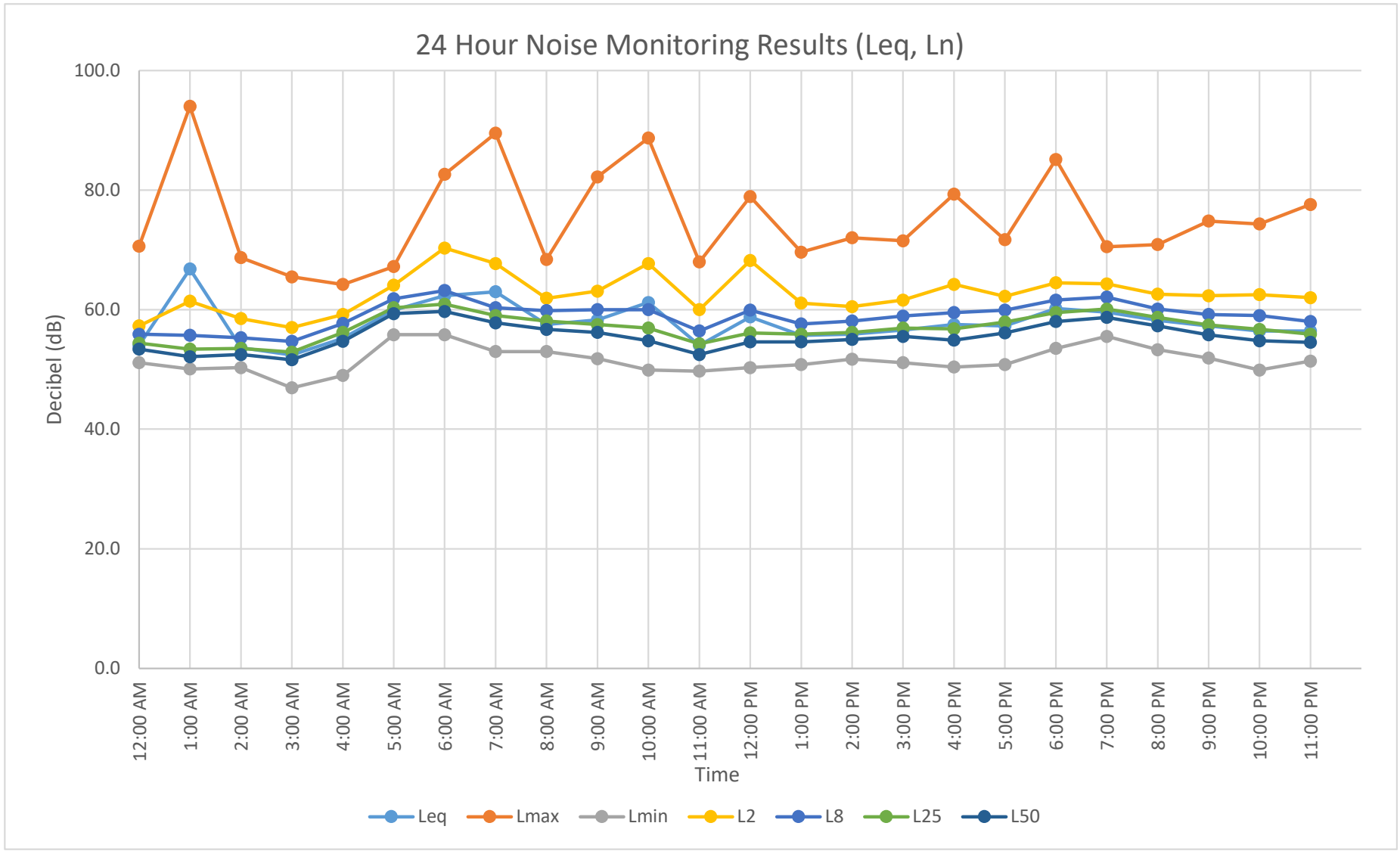
Field Sheet - ST1 Location Photos

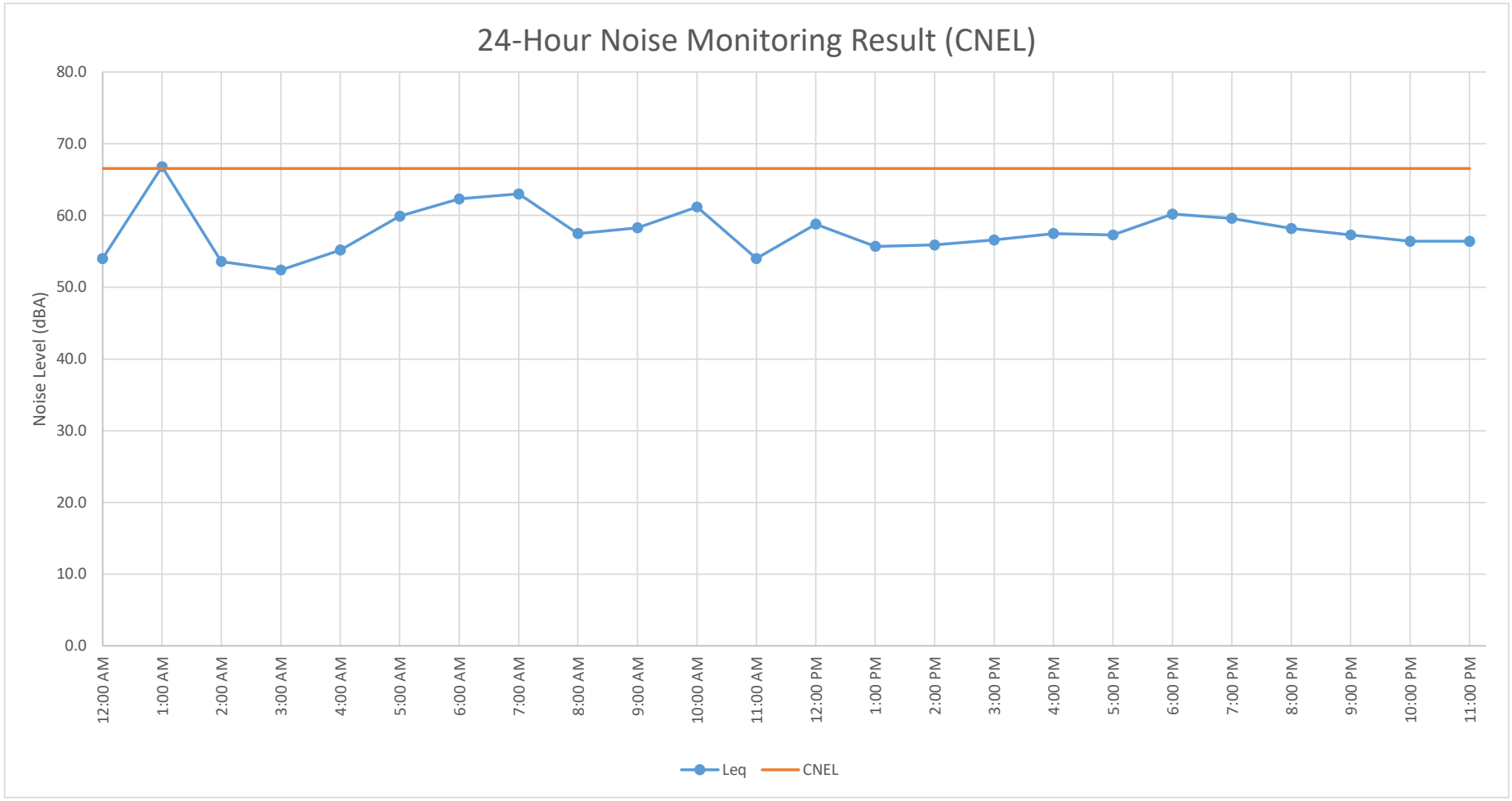
Project: Garden Grove Hotel Site B-2	**Engineer:** D. Shivaiah	**Date:**	6/16/2021
		JN:	2250-2020-03
Measurement Address:	**City:** Garden Grove	**Site No.:**	1
Approximately 25 ft from the southern PL and 105 ft from the western PL			



RK engineering group, inc.

PROJECT:	Garden Grove Hotel Site B-2					JOB #:	2250-2020-03
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	16-Jun-21
LOCATION:	Approximately 30 ft from the southern PL and 105 ft from the western PL					BY:	D. Shivaiah
Time	Leq	Lmax	Lmin	L2	L8	L25	L50
12:00 AM	54.0	70.6	51.1	57.3	55.9	54.4	53.4
1:00 AM	66.8	94.0	50.1	61.4	55.7	53.4	52.1
2:00 AM	53.6	68.7	50.3	58.5	55.3	53.5	52.5
3:00 AM	52.4	65.5	46.9	57.0	54.7	52.9	51.6
4:00 AM	55.2	64.2	49.0	59.2	57.7	56.2	54.7
5:00 AM	59.9	67.2	55.8	64.1	61.8	60.3	59.3
6:00 AM	62.3	82.6	55.8	70.3	63.2	60.9	59.7
7:00 AM	63.0	89.5	53.0	67.7	60.3	59.0	57.8
8:00 AM	57.5	68.4	53.0	61.9	59.8	58.1	56.7
9:00 AM	58.3	82.2	51.8	63.1	60.0	57.5	56.2
10:00 AM	61.2	88.7	49.9	67.7	60.0	56.9	54.8
11:00 AM	54.0	68.0	49.7	60.0	56.4	54.3	52.5
12:00 PM	58.8	78.9	50.3	68.2	59.9	56.1	54.6
1:00 PM	55.7	69.6	50.8	61.1	57.6	55.9	54.6
2:00 PM	55.9	72.0	51.7	60.5	58.1	56.2	55.0
3:00 PM	56.6	71.5	51.1	61.6	58.9	56.9	55.5
4:00 PM	57.5	79.3	50.4	64.2	59.5	56.8	54.9
5:00 PM	57.3	71.7	50.8	62.2	59.9	57.9	56.1
6:00 PM	60.2	85.1	53.5	64.5	61.6	59.5	58.0
7:00 PM	59.6	70.5	55.5	64.3	62.1	60.1	58.7
8:00 PM	58.2	70.9	53.3	62.6	60.1	58.7	57.3
9:00 PM	57.3	74.8	51.9	62.3	59.2	57.4	55.8
10:00 PM	56.4	74.3	49.9	62.5	59.0	56.7	54.8
11:00 PM	56.4	77.6	51.4	62.0	58.0	55.9	54.5
Daytime	58.6	89.5	49.7	64.2	59.7	57.6	56.1
Nighttime	60.5	94.0	46.9	63.7	58.9	57.0	55.8


24 Hour Noise Monitoring Results (Leq, Ln)
100.0
80.0
60.0
40.0
20.0
0.0
Decibel (dB)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time
Leq
Lmax
Lmin
L2
L8
L25
L50


24-Hour Noise Monitoring Result (CNEL)
Noise Level (dBA)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Leq
CNEL

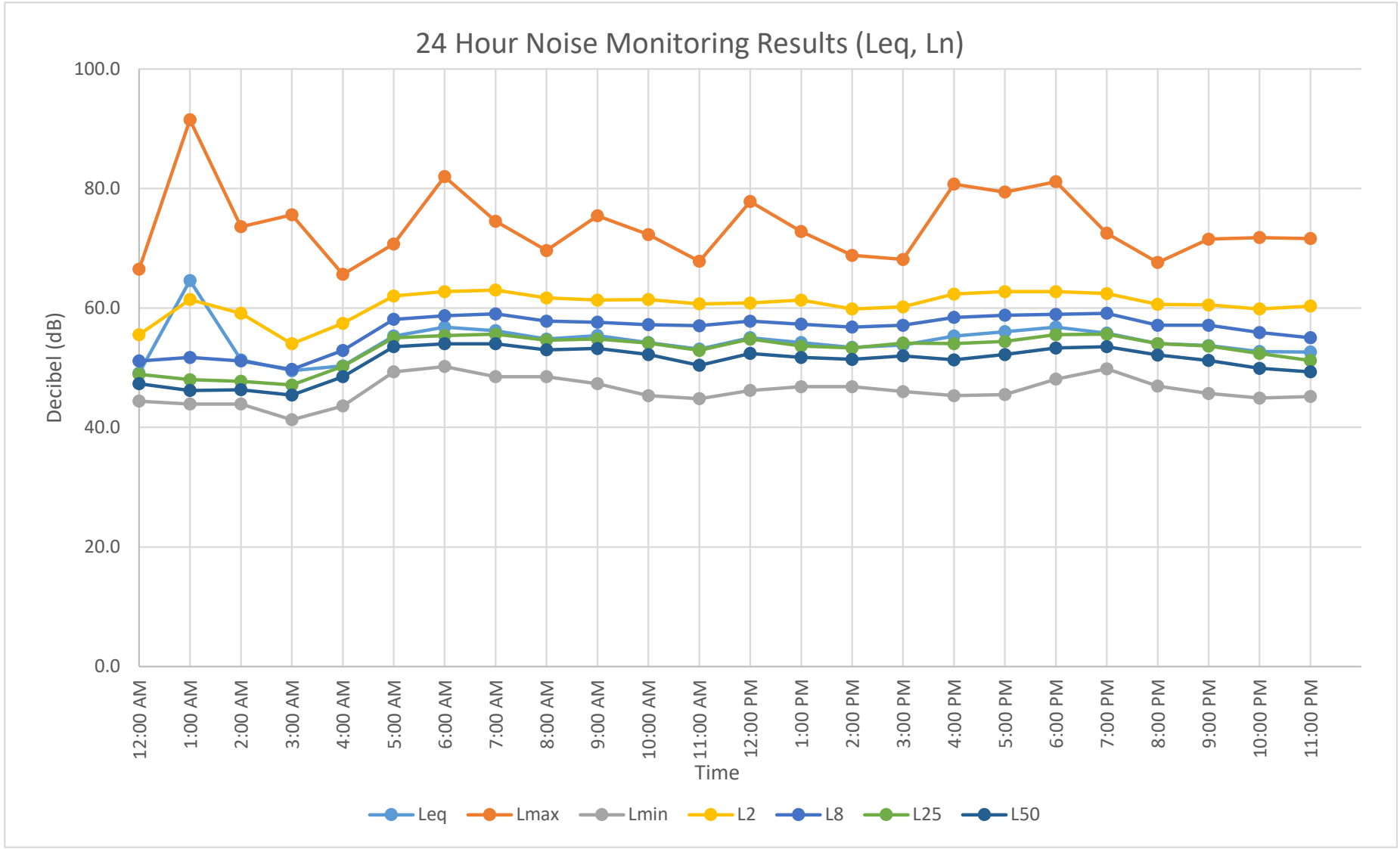
Field Sheet - ST2 Location Photos

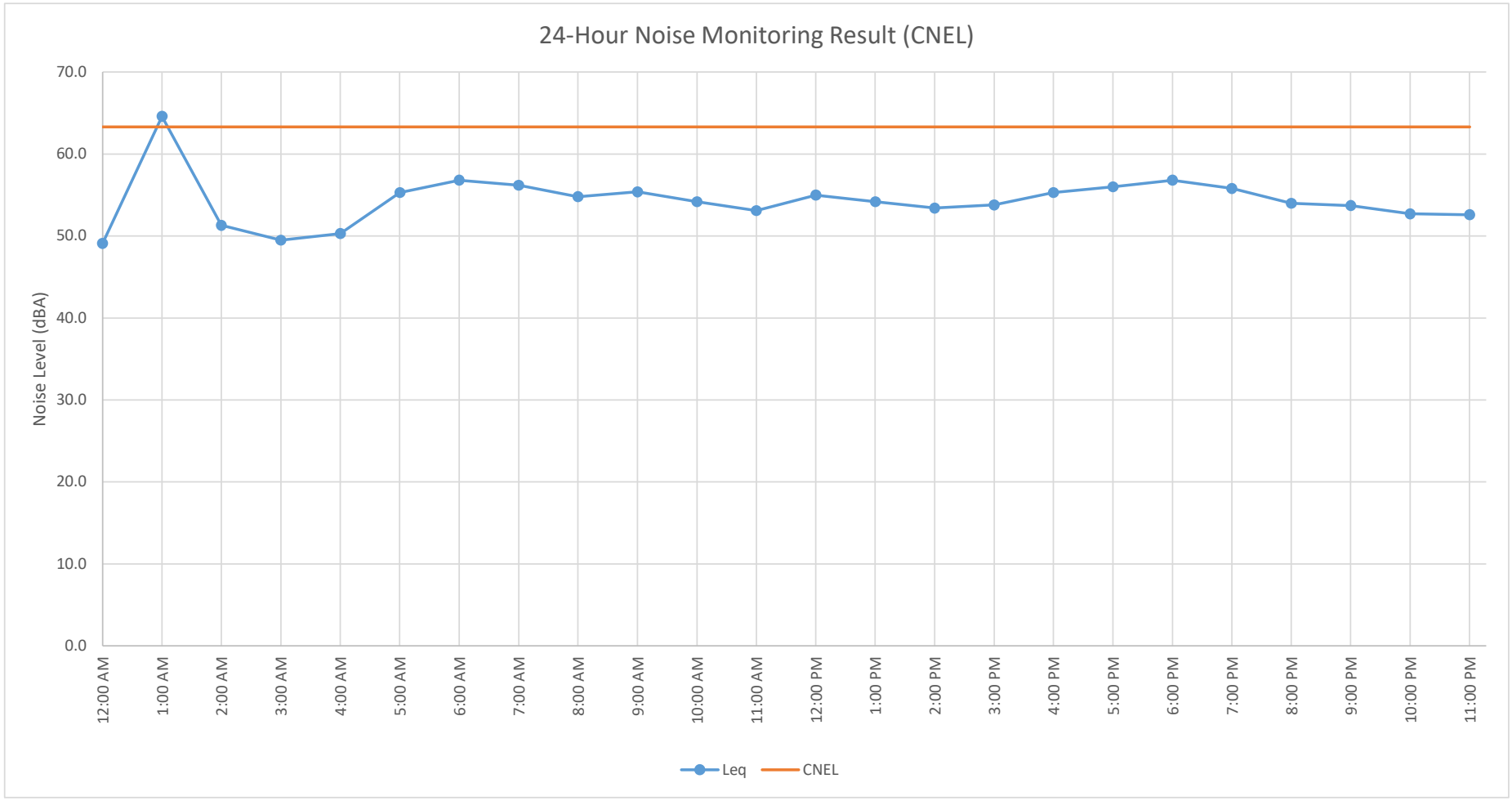
Project: Garden Grove Hotel Site B-2	**Engineer:** D. Shivaiah	**Date:**	6/16/2021
		JN:	2250-2020-03
Measurement Address:	**City:** Garden Grove	**Site No.:**	2
Along western property line approximately 180 feet from southern property line.			



RK engineering group, inc.

PROJECT:	Garden Grove Hotel Site B-2					JOB #:	2250-2020-03
NOISE METER	Piccolo II SLM, 24-Hour Measurement					DATE:	16-Jun-21
LOCATION:	Along western property line approximately 210 feet from southern property line.					BY:	D. Shivaiah
Time	Leq	Lmax	Lmin	L2	L8	L25	L50
12:00 AM	49.1	66.5	44.4	55.5	51.1	48.9	47.3
1:00 AM	64.6	91.5	43.9	61.4	51.7	48.0	46.2
2:00 AM	51.3	73.6	43.9	59.1	51.1	47.7	46.3
3:00 AM	49.5	75.6	41.3	54.0	49.7	47.1	45.4
4:00 AM	50.3	65.6	43.6	57.4	52.9	50.2	48.5
5:00 AM	55.3	70.7	49.3	62.0	58.1	55.0	53.5
6:00 AM	56.8	82.0	50.2	62.7	58.7	55.4	54.0
7:00 AM	56.2	74.5	48.5	63.0	59.0	55.6	54.0
8:00 AM	54.8	69.6	48.5	61.7	57.8	54.6	53.0
9:00 AM	55.4	75.4	47.3	61.3	57.6	54.8	53.2
10:00 AM	54.2	72.3	45.3	61.4	57.2	54.1	52.2
11:00 AM	53.1	67.8	44.8	60.7	57.0	52.9	50.4
12:00 PM	55.0	77.8	46.2	60.8	57.8	54.8	52.4
1:00 PM	54.2	72.8	46.8	61.3	57.3	53.6	51.7
2:00 PM	53.4	68.8	46.8	59.8	56.8	53.3	51.4
3:00 PM	53.8	68.1	46.0	60.2	57.1	54.1	52.0
4:00 PM	55.3	80.7	45.3	62.3	58.4	54.0	51.3
5:00 PM	56.0	79.4	45.5	62.7	58.8	54.4	52.2
6:00 PM	56.8	81.1	48.1	62.7	58.9	55.5	53.3
7:00 PM	55.8	72.5	49.8	62.4	59.1	55.6	53.5
8:00 PM	54.0	67.6	46.9	60.6	57.1	54.0	52.1
9:00 PM	53.7	71.5	45.7	60.5	57.1	53.6	51.2
10:00 PM	52.7	71.8	44.9	59.8	55.9	52.4	49.9
11:00 PM	52.6	71.6	45.2	60.3	55.0	51.2	49.3
Daytime	54.8	81.1	44.8	61.4	57.8	54.3	52.2
Nighttime	57.3	91.5	41.3	59.9	54.8	51.6	50.0


24 Hour Noise Monitoring Results (Leq, Ln)
100.0
80.0
60.0
40.0
20.0
0.0
Decibel (dB)
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time
Leq
Lmax
Lmin
L2
L8
L25
L50


24-Hour Noise Monitoring Result (CNEL)
Noise Level (dBA)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Leq
CNEL

Appendix C

Noise Analysis Results
(SoundPLAN)

Noise emissions of industry sources

Source name	Referen	Level		Frequency spectrum [dB(A)]																										Correctio		
			dB(A	31 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.3 kHz	1.6 kHz	2 kHz	2.5 kHz	3.2 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	Cwa dB	Cl dB	CT dB
Water Slide-1	Lw/	Day	89.0	-	-	-	-	-	-	-	-	-	-	-	-	89.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Slide-2	Lw/unit	Day	89.0	-	-	-	-	-	-	-	-	-	-	-	-	89.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Loading Dock	Lw/	Day	80.0	-	-	-	47.	50.	54.	57.	59.	61.	64.	66.	68.	70.	71.	72.	73.	73.	73.	74.	74.	74.	74.	73.	73.	72.	-	-	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Loud Speakers Wes	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Loud Speakers Wes	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Loud Speakers Eas	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Loud Speakers Eas	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Loud Speakers Nor	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Loud Speakers Sou	Lw/	Day	82.0	-	-	-	-	-	-	-	-	-	-	-	-	82.	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-
Water Slide-3	Lw/	Day	89.0	-	-	-	-	-	-	-	-	-	-	-	-	89.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hotel Themed Pool	Lw/unit	Day	88.0	-0.9	8.9	17.	25.	32.	37.	43.	50.	56.	61.	65.	70.	74.	76.	78.	80.	80.	79.	78.	76.	74.	72.	70.	65.	62.	58.	-	-	-
		Nigh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parking Garage to t	Lw/unit	Day	79.3																										3.0	-	-
		Nigh	79.3																										3.0	-	-
Parking Garage to t	Lw/unit	Day	79.3																										3.0	-	-
		Nigh	79.3																										3.0	-	-
Parking Garage to t	Lw/unit	Day	79.3																										3.0	-	-
		Nigh	79.3																										3.0	-	-

Receiver list

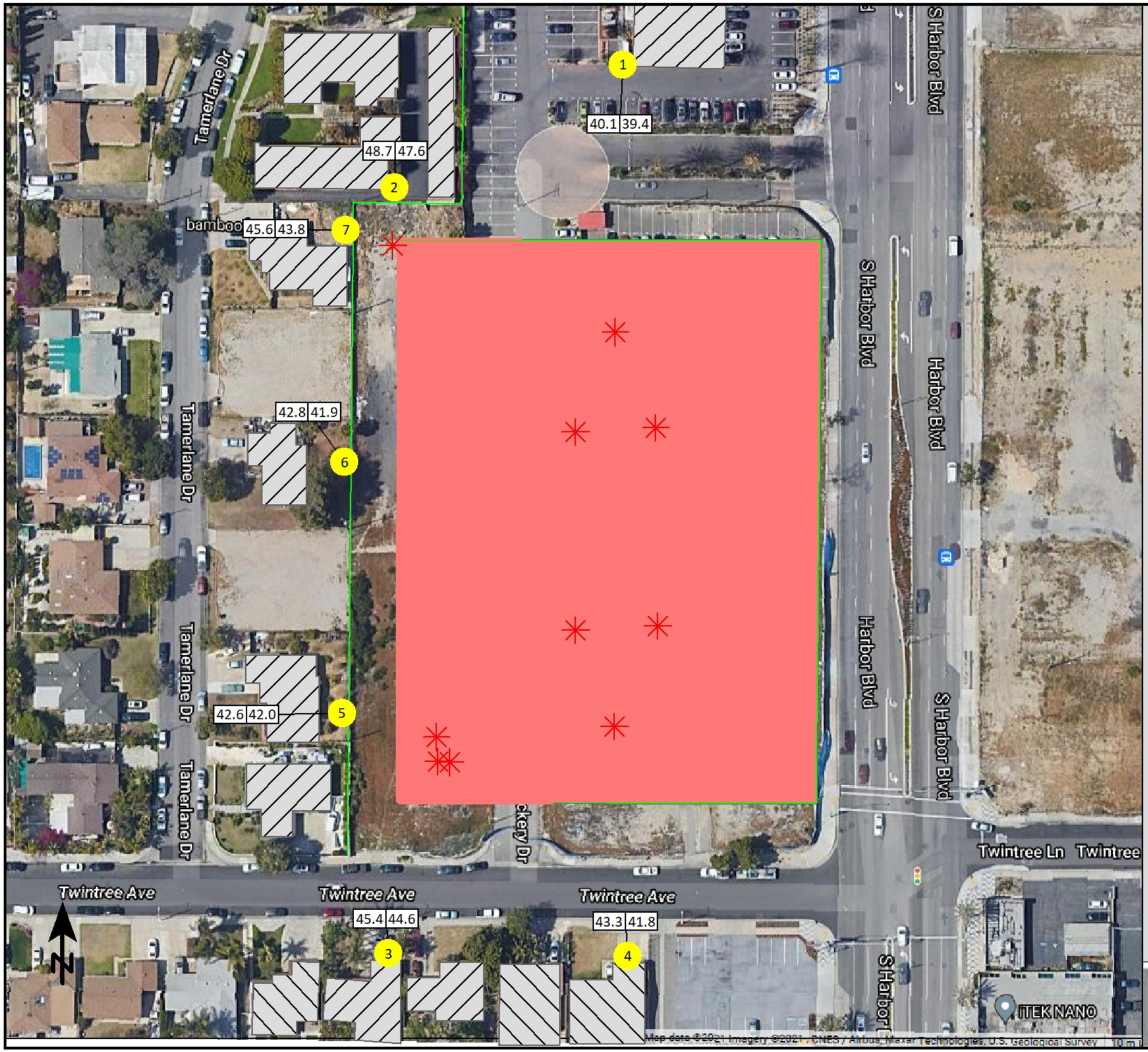
No.	Receiver name	Building side	Floor	Limit		Level w/o NP		Level w NP		Difference		Conflict	
				Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
				dB(A)		dB(A)		dB(A)		dB		dB	
1	Hotel Use to the North	-	GF	-	-	41.0	39.5	40.1	39.4	-0.9	0.0	-	-
2	Residential Use to the Northw	-	GF	-	-	52.6	49.3	48.7	47.6	-3.9	-1.7	-	-
3	Residential Use to the South-	-	GF	-	-	46.6	44.6	45.4	44.6	-1.2	0.0	-	-
4	Residential Use to the South-	-	GF	-	-	45.3	41.8	43.3	41.8	-2.0	0.0	-	-
5	Residential Use to the West-1	-	GF	-	-	46.4	45.9	42.6	42.0	-3.8	-3.9	-	-
6	Residential Use to the West-2	-	GF	-	-	47.3	46.0	42.8	41.9	-4.5	-4.1	-	-
7	Residential Use to the West-3	-	GF	-	-	54.6	48.7	45.6	43.8	-9.1	-5.0	-	-

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP Day	Level w/o NP Night	Level w NP Day	Level w NP Night
		dB(A)		dB(A)	
Hotel Use to the North	GF	41.0	39.5	40.1	39.4
Hotel Themed Pool	-	32.0	-	23.0	-
Loading Dock	-	18.6	-	20.7	-
Loud Speakers East-1	-	15.2	-	15.1	-
Loud Speakers East-2	-	11.7	-	11.6	-
Loud Speakers North	-	31.7	-	27.4	-
Loud Speakers South	-	10.3	-	10.2	-
Loud Speakers West-1	-	15.0	-	15.0	-
Loud Speakers West-2	-	11.6	-	11.5	-
Parking Garage to the North	-	39.4	39.4	39.4	39.4
Parking Garage to the South	-	6.5	6.5	6.5	6.5
Parking Garage to the West	-	13.8	13.8	13.8	13.8
Water Slide-1	-	22.7	-	20.9	-
Water Slide-2	-	22.4	-66.6	20.5	-68.5
Water Slide-3	-	22.3	-	20.5	-
Residential Use to the Northwest	GF	52.6	49.3	48.7	47.6
Hotel Themed Pool	-	28.9	-	23.0	-
Loading Dock	-	49.9	-	42.1	-
Loud Speakers East-1	-	14.3	-	14.1	-
Loud Speakers East-2	-	10.6	-	10.6	-
Loud Speakers North	-	22.6	-	21.3	-
Loud Speakers South	-	9.6	-	9.6	-
Loud Speakers West-1	-	20.0	-	20.0	-
Loud Speakers West-2	-	16.3	-	16.2	-
Parking Garage to the North	-	48.6	48.6	47.0	47.0
Parking Garage to the South	-	9.5	9.5	8.5	8.5
Parking Garage to the West	-	41.1	41.1	38.7	38.7
Water Slide-1	-	22.0	-	21.0	-
Water Slide-2	-	21.6	-67.4	20.5	-68.5
Water Slide-3	-	21.2	-	20.5	-
Residential Use to the South-1	GF	46.6	44.6	45.4	44.6
Hotel Themed Pool	-	31.6	-	22.8	-
Loading Dock	-	29.4	-	29.7	-
Loud Speakers East-1	-	11.8	-	11.7	-
Loud Speakers East-2	-	12.8	-	12.3	-
Loud Speakers North	-	10.8	-	10.9	-
Loud Speakers South	-	30.6	-	26.7	-
Loud Speakers West-1	-	19.7	-	18.0	-
Loud Speakers West-2	-	25.1	-	22.8	-
Parking Garage to the North	-	9.6	9.6	9.8	9.8
Parking Garage to the South	-	43.6	43.6	43.6	43.6
Parking Garage to the West	-	37.4	37.4	37.4	37.4
Water Slide-1	-	25.1	-	25.2	-
Water Slide-2	-	38.0	-51.0	33.0	-56.0
Water Slide-3	-	37.9	-	32.9	-
Residential Use to the South-2	GF	45.3	41.8	43.3	41.8
Hotel Themed Pool	-	33.5	-	24.0	-
Loading Dock	-	4.2	-	4.2	-
Loud Speakers East-1	-	10.4	-	10.4	-
Loud Speakers East-2	-	14.4	-	14.4	-
Loud Speakers North	-	9.0	-	8.9	-
Loud Speakers South	-	32.0	-	28.0	-
Loud Speakers West-1	-	10.4	-	10.4	-
Loud Speakers West-2	-	21.6	-	19.8	-
Parking Garage to the North	-	6.2	6.2	6.2	6.2
Parking Garage to the South	-	41.8	41.8	41.8	41.8
Parking Garage to the West	-	14.2	14.2	14.3	14.3
Water Slide-1	-	35.4	-	31.7	-
Water Slide-2	-	38.1	-50.9	33.1	-55.9
Water Slide-3	-	36.7	-	31.7	-
Residential Use to the West-1	GF	46.4	45.9	42.6	42.0
Hotel Themed Pool	-	29.7	-	23.8	-

Contribution levels of the receivers

Source name	Traffic lane	Level w/o NP		Level w NP	
		Day	Night	Day	Night
		dB(A)		dB(A)	
Loading Dock	-	32.2	-	26.4	-
Loud Speakers East-1	-	12.2	-	12.2	-
Loud Speakers East-2	-	14.5	-	14.4	-
Loud Speakers North	-	11.9	-	11.4	-
Loud Speakers South	-	16.3	-	16.0	-
Loud Speakers West-1	-	18.5	-	18.4	-
Loud Speakers West-2	-	21.4	-	21.4	-
Parking Garage to the North	-	11.8	11.8	11.6	11.6
Parking Garage to the South	-	25.5	25.5	22.8	22.8
Parking Garage to the West	-	45.9	45.9	41.9	41.9
Water Slide-1	-	27.5	-	27.5	-
Water Slide-2	-	28.0	-61.0	27.3	-61.7
Water Slide-3	-	27.0	-	26.6	-
Residential Use to the West-2	GF	47.3	46.0	42.8	41.9
Hotel Themed Pool	-	30.5	-	24.9	-
Loading Dock	-	39.9	-	31.2	-
Loud Speakers East-1	-	14.8	-	14.8	-
Loud Speakers East-2	-	13.8	-	13.7	-
Loud Speakers North	-	15.3	-	15.2	-
Loud Speakers South	-	13.3	-	13.3	-
Loud Speakers West-1	-	21.9	-	21.9	-
Loud Speakers West-2	-	20.4	-	20.3	-
Parking Garage to the North	-	18.5	18.5	17.9	17.9
Parking Garage to the South	-	14.3	14.3	13.8	13.8
Parking Garage to the West	-	46.0	46.0	41.9	41.9
Water Slide-1	-	29.8	-	27.3	-
Water Slide-2	-	29.3	-59.7	26.8	-62.2
Water Slide-3	-	28.2	-	26.0	-
Residential Use to the West-3	GF	54.6	48.7	45.6	43.8
Hotel Themed Pool	-	28.1	-	22.7	-
Loading Dock	-	53.3	-	40.5	-
Loud Speakers East-1	-	14.2	-	13.5	-
Loud Speakers East-2	-	10.7	-	10.7	-
Loud Speakers North	-	21.0	-	20.3	-
Loud Speakers South	-	10.3	-	9.8	-
Loud Speakers West-1	-	19.9	-	19.9	-
Loud Speakers West-2	-	16.6	-	16.5	-
Parking Garage to the North	-	47.4	47.4	41.9	41.9
Parking Garage to the South	-	10.0	10.0	9.3	9.3
Parking Garage to the West	-	43.1	43.1	39.2	39.2
Water Slide-1	-	27.2	-	24.6	-
Water Slide-2	-	26.8	-62.2	24.2	-64.8
Water Slide-3	-	25.7	-	23.5	-



Garden Grove Hotel Site B-2
Noise Impact Study

City of Garden Grove

Signs and symbols

- Ground effects
- Wall
- Receiver
- Point source
- Area source

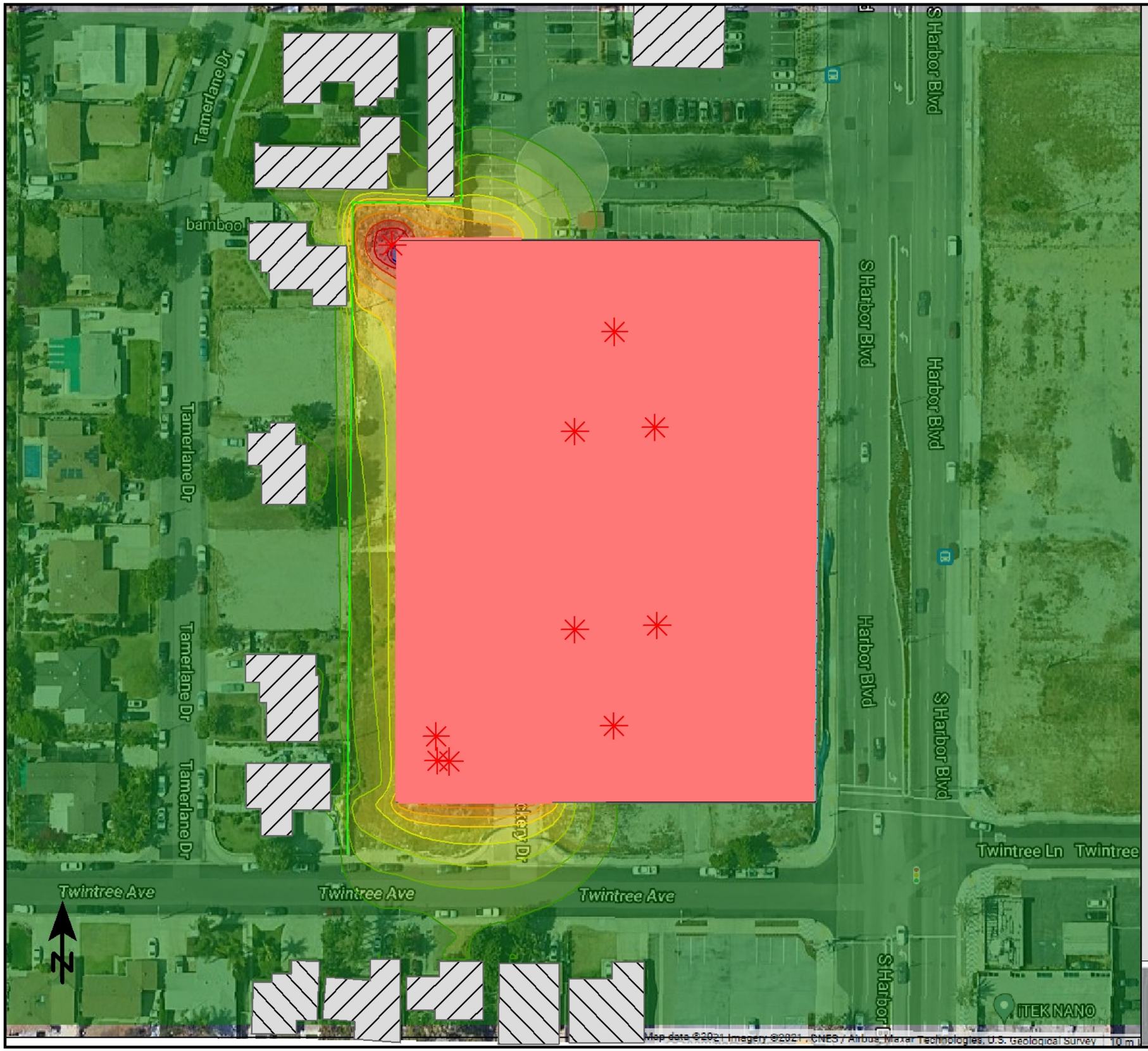
1 : 1249

0 5 10 20 30 40 m

RK engineering group, inc.

Garden Grove Hotel Site B-2 Noise Impact Study - Daytime Contours

City of Garden Grove



Signs and symbols

- Wall
- Adjacent Receptor Buildings
- Proposed Project
- Point source
- Area source

Levels in dB(A)

< 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
55 - 57
57 - 59
59 - 61
61 - 63
63 - 65
>= 65

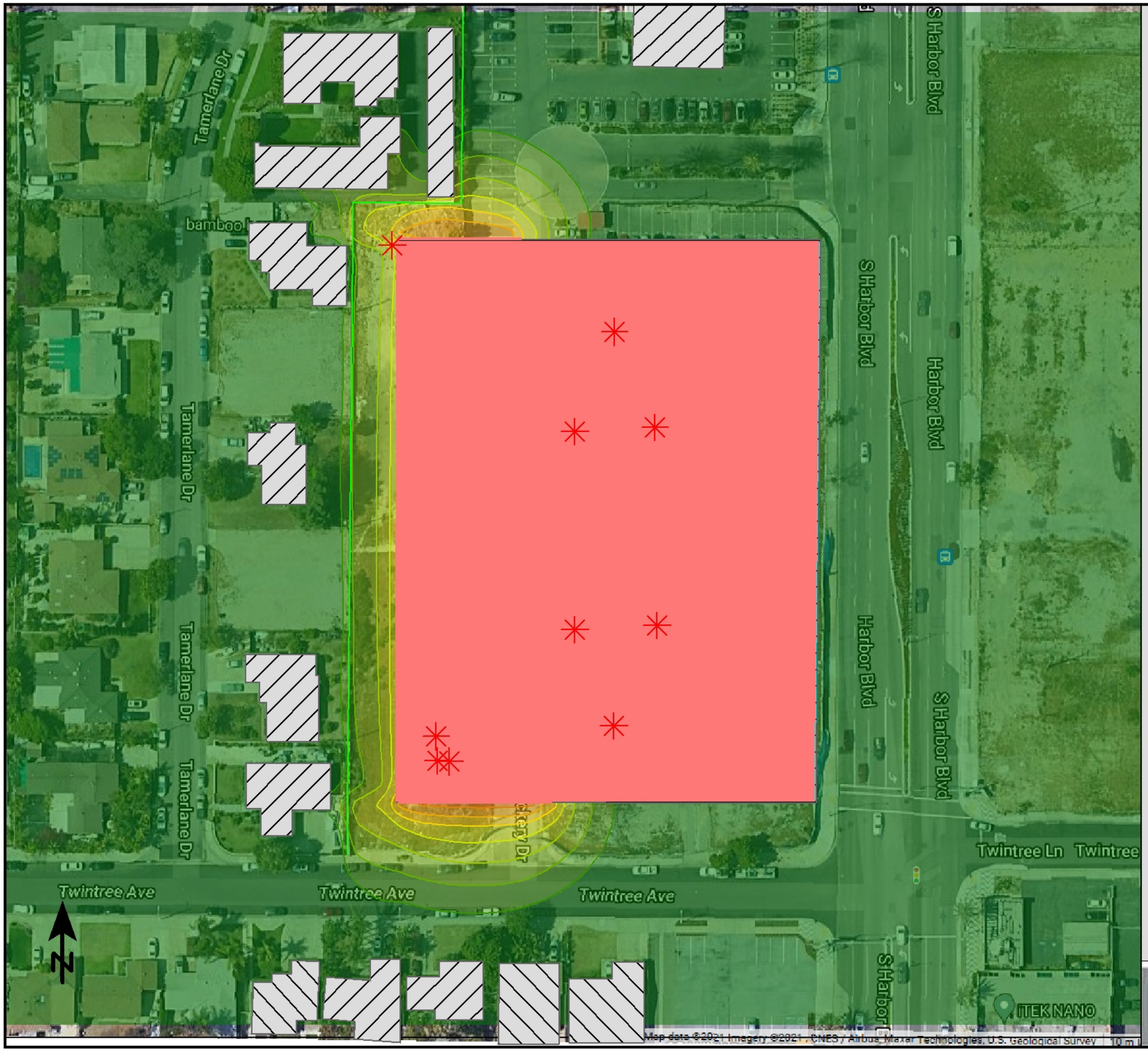
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RK engineering group, inc.

Garden Grove Hotel Site B-2 Noise Impact Study - Nighttime Contours

City of Garden Grove



Signs and symbols

- Wall
- Adjacent Receptor Buildings
- Proposed Project
- Point source
- Area source

Levels in dB(A)

< 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
55 - 57
57 - 59
59 - 61
61 - 63
63 - 65
>= 65

1 : 1249

0 5 10 20 30 40 m

RK engineering group, inc.

Appendix D

Construction and Vibration
Result Sheets

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/5/2021
Case Description: Garden Grove Site B-2 Hotel

				---- Receptor #1 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
Site Preparation	Residential	55	50	50			

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	100	0
Tractor	No	40	84		100	0
Dozer	No	40				
Dozer	No	40				
Tractor	No	40				
Tractor	No	40				
Tractor	No	40				

		Calculated (dBA)	
Equipment		*Lmax	Leq
Dozer		75.6	71.7
Tractor		78	74
Dozer		75.6	71.7
Dozer		75.6	71.7
Tractor		78	74
Tractor		78	74
Tractor		78	74
	Total	78	81.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/5/2021
Case Description: Garden Grove Site B-2 Hotel

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Grading	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	100	0
Grader	No	40	85		100	0
Dozer	No	40				
Tractor	No	40				
Excavator	No	40				
Tractor	No	40				
Tractor	No	40				

Calculated (dBA)

Equipment		*Lmax	Leq
Excavator		74.7	70.7
Grader		79	75
Dozer		75.6	71.7
Tractor		78	74
Excavator		74.7	70.7
Tractor		78	74
Tractor		78	74
	Total	79	81.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/5/2021
Case Description: Garden Grove Site B-2 Hotel

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Building Construction	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	100	0
Pickup Truck	No	40		75	100	0
Generator	No	50				
Tractor	No	40				
Auger Drill Rig	No	20				
Welder / Torch	No	40				
Pickup Truck	No	40				
Pickup Truck	No	40				
Tractor	No	40				
Tractor	No	40				

		Calculated (dBA)	
Equipment		*Lmax	Leq
Crane		74.5	66.6
Pickup Truck		69	65
Generator		74.6	71.6
Tractor		78	74
Auger Drill Rig		78.3	71.3
Welder / Torch		68	64
Pickup Truck		69	65
Pickup Truck		69	65
Tractor		78	74
Tractor		78	74
	Total	78.3	80.8

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/5/2021
Case Description: Garden Grove Site B-2 Hotel

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Paving	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	100	0
Paver	No	50		77.2	100	0
Paver	No	50				
Roller	No	20				
Tractor	No	40				
Concrete Mixer Truck	No	40				
Paver	No	50				
Roller	No	20				

		Calculated (dBA)	
Equipment		*Lmax	Leq
Concrete Mixer Truck		72.8	68.8
Paver		71.2	68.2
Paver		71.2	68.2
Roller		74	67
Tractor		78	74
Concrete Mixer Truck		72.8	68.8
Paver		71.2	68.2
Roller		74	67
	Total	78	78.5

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/5/2021
Case Description: Garden Grove Site B-2 Hotel

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Architectural Coating	Residential	55	50	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	100	0

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		71.6	67.7
	Total	71.6	67.7

*Calculated Lmax is the Loudest value.

NOISE BARRIER CALCULATIONS - BASED UPON FHWA - RD-77-108

PROJECT:	Garden Grove Site B-2 Hotel	JOB #:	2250-2020-3
SOURCE:	Worst Case Construction Noise	DATE:	05-Aug-21
LOCATION:	Receptor at 100 Feet	BY:	Darshan Shivaiah

NOISE INPUT DATA

OBS DIST=	100.0			
DT WALL=	95.0			
DT W/OB=	5.0			
HTH WALL=	6.0	********		
BARRIER =	0.0	(0=WALL,1=BERM)		
OBS HTH=	5.0			
NOISE HTH=	8.0		BARRIER+	
OBS EL =	0.0		TOPO SHIELDING =	-5.71
NOISE EL =	0.0		NOISE HTH EL=	8.0
DROP-OFF=	10.0	(20 = 6 dBA PER DOUBLING OF DISTANCE)		
COFF				

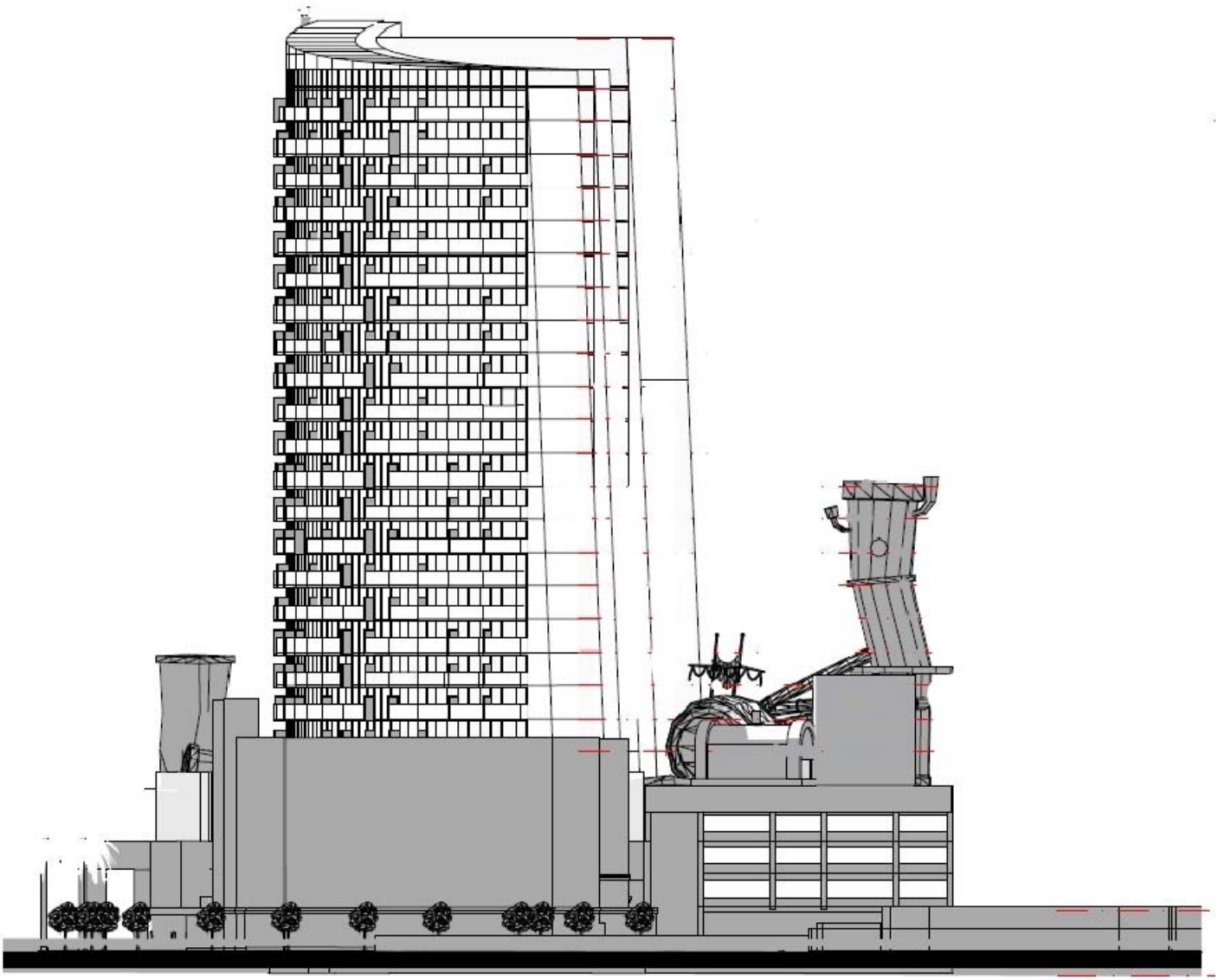
NOISE OUTPUT DATA (dBA)

	DIST (FT)	Leq	Lmax	L2	L8	L25	L50
REF LEVEL	100	81.6	93.7	93.7	93.7	93.7	93.7
PROJ LEVEL	100	81.6	93.7	93.7	93.7	93.7	93.7
SHIELDING	100	-5.7	-5.7	-5.7	-5.7	-5.7	-5.7
ADJ LEVEL	100	***75.9***	***88.0***	***88.0***	***88.0***	***88.0***	***88.0***

NOISE LEVEL REDUCTION DUE TO DISTANCE = 0

Appendix I
Traffic Impact Study

SITE "B-2" HOTEL
TRAFFIC IMPACT STUDY
City of Garden Grove, California



RK engineering group, inc.

SITE "B-2" HOTEL
TRAFFIC IMPACT STUDY
City of Garden Grove, California

Prepared for:

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Orange, CA 92868

Prepared by:

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Justin Tucker, P.E.
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April 27, 2022

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OCTA Bus Routes & Schedules I

Executive Summary

The purpose of this traffic impact analysis is to evaluate the proposed Site "B-2" Hotel project (hereinafter referred to as project) from a traffic and circulation standpoint. This study has been conducted pursuant to the *City of Garden Grove Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment (May 2020)* (TIA Guidelines), and the California Environmental Quality Act (CEQA) requirements.

This traffic study has been prepared in accordance with the scope of work set forth prior to initiating the analysis.

The project site is located at the northwest corner of Harbor Boulevard at Twintree Avenue in the City of Garden Grove.

The project consists of the construction and operation of a 500 room high-rise hotel with other supporting amenities such as conference space and restaurants. The project will also include a multi-level parking structure (four levels above grade and one level below) with a grand total of 528 spaces to serve the suites, event space, and hotel amenities.

The project is planned to consist of the following land uses:

- 500 rooms of Hotel;
    - Includes 9,490 square feet of Hotel Ballroom;
    - Includes 8,225 square feet of Hotel Meeting Rooms;
    - Includes 6,448 square feet of Hotel Studio Hall (for guest use);
    - Includes 7,000 square feet of Hotel Arcade (for guest use);
    - Includes 24,980 square feet of Hotel Themed Pool (for guest use); and
    - Includes 13,238 square feet of Hotel Themed Amenities (for guest use).
- 7,039 square feet of Hotel Theatre (600 seats);

- 5,480 square feet of Retail;
- 8,532 square feet of Spa; and
- 22,296 square feet of Quality Restaurant (11,148 square feet restaurant and 11,148 square feet hotel restaurant).

Access to the project site will be provided via the following:

- One (1) full access driveway on Harbor Boulevard (signalized); and
- One (1) full access driveway on Twintree Avenue (unsignalized).

The project is restricting access to the site along Twintree Avenue to emergency vehicles, maintenance, and trash/delivery trucks only. All employee and guest access to the site, including tourist buses and shuttles, will be via Harbor Boulevard. Therefore, the project access on Twintree Avenue will not experience any vehicle trips associated with employees or outside guests/visitors to the hotel.

The project is planned to open in 2025 and will be evaluated in one (1) single phase.

Trip Generation Summary:

Based on the ITE trip generation rates, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

MUTCD Traffic Signal Warrant Analysis Summary:

The following is a summary of the traffic signal warrants met:

- **Int 10 –** Harbor Boulevard / Project Access:
  - Existing Plus Project Conditions (PM peak hour only);
  - Project Buildout Year (2025) Without Project Conditions (both peak hours); and

        - Project Buildout Year (2025) With Project Conditions (both peak hours).

    - **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue:

        - Existing Conditions (AM peak hour only);

        - Existing Plus Project Conditions (AM peak hour only);

        - Project Buildout Year (2025) Without Project Conditions (both peak hours); and

        - Project Buildout Year (2025) With Project Conditions (both peak hours).

    - **Int 15 –** Harbor Boulevard / Blue Spruce Avenue:

        - No warrants met.

Local Agency Level of Service (LOS) Analysis Summary:

This analysis is being provided for non-CEQA purposes in order to comply with the applicable City of Garden Grove General Plan consistency requirements related to LOS.

Existing Conditions:

All study intersections are currently operating at an acceptable LOS (LOS D or better) during the peak hours for Existing Conditions, with the exception of the following study intersections which are currently operating at a deficient LOS (LOS E or F):

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Existing Plus Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Existing Plus Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 10 –** Harbor Boulevard / Project Access (PM peak hour only);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Existing Plus Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersection 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Existing Plus Project Conditions:

Intersection Improvement #1	**Int 10 – Harbor Boulevard / Project Access:** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #2	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue:** Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study

intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Project Buildout Year (2025) Without Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025) Without Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Project Buildout Year (2025) With Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025) With Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Project Buildout Year (2025) With Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersections 5, 6, and 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Project Buildout Year (2025) With Project Conditions:

Intersection Improvement #3	**Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*):** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #4	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*):** Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Congestion Management Program (CMP) LOS Analysis Summary:

All CMP study intersections are forecast to continue to operate at an acceptable LOS (LOS E or better) during the peak hours for all of the analysis scenarios evaluated as part of this report.

Based on the agency-established level of service performance thresholds, the project is forecast to not be required to contribute a fair-share to improving the CMP study intersections.

Left-Turn Pocket Queue Analysis Summary:

The following left-turn movements would require additional left-turn capacity:

- Int 2 – Harbor Boulevard / Orangewood Avenue:
  - Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 85 feet
    - Required Left-Turn Capacity without Project: 257 feet
    - Required Left-Turn Capacity with Project: 266 feet
    - Improvement: Coordinate with the City of Anaheim to determine if the project is required to make a fair-share contribution to extend the left-turn capacity up to 266 feet
- Int 3 – West Street / Chapman Avenue:
  - Southbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 100 feet
    - Required Left-Turn Capacity without Project: 160 feet
    - Required Left-Turn Capacity with Project: 169 feet

        - Improvement: Pay full cost to extend the left-turn capacity up to 169 feet

    - Eastbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 150 feet
        - Required Left-Turn Capacity without Project: 158 feet
        - Required Left-Turn Capacity with Project: 158 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 4 – Harbor Boulevard / Chapman Avenue:

    - Westbound Left-Turn (deficient with the project):

        - Existing Left-Turn Capacity: 300 feet
        - Required Left-Turn Capacity with Project: 311 feet
        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible

- Int 5 – Haster Street / Chapman Avenue:

    - Northbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 175 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Southbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 100 feet
    - Required Left-Turn Capacity without Project: 178 feet
    - Required Left-Turn Capacity with Project: 178 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 6 – Lewis Street / Chapman Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 180 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 80 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 96 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 280 feet
        - Required Left-Turn Capacity without Project: 371 feet
        - Required Left-Turn Capacity with Project: 371 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 10 – Harbor Boulevard / Project Access:
    - Northbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity with Project: 91 feet
        - No Improvements are required by the project since the additional required left-turn capacity (1 foot) is negligible
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 145 feet
        - Required Left-Turn Capacity without Project: 210 feet
        - Required Left-Turn Capacity with Project: 210 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 12 – West Street / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet

        - Required Left-Turn Capacity without Project: 98 feet
        - Required Left-Turn Capacity with Project: 98 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet
        - Required Left-Turn Capacity without Project: 86 feet
        - Required Left-Turn Capacity with Project: 86 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 13 – Harbor Boulevard / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 105 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 105 feet
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 80 feet
        - Required Left-Turn Capacity without Project: 219 feet

        - Required Left-Turn Capacity with Project: 219 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 14 – Haster Street / Lampson Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 100 feet
        - Required Left-Turn Capacity without Project: 124 feet
        - Required Left-Turn Capacity with Project: 133 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 133 feet
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 125 feet
        - Required Left-Turn Capacity without Project: 175 feet
        - Required Left-Turn Capacity with Project: 175 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 75 feet
        - Required Left-Turn Capacity without Project: 145 feet
        - Required Left-Turn Capacity with Project: 145 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

    - Westbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 125 feet
        - Required Left-Turn Capacity without Project: 220 feet
        - Required Left-Turn Capacity with Project: 220 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 17 – Harbor Boulevard / Garden Grove Boulevard:

    - Northbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 328 feet
        - Required Left-Turn Capacity with Project: 328 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

    - Southbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 95 feet
        - Required Left-Turn Capacity without Project: 137 feet
        - Required Left-Turn Capacity with Project: 144 feet

        - No Improvements are recommended since lengthening of the southbound left-turn pocket is not feasible given the existing street configuration

    - Eastbound Left-Turn (deficient with the project):

        - Existing Left-Turn Capacity: 365 feet

        - Required Left-Turn Capacity with Project: 373 feet

        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible

    - Westbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 220 feet

        - Required Left-Turn Capacity without Project: 284 feet

        - Required Left-Turn Capacity with Project: 284 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 18 – Harbor Boulevard / SR-22 WB Ramps – Banner Drive:

    - Northbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 65 feet

        - Required Left-Turn Capacity without Project: 123 feet

        - Required Left-Turn Capacity with Project: 123 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

- Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 550 feet
    - Required Left-Turn Capacity without Project: 965 feet
    - Required Left-Turn Capacity with Project: 965 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 19 – Harbor Boulevard / Trask Avenue:
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 315 feet
        - Required Left-Turn Capacity without Project: 370 feet
        - Required Left-Turn Capacity with Project: 381 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 381 feet
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 196 feet
        - Required Left-Turn Capacity with Project: 196 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 113 feet
        - Required Left-Turn Capacity with Project: 113 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 20 – SR-22 EB Ramps / Trask Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 520 feet
        - Required Left-Turn Capacity without Project: 652 feet
        - Required Left-Turn Capacity with Project: 666 feet
        - No Improvements are recommended since the eastbound outside left-turn lane storage length is sufficient as it extends west toward Harbor Boulevard

CEQA Vehicle Miles Traveled (VMT) Analysis Summary:

Land use projects located within a Transit Priority Area (TPA) may be presumed to have a less than significant VMT impact absent substantial evidence to the contrary, if the project meets the following four (4) conditions:

1. Has a Floor Area Ratio (FAR) of 0.75 or greater;
2. Does **not** include more parking for use by residents, customers, or employees of the project than required by the City;
3. Is consistent with the applicable Sustainable Communities Strategy (SCS) (as determined by the lead agency, with input from the Southern California Association of Governments [SCAG]); and

4. Does **not** replace affordable residential units with a smaller number of moderate- or high-income residential units.

A TPA is defined as a half-mile area around an existing major transit stop or an existing stop along a high-quality transit corridor (HQTC) (Public Resources Code § 21099(a)(7)).

A major transit stop is defined as a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes of less during the morning and afternoon peak commute periods (Public Resources Code § 21064.3).

As explained in detail in Section 9.4 of this report, the project meets the four (4) conditions listed above, and is located within a half-mile of the Harbor Boulevard / Chapman Avenue intersection, which is a major transit stop.

As a result, the project satisfies the TPA screening criteria, and is presumed to have a less than significant VMT impact under CEQA. Therefore, no further VMT analysis is required.

Short-Term Construction Traffic Analysis:

The maximum construction trip generation occurs during the grading phase, when the project is forecast to generate approximately 813 PCE-adjusted daily construction trips which include approximately 203 PCE-adjusted AM peak hour construction trips and approximately 203 PCE-adjusted PM peak hour construction trips.

During operations, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

The maximum forecast construction trip generation is less than the project trip generation during operation conditions based on the associated land uses from the latest ITE Trip Generation Manual. As a result, the project's short-term construction traffic is forecast to not adversely affect the LOS of the study intersections beyond what has been identified for the project operation conditions and its related analysis contained in this report.

Hence, if short-term construction traffic access is planned at the Harbor Boulevard / Project Access or Harbor Boulevard / Twintree Avenue intersections, the following recommended improvements *previously identified for project operations* will be required to offset project LOS during the construction phase:

Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*): Make a fair-share contribution to install a traffic signal.

Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*): Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Active Transportation & Public Transit Analysis:

Per the City of Garden Grove adopted thresholds, a significant active transportation and public transit impact occurs if the project conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decreases the performance or safety of such facilities.

The proposed project is not planned to significantly change or modify any of the existing public transit, bicycle, or pedestrian facilities or make any modification that could conflict with adopted policies, plans or programs, or modify the safety of such facilities.

More specifically, the project is not planned to make any modification that could result in a conflict with the Master Plan of Streets and Highways, the Existing Transit Routes, or the Master Plan of Bikeway Facilities, as indicated in the City of Garden Grove General Plan.

Furthermore, the project is expected to encourage and support multi-modal transit by implementing trip reduction measures and project design features that will reduce the number of auto-based trips generated by the project and encourage the use of transit, bicycling, and walking. The following measures will be implemented by the project with

respect to greenhouse gas emissions, and are listed below to show consistency with the statewide goal of promoting active transportation and public transit ridership:

1. Improve the walkability and design of the project by providing pedestrian and bicycling connections within the project site and to adjacent off-site facilities (i.e., sidewalks, crosswalks, wayfinding signage, etc.);

2. Provide traffic calming measures (i.e., marked crosswalks, raised crosswalks, raised intersections, count-down signal timers, curb extensions, speed tables, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc.);

3. Provide secure on-site bicycle racks and provide bicycle rentals for hotel guests;

4. Provide transit/shuttle service for guests to local area attractions. The shuttle service shall operate on a regular basis and be offered to all guests staying at the hotel; and

5. Hotel management/concierge should provide information that promotes walking, bicycling and public transit options to nearby attractions. This should include information on local bus routes and schedules and wayfinding to the existing transit stops along Harbor Boulevard.

Hence, with the implementation of the mitigation measures described above, the project is forecast to not have a significant active transportation and public transit impact.

Circulation Recommendations:

The project will share access with the adjacent Sheraton Hotel via the existing access on Harbor Boulevard. RK has reviewed the preliminary site and circulation plan and provides the following recommendations. These recommendations, which are considered standard site plan review requirements, would also ensure the project has a less than significant impact on potential safety and hazard issues as they relate to CEQA.

- Ensure adequate radius is provided for appropriate vehicles (fire trucks, buses, limousines, trash trucks, etc.) to navigate the project access and roundabout;

- Provide adequate drive aisle and lane widths;

- Parking spaces should not be located near or within the roundabout. If absolutely necessary, the spaces near the roundabout should be valet-operated and used for long-term parking. In any case, adequate clearance and space should be provided for vehicles navigating the roundabout.

- The entrance roundabout should be designed appropriately and per engineering standards for roundabouts, including geometric elements such as Center Island, travel lanes, deflections, and inscribed circles. Appropriate design needs to be considered and implemented for all appropriate modes of transportation including pedestrians and bicycles.

- Provide appropriate and adequate wayfinding and signage for drivers to easily navigate the entrance and exit.

- During times of high activity for the project and/or the adjacent Sheraton Hotel, provide adequate valet staff and means to ensure traffic does not spill back onto the roundabout or Harbor Boulevard and impede the flow of vehicles.

- Prior to final circulation design, provide a detailed plan including drive aisle dimensions and roundabout details for review by a registered traffic engineer.

1.0 Introduction

1.1 Purpose of Report and Study Objectives

The purpose of this traffic impact analysis is to evaluate the proposed Site "B-2" Hotel project (hereinafter referred to as project) from a traffic and circulation standpoint. This study has been conducted pursuant to the *City of Garden Grove Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment (May 2020)* (TIA Guidelines), and the California Environmental Quality Act (CEQA) requirements.

This traffic study has been prepared in accordance with the scope of work set forth prior to initiating the analysis.

1.2 Site Location

The project site is located at the northwest corner of Harbor Boulevard at Twintree Avenue in the City of Garden Grove.

The project site location map is shown on Exhibit 1-1.

1.3 Project Description

The project consists of the construction and operation of a 500 room high-rise hotel with other supporting amenities such as conference space and restaurants. The project will also include a multi-level parking structure (four levels above grade and one level below) with a grand total of 528 spaces to serve the suites, event space, and hotel amenities.

The project is planned to consist of the following land uses:

- 500 rooms of Hotel;
    - Includes 9,490 square feet of Hotel Ballroom;
    - Includes 8,225 square feet of Hotel Meeting Rooms;
    - Includes 6,448 square feet of Hotel Studio Hall (for guest use);

    - Includes 7,000 square feet of Hotel Arcade (for guest use);
    - Includes 24,980 square feet of Hotel Themed Pool (for guest use); and
    - Includes 13,238 square feet of Hotel Themed Amenities (for guest use).
- 7,039 square feet of Hotel Theatre (600 seats);
- 5,480 square feet of Retail;
- 8,532 square feet of Spa; and
- 22,296 square feet of Quality Restaurant (11,148 square feet restaurant and 11,148 square feet hotel restaurant).

Access to the project site will be provided via the following:

- One (1) full access driveway on Harbor Boulevard (signalized); and
- One (1) full access driveway on Twintree Avenue (unsignalized).

The project is restricting access to the site along Twintree Avenue to emergency vehicles, maintenance, and trash/delivery trucks only. All employee and guest access to the site, including tourist buses and shuttles, will be via Harbor Boulevard. Therefore, the project access on Twintree Avenue will not experience any vehicle trips associated with employees or outside guests/visitors to the hotel.

The project is planned to open in 2025 and will be evaluated in one (1) single phase.

The project site plan is shown on Exhibit 1-2.

Exhibit 1-1

Location Map

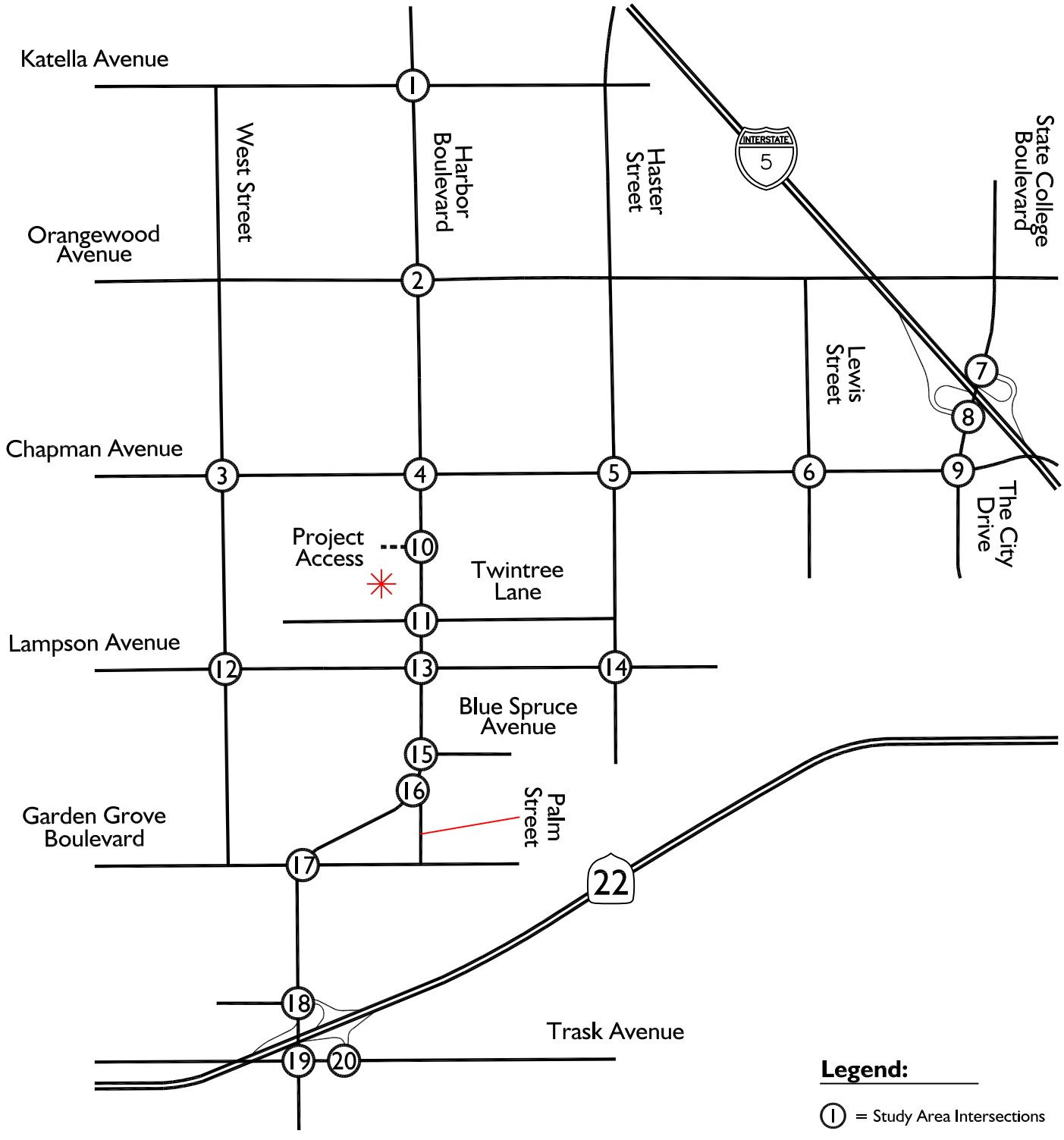
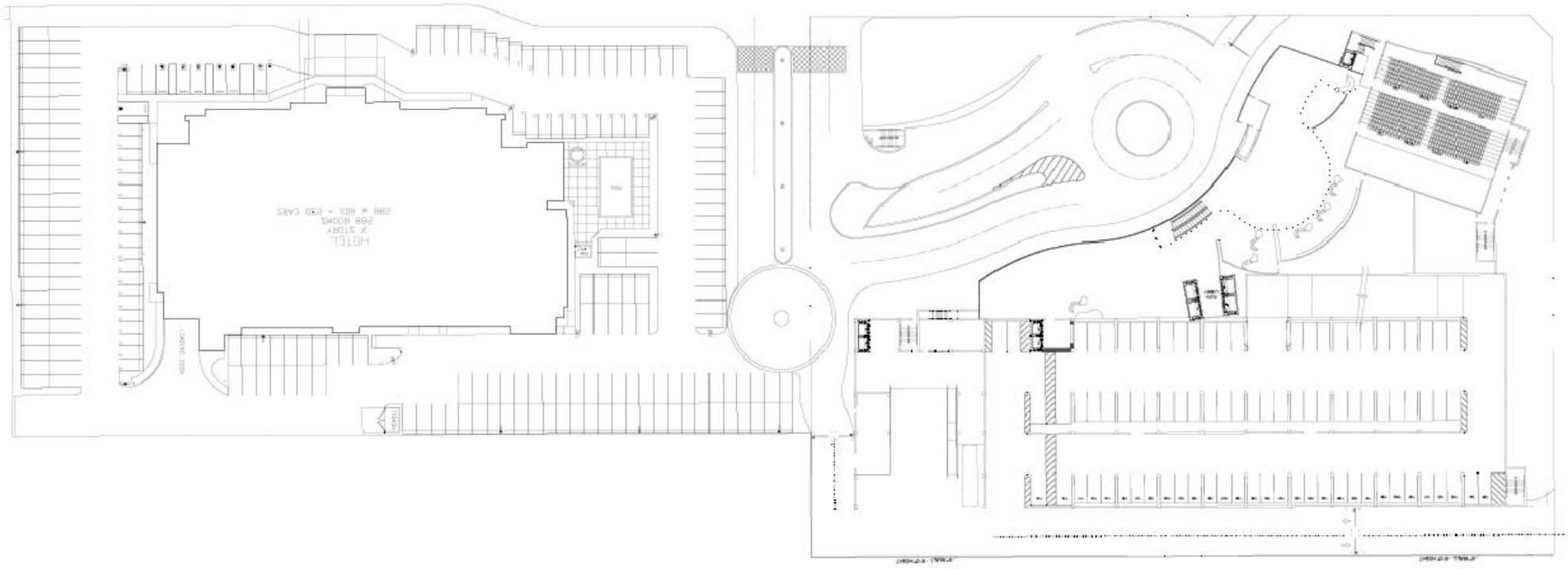


Exhibit 1-2
Site Plan



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2.0 Study Area & Analysis Methodology

This section of the report presents the analysis study area and the methodologies used to perform the traffic analyses summarized in this report in accordance with the City of Garden Grove requirements. This section also discusses the agency-established applicable performance criteria and thresholds of significance for the study facilities.

2.1 Study Area Intersections

The study area included in this analysis has been determined based upon existing and future transportation facilities within the vicinity of the site where the project may contribute a significant amount of traffic. The traffic analysis evaluates the following study intersections:

1. Harbor Boulevard / Katella Avenue;
2. Harbor Boulevard / Orangewood Avenue;
3. West Street / Chapman Avenue;
4. Harbor Boulevard / Chapman Avenue;
5. Haster Street / Chapman Avenue;
6. Lewis Street / Chapman Avenue;
7. State College Boulevard / I-5 NB Ramps – Anaheim Way;
8. State College Boulevard – The City Drive / I-5 SB Ramps;
9. The City Drive / Chapman Avenue;
10. Harbor Boulevard / Project Access;
11. Harbor Boulevard / Twintree Lane – Twintree Avenue;
12. West Street / Lampson Avenue;

13. Harbor Boulevard / Lampson Avenue;
14. Haster Street / Lampson Avenue;
15. Harbor Boulevard / Blue Spruce Avenue;
16. Harbor Boulevard / Palm Street;
17. Harbor Boulevard / Garden Grove Boulevard;
18. Harbor Boulevard / SR-22 WB Ramps – Banner Drive;
19. Harbor Boulevard / Trask Avenue; and
20. SR-22 EB Ramps / Trask Avenue.

The analysis evaluates traffic conditions for the following scenarios during the weekday AM (7:00 AM to 9:00 AM) and weekday PM (4:00 PM to 6:00 PM) peak hours:

- Existing Conditions;
- Existing Plus Project Conditions;
- Project Buildout Year (2025) Without Project Conditions; and
- Project Buildout Year (2025) With Project Conditions.

2.2 Intersection Capacity Utilization (ICU) Methodology (Signalized Intersections)

The Intersection Capacity Utilization (ICU) methodology is used for analyzing level of service (LOS) at signalized intersections within the City of Garden Grove for non-CEQA purposes. To calculate the ICU, the volume of traffic using the intersection is compared with the capacity of the intersection; this is referred to as the volume-to-capacity (V/C) ratio. The V/C ratio represents the portion of the hour required to provide sufficient capacity to accommodate all intersection traffic if all approaches operate at capacity.

Per the City of Garden Grove TIA Guidelines, the ICU analysis will utilize the following parameters:

- Saturation flow rate of 1,700 vehicles per lane per hour for all lanes used; and
- Clearance interval factor of 0.05 (5%).

Table 2-1 below shows the LOS criteria based on the V/C ratio of an intersection.

Table 2-1
ICU LOS - Volume to Capacity (V/C)

Level of Service (LOS)	Critical V/C Ratio
A	0.00 - 0.60
B	0.61 - 0.70
C	0.71 - 0.80
D	0.81 - 0.90
E	0.91 - 1.00
F	>1.00

2.3 Highway Capacity Manual (HCM) Methodology (Unsignalized Intersections)

The Highway Capacity Manual (HCM) methodology is used for analyzing LOS at unsignalized intersections within the City of Garden Grove for non-CEQA purposes. For intersections with stop control on the minor street only, the calculation of level of service is dependent on the occurrence of gaps occurring in the traffic flow of the main street, and the level of service is determined based on the vehicle delay of the worst individual movement or movements sharing a single lane.

Table 2-2 below shows the level of service criteria based on the HCM methodology.

Table 2-2
HCM LOS - Vehicle Delay

Level of Service (LOS)	Vehicle Delay (seconds/vehicle)
A	0.00 - 10.00
B	10.01 - 15.00
C	15.01 - 25.00
D	25.01 - 35.00
E	35.01 - 50.00
F	>50.01

2.4 City of Garden Grove Study Intersection LOS Performance Criteria

This analysis is being provided for non-CEQA purposes in order to comply with the applicable City of Garden Grove General Plan consistency requirements related to LOS.

The following is a summary of the performance standards adopted by the City of Garden Grove.

Performance Criteria:

The acceptable LOS for intersections in the City of Garden Grove is LOS D or better as established in the City's General Plan. An intersection operating at a LOS E or F is considered deficient.

LOS Impact Criteria:

Signalized intersections will require improvements if **one** of the following conditions is met:

- The addition of project traffic to an intersection results in the degradation of intersection operations from acceptable operations (LOS D or better) to unacceptable operations (LOS E or F); **OR**

- The project-related increase in volume-to-capacity (V/C) ratio is equal to or greater than 0.010 at an intersection that is already operating at LOS E or F.

Unsignalized intersections will require improvements if **both** of the following conditions are met:

- The addition of project traffic to an intersection results in the degradation of intersection operations from acceptable operations (LOS D or better) to unacceptable operations (LOS E or F); **AND**

- The intersection meets peak hour signal warrants either caused by project volumes, or project volumes are added at an intersection that meets peak hour signal warrants in the baseline scenario(s). Peak hour signal warrants should be determined based on the latest *California Manual on Uniform Traffic Control Devices (CA MUTCD)*.

2.5 Congestion Management Program (CMP) Study Intersection LOS Performance Criteria

The following is a summary of the performance standards adopted by the Orange County Congestion Management Program (CMP).

Performance Criteria:

The acceptable LOS for CMP intersections is LOS E or better as established in the County's Congestion Management Program. An intersection operating at a LOS F is considered deficient.

LOS Impact Criteria:

CMP statute requires that CMP intersections maintain a LOS of E or better, unless the baseline is worse than LOS E; in which case, the ICU V/C ratio cannot increase by more than 0.10.

2.6 City of Garden Grove Active Transportation & Public Transit

A significant impact occurs if the project conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decreases the performance or safety of such facilities.

3.0 Existing Traffic Volumes & Circulation System

This section provides a discussion of existing study area conditions and traffic volumes.

3.1 Existing Traffic Controls and Intersection Geometrics

Exhibit 3-1 identifies the existing roadway conditions within the study area. The number of through traffic lanes for existing roadways and the existing intersection controls are identified. The type of traffic control and number of lanes at an intersection are key inputs for the calculation of LOS.

3.2 Existing Traffic Volumes

Due to the COVID-19 Pandemic, traffic patterns within the study area were not typical at the time this study was being conducted. As such, to derive existing (2021) traffic volumes at the study intersections for use in this study, RK utilized historical 2016 and 2017 traffic volume data, with the exception of the intersections listed below, at which new traffic counts were collected on July 2021. New traffic counts were collected at the five (5) study intersections listed below either because they do not have recent valid traffic counts, or as a measure to obtain the most current traffic volume data to be consistent with the new traffic counts collected at the nearby intersections at which there are no historical counts. An annual growth rate of one percent (1%) per year was applied to the historical count data to derive existing (2021) traffic volumes at those specific study intersections.

New traffic counts were collected for the following study intersections:

7. State College Boulevard / I-5 NB Ramps – Anaheim Way;

8. State College Boulevard – The City Drive / I-5 SB Ramps;

9. The City Drive / Chapman Avenue;

15. Harbor Boulevard / Blue Spruce Avenue; and

16. Harbor Boulevard / Palm Street.

The AM peak hour of traffic was counted from 7:00 AM to 9:00 AM and the PM peak hour of traffic was counted from 4:00 PM to 6:00 PM.

Existing (2021) traffic volumes within the study area are shown on Exhibit 3-2.

The traffic count worksheets are included in Appendix A.

3.3 City of Garden Grove General Plan

The City of Garden Grove General Plan Master Plan of Streets and Highways is shown on Exhibit 3-3.

The City of Garden Grove General Plan Typical Roadway Cross-Sections are shown on Exhibit 3-4.

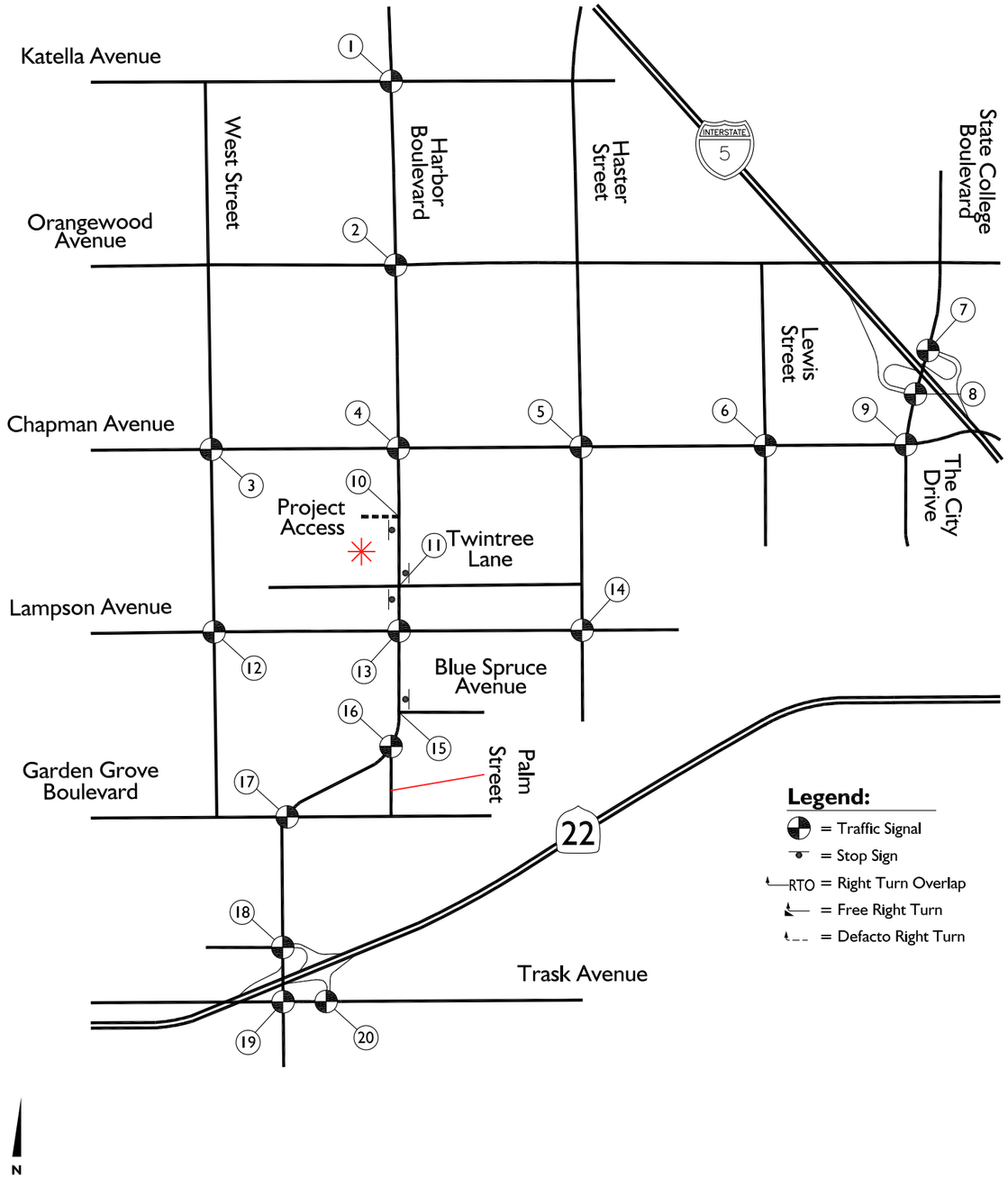
The City of Garden Grove General Plan Designated Truck Routes are shown on Exhibit 3-5.

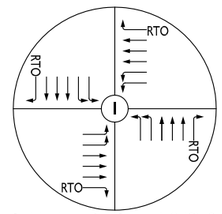
The City of Garden Grove General Plan Existing Transit Routes are shown on Exhibit 3-6.

The City of Garden Grove General Plan Master Plan of Bikeway Facilities is shown on Exhibit 3-7.

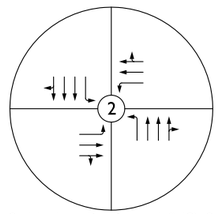
Exhibit 3-1

Existing Lane Geometry & Traffic Controls

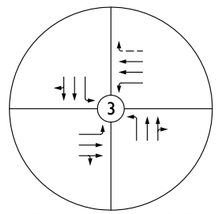




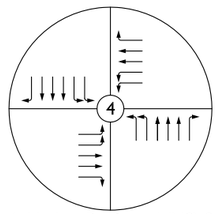
1. Harbor Boulevard (NS) & Katella Avenue (EW)



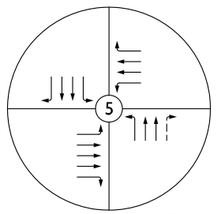
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



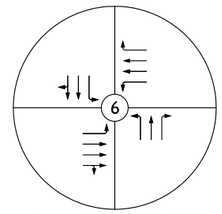
3. West Street (NS) & Chapman Avenue (EW)



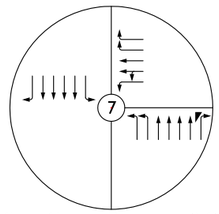
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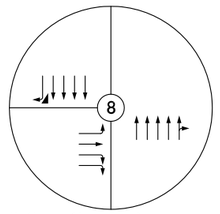
5. Haster Street (NS) & Chapman Avenue (EW)



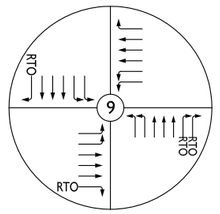
6. Lewis Street (NS) & Chapman Avenue (EW)



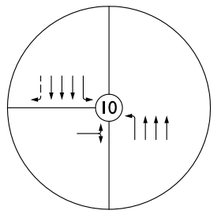
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



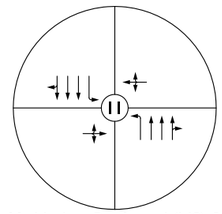
8. State College Boulevard - The City Drive (NS) & I-5 SB Ramps (EW)



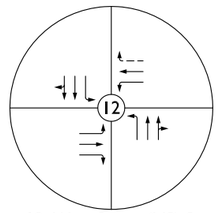
9. The City Drive (NS) & Chapman Avenue (EW)



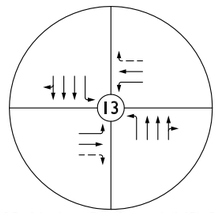
10. Harbor Boulevard (NS) & Project Access 1 (EW)



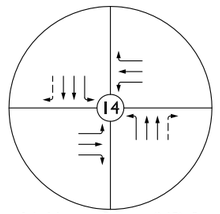
11. Harbor Boulevard (NS) & Twintree Lane - Twintree Avenue (EW)



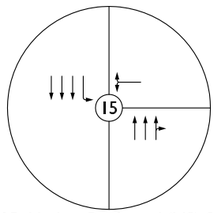
12. West Street (NS) & Lampson Avenue (EW)



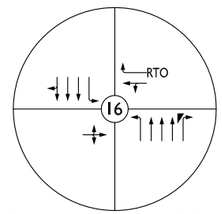
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



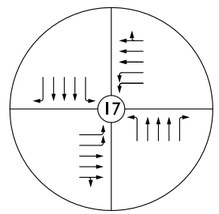
14. Haster Street (NS) & Lampson Avenue (EW)



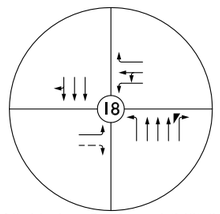
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



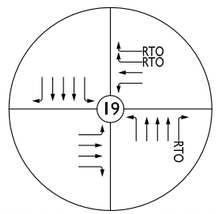
16. Harbor Boulevard (NS) & Palm Street (EW)



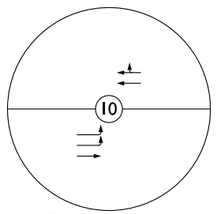
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18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



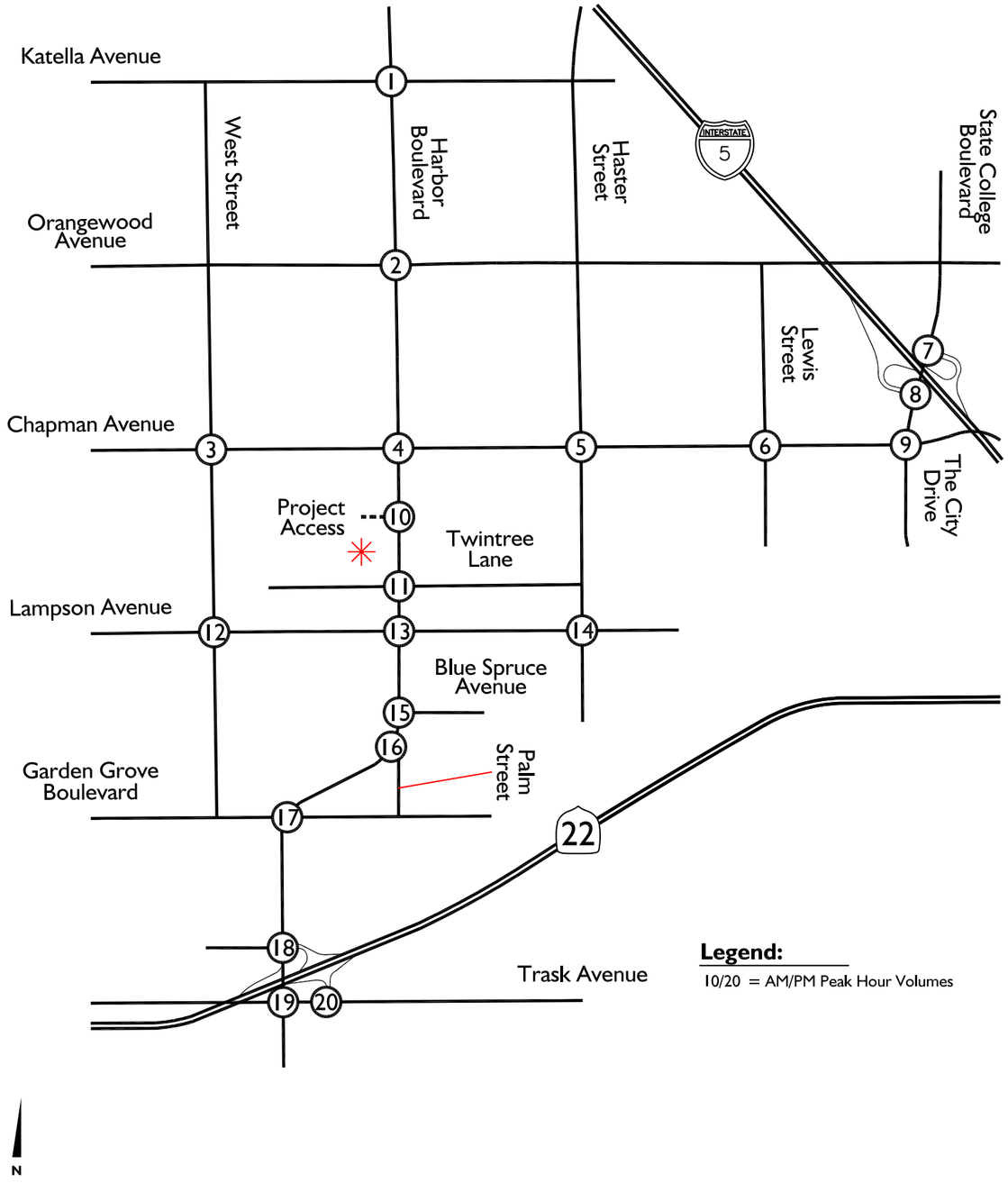
19. Harbor Boulevard (NS) & Trask Avenue (EW)



20.SR-22 EB Ramps (NS) & Trask Avenue (EW)

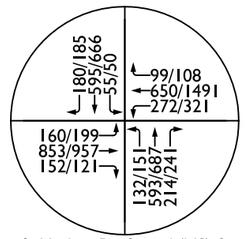
Exhibit 3-2

Existing Traffic Volumes

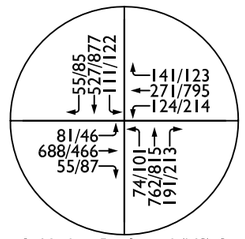


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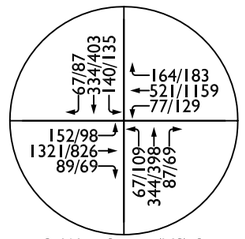
10/20 = AM/PM Peak Hour Volumes



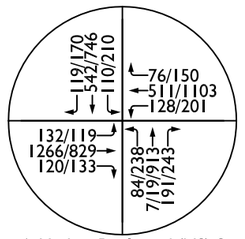
1. Harbor Boulevard (NS) & Katella Avenue (EW)



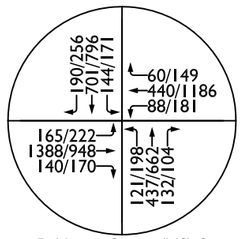
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



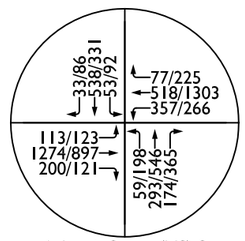
3. West Street (NS) & Chapman Avenue (EW)



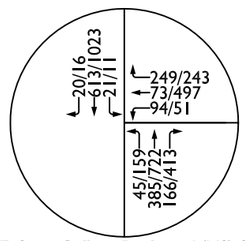
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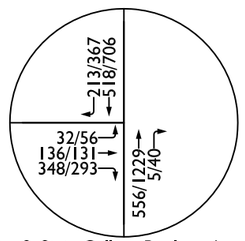
5. Haster Street (NS) & Chapman Avenue (EW)



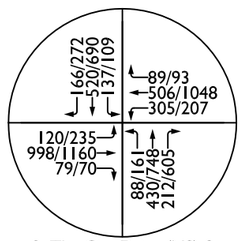
6. Lewis Street (NS) & Chapman Avenue (EW)



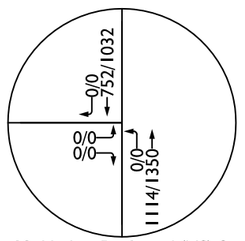
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



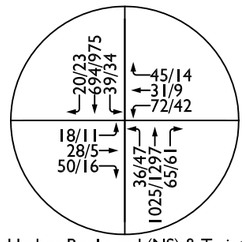
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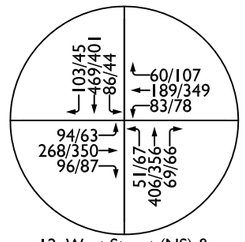
9. The City Drive (NS) & Chapman Avenue (EW)



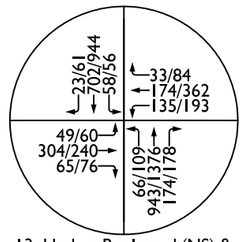
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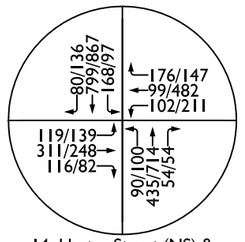
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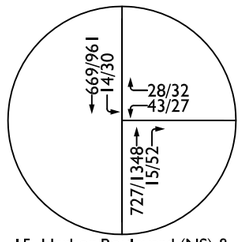
12. West Street (NS) & Lampson Avenue (EW)



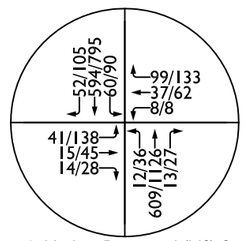
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



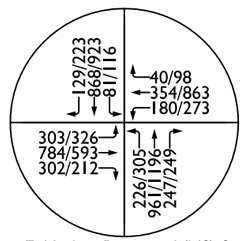
14. Haster Street (NS) & Lampson Avenue (EW)



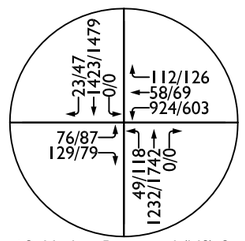
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



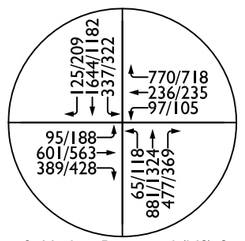
16. Harbor Boulevard (NS) & Palm Street (EW)



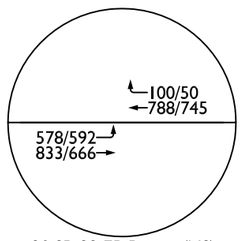
17. Harbor Boulevard (NS) & Garden Grove Boulevard (EW)



18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



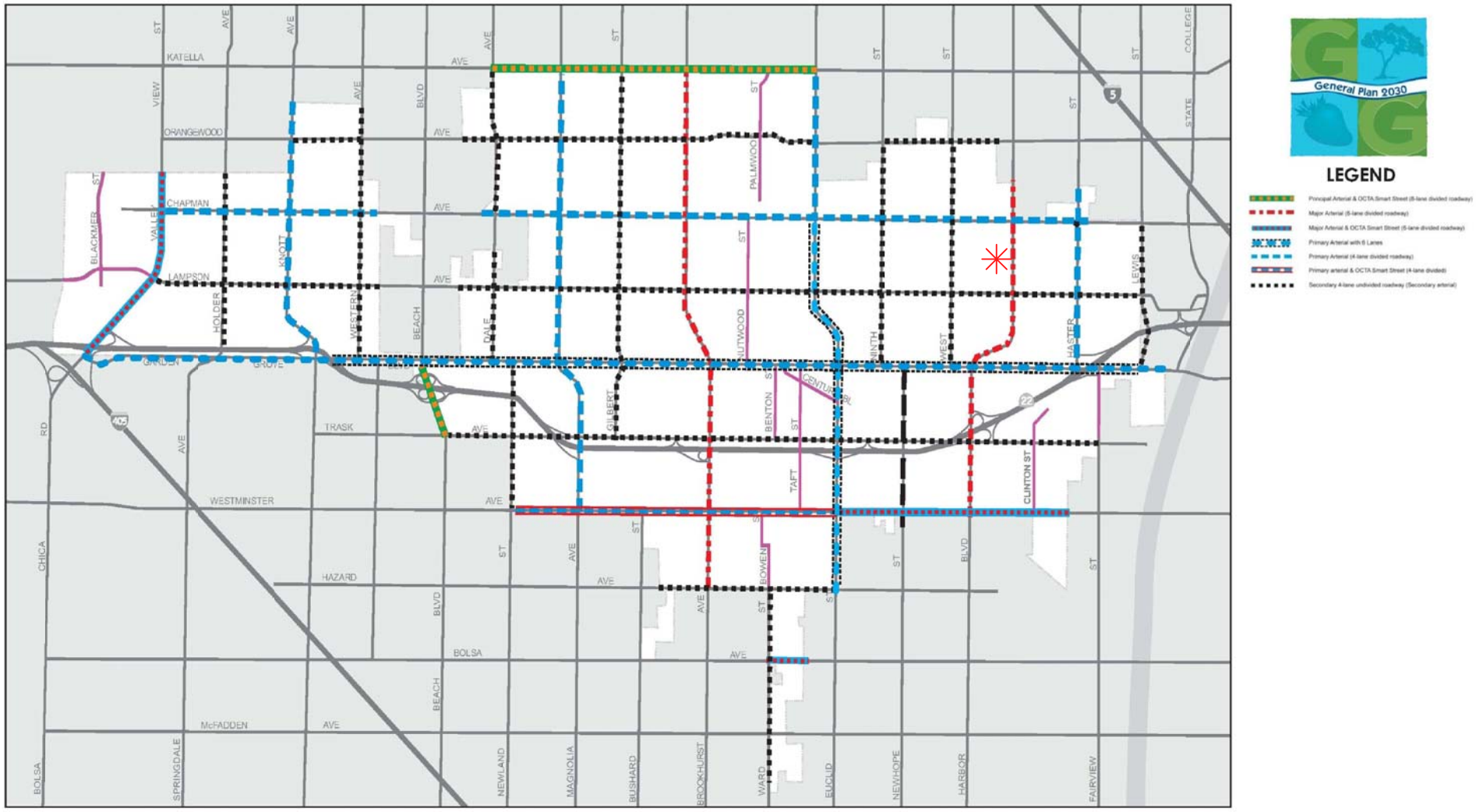
19. Harbor Boulevard (NS) & Trask Avenue (EW)



20.SR-22 EB Ramps (NS) & Trask Avenue (EW)

Exhibit 3-3

City of Garden Grove General Plan
Master Plan of Streets and Highways



Legend:

✳ = Project Site Location

N

RK engineering group, inc.

Exhibit 3-4

City of Garden Grove General Plan
Typical Roadway Cross-Sections

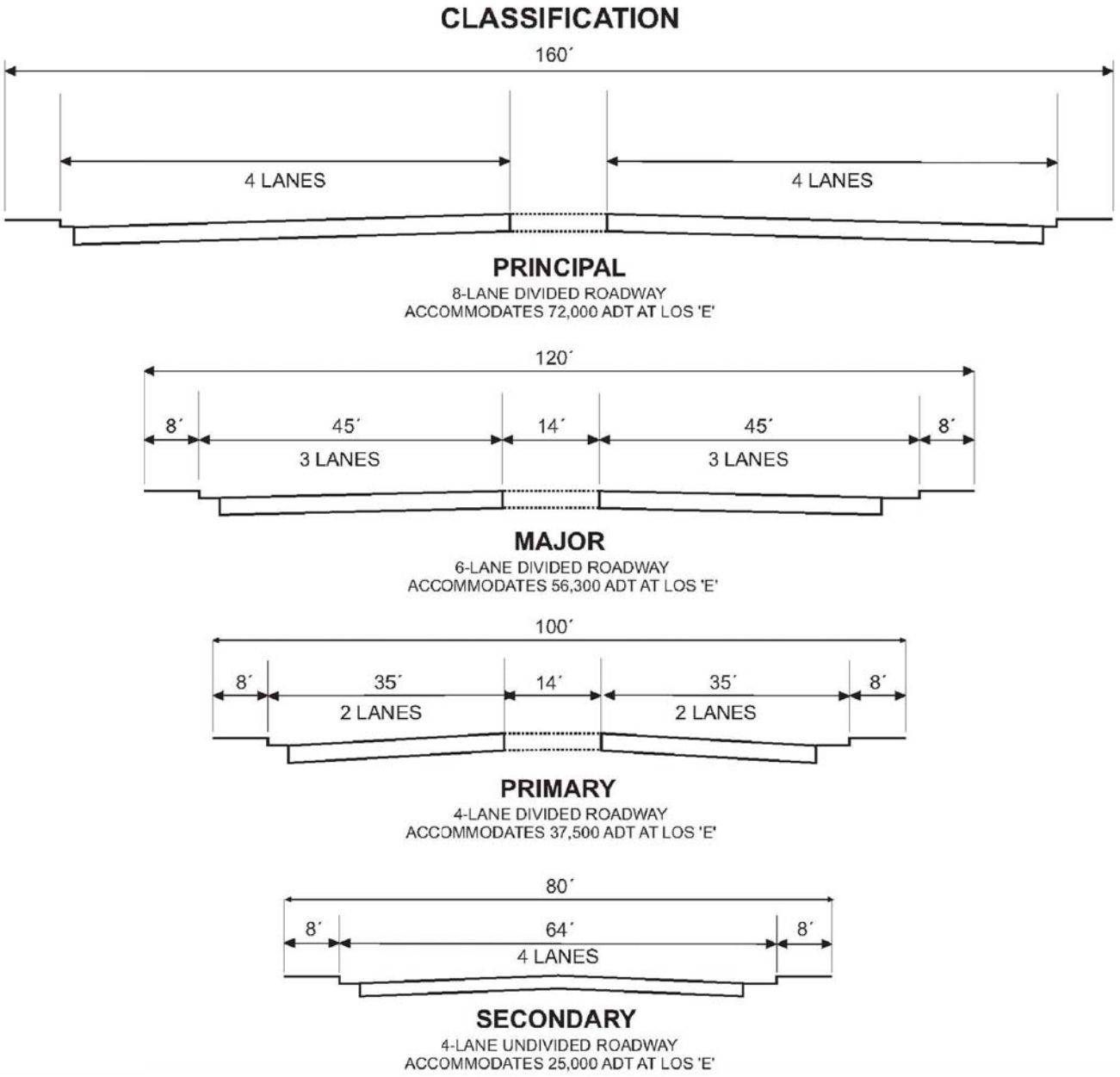
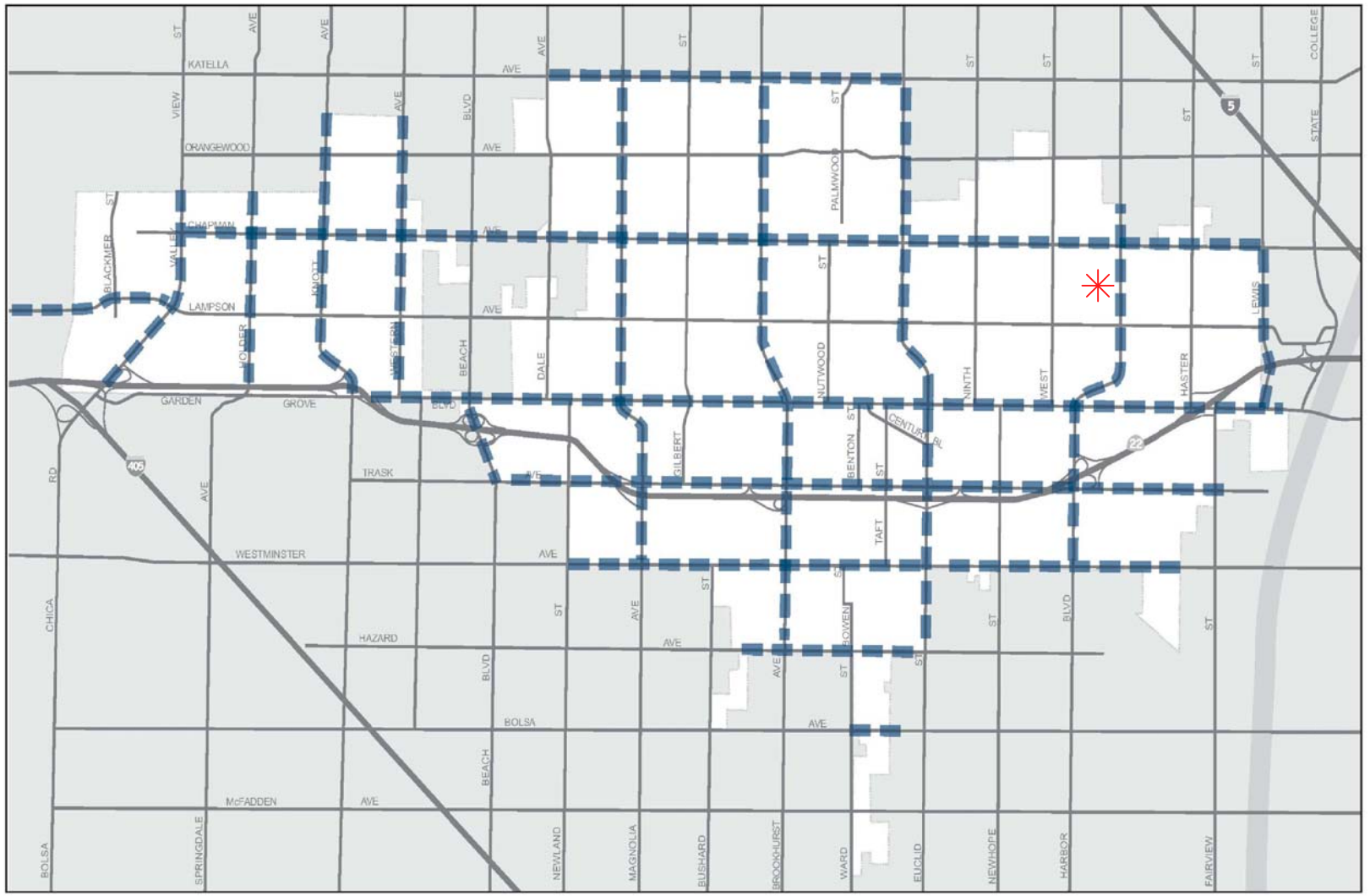


Exhibit 3-5

City of Garden Grove General Plan Designated Truck Routes





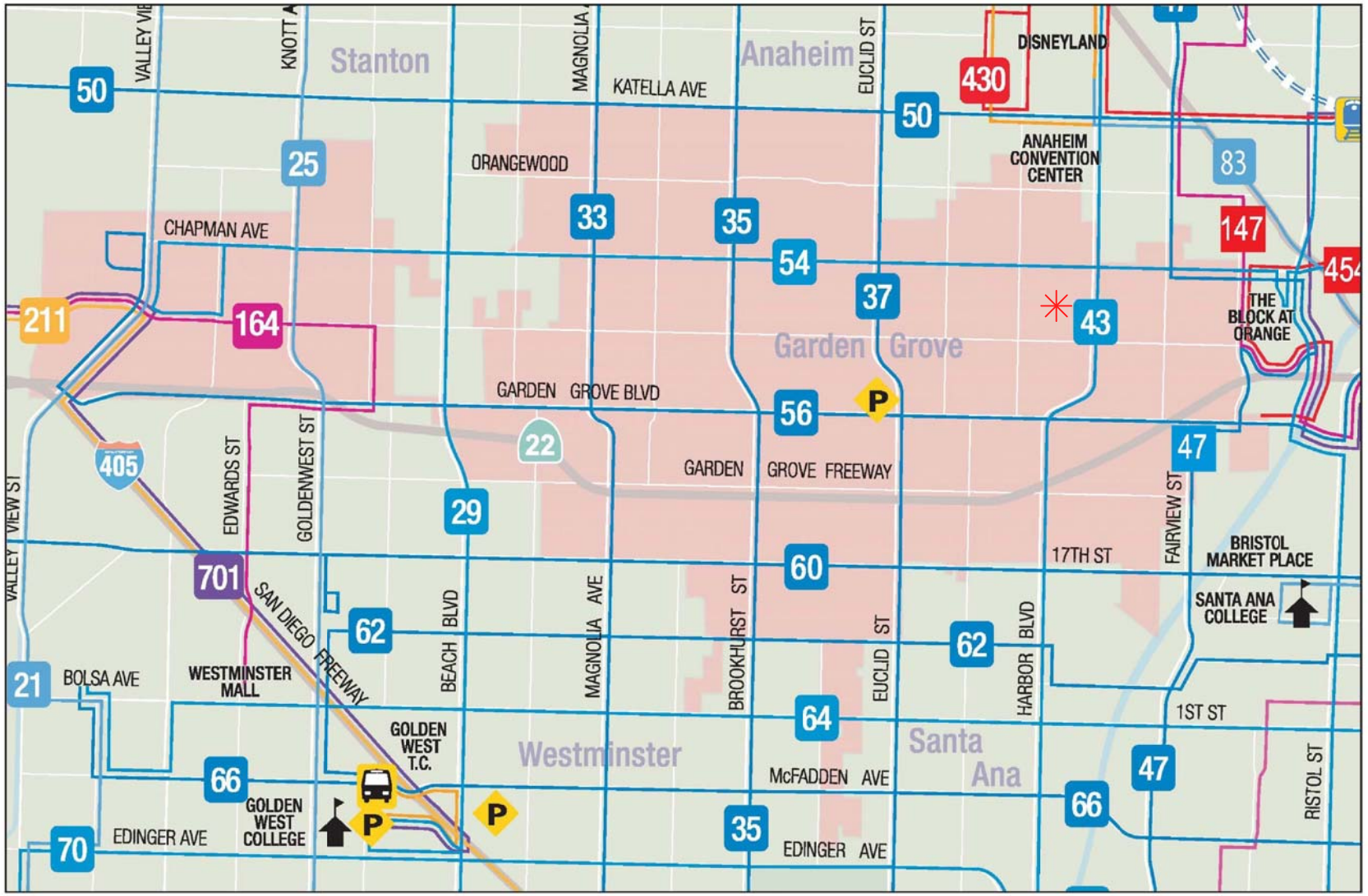
Legend:

✳ = Project Site Location

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Exhibit 3-6

City of Garden Grove General Plan
Existing Transit Routes





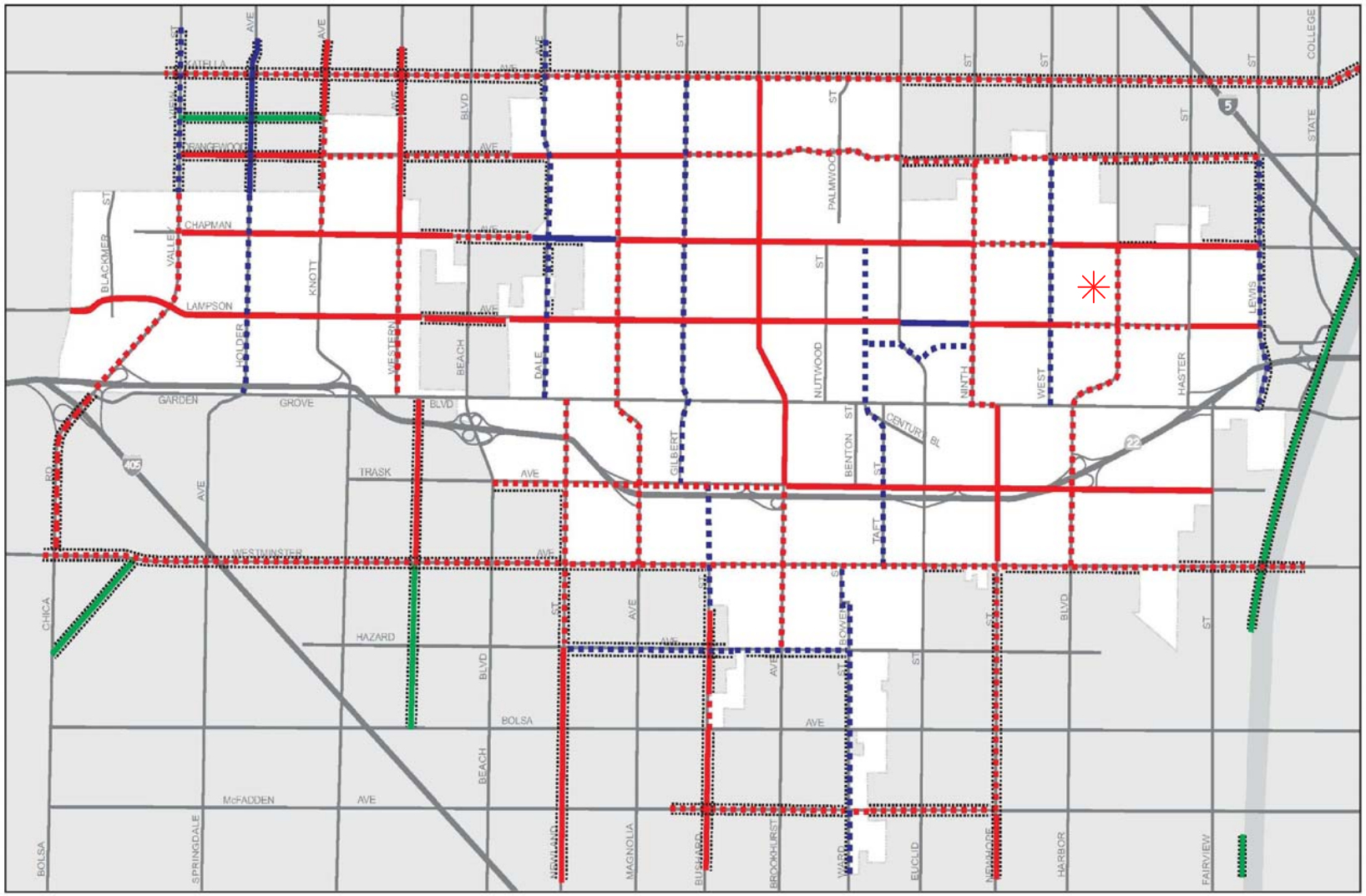
Legend:

✳ = Project Site Location

N

Exhibit 3-7

City of Garden Grove General Plan
Master Plan of Bikeway Facilities





LEGEND

City of Garden Grove

Existing	Proposed	
		Class I Bike Trail (Off Street Trail)
		Class II Bike Lanes (On-Street Striped Lanes)
		Class III Bike Route (On-Street Signed Route)

County of Orange and Adjacent Cities

Existing	Proposed	
		Class I Bike Trail (Off Street Trail)
		Class II Bike Lanes (On-Street Striped Lanes)
		Class III Bike Route (On-Street Signed Route)

Legend:

✳ = Project Site Location

N

4.0 Projected & Future Traffic Volumes

This section of the report provides a discussion on methodologies utilized to derive future traffic volumes for the study area.

4.1 Project Traffic Conditions

4.1.1 Trip Generation

Trip generation represents the amount of traffic that is attracted and produced by a development. The trip generation for the project is based upon the specific land uses that have been planned for this development.

Trip generation is typically estimated based on the trip generation rates from the latest *Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021)*. This publication provides a comprehensive evaluation of trip generation rates for a variety of land uses.

Table 4-1 shows the ITE trip generation rates utilized for the trip generation analysis of the project land uses.

Table 4-1
ITE Trip Generation Rates[1]

Land Use	ITE Code	Units[2]	Weekday						
			AM			PM			Daily
			In	Out	Total	In	Out	Total	
Hotel	310	RM	0.26	0.20	0.46	0.30	0.29	0.59	7.99
Movie Theater	445	TSF	NA	NA	NA	5.80	0.37	6.17	78.09

[1] Source: *ITE Trip Generation Manual* (11th Edition, 2021).
[2] RM = Rooms;
TSF = Thousand Square Feet.

Utilizing the trip generation rates from Table 4-1, Table 4-2 summarizes the daily and peak hour trip generation for the project.

Table 4-2

Project Trip Generation[1]

Land Use	ITE Code	Quantity	Units[2]	Peak Hour						Daily
				AM			PM			
				In	Out	Total	In	Out	Total	
Hotel	310	500	RM	129	101	230	150	145	295	3,995
Hotel Ballroom		9.490	TSF	Ancillary Uses Included in Hotel Trip Generation						
Hotel Meeting Rooms		8.225	TSF							
Quality Restaurant		22.296	TSF							
Hotel Themed Amenities		13.238	TSF							
Studio Hall		6.448	TSF							
Nick Arcade		7.000	TSF							
Spa/Fitness		8.532	TSF							
Hotel Themed Pool[3]		24.980	TSF							
Hotel Office (Production)		3.173	TSF							
Hotel Support (Office)		11.329	TSF							
Back of House (Support)		16.492	TSF							
Retail		5.480	TSF							
Nick Studio (Theatre)	445	7.039	TSF	0	0	0	41	3	44	550
Subtotal Project Net Trip Generation				***129***	***101***	***230***	***191***	***148***	***339***	***4,545***
Multi-Modal Trip Reduction (5%)[4]				*-7*	*-5*	*-12*	*-10*	*-7*	*-17*	*-227*
Net Trip Generation				**122**	**96**	**218**	**181**	**141**	**322**	**4,318**

[1] Source: *ITE Trip Generation Manual* (11th Edition, 2021).

[2] RM = Rooms;
TSF = Thousand Square Feet.

[3] Use will be restricted to hotel guests only. No outside guests or visitors shall be permitted.

[4] A multi-modal trip reduction of 5% is applied to the subtotal project net trip generation to account for the proportion of traffic generated by the project that may utilize alternate modes of transportation, such as public transit or bicycles. This reduction is applied to the project since it is located within a Transit Priority Area (TPA) - defined as a half-mile area around a major transit stop or an existing stop along a high-quality transit corridor (HQTC).

As shown in Table 4-2, based on the ITE trip generation rates, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

4.1.2 Trip Distribution

Trip distribution represents the directional orientation of traffic to and from the project site. Trip distribution is heavily influenced by the geographical location of the site, the location of retail, employment, and recreational opportunities, and the proximity to the regional freeway system. The directional orientation of traffic was determined by evaluating existing and land uses and highways within the study area.

The project trip distribution is shown on Exhibit 4-1.

4.1.3 Modal Split

Modal split denotes the proportion of traffic generated by a project that would use any of the transportation modes, namely buses, cars, bicycles, motorcycles, trains, carpools, etc. The traffic-reducing potential of public transit and other modes is significant. However, the traffic projections in this study are conservative in that public transit and alternative transportation may be able to reduce the traffic volumes, but no modal split reduction is applied to the projections. With the implementation of transit service and provision of alternative transportation ideas and incentives, the automobile traffic demand can be reduced significantly.

4.1.4 Project Traffic Volumes/Assignment

The assignment of project traffic to the adjoining roadway system is based upon the project's trip generation, trip distribution, and arterial highway and local street systems that would be in place by the time of initial occupancy of the site.

Project traffic volumes are shown on Exhibit 4-2.

4.2 Existing Plus Project Conditions Traffic Volumes

Existing Plus Project Conditions traffic volumes consist of the summation of the existing traffic volumes shown on Exhibit 3-2 and the project traffic volumes shown on Exhibit 4-2.

Existing Plus Project Conditions traffic volumes are shown on Exhibit 4-3.

4.3 Background Traffic

4.3.1 Method of Projection

To assess future conditions, project traffic is combined with existing traffic and area-wide growth. As directed by City staff, to account for area-wide/ambient growth in the study area, an annual growth rate of one percent (1%) per year has been applied to the existing (2021) traffic volumes over a 4-year period from 2021 for opening year (2025).

4.3.2 Cumulative Projects Traffic

Information on future projects in the vicinity of the study area has been provided by City of Garden Grove, City of Santa Ana, City of Orange, and City of Anaheim staff for inclusion in this analysis and is shown in Table 4-3. None of the cumulative projects from the City of Anaheim where within the sphere of influence of the study area for this project.

The list of cumulative projects provided are for projects that have been officially submitted for land use review, are waiting public hearing approval or have been approved by the public hearing body.

Table 4-3 shows the land uses, and daily and peak hour trip generation for the nearby cumulative projects provided by the public agencies.

A location map of the cumulative projects is shown on Exhibit 4-4.

Cumulative projects traffic volumes are shown on Exhibit 4-5.

Conditions of Approval:

Some of the cumulative projects may be downsized or may not be developed by the project opening year (2025). In addition, many of the related projects have been or will be subject to a variety of mitigation and/or conditions of approval that will reduce the potential environmental impacts associated with those projects.

However, those mitigation measures have not been taken into account in projecting the environmental impact of the related projects.

Therefore, the traffic cumulative analyses set forth below are conservative and could result in greater impacts than actually anticipated. Additionally, the analysis utilizes a growth rate of one percent (1%) per year for project opening year (2025) conditions, which would already capture and account for most projects in the area. The growth rate methodology is considered conservative since it is applied to all movements in all the study intersections.

4.4 Project Buildout Year (2025) Without Project Conditions Traffic Volumes

Project Buildout Year (2025) Without Project Conditions traffic volumes consist of four (4) years of annual growth on top of existing (2021) traffic volumes at one percent (1%) per year, plus the traffic generated by the cumulative projects.

Project Buildout Year (2025) Without Project Conditions traffic volumes are shown on Exhibit 4-6.

4.5 Project Buildout Year (2025) With Project Conditions Traffic Volumes

Project Buildout Year (2025) With Project Conditions traffic volumes consist of four (4) years of annual growth on top of existing (2021) traffic volumes at one percent (1%) per year, plus the traffic generated by the cumulative projects and the traffic generated by the project.

Project Buildout Year (2025) With Project Conditions traffic volumes are shown on Exhibit 4-7.

Exhibit 4-1

Project Trip Distribution

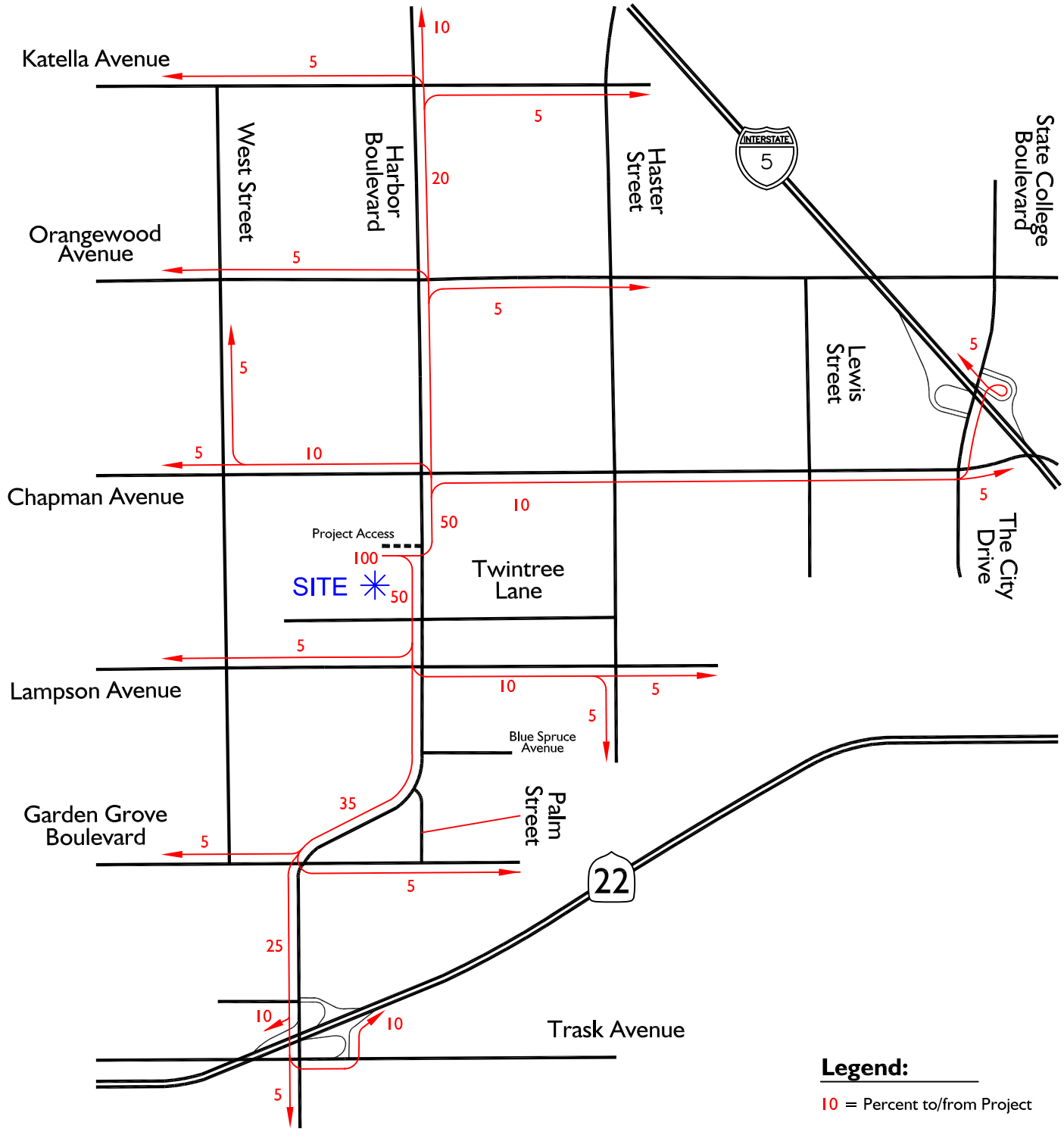
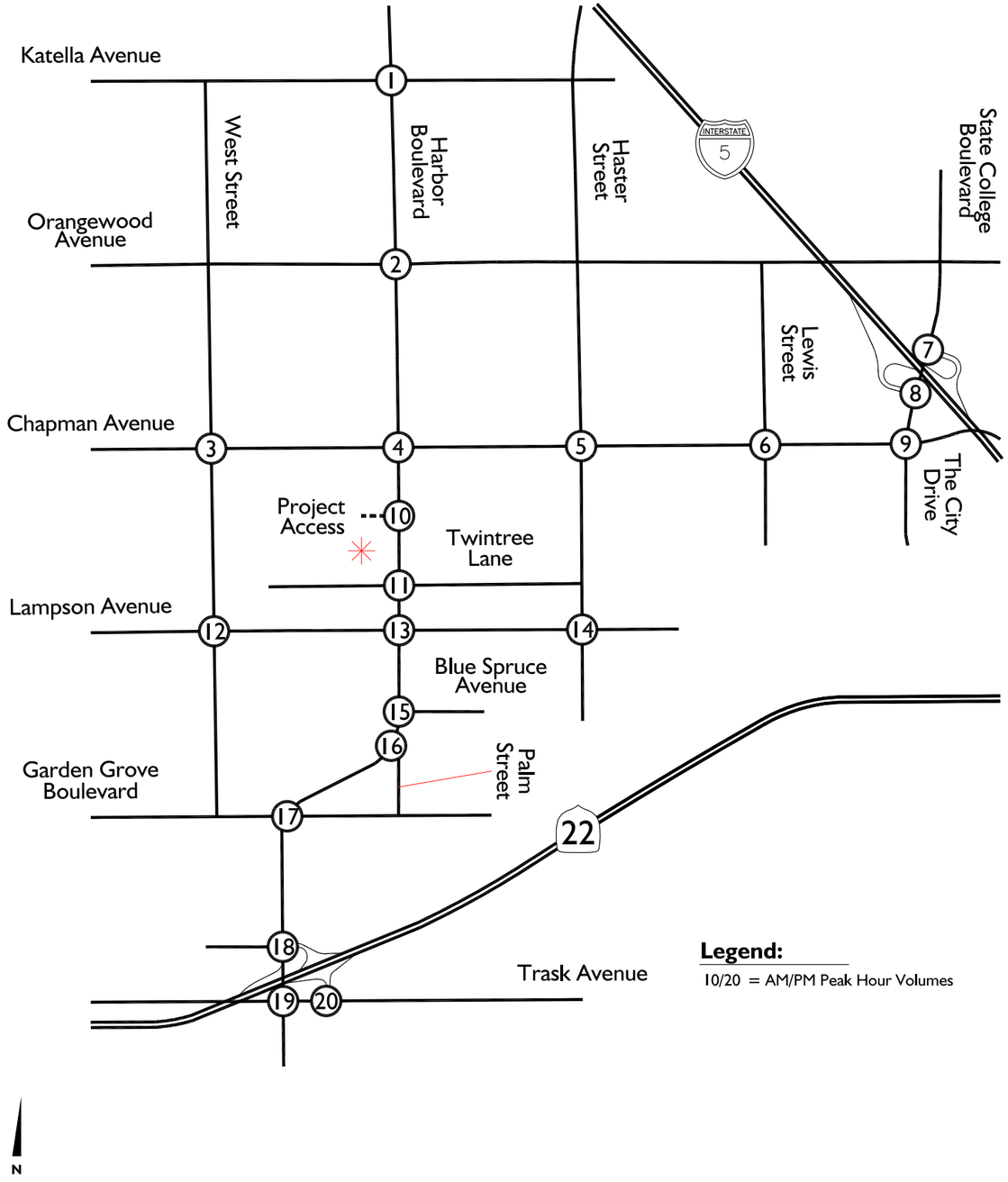
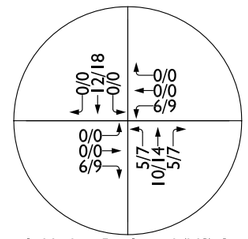


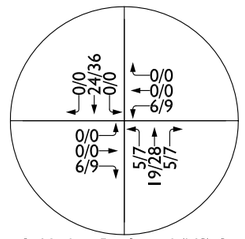
Exhibit 4-2

Project Traffic Volumes

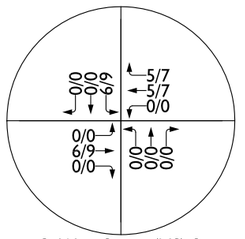




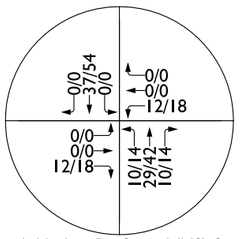
1. Harbor Boulevard (NS) & Katella Avenue (EW)



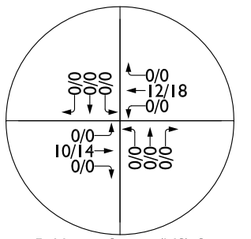
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



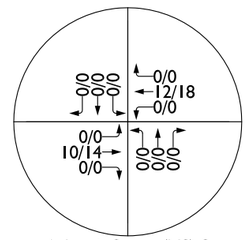
3. West Street (NS) & Chapman Avenue (EW)



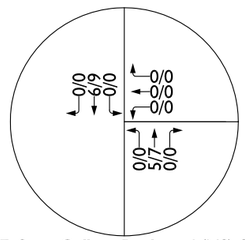
4. Harbor Boulevard (NS) & Chapman Avenue (EW)



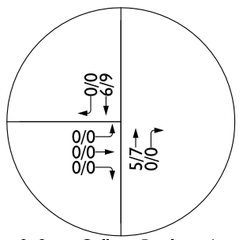
5. Haster Street (NS) & Chapman Avenue (EW)



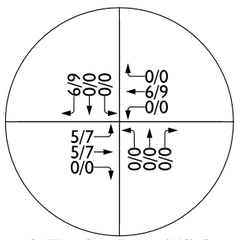
6. Lewis Street (NS) & Chapman Avenue (EW)



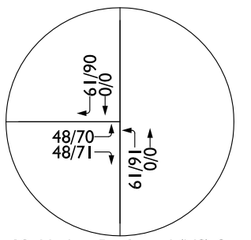
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



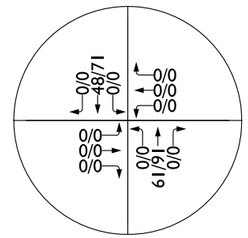
8. State College Boulevard - The City Drive (NS) & I-5 SB Ramps (EW)



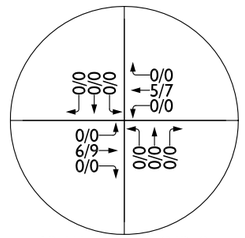
9. The City Drive (NS) & Chapman Avenue (EW)



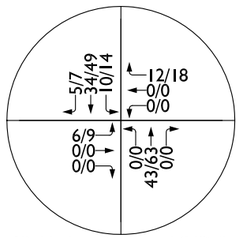
10. Harbor Boulevard (NS) & Project Access 1 (EW)



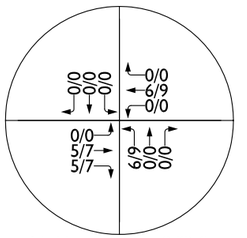
11. Harbor Boulevard (NS) & Twintree Lane - Twintree Avenue (EW)



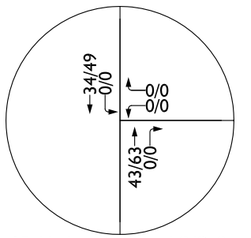
12. West Street (NS) & Lampson Avenue (EW)



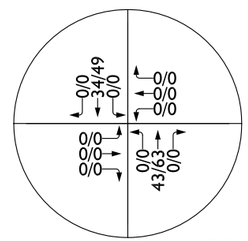
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



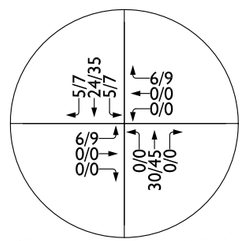
14. Haster Street (NS) & Lampson Avenue (EW)



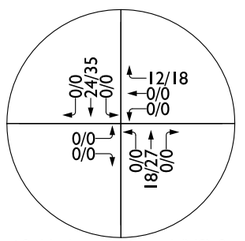
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



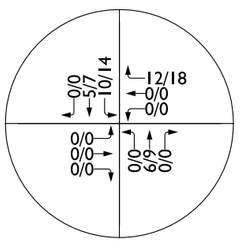
16. Harbor Boulevard (NS) & Palm Street (EW)



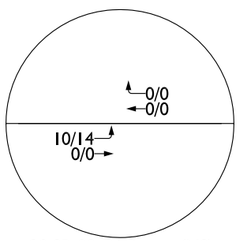
17. Harbor Boulevard (NS) & Garden Grove Boulevard (EW)



18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



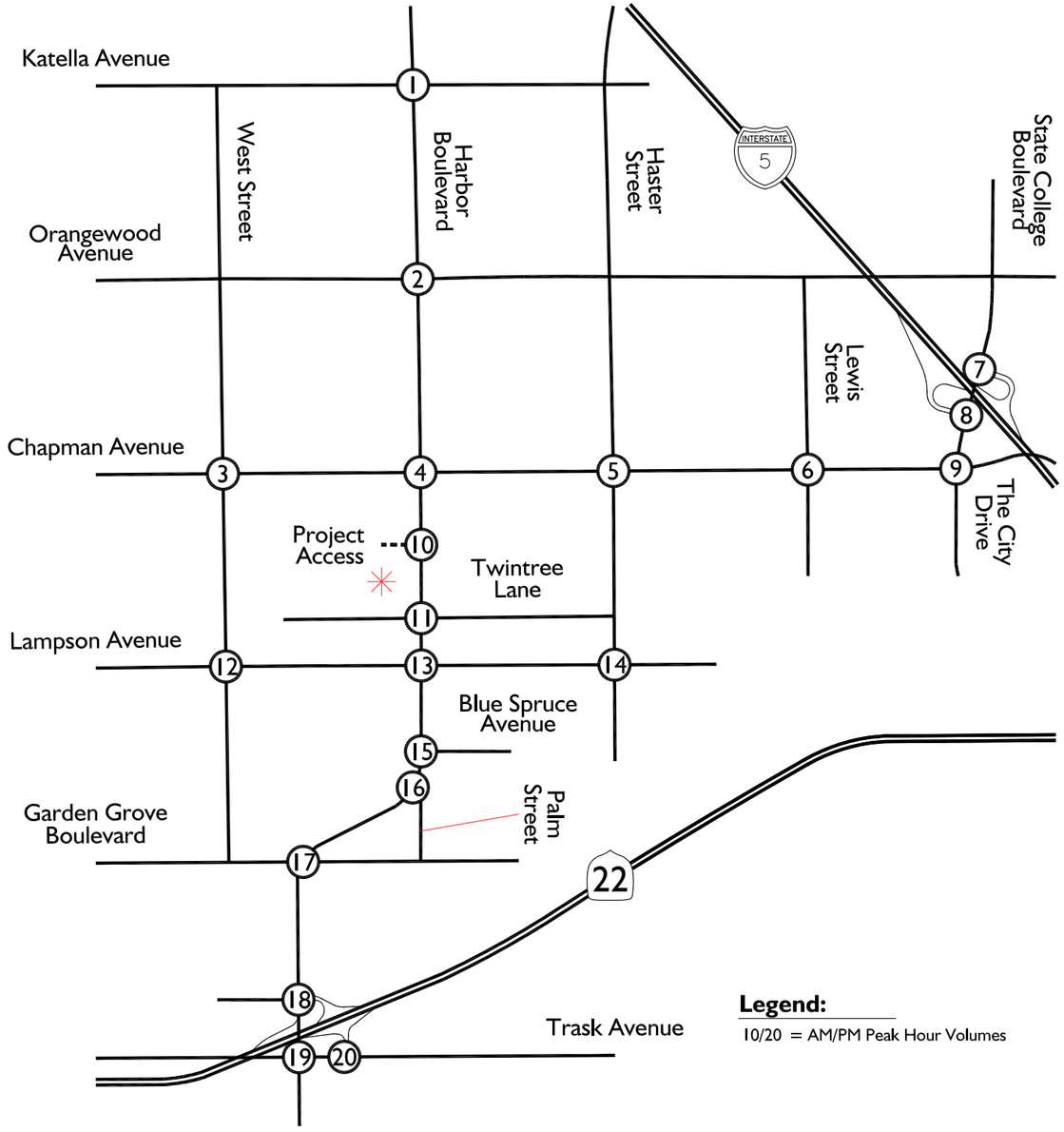
19. Harbor Boulevard (NS) & Trask Avenue (EW)

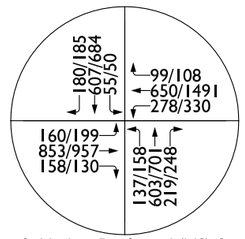


20. SR-22 EB Ramps (NS) & Trask Avenue (EW)

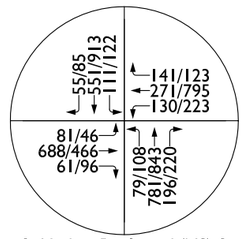
Exhibit 4-3

Existing Plus Project Conditions Traffic Volumes

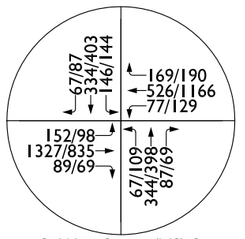




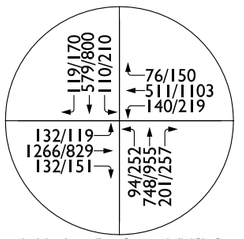
1. Harbor Boulevard (NS) & Katella Avenue (EW)



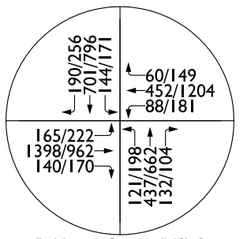
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



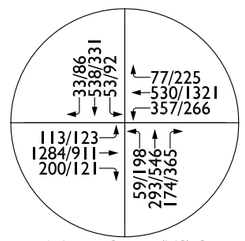
3. West Street (NS) & Chapman Avenue (EW)



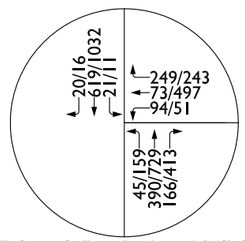
4. Harbor Boulevard (NS) & Chapman Avenue (EW)



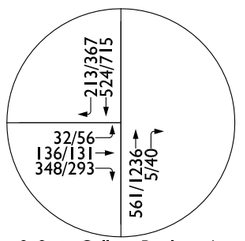
5. Haster Street (NS) & Chapman Avenue (EW)



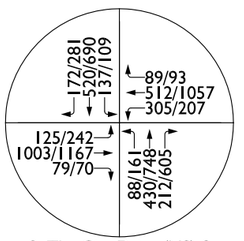
6. Lewis Street (NS) & Chapman Avenue (EW)



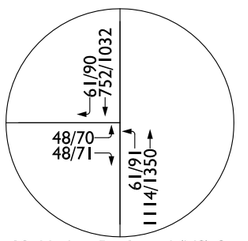
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



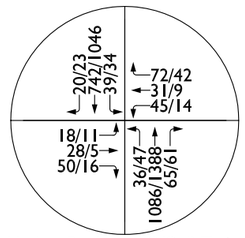
8. State College Boulevard - The City Drive (NS) & I-5 SB Ramps (EW)



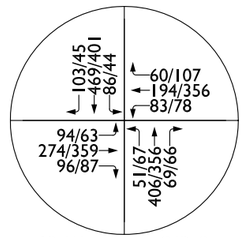
9. The City Drive (NS) & Chapman Avenue (EW)



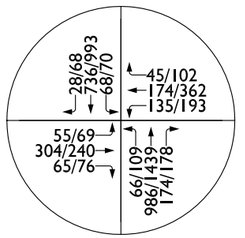
10. Harbor Boulevard (NS) & Project Access 1 (EW)



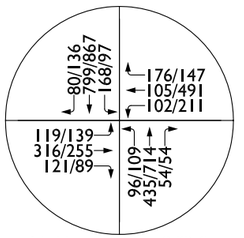
11. Harbor Boulevard (NS) & Twintree Lane - Twintree Avenue (EW)



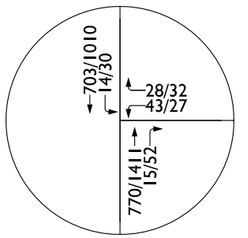
12. West Street (NS) & Lampson Avenue (EW)



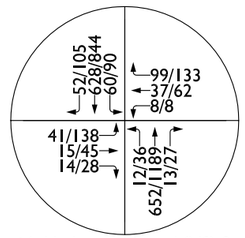
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



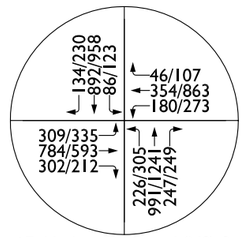
14. Haster Street (NS) & Lampson Avenue (EW)



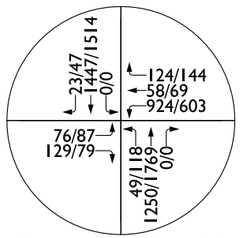
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



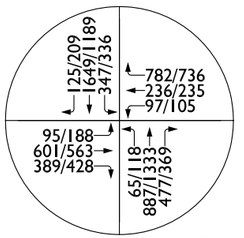
16. Harbor Boulevard (NS) & Palm Street (EW)



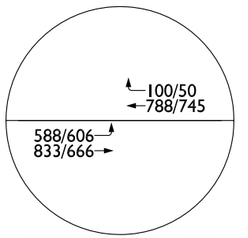
17. Harbor Boulevard (NS) & Garden Grove Boulevard (EW)



18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



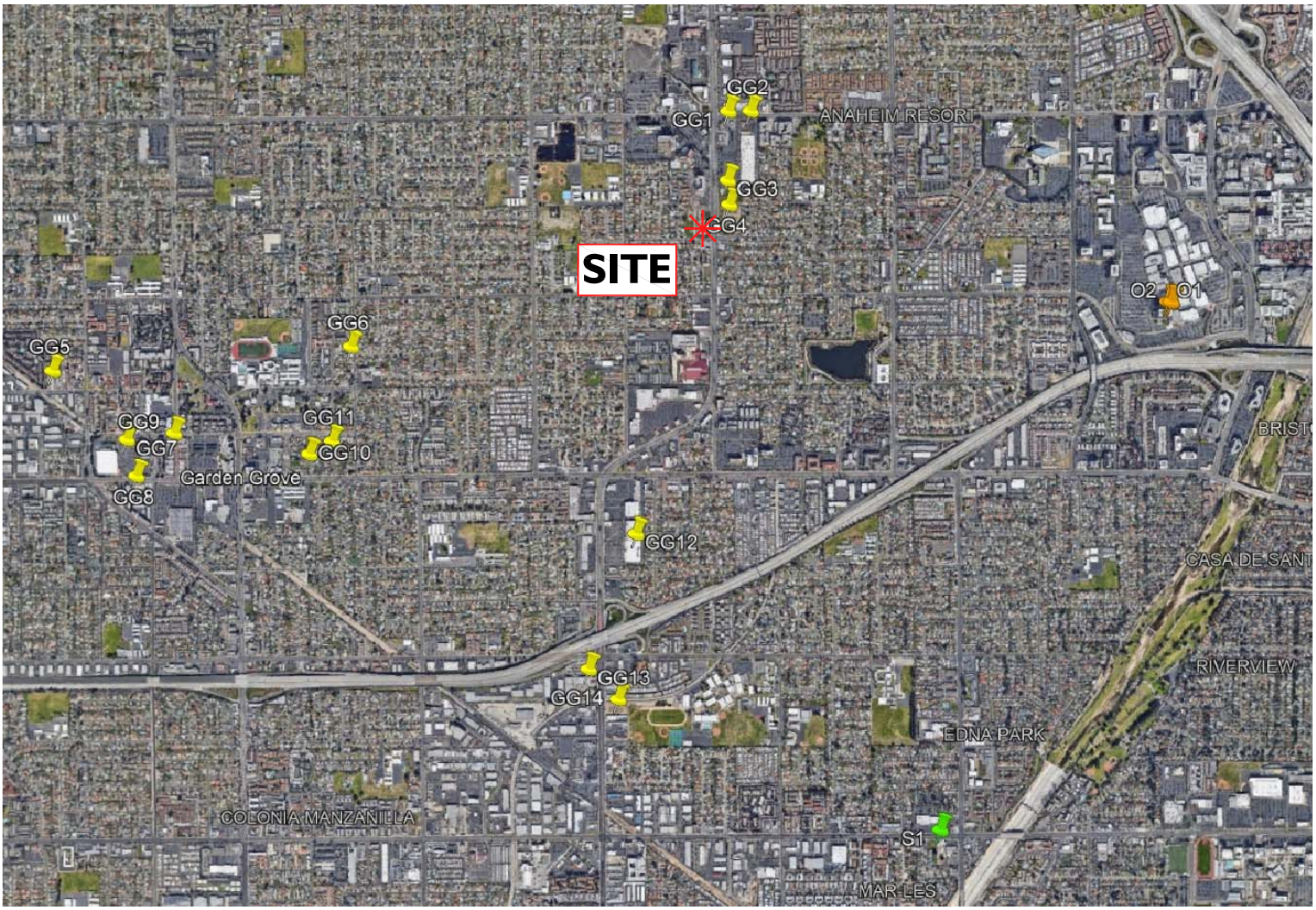
19. Harbor Boulevard (NS) & Trask Avenue (EW)



20.SR-22 EB Ramps (NS) & Trask Avenue (EW)

Exhibit 4-4

Cumulative Projects Location Map



NOTE: See report for full list of cumulative projects and traffic analysis zones (TAZ).

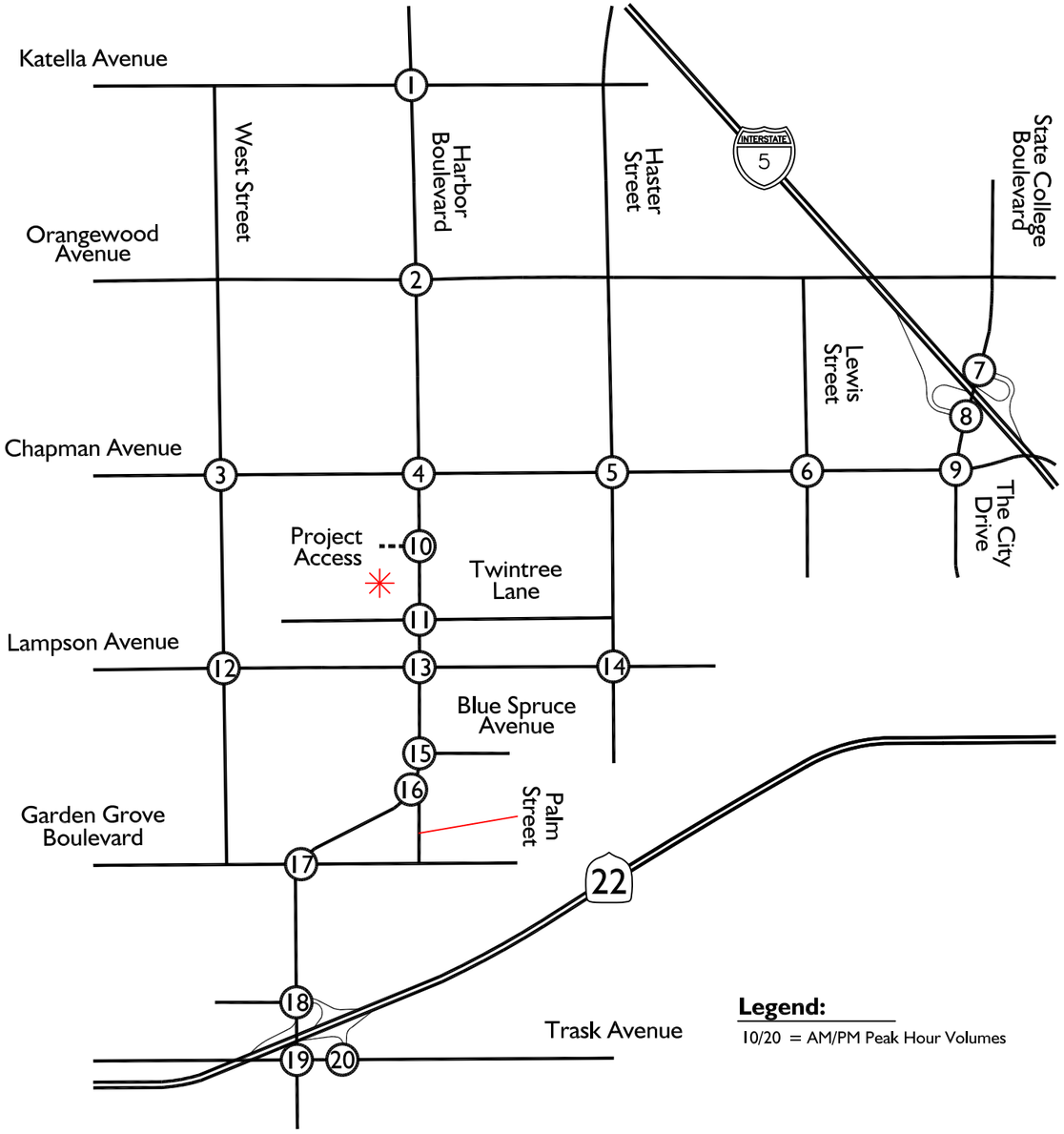
Legend:

- = City of Garden Grove Cumulative Project
- = City of Santa Ana Cumulative Project
- = City of Orange Cumulative Project

N

Exhibit 4-5

Cumulative Projects Traffic Volumes



Legend:

10/20 = AM/PM Peak Hour Volumes

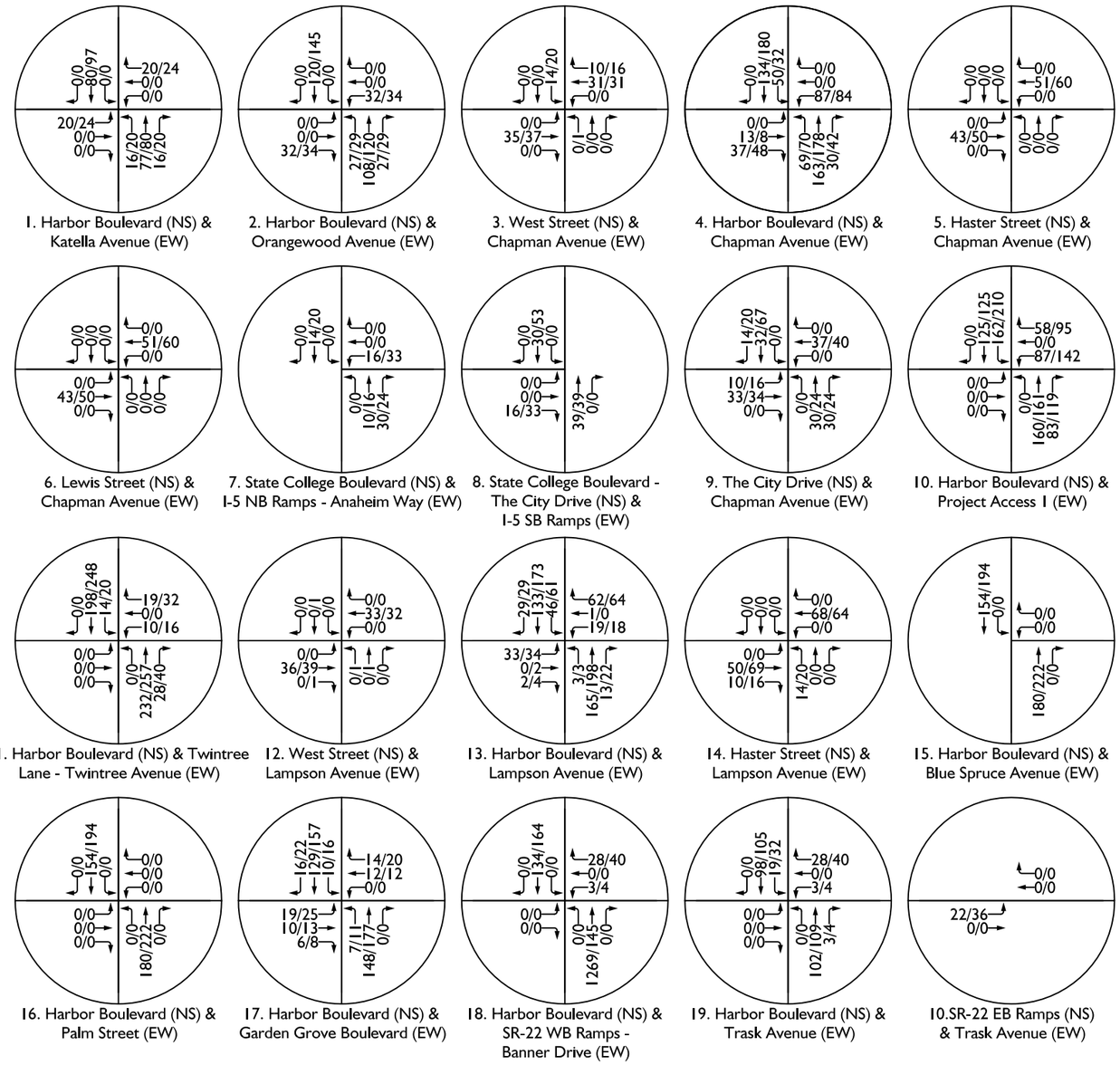
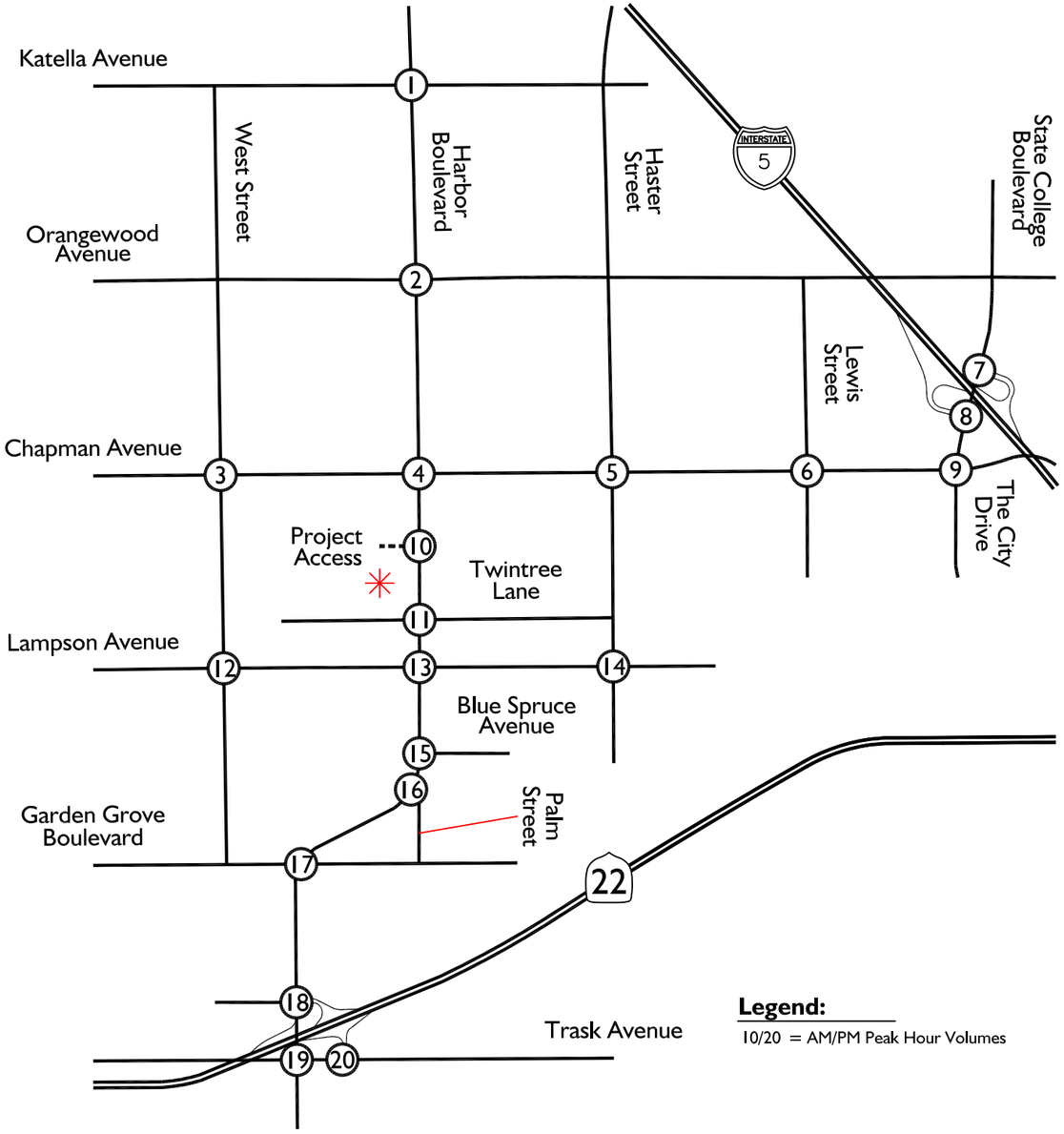
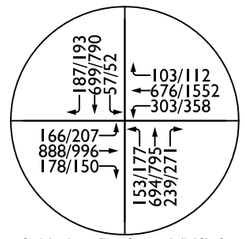


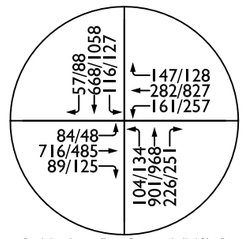
Exhibit 4-6

Project Buildout Year (2025) Without Project Conditions Traffic Volumes

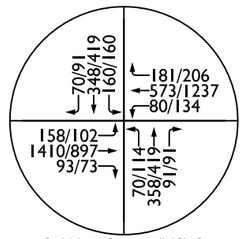




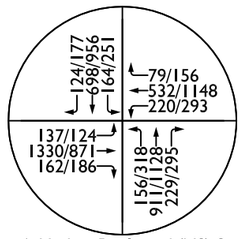
1. Harbor Boulevard (NS) & Katella Avenue (EW)



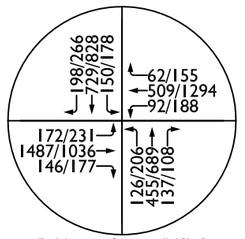
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



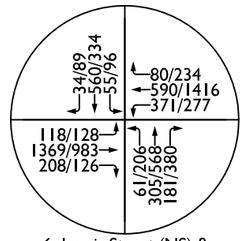
3. West Street (NS) & Chapman Avenue (EW)



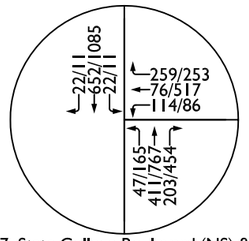
4. Harbor Boulevard (NS) & Chapman Avenue (EW)



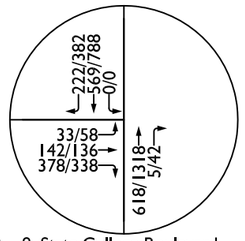
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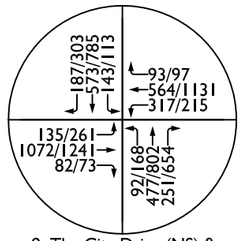
6. Lewis Street (NS) & Chapman Avenue (EW)



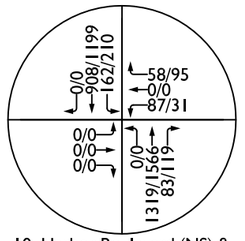
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



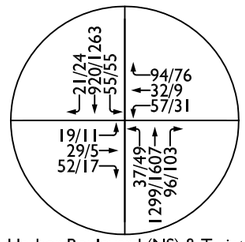
8. State College Boulevard - The City Drive (NS) & I-5 SB Ramps (EW)



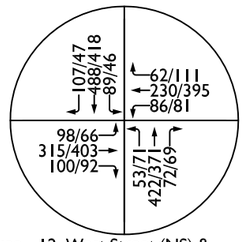
9. The City Drive (NS) & Chapman Avenue (EW)



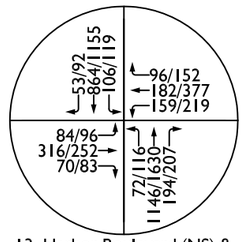
10. Harbor Boulevard (NS) & Project Access 1 (EW)



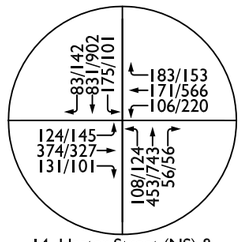
11. Harbor Boulevard (NS) & Twintree Lane - Twintree Avenue (EW)



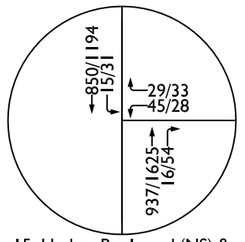
12. West Street (NS) & Lampson Avenue (EW)



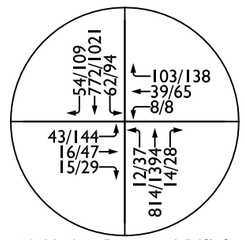
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



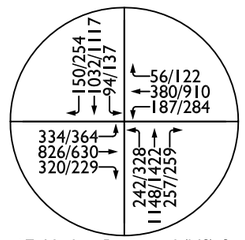
14. Haster Street (NS) & Lampson Avenue (EW)



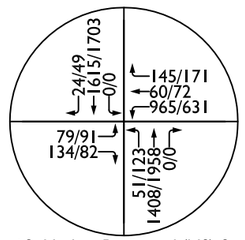
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



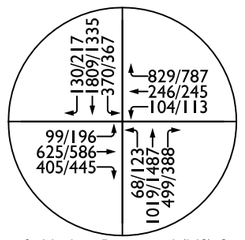
16. Harbor Boulevard (NS) & Palm Street (EW)



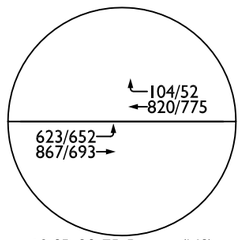
17. Harbor Boulevard (NS) & Garden Grove Boulevard (EW)



18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



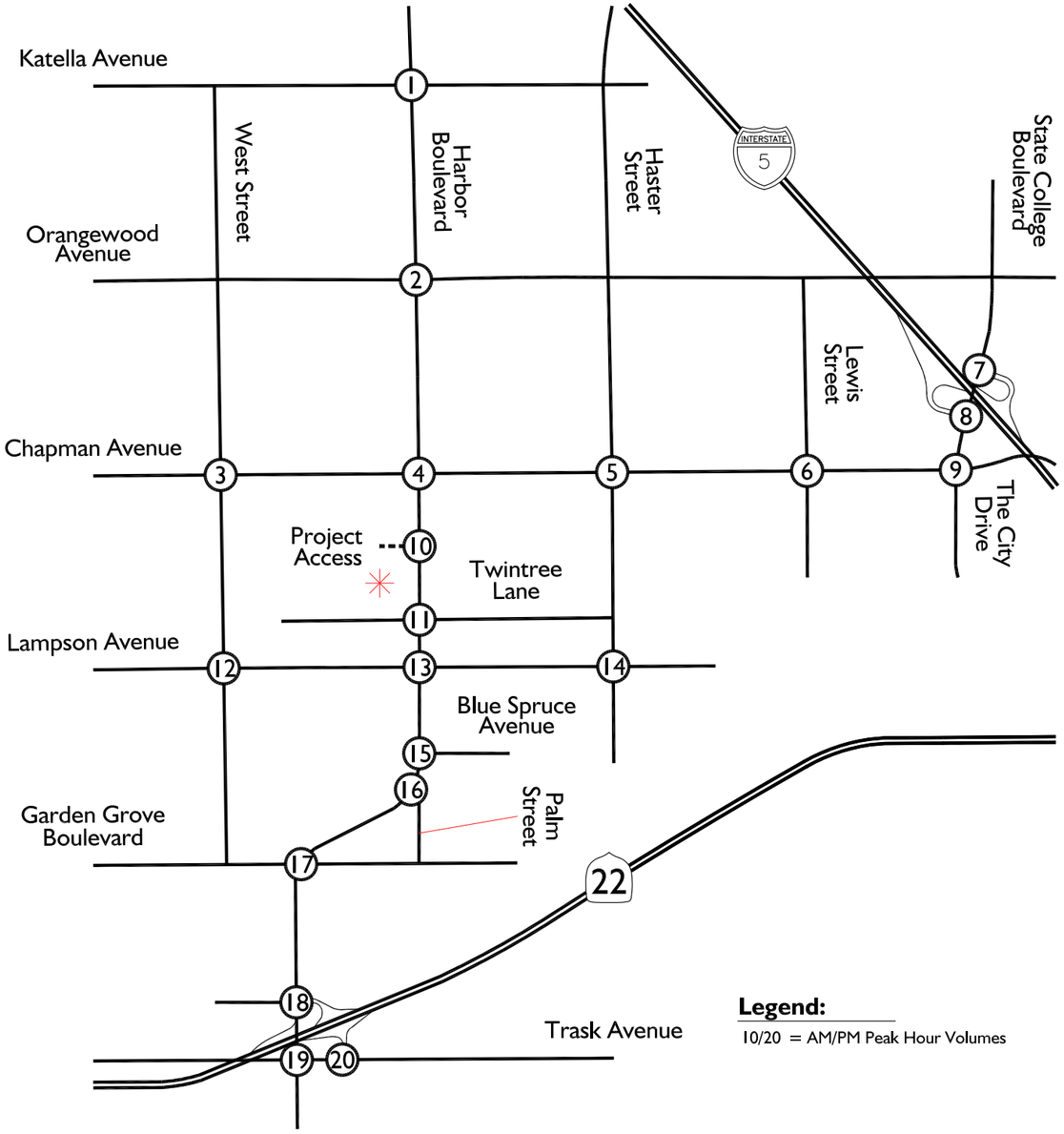
19. Harbor Boulevard (NS) & Trask Avenue (EW)

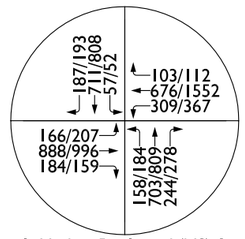


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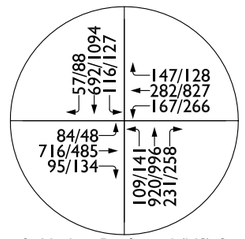
Exhibit 4-7

Project Buildout Year (2025) With Project Conditions Traffic Volumes

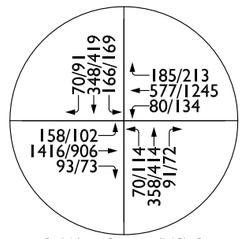




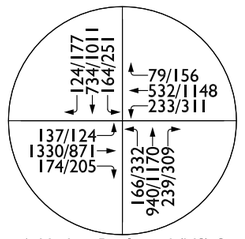
1. Harbor Boulevard (NS) & Katella Avenue (EW)



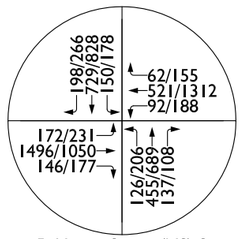
2. Harbor Boulevard (NS) & Orangewood Avenue (EW)



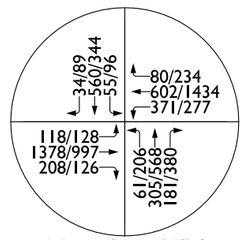
3. West Street (NS) & Chapman Avenue (EW)



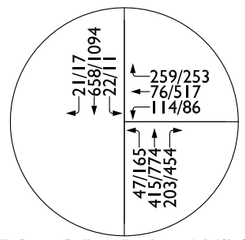
4. Harbor Boulevard (NS) & Chapman Avenue (EW)



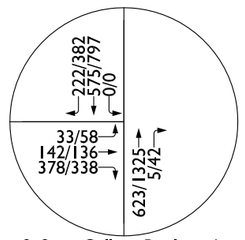
5. Haster Street (NS) & Chapman Avenue (EW)



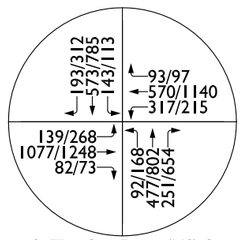
6. Lewis Street (NS) & Chapman Avenue (EW)



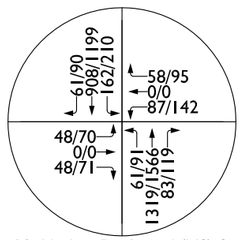
7. State College Boulevard (NS) & I-5 NB Ramps - Anaheim Way (EW)



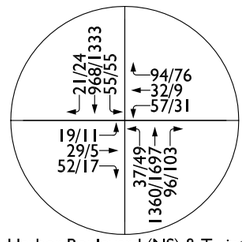
8. State College Boulevard - The City Drive (NS) & I-5 SB Ramps (EW)



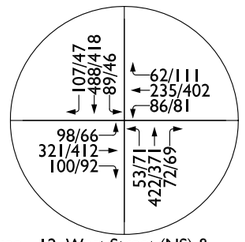
9. The City Drive (NS) & Chapman Avenue (EW)



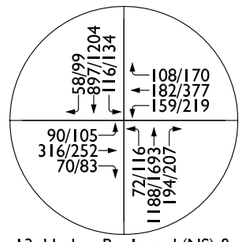
10. Harbor Boulevard (NS) & Project Access 1 (EW)



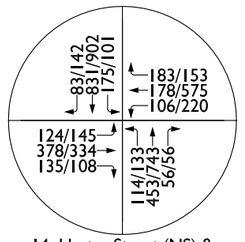
11. Harbor Boulevard (NS) & Twintree Lane - Twintree Avenue (EW)



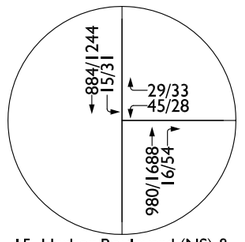
12. West Street (NS) & Lampson Avenue (EW)



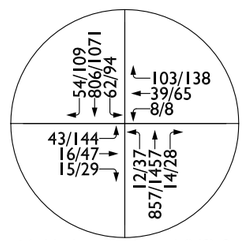
13. Harbor Boulevard (NS) & Lampson Avenue (EW)



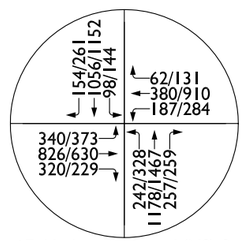
14. Haster Street (NS) & Lampson Avenue (EW)



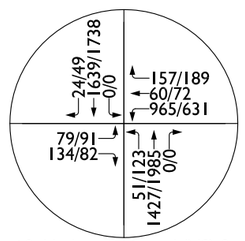
15. Harbor Boulevard (NS) & Blue Spruce Avenue (EW)



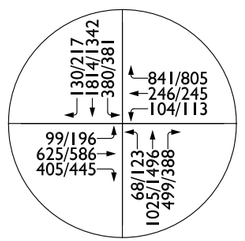
16. Harbor Boulevard (NS) & Palm Street (EW)



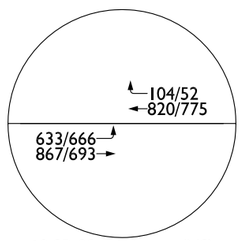
17. Harbor Boulevard (NS) & Garden Grove Boulevard (EW)



18. Harbor Boulevard (NS) & SR-22 WB Ramps - Banner Drive (EW)



19. Harbor Boulevard (NS) & Trask Avenue (EW)



10.SR-22 EB Ramps (NS) & Trask Avenue (EW)

Table 4-3
Cumulative Projects Trip Generation[1]

ID No.	Jurisdiction	Project Name / Case Number	Land Use	Quantity	Units[2]	Peak Hour						Daily
						AM			PM			
						In	Out	Total	In	Out	Total	
TAZ 1												
GG1	**Garden Grove**	SP-090-2020	Coffee Shop With Drive-Thru	1.900	TSF	86	83	169	41	41	82	1,559
GG2	**Garden Grove**	SP-102-2021	Car Wash	1	Tunnels	39	39	78	39	39	78	780
					TAZ 1 Total	**125**	**122**	**247**	**80**	**80**	**160**	**2,339**
TAZ 2												
GG 3	**Garden Grove**	SP-099-2021	Fast Food Restaurant With Drive-Thru	3.267	TSF	67	64	131	56	51	107	1,539
					TAZ 2 Total	**67**	**64**	**131**	**56**	**51**	**107**	**1,539**
TAZ 3												
GG 4	**Garden Grove**	Site C Hotel[3]	Hotel	--	--	277	193	470	398	316	714	9,257
					TAZ 3 Total	**277**	**193**	**470**	**398**	**316**	**714**	**9,257**
TAZ 4												
O 1	**Orange**	TPM No. 0010-16	Multi-Family Housing (Low-Rise)	331	DU	35	117	152	117	69	186	2,423
O 2	**Orange**	TPM No. 0011-16	Hotel	165	RM	46	32	78	50	49	99	1,379
					TAZ 4 Total	**81**	**149**	**230**	**167**	**118**	**285**	**3,802**
TAZ 5												
GG 5	**Garden Grove**	SP-055-2018	Utilities	4.992	TSF	9	2	11	2	9	11	66
GG 6	**Garden Grove**	SP-046-2018	Multi-Family Housing (Low-Rise)	4	DU	0	1	1	1	1	2	29
					TAZ 5 Total	**9**	**3**	**12**	**3**	**10**	**13**	**95**
TAZ 6												
GG 7	**Garden Grove**	SP-058-2018	Fast Food Restaurant With Drive-Thru	2.485	TSF	51	49	100	42	39	81	1,170
GG 8	**Garden Grove**	SP-061-2019	General Office	6.662	TSF	7	1	8	1	6	7	65
			Medical Office	2.170	TSF	5	1	6	2	5	7	76
GG 9	**Garden Grove**	SP-053-2018	Retail	3.888	TSF	2	1	3	7	8	15	147
			Multi-Family Housing (Low-Rise)	9	DU	1	3	4	3	2	5	66
GG 10	**Garden Grove**	SP-045-2018	High-Turnover Sit-Down Restaurant	2.981	TSF	16	13	29	18	11	29	334
			Retail	3.465	TSF	2	1	3	6	7	13	131
			General Office	0.200	TSF	0	0	0	0	0	0	2
GG 11	**Garden Grove**	SP-078-2019	High-Turnover Sit-Down Restaurant	5.232	TSF	29	23	52	32	19	51	587
			Quality Restaurant	1.257	TSF	1	0	1	7	3	10	105
			Food Cart Pod	5	Stalls	0	0	0	0	0	15	75
			Retail	1.535	TSF	1	1	2	3	3	6	58
			General Office	0.955	TSF	1	0	1	0	1	1	9
			Motel	10	RM	1	2	3	2	2	4	34
					TAZ 6 Total	**117**	**95**	**212**	**123**	**106**	**244**	**2,859**
TAZ 7												
GG 12	**Garden Grove**	SP-033-2017 TE1	Retail	4.954	TSF	3	2	5	9	10	19	187
					TAZ 7 Total	**3**	**2**	**5**	**9**	**10**	**19**	**187**
TAZ 8												
GG 13	**Garden Grove**	SP-087-2020	Mini Warehouse	856	Units	6	6	12	8	8	16	154
					TAZ 8 Total	**6**	**6**	**12**	**8**	**8**	**16**	**154**
TAZ 9												
GG 14	**Garden Grove**	SP-056-2018	Hotel	124	RM	34	24	58	38	36	74	1,037
S 1	**Santa Ana**	Westview Housing	Multi-Family Housing (Mid-Rise)	85	DU	8	23	31	23	15	38	462
					TAZ 9 Total	**42**	**47**	**89**	**61**	**51**	**112**	**1,499**
					Total Cumulative Projects Trip Generation	***450***	***488***	***938***	***507***	***434***	***956***	***12,474***

[1] Cumulative Projects information provided by the City of Garden Grove, City of Santa Ana, City of Orange, and City of Anaheim.

[2] TSF =Thousand Square Feet
DU = Dwelling Units
RM = Rooms
Units = Storage Units

[3] Trip Generation was referenced from *Site "C" Mixed Use Hotel Traffic Impact Study, September 13, 2017 (RK Engineering Group, Inc.).*

5.0 MUTCD Traffic Signal Warrant Analysis

The following study intersections have been evaluated for signalization based on the peak hour traffic signal warrants and procedures contained in the *California Manual on Uniform Traffic Control Devices (CA MUTCD), 2014 Edition*:

- **Int 10 –** Harbor Boulevard / Project Access;
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue; and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue.

It should be noted, signal warrant analysis only determines if an intersection meets the minimum traffic volume requirements for installation of a traffic signal. If a traffic signal warrant is satisfied, it means the location has enough traffic volume to be considered for signalization.

Signal warrants have no relation to level of service operation and satisfying a signal warrant does not necessarily mean a traffic signal is needed or should be installed and it is no indication for requiring improvements or impact determination. It solely shows that if needed based on level of service operations and other performance parameters, the intersection can be further considered for signalization.

Table 5-1 summarizes the results of the *MUTCD* peak hour traffic signal warrant analysis at the study intersections noted above for all analysis scenarios evaluated in this study.

Detailed *MUTCD* signal warrant analysis worksheets are included in Appendix B.

The following is a summary of the traffic signal warrants met:

- **Int 10 –** Harbor Boulevard / Project Access:
  - Existing Plus Project Conditions (PM peak hour only);
  - Project Buildout Year (2025) Without Project Conditions (both peak hours); and

- Project Buildout Year (2025) With Project Conditions (both peak hours).

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue:
  - Existing Conditions (AM peak hour only);
  - Existing Plus Project Conditions (AM peak hour only);
  - Project Buildout Year (2025) Without Project Conditions (both peak hours); and
  - Project Buildout Year (2025) With Project Conditions (both peak hours).

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue:
  - No warrants met.

Table 5-1
MUTCD Peak Hour Traffic Signal Warrant Analysis Summary

Analysis Scenario	Intersection					
	10. Harbor Boulevard (NS) / Project Access (EW)		11. Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)		15. Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	
	AM	PM	AM	PM	AM	PM
Existing Conditions	NO	NO	**YES**	NO	NO	NO
Existing Plus Project Traffic Conditions	NO	**YES**	**YES**	NO	NO	NO
Project Buildout Year (2025) Without Project Conditions	**YES**	**YES**	**YES**	**YES**	NO	NO
Project Buildout Year (2025) With Project Conditions	**YES**	**YES**	**YES**	**YES**	NO	NO

6.0 Study Intersection Peak Hour LOS Analysis

This section of the report provides a discussion on the study intersection peak hour LOS analysis and findings.

This analysis is being provided for non-CEQA purposes in order to comply with the applicable City of Garden Grove General Plan consistency requirements related to LOS.

6.1 Existing Conditions LOS

Existing Conditions LOS calculations for the study intersections are shown in Table 6-1 and are based upon the existing (2021) traffic volumes shown on Exhibit 3-2, and the existing geometry shown on Exhibit 3-1.

As shown in Table 6-1, all study intersections are currently operating at an acceptable LOS (LOS D or better) during the peak hours for Existing Conditions, with the exception of the following study intersections which are currently operating at a deficient LOS (LOS E or F):

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Detailed LOS analysis worksheets for Existing Conditions are included in Appendix C.

6.2 Existing Plus Project Conditions LOS

Existing Plus Project Conditions LOS calculations for the study intersections are shown in Table 6-2 and are based upon the Existing Plus Project Conditions traffic volumes shown on Exhibit 4-3, and the existing geometry shown on Exhibit 3-1.

As shown in Table 6-2, all study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Existing Plus Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 10 –** Harbor Boulevard / Project Access (PM peak hour only);

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Existing Plus Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersection 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Existing Plus Project Conditions:

Intersection Improvement #1	**Int 10 – Harbor Boulevard / Project Access:** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #2	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue:** Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Detailed LOS analysis worksheets for Existing Plus Project Conditions are included in Appendix D.

Detailed LOS analysis worksheets for Existing Plus Project Conditions With Improvements are included in Appendix E.

6.3 Project Buildout Year (2025) Without Project Conditions LOS

Project Buildout Year (2025) Without Project Conditions LOS calculations for the study intersections are shown in Table 6-3 and are based upon the Project Buildout Year (2025) Without Project Conditions traffic volumes shown on Exhibit 4-6, and the existing geometry shown on Exhibit 3-1.

As shown in Table 6-3, all study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025) Without Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Detailed LOS analysis worksheets for Project Buildout Year (2025) Without Project Conditions are included in Appendix F.

6.4 Project Buildout Year (2025) With Project Conditions LOS

Project Buildout Year (2025) With Project Conditions LOS calculations for the study intersections are shown in Table 6-4 and are based upon the Project Buildout Year (2025) With Project Conditions traffic volumes shown on Exhibit 4-7, and the existing geometry shown on Exhibit 3-1.

As shown in Table 6-4, all study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025)

With Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Project Buildout Year (2025) With Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersections 5, 6, and 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Project Buildout Year (2025) With Project Conditions:

Intersection Improvement #3	**Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*):** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #4	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*):** Make a fair-share contribution to install a traffic

signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Detailed LOS analysis worksheets for Project Buildout Year (2025) With Project Conditions are included in Appendix G.

Detailed LOS analysis worksheets for Project Buildout Year (2025) With Project Conditions With Improvements are included in Appendix H.

Table 6-1
Study Intersection LOS Analysis Summary
Existing Conditions

	Intersection	Traffic Control[3]	Methodology	Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Level of Service	
				AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	- -	- -	0.453	0.576	A	A
2.	Harbor Boulevard (NS) / Orangewood Avenue (EW)	TS	ICU	- -	- -	0.594	0.620	A	B
3.	West Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.719	0.665	C	B
4.	Harbor Boulevard (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.633	0.650	B	B
5.	Haster Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.651	0.880	B	D
6.	Lewis Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.752	0.881	C	D
7.	State College Boulevard (NS) / I-5 NB Ramps - Anaheim Way (EW)	TS	ICU	- -	- -	0.227	0.393	A	A
8.	State College Boulevard - The City Drive (NS) / I-5 SB Ramps (EW)	TS	ICU	- -	- -	0.229	0.285	A	A
9.	The City Drive (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.463	0.521	A	A
10.	Harbor Boulevard (NS) / Project Access (EW)	CSS	HCM	0.0	0.0	- -	- -	A	A
11.	Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	CSS	HCM	**411.5**	**292.6**	- -	- -	**F**	**F**
12.	West Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.455	0.472	A	A
13.	Harbor Boulevard (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.561	0.642	A	B
14.	Haster Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.581	0.729	A	C
15.	Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	CSS	HCM	18.3	**49.0**	- -	- -	C	**E**
16.	Harbor Boulevard (NS) / Palm Street (EW)	TS	ICU	- -	- -	0.255	0.446	A	A
17.	Harbor Boulevard (NS) / Garden Grove Boulevard (EW)	TS	ICU	- -	- -	0.619	0.695	B	B
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	- -	- -	0.727	0.667	C	B
19.	Harbor Boulevard (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.758	0.813	C	D
20.	SR-22 EB Ramps (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.540	0.458	A	A

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

HCM Analysis Software: Synchro, Version 10.0. Per the Highway Capacity Manual 6th Edition, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

[3] TS = Traffic Signal

CSS = Cross-Street Stop

Table 6-2
Study Intersection LOS Analysis Summary
Existing Plus Project Conditions

	Intersection	Traffic Control[3]	Methodology	Existing Conditions						Existing Plus Project Conditions									
				Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Level of Service		Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Increase in Delay or V/C		Level of Service		Requires Improvement?	
				AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	- -	- -	0.453	0.576	A	A	- -	- -	0.458	0.581	0.005	0.005	A	A	No	No
2.	Harbor Boulevard (NS) / Orangewood Avenue (EW)	TS	ICU	- -	- -	0.594	0.620	A	B	- -	- -	0.604	0.627	0.010	0.007	B	B	No	No
3.	West Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.719	0.665	C	B	- -	- -	0.724	0.673	0.005	0.008	C	B	No	No
4.	Harbor Boulevard (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.633	0.650	B	B	- -	- -	0.643	0.658	0.010	0.008	B	B	No	No
5.	Haster Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.651	0.880	B	D	- -	- -	0.653	0.885	0.002	0.005	B	D	No	No
6.	Lewis Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.752	0.881	C	D	- -	- -	0.754	0.886	0.002	0.005	C	D	No	No
7.	State College Boulevard (NS) / I-5 NB Ramps - Anaheim Way (EW)	TS	ICU	- -	- -	0.227	0.393	A	A	- -	- -	0.228	0.395	0.001	0.002	A	A	No	No
8.	State College Boulevard - The City Drive (NS) / I-5 SB Ramps (EW)	TS	ICU	- -	- -	0.229	0.285	A	A	- -	- -	0.229	0.286	0.000	0.001	A	A	No	No
9.	The City Drive (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.463	0.521	A	A	- -	- -	0.464	0.522	0.001	0.001	A	A	No	No
10.	Harbor Boulevard (NS) / Project Access (EW)	CSS	HCM	0.0	0.0	- -	- -	A	A	30.7	**238.1**	- -	- -	30.7	238.1	D	**F**	No	**Yes**
	With Improvements	*TS*	*ICU*	- -	- -	- -	- -	- -	- -	- -	- -	*0.325*	*0.398*	- -	- -	*A*	*A*	*No*	*No*
11.	Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	CSS	HCM	**411.5**	**292.6**	- -	- -	**F**	**F**	**630.8**	**494.9**	- -	- -	219.3	202.3	**F**	**F**	**Yes**	**Yes**
	With Improvements	*TS*	*ICU*	- -	- -	- -	- -	- -	- -	- -	- -	*0.442*	*0.411*	- -	- -	*A*	*A*	*No*	*No*
12.	West Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.455	0.472	A	A	- -	- -	0.458	0.478	0.003	0.006	A	A	No	No
13.	Harbor Boulevard (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.561	0.642	A	B	- -	- -	0.576	0.663	0.015	0.021	A	B	No	No
14.	Haster Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.581	0.729	A	C	- -	- -	0.587	0.740	0.006	0.011	A	C	No	No
15.	Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	CSS	HCM	18.3	**49.0**	- -	- -	C	**E**	19.3	**57.6**	- -	- -	1.0	8.6	C	**F**	No	No
16.	Harbor Boulevard (NS) / Palm Street (EW)	TS	ICU	- -	- -	0.255	0.446	A	A	- -	- -	0.264	0.458	0.009	0.012	A	A	No	No
17.	Harbor Boulevard (NS) / Garden Grove Boulevard (EW)	TS	ICU	- -	- -	0.619	0.695	B	B	- -	- -	0.624	0.706	0.005	0.011	B	C	No	No
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	- -	- -	0.727	0.667	C	B	- -	- -	0.732	0.674	0.005	0.007	C	B	No	No
19.	Harbor Boulevard (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.758	0.813	C	D	- -	- -	0.764	0.823	0.006	0.010	C	D	No	No
20.	SR-22 EB Ramps (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.540	0.458	A	A	- -	- -	0.540	0.462	0.000	0.004	A	A	No	No

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

HCM Analysis Software: Synchro, Version 10.0. Per the Highway Capacity Manual 6th Edition, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

[3] TS = Traffic Signal

CSS = Cross-Street Stop

Table 6-3
Study Intersection LOS Analysis Summary
Project Buildout Year (2025) Without Project Conditions

	Intersection	Traffic Control[3]	Methodology	Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Level of Service	
				AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	- -	- -	0.495	0.622	A	B
2.	Harbor Boulevard (NS) / Orangewood Avenue (EW)	TS	ICU	- -	- -	0.670	0.694	B	B
3.	West Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.765	0.711	C	C
4.	Harbor Boulevard (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.733	0.719	C	C
5.	Haster Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.684	**0.931**	B	**E**
6.	Lewis Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.789	**0.932**	C	**E**
7.	State College Boulevard (NS) / I-5 NB Ramps - Anaheim Way (EW)	TS	ICU	- -	- -	0.236	0.410	A	A
8.	State College Boulevard - The City Drive (NS) / I-5 SB Ramps (EW)	TS	ICU	- -	- -	0.245	0.309	A	A
9.	The City Drive (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.493	0.552	A	A
10.	Harbor Boulevard (NS) / Project Access (EW)	CSS	HCM	**2826.1**	**311.1**	- -	- -	**F**	**F**
11.	Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	CSS	HCM	24.2	**43.4**	- -	- -	C	**E**
12.	West Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.492	0.513	A	A
13.	Harbor Boulevard (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.655	0.757	B	C
14.	Haster Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.640	0.806	B	D
15.	Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	CSS	HCM	25.4	**123.0**	- -	- -	D	**F**
16.	Harbor Boulevard (NS) / Palm Street (EW)	TS	ICU	- -	- -	0.299	0.512	A	A
17.	Harbor Boulevard (NS) / Garden Grove Boulevard (EW)	TS	ICU	- -	- -	0.675	0.772	B	C
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	- -	- -	0.782	0.726	C	C
19.	Harbor Boulevard (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.799	0.886	C	D
20.	SR-22 EB Ramps (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.560	0.485	A	A

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

HCM Analysis Software: Synchro, Version 10.0. Per the Highway Capacity Manual 6th Edition, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

[3] TS = Traffic Signal

CSS = Cross-Street Stop

Table 6-4
Study Intersection LOS Analysis Summary
Project Buildout Year (2025) With Project Conditions

	Intersection	Traffic Control[3]	Methodology	Project Buildout Year (2025) Without Project Conditions						Project Buildout Year (2025) With Project Conditions									
				Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Level of Service		Delay (sec/veh)[1,2]		V/C Ratio[1,2]		Increase in Delay or V/C		Level of Service		Requires Improvement?	
				AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	- -	- -	0.495	0.622	A	B	- -	- -	0.501	0.628	0.006	0.006	A	B	No	No
2.	Harbor Boulevard (NS) / Orangewood Avenue (EW)	TS	ICU	- -	- -	0.670	0.694	B	B	- -	- -	0.680	0.709	0.010	0.015	B	C	No	No
3.	West Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.765	0.711	C	C	- -	- -	0.770	0.719	0.005	0.008	C	C	No	No
4.	Harbor Boulevard (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.733	0.719	C	C	- -	- -	0.743	0.720	0.010	0.001	C	C	No	No
5.	Haster Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.684	**0.931**	B	**E**	- -	- -	0.686	**0.937**	0.002	0.006	B	**E**	No	No
6.	Lewis Street (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.789	**0.932**	C	**E**	- -	- -	0.790	**0.938**	0.001	0.006	C	**E**	No	No
7.	State College Boulevard (NS) / I-5 NB Ramps - Anaheim Way (EW)	TS	ICU	- -	- -	0.236	0.410	A	A	- -	- -	0.237	0.412	0.001	0.002	A	A	No	No
8.	State College Boulevard - The City Drive (NS) / I-5 SB Ramps (EW)	TS	ICU	- -	- -	0.245	0.309	A	A	- -	- -	0.246	0.310	0.001	0.001	A	A	No	No
9.	The City Drive (NS) / Chapman Avenue (EW)	TS	ICU	- -	- -	0.493	0.552	A	A	- -	- -	0.494	0.555	0.001	0.003	A	A	No	No
10.	Harbor Boulevard (NS) / Project Access (EW)	CSS	HCM	**2826.1**	**311.1**	- -	- -	**F**	**F**	**4449.1**	**311.1**	- -	- -	1623.0	0.0	**F**	**F**	**Yes**	**Yes**
	With Improvements	*TS*	*ICU*	- -	- -	- -	- -	- -	- -	- -	- -	*0.517*	*0.661*	- -	- -	*A*	*B*	*No*	*No*
11.	Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	CSS	HCM	24.2	**43.4**	- -	- -	C	**E**	26.1	**51.0**	- -	- -	1.9	7.6	D	**F**	No	**Yes**
	With Improvements	*TS*	*ICU*	- -	- -	- -	- -	- -	- -	- -	- -	*0.534*	*0.523*	- -	- -	*A*	*A*	*No*	*No*
12.	West Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.492	0.513	A	A	- -	- -	0.496	0.519	0.004	0.006	A	A	No	No
13.	Harbor Boulevard (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.655	0.757	B	C	- -	- -	0.669	0.778	0.014	0.021	B	C	No	No
14.	Haster Street (NS) / Lampson Avenue (EW)	TS	ICU	- -	- -	0.640	0.806	B	D	- -	- -	0.646	0.817	0.006	0.011	B	D	No	No
15.	Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	CSS	HCM	25.4	**123.0**	- -	- -	D	**F**	27.1	**154.2**	- -	- -	1.7	31.2	D	**F**	No	No
16.	Harbor Boulevard (NS) / Palm Street (EW)	TS	ICU	- -	- -	0.299	0.512	A	A	- -	- -	0.307	0.525	0.008	0.013	A	A	No	No
17.	Harbor Boulevard (NS) / Garden Grove Boulevard (EW)	TS	ICU	- -	- -	0.675	0.772	B	C	- -	- -	0.679	0.783	0.004	0.011	B	C	No	No
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	- -	- -	0.782	0.726	C	C	- -	- -	0.786	0.733	0.004	0.007	C	C	No	No
19.	Harbor Boulevard (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.799	0.886	C	D	- -	- -	0.805	0.896	0.006	0.010	D	D	No	No
20.	SR-22 EB Ramps (NS) / Trask Avenue (EW)	TS	ICU	- -	- -	0.560	0.485	A	A	- -	- -	0.560	0.489	0.000	0.004	A	A	No	No

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

HCM Analysis Software: Synchro, Version 10.0. Per the Highway Capacity Manual 6th Edition, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

[3] TS = Traffic Signal

CSS = Cross-Street Stop

7.0 Congestion Management Program (CMP) Study Intersection Peak Hour LOS Analysis

This section of the report provides a discussion on the Orange County Congestion Management Program (CMP) study intersection peak hour LOS analysis and findings. The CMP requires that any CMP Highway System intersection that experiences fifty-one (51) or more project-related trips be analyzed for LOS utilizing the ICU methodology. As a result, the following study intersections are evaluated as part of the CMP analysis:

- Int 1 – Harbor Boulevard / Katella Avenue; and
- Int 18 – Harbor Boulevard / SR-22 WB Ramps – Banner Drive.

7.1 CMP – Existing Conditions LOS

Existing Conditions LOS calculations for the CMP study intersections are shown in Table 7-1 and are based upon the existing (2021) traffic volumes shown on Exhibit 3-2, and the existing geometry shown on Exhibit 3-1.

As shown in Table 7-1, all CMP study intersections are currently operating at an acceptable LOS (LOS E or better) during the peak hours for Existing Conditions.

Detailed LOS analysis worksheets for Existing Conditions are included in Appendix C.

7.2 CMP – Existing Plus Project Conditions LOS

Existing Plus Project Conditions LOS calculations for the CMP study intersections are shown in Table 7-2 and are based upon the Existing Plus Project Conditions traffic volumes shown on Exhibit 4-3, and the existing geometry shown on Exhibit 3-1.

As shown in Table 7-2, all CMP study intersections are forecast to continue to operate at an acceptable LOS (LOS E or better) during the peak hours for Existing Plus Project Conditions.

Based on the agency-established LOS performance thresholds, the project is forecast to not be required to contribute a fair-share to improving the CMP study intersections for Existing Plus Project Conditions.

Detailed LOS analysis worksheets for Existing Plus Project Conditions are included in Appendix D.

7.3 CMP – Project Buildout Year (2025) Without Project Conditions LOS

Project Buildout Year (2025) Without Project Conditions LOS calculations for the CMP study intersections are shown in Table 7-3 and are based upon the Project Buildout Year (2025) Without Project Conditions traffic volumes shown on Exhibit 4-6, and the existing geometry shown on Exhibit 3-1.

As shown in Table 7-3, all CMP study intersections are forecast to continue to operate at an acceptable LOS (LOS E or better) during the peak hours for Project Buildout Year (2025) Without Project Conditions.

Detailed LOS analysis worksheets for Project Buildout Year (2025) Without Project Conditions are contained in Appendix F.

7.4 CMP – Project Buildout Year (2025) With Project Conditions LOS

Project Buildout Year (2025) With Project Conditions LOS calculations for the CMP study intersections are shown in Table 7-4 and are based upon the Project Buildout Year (2025) With Project Conditions traffic volumes shown on Exhibit 4-7, and the existing geometry shown on Exhibit 3-1.

As shown in Table 7-4, all CMP study intersections are forecast to continue to operate at an acceptable LOS (LOS E or better) during the peak hours for Project Buildout Year (2025) With Project Conditions.

Based on the agency-established LOS performance thresholds, the project is forecast to not be required to contribute a fair-share to improving the CMP study intersections for Project Buildout Year (2025) With Project Conditions.

Detailed LOS analysis worksheets for Project Buildout Year (2025) With Project Conditions are included in Appendix G.

Table 7-1
CMP Study Intersection LOS Analysis Summary
Existing Conditions

	Intersection	Traffic Control[3]	Methodology	V/C Ratio[1,2]		Level of Service	
				AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	0.453	0.576	A	A
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	0.727	0.667	C	B

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

[3] TS = Traffic Signal

Table 7-2
CMP Study Intersection LOS Analysis Summary
Existing Plus Project Conditions

	Intersection	Traffic Control[3]	Methodology	Existing Conditions				Existing Plus Project Conditions							
				V/C Ratio[1,2]		Level of Service		V/C Ratio[1,2]		Increase in V/C		Level of Service		Requires Improvement?	
				AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	0.453	0.576	A	A	0.458	0.581	0.005	0.005	A	A	No	No
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	0.727	0.667	C	B	0.732	0.674	0.005	0.007	C	B	No	No

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

[3] TS = Traffic Signal

Table 7-3
CMP Study Intersection LOS Analysis Summary
Project Buildout Year (2025) Without Project Conditions

	Intersection	Traffic Control[3]	Methodology	V/C Ratio[1,2]		Level of Service	
				AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	0.495	0.622	A	B
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	0.782	0.726	C	C

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

[3] TS = Traffic Signal

Table 7-4
CMP Study Intersection LOS Analysis Summary
Project Buildout Year (2025) With Project Conditions

	Intersection	Traffic Control[3]	Methodology	Project Buildout Year (2025) Without Project Conditions				Project Buildout Year (2025) With Project Conditions							
				V/C Ratio[1,2]		Level of Service		V/C Ratio[1,2]		Increase in V/C		Level of Service		Requires Improvement?	
				AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	TS	ICU	0.495	0.622	A	B	0.501	0.628	0.006	0.006	A	B	No	No
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	TS	ICU	0.782	0.726	C	C	0.786	0.733	0.004	0.007	C	C	No	No

[1] Deficient operation shown in **Bold**.

[2] ICU Analysis Software: Traffic, Version 8.0. Volume to Capacity Ratio (V/C) is calculated utilizing the Intersection Capacity Utilization methodolgy for signalized intersections.

[3] TS = Traffic Signal

8.0 Left-Turn Pocket Queue Analysis

As requested by City staff, an analysis of the left-turn storage capacity for the study intersections has been performed to determine if adequate storage is currently provided to accommodate the left-turn vehicular queues at the study intersections for each analysis scenario.

The analysis assumes one (1) foot of storage to be required per left-turning vehicle during the peak hour.

Table 8-1 shows the results of the left-turn queue analysis.

As shown in Table 8-1, the following left-turn movements would require additional left-turn capacity:

- Int 2 – Harbor Boulevard / Orangewood Avenue:
  - Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 85 feet
    - Required Left-Turn Capacity without Project: 257 feet
    - Required Left-Turn Capacity with Project: 266 feet
    - Improvement: Coordinate with the City of Anaheim to determine if the project is required to make a fair-share contribution to extend the left-turn capacity up to 266 feet
- Int 3 – West Street / Chapman Avenue:
  - Southbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 100 feet
    - Required Left-Turn Capacity without Project: 160 feet

        - Required Left-Turn Capacity with Project: 169 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 169 feet
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 150 feet
        - Required Left-Turn Capacity without Project: 158 feet
        - Required Left-Turn Capacity with Project: 158 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 4 – Harbor Boulevard / Chapman Avenue:
    - Westbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 300 feet
        - Required Left-Turn Capacity with Project: 311 feet
        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible

- Int 5 – Haster Street / Chapman Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 175 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

    - Southbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 100 feet
        - Required Left-Turn Capacity without Project: 178 feet
        - Required Left-Turn Capacity with Project: 178 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 6 – Lewis Street / Chapman Avenue:

    - Northbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 180 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

    - Southbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 80 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 96 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 280 feet
    - Required Left-Turn Capacity without Project: 371 feet
    - Required Left-Turn Capacity with Project: 371 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 10 – Harbor Boulevard / Project Access:
    - Northbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity with Project: 91 feet
        - No Improvements are required by the project since the additional required left-turn capacity (1 foot) is negligible
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 145 feet
        - Required Left-Turn Capacity without Project: 210 feet
        - Required Left-Turn Capacity with Project: 210 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 12 – West Street / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet
        - Required Left-Turn Capacity without Project: 98 feet
        - Required Left-Turn Capacity with Project: 98 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet
        - Required Left-Turn Capacity without Project: 86 feet
        - Required Left-Turn Capacity with Project: 86 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
- Int 13 – Harbor Boulevard / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 105 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 105 feet

- Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 80 feet
    - Required Left-Turn Capacity without Project: 219 feet
    - Required Left-Turn Capacity with Project: 219 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 14 – Haster Street / Lampson Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 100 feet
        - Required Left-Turn Capacity without Project: 124 feet
        - Required Left-Turn Capacity with Project: 133 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 133 feet
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 125 feet
        - Required Left-Turn Capacity without Project: 175 feet
        - Required Left-Turn Capacity with Project: 175 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Eastbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 75 feet
    - Required Left-Turn Capacity without Project: 145 feet
    - Required Left-Turn Capacity with Project: 145 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency
- Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 125 feet
    - Required Left-Turn Capacity without Project: 220 feet
    - Required Left-Turn Capacity with Project: 220 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 17 – Harbor Boulevard / Garden Grove Boulevard:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 328 feet
        - Required Left-Turn Capacity with Project: 328 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Southbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 95 feet
        - Required Left-Turn Capacity without Project: 137 feet
        - Required Left-Turn Capacity with Project: 144 feet
        - No Improvements are recommended since lengthening of the southbound left-turn pocket is not feasible given the existing street configuration
    - Eastbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 365 feet
        - Required Left-Turn Capacity with Project: 373 feet
        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 220 feet
        - Required Left-Turn Capacity without Project: 284 feet
        - Required Left-Turn Capacity with Project: 284 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
- Int 18 – Harbor Boulevard / SR-22 WB Ramps – Banner Drive:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 65 feet
        - Required Left-Turn Capacity without Project: 123 feet

        - Required Left-Turn Capacity with Project: 123 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 550 feet
        - Required Left-Turn Capacity without Project: 965 feet
        - Required Left-Turn Capacity with Project: 965 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 19 – Harbor Boulevard / Trask Avenue:
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 315 feet
        - Required Left-Turn Capacity without Project: 370 feet
        - Required Left-Turn Capacity with Project: 381 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 381 feet
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 196 feet
        - Required Left-Turn Capacity with Project: 196 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

    - Westbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 113 feet
        - Required Left-Turn Capacity with Project: 113 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 20 – SR-22 EB Ramps / Trask Avenue:

    - Eastbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 520 feet
        - Required Left-Turn Capacity without Project: 652 feet
        - Required Left-Turn Capacity with Project: 666 feet
        - No Improvements are recommended since the eastbound outside left-turn lane storage length is sufficient as it extends west toward Harbor Boulevard

Table 8-1
Left-Turn Pocket Queue Analysis Summary

	Intersection	Movement	No. Left Turn Lanes	Total Storage Length (Feet)[1]	Existing Conditions				Existing Plus Project Conditions				Project Buildout Year (2025) Without Project Conditions				Project Buildout Year (2025) With Project Conditions			
					Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?	
					AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1.	Harbor Boulevard (NS) / Katella Avenue (EW)	Northbound Left-Turn	2	600	132	151	YES	YES	137	158	YES	YES	153	177	YES	YES	158	184	YES	YES
		Southbound Left-Turn	2	590	55	50	YES	YES	55	50	YES	YES	57	52	YES	YES	57	52	YES	YES
		Eastbound Left-Turn	2	590	160	199	YES	YES	160	199	YES	YES	166	207	YES	YES	166	207	YES	YES
		Westbound Left-Turn	2	590	272	321	YES	YES	278	330	YES	YES	303	358	YES	YES	309	367	YES	YES
2.	Harbor Boulevard (NS) / Orangewood Avenue (EW)	Northbound Left-Turn	1	240	74	101	YES	YES	79	108	YES	YES	104	134	YES	YES	109	141	YES	YES
		Southbound Left-Turn	1	210	111	122	YES	YES	111	122	YES	YES	116	127	YES	YES	116	127	YES	YES
		Eastbound Left-Turn	1	100	81	46	YES	YES	81	46	YES	YES	84	48	YES	YES	84	48	YES	YES
		Westbound Left-Turn	1	85	**124**	**214**	**NO**	**NO**	**130**	**223**	**NO**	**NO**	**161**	**257**	**NO**	**NO**	**167**	**266**	**NO**	**NO**
3.	West Street (NS) / Chapman Avenue (EW)	Northbound Left-Turn	1	140	67	109	YES	YES	67	109	YES	YES	70	114	YES	YES	70	114	YES	YES
		Southbound Left-Turn	1	100	**140**	**135**	**NO**	**NO**	**146**	**144**	**NO**	**NO**	**160**	**160**	**NO**	**NO**	**166**	**169**	**NO**	**NO**
		Eastbound Left-Turn	1	150	**152**	98	**NO**	YES	**152**	98	**NO**	YES	**158**	102	**NO**	YES	**158**	102	**NO**	YES
		Westbound Left-Turn	1	145	77	129	YES	YES	77	129	YES	YES	80	134	YES	YES	80	134	YES	YES
4.	Harbor Boulevard (NS) / Chapman Avenue (EW)	Northbound Left-Turn	2	350	84	238	YES	YES	94	252	YES	YES	156	318	YES	YES	166	332	YES	YES
		Southbound Left-Turn	2	400	110	210	YES	YES	110	210	YES	YES	164	251	YES	YES	164	251	YES	YES
		Eastbound Left-Turn	2	340	132	119	YES	YES	132	119	YES	YES	137	124	YES	YES	137	124	YES	YES
		Westbound Left-Turn	2	300	128	201	YES	YES	140	219	YES	YES	220	293	YES	YES	233	**311**	YES	**NO**
5.	Haster Street (NS) / Chapman Avenue (EW)	Northbound Left-Turn	1	175	121	**198**	YES	**NO**	121	**198**	YES	**NO**	126	**206**	YES	**NO**	126	**206**	YES	**NO**
		Southbound Left-Turn	1	100	**144**	**171**	**NO**	**NO**	**144**	**171**	**NO**	**NO**	**150**	**178**	**NO**	**NO**	**150**	**178**	**NO**	**NO**
		Eastbound Left-Turn	1	270	165	222	YES	YES	165	222	YES	YES	172	231	YES	YES	172	231	YES	YES
		Westbound Left-Turn	1	250	88	181	YES	YES	88	181	YES	YES	92	188	YES	YES	92	188	YES	YES
6.	Lewis Street (NS) / Chapman Avenue (EW)	Northbound Left-Turn	1	180	59	**198**	YES	**NO**	59	**198**	YES	**NO**	61	**206**	YES	**NO**	61	**206**	YES	**NO**
		Southbound Left-Turn	1	80	53	**92**	YES	**NO**	53	**92**	YES	**NO**	55	**96**	YES	**NO**	55	**96**	YES	**NO**
		Eastbound Left-Turn	1	150	113	123	YES	YES	113	123	YES	YES	118	128	YES	YES	118	128	YES	YES
		Westbound Left-Turn	1	280	**357**	266	**NO**	YES	**357**	266	**NO**	YES	**371**	277	**NO**	YES	**371**	277	**NO**	YES
7.	State College Boulevard (NS) / I-5 NB Ramps - Anaheim Way (EW)	Northbound Left-Turn	2	870	45	159	YES	YES	45	159	YES	YES	47	165	YES	YES	47	165	YES	YES
		Southbound Left-Turn	1	185	21	11	YES	YES	21	11	YES	YES	22	11	YES	YES	22	11	YES	YES
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	2	470	94	51	YES	YES	94	51	YES	YES	114	86	YES	YES	114	86	YES	YES

Table 8-1
Left-Turn Pocket Queue Analysis Summary

	Intersection	Movement	No. Left Turn Lanes	Total Storage Length (Feet)[1]	Existing Conditions				Existing Plus Project Conditions				Project Buildout Year (2025) Without Project Conditions				Project Buildout Year (2025) With Project Conditions			
					Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?	
					AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
8.	State College Boulevard - The City Drive (NS) / I-5 SB Ramps (EW)	Northbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Southbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Eastbound Left-Turn	1	250	32	56	YES	YES	32	56	YES	YES	33	58	YES	YES	33	58	YES	YES
		Westbound Left-Turn	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
9.	The City Drive (NS) / Chapman Avenue (EW)	Northbound Left-Turn	2	300	88	161	YES	YES	88	161	YES	YES	92	168	YES	YES	92	168	YES	YES
		Southbound Left-Turn	2	390	137	109	YES	YES	137	109	YES	YES	143	113	YES	YES	143	113	YES	YES
		Eastbound Left-Turn	2	340	120	235	YES	YES	125	242	YES	YES	135	261	YES	YES	139	268	YES	YES
		Westbound Left-Turn	2	450	305	207	YES	YES	305	207	YES	YES	317	215	YES	YES	317	215	YES	YES
10.	Harbor Boulevard (NS) / Project Access (EW)	Northbound Left-Turn	1	90	0	0	YES	YES	61	**91**	YES	**NO**	0	0	YES	YES	61	**91**	YES	**NO**
		Southbound Left-Turn	1	145	0	0	YES	YES	0	0	YES	YES	**162**	**210**	**NO**	**NO**	**162**	**210**	**NO**	**NO**
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
11.	Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	Northbound Left-Turn	1	90	36	47	YES	YES	36	47	YES	YES	37	49	YES	YES	37	49	YES	YES
		Southbound Left-Turn	1	75	39	34	YES	YES	39	34	YES	YES	55	55	YES	YES	55	55	YES	YES
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
12.	West Street (NS) / Lampson Avenue (EW)	Northbound Left-Turn	1	100	51	67	YES	YES	51	67	YES	YES	53	71	YES	YES	53	71	YES	YES
		Southbound Left-Turn	1	100	86	44	YES	YES	86	44	YES	YES	89	46	YES	YES	89	46	YES	YES
		Eastbound Left-Turn	1	85	**94**	63	**NO**	YES	**94**	63	**NO**	YES	**98**	66	**NO**	YES	**98**	66	**NO**	YES
		Westbound Left-Turn	1	85	83	78	YES	YES	83	78	YES	YES	**86**	81	**NO**	YES	**86**	81	**NO**	YES
13.	Harbor Boulevard (NS) / Lampson Avenue (EW)	Northbound Left-Turn	1	160	66	109	YES	YES	66	109	YES	YES	72	116	YES	YES	72	116	YES	YES
		Southbound Left-Turn	1	195	58	56	YES	YES	68	70	YES	YES	106	119	YES	YES	116	134	YES	YES
		Eastbound Left-Turn	1	90	49	60	YES	YES	55	69	YES	YES	84	**96**	YES	**NO**	90	**105**	YES	**NO**
		Westbound Left-Turn	1	80	**135**	**193**	**NO**	**NO**	**135**	**193**	**NO**	**NO**	**159**	**219**	**NO**	**NO**	**159**	**219**	**NO**	**NO**
14.	Haster Street (NS) / Lampson Avenue (EW)	Northbound Left-Turn	1	100	90	100	YES	YES	96	**109**	YES	**NO**	**108**	**124**	**NO**	**NO**	**114**	**133**	**NO**	**NO**
		Southbound Left-Turn	1	125	**168**	97	**NO**	YES	**168**	97	**NO**	YES	**175**	101	**NO**	YES	**175**	101	**NO**	YES
		Eastbound Left-Turn	1	75	**119**	**139**	**NO**	**NO**	**119**	**139**	**NO**	**NO**	**124**	**145**	**NO**	**NO**	**124**	**145**	**NO**	**NO**
		Westbound Left-Turn	1	125	102	**211**	YES	**NO**	102	**211**	YES	**NO**	106	**220**	YES	**NO**	106	**220**	YES	**NO**
15.	Harbor Boulevard (NS) / Blue Spruce Avenue (EW)	Northbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Southbound Left-Turn	1	90	14	30	YES	YES	14	30	YES	YES	15	31	YES	YES	15	31	YES	YES
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Table 8-1
Left-Turn Pocket Queue Analysis Summary

	Intersection	Movement	No. Left Turn Lanes	Total Storage Length (Feet)[1]	Existing Conditions				Existing Plus Project Conditions				Project Buildout Year (2025) Without Project Conditions				Project Buildout Year (2025) With Project Conditions			
					Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?		Vehicular Queue Length (# of vehicles)		Adequate Storage Provided?	
					AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
16.	Harbor Boulevard (NS) / Palm Street (EW)	Northbound Left-Turn	1	190	12	36	YES	YES	12	36	YES	YES	12	37	YES	YES	12	37	YES	YES
		Southbound Left-Turn	1	220	60	90	YES	YES	60	90	YES	YES	62	94	YES	YES	62	94	YES	YES
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
17.	Harbor Boulevard (NS) / Garden Grove Boulevard (EW)	Northbound Left-Turn	1	195	**226**	**305**	**NO**	**NO**	**226**	**305**	**NO**	**NO**	**242**	**328**	**NO**	**NO**	**242**	**328**	**NO**	**NO**
		Southbound Left-Turn	1	95	81	**116**	YES	**NO**	86	**123**	YES	**NO**	94	**137**	YES	**NO**	**98**	**144**	**NO**	**NO**
		Eastbound Left-Turn	2	365	303	326	YES	YES	309	335	YES	YES	334	364	YES	YES	340	**373**	YES	**NO**
		Westbound Left-Turn	2	220	180	**273**	YES	**NO**	180	**273**	YES	**NO**	187	**284**	YES	**NO**	187	**284**	YES	**NO**
18.	Harbor Boulevard (NS) / SR-22 WB Ramps - Banner Drive (EW)	Northbound Left-Turn	1	65	49	**118**	YES	**NO**	49	**118**	YES	**NO**	51	**123**	YES	**NO**	51	**123**	YES	**NO**
		Southbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Eastbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Westbound Left-Turn	2	550	**924**	**603**	**NO**	**NO**	**924**	**603**	**NO**	**NO**	**965**	**631**	**NO**	**NO**	**965**	**631**	**NO**	**NO**
19.	Harbor Boulevard (NS) / Trask Avenue (EW)	Northbound Left-Turn	1	160	65	118	YES	YES	65	118	YES	YES	68	123	YES	YES	68	123	YES	YES
		Southbound Left-Turn	1	315	**337**	**322**	**NO**	**NO**	**347**	**336**	**NO**	**NO**	**370**	**367**	**NO**	**NO**	**380**	**381**	**NO**	**NO**
		Eastbound Left-Turn	1	195	95	188	YES	YES	95	188	YES	YES	99	**196**	YES	**NO**	99	**196**	YES	**NO**
		Westbound Left-Turn	1	90	**97**	**105**	**NO**	**NO**	**97**	**105**	**NO**	**NO**	**104**	**113**	**NO**	**NO**	**104**	**113**	**NO**	**NO**
20.	SR-22 EB Ramps (NS) / Trask Avenue (EW)	Northbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Southbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
		Eastbound Left-Turn	2	520	**578**	**592**	**NO**	**NO**	**588**	**606**	**NO**	**NO**	**623**	**652**	**NO**	**NO**	**633**	**666**	**NO**	**NO**
		Westbound Left-Turn	0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

[1] Storage length for total of all left-turn lanes per movement combined is reported.

9.0 CEQA Vehicle Miles Traveled (VMT) Analysis

In response to Senate Bill (SB) 743, the California Natural Resource Agency certified and adopted new CEQA Guidelines in December 2018 which now identify Vehicle Miles Traveled (VMT) as the most appropriate metric to evaluate a project's transportation impact under CEQA (§ 15064.3).

Effective July 1, 2020, the previous CEQA metric of LOS, typically measured in terms of automobile delay, roadway capacity and congestion, generally will no longer constitute a significant environmental impact.

The City of Garden Grove has updated its transportation impact guidelines, *City of Garden Grove Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment (May 2020)* (TIA Guidelines), to provide recommendations in the form of thresholds of significance and methodology for identifying VMT related impacts.

Per the City's TIA Guidelines, there are three (3) types of screening that may be applied to effectively screen out land use projects from project-level VMT assessment. The screening criteria are the following:

- Transit Priority Area (TPA) Screening
- Low VMT Area Screening
- Project Type Screening

9.1 Transit Priority Area (TPA) Screening

Land use projects located within a TPA may be presumed to have a less than significant VMT impact absent substantial evidence to the contrary, if the project meets the following four (4) conditions:

1. Has a Floor Area Ratio (FAR) of 0.75 or greater;
2. Does **not** include more parking for use by residents, customers, or employees of the project than required by the City;

3. Is consistent with the applicable Sustainable Communities Strategy (SCS) (as determined by the lead agency, with input from the Southern California Association of Governments [SCAG]); and

4. Does **not** replace affordable residential units with a smaller number of moderate- or high-income residential units.

A TPA is defined as a half-mile area around an existing major transit stop or an existing stop along a high-quality transit corridor (HQTC) (Public Resources Code § 21099(a)(7)).

A major transit stop is defined as a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes of less during the morning and afternoon peak commute periods (Public Resources Code § 21064.3).

As further discussed in Section 9.4 of this report, the project satisfies the TPA screening criteria.

9.2 Low VMT Area Screening

Residential and office projects located within a low VMT-generating area may be presumed to have a less than significant impact absent substantial evidence to the contrary.

In addition, other employment-related and mixed-use land use projects may qualify for the use of screening if the project can reasonably be expected to generate VMT per resident, per worker, or per service population that is similar to the existing land uses in the low VMT area.

The project does not satisfy the low VMT area screening criteria.

9.3 Project Type Screening

The following uses are considered local-serving and are exempt from VMT analysis. This presumption is based on the substantial evidence provided in the OPR Technical Advisory supporting SB 743 implementation or is related to projects that are local-serving, which, by definition, would decrease the number of trips or the distance those trips travel to access the development (and are VMT-reducing trips).

1. Local-serving K-12 schools
2. Local parks
3. Day care centers
4. Local-serving retail uses less than 50,000 square feet, including:
    a. Gas Stations
    b. Banks
    c. Restaurants
    d. Shopping Center
5. Local-serving hotels (e.g. non-destination hotels)
6. Student housing projects on or adjacent to a college campus
7. Local-serving assembly uses (places of worship, community organizations)
8. Community institutions (public libraries, fire stations, local government)
9. Affordable, supportive, or transitional housing
10. Assisting living facilities
11. Senior housing (as defined by the U.S. Department of Housing and Urban Development (HUD))
12. Local-serving community colleges that are consistent with the assumptions noted in the Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS)
13. Projects generating less than 110 daily vehicle trips

The project does not satisfy the project type screening criteria.

9.4 Project Screening Analysis

Based on the building area square footage (691,693 square feet) and the project site area (3.72 acres), the project has a floor area ratio (FAR) of approximately 4.27, which is greater than the threshold of 0.75.

Furthermore, the project will provide a total of 528 parking spaces, which is **not** more parking than required by the City, as shown below and further discussed in the ULI shared parking study provided for the project (separate document):

- Parking Structure Level 4: 110 spaces
- Parking Structure Level 3: 110 spaces
- Parking Structure Level 2: 110 spaces
- Parking Structure Level 1: 84 spaces
- Parking Structure Level B1: 114 spaces
- **Total Parking Spaces: 528 spaces**

The project is consistent with the applicable Sustainable Communities Strategy (SCS), as determined by the City of Garden Grove.

Lastly, since the project site is currently vacant and the proposed land uses are not residential, the project does **not** replace affordable residential units with a smaller number of moderate- or high-income residential units.

The project meets the four (4) conditions required to satisfy the TPA screening criteria, and is located within a half-mile of the Harbor Boulevard / Chapman Avenue intersection, which is a major transit stop. The following Orange County Transportation Authority (OCTA) bus routes serve the Harbor Boulevard / Chapman Avenue intersection with a morning and afternoon peak commute period frequency of service interval of 15 minutes or less:

- **OCTA Route 54** – Garden Grove to Orange (via Chapman Avenue); and

- **OCTA Route 543** – Fullerton to Santa Ana (via Harbor Boulevard).

The latest OCTA bus routes and schedules with service times for the routes listed above are included in Appendix I.

As a result, the project satisfies the TPA screening criteria, and is presumed to have a less than significant VMT impact under CEQA. Therefore, no further VMT analysis is required.

10.0 Short-Term Construction Traffic Analysis

As requested by City staff, an analysis of the short-term construction traffic is required to determine whether the project's short-term construction traffic will have an impact on the adjoining roadway system from a traffic and circulation standpoint.

Table 10-1 shows the daily construction trip generation for each of the construction phases. The total daily trips for each construction phase consist of worker trips, vendor trips and hauling trips (whichever apply), with the appropriate passenger car equivalent (PCE) factors applied.

Table 10-2 shows the peak hour construction trip generation for each of the construction phases. The maximum construction trip generation occurs during the grading phase, when the project is forecast to generate approximately 813 PCE-adjusted daily construction trips which include approximately 203 PCE-adjusted AM peak hour construction trips and approximately 203 PCE-adjusted PM peak hour construction trips.

As previously mentioned in Section 4.1.1 of this report and as shown in Table 4-2, during operations, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

The maximum forecast construction trip generation is less than the project trip generation during operation conditions based on the associated land uses from the latest ITE Trip Generation Manual. As a result, the project's short-term construction traffic is forecast to not adversely affect the LOS of the study intersections beyond what has been identified for the project operation conditions and its related analysis contained in this report.

Hence, if short-term construction traffic access is planned at the Harbor Boulevard / Project Access or Harbor Boulevard / Twintree Avenue intersections, the following recommended improvements *previously identified for project operations* will be required to offset project LOS during the construction phase:

Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*): Make a fair-share contribution to install a traffic signal.

Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*): Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Table 10-1
Daily Construction Trip Generation (PCE-Adjusted)[1]

Construction Phase	Average Daily Trips (ADT)							
	Worker Trips	Vendor Trips[2]			Hauling Trips[3]			Total Daily Trips (with PCE)
		Vendor Trips	PCE Factor	Vendor w/PCE	Hauling Trips	PCE Factor	Hauling Trips w/PCE	
Site Preparation	18	- -	- -	- -	- -	- -	- -	18
Grading	15	- -	- -	- -	399	2.0	798	813
Building Construction	253	99	3.0	297	- -	- -	- -	550
Paving	20	- -	- -	- -	- -	- -	- -	20
Coating	51	- -	- -	- -	- -	- -	- -	51

[1] Source: *Garden Grove Hotel Site B-2 Air Quality and Greenhouse Gas Impact Study, April 2022 (RK Engineering Group, Inc.).*

[2] Vendor trips assume 4-axle+ semi-tractor-trailer truck (PCE x 3.0).

[3] Hauling trips assume typical 3-axle dump trucks. (PCE x 2.0).

[4] PCE = Passenger Car Equivalents

Table 10-2
Peak Hour Construction Trip Generation

Construction Phase	AM Peak Hour			PM Peak Hour			Total Daily Trips (with PCE)[1]
	In[3]	Out[3]	Total[2]	In[3]	Out[3]	Total[2]	
Site Preparation	3	2	5	2	3	5	18
Grading	102	101	203	101	102	203	813
Building Construction	69	69	138	69	69	138	550
Paving	3	2	5	2	3	5	20
Coating	7	6	13	6	7	13	51
Maximum Trip Generation	**102**	**101**	**203**	**101**	**102**	**203**	**813**

[1] See Table 10-1 for Construction Trip Generation estimates and PCE conversion factors.

[2] Total peak hour trips estimated to be 25% of daily traffic.

[3] Directional (in/out) split estimated to be 50/50.

11.0 Active Transportation & Public Transit Analysis

Per the City of Garden Grove adopted thresholds, a significant active transportation and public transit impact occurs if the project conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decreases the performance or safety of such facilities.

The proposed project is not planned to significantly change or modify any of the existing public transit, bicycle, or pedestrian facilities, or make any modification that could conflict with adopted policies, plans or programs, or modify the safety of such facilities.

More specifically, the project is not planned to make any modification that could result in a conflict with the Master Plan of Streets and Highways, the Existing Transit Routes, or the Master Plan of Bikeway Facilities, as indicated in the City of Garden Grove General Plan.

Furthermore, the project is expected to encourage and support multi-modal transit by implementing trip reduction measures and project design features that will reduce the number of auto-based trips generated by the project and encourage the use of transit, bicycling, and walking. The following measures will be implemented by the project with respect to greenhouse gas emissions, and are listed below to show consistency with the statewide goal of promoting active transportation and public transit ridership:

1. Improve the walkability and design of the project by providing pedestrian and bicycling connections within the project site and to adjacent off-site facilities (i.e., sidewalks, crosswalks, wayfinding signage, etc.);

2. Provide traffic calming measures (i.e., marked crosswalks, raised crosswalks, raised intersections, count-down signal timers, curb extensions, speed tables, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc.);

3. Provide secure on-site bicycle racks and provide bicycle rentals for hotel guests;

4. Provide transit/shuttle service for guests to local area attractions. The shuttle service shall operate on a regular basis and be offered to all guests staying at the hotel; and

5. Hotel management/concierge should provide information that promotes walking, bicycling and public transit options to nearby attractions. This should include information on local bus routes and schedules and wayfinding to the existing transit stops along Harbor Boulevard.

Hence, with the implementation of the mitigation measures described above, the project is forecast to not have a significant active transportation and public transit impact.

12.0 Findings, Conclusions & Recommendations

The purpose of this traffic impact analysis is to evaluate the proposed Site "B-2" Hotel project (herein referred to as project) from a traffic and circulation standpoint. This study has been conducted pursuant to the *City of Garden Grove Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment (May 2020)* (TIA Guidelines), and the California Environmental Quality Act (CEQA) requirements.

This traffic study has been prepared in accordance with the scope of work set forth prior to initiating the analysis.

The project site is located at the northwest corner of Harbor Boulevard at Twintree Avenue in the City of Garden Grove.

The project consists of the construction and operation of a 500 room high-rise hotel with other supporting amenities such as conference space and restaurants. The project will also include a multi-level parking structure (four levels above grade and one level below) with a grand total of 528 spaces to serve the suites, event space, and hotel amenities.

The project is planned to consist of the following land uses:

- 500 rooms of Hotel;
    - Includes 9,490 square feet of Hotel Ballroom;
    - Includes 8,225 square feet of Hotel Meeting Rooms;
    - Includes 6,448 square feet of Hotel Studio Hall (for guest use);
    - Includes 7,000 square feet of Hotel Arcade (for guest use);
    - Includes 24,980 square feet of Hotel Themed Pool (for guest use); and
    - Includes 13,238 square feet of Hotel Themed Amenities (for guest use).
- 7,039 square feet of Hotel Theatre (600 seats);

- 5,480 square feet of Retail;
- 8,532 square feet of Spa; and
- 22,296 square feet of Quality Restaurant (11,148 square feet restaurant and 11,148 square feet hotel restaurant).

Access to the project site will be provided via the following:

- One (1) full access driveway on Harbor Boulevard (signalized); and
- One (1) full access driveway on Twintree Avenue (unsignalized).

The project is restricting access to the site along Twintree Avenue to emergency vehicles, maintenance, and trash/delivery trucks only. All employee and guest access to the site, including tourist buses and shuttles, will be via Harbor Boulevard. Therefore, the project access on Twintree Avenue will not experience any vehicle trips associated with employees or outside guests/visitors to the hotel.

The project is planned to open in 2025 and will be evaluated in one (1) single phase.

Trip Generation Summary:

Based on the ITE trip generation rates, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

MUTCD Traffic Signal Warrant Analysis Summary:

The following is a summary of the traffic signal warrants met:

- **Int 10 –** Harbor Boulevard / Project Access:
  - Existing Plus Project Conditions (PM peak hour only);
  - Project Buildout Year (2025) Without Project Conditions (both peak hours); and

- Project Buildout Year (2025) With Project Conditions (both peak hours).

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue:

  - Existing Conditions (AM peak hour only);

  - Existing Plus Project Conditions (AM peak hour only);

  - Project Buildout Year (2025) Without Project Conditions (both peak hours); and

  - Project Buildout Year (2025) With Project Conditions (both peak hours).

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue:

  - No warrants met.

Local Agency Level of Service (LOS) Analysis Summary:

This analysis is bring provided for non-CEQA purposes in order to comply with the applicable City of Garden Grove General Plan consistency requirements related to LOS.

Existing Conditions:

All study intersections are currently operating at an acceptable LOS (LOS D or better) during the peak hours for Existing Conditions, with the exception of the following study intersections which are currently operating at a deficient LOS (LOS E or F):

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Existing Plus Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Existing Plus Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 10 –** Harbor Boulevard / Project Access (PM peak hour only);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (both peak hours); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Existing Plus Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersection 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Existing Plus Project Conditions:

Intersection Improvement #1	**Int 10 – Harbor Boulevard / Project Access:** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #2	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue:** Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study

intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Project Buildout Year (2025) Without Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025) Without Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and
- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Project Buildout Year (2025) With Project Conditions:

All study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) during the peak hours for Project Buildout Year (2025) With Project Conditions, with the exception of the following study intersections which are forecast to operate at a deficient LOS (LOS E or F):

- **Int 5 –** Haster Street / Chapman Avenue (PM peak hour only);
- **Int 6 –** Lewis Street / Chapman Avenue (PM peak hour only);
- **Int 10 –** Harbor Boulevard / Project Access (both peak hours);
- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue (PM peak hour only); and

- **Int 15 –** Harbor Boulevard / Blue Spruce Avenue (PM peak hour only).

Based on the agency-established LOS performance thresholds, the project is forecast to be required to contribute a fair-share to improving the following study intersections for Project Buildout Year (2025) With Project Conditions:

- **Int 10 –** Harbor Boulevard / Project Access; and

- **Int 11 –** Harbor Boulevard / Twintree Lane – Twintree Avenue.

The other identified intersections operating at a deficient LOS (Intersections 5, 6, and 15) do not satisfy the agency established thresholds for requiring LOS improvement by the project.

The following recommended improvements are identified to offset the identified project LOS impacts for Project Buildout Year (2025) With Project Conditions:

Intersection Improvement #3	**Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*):** Make a fair-share contribution to install a traffic signal.
Intersection Improvement #4	**Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*):** Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Congestion Management Program (CMP) LOS Analysis Summary:

All CMP study intersections are forecast to continue to operate at an acceptable LOS (LOS E or better) during the peak hours for all of the analysis scenarios evaluated as part of this report.

Based on the agency-established LOS performance thresholds, the project is forecast to not be required to contribute a fair-share to improving the CMP study intersections.

Left-Turn Pocket Queue Analysis Summary:

The following left-turn movements would require additional left-turn capacity:

- Int 2 – Harbor Boulevard / Orangewood Avenue:
  - Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 85 feet
    - Required Left-Turn Capacity without Project: 257 feet
    - Required Left-Turn Capacity with Project: 266 feet
    - Improvement: Coordinate with the City of Anaheim to determine if the project is required to make a fair-share contribution to extend the left-turn capacity up to 266 feet
- Int 3 – West Street / Chapman Avenue:
  - Southbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 100 feet
    - Required Left-Turn Capacity without Project: 160 feet
    - Required Left-Turn Capacity with Project: 169 feet
    - Improvement: Pay full cost to extend the left-turn capacity up to 169 feet

- Eastbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 150 feet
    - Required Left-Turn Capacity without Project: 158 feet
    - Required Left-Turn Capacity with Project: 158 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 4 – Harbor Boulevard / Chapman Avenue:
    - Westbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 300 feet
        - Required Left-Turn Capacity with Project: 311 feet
        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible

- Int 5 – Haster Street / Chapman Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 175 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Southbound Left-Turn (deficient without and with the project):

        - Existing Left-Turn Capacity: 100 feet
        - Required Left-Turn Capacity without Project: 178 feet
        - Required Left-Turn Capacity with Project: 178 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 6 – Lewis Street / Chapman Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 180 feet
        - Required Left-Turn Capacity without Project: 206 feet
        - Required Left-Turn Capacity with Project: 206 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 80 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 96 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 280 feet

        - Required Left-Turn Capacity without Project: 371 feet
        - Required Left-Turn Capacity with Project: 371 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 10 – Harbor Boulevard / Project Access:
    - Northbound Left-Turn (deficient with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity with Project: 91 feet
        - No Improvements are required by the project since the additional required left-turn capacity (1 foot) is negligible
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 145 feet
        - Required Left-Turn Capacity without Project: 210 feet
        - Required Left-Turn Capacity with Project: 210 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 12 – West Street / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet
        - Required Left-Turn Capacity without Project: 98 feet

        - Required Left-Turn Capacity with Project: 98 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 85 feet
        - Required Left-Turn Capacity without Project: 86 feet
        - Required Left-Turn Capacity with Project: 86 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 13 – Harbor Boulevard / Lampson Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 96 feet
        - Required Left-Turn Capacity with Project: 105 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 105 feet
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 80 feet
        - Required Left-Turn Capacity without Project: 219 feet
        - Required Left-Turn Capacity with Project: 219 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 14 – Haster Street / Lampson Avenue:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 100 feet
        - Required Left-Turn Capacity without Project: 124 feet
        - Required Left-Turn Capacity with Project: 133 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 133 feet
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 125 feet
        - Required Left-Turn Capacity without Project: 175 feet
        - Required Left-Turn Capacity with Project: 175 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 75 feet
        - Required Left-Turn Capacity without Project: 145 feet
        - Required Left-Turn Capacity with Project: 145 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Westbound Left-Turn (deficient without and with the project):
    - Existing Left-Turn Capacity: 125 feet
    - Required Left-Turn Capacity without Project: 220 feet
    - Required Left-Turn Capacity with Project: 220 feet
    - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 17 – Harbor Boulevard / Garden Grove Boulevard:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 328 feet
        - Required Left-Turn Capacity with Project: 328 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 95 feet
        - Required Left-Turn Capacity without Project: 137 feet
        - Required Left-Turn Capacity with Project: 144 feet
        - No Improvements are recommended since lengthening of the southbound left-turn pocket is not feasible given the existing street configuration
    - Eastbound Left-Turn (deficient with the project):

        - Existing Left-Turn Capacity: 365 feet
        - Required Left-Turn Capacity with Project: 373 feet
        - No Improvements are required by the project since the additional required left-turn capacity (5 feet per lane for dual lanes) is negligible
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 220 feet
        - Required Left-Turn Capacity without Project: 284 feet
        - Required Left-Turn Capacity with Project: 284 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 18 – Harbor Boulevard / SR-22 WB Ramps – Banner Drive:
    - Northbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 65 feet
        - Required Left-Turn Capacity without Project: 123 feet
        - Required Left-Turn Capacity with Project: 123 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 550 feet
        - Required Left-Turn Capacity without Project: 965 feet

        - Required Left-Turn Capacity with Project: 965 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 19 – Harbor Boulevard / Trask Avenue:
    - Southbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 315 feet
        - Required Left-Turn Capacity without Project: 370 feet
        - Required Left-Turn Capacity with Project: 381 feet
        - Improvement: Pay full cost to extend the left-turn capacity up to 381 feet
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 195 feet
        - Required Left-Turn Capacity without Project: 196 feet
        - Required Left-Turn Capacity with Project: 196 feet
        - No Improvements are required by the project since the project does not contribute to the deficiency
    - Westbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 90 feet
        - Required Left-Turn Capacity without Project: 113 feet
        - Required Left-Turn Capacity with Project: 113 feet

        - No Improvements are required by the project since the project does not contribute to the deficiency

- Int 20 – SR-22 EB Ramps / Trask Avenue:
    - Eastbound Left-Turn (deficient without and with the project):
        - Existing Left-Turn Capacity: 520 feet
        - Required Left-Turn Capacity without Project: 652 feet
        - Required Left-Turn Capacity with Project: 666 feet
        - No Improvements are recommended since the eastbound outside left-turn lane storage length is sufficient as it extends west toward Harbor Boulevard

CEQA Vehicle Miles Traveled (VMT) Analysis Summary:

Land use projects located within a TPA may be presumed to have a less than significant VMT impact absent substantial evidence to the contrary, if the project meets the following four (4) conditions:

1. Has a Floor Area Ratio (FAR) of 0.75 or greater;
2. Does **not** include more parking for use by residents, customers, or employees of the project than required by the City;
3. Is consistent with the applicable Sustainable Communities Strategy (SCS) (as determined by the lead agency, with input from the Southern California Association of Governments [SCAG]); and
4. Does **not** replace affordable residential units with a smaller number of moderate- or high-income residential units.

A TPA is defined as a half-mile area around an existing major transit stop or an existing stop along a high-quality transit corridor (HQTC) (Public Resources Code § 21099(a)(7)).

A major transit stop is defined as a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes of less during the morning and afternoon peak commute periods (Public Resources Code § 21064.3).

As explained in detail in Section 9.4 of this report, the project meets the four (4) conditions listed above, and is located within a half-mile of the Harbor Boulevard / Chapman Avenue intersection, which is a major transit stop.

As a result, the project satisfies the TPA screening criteria, and is presumed to have a less than significant VMT impact under CEQA. Therefore, no further VMT analysis is required.

Short-Term Construction Traffic Analysis:

The maximum construction trip generation occurs during the grading phase, when the project is forecast to generate approximately 813 PCE-adjusted daily construction trips which include approximately 203 PCE-adjusted AM peak hour construction trips and approximately 203 PCE-adjusted PM peak hour construction trips.

During operations, the project is forecast to generate approximately 4,318 daily trips which include approximately 218 AM peak hour trips and approximately 322 PM peak hour trips.

The maximum forecast construction trip generation is less than the project trip generation during operation conditions based on the associated land uses from the latest ITE Trip Generation Manual. As a result, the project's short-term construction traffic is forecast to not adversely affect the LOS of the study intersections beyond what has been identified for the project operation conditions and its related analysis contained in this report.

Hence, if short-term construction traffic access is planned at the Harbor Boulevard / Project Access or Harbor Boulevard / Twintree Avenue intersections, the following recommended improvements *previously identified for project operations* will be required to offset project LOS during the construction phase:

Int 10 – Harbor Boulevard / Project Access (*Identical to Intersection Improvement #1*): Make a fair-share contribution to install a traffic signal.

Int 11 – Harbor Boulevard / Twintree Lane – Twintree Avenue (*Identical to Intersection Improvement #2*): Make a fair-share contribution to install a traffic signal. The existing HAWK signal will be converted to a full traffic signal as part of the Site C development.

It should be noted that if the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at the abovementioned study intersections (intersections 10 and 11) are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Active Transportation & Public Transit Analysis:

Per the City of Garden Grove adopted thresholds, a significant active transportation and public transit impact occurs if the project conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decreases the performance or safety of such facilities.

The proposed project is not planned to significantly change or modify any of the existing public transit, bicycle, or pedestrian facilities or make any modification that could conflict with adopted policies, plans or programs, or modify the safety of such facilities.

More specifically, the project is not planned to make any modification that could result in a conflict with the Master Plan of Streets and Highways, the Existing Transit Routes, or the Master Plan of Bikeway Facilities, as indicated in the City of Garden Grove General Plan.

Furthermore, the project is expected to encourage and support multi-modal transit by implementing trip reduction measures and project design features that will reduce the number of auto-based trips generated by the project and encourage the use of transit, bicycling, and walking. The following measures will be implemented by the project with respect to greenhouse gas emissions, and are listed below to show consistency with the statewide goal of promoting active transportation and public transit ridership:

1. Improve the walkability and design of the project by providing pedestrian and bicycling connections within the project site and to adjacent off-site facilities (i.e., sidewalks, crosswalks, wayfinding signage, etc.);

2. Provide traffic calming measures (i.e., marked crosswalks, raised crosswalks, raised intersections, count-down signal timers, curb extensions, speed tables, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc.);

3. Provide secure on-site bicycle racks and provide bicycle rentals for hotel guests;

4. Provide transit/shuttle service for guests to local area attractions. The shuttle service shall operate on a regular basis and be offered to all guests staying at the hotel; and

5. Hotel management/concierge should provide information that promotes walking, bicycling and public transit options to nearby attractions. This should include information on local bus routes and schedules and wayfinding to the existing transit stops along Harbor Boulevard.

Hence, with the implementation of the mitigation measures described above, the project is forecast to not have a significant active transportation and public transit impact.

Circulation Recommendations:

The project will share access with the adjacent Sheraton Hotel via the existing access on Harbor Boulevard. RK has reviewed the preliminary site and circulation plan provided and provides the following recommendations. These recommendations, which are considered standard site plan review requirements, would also ensure the project has a less than significant impact on potential safety and hazard issues as they relate to CEQA.

- Ensure adequate radius is provided for appropriate vehicles (fire trucks, buses, limousines, trash trucks, etc.) to navigate the project access and roundabout;

- Provide adequate drive aisle and lane widths;

- Parking spaces should not be located near or within the roundabout. If absolutely necessary, the spaces near the roundabout should be valet-operated and used for long-term parking. In any case, adequate clearance and space should be provided for vehicles navigating the roundabout.

- The entrance roundabout should be designed appropriately and per engineering standards for roundabouts, including geometric elements such as Center Island, travel lanes, deflections, and inscribed circles. Appropriate design needs to be considered and implemented for all appropriate modes of transportation including pedestrians and bicycles.

- Provide appropriate and adequate wayfinding and signage for drivers to easily navigate the entrance and exit.

- During times of high activity for the project and/or the adjacent Sheraton Hotel, provide adequate valet staff and means to ensure traffic does not spill back onto the roundabout or Harbor Boulevard and impede the flow of vehicles.

- Prior to final circulation design, provide a detailed plan including drive aisle dimensions and roundabout details for review by a registered traffic engineer.

Table 12-1
Recommended Intersection Improvements[1]

Intersection	Existing Plus Project Conditions (Direct Impacts)	Project Buildout Year (2025) With Project Conditions (Cumulative Impacts)[2]
10. Harbor Boulevard (NS) / Project Access (EW)	- Install traffic signal	[See previous phase improvements; no additional improvements needed]
11. Harbor Boulevard (NS) / Twintree Lane - Twintree Avenue (EW)	- Install traffic signal	[See previous phase improvements; no additional improvements needed]

1 Recommended improvements generally consist of the minimum necessary improvements to improve operations to acceptable level of service.

2 See Table 12-2 for project fair-share contribution towards cumulative impacts.

Table 12-2
Project Fair-Share Contribution Summary[1]

Intersection	Existing Conditions Traffic		Project Buildout Year (2025) With Project Conditions Traffic		Growth in Traffic		Project Traffic		Project Fair-Share[2]	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
10. Harbor Boulevard (NS) / Project Access (EW)	1,866	2,382	2,835	3,653	969	1,271	218	322	22.50%	25.33%
11. Harbor Boulevard (NS) / Twintree Lane - Twintee Avenue (EW)	2,123	2,534	2,819	3,410	696	876	109	162	15.66%	18.49%

[1] Project Fair-Share Contribution represents the project's traffic contribution at each impacted study area intersection as a percentage of the overall growth in traffic for Project Buildout Year (2025) With Project Conditions. This table is for informational purposes only and is not tied to any mitigation.

[2] If the Site C development at the northeast corner of Harbor Boulevard at Twintree Lane does not get developed and the traffic signals at study intersections #10 and #11 are not installed by the time the project applies for building permits, then the project will be responsible to pay for the entire costs of these improvements, not just fair-share.

Appendices

Appendix A

Traffic Count Worksheets

Counts Unlimited
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(951) 268-6268

City of Anaheim
N/S: Harbor Boulevard
E/W: Katella Avenue
Weather: Clear

File Name : ANAHAKAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

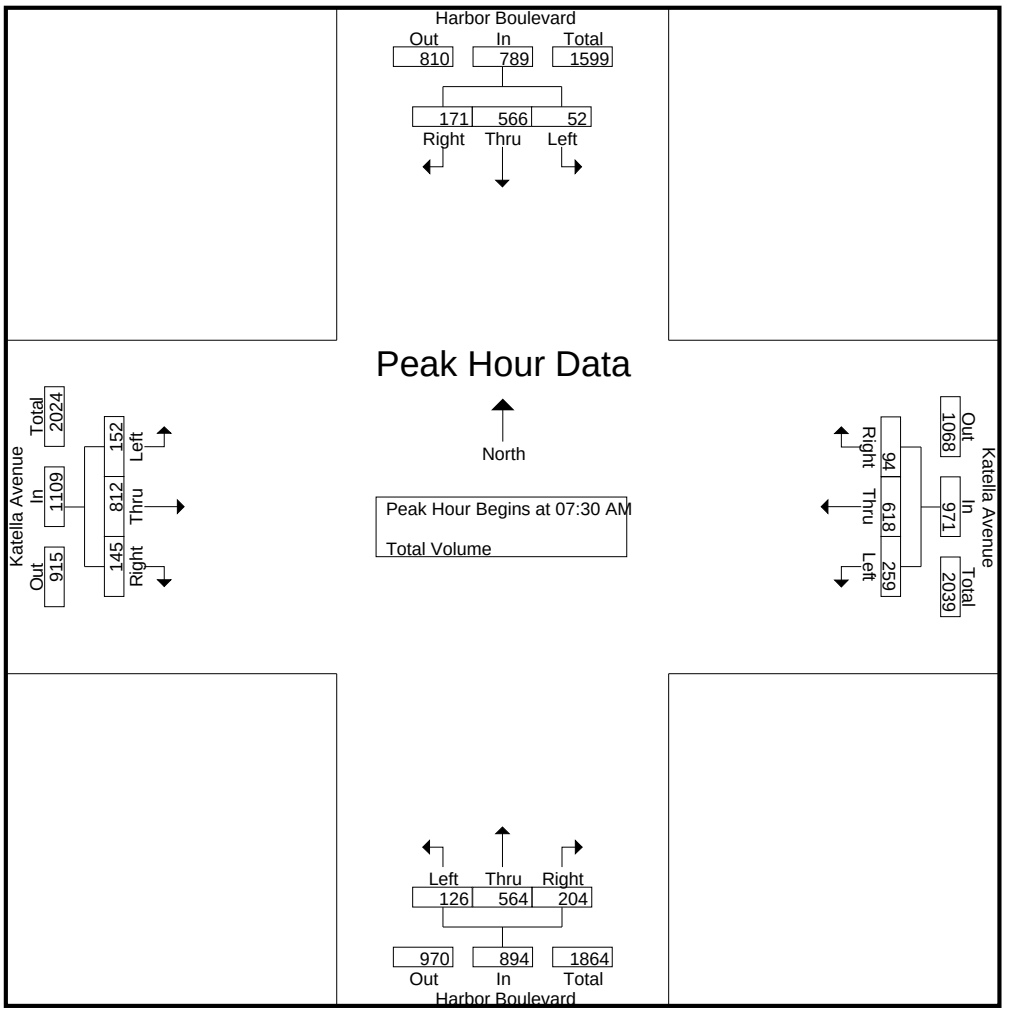
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Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	17	134	30	181	48	131	19	198	25	118	47	190	26	202	24	252	821
07:15 AM	11	140	26	177	52	159	18	229	27	108	43	178	31	226	23	280	864
07:30 AM	13	159	31	203	52	137	10	199	29	167	47	243	34	249	27	310	955
07:45 AM	16	150	46	212	62	177	31	270	28	132	60	220	28	229	29	286	988
Total	57	583	133	773	214	604	78	896	109	525	197	831	119	906	103	1128	3628
08:00 AM	10	125	49	184	65	158	23	246	33	133	55	221	48	179	53	280	931
08:15 AM	13	132	45	190	80	146	30	256	36	132	42	210	42	155	36	233	889
08:30 AM	21	131	44	196	63	153	18	234	38	133	67	238	30	129	31	190	858
08:45 AM	13	115	49	177	68	165	28	261	40	108	42	190	45	155	30	230	858
Total	57	503	187	747	276	622	99	997	147	506	206	859	165	618	150	933	3536
Grand Total	114	1086	320	1520	490	1226	177	1893	256	1031	403	1690	284	1524	253	2061	7164
Apprch %	7.5	71.4	21.1		25.9	64.8	9.4		15.1	61	23.8		13.8	73.9	12.3		
Total %	1.6	15.2	4.5	21.2	6.8	17.1	2.5	26.4	3.6	14.4	5.6	23.6	4	21.3	3.5	28.8	

	Harbor Boulevard Southbound				Katella Avenue Westbound				Harbor Boulevard Northbound				Katella Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	13	**159**	31	203	52	137	10	199	29	**167**	47	**243**	34	**249**	27	**310**	955
07:45 AM	**16**	150	46	**212**	62	**177**	**31**	**270**	28	132	**60**	220	28	229	29	286	**988**
08:00 AM	10	125	**49**	184	65	158	23	246	33	133	55	221	**48**	179	**53**	280	931
08:15 AM	13	132	45	190	**80**	146	30	256	**36**	132	42	210	42	155	36	233	889
Total Volume	52	566	171	789	259	618	94	971	126	564	204	894	152	812	145	1109	3763
% App. Total	6.6	71.7	21.7		26.7	63.6	9.7		14.1	63.1	22.8		13.7	73.2	13.1		
PHF	.813	.890	.872	.930	.809	.873	.758	.899	.875	.844	.850	.920	.792	.815	.684	.894	.952

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Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:45 AM				07:30 AM				07:15 AM			
+0 mins.	13	**159**	31	203	62	**177**	**31**	**270**	29	**167**	47	**243**	31	226	23	280
+15 mins.	**16**	150	46	**212**	65	158	23	246	28	132	**60**	220	34	**249**	27	**310**
+30 mins.	10	125	**49**	184	**80**	146	30	256	33	133	55	221	28	229	29	286
+45 mins.	13	132	45	190	63	153	18	234	**36**	132	42	210	**48**	179	**53**	280
Total Volume	52	566	171	789	270	634	102	1006	126	564	204	894	141	883	132	1156
% App. Total	6.6	71.7	21.7		26.8	63	10.1		14.1	63.1	22.8		12.2	76.4	11.4	
PHF	.813	.890	.872	.930	.844	.895	.823	.931	.875	.844	.850	.920	.734	.887	.623	.932

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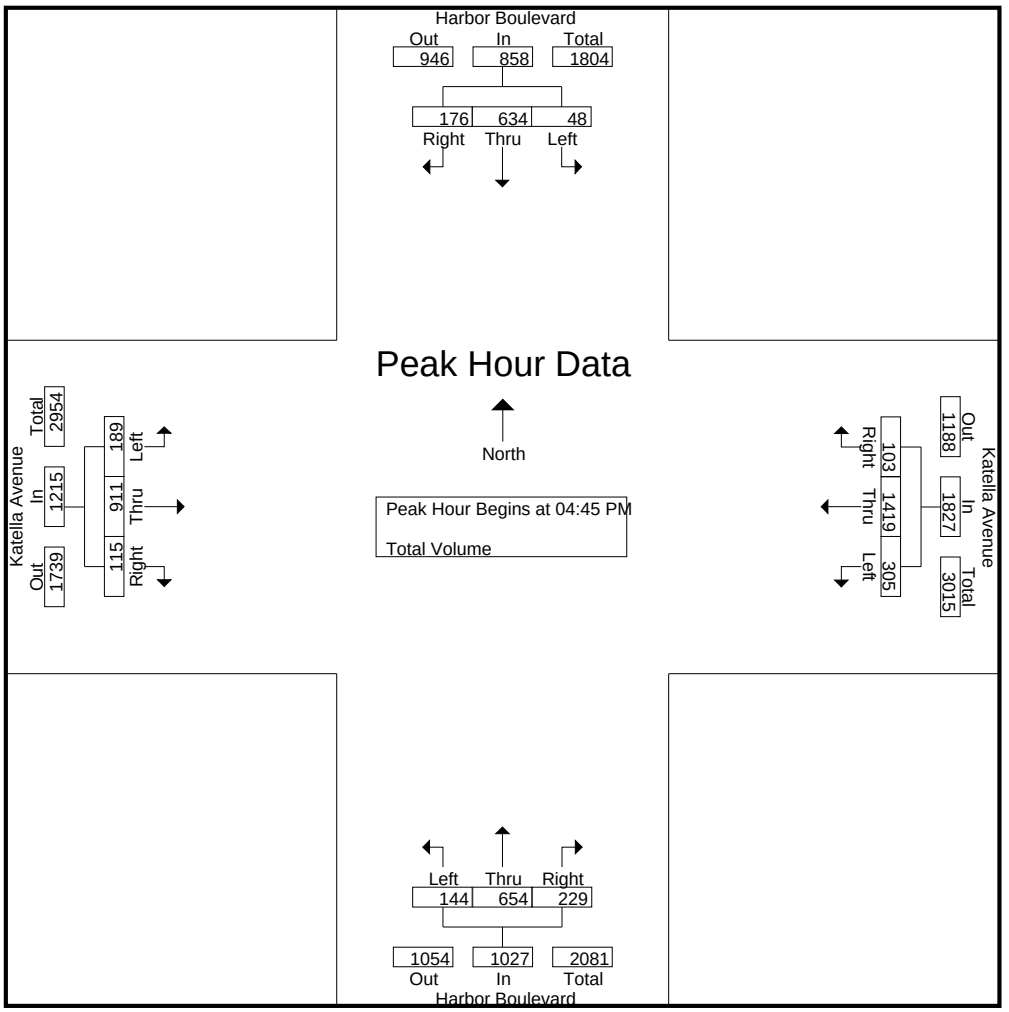
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Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	16	136	44	196	65	307	33	405	32	150	43	225	45	179	36	260	1086
04:15 PM	23	128	47	198	86	307	32	425	31	175	49	255	34	168	20	222	1100
04:30 PM	13	151	36	200	73	302	26	401	37	180	63	280	34	214	28	276	1157
04:45 PM	13	158	43	214	93	335	25	453	47	166	43	256	61	239	25	325	1248
Total	65	573	170	808	317	1251	116	1684	147	671	198	1016	174	800	109	1083	4591
05:00 PM	10	174	45	229	71	338	26	435	39	171	50	260	54	232	24	310	1234
05:15 PM	8	158	45	211	69	401	21	491	31	141	45	217	31	233	30	294	1213
05:30 PM	17	144	43	204	72	345	31	448	27	176	91	294	43	207	36	286	1232
05:45 PM	16	154	34	204	99	269	27	395	27	225	43	295	32	219	27	278	1172
Total	51	630	167	848	311	1353	105	1769	124	713	229	1066	160	891	117	1168	4851
Grand Total	116	1203	337	1656	628	2604	221	3453	271	1384	427	2082	334	1691	226	2251	9442
Apprch %	7	72.6	20.4		18.2	75.4	6.4		13	66.5	20.5		14.8	75.1	10		
Total %	1.2	12.7	3.6	17.5	6.7	27.6	2.3	36.6	2.9	14.7	4.5	22.1	3.5	17.9	2.4	23.8	

	Harbor Boulevard Southbound				Katella Avenue Westbound				Harbor Boulevard Northbound				Katella Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	13	158	43	214	**93**	335	25	453	**47**	166	43	256	**61**	**239**	25	**325**	**1248**
05:00 PM	10	**174**	**45**	**229**	71	338	26	435	39	171	50	260	54	232	24	310	1234
05:15 PM	8	158	45	211	69	**401**	21	**491**	31	141	45	217	31	233	30	294	1213
05:30 PM	**17**	144	43	204	72	345	**31**	448	27	**176**	**91**	**294**	43	207	**36**	286	1232
Total Volume	48	634	176	858	305	1419	103	1827	144	654	229	1027	189	911	115	1215	4927
% App. Total	5.6	73.9	20.5		16.7	77.7	5.6		14	63.7	22.3		15.6	75	9.5		
PHF	.706	.911	.978	.937	.820	.885	.831	.930	.766	.929	.629	.873	.775	.953	.799	.935	.987

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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				04:45 PM				05:00 PM				04:45 PM			
+0 mins.	13	158	43	214	**93**	335	25	453	**39**	171	50	260	**61**	**239**	25	**325**
+15 mins.	10	**174**	**45**	**229**	71	338	26	435	31	141	45	217	54	232	24	310
+30 mins.	8	158	45	211	69	**401**	21	**491**	27	176	**91**	294	31	233	30	294
+45 mins.	**17**	144	43	204	72	345	**31**	448	27	**225**	43	**295**	43	207	**36**	286
Total Volume	48	634	176	858	305	1419	103	1827	124	713	229	1066	189	911	115	1215
% App. Total	5.6	73.9	20.5		16.7	77.7	5.6		11.6	66.9	21.5		15.6	75	9.5	
PHF	.706	.911	.978	.937	.820	.885	.831	.930	.795	.792	.629	.903	.775	.953	.799	.935

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Weather: Clear

File Name : ANAHAORAM
Site Code : 10516364
Start Date : 6/14/2016
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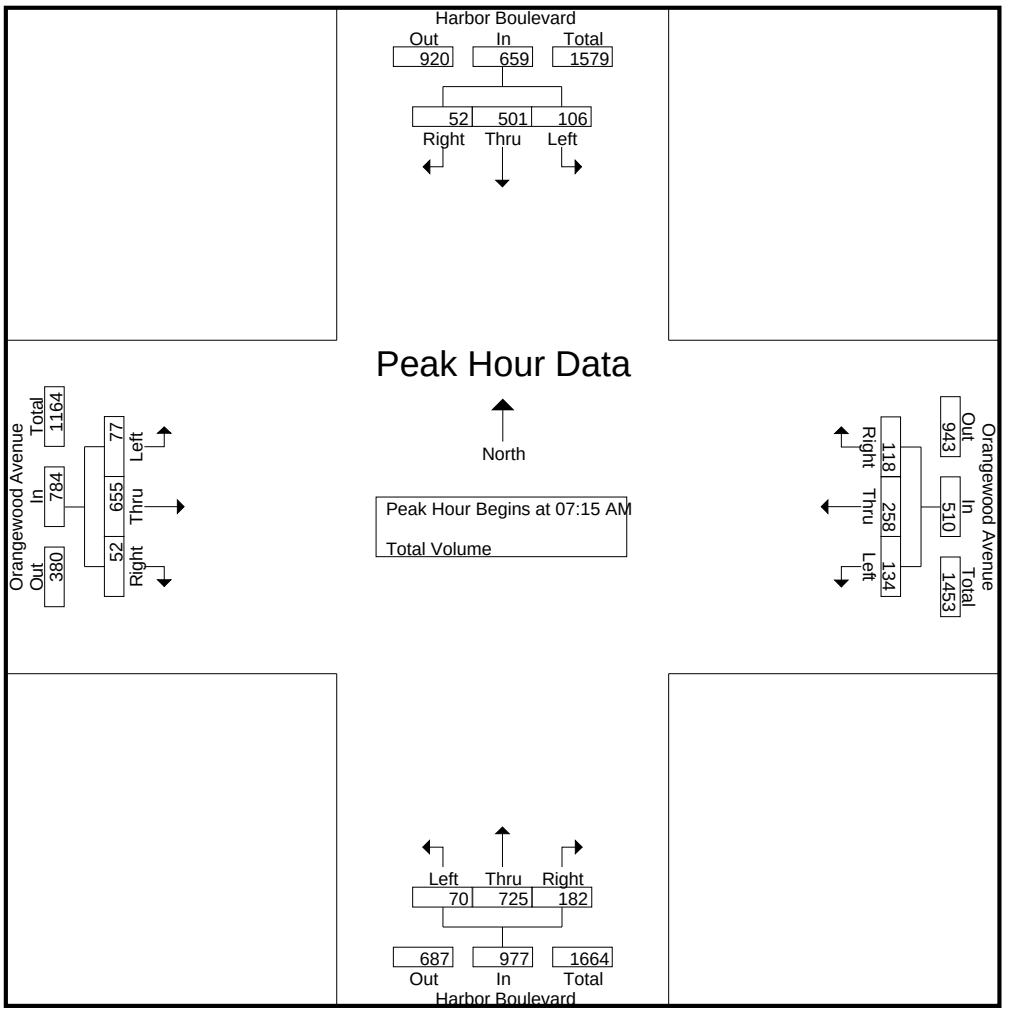
	Harbor Boulevard Southbound				Orangewood Avenue Westbound				Harbor Boulevard Northbound				Orangewood Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	20	120	7	147	36	38	24	98	13	148	29	190	16	153	18	187	622
07:15 AM	22	108	13	143	37	58	25	120	11	172	39	222	28	180	9	217	702
07:30 AM	25	132	11	168	36	70	25	131	15	210	48	273	11	164	14	189	761
07:45 AM	33	122	16	171	36	65	41	142	17	180	49	246	24	174	10	208	767
Total	100	482	47	629	145	231	115	491	56	710	165	931	79	671	51	801	2852
08:00 AM	26	139	12	177	25	65	27	117	27	163	46	236	14	137	19	170	700
08:15 AM	35	141	6	182	33	42	21	96	19	159	46	224	13	141	17	171	673
08:30 AM	28	148	15	191	7	55	24	86	18	139	33	190	13	127	12	152	619
08:45 AM	27	100	16	143	33	59	24	116	16	159	28	203	14	109	20	143	605
Total	116	528	49	693	98	221	96	415	80	620	153	853	54	514	68	636	2597
Grand Total	216	1010	96	1322	243	452	211	906	136	1330	318	1784	133	1185	119	1437	5449
Apprch %	16.3	76.4	7.3		26.8	49.9	23.3		7.6	74.6	17.8		9.3	82.5	8.3		
Total %	4	18.5	1.8	24.3	4.5	8.3	3.9	16.6	2.5	24.4	5.8	32.7	2.4	21.7	2.2	26.4	

	Harbor Boulevard Southbound				Orangewood Avenue Westbound				Harbor Boulevard Northbound				Orangewood Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	22	108	13	143	**37**	58	25	120	11	172	39	222	**28**	**180**	9	**217**	702
07:30 AM	25	132	11	168	36	**70**	25	131	15	**210**	48	**273**	11	164	14	189	761
07:45 AM	**33**	122	**16**	171	36	65	**41**	**142**	17	180	**49**	246	24	174	10	208	**767**
08:00 AM	26	**139**	12	**177**	25	65	27	117	**27**	163	46	236	14	137	**19**	170	700
Total Volume	106	501	52	659	134	258	118	510	70	725	182	977	77	655	52	784	2930
% App. Total	16.1	76	7.9		26.3	50.6	23.1		7.2	74.2	18.6		9.8	83.5	6.6		
PHF	.803	.901	.813	.931	.905	.921	.720	.898	.648	.863	.929	.895	.688	.910	.684	.903	.955

Counts Unlimited
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City of Anaheim
N/S: Harbor Boulevard
E/W: Orangewood Avenue
Weather: Clear

File Name : ANAHAORAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM				07:15 AM				07:30 AM				07:00 AM			
+0 mins.	33	122	**16**	171	**37**	58	25	120	15	**210**	48	**273**	16	153	**18**	187
+15 mins.	26	139	12	177	36	**70**	25	131	17	180	**49**	246	**28**	**180**	9	**217**
+30 mins.	**35**	141	6	182	36	65	**41**	**142**	**27**	163	46	236	11	164	14	189
+45 mins.	28	**148**	15	**191**	25	65	27	117	19	159	46	224	24	174	10	208
Total Volume	122	550	49	721	134	258	118	510	78	712	189	979	79	671	51	801
% App. Total	16.9	76.3	6.8		26.3	50.6	23.1		8	72.7	19.3		9.9	83.8	6.4	
PHF	.871	.929	.766	.944	.905	.921	.720	.898	.722	.848	.964	.897	.705	.932	.708	.923

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City of Anaheim
N/S: Harbor Boulevard
E/W: Orangewood Avenue
Weather: Clear

File Name : ANAHAORPM
Site Code : 10516364
Start Date : 6/14/2016

Groups Printed- Total Volume

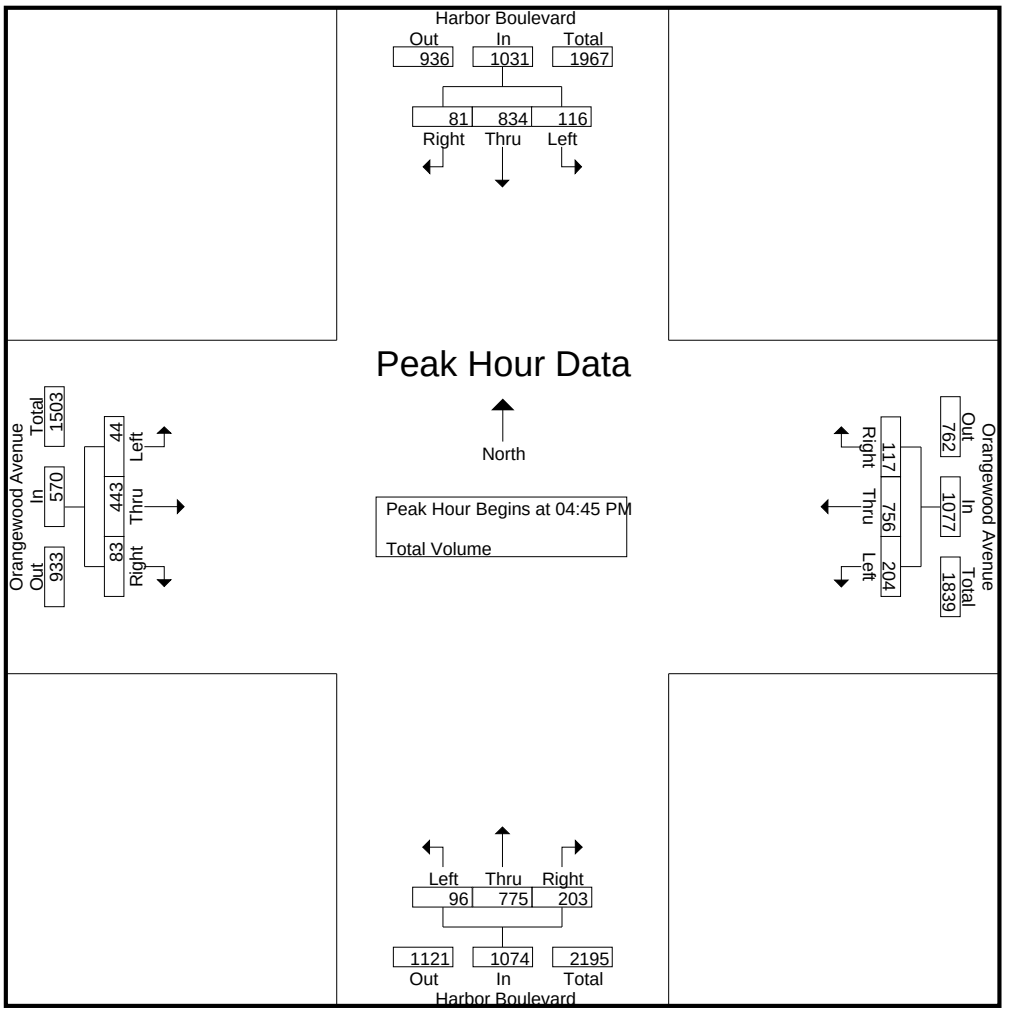
	Harbor Boulevard Southbound				Orangewood Avenue Westbound				Harbor Boulevard Northbound				Orangewood Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	24	191	20	235	33	108	31	172	19	177	45	241	20	82	18	120	768
04:15 PM	14	198	19	231	31	144	19	194	24	192	44	260	10	105	26	141	826
04:30 PM	35	199	25	259	35	142	26	203	29	194	40	263	18	87	22	127	852
04:45 PM	27	242	22	291	51	175	26	252	25	190	53	268	14	103	22	139	950
Total	100	830	86	1016	150	569	102	821	97	753	182	1032	62	377	88	527	3396
05:00 PM	29	201	20	250	56	195	31	282	26	182	42	250	10	108	20	138	920
05:15 PM	31	201	18	250	53	219	27	299	24	199	47	270	10	107	27	144	963
05:30 PM	29	190	21	240	44	167	33	244	21	204	61	286	10	125	14	149	919
05:45 PM	19	186	13	218	56	146	35	237	31	196	45	272	13	111	21	145	872
Total	108	778	72	958	209	727	126	1062	102	781	195	1078	43	451	82	576	3674
Grand Total	208	1608	158	1974	359	1296	228	1883	199	1534	377	2110	105	828	170	1103	7070
Apprch %	10.5	81.5	8		19.1	68.8	12.1		9.4	72.7	17.9		9.5	75.1	15.4		
Total %	2.9	22.7	2.2	27.9	5.1	18.3	3.2	26.6	2.8	21.7	5.3	29.8	1.5	11.7	2.4	15.6	

	Harbor Boulevard Southbound				Orangewood Avenue Westbound				Harbor Boulevard Northbound				Orangewood Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	27	**242**	**22**	**291**	51	175	26	252	25	190	53	268	**14**	103	22	139	950
05:00 PM	29	201	20	250	**56**	195	31	282	**26**	182	42	250	10	108	20	138	920
05:15 PM	**31**	201	18	250	53	**219**	27	**299**	24	199	47	270	10	107	**27**	144	**963**
05:30 PM	29	190	21	240	44	167	**33**	244	21	**204**	**61**	**286**	10	**125**	14	**149**	919
Total Volume	116	834	81	1031	204	756	117	1077	96	775	203	1074	44	443	83	570	3752
% App. Total	11.3	80.9	7.9		18.9	70.2	10.9		8.9	72.2	18.9		7.7	77.7	14.6		
PHF	.935	.862	.920	.886	.911	.863	.886	.901	.923	.950	.832	.939	.786	.886	.769	.956	.974

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City of Anaheim
N/S: Harbor Boulevard
E/W: Orangewood Avenue
Weather: Clear

File Name : ANAHAORPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:45 PM				05:00 PM				05:00 PM			
+0 mins.	**35**	199	**25**	259	51	175	26	252	26	182	42	250	10	108	20	138
+15 mins.	27	**242**	22	**291**	**56**	195	31	282	24	199	47	270	10	107	**27**	144
+30 mins.	29	201	20	250	53	**219**	27	**299**	21	**204**	**61**	**286**	10	**125**	14	**149**
+45 mins.	31	201	18	250	44	167	**33**	244	**31**	196	45	272	**13**	111	21	145
Total Volume	122	843	85	1050	204	756	117	1077	102	781	195	1078	43	451	82	576
% App. Total	11.6	80.3	8.1		18.9	70.2	10.9		9.5	72.4	18.1		7.5	78.3	14.2	
PHF	.871	.871	.850	.902	.911	.863	.886	.901	.823	.957	.799	.942	.827	.902	.759	.966

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City of Garden Grove
N/S: West Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGWECHAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 1

Groups Printed- Total Volume

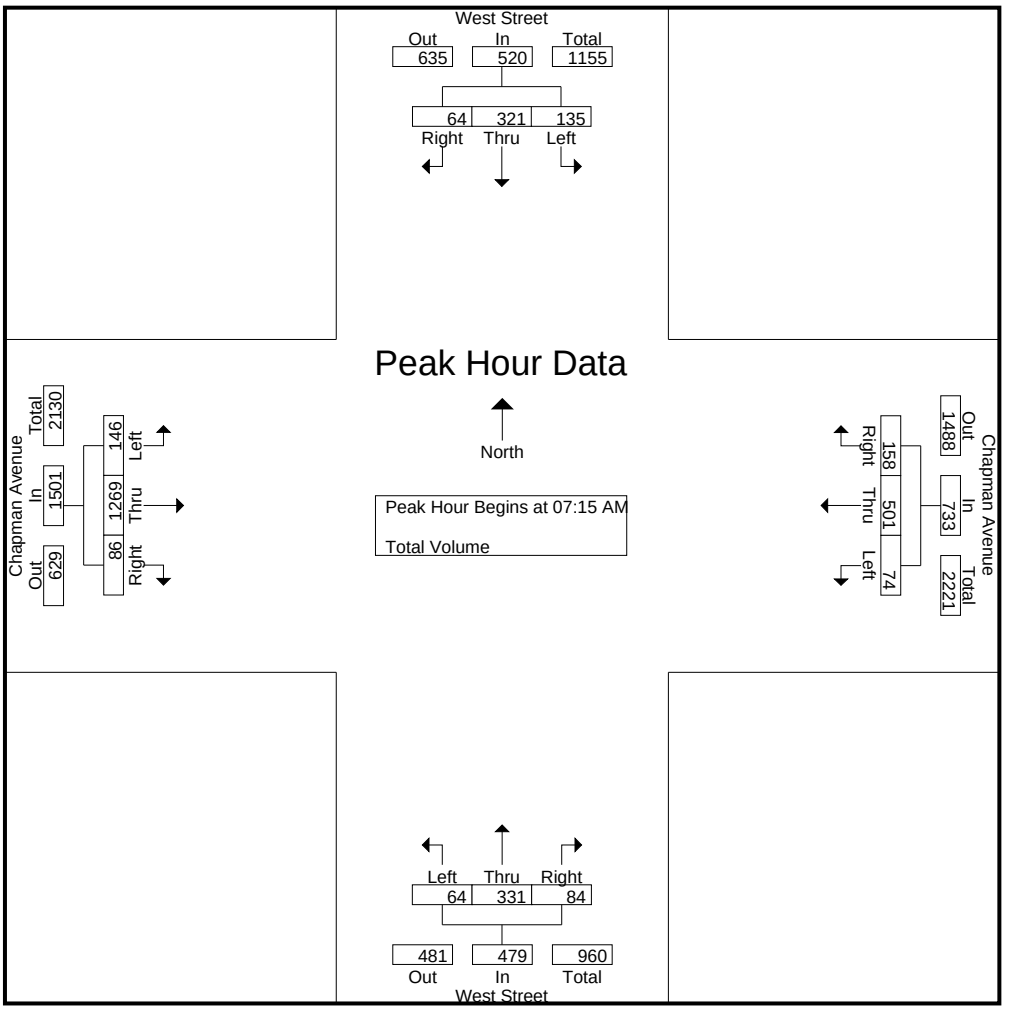
	West Street Southbound				Chapman Avenue Westbound				West Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	24	60	8	92	13	85	15	113	5	52	11	68	23	287	11	321	594
07:15 AM	31	84	14	129	15	103	34	152	13	71	19	103	16	293	27	336	720
07:30 AM	33	97	23	153	26	136	31	193	11	81	21	113	31	334	32	397	856
07:45 AM	29	84	10	123	25	155	47	227	28	86	28	142	45	311	13	369	861
Total	117	325	55	497	79	479	127	685	57	290	79	426	115	1225	83	1423	3031
08:00 AM	42	56	17	115	8	107	46	161	12	93	16	121	54	331	14	399	796
08:15 AM	37	70	19	126	15	120	26	161	10	54	14	78	38	253	17	308	673
08:30 AM	31	54	12	97	9	94	15	118	9	41	13	63	20	240	14	274	552
08:45 AM	21	55	8	84	13	119	23	155	8	53	19	80	25	255	18	298	617
Total	131	235	56	422	45	440	110	595	39	241	62	342	137	1079	63	1279	2638
Grand Total	248	560	111	919	124	919	237	1280	96	531	141	768	252	2304	146	2702	5669
Apprch %	27	60.9	12.1		9.7	71.8	18.5		12.5	69.1	18.4		9.3	85.3	5.4		
Total %	4.4	9.9	2	16.2	2.2	16.2	4.2	22.6	1.7	9.4	2.5	13.5	4.4	40.6	2.6	47.7	

	West Street Southbound				Chapman Avenue Westbound				West Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	31	84	14	129	15	103	34	152	13	71	19	103	16	293	27	336	720
07:30 AM	33	**97**	**23**	**153**	**26**	136	31	193	11	81	21	113	31	**334**	**32**	397	856
07:45 AM	29	84	10	123	25	**155**	**47**	**227**	**28**	86	**28**	**142**	45	311	13	369	**861**
08:00 AM	**42**	56	17	115	8	107	46	161	12	**93**	16	121	**54**	331	14	**399**	796
Total Volume	135	321	64	520	74	501	158	733	64	331	84	479	146	1269	86	1501	3233
% App. Total	26	61.7	12.3		10.1	68.3	21.6		13.4	69.1	17.5		9.7	84.5	5.7		
PHF	.804	.827	.696	.850	.712	.808	.840	.807	.571	.890	.750	.843	.676	.950	.672	.940	.939

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City of Garden Grove
N/S: West Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGWECHAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:15 AM				07:15 AM			
+0 mins.	31	84	14	129	**26**	136	31	193	13	71	19	103	16	293	27	336
+15 mins.	33	**97**	**23**	**153**	25	**155**	**47**	**227**	11	81	21	113	31	**334**	**32**	397
+30 mins.	29	84	10	123	8	107	46	161	**28**	86	**28**	**142**	45	311	13	369
+45 mins.	**42**	56	17	115	15	120	26	161	12	**93**	16	121	**54**	331	14	**399**
Total Volume	135	321	64	520	74	518	150	742	64	331	84	479	146	1269	86	1501
% App. Total	26	61.7	12.3		10	69.8	20.2		13.4	69.1	17.5		9.7	84.5	5.7	
PHF	.804	.827	.696	.850	.712	.835	.798	.817	.571	.890	.750	.843	.676	.950	.672	.940

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City of Garden Grove
N/S: West Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGWECHPM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 1

Groups Printed- Total Volume

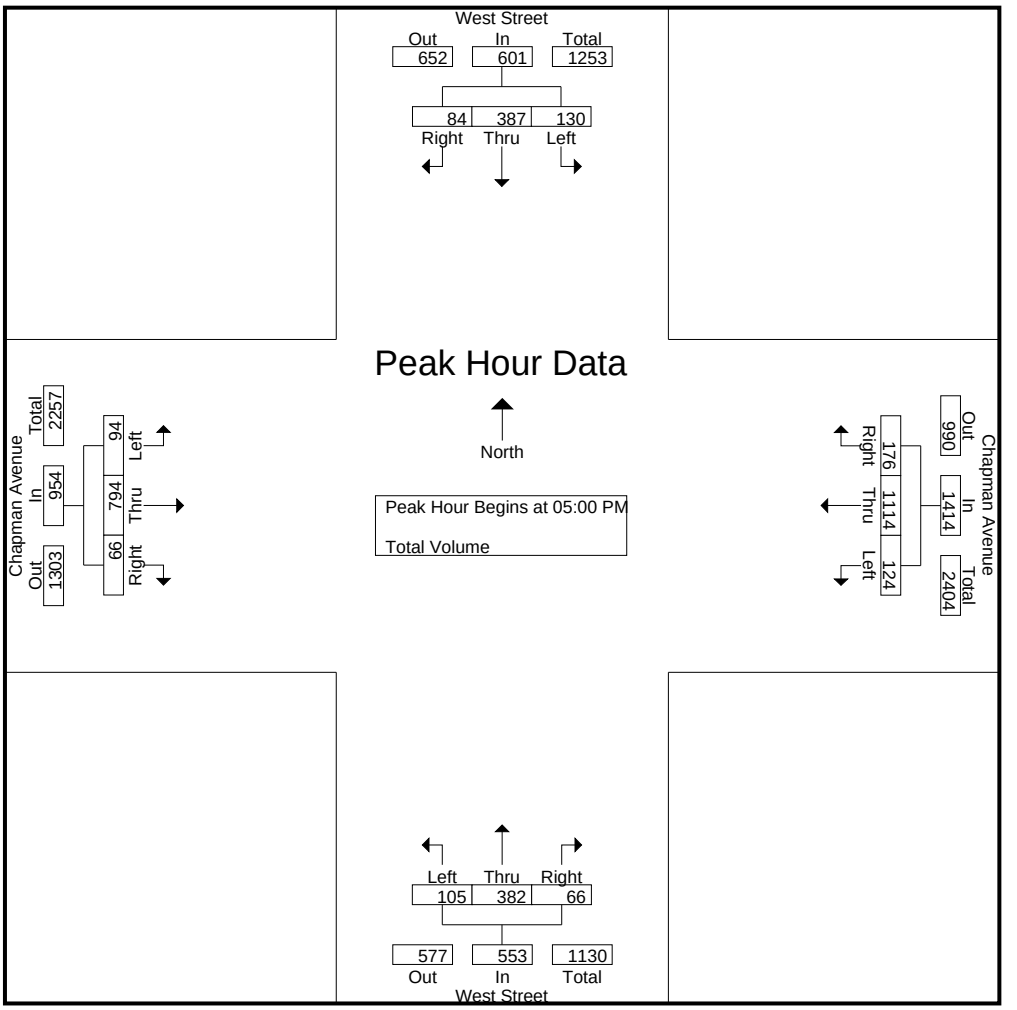
	West Street Southbound				Chapman Avenue Westbound				West Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	28	85	10	123	22	243	28	293	10	81	12	103	22	186	17	225	744
04:15 PM	29	79	12	120	23	274	36	333	24	85	18	127	16	196	16	228	808
04:30 PM	33	91	30	154	25	250	43	318	25	125	17	167	23	166	15	204	843
04:45 PM	40	93	31	164	38	286	34	358	19	69	12	100	24	184	16	224	846
Total	130	348	83	561	108	1053	141	1302	78	360	59	497	85	732	64	881	3241
05:00 PM	32	102	23	157	22	248	50	320	27	98	22	147	24	193	16	233	857
05:15 PM	31	95	22	148	24	304	31	359	20	88	7	115	22	223	12	257	879
05:30 PM	37	105	17	159	42	268	40	350	34	110	21	165	29	175	20	224	898
05:45 PM	30	85	22	137	36	294	55	385	24	86	16	126	19	203	18	240	888
Total	130	387	84	601	124	1114	176	1414	105	382	66	553	94	794	66	954	3522
Grand Total	260	735	167	1162	232	2167	317	2716	183	742	125	1050	179	1526	130	1835	6763
Apprch %	22.4	63.3	14.4		8.5	79.8	11.7		17.4	70.7	11.9		9.8	83.2	7.1		
Total %	3.8	10.9	2.5	17.2	3.4	32	4.7	40.2	2.7	11	1.8	15.5	2.6	22.6	1.9	27.1	

	West Street Southbound				Chapman Avenue Westbound				West Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	32	102	**23**	157	22	248	50	320	27	98	**22**	147	24	193	16	233	857
05:15 PM	31	95	22	148	24	**304**	31	359	20	88	7	115	22	**223**	12	**257**	879
05:30 PM	**37**	**105**	17	**159**	**42**	268	40	350	**34**	**110**	21	**165**	**29**	175	**20**	224	**898**
05:45 PM	30	85	22	137	36	294	**55**	**385**	24	86	16	126	19	203	18	240	888
Total Volume	130	387	84	601	124	1114	176	1414	105	382	66	553	94	794	66	954	3522
% App. Total	21.6	64.4	14		8.8	78.8	12.4		19	69.1	11.9		9.9	83.2	6.9		
PHF	.878	.921	.913	.945	.738	.916	.800	.918	.772	.868	.750	.838	.810	.890	.825	.928	.981

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City of Garden Grove
N/S: West Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGWECHPM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				05:00 PM				05:00 PM				05:00 PM			
+0 mins.	**40**	93	**31**	**164**	22	248	50	320	27	98	**22**	147	24	193	16	233
+15 mins.	32	102	23	157	24	**304**	31	359	20	88	7	115	22	**223**	12	**257**
+30 mins.	31	95	22	148	**42**	268	40	350	**34**	**110**	21	**165**	**29**	175	**20**	224
+45 mins.	37	**105**	17	159	36	294	**55**	**385**	24	86	16	126	19	203	18	240
Total Volume	140	395	93	628	124	1114	176	1414	105	382	66	553	94	794	66	954
% App. Total	22.3	62.9	14.8		8.8	78.8	12.4		19	69.1	11.9		9.9	83.2	6.9	
PHF	.875	.940	.750	.957	.738	.916	.800	.918	.772	.868	.750	.838	.810	.890	.825	.928

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Chapman Avenue
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File Name : GRGHACHAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

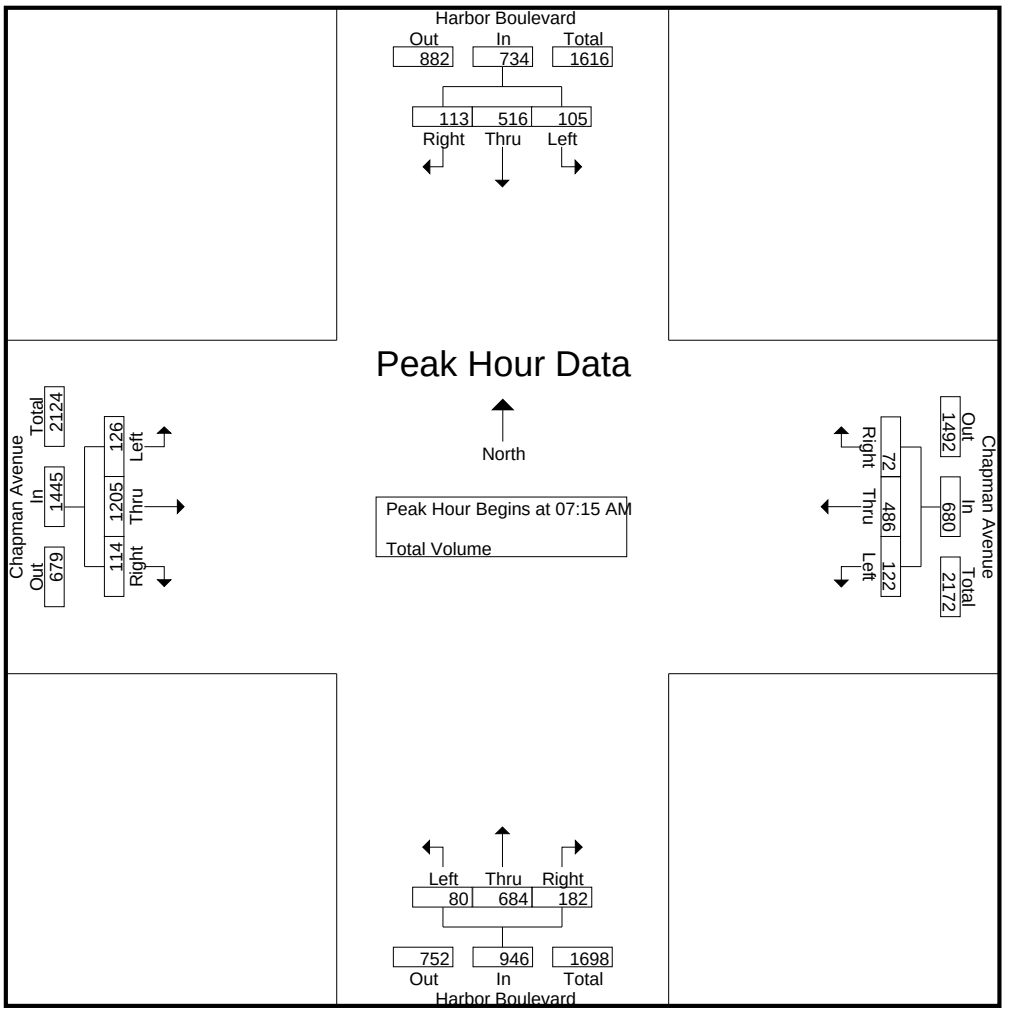
	Harbor Boulevard Southbound				Chapman Avenue Westbound				Harbor Boulevard Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	24	136	26	186	24	78	14	116	18	148	32	198	16	239	26	281	781
07:15 AM	22	120	26	168	28	113	13	154	11	140	27	178	32	290	23	345	845
07:30 AM	20	142	30	192	38	121	22	181	22	186	59	267	31	301	30	362	1002
07:45 AM	35	112	30	177	29	126	21	176	19	181	50	250	35	325	38	398	1001
Total	101	510	112	723	119	438	70	627	70	655	168	893	114	1155	117	1386	3629
08:00 AM	28	142	27	197	27	126	16	169	28	177	46	251	28	289	23	340	957
08:15 AM	26	110	27	163	32	84	17	133	22	157	44	223	26	277	22	325	844
08:30 AM	36	140	20	196	30	79	11	120	23	129	43	195	24	203	18	245	756
08:45 AM	30	112	22	164	17	91	19	127	22	124	35	181	25	223	32	280	752
Total	120	504	96	720	106	380	63	549	95	587	168	850	103	992	95	1190	3309
Grand Total	221	1014	208	1443	225	818	133	1176	165	1242	336	1743	217	2147	212	2576	6938
Apprch %	15.3	70.3	14.4		19.1	69.6	11.3		9.5	71.3	19.3		8.4	83.3	8.2		
Total %	3.2	14.6	3	20.8	3.2	11.8	1.9	17	2.4	17.9	4.8	25.1	3.1	30.9	3.1	37.1	

	Harbor Boulevard Southbound				Chapman Avenue Westbound				Harbor Boulevard Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	22	120	26	168	28	113	13	154	11	140	27	178	32	290	23	345	845
07:30 AM	20	**142**	**30**	192	**38**	121	**22**	**181**	22	**186**	**59**	**267**	31	301	30	362	**1002**
07:45 AM	**35**	112	30	177	29	**126**	21	176	19	181	50	250	**35**	**325**	**38**	**398**	1001
08:00 AM	28	142	27	**197**	27	126	16	169	**28**	177	46	251	28	289	23	340	957
Total Volume	105	516	113	734	122	486	72	680	80	684	182	946	126	1205	114	1445	3805
% App. Total	14.3	70.3	15.4		17.9	71.5	10.6		8.5	72.3	19.2		8.7	83.4	7.9		
PHF	.750	.908	.942	.931	.803	.964	.818	.939	.714	.919	.771	.886	.900	.927	.750	.908	.949

Counts Unlimited
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City of Garden Grove
N/S: Harbor Boulevard
E/W: Chapman Avenue
Weather: Clear

File Name : GRGHACHAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:15 AM				07:30 AM				07:15 AM			
+0 mins.	22	120	26	168	28	113	13	154	22	**186**	**59**	**267**	32	290	23	345
+15 mins.	20	**142**	**30**	192	**38**	121	**22**	**181**	19	181	50	250	31	301	30	362
+30 mins.	**35**	112	30	177	29	**126**	21	176	**28**	177	46	251	**35**	**325**	**38**	**398**
+45 mins.	28	142	27	**197**	27	126	16	169	22	157	44	223	28	289	23	340
Total Volume	105	516	113	734	122	486	72	680	91	701	199	991	126	1205	114	1445
% App. Total	14.3	70.3	15.4		17.9	71.5	10.6		9.2	70.7	20.1		8.7	83.4	7.9	
PHF	.750	.908	.942	.931	.803	.964	.818	.939	.813	.942	.843	.928	.900	.927	.750	.908

Counts Unlimited
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City of Garden Grove
N/S: Harbor Boulevard
E/W: Chapman Avenue
Weather: Clear

File Name : GRGHACHPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

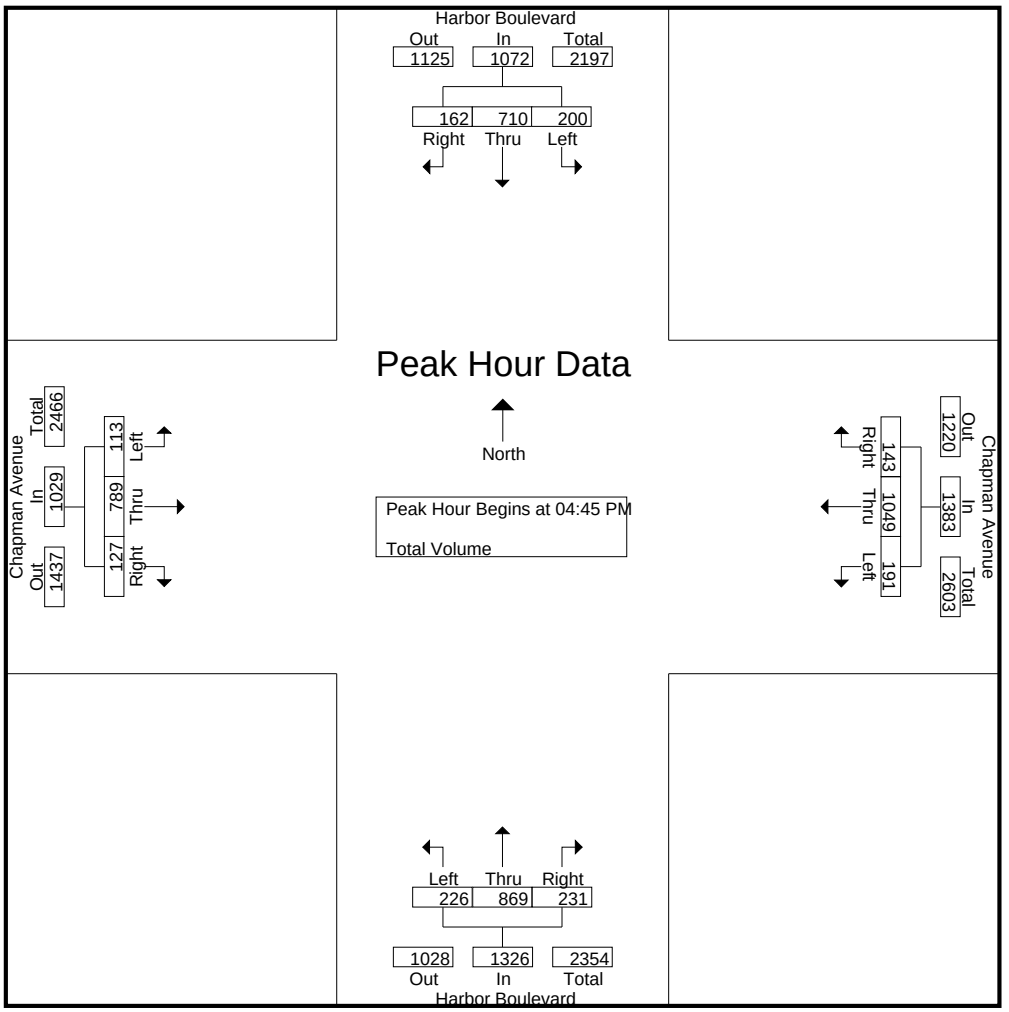
	Harbor Boulevard Southbound				Chapman Avenue Westbound				Harbor Boulevard Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	32	146	31	209	52	214	27	293	37	218	61	316	27	176	33	236	1054
04:15 PM	39	177	30	246	49	225	39	313	40	197	52	289	26	189	30	245	1093
04:30 PM	48	189	48	285	53	229	37	319	47	202	75	324	27	171	31	229	1157
04:45 PM	57	198	47	302	48	270	34	352	70	222	61	353	24	189	31	244	1251
Total	176	710	156	1042	202	938	137	1277	194	839	249	1282	104	725	125	954	4555
05:00 PM	54	167	42	263	43	253	40	336	50	220	58	328	31	179	32	242	1169
05:15 PM	46	179	38	263	50	266	36	352	67	205	56	328	25	223	37	285	1228
05:30 PM	43	166	35	244	50	260	33	343	39	222	56	317	33	198	27	258	1162
05:45 PM	43	163	38	244	45	268	40	353	64	240	59	363	25	190	39	254	1214
Total	186	675	153	1014	188	1047	149	1384	220	887	229	1336	114	790	135	1039	4773
Grand Total	362	1385	309	2056	390	1985	286	2661	414	1726	478	2618	218	1515	260	1993	9328
Apprch %	17.6	67.4	15		14.7	74.6	10.7		15.8	65.9	18.3		10.9	76	13		
Total %	3.9	14.8	3.3	22	4.2	21.3	3.1	28.5	4.4	18.5	5.1	28.1	2.3	16.2	2.8	21.4	

	Harbor Boulevard Southbound				Chapman Avenue Westbound				Harbor Boulevard Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**57**	**198**	**47**	**302**	48	**270**	34	**352**	**70**	**222**	**61**	**353**	24	189	31	244	**1251**
05:00 PM	54	167	42	263	43	253	**40**	336	50	220	58	328	31	179	32	242	1169
05:15 PM	46	179	38	263	**50**	266	36	352	67	205	56	328	25	**223**	**37**	**285**	1228
05:30 PM	43	166	35	244	50	260	33	343	39	222	56	317	**33**	198	27	258	1162
Total Volume	200	710	162	1072	191	1049	143	1383	226	869	231	1326	113	789	127	1029	4810
% App. Total	18.7	66.2	15.1		13.8	75.8	10.3		17	65.5	17.4		11	76.7	12.3		
PHF	.877	.896	.862	.887	.955	.971	.894	.982	.807	.979	.947	.939	.856	.885	.858	.903	.961

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City of Garden Grove
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File Name : GRGHACHPM
Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				05:00 PM				05:00 PM				05:00 PM			
+0 mins.	48	189	**48**	285	43	253	**40**	336	50	220	58	328	31	179	32	242
+15 mins.	**57**	**198**	47	**302**	**50**	266	36	352	**67**	205	56	328	25	**223**	37	**285**
+30 mins.	54	167	42	263	50	260	33	343	39	222	56	317	**33**	198	27	258
+45 mins.	46	179	38	263	45	**268**	40	**353**	64	**240**	**59**	**363**	25	190	**39**	254
Total Volume	205	733	175	1113	188	1047	149	1384	220	887	229	1336	114	790	135	1039
% App. Total	18.4	65.9	15.7		13.6	75.7	10.8		16.5	66.4	17.1		11	76	13	
PHF	.899	.926	.911	.921	.940	.977	.931	.980	.821	.924	.970	.920	.864	.886	.865	.911

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City of Garden Grove
N/S: Haster Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGHSCHAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

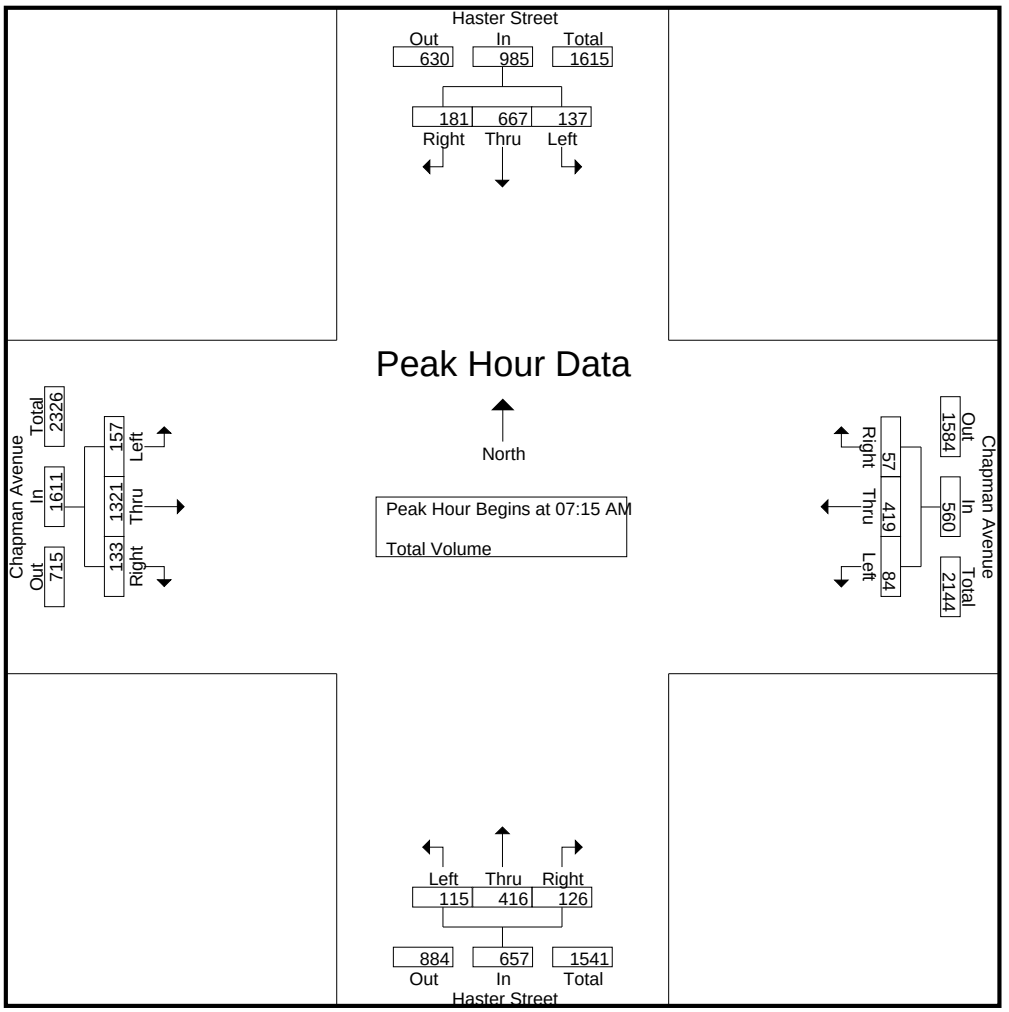
	Haster Street Southbound				Chapman Avenue Westbound				Haster Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	26	120	25	171	12	71	16	99	27	99	31	157	27	246	21	294	721
07:15 AM	26	148	34	208	18	100	8	126	22	90	42	154	25	336	17	378	866
07:30 AM	42	185	54	281	23	113	12	148	29	86	28	143	47	331	31	409	981
07:45 AM	38	172	42	252	22	103	20	145	34	119	30	183	51	341	35	427	1007
Total	132	625	155	912	75	387	56	518	112	394	131	637	150	1254	104	1508	3575
08:00 AM	31	162	51	244	21	103	17	141	30	121	26	177	34	313	50	397	959
08:15 AM	22	147	25	194	12	89	13	114	27	111	41	179	43	306	29	378	865
08:30 AM	25	124	29	178	9	83	9	101	32	93	23	148	36	238	23	297	724
08:45 AM	18	88	20	126	14	85	5	104	31	71	12	114	34	259	22	315	659
Total	96	521	125	742	56	360	44	460	120	396	102	618	147	1116	124	1387	3207
Grand Total	228	1146	280	1654	131	747	100	978	232	790	233	1255	297	2370	228	2895	6782
Apprch %	13.8	69.3	16.9		13.4	76.4	10.2		18.5	62.9	18.6		10.3	81.9	7.9		
Total %	3.4	16.9	4.1	24.4	1.9	11	1.5	14.4	3.4	11.6	3.4	18.5	4.4	34.9	3.4	42.7	

	Haster Street Southbound				Chapman Avenue Westbound				Haster Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	26	148	34	208	18	100	8	126	22	90	**42**	154	25	336	17	378	866
07:30 AM	**42**	**185**	**54**	**281**	**23**	**113**	12	**148**	29	86	28	143	47	331	31	409	981
07:45 AM	38	172	42	252	22	103	**20**	145	**34**	119	30	**183**	**51**	**341**	35	**427**	**1007**
08:00 AM	31	162	51	244	21	103	17	141	30	**121**	26	177	34	313	**50**	397	959
Total Volume	137	667	181	985	84	419	57	560	115	416	126	657	157	1321	133	1611	3813
% App. Total	13.9	67.7	18.4		15	74.8	10.2		17.5	63.3	19.2		9.7	82	8.3		
PHF	.815	.901	.838	.876	.913	.927	.713	.946	.846	.860	.750	.898	.770	.968	.665	.943	.947

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City of Garden Grove
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E/W: Chapman Avenue
Weather: Clear

File Name : GRGHSCHAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:15 AM				07:45 AM				07:15 AM			
+0 mins.	26	148	34	208	18	100	8	126	**34**	119	30	**183**	25	336	17	378
+15 mins.	**42**	**185**	**54**	**281**	**23**	**113**	12	**148**	30	**121**	26	177	47	331	31	409
+30 mins.	38	172	42	252	22	103	**20**	145	27	111	**41**	179	**51**	**341**	35	**427**
+45 mins.	31	162	51	244	21	103	17	141	32	93	23	148	34	313	**50**	397
Total Volume	137	667	181	985	84	419	57	560	123	444	120	687	157	1321	133	1611
% App. Total	13.9	67.7	18.4		15	74.8	10.2		17.9	64.6	17.5		9.7	82	8.3	
PHF	.815	.901	.838	.876	.913	.927	.713	.946	.904	.917	.732	.939	.770	.968	.665	.943

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City of Garden Grove
N/S: Haster Street
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Weather: Clear

File Name : GRGHSCHPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

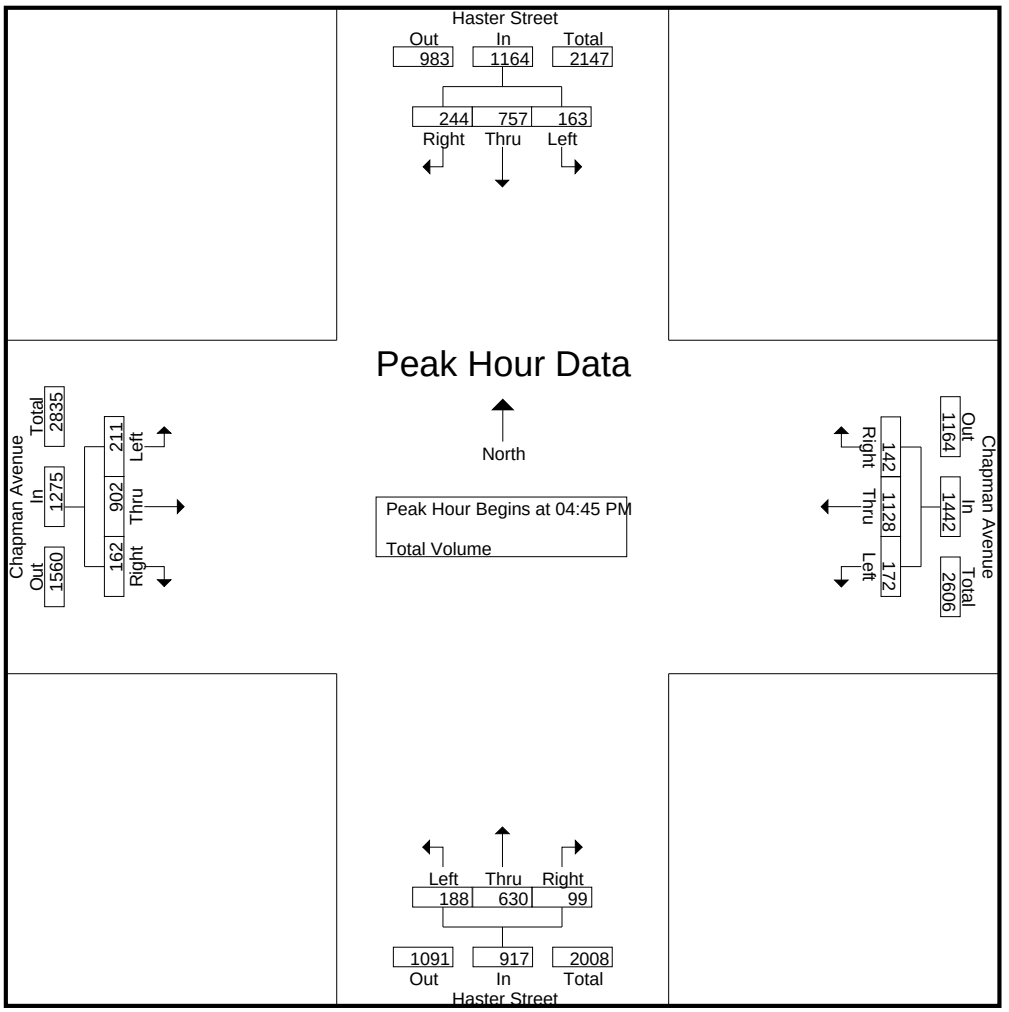
	Haster Street Southbound				Chapman Avenue Westbound				Haster Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	28	127	56	211	29	230	26	285	48	119	26	193	50	203	20	273	962
04:15 PM	40	166	47	253	28	248	32	308	43	134	22	199	51	199	26	276	1036
04:30 PM	48	157	51	256	45	251	30	326	45	157	35	237	57	230	31	318	1137
04:45 PM	38	177	59	274	38	296	40	374	54	170	32	256	47	204	53	304	1208
Total	154	627	213	994	140	1025	128	1293	190	580	115	885	205	836	130	1171	4343
05:00 PM	45	160	64	269	43	280	35	358	38	139	24	201	55	234	38	327	1155
05:15 PM	45	193	55	293	38	278	33	349	46	156	20	222	55	236	33	324	1188
05:30 PM	35	227	66	328	53	274	34	361	50	165	23	238	54	228	38	320	1247
05:45 PM	37	170	50	257	33	299	40	372	55	120	22	197	61	204	38	303	1129
Total	162	750	235	1147	167	1131	142	1440	189	580	89	858	225	902	147	1274	4719
Grand Total	316	1377	448	2141	307	2156	270	2733	379	1160	204	1743	430	1738	277	2445	9062
Apprch %	14.8	64.3	20.9		11.2	78.9	9.9		21.7	66.6	11.7		17.6	71.1	11.3		
Total %	3.5	15.2	4.9	23.6	3.4	23.8	3	30.2	4.2	12.8	2.3	19.2	4.7	19.2	3.1	27	

	Haster Street Southbound				Chapman Avenue Westbound				Haster Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	38	177	59	274	38	**296**	**40**	**374**	**54**	**170**	**32**	**256**	47	204	**53**	304	1208
05:00 PM	**45**	160	64	269	43	280	35	358	38	139	24	201	**55**	234	38	**327**	1155
05:15 PM	45	193	55	293	38	278	33	349	46	156	20	222	55	**236**	33	324	1188
05:30 PM	35	**227**	**66**	**328**	**53**	274	34	361	50	165	23	238	54	228	38	320	**1247**
Total Volume	163	757	244	1164	172	1128	142	1442	188	630	99	917	211	902	162	1275	4798
% App. Total	14	65	21		11.9	78.2	9.8		20.5	68.7	10.8		16.5	70.7	12.7		
PHF	.906	.834	.924	.887	.811	.953	.888	.964	.870	.926	.773	.896	.959	.956	.764	.975	.962

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File Name : GRGHSCHPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				04:45 PM				04:45 PM				04:45 PM			
+0 mins.	38	177	59	274	38	**296**	**40**	**374**	**54**	**170**	**32**	**256**	47	204	**53**	304
+15 mins.	**45**	160	64	269	43	280	35	358	38	139	24	201	**55**	234	38	**327**
+30 mins.	45	193	55	293	38	278	33	349	46	156	20	222	55	**236**	33	324
+45 mins.	35	**227**	**66**	**328**	**53**	274	34	361	50	165	23	238	54	228	38	320
Total Volume	163	757	244	1164	172	1128	142	1442	188	630	99	917	211	902	162	1275
% App. Total	14	65	21		11.9	78.2	9.8		20.5	68.7	10.8		16.5	70.7	12.7	
PHF	.906	.834	.924	.887	.811	.953	.888	.964	.870	.926	.773	.896	.959	.956	.764	.975

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City of Garden Grove
N/S: South Lewis Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGLECHAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 1

Groups Printed- Total Volume

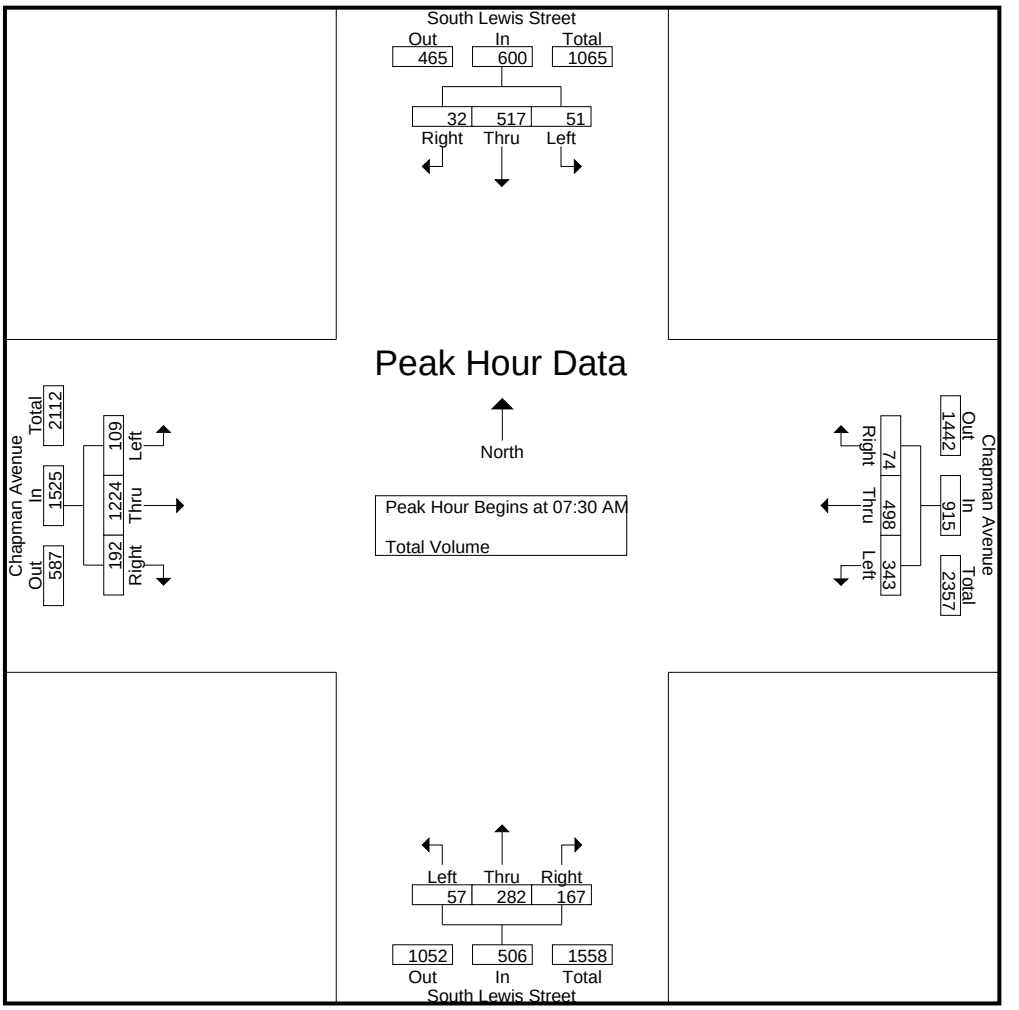
	South Lewis Street Southbound				Chapman Avenue Westbound				South Lewis Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	12	80	6	98	47	74	7	128	18	49	45	112	27	324	27	378	716
07:15 AM	16	109	5	130	66	102	12	180	7	51	46	104	19	348	38	405	819
07:30 AM	10	117	7	134	81	102	22	205	10	76	55	141	27	312	40	379	859
07:45 AM	13	161	6	180	97	136	15	248	15	65	40	120	21	295	49	365	913
Total	51	467	24	542	291	414	56	761	50	241	186	477	94	1279	154	1527	3307
08:00 AM	11	131	11	153	94	135	22	251	16	86	33	135	31	306	56	393	932
08:15 AM	17	108	8	133	71	125	15	211	16	55	39	110	30	311	47	388	842
08:30 AM	13	111	6	130	59	115	25	199	18	60	37	115	34	251	23	308	752
08:45 AM	10	90	15	115	62	98	17	177	17	42	40	99	27	235	37	299	690
Total	51	440	40	531	286	473	79	838	67	243	149	459	122	1103	163	1388	3216
Grand Total	102	907	64	1073	577	887	135	1599	117	484	335	936	216	2382	317	2915	6523
Apprch %	9.5	84.5	6		36.1	55.5	8.4		12.5	51.7	35.8		7.4	81.7	10.9		
Total %	1.6	13.9	1	16.4	8.8	13.6	2.1	24.5	1.8	7.4	5.1	14.3	3.3	36.5	4.9	44.7	

	South Lewis Street Southbound				Chapman Avenue Westbound				South Lewis Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	10	117	7	134	81	102	**22**	205	10	76	**55**	**141**	27	**312**	40	379	859
07:45 AM	13	**161**	6	**180**	**97**	**136**	15	248	15	65	40	120	21	295	49	365	913
08:00 AM	11	131	**11**	153	94	135	22	**251**	**16**	**86**	33	135	**31**	306	**56**	**393**	**932**
08:15 AM	**17**	108	8	133	71	125	15	211	16	55	39	110	30	311	47	388	842
Total Volume	51	517	32	600	343	498	74	915	57	282	167	506	109	1224	192	1525	3546
% App. Total	8.5	86.2	5.3		37.5	54.4	8.1		11.3	55.7	33		7.1	80.3	12.6		
PHF	.750	.803	.727	.833	.884	.915	.841	.911	.891	.820	.759	.897	.879	.981	.857	.970	.951

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City of Garden Grove
N/S: South Lewis Street
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Weather: Clear

File Name : GRGLECHAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:30 AM				07:30 AM				07:15 AM			
+0 mins.	10	117	7	134	81	102	**22**	205	10	76	**55**	**141**	19	**348**	38	**405**
+15 mins.	13	**161**	6	**180**	**97**	**136**	15	248	15	65	40	120	27	312	40	379
+30 mins.	11	131	**11**	153	94	135	22	**251**	**16**	**86**	33	135	21	295	49	365
+45 mins.	**17**	108	8	133	71	125	15	211	16	55	39	110	**31**	306	**56**	393
Total Volume	51	517	32	600	343	498	74	915	57	282	167	506	98	1261	183	1542
% App. Total	8.5	86.2	5.3		37.5	54.4	8.1		11.3	55.7	33		6.4	81.8	11.9	
PHF	.750	.803	.727	.833	.884	.915	.841	.911	.891	.820	.759	.897	.790	.906	.817	.952

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Groups Printed- Total Volume

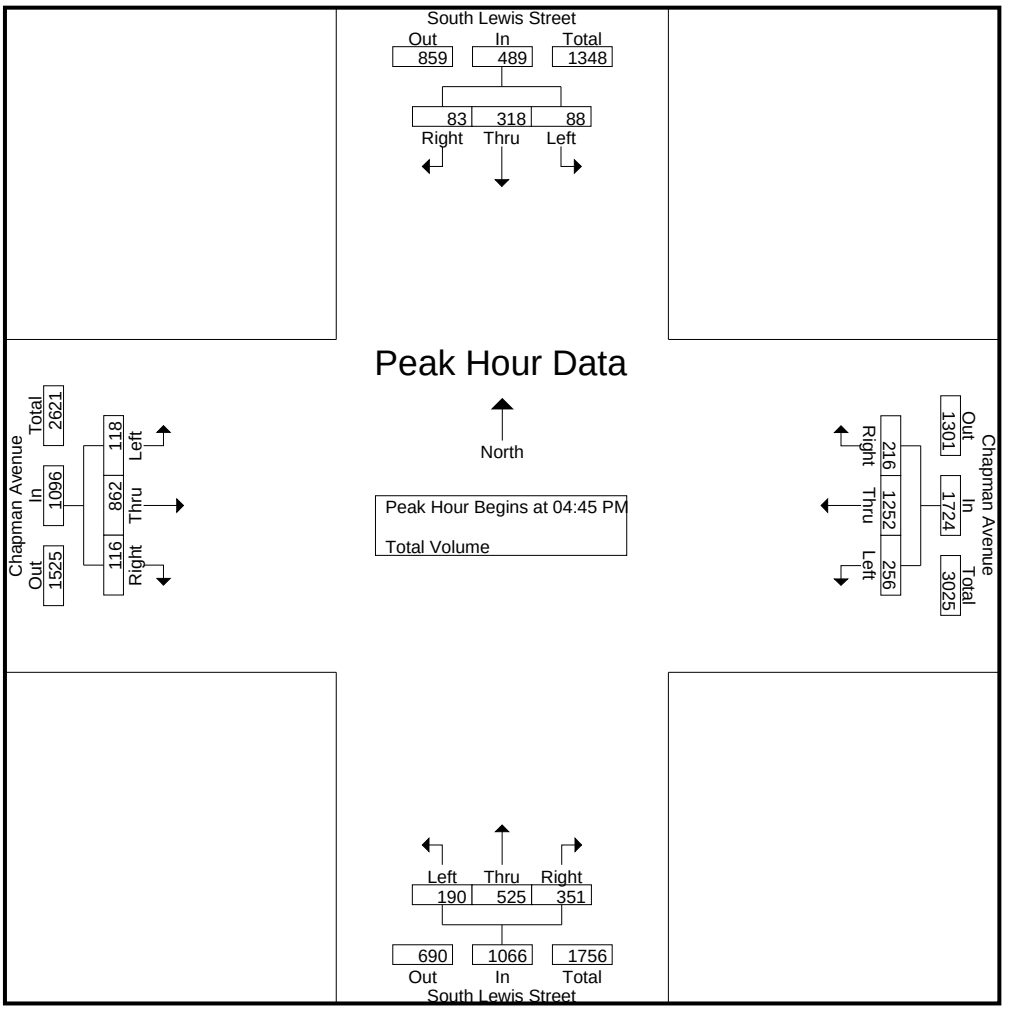
	South Lewis Street Southbound				Chapman Avenue Westbound				South Lewis Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	28	62	18	108	42	268	31	341	40	93	73	206	30	178	18	226	881
04:15 PM	14	79	23	116	49	263	39	351	31	92	71	194	25	196	26	247	908
04:30 PM	24	72	31	127	61	275	39	375	44	116	68	228	29	211	30	270	1000
04:45 PM	27	72	20	119	58	321	44	423	50	106	70	226	30	205	24	259	1027
Total	93	285	92	470	210	1127	153	1490	165	407	282	854	114	790	98	1002	3816
05:00 PM	15	71	18	104	54	315	48	417	53	136	93	282	19	231	28	278	1081
05:15 PM	17	90	16	123	68	318	71	457	50	148	103	301	39	217	30	286	1167
05:30 PM	29	85	29	143	76	298	53	427	37	135	85	257	30	209	34	273	1100
05:45 PM	20	86	13	119	55	262	36	353	40	130	86	256	23	199	21	243	971
Total	81	332	76	489	253	1193	208	1654	180	549	367	1096	111	856	113	1080	4319
Grand Total	174	617	168	959	463	2320	361	3144	345	956	649	1950	225	1646	211	2082	8135
Apprch %	18.1	64.3	17.5		14.7	73.8	11.5		17.7	49	33.3		10.8	79.1	10.1		
Total %	2.1	7.6	2.1	11.8	5.7	28.5	4.4	38.6	4.2	11.8	8	24	2.8	20.2	2.6	25.6	

	South Lewis Street Southbound				Chapman Avenue Westbound				South Lewis Street Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	27	72	20	119	58	**321**	44	423	50	106	70	226	30	205	24	259	1027
05:00 PM	15	71	18	104	54	315	48	417	**53**	136	93	282	19	**231**	28	278	1081
05:15 PM	17	**90**	16	123	68	318	**71**	**457**	50	**148**	**103**	**301**	**39**	217	30	**286**	**1167**
05:30 PM	**29**	85	**29**	**143**	**76**	298	53	427	37	135	85	257	30	209	**34**	273	1100
Total Volume	88	318	83	489	256	1252	216	1724	190	525	351	1066	118	862	116	1096	4375
% App. Total	18	65	17		14.8	72.6	12.5		17.8	49.2	32.9		10.8	78.6	10.6		
PHF	.759	.883	.716	.855	.842	.975	.761	.943	.896	.887	.852	.885	.756	.933	.853	.958	.937

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City of Garden Grove
N/S: South Lewis Street
E/W: Chapman Avenue
Weather: Clear

File Name : GRGLECHPM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				04:45 PM				05:00 PM				04:45 PM			
+0 mins.	27	72	20	119	58	**321**	44	423	**53**	136	93	282	30	205	24	259
+15 mins.	15	71	18	104	54	315	48	417	50	**148**	**103**	**301**	19	**231**	28	278
+30 mins.	17	**90**	16	123	68	318	**71**	**457**	37	135	85	257	**39**	217	30	**286**
+45 mins.	**29**	85	**29**	**143**	**76**	298	53	427	40	130	86	256	30	209	**34**	273
Total Volume	88	318	83	489	256	1252	216	1724	180	549	367	1096	118	862	116	1096
% App. Total	18	65	17		14.8	72.6	12.5		16.4	50.1	33.5		10.8	78.6	10.6	
PHF	.759	.883	.716	.855	.842	.975	.761	.943	.849	.927	.891	.910	.756	.933	.853	.958

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Northbound Ramps
Weather: Clear

File Name : 01_GRG_State College_5N AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

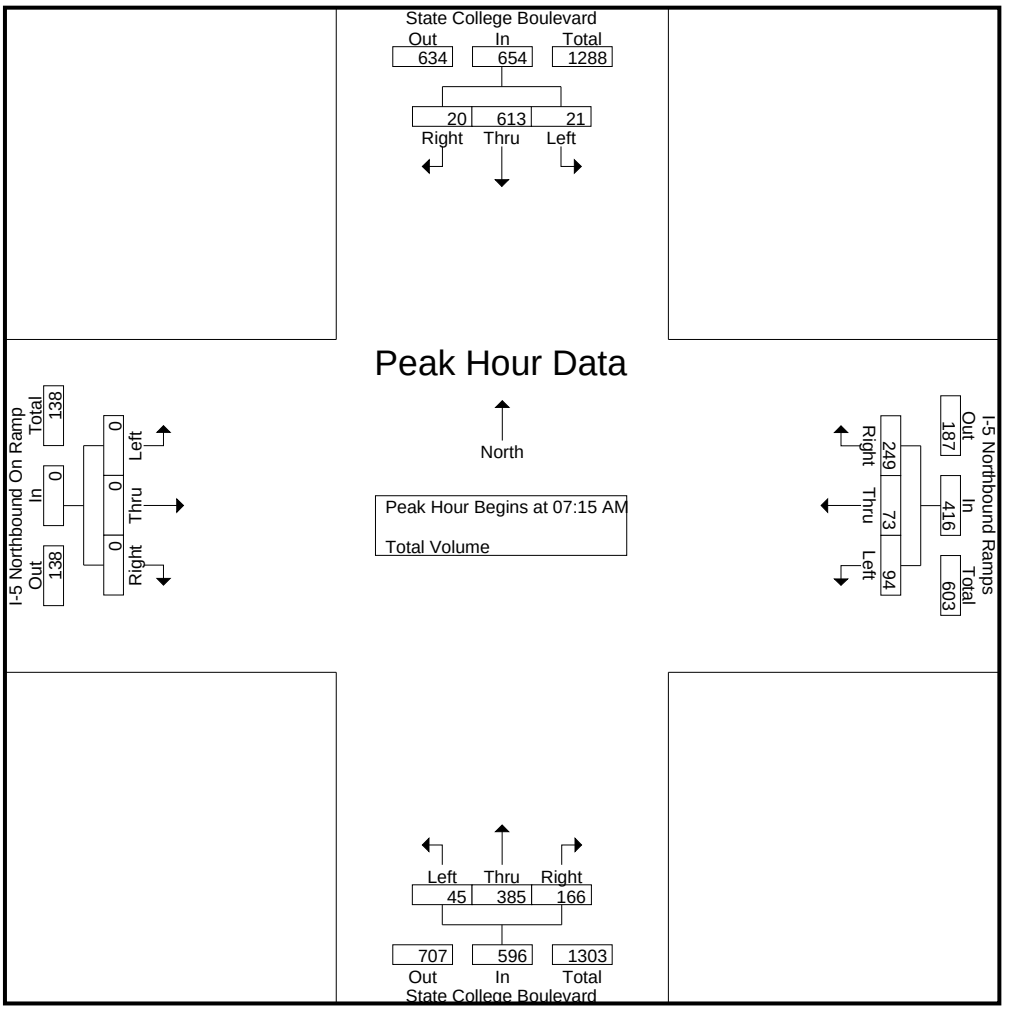
	State College Boulevard Southbound				I-5 Northbound Ramps Westbound				State College Boulevard Northbound				I-5 Northbound On Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	5	141	4	150	16	25	26	67	10	89	30	129	0	0	0	0	346
07:15 AM	5	153	3	161	25	12	54	91	9	96	37	142	0	0	0	0	394
07:30 AM	8	160	4	172	26	16	56	98	14	92	58	164	0	0	0	0	434
07:45 AM	3	151	6	160	21	24	75	120	14	112	44	170	0	0	0	0	450
Total	21	605	17	643	88	77	211	376	47	389	169	605	0	0	0	0	1624
08:00 AM	5	149	7	161	22	21	64	107	8	85	27	120	0	0	0	0	388
08:15 AM	2	160	2	164	25	25	55	105	9	87	20	116	0	0	0	0	385
08:30 AM	3	150	9	162	22	24	43	89	7	83	35	125	0	0	0	0	376
08:45 AM	1	134	6	141	25	16	53	94	13	84	27	124	0	0	0	0	359
Total	11	593	24	628	94	86	215	395	37	339	109	485	0	0	0	0	1508
Grand Total	32	1198	41	1271	182	163	426	771	84	728	278	1090	0	0	0	0	3132
Apprch %	2.5	94.3	3.2		23.6	21.1	55.3		7.7	66.8	25.5		0	0	0		
Total %	1	38.3	1.3	40.6	5.8	5.2	13.6	24.6	2.7	23.2	8.9	34.8	0	0	0	0	

	State College Boulevard Southbound				I-5 Northbound Ramps Westbound				State College Boulevard Northbound				I-5 Northbound On Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	5	153	3	161	25	12	54	91	9	96	37	142	0	0	0	0	394
07:30 AM	**8**	**160**	4	**172**	**26**	16	56	98	**14**	92	**58**	164	0	0	0	0	434
07:45 AM	3	151	6	160	21	**24**	**75**	**120**	14	**112**	44	**170**	0	0	0	0	**450**
08:00 AM	5	149	**7**	161	22	21	64	107	8	85	27	120	0	0	0	0	388
Total Volume	21	613	20	654	94	73	249	416	45	385	166	596	0	0	0	0	1666
% App. Total	3.2	93.7	3.1		22.6	17.5	59.9		7.6	64.6	27.9		0	0	0		
PHF	.656	.958	.714	.951	.904	.760	.830	.867	.804	.859	.716	.876	.000	.000	.000	.000	.926

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Northbound Ramps
Weather: Clear

File Name : 01_GRG_State College_5N AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:30 AM				07:00 AM				07:00 AM			
+0 mins.	**8**	**160**	4	**172**	**26**	16	56	98	10	89	30	129	0	0	0	0
+15 mins.	3	151	6	160	21	24	**75**	**120**	9	96	37	142	0	0	0	0
+30 mins.	5	149	**7**	161	22	21	64	107	**14**	92	**58**	164	0	0	0	0
+45 mins.	2	160	2	164	25	**25**	55	105	14	**112**	44	**170**	0	0	0	0
Total Volume	18	620	19	657	94	86	250	430	47	389	169	605	0	0	0	0
% App. Total	2.7	94.4	2.9		21.9	20	58.1		7.8	64.3	27.9		0	0	0	
PHF	.563	.969	.679	.955	.904	.860	.833	.896	.839	.868	.728	.890	.000	.000	.000	.000

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Northbound Ramps
Weather: Clear

File Name : 01_GRG_State College_5N PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

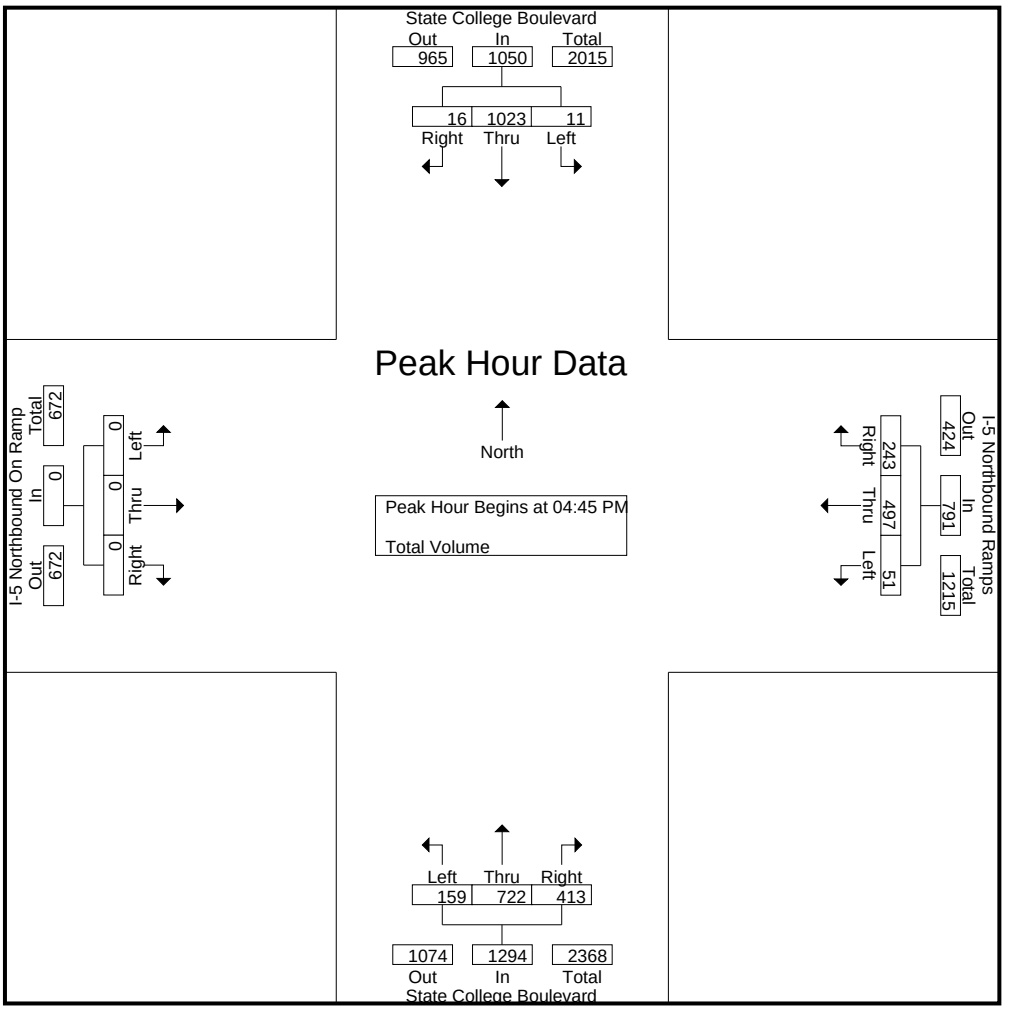
	State College Boulevard Southbound				I-5 Northbound Ramps Westbound				State College Boulevard Northbound				I-5 Northbound On Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	5	220	6	231	19	49	39	107	21	131	78	230	0	0	0	0	568
04:15 PM	3	232	2	237	17	42	45	104	27	154	91	272	0	0	0	0	613
04:30 PM	4	266	4	274	19	68	48	135	17	148	93	258	0	0	0	0	667
04:45 PM	1	275	6	282	13	96	50	159	29	156	95	280	0	0	0	0	721
Total	13	993	18	1024	68	255	182	505	94	589	357	1040	0	0	0	0	2569
05:00 PM	3	313	5	321	9	109	64	182	47	179	143	369	0	0	0	0	872
05:15 PM	4	234	2	240	11	144	57	212	39	196	85	320	0	0	0	0	772
05:30 PM	3	201	3	207	18	148	72	238	44	191	90	325	0	0	0	0	770
05:45 PM	3	185	3	191	18	142	75	235	44	150	74	268	0	0	0	0	694
Total	13	933	13	959	56	543	268	867	174	716	392	1282	0	0	0	0	3108
Grand Total	26	1926	31	1983	124	798	450	1372	268	1305	749	2322	0	0	0	0	5677
Apprch %	1.3	97.1	1.6		9	58.2	32.8		11.5	56.2	32.3		0	0	0		
Total %	0.5	33.9	0.5	34.9	2.2	14.1	7.9	24.2	4.7	23	13.2	40.9	0	0	0	0	

	State College Boulevard Southbound				I-5 Northbound Ramps Westbound				State College Boulevard Northbound				I-5 Northbound On Ramp Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	1	275	**6**	282	13	96	50	159	29	156	95	280	0	0	0	0	721
05:00 PM	3	**313**	5	**321**	9	109	64	182	**47**	179	**143**	**369**	0	0	0	0	**872**
05:15 PM	**4**	234	2	240	11	144	57	212	39	**196**	85	320	0	0	0	0	772
05:30 PM	3	201	3	207	**18**	**148**	**72**	**238**	44	191	90	325	0	0	0	0	770
Total Volume	11	1023	16	1050	51	497	243	791	159	722	413	1294	0	0	0	0	3135
% App. Total	1	97.4	1.5		6.4	62.8	30.7		12.3	55.8	31.9		0	0	0		
PHF	.688	.817	.667	.818	.708	.840	.844	.831	.846	.921	.722	.877	.000	.000	.000	.000	.899

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Northbound Ramps
Weather: Clear

File Name : 01_GRG_State College_5N PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				05:00 PM				04:45 PM				04:00 PM			
+0 mins.	**4**	266	4	274	9	109	64	182	29	156	95	280	0	0	0	0
+15 mins.	1	275	**6**	282	11	144	57	212	**47**	179	**143**	**369**	0	0	0	0
+30 mins.	3	**313**	5	**321**	**18**	**148**	72	**238**	39	**196**	85	320	0	0	0	0
+45 mins.	4	234	2	240	18	142	**75**	235	44	191	90	325	0	0	0	0
Total Volume	12	1088	17	1117	56	543	268	867	159	722	413	1294	0	0	0	0
% App. Total	1.1	97.4	1.5		6.5	62.6	30.9		12.3	55.8	31.9		0	0	0	
PHF	.750	.869	.708	.870	.778	.917	.893	.911	.846	.921	.722	.877	.000	.000	.000	.000

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Southbound Ramps
Weather: Clear

File Name : 02_GRG_State College_5S AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

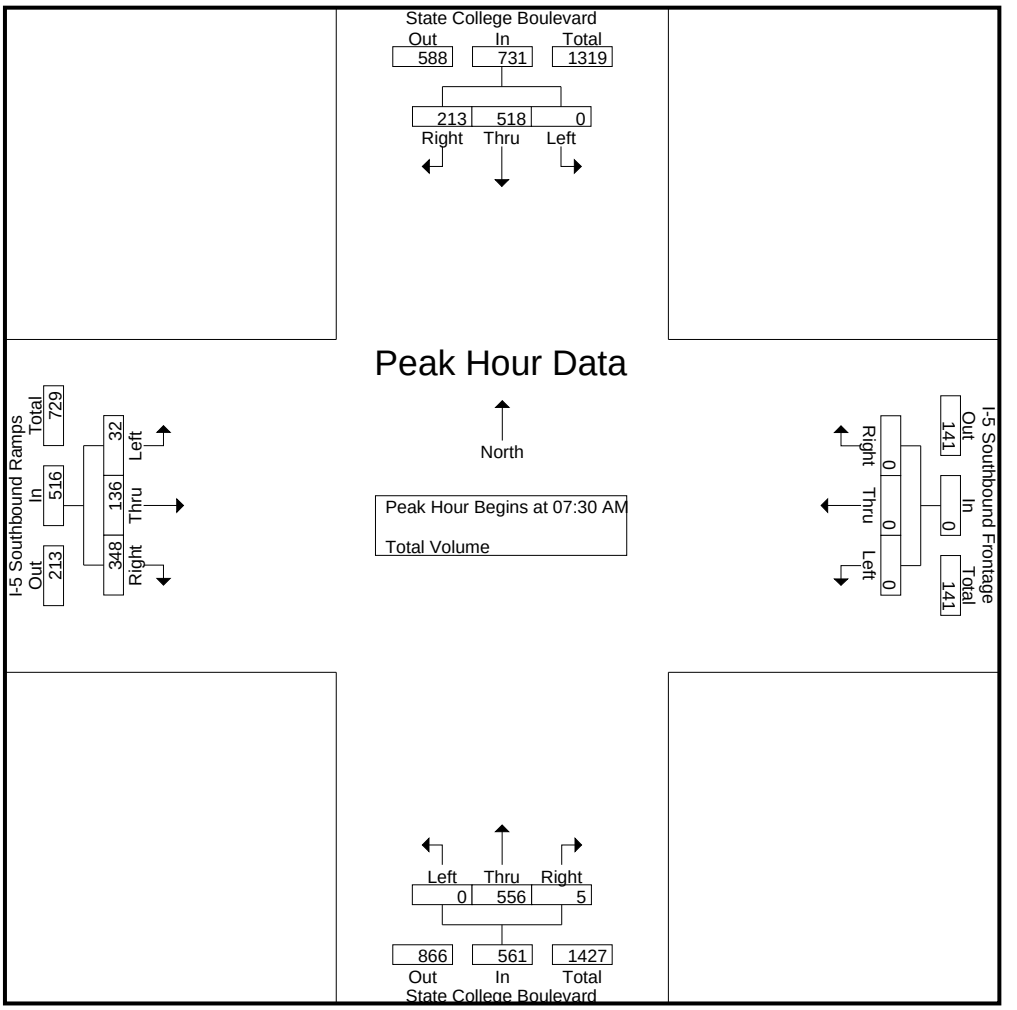
	State College Boulevard Southbound				I-5 Southbound Frontage Westbound				State College Boulevard Northbound				I-5 Southbound Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	99	50	149	0	0	0	0	0	120	5	125	9	32	71	112	386
07:15 AM	0	123	46	169	0	0	0	0	0	125	2	127	10	32	59	101	397
07:30 AM	0	140	53	193	0	0	0	0	0	165	0	165	6	28	82	116	474
07:45 AM	0	132	43	175	0	0	0	0	0	162	1	163	7	57	119	183	521
Total	0	494	192	686	0	0	0	0	0	572	8	580	32	149	331	512	1778
08:00 AM	0	124	49	173	0	0	0	0	0	116	3	119	11	28	78	117	409
08:15 AM	0	122	68	190	0	0	0	0	0	113	1	114	8	23	69	100	404
08:30 AM	0	113	63	176	0	0	0	0	0	123	5	128	4	37	55	96	400
08:45 AM	0	107	47	154	0	0	0	0	0	119	0	119	5	50	68	123	396
Total	0	466	227	693	0	0	0	0	0	471	9	480	28	138	270	436	1609
Grand Total	0	960	419	1379	0	0	0	0	0	1043	17	1060	60	287	601	948	3387
Apprch %	0	69.6	30.4		0	0	0		0	98.4	1.6		6.3	30.3	63.4		
Total %	0	28.3	12.4	40.7	0	0	0	0	0	30.8	0.5	31.3	1.8	8.5	17.7	28	

	State College Boulevard Southbound				I-5 Southbound Frontage Westbound				State College Boulevard Northbound				I-5 Southbound Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	**140**	53	**193**	0	0	0	0	0	**165**	0	**165**	6	28	82	116	474
07:45 AM	0	132	43	175	0	0	0	0	0	162	1	163	7	**57**	**119**	**183**	**521**
08:00 AM	0	124	49	173	0	0	0	0	0	116	**3**	119	**11**	28	78	117	409
08:15 AM	0	122	**68**	190	0	0	0	0	0	113	1	114	8	23	69	100	404
Total Volume	0	518	213	731	0	0	0	0	0	556	5	561	32	136	348	516	1808
% App. Total	0	70.9	29.1		0	0	0		0	99.1	0.9		6.2	26.4	67.4		
PHF	.000	.925	.783	.947	.000	.000	.000	.000	.000	.842	.417	.850	.727	.596	.731	.705	.868

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Southbound Ramps
Weather: Clear

File Name : 02_GRG_State College_5S AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:00 AM				07:00 AM				07:15 AM			
+0 mins.	0	**140**	53	**193**	0	0	0	0	0	120	**5**	125	10	32	59	101
+15 mins.	0	132	43	175	0	0	0	0	0	125	2	127	6	28	82	116
+30 mins.	0	124	49	173	0	0	0	0	0	**165**	0	**165**	7	**57**	**119**	**183**
+45 mins.	0	122	**68**	190	0	0	0	0	0	162	1	163	**11**	28	78	117
Total Volume	0	518	213	731	0	0	0	0	0	572	8	580	34	145	338	517
% App. Total	0	70.9	29.1		0	0	0		0	98.6	1.4		6.6	28	65.4	
PHF	.000	.925	.783	.947	.000	.000	.000	.000	.000	.867	.400	.879	.773	.636	.710	.706

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Southbound Ramps
Weather: Clear

File Name : 02_GRG_State College_5S PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

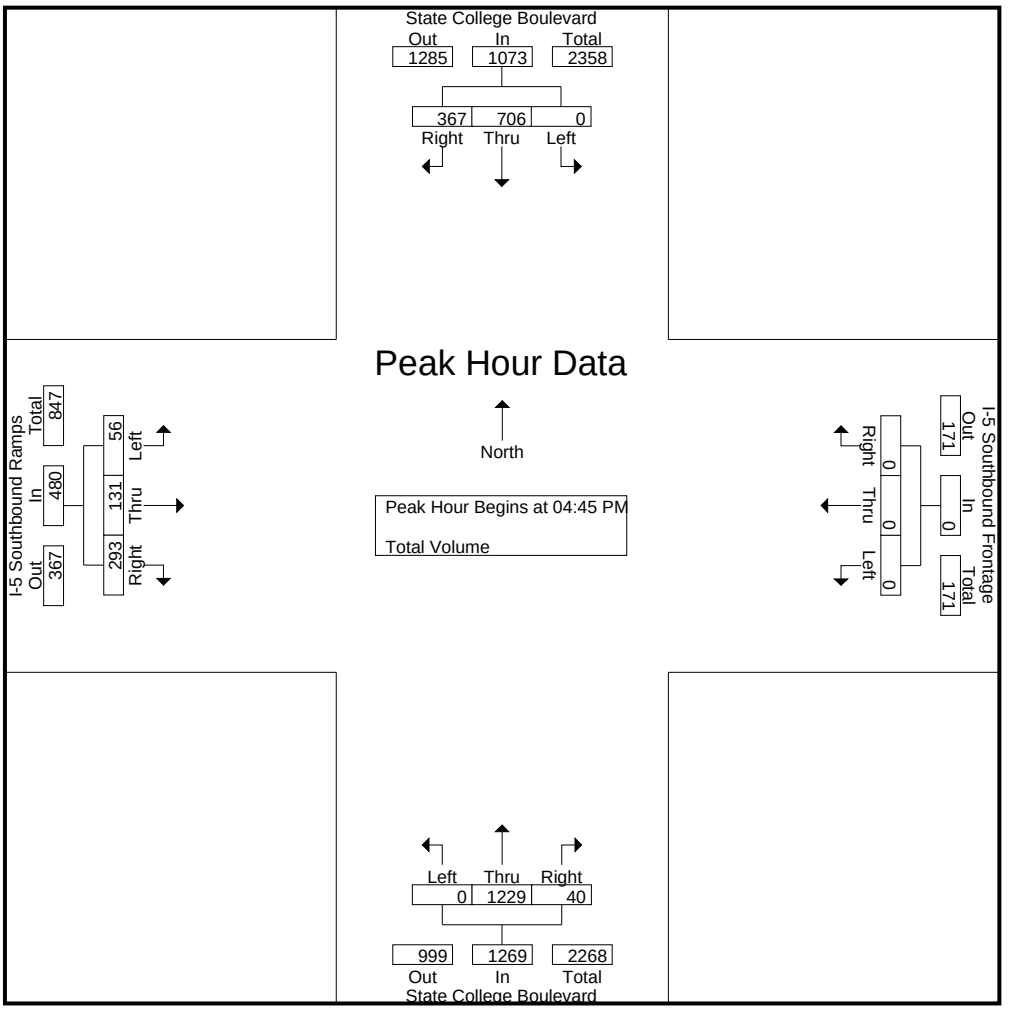
	State College Boulevard Southbound				I-5 Southbound Frontage Westbound				State College Boulevard Northbound				I-5 Southbound Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	0	158	86	244	0	0	0	0	0	221	5	226	15	30	90	135	605
04:15 PM	0	170	79	249	0	0	0	0	0	253	6	259	16	39	67	122	630
04:30 PM	0	203	82	285	0	0	0	0	0	252	1	253	11	27	67	105	643
04:45 PM	0	189	95	284	0	0	0	0	0	263	5	268	17	35	72	124	676
Total	0	720	342	1062	0	0	0	0	0	989	17	1006	59	131	296	486	2554
05:00 PM	0	211	106	317	0	0	0	0	0	350	10	360	13	30	76	119	796
05:15 PM	0	160	90	250	0	0	0	0	0	305	9	314	10	32	61	103	667
05:30 PM	0	146	76	222	0	0	0	0	0	311	16	327	16	34	84	134	683
05:45 PM	0	151	54	205	0	0	0	0	0	245	7	252	15	31	92	138	595
Total	0	668	326	994	0	0	0	0	0	1211	42	1253	54	127	313	494	2741
Grand Total	0	1388	668	2056	0	0	0	0	0	2200	59	2259	113	258	609	980	5295
Apprch %	0	67.5	32.5		0	0	0		0	97.4	2.6		11.5	26.3	62.1		
Total %	0	26.2	12.6	38.8	0	0	0	0	0	41.5	1.1	42.7	2.1	4.9	11.5	18.5	

	State College Boulevard Southbound				I-5 Southbound Frontage Westbound				State College Boulevard Northbound				I-5 Southbound Ramps Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	189	95	284	0	0	0	0	0	263	5	268	**17**	**35**	72	124	676
05:00 PM	0	**211**	**106**	**317**	0	0	0	0	0	**350**	10	**360**	13	30	76	119	**796**
05:15 PM	0	160	90	250	0	0	0	0	0	305	9	314	10	32	61	103	667
05:30 PM	0	146	76	222	0	0	0	0	0	311	**16**	327	16	34	**84**	**134**	683
Total Volume	0	706	367	1073	0	0	0	0	0	1229	40	1269	56	131	293	480	2822
% App. Total	0	65.8	34.2		0	0	0		0	96.8	3.2		11.7	27.3	61		
PHF	.000	.836	.866	.846	.000	.000	.000	.000	.000	.878	.625	.881	.824	.936	.872	.896	.886

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City of Garden Grove
N/S: State College Boulevard
E/W: I-5 Southbound Ramps
Weather: Clear

File Name : 02_GRG_State College_5S PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:00 PM				04:45 PM				05:00 PM			
+0 mins.	0	203	82	285	0	0	0	0	0	263	5	268	13	30	76	119
+15 mins.	0	189	95	284	0	0	0	0	0	**350**	10	**360**	10	32	61	103
+30 mins.	0	**211**	**106**	**317**	0	0	0	0	0	305	9	314	**16**	**34**	84	134
+45 mins.	0	160	90	250	0	0	0	0	0	311	**16**	327	15	31	**92**	**138**
Total Volume	0	763	373	1136	0	0	0	0	0	1229	40	1269	54	127	313	494
% App. Total	0	67.2	32.8		0	0	0		0	96.8	3.2		10.9	25.7	63.4	
PHF	.000	.904	.880	.896	.000	.000	.000	.000	.000	.878	.625	.881	.844	.934	.851	.895

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City of Garden Grove
N/S: State College Blvd/The City Drive S
E/W: Chapman Avenue
Weather: Clear

File Name : 03_GRG_State College_Chapman AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

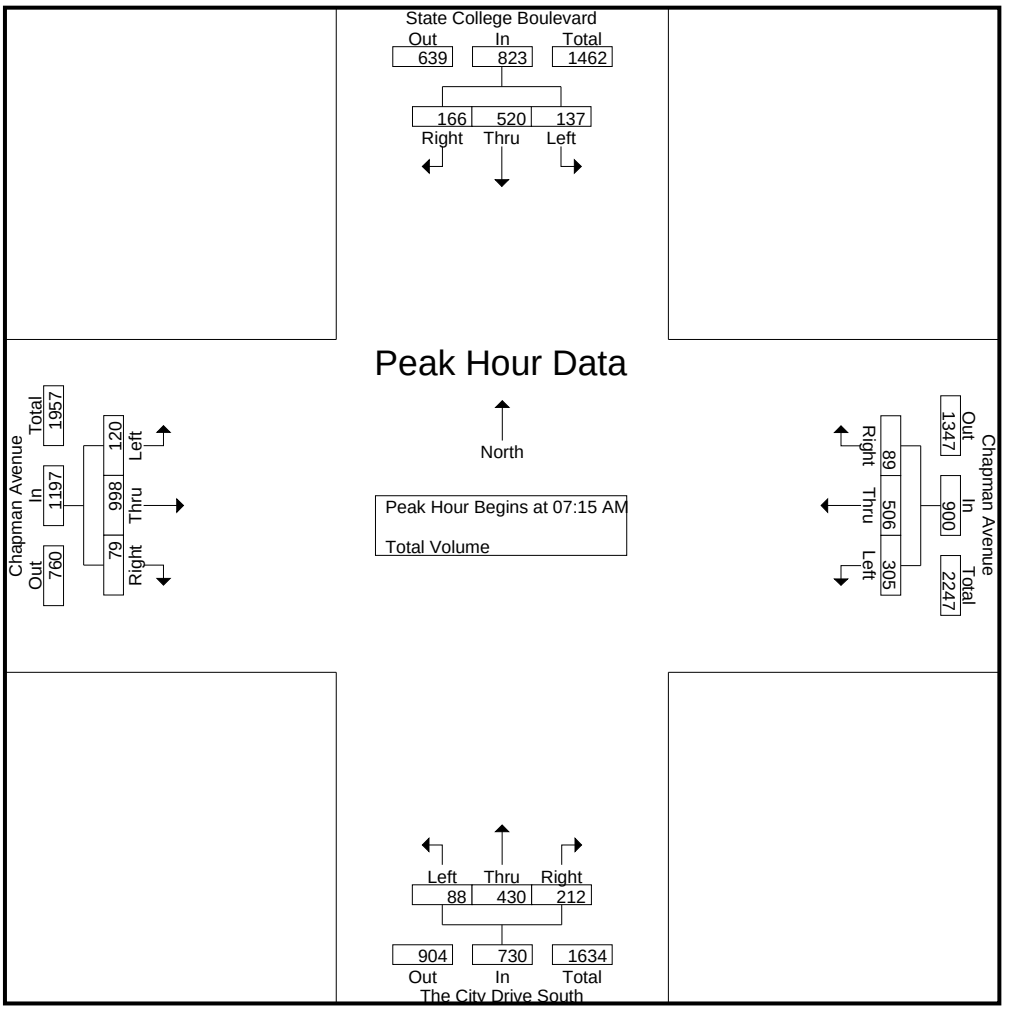
	State College Boulevard Southbound				Chapman Avenue Westbound				The City Drive South Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	33	100	32	165	50	90	20	160	19	91	63	173	26	216	8	250	748
07:15 AM	38	103	31	172	69	90	19	178	22	101	43	166	28	307	16	351	867
07:30 AM	35	133	50	218	68	147	29	244	26	126	68	220	34	235	20	289	971
07:45 AM	34	167	44	245	104	147	28	279	18	125	68	211	34	252	22	308	1043
Total	140	503	157	800	291	474	96	861	85	443	242	770	122	1010	66	1198	3629
08:00 AM	30	117	41	188	64	122	13	199	22	78	33	133	24	204	21	249	769
08:15 AM	31	106	58	195	61	144	13	218	13	75	27	115	27	228	16	271	799
08:30 AM	24	111	31	166	57	124	20	201	19	77	38	134	38	250	11	299	800
08:45 AM	36	110	39	185	57	137	17	211	14	71	46	131	26	253	18	297	824
Total	121	444	169	734	239	527	63	829	68	301	144	513	115	935	66	1116	3192
Grand Total	261	947	326	1534	530	1001	159	1690	153	744	386	1283	237	1945	132	2314	6821
Apprch %	17	61.7	21.3		31.4	59.2	9.4		11.9	58	30.1		10.2	84.1	5.7		
Total %	3.8	13.9	4.8	22.5	7.8	14.7	2.3	24.8	2.2	10.9	5.7	18.8	3.5	28.5	1.9	33.9	

	State College Boulevard Southbound				Chapman Avenue Westbound				The City Drive South Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	**38**	103	31	172	69	90	19	178	22	101	43	166	28	**307**	16	**351**	867
07:30 AM	35	133	**50**	218	68	**147**	**29**	244	**26**	**126**	**68**	**220**	**34**	235	20	289	971
07:45 AM	34	**167**	44	**245**	**104**	147	28	**279**	18	125	68	211	34	252	**22**	308	**1043**
08:00 AM	30	117	41	188	64	122	13	199	22	78	33	133	24	204	21	249	769
Total Volume	137	520	166	823	305	506	89	900	88	430	212	730	120	998	79	1197	3650
% App. Total	16.6	63.2	20.2		33.9	56.2	9.9		12.1	58.9	29		10	83.4	6.6		
PHF	.901	.778	.830	.840	.733	.861	.767	.806	.846	.853	.779	.830	.882	.813	.898	.853	.875

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City of Garden Grove
N/S: State College Blvd/The City Drive S
E/W: Chapman Avenue
Weather: Clear

File Name : 03_GRG_State College_Chapman AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:30 AM				07:00 AM				07:00 AM			
+0 mins.	**35**	133	50	218	68	**147**	**29**	244	19	91	63	173	26	216	8	250
+15 mins.	34	**167**	44	**245**	**104**	147	28	**279**	22	101	43	166	28	**307**	16	**351**
+30 mins.	30	117	41	188	64	122	13	199	**26**	**126**	**68**	**220**	**34**	235	20	289
+45 mins.	31	106	**58**	195	61	144	13	218	18	125	68	211	34	252	**22**	308
Total Volume	130	523	193	846	297	560	83	940	85	443	242	770	122	1010	66	1198
% App. Total	15.4	61.8	22.8		31.6	59.6	8.8		11	57.5	31.4		10.2	84.3	5.5	
PHF	.929	.783	.832	.863	.714	.952	.716	.842	.817	.879	.890	.875	.897	.822	.750	.853

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City of Garden Grove
N/S: State College Blvd/The City Drive S
E/W: Chapman Avenue
Weather: Clear

File Name : 03_GRG_State College_Chapman PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

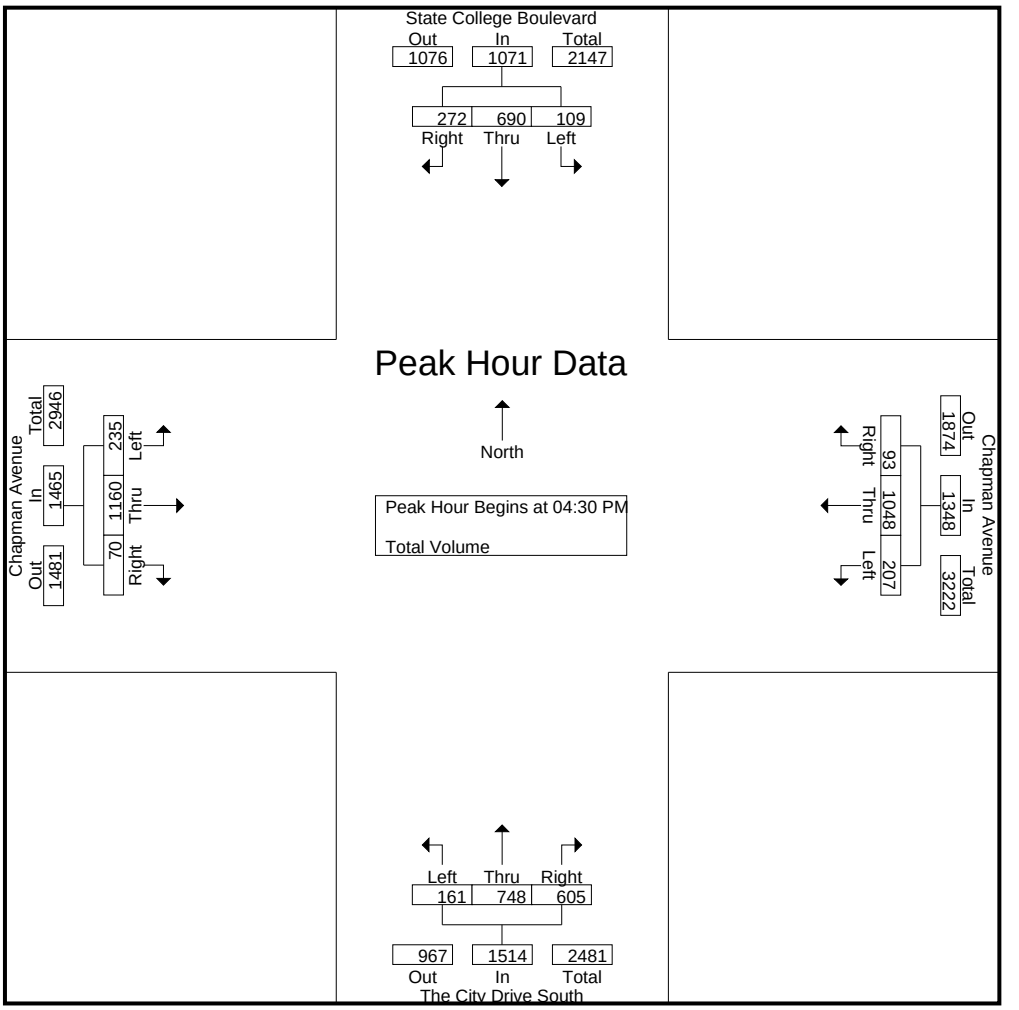
	State College Boulevard Southbound				Chapman Avenue Westbound				The City Drive South Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	39	147	47	233	52	248	19	319	25	186	148	359	55	265	14	334	1245
04:15 PM	28	164	52	244	47	177	14	238	33	130	85	248	47	298	19	364	1094
04:30 PM	25	190	86	301	46	232	24	302	37	144	131	312	55	297	18	370	1285
04:45 PM	34	150	61	245	48	245	18	311	34	173	148	355	56	282	25	363	1274
Total	126	651	246	1023	193	902	75	1170	129	633	512	1274	213	1142	76	1431	4898
05:00 PM	23	189	76	288	46	271	31	348	45	227	203	475	69	324	16	409	1520
05:15 PM	27	161	49	237	67	300	20	387	45	204	123	372	55	257	11	323	1319
05:30 PM	23	148	48	219	64	241	26	331	36	225	107	368	58	289	15	362	1280
05:45 PM	26	164	79	269	66	215	20	301	29	173	98	300	40	256	17	313	1183
Total	99	662	252	1013	243	1027	97	1367	155	829	531	1515	222	1126	59	1407	5302
Grand Total	225	1313	498	2036	436	1929	172	2537	284	1462	1043	2789	435	2268	135	2838	10200
Apprch %	11.1	64.5	24.5		17.2	76	6.8		10.2	52.4	37.4		15.3	79.9	4.8		
Total %	2.2	12.9	4.9	20	4.3	18.9	1.7	24.9	2.8	14.3	10.2	27.3	4.3	22.2	1.3	27.8	

	State College Boulevard Southbound				Chapman Avenue Westbound				The City Drive South Northbound				Chapman Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	25	**190**	**86**	**301**	46	232	24	302	37	144	131	312	55	297	18	370	1285
04:45 PM	**34**	150	61	245	48	245	18	311	34	173	148	355	56	282	**25**	363	1274
05:00 PM	23	189	76	288	46	271	**31**	348	**45**	**227**	**203**	**475**	**69**	**324**	16	**409**	**1520**
05:15 PM	27	161	49	237	**67**	**300**	20	**387**	45	204	123	372	55	257	11	323	1319
Total Volume	109	690	272	1071	207	1048	93	1348	161	748	605	1514	235	1160	70	1465	5398
% App. Total	10.2	64.4	25.4		15.4	77.7	6.9		10.6	49.4	40		16	79.2	4.8		
PHF	.801	.908	.791	.890	.772	.873	.750	.871	.894	.824	.745	.797	.851	.895	.700	.895	.888

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City of Garden Grove
N/S: State College Blvd/The City Drive S
E/W: Chapman Avenue
Weather: Clear

File Name : 03_GRG_State College_Chapman PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM				04:45 PM				04:45 PM				04:15 PM			
+0 mins.	28	164	52	244	48	245	18	311	34	173	148	355	47	298	19	364
+15 mins.	25	**190**	**86**	**301**	46	271	**31**	348	**45**	**227**	**203**	**475**	55	297	18	370
+30 mins.	**34**	150	61	245	**67**	**300**	20	**387**	45	204	123	372	56	282	**25**	363
+45 mins.	23	189	76	288	64	241	26	331	36	225	107	368	**69**	**324**	16	**409**
Total Volume	110	693	275	1078	225	1057	95	1377	160	829	581	1570	227	1201	78	1506
% App. Total	10.2	64.3	25.5		16.3	76.8	6.9		10.2	52.8	37		15.1	79.7	5.2	
PHF	.809	.912	.799	.895	.840	.881	.766	.890	.889	.913	.716	.826	.822	.927	.780	.921

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Twintree Lane
Weather: Clear

File Name : GRGHATWAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 1

Groups Printed- Total Volume

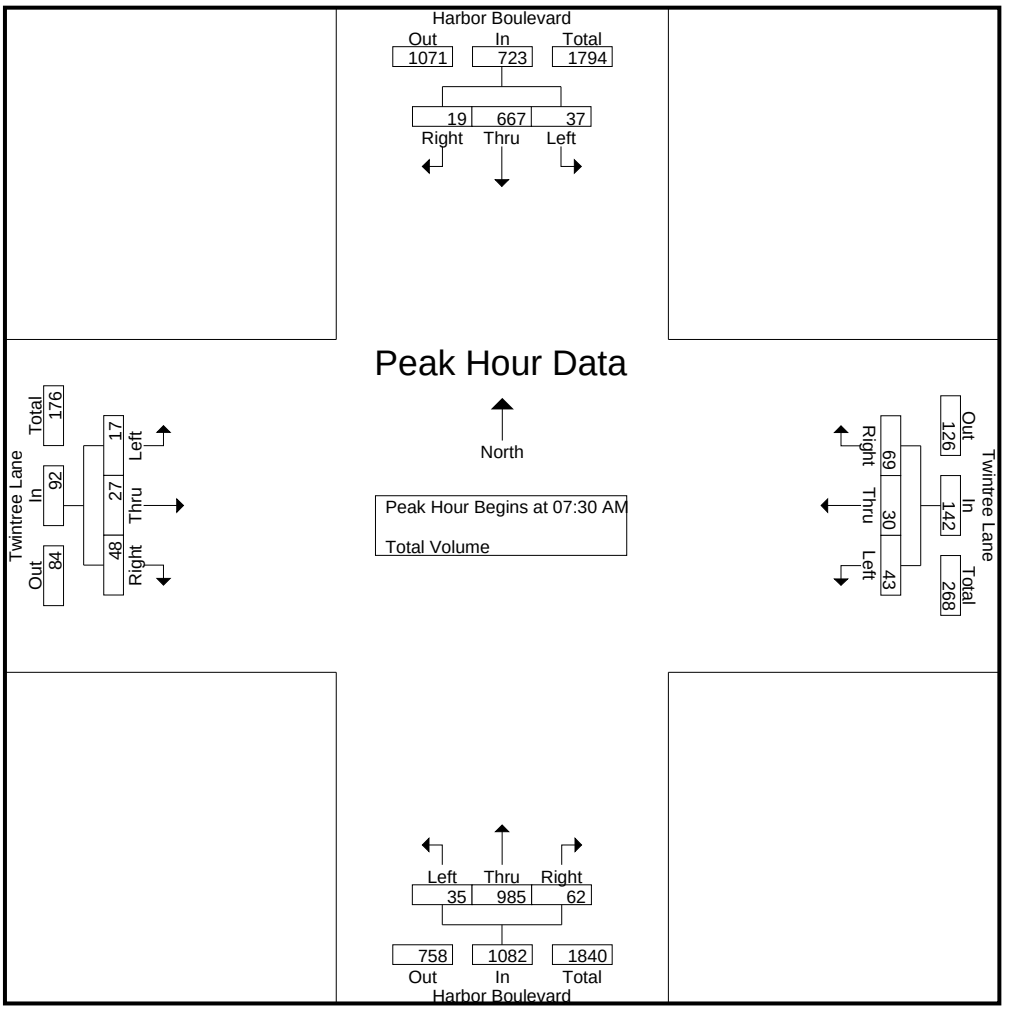
	Harbor Boulevard Southbound				Twintree Lane Westbound				Harbor Boulevard Northbound				Twintree Lane Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	4	174	4	182	3	1	4	8	7	175	5	187	11	2	8	21	398
07:15 AM	3	181	2	186	10	0	7	17	10	172	6	188	3	3	10	16	407
07:30 AM	5	181	8	194	7	8	10	25	8	262	7	277	4	6	15	25	521
07:45 AM	11	155	4	170	5	4	6	15	11	282	19	312	6	5	13	24	521
Total	23	691	18	732	25	13	27	65	36	891	37	964	24	16	46	86	1847
08:00 AM	14	185	4	203	15	16	26	57	10	201	27	238	2	11	12	25	523
08:15 AM	7	146	3	156	16	2	27	45	6	240	9	255	5	5	8	18	474
08:30 AM	5	181	3	189	2	3	8	13	2	199	9	210	1	1	3	5	417
08:45 AM	4	126	0	130	4	0	9	13	0	195	2	197	2	1	6	9	349
Total	30	638	10	678	37	21	70	128	18	835	47	900	10	18	29	57	1763
Grand Total	53	1329	28	1410	62	34	97	193	54	1726	84	1864	34	34	75	143	3610
Apprch %	3.8	94.3	2		32.1	17.6	50.3		2.9	92.6	4.5		23.8	23.8	52.4		
Total %	1.5	36.8	0.8	39.1	1.7	0.9	2.7	5.3	1.5	47.8	2.3	51.6	0.9	0.9	2.1	4	

	Harbor Boulevard Southbound				Twintree Lane Westbound				Harbor Boulevard Northbound				Twintree Lane Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	5	181	**8**	194	7	8	10	25	8	262	7	277	4	6	**15**	**25**	521
07:45 AM	11	155	4	170	5	4	6	15	**11**	**282**	19	**312**	**6**	5	13	24	521
08:00 AM	**14**	**185**	4	**203**	15	**16**	26	**57**	10	201	**27**	238	2	**11**	12	25	**523**
08:15 AM	7	146	3	156	**16**	2	**27**	45	6	240	9	255	5	5	8	18	474
Total Volume	37	667	19	723	43	30	69	142	35	985	62	1082	17	27	48	92	2039
% App. Total	5.1	92.3	2.6		30.3	21.1	48.6		3.2	91	5.7		18.5	29.3	52.2		
PHF	.661	.901	.594	.890	.672	.469	.639	.623	.795	.873	.574	.867	.708	.614	.800	.920	.975

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Twintree Lane
Weather: Clear

File Name : GRGHATWAM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:30 AM				07:30 AM			
+0 mins.	3	181	2	186	7	8	10	25	8	262	7	277	4	6	**15**	**25**
+15 mins.	5	181	**8**	194	5	4	6	15	**11**	**282**	19	**312**	**6**	5	13	24
+30 mins.	11	155	4	170	15	**16**	26	**57**	10	201	**27**	238	2	**11**	12	25
+45 mins.	**14**	**185**	4	**203**	**16**	2	**27**	45	6	240	9	255	5	5	8	18
Total Volume	33	702	18	753	43	30	69	142	35	985	62	1082	17	27	48	92
% App. Total	4.4	93.2	2.4		30.3	21.1	48.6		3.2	91	5.7		18.5	29.3	52.2	
PHF	.589	.949	.563	.927	.672	.469	.639	.623	.795	.873	.574	.867	.708	.614	.800	.920

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Twintree Lane
Weather: Clear

File Name : GRGHATWPM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 1

Groups Printed- Total Volume

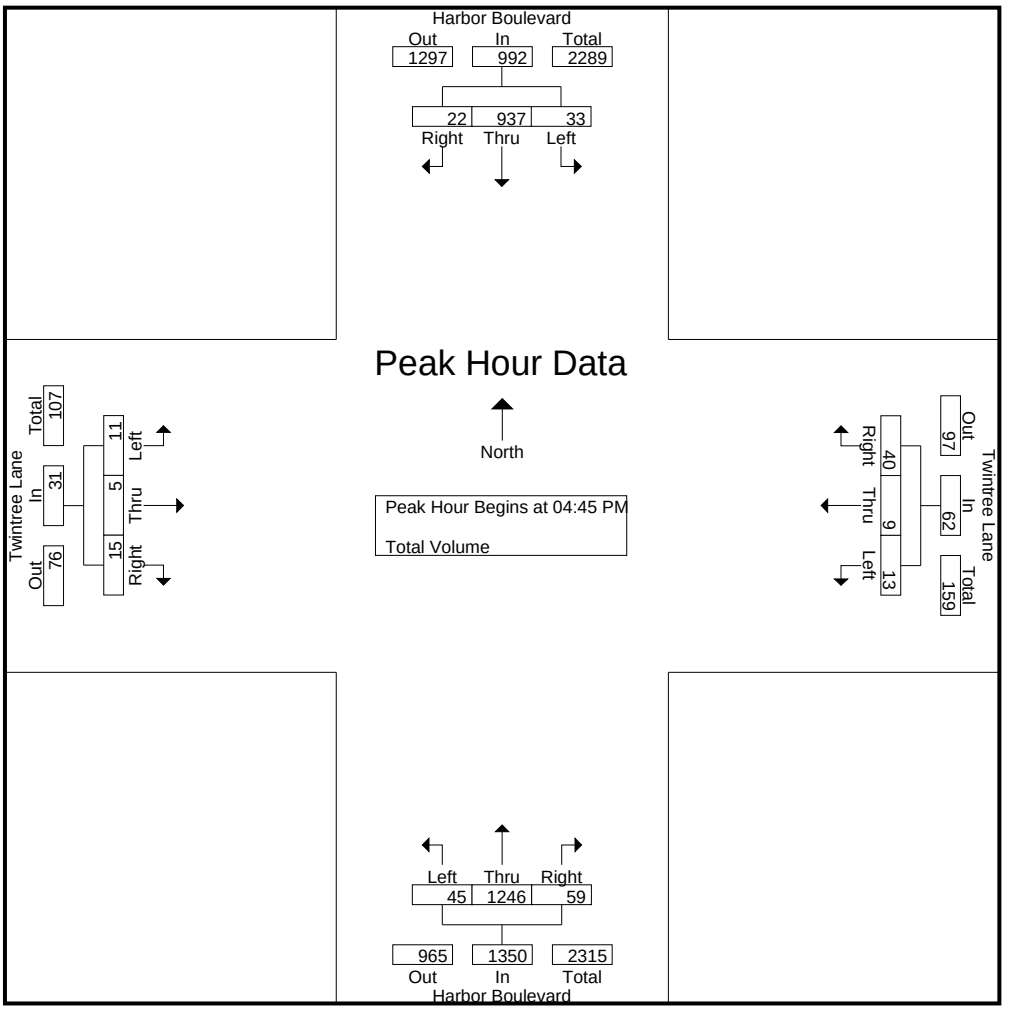
	Harbor Boulevard Southbound				Twintree Lane Westbound				Harbor Boulevard Northbound				Twintree Lane Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	11	193	3	207	1	1	8	10	12	277	14	303	3	0	2	5	525
04:15 PM	9	193	5	207	3	1	9	13	6	322	14	342	3	1	6	10	572
04:30 PM	5	253	8	266	3	2	10	15	8	270	10	288	0	2	3	5	574
04:45 PM	7	227	4	238	6	1	6	13	13	323	15	351	2	1	8	11	613
Total	32	866	20	918	13	5	33	51	39	1192	53	1284	8	4	19	31	2284
05:00 PM	9	229	4	242	4	2	9	15	9	278	15	302	4	1	3	8	567
05:15 PM	9	225	4	238	1	3	13	17	9	322	12	343	2	1	2	5	603
05:30 PM	8	256	10	274	2	3	12	17	14	323	17	354	3	2	2	7	652
05:45 PM	9	205	6	220	5	2	16	23	12	308	17	337	1	1	5	7	587
Total	35	915	24	974	12	10	50	72	44	1231	61	1336	10	5	12	27	2409
Grand Total	67	1781	44	1892	25	15	83	123	83	2423	114	2620	18	9	31	58	4693
Apprch %	3.5	94.1	2.3		20.3	12.2	67.5		3.2	92.5	4.4		31	15.5	53.4		
Total %	1.4	38	0.9	40.3	0.5	0.3	1.8	2.6	1.8	51.6	2.4	55.8	0.4	0.2	0.7	1.2	

	Harbor Boulevard Southbound				Twintree Lane Westbound				Harbor Boulevard Northbound				Twintree Lane Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	7	227	4	238	**6**	1	6	13	13	**323**	15	351	2	1	**8**	**11**	613
05:00 PM	**9**	229	4	242	4	2	9	15	9	278	15	302	**4**	1	3	8	567
05:15 PM	9	225	4	238	1	**3**	**13**	**17**	9	322	12	343	2	1	2	5	603
05:30 PM	8	**256**	**10**	**274**	2	3	12	17	**14**	323	**17**	**354**	3	**2**	2	7	**652**
Total Volume	33	937	22	992	13	9	40	62	45	1246	59	1350	11	5	15	31	2435
% App. Total	3.3	94.5	2.2		21	14.5	64.5		3.3	92.3	4.4		35.5	16.1	48.4		
PHF	.917	.915	.550	.905	.542	.750	.769	.912	.804	.964	.868	.953	.688	.625	.469	.705	.934

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Twintree Lane
Weather: Clear

File Name : GRGHATWPM
Site Code : 10517196
Start Date : 3/28/2017
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				05:00 PM				04:45 PM				04:15 PM			
+0 mins.	7	227	4	238	4	2	9	15	13	**323**	15	351	3	1	6	10
+15 mins.	**9**	229	4	242	1	**3**	13	17	9	278	15	302	0	**2**	3	5
+30 mins.	9	225	4	238	2	3	12	17	9	322	12	343	2	1	**8**	**11**
+45 mins.	8	**256**	**10**	**274**	**5**	2	**16**	**23**	**14**	323	**17**	**354**	**4**	1	3	8
Total Volume	33	937	22	992	12	10	50	72	45	1246	59	1350	9	5	20	34
% App. Total	3.3	94.5	2.2		16.7	13.9	69.4		3.3	92.3	4.4		26.5	14.7	58.8	
PHF	.917	.915	.550	.905	.600	.833	.781	.783	.804	.964	.868	.953	.563	.625	.625	.773

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City of Garden Grove
N/S: West Street
E/W: Lampson Avenue
Weather: Clear

File Name : GRGWELAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

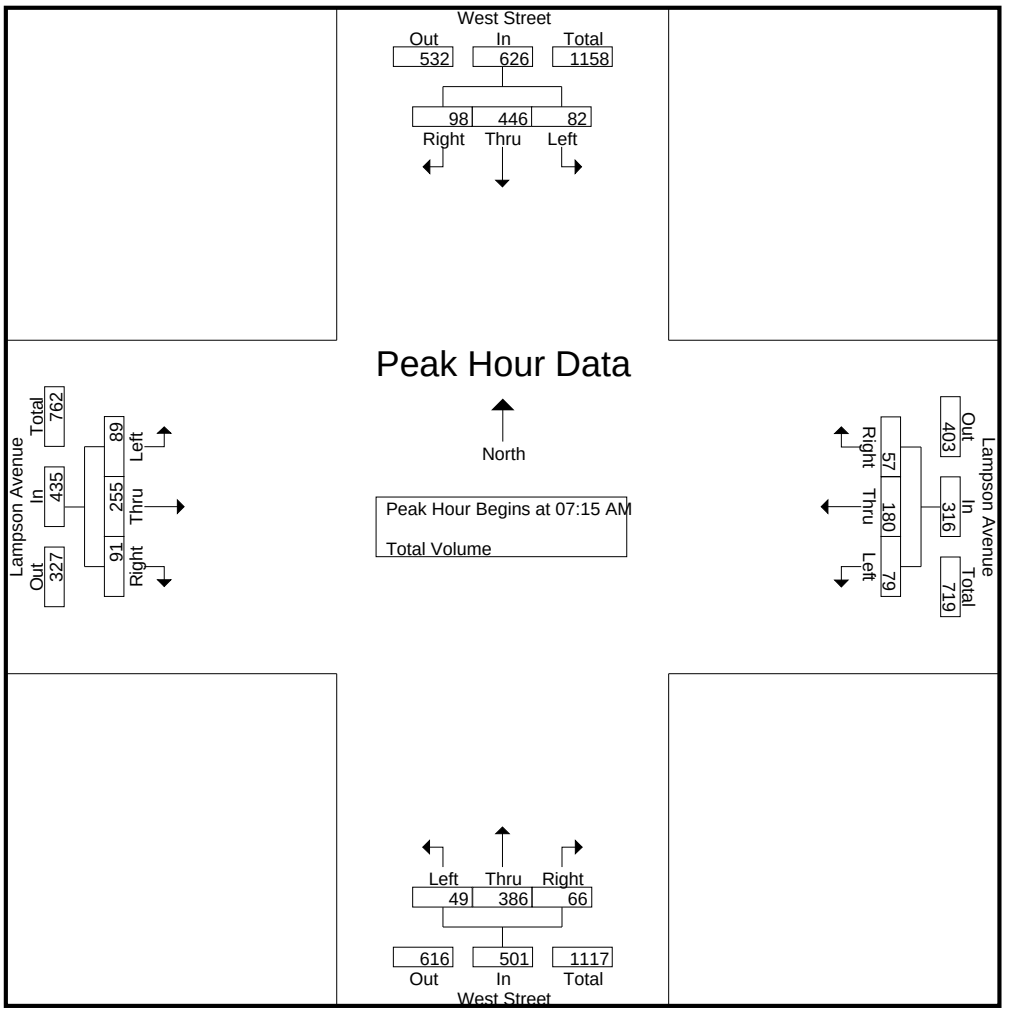
	West Street Southbound				Lampson Avenue Westbound				West Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	8	81	3	92	10	21	4	35	6	64	12	82	7	48	14	69	278
07:15 AM	17	104	19	140	10	30	5	45	8	81	14	103	19	52	13	84	372
07:30 AM	28	121	32	181	22	43	19	84	12	123	12	147	18	67	24	109	521
07:45 AM	21	135	33	189	38	60	24	122	19	94	23	136	26	64	25	115	562
Total	74	441	87	602	80	154	52	286	45	362	61	468	70	231	76	377	1733
08:00 AM	16	86	14	116	9	47	9	65	10	88	17	115	26	72	29	127	423
08:15 AM	15	93	3	111	15	39	12	66	6	57	16	79	6	64	20	90	346
08:30 AM	9	62	5	76	10	28	6	44	5	77	10	92	5	49	18	72	284
08:45 AM	11	65	2	78	18	28	7	53	7	57	13	77	1	48	13	62	270
Total	51	306	24	381	52	142	34	228	28	279	56	363	38	233	80	351	1323
Grand Total	125	747	111	983	132	296	86	514	73	641	117	831	108	464	156	728	3056
Apprch %	12.7	76	11.3		25.7	57.6	16.7		8.8	77.1	14.1		14.8	63.7	21.4		
Total %	4.1	24.4	3.6	32.2	4.3	9.7	2.8	16.8	2.4	21	3.8	27.2	3.5	15.2	5.1	23.8	

	West Street Southbound				Lampson Avenue Westbound				West Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	17	104	19	140	10	30	5	45	8	81	14	103	19	52	13	84	372
07:30 AM	**28**	121	32	181	22	43	19	84	12	**123**	12	**147**	18	67	24	109	521
07:45 AM	21	**135**	**33**	**189**	**38**	**60**	**24**	**122**	**19**	94	**23**	136	**26**	64	25	115	**562**
08:00 AM	16	86	14	116	9	47	9	65	10	88	17	115	26	**72**	**29**	**127**	423
Total Volume	82	446	98	626	79	180	57	316	49	386	66	501	89	255	91	435	1878
% App. Total	13.1	71.2	15.7		25	57	18		9.8	77	13.2		20.5	58.6	20.9		
PHF	.732	.826	.742	.828	.520	.750	.594	.648	.645	.785	.717	.852	.856	.885	.784	.856	.835

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City of Garden Grove
N/S: West Street
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Site Code : 10516364
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:15 AM				07:30 AM			
+0 mins.	17	104	19	140	22	43	19	84	8	81	14	103	18	67	24	109
+15 mins.	**28**	121	32	181	**38**	**60**	**24**	**122**	12	**123**	12	**147**	**26**	64	25	115
+30 mins.	21	**135**	**33**	**189**	9	47	9	65	**19**	94	**23**	136	26	**72**	**29**	**127**
+45 mins.	16	86	14	116	15	39	12	66	10	88	17	115	6	64	20	90
Total Volume	82	446	98	626	84	189	64	337	49	386	66	501	76	267	98	441
% App. Total	13.1	71.2	15.7		24.9	56.1	19		9.8	77	13.2		17.2	60.5	22.2	
PHF	.732	.826	.742	.828	.553	.788	.667	.691	.645	.785	.717	.852	.731	.927	.845	.868

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City of Garden Grove
N/S: West Street
E/W: Lampson Avenue
Weather: Clear

File Name : GRGWELAPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

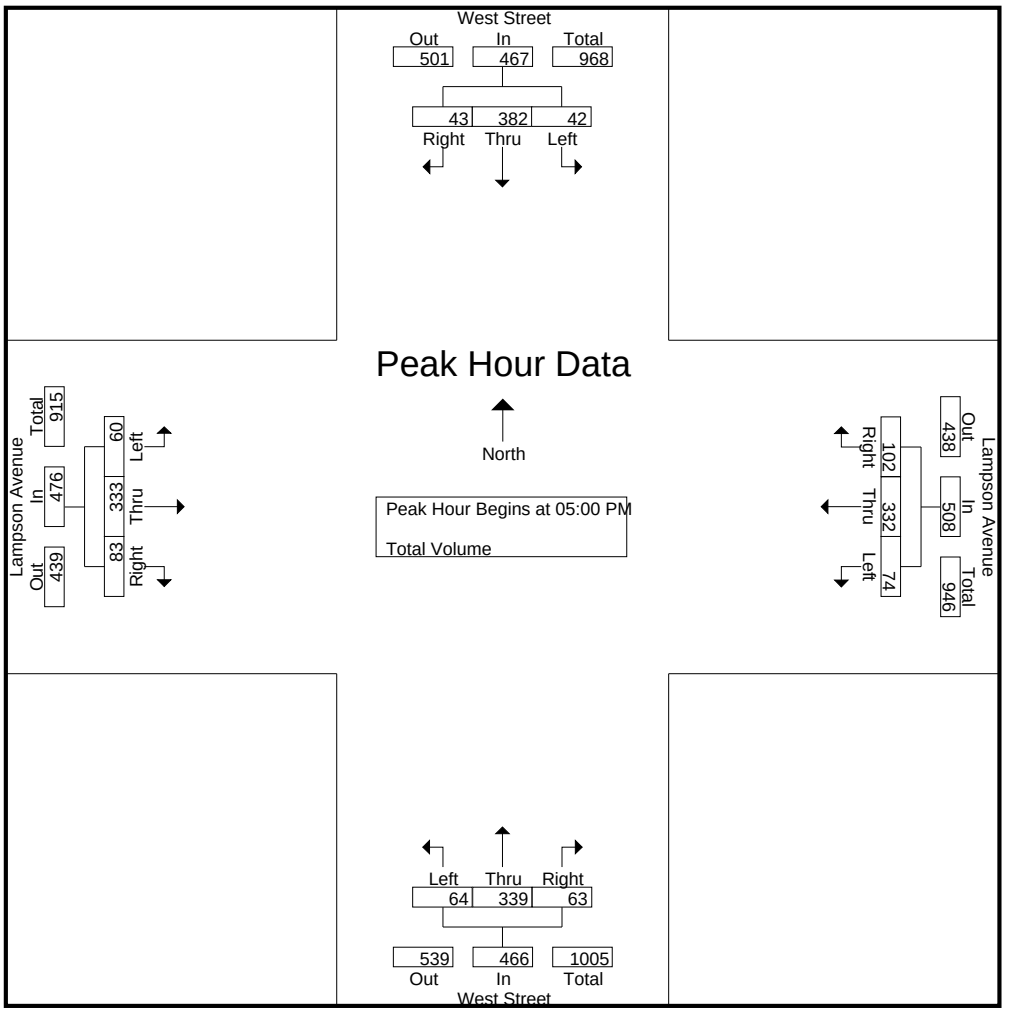
	West Street Southbound				Lampson Avenue Westbound				West Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	6	77	6	89	13	74	13	100	9	96	19	124	3	59	12	74	387
04:15 PM	15	91	6	112	14	69	15	98	6	85	11	102	7	44	15	66	378
04:30 PM	5	95	6	106	15	72	16	103	16	107	14	137	7	60	13	80	426
04:45 PM	7	88	12	107	18	74	17	109	9	85	15	109	18	63	13	94	419
Total	33	351	30	414	60	289	61	410	40	373	59	472	35	226	53	314	1610
05:00 PM	9	108	13	130	24	85	26	135	16	69	12	97	17	81	22	120	482
05:15 PM	7	86	10	103	19	93	26	138	15	92	13	120	11	74	21	106	467
05:30 PM	13	95	10	118	19	80	33	132	14	78	14	106	15	83	18	116	472
05:45 PM	13	93	10	116	12	74	17	103	19	100	24	143	17	95	22	134	496
Total	42	382	43	467	74	332	102	508	64	339	63	466	60	333	83	476	1917
Grand Total	75	733	73	881	134	621	163	918	104	712	122	938	95	559	136	790	3527
Apprch %	8.5	83.2	8.3		14.6	67.6	17.8		11.1	75.9	13		12	70.8	17.2		
Total %	2.1	20.8	2.1	25	3.8	17.6	4.6	26	2.9	20.2	3.5	26.6	2.7	15.8	3.9	22.4	

	West Street Southbound				Lampson Avenue Westbound				West Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	9	**108**	**13**	**130**	**24**	85	26	135	16	69	12	97	**17**	81	**22**	120	482
05:15 PM	7	86	10	103	19	**93**	26	**138**	15	92	13	120	11	74	21	106	467
05:30 PM	**13**	95	10	118	19	80	**33**	132	14	78	14	106	15	83	18	116	472
05:45 PM	13	93	10	116	12	74	17	103	**19**	**100**	**24**	**143**	17	**95**	22	**134**	**496**
Total Volume	42	382	43	467	74	332	102	508	64	339	63	466	60	333	83	476	1917
% App. Total	9	81.8	9.2		14.6	65.4	20.1		13.7	72.7	13.5		12.6	70	17.4		
PHF	.808	.884	.827	.898	.771	.892	.773	.920	.842	.848	.656	.815	.882	.876	.943	.888	.966

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Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	05:00 PM				04:45 PM				04:00 PM				05:00 PM			
+0 mins.	9	**108**	**13**	**130**	18	74	17	109	9	96	**19**	124	**17**	81	**22**	120
+15 mins.	7	86	10	103	**24**	85	26	135	6	85	11	102	11	74	21	106
+30 mins.	**13**	95	10	118	19	**93**	26	**138**	**16**	**107**	14	**137**	15	83	18	116
+45 mins.	13	93	10	116	19	80	**33**	132	9	85	15	109	17	**95**	22	**134**
Total Volume	42	382	43	467	80	332	102	514	40	373	59	472	60	333	83	476
% App. Total	9	81.8	9.2		15.6	64.6	19.8		8.5	79	12.5		12.6	70	17.4	
PHF	.808	.884	.827	.898	.833	.892	.773	.931	.625	.871	.776	.861	.882	.876	.943	.888

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Lampson Avenue
Weather: Clear

File Name : GRGHALAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

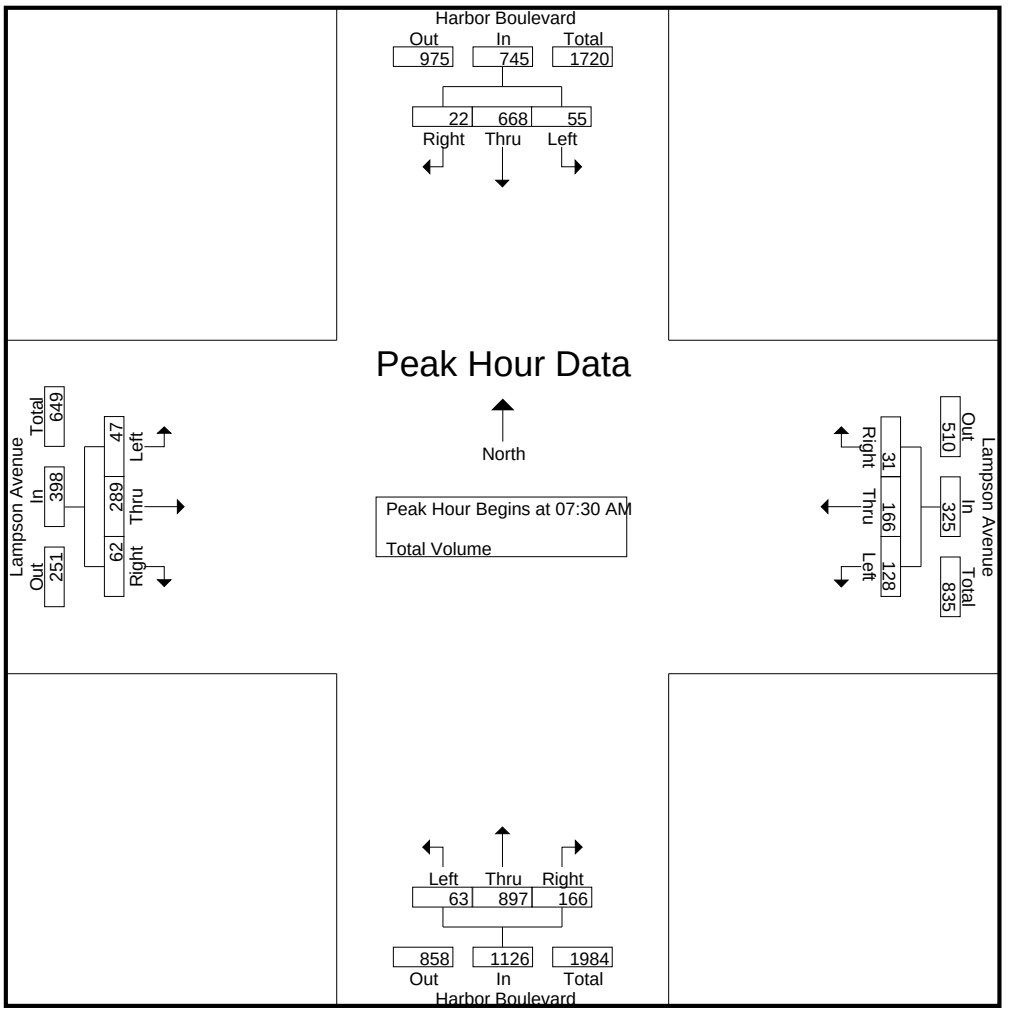
	Harbor Boulevard Southbound				Lampson Avenue Westbound				Harbor Boulevard Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	14	154	3	171	33	23	12	68	12	162	22	196	2	41	13	56	491
07:15 AM	9	166	3	178	32	34	3	69	15	198	19	232	5	74	5	84	563
07:30 AM	17	186	5	208	35	48	5	88	18	219	42	279	12	71	13	96	671
07:45 AM	14	148	5	167	34	45	11	90	18	251	43	312	12	81	17	110	679
Total	54	654	16	724	134	150	31	315	63	830	126	1019	31	267	48	346	2404
08:00 AM	12	177	5	194	30	40	9	79	15	228	38	281	17	73	14	104	658
08:15 AM	12	157	7	176	29	33	6	68	12	199	43	254	6	64	18	88	586
08:30 AM	8	160	3	171	23	27	10	60	6	175	34	215	9	31	11	51	497
08:45 AM	8	129	7	144	28	23	6	57	17	144	30	191	11	42	19	72	464
Total	40	623	22	685	110	123	31	264	50	746	145	941	43	210	62	315	2205
Grand Total	94	1277	38	1409	244	273	62	579	113	1576	271	1960	74	477	110	661	4609
Apprch %	6.7	90.6	2.7		42.1	47.2	10.7		5.8	80.4	13.8		11.2	72.2	16.6		
Total %	2	27.7	0.8	30.6	5.3	5.9	1.3	12.6	2.5	34.2	5.9	42.5	1.6	10.3	2.4	14.3	

	Harbor Boulevard Southbound				Lampson Avenue Westbound				Harbor Boulevard Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	**17**	**186**	5	**208**	**35**	**48**	5	88	**18**	219	42	279	12	71	13	96	671
07:45 AM	14	148	5	167	34	45	**11**	**90**	18	**251**	**43**	**312**	12	**81**	17	**110**	**679**
08:00 AM	12	177	5	194	30	40	9	79	15	228	38	281	**17**	73	14	104	658
08:15 AM	12	157	**7**	176	29	33	6	68	12	199	43	254	6	64	**18**	88	586
Total Volume	55	668	22	745	128	166	31	325	63	897	166	1126	47	289	62	398	2594
% App. Total	7.4	89.7	3		39.4	51.1	9.5		5.6	79.7	14.7		11.8	72.6	15.6		
PHF	.809	.898	.786	.895	.914	.865	.705	.903	.875	.893	.965	.902	.691	.892	.861	.905	.955

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E/W: Lampson Avenue
Weather: Clear

File Name : GRGHALAAM
Site Code : 10516364
Start Date : 6/14/2016



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:15 AM				07:30 AM				07:30 AM			
+0 mins.	9	166	3	178	32	34	3	69	**18**	219	42	279	12	71	13	96
+15 mins.	**17**	**186**	**5**	**208**	**35**	**48**	5	88	18	**251**	**43**	**312**	12	**81**	17	**110**
+30 mins.	14	148	5	167	34	45	**11**	**90**	15	228	38	281	**17**	73	14	104
+45 mins.	12	177	5	194	30	40	9	79	12	199	43	254	6	64	**18**	88
Total Volume	52	677	18	747	131	167	28	326	63	897	166	1126	47	289	62	398
% App. Total	7	90.6	2.4		40.2	51.2	8.6		5.6	79.7	14.7		11.8	72.6	15.6	
PHF	.765	.910	.900	.898	.936	.870	.636	.906	.875	.893	.965	.902	.691	.892	.861	.905

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City of Garden Grove
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Weather: Clear

File Name : GRGHALAPM
Site Code : 10516364
Start Date : 6/14/2016
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Groups Printed- Total Volume

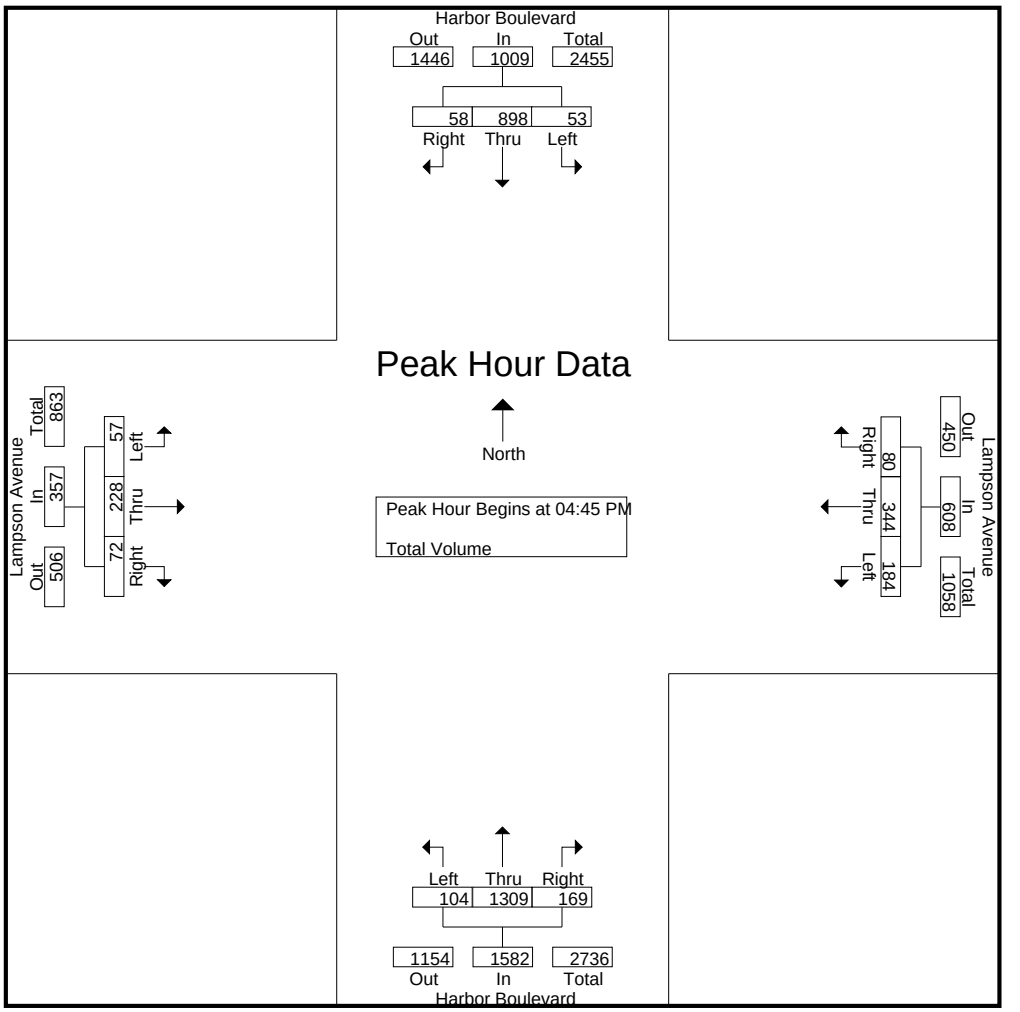
	Harbor Boulevard Southbound				Lampson Avenue Westbound				Harbor Boulevard Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	19	186	10	215	32	60	20	112	19	301	39	359	12	53	12	77	763
04:15 PM	21	229	8	258	43	78	21	142	30	285	38	353	13	33	13	59	812
04:30 PM	18	232	6	256	39	75	16	130	16	290	32	338	9	50	14	73	797
04:45 PM	17	258	18	293	40	79	25	144	30	341	44	415	14	38	13	65	917
Total	75	905	42	1022	154	292	82	528	95	1217	153	1465	48	174	52	274	3289
05:00 PM	11	210	21	242	51	97	19	167	36	334	48	418	19	60	19	98	925
05:15 PM	15	229	11	255	45	84	23	152	23	323	38	384	5	60	22	87	878
05:30 PM	10	201	8	219	48	84	13	145	15	311	39	365	19	70	18	107	836
05:45 PM	14	207	12	233	31	73	22	126	22	342	31	395	18	62	22	102	856
Total	50	847	52	949	175	338	77	590	96	1310	156	1562	61	252	81	394	3495
Grand Total	125	1752	94	1971	329	630	159	1118	191	2527	309	3027	109	426	133	668	6784
Apprch %	6.3	88.9	4.8		29.4	56.4	14.2		6.3	83.5	10.2		16.3	63.8	19.9		
Total %	1.8	25.8	1.4	29.1	4.8	9.3	2.3	16.5	2.8	37.2	4.6	44.6	1.6	6.3	2	9.8	

	Harbor Boulevard Southbound				Lampson Avenue Westbound				Harbor Boulevard Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**17**	**258**	18	**293**	40	79	**25**	144	30	**341**	44	415	14	38	13	65	917
05:00 PM	11	210	**21**	242	**51**	**97**	19	**167**	**36**	334	**48**	**418**	**19**	60	19	98	**925**
05:15 PM	15	229	11	255	45	84	23	152	23	323	38	384	5	60	**22**	87	878
05:30 PM	10	201	8	219	48	84	13	145	15	311	39	365	19	**70**	18	**107**	836
Total Volume	53	898	58	1009	184	344	80	608	104	1309	169	1582	57	228	72	357	3556
% App. Total	5.3	89	5.7		30.3	56.6	13.2		6.6	82.7	10.7		16	63.9	20.2		
PHF	.779	.870	.690	.861	.902	.887	.800	.910	.722	.960	.880	.946	.750	.814	.818	.834	.961

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Lampson Avenue
Weather: Clear

File Name : GRGHALAPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:15 PM				04:45 PM				04:45 PM				05:00 PM			
+0 mins.	**21**	229	8	258	40	79	**25**	144	30	**341**	44	415	**19**	60	19	98
+15 mins.	18	232	6	256	**51**	**97**	19	**167**	**36**	334	**48**	**418**	5	60	**22**	87
+30 mins.	17	**258**	18	**293**	45	84	23	152	23	323	38	384	19	**70**	18	**107**
+45 mins.	11	210	**21**	242	48	84	13	145	15	311	39	365	18	62	22	102
Total Volume	67	929	53	1049	184	344	80	608	104	1309	169	1582	61	252	81	394
% App. Total	6.4	88.6	5.1		30.3	56.6	13.2		6.6	82.7	10.7		15.5	64	20.6	
PHF	.798	.900	.631	.895	.902	.887	.800	.910	.722	.960	.880	.946	.803	.900	.920	.921

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City of Garden Grove
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E/W: Lampson Avenue
Weather: Clear

File Name : GRGHSLAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

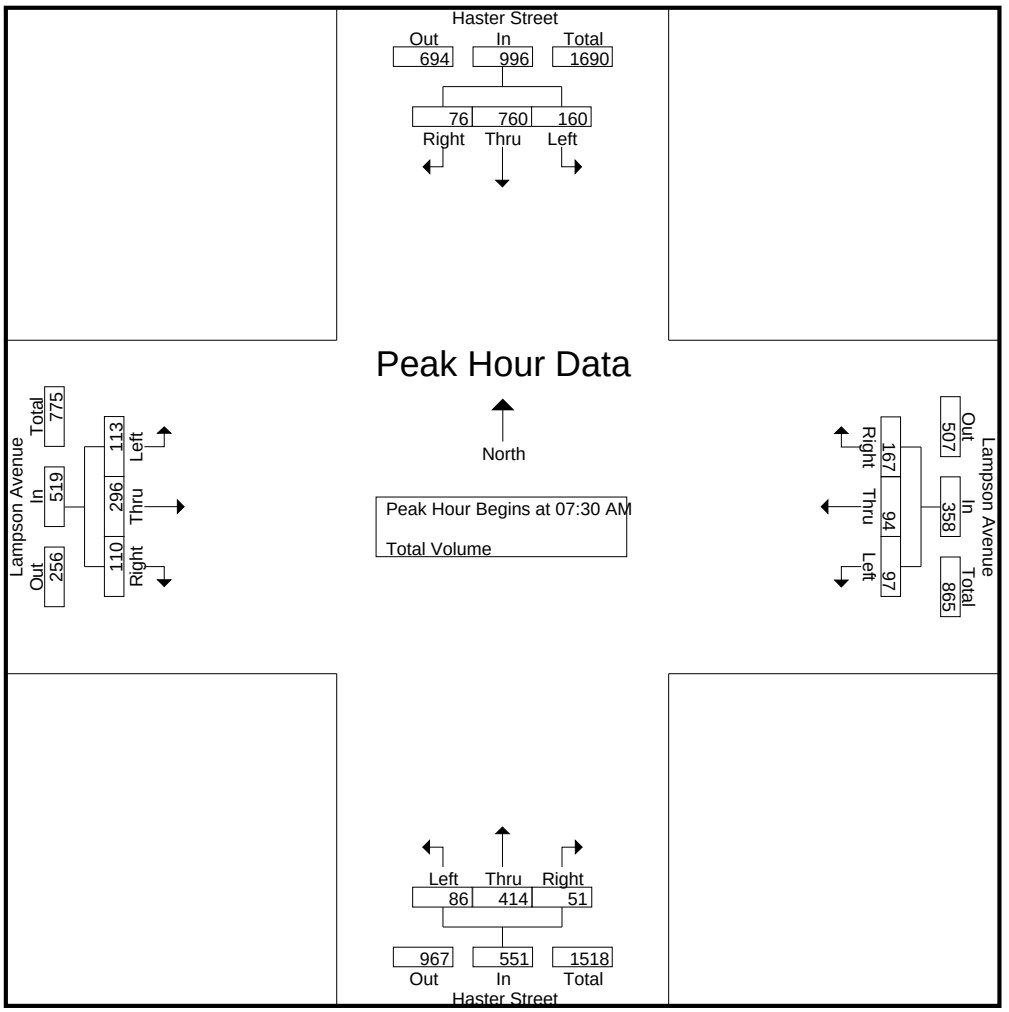
	Haster Street Southbound				Lampson Avenue Westbound				Haster Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	8	149	16	173	17	11	15	43	22	97	13	132	12	64	34	110	458
07:15 AM	28	179	16	223	7	14	12	33	17	97	17	131	18	64	22	104	491
07:30 AM	32	231	18	281	30	24	25	79	24	88	17	129	21	81	33	135	624
07:45 AM	50	190	19	259	20	23	36	79	27	109	16	152	31	75	31	137	627
Total	118	749	69	936	74	72	88	234	90	391	63	544	82	284	120	486	2200
08:00 AM	54	181	20	255	33	26	84	143	25	114	12	151	28	79	22	129	678
08:15 AM	24	158	19	201	14	21	22	57	10	103	6	119	33	61	24	118	495
08:30 AM	15	142	15	172	14	25	20	59	21	103	9	133	18	53	23	94	458
08:45 AM	12	124	16	152	13	8	5	26	17	85	15	117	20	45	15	80	375
Total	105	605	70	780	74	80	131	285	73	405	42	520	99	238	84	421	2006
Grand Total	223	1354	139	1716	148	152	219	519	163	796	105	1064	181	522	204	907	4206
Apprch %	13	78.9	8.1		28.5	29.3	42.2		15.3	74.8	9.9		20	57.6	22.5		
Total %	5.3	32.2	3.3	40.8	3.5	3.6	5.2	12.3	3.9	18.9	2.5	25.3	4.3	12.4	4.9	21.6	

	Haster Street Southbound				Lampson Avenue Westbound				Haster Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	32	**231**	18	**281**	30	24	25	79	24	88	**17**	129	21	**81**	**33**	135	624
07:45 AM	50	190	19	259	20	23	36	79	**27**	109	16	**152**	31	75	31	**137**	627
08:00 AM	**54**	181	**20**	255	**33**	**26**	**84**	**143**	25	**114**	12	151	28	79	22	129	**678**
08:15 AM	24	158	19	201	14	21	22	57	10	103	6	119	**33**	61	24	118	495
Total Volume	160	760	76	996	97	94	167	358	86	414	51	551	113	296	110	519	2424
% App. Total	16.1	76.3	7.6		27.1	26.3	46.6		15.6	75.1	9.3		21.8	57	21.2		
PHF	.741	.823	.950	.886	.735	.904	.497	.626	.796	.908	.750	.906	.856	.914	.833	.947	.894

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City of Garden Grove
N/S: Haster Street
E/W: Lampson Avenue
Weather: Clear

File Name : GRGHSLAAM
Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:15 AM				07:30 AM			
+0 mins.	28	179	16	223	30	24	25	79	17	97	**17**	131	21	**81**	**33**	135
+15 mins.	32	**231**	18	**281**	20	23	36	79	24	88	17	129	31	75	31	**137**
+30 mins.	50	190	19	259	**33**	**26**	**84**	**143**	**27**	109	16	**152**	28	79	22	129
+45 mins.	**54**	181	**20**	255	14	21	22	57	25	**114**	12	151	**33**	61	24	118
Total Volume	164	781	73	1018	97	94	167	358	93	408	62	563	113	296	110	519
% App. Total	16.1	76.7	7.2		27.1	26.3	46.6		16.5	72.5	11		21.8	57	21.2	
PHF	.759	.845	.913	.906	.735	.904	.497	.626	.861	.895	.912	.926	.856	.914	.833	.947

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City of Garden Grove
N/S: Haster Street
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Weather: Clear

File Name : GRGHSLAPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

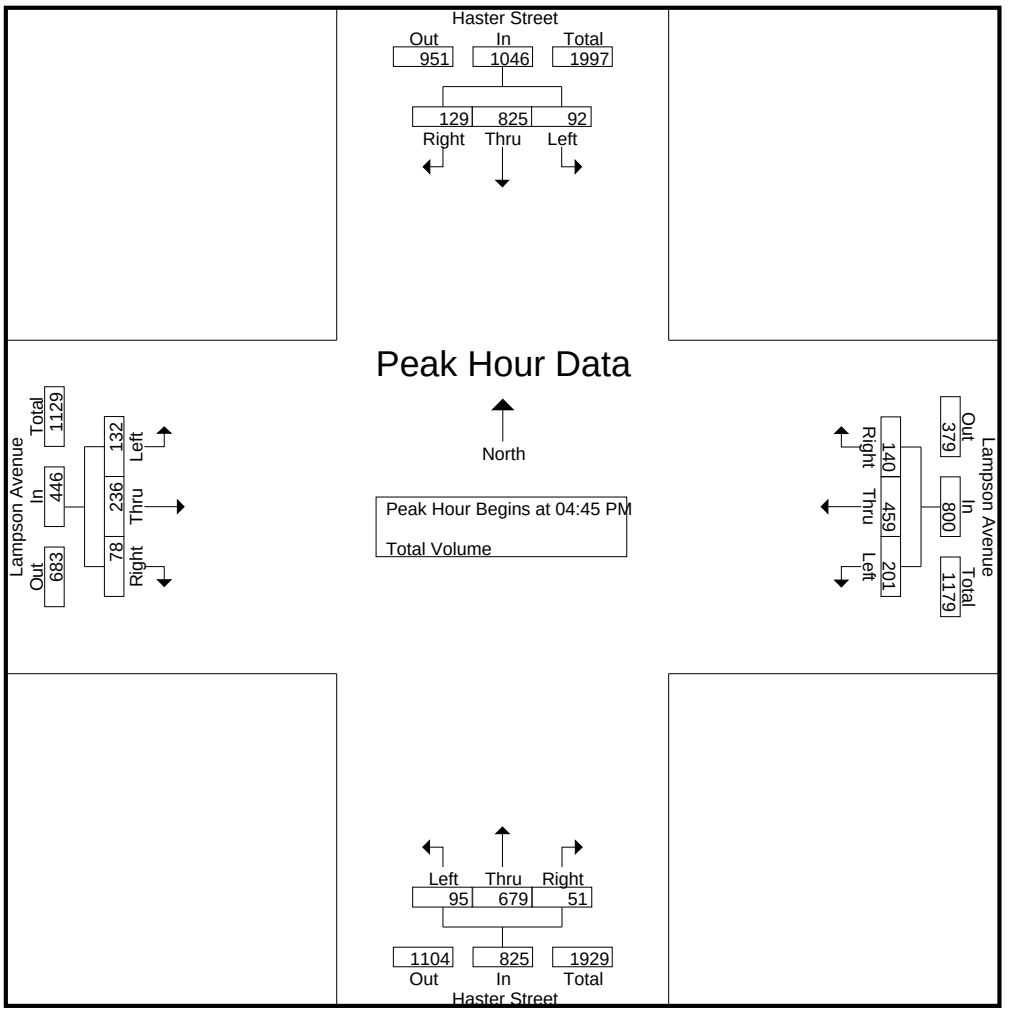
	Haster Street Southbound				Lampson Avenue Westbound				Haster Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	15	171	28	214	21	60	13	94	30	174	14	218	29	46	23	98	624
04:15 PM	18	155	32	205	29	77	13	119	46	166	13	225	33	45	21	99	648
04:30 PM	19	176	37	232	38	69	23	130	29	208	12	249	42	41	25	108	719
04:45 PM	17	181	29	227	32	100	25	157	27	163	18	208	30	45	17	92	684
Total	69	683	126	878	120	306	74	500	132	711	57	900	134	177	86	397	2675
05:00 PM	21	184	34	239	55	123	32	210	19	184	12	215	32	61	17	110	774
05:15 PM	22	224	33	279	69	123	29	221	27	172	9	208	31	57	26	114	822
05:30 PM	32	236	33	301	45	113	54	212	22	160	12	194	39	73	18	130	837
05:45 PM	31	162	31	224	31	90	27	148	21	144	13	178	32	62	21	115	665
Total	106	806	131	1043	200	449	142	791	89	660	46	795	134	253	82	469	3098
Grand Total	175	1489	257	1921	320	755	216	1291	221	1371	103	1695	268	430	168	866	5773
Apprch %	9.1	77.5	13.4		24.8	58.5	16.7		13	80.9	6.1		30.9	49.7	19.4		
Total %	3	25.8	4.5	33.3	5.5	13.1	3.7	22.4	3.8	23.7	1.8	29.4	4.6	7.4	2.9	15	

	Haster Street Southbound				Lampson Avenue Westbound				Haster Street Northbound				Lampson Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	17	181	29	227	32	100	25	157	**27**	163	**18**	208	30	45	17	92	684
05:00 PM	21	184	**34**	239	55	**123**	32	210	19	**184**	12	**215**	32	61	17	110	774
05:15 PM	22	224	33	279	**69**	123	29	**221**	27	172	9	208	31	57	**26**	114	822
05:30 PM	**32**	**236**	33	**301**	45	113	**54**	212	22	160	12	194	**39**	**73**	18	**130**	**837**
Total Volume	92	825	129	1046	201	459	140	800	95	679	51	825	132	236	78	446	3117
% App. Total	8.8	78.9	12.3		25.1	57.4	17.5		11.5	82.3	6.2		29.6	52.9	17.5		
PHF	.719	.874	.949	.869	.728	.933	.648	.905	.880	.923	.708	.959	.846	.808	.750	.858	.931

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Site Code : 10516364
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:45 PM				04:45 PM				04:00 PM				05:00 PM			
+0 mins.	17	181	29	227	32	100	25	157	30	174	14	218	32	61	17	110
+15 mins.	21	184	**34**	239	55	**123**	32	210	**46**	166	13	225	31	57	**26**	114
+30 mins.	22	224	33	279	**69**	123	29	**221**	29	**208**	12	**249**	**39**	**73**	18	**130**
+45 mins.	**32**	**236**	33	**301**	45	113	**54**	212	27	163	**18**	208	32	62	21	115
Total Volume	92	825	129	1046	201	459	140	800	132	711	57	900	134	253	82	469
% App. Total	8.8	78.9	12.3		25.1	57.4	17.5		14.7	79	6.3		28.6	53.9	17.5	
PHF	.719	.874	.949	.869	.728	.933	.648	.905	.717	.855	.792	.904	.859	.866	.788	.902

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Blue Spruce Avenue
Weather: Clear

File Name : 04_GRG_Harbor_Blue Spruce AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

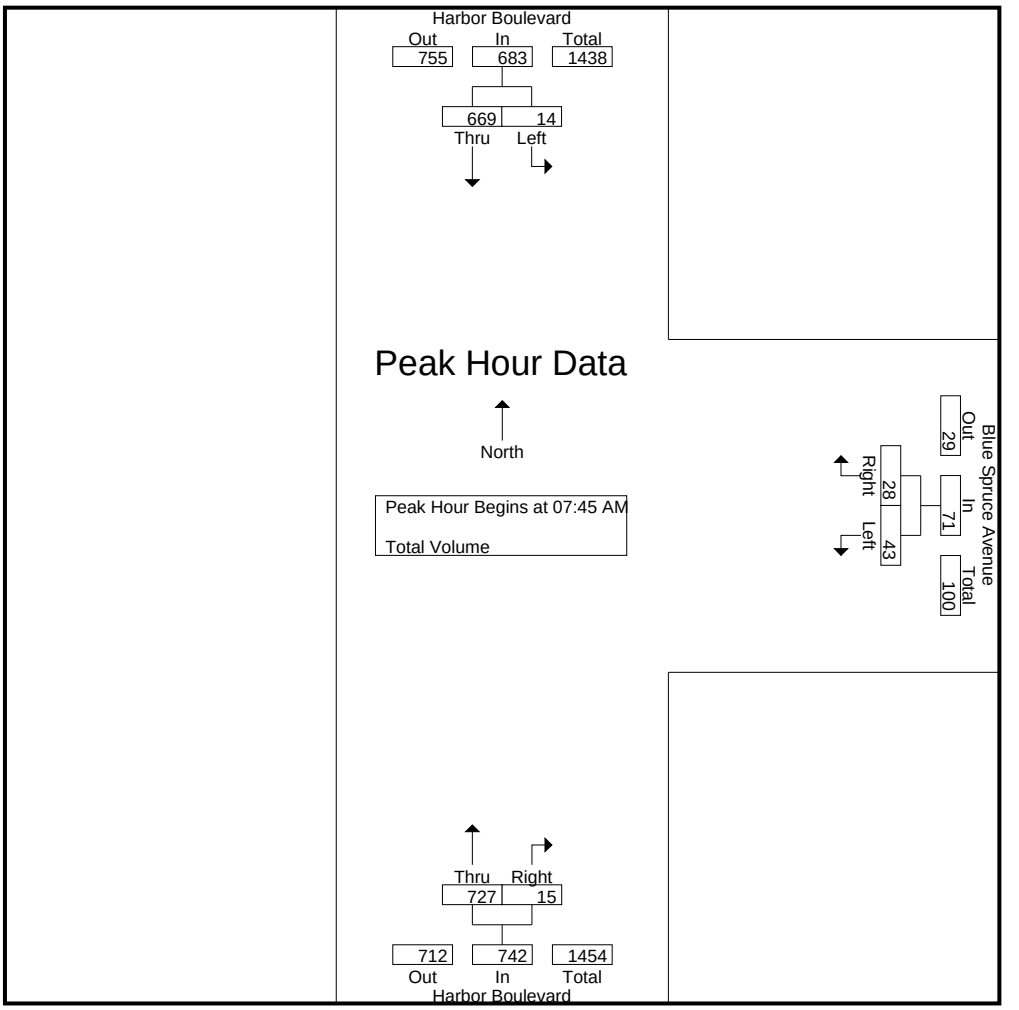
	Harbor Boulevard Southbound			Blue Spruce Avenue Westbound			Harbor Boulevard Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
07:00 AM	2	132	134	5	6	11	139	4	143	288
07:15 AM	3	144	147	5	4	9	156	2	158	314
07:30 AM	2	163	165	8	2	10	182	0	182	357
07:45 AM	4	168	172	10	8	18	188	2	190	380
Total	11	607	618	28	20	48	665	8	673	1339
08:00 AM	3	179	182	13	6	19	183	3	186	387
08:15 AM	4	159	163	8	4	12	179	3	182	357
08:30 AM	3	163	166	12	10	22	177	7	184	372
08:45 AM	1	154	155	10	6	16	187	8	195	366
Total	11	655	666	43	26	69	726	21	747	1482
Grand Total	22	1262	1284	71	46	117	1391	29	1420	2821
Apprch %	1.7	98.3		60.7	39.3		98	2		
Total %	0.8	44.7	45.5	2.5	1.6	4.1	49.3	1	50.3	

	Harbor Boulevard Southbound			Blue Spruce Avenue Westbound			Harbor Boulevard Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	**4**	168	172	10	8	18	**188**	2	**190**	380
08:00 AM	3	**179**	**182**	**13**	6	19	183	3	186	**387**
08:15 AM	4	159	163	8	4	12	179	3	182	357
08:30 AM	3	163	166	12	**10**	**22**	177	**7**	184	372
Total Volume	14	669	683	43	28	71	727	15	742	1496
% App. Total	2	98		60.6	39.4		98	2		
PHF	.875	.934	.938	.827	.700	.807	.967	.536	.976	.966

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City of Garden Grove
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Weather: Clear

File Name : 04_GRG_Harbor_Blue Spruce AM
Site Code : 10521348
Start Date : 7/14/2021
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM			07:45 AM			08:00 AM		
+0 mins.	**4**	168	172	10	8	18	183	3	186
+15 mins.	3	**179**	**182**	**13**	6	19	179	3	182
+30 mins.	4	159	163	8	4	12	177	7	184
+45 mins.	3	163	166	12	**10**	**22**	**187**	**8**	**195**
Total Volume	14	669	683	43	28	71	726	21	747
% App. Total	2	98		60.6	39.4		97.2	2.8	
PHF	.875	.934	.938	.827	.700	.807	.971	.656	.958

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City of Garden Grove
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Weather: Clear

File Name : 04_GRG_Harbor_Blue Spruce PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

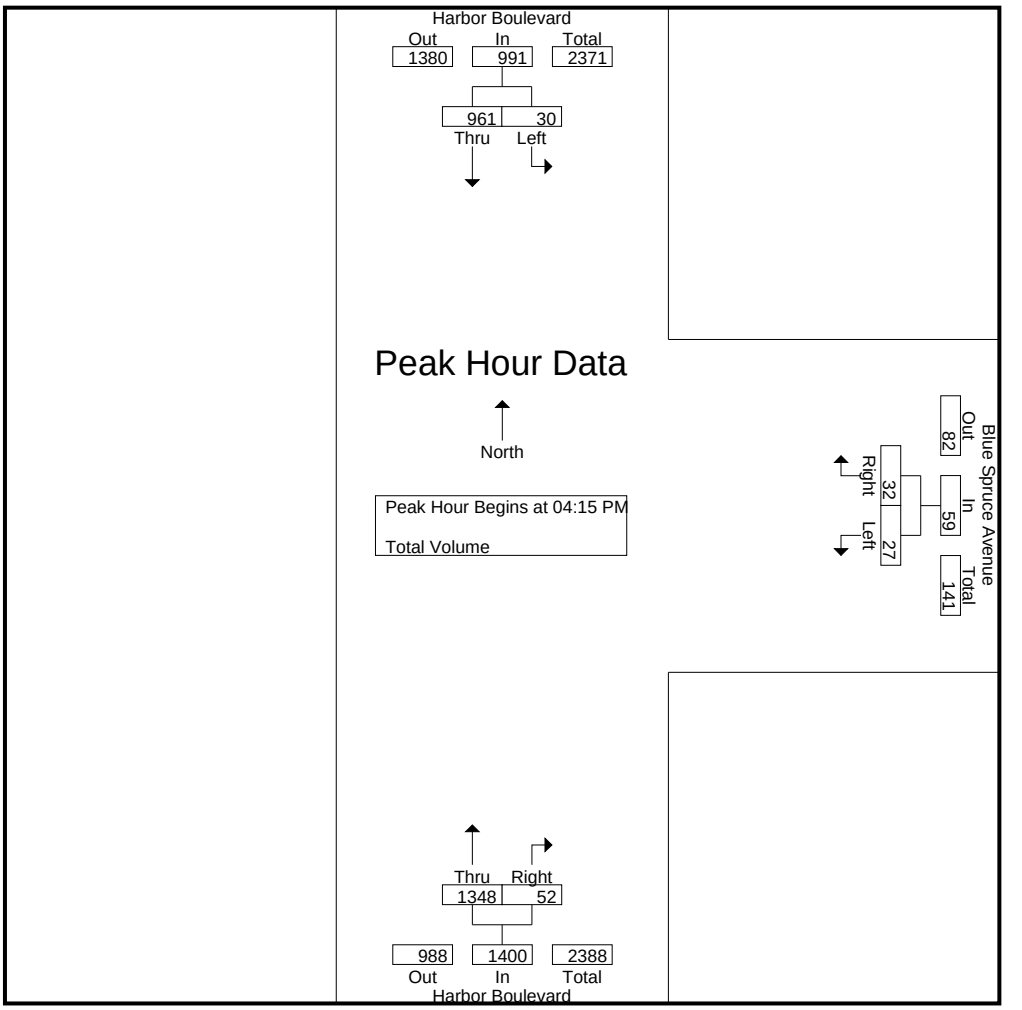
	Harbor Boulevard Southbound			Blue Spruce Avenue Westbound			Harbor Boulevard Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
04:00 PM	8	231	239	4	5	9	296	13	309	557
04:15 PM	8	230	238	8	7	15	353	12	365	618
04:30 PM	3	261	264	8	6	14	284	10	294	572
04:45 PM	7	225	232	6	10	16	340	18	358	606
Total	26	947	973	26	28	54	1273	53	1326	2353
05:00 PM	12	245	257	5	9	14	371	12	383	654
05:15 PM	8	240	248	4	8	12	296	18	314	574
05:30 PM	7	213	220	7	9	16	333	19	352	588
05:45 PM	8	217	225	8	7	15	273	14	287	527
Total	35	915	950	24	33	57	1273	63	1336	2343
Grand Total	61	1862	1923	50	61	111	2546	116	2662	4696
Apprch %	3.2	96.8		45	55		95.6	4.4		
Total %	1.3	39.7	40.9	1.1	1.3	2.4	54.2	2.5	56.7	

	Harbor Boulevard Southbound			Blue Spruce Avenue Westbound			Harbor Boulevard Northbound			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	8	230	238	**8**	7	15	353	12	365	618
04:30 PM	3	**261**	**264**	8	6	14	284	10	294	572
04:45 PM	7	225	232	6	**10**	**16**	340	**18**	358	606
05:00 PM	**12**	245	257	5	9	14	**371**	12	**383**	**654**
Total Volume	30	961	991	27	32	59	1348	52	1400	2450
% App. Total	3	97		45.8	54.2		96.3	3.7		
PHF	.625	.920	.938	.844	.800	.922	.908	.722	.914	.937

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Weather: Clear

File Name : 04_GRG_Harbor_Blue Spruce PM
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM			04:15 PM			04:45 PM		
+0 mins.	3	**261**	**264**	**8**	7	15	340	18	358
+15 mins.	7	225	232	8	6	14	**371**	12	**383**
+30 mins.	**12**	245	257	6	**10**	**16**	296	18	314
+45 mins.	8	240	248	5	9	14	333	**19**	352
Total Volume	30	971	1001	27	32	59	1340	67	1407
% App. Total	3	97		45.8	54.2		95.2	4.8	
PHF	.625	.930	.948	.844	.800	.922	.903	.882	.918

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Palm Street
Weather: Clear

File Name : 05_GRG_Harbor_Palm AM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 1

Groups Printed- Total Volume

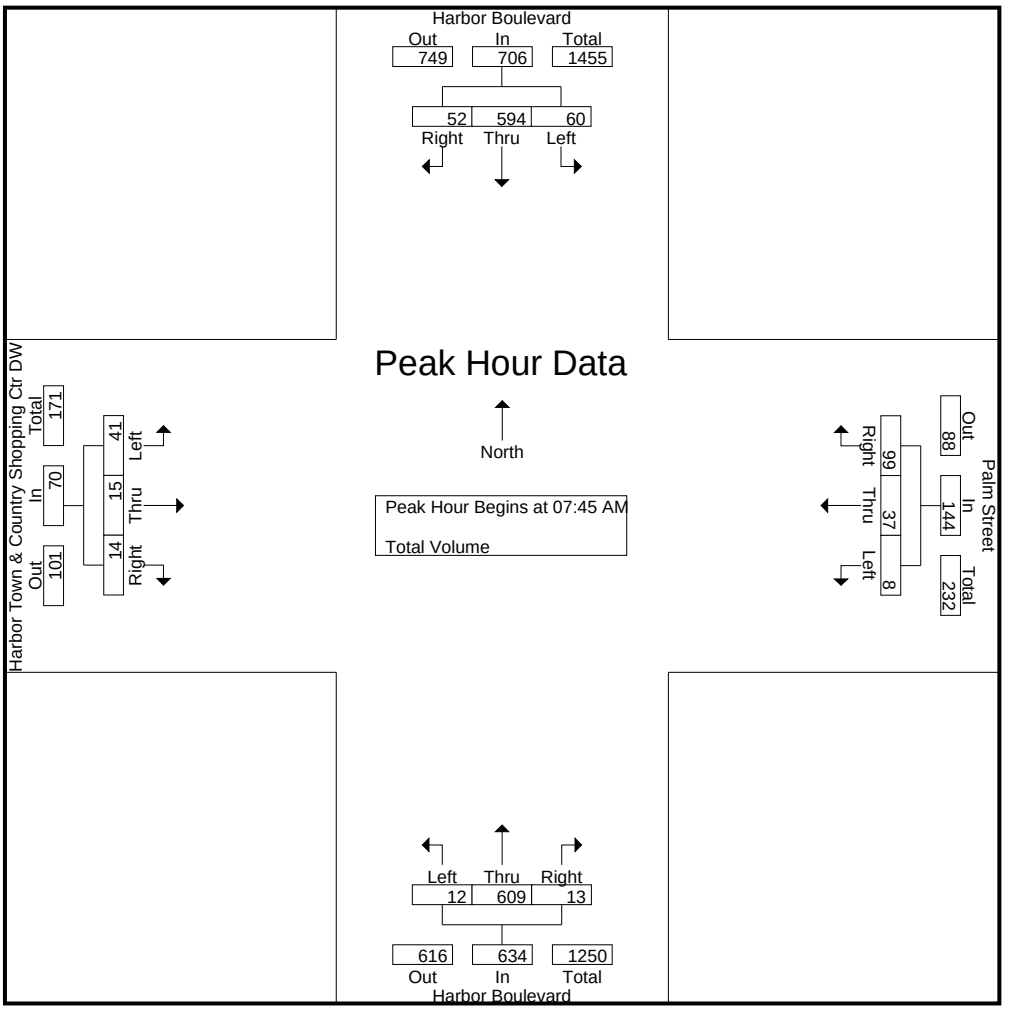
	Harbor Boulevard Southbound				Palm Street Westbound				Harbor Boulevard Northbound				Harbor Town & Country Shopping Ctr DW Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	6	118	13	137	2	7	21	30	1	120	4	125	5	4	4	13	305
07:15 AM	10	131	5	146	0	8	17	25	1	136	0	137	2	0	1	3	311
07:30 AM	13	144	9	166	3	7	19	29	1	151	2	154	8	2	2	12	361
07:45 AM	21	142	14	177	2	8	32	42	3	152	2	157	10	3	2	15	391
Total	50	535	41	626	7	30	89	126	6	559	8	573	25	9	9	43	1368
08:00 AM	15	160	11	186	1	12	22	35	5	150	1	156	9	4	5	18	395
08:15 AM	12	143	12	167	1	7	27	35	4	148	5	157	9	5	6	20	379
08:30 AM	12	149	15	176	4	10	18	32	0	159	5	164	13	3	1	17	389
08:45 AM	11	137	12	160	3	10	20	33	4	157	1	162	11	1	2	14	369
Total	50	589	50	689	9	39	87	135	13	614	12	639	42	13	14	69	1532
Grand Total	100	1124	91	1315	16	69	176	261	19	1173	20	1212	67	22	23	112	2900
Apprch %	7.6	85.5	6.9		6.1	26.4	67.4		1.6	96.8	1.7		59.8	19.6	20.5		
Total %	3.4	38.8	3.1	45.3	0.6	2.4	6.1	9	0.7	40.4	0.7	41.8	2.3	0.8	0.8	3.9	

	Harbor Boulevard Southbound				Palm Street Westbound				Harbor Boulevard Northbound				Harbor Town & Country Shopping Ctr DW Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	**21**	142	14	177	2	8	**32**	**42**	3	152	2	157	10	3	2	15	391
08:00 AM	15	**160**	11	**186**	1	**12**	22	35	**5**	150	1	156	9	4	5	18	**395**
08:15 AM	12	143	12	167	1	7	27	35	4	148	**5**	157	9	**5**	**6**	**20**	379
08:30 AM	12	149	**15**	176	**4**	10	18	32	0	**159**	5	**164**	**13**	3	1	17	389
Total Volume	60	594	52	706	8	37	99	144	12	609	13	634	41	15	14	70	1554
% App. Total	8.5	84.1	7.4		5.6	25.7	68.8		1.9	96.1	2.1		58.6	21.4	20		
PHF	.714	.928	.867	.949	.500	.771	.773	.857	.600	.958	.650	.966	.788	.750	.583	.875	.984

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Site Code : 10521348
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:45 AM				07:45 AM				08:00 AM				07:45 AM			
+0 mins.	**21**	142	14	177	2	8	**32**	**42**	**5**	150	1	156	10	3	2	15
+15 mins.	15	**160**	11	**186**	1	**12**	22	35	4	148	**5**	157	9	4	5	18
+30 mins.	12	143	12	167	1	7	27	35	0	**159**	5	**164**	9	**5**	**6**	**20**
+45 mins.	12	149	**15**	176	**4**	10	18	32	4	157	1	162	**13**	3	1	17
Total Volume	60	594	52	706	8	37	99	144	13	614	12	639	41	15	14	70
% App. Total	8.5	84.1	7.4		5.6	25.7	68.8		2	96.1	1.9		58.6	21.4	20	
PHF	.714	.928	.867	.949	.500	.771	.773	.857	.650	.965	.600	.974	.788	.750	.583	.875

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City of Garden Grove
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File Name : 05_GRG_Harbor_Palm PM
Site Code : 10521348
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Groups Printed- Total Volume

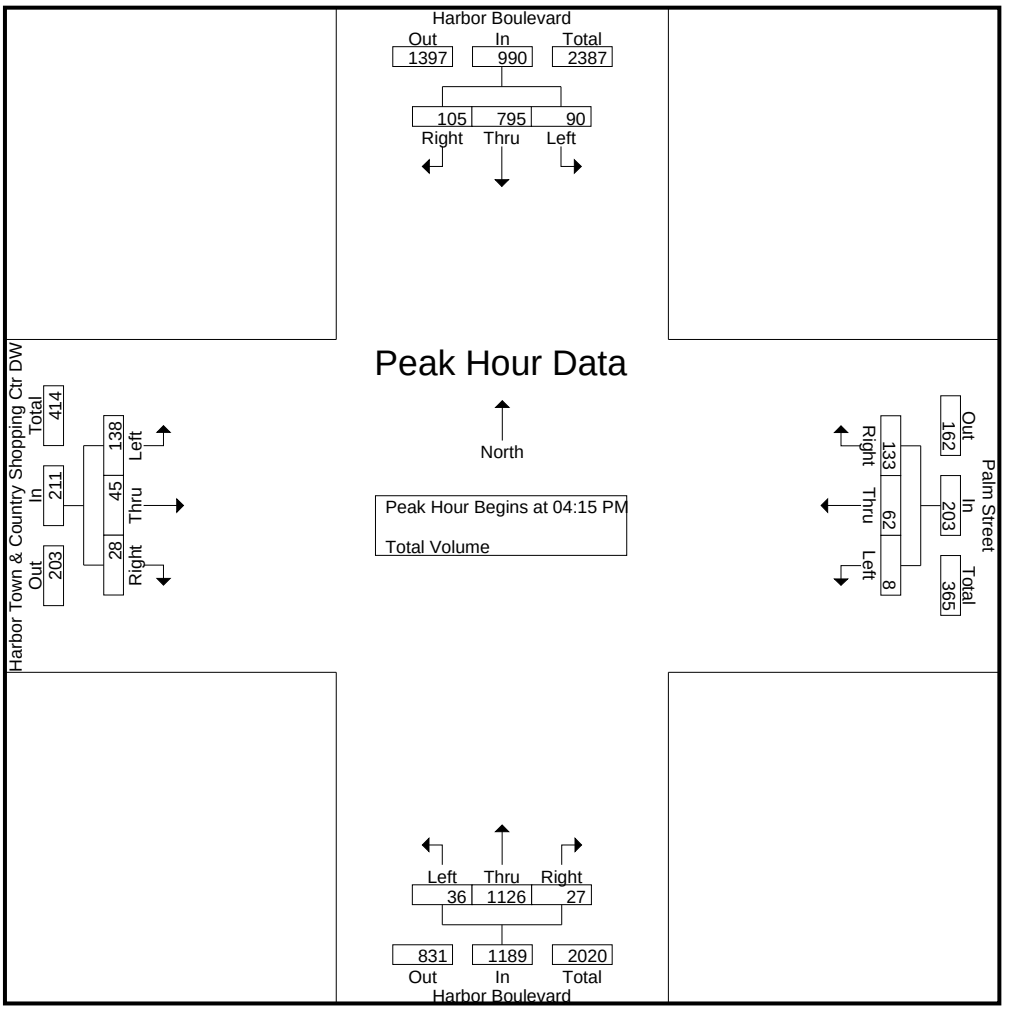
	Harbor Boulevard Southbound				Palm Street Westbound				Harbor Boulevard Northbound				Harbor Town & Country Shopping Ctr DW Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	21	186	27	234	2	17	35	54	7	254	9	270	24	11	13	48	606
04:15 PM	20	191	29	240	3	18	34	55	11	286	5	302	36	13	7	56	653
04:30 PM	25	204	29	258	2	22	26	50	7	247	4	258	27	16	5	48	614
04:45 PM	16	208	29	253	2	10	32	44	6	289	5	300	39	9	11	59	656
Total	82	789	114	985	9	67	127	203	31	1076	23	1130	126	49	36	211	2529
05:00 PM	29	192	18	239	1	12	41	54	12	304	13	329	36	7	5	48	670
05:15 PM	15	217	16	248	1	13	33	47	6	257	2	265	24	11	5	40	600
05:30 PM	27	166	21	214	4	13	32	49	5	291	8	304	28	11	9	48	615
05:45 PM	29	186	17	232	1	11	40	52	1	219	5	225	30	5	10	45	554
Total	100	761	72	933	7	49	146	202	24	1071	28	1123	118	34	29	181	2439
Grand Total	182	1550	186	1918	16	116	273	405	55	2147	51	2253	244	83	65	392	4968
Apprch %	9.5	80.8	9.7		4	28.6	67.4		2.4	95.3	2.3		62.2	21.2	16.6		
Total %	3.7	31.2	3.7	38.6	0.3	2.3	5.5	8.2	1.1	43.2	1	45.4	4.9	1.7	1.3	7.9	

	Harbor Boulevard Southbound				Palm Street Westbound				Harbor Boulevard Northbound				Harbor Town & Country Shopping Ctr DW Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	20	191	**29**	240	**3**	18	34	**55**	11	286	5	302	36	13	7	56	653
04:30 PM	25	204	29	**258**	2	**22**	26	50	7	247	4	258	27	**16**	5	48	614
04:45 PM	16	**208**	29	253	2	10	32	44	6	289	5	300	**39**	9	**11**	**59**	656
05:00 PM	**29**	192	18	239	1	12	**41**	54	**12**	**304**	**13**	**329**	36	7	5	48	**670**
Total Volume	90	795	105	990	8	62	133	203	36	1126	27	1189	138	45	28	211	2593
% App. Total	9.1	80.3	10.6		3.9	30.5	65.5		3	94.7	2.3		65.4	21.3	13.3		
PHF	.776	.956	.905	.959	.667	.705	.811	.923	.750	.926	.519	.903	.885	.703	.636	.894	.968

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Palm Street
Weather: Clear

File Name : 05_GRG_Harbor_Palm PM
Site Code : 10521348
Start Date : 7/14/2021
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:00 PM				04:45 PM				04:00 PM			
+0 mins.	25	204	**29**	**258**	2	17	**35**	54	6	289	5	300	24	11	**13**	48
+15 mins.	16	208	29	253	**3**	18	34	**55**	**12**	**304**	**13**	**329**	36	13	7	56
+30 mins.	**29**	192	18	239	2	**22**	26	50	6	257	2	265	27	**16**	5	48
+45 mins.	15	**217**	16	248	2	10	32	44	5	291	8	304	**39**	9	11	**59**
Total Volume	85	821	92	998	9	67	127	203	29	1141	28	1198	126	49	36	211
% App. Total	8.5	82.3	9.2		4.4	33	62.6		2.4	95.2	2.3		59.7	23.2	17.1	
PHF	.733	.946	.793	.967	.750	.761	.907	.923	.604	.938	.538	.910	.808	.766	.692	.894

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Garden Grove Boulevard
Weather: Clear

File Name : GRGHAGAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

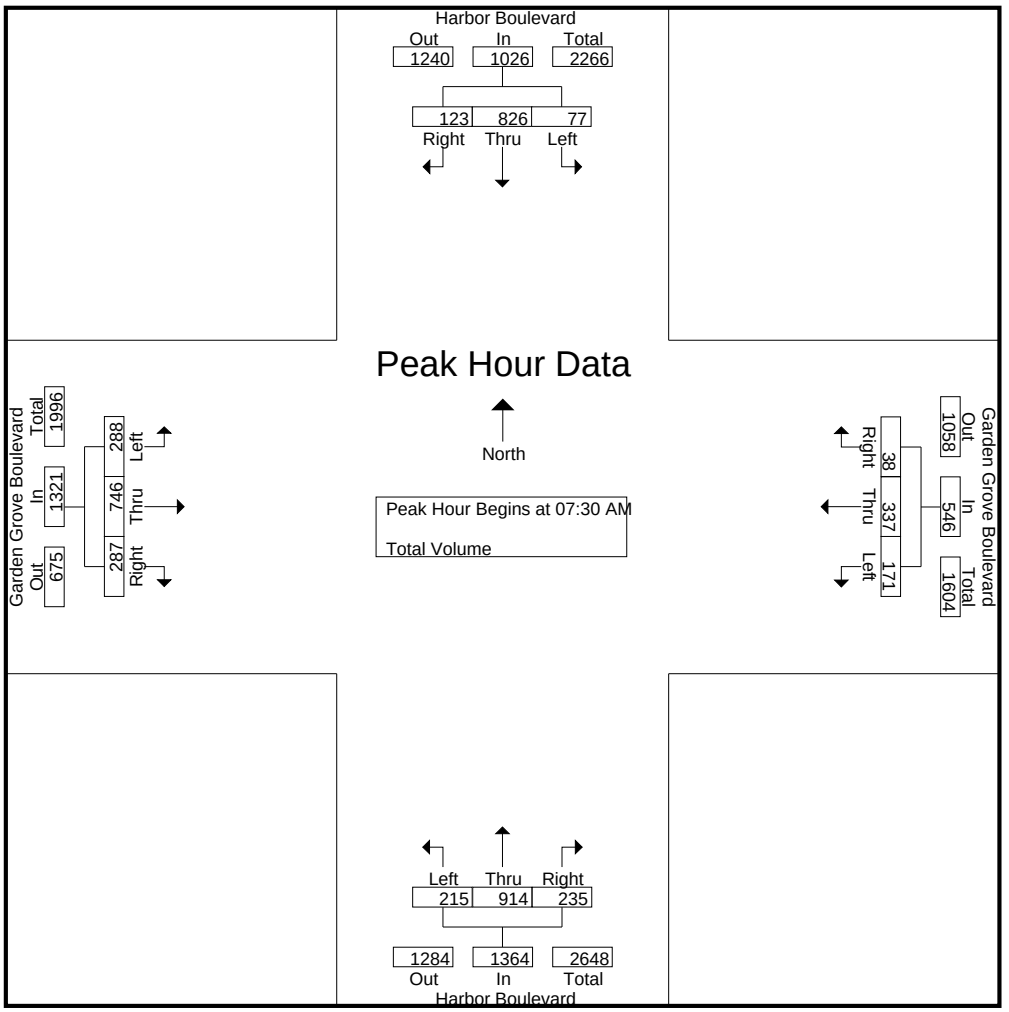
	Harbor Boulevard Southbound				Garden Grove Boulevard Westbound				Harbor Boulevard Northbound				Garden Grove Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	10	162	26	198	30	52	4	86	45	141	26	212	37	143	51	231	727
07:15 AM	18	204	25	247	40	67	4	111	48	182	28	258	36	128	71	235	851
07:30 AM	12	239	26	277	61	97	8	166	55	205	44	304	45	194	77	316	1063
07:45 AM	27	222	38	287	45	104	13	162	55	252	57	364	96	192	79	367	1180
Total	67	827	115	1009	176	320	29	525	203	780	155	1138	214	657	278	1149	3821
08:00 AM	14	187	24	225	35	65	7	107	61	268	72	401	76	167	65	308	1041
08:15 AM	24	178	35	237	30	71	10	111	44	189	62	295	71	193	66	330	973
08:30 AM	23	175	26	224	31	70	10	111	44	181	53	278	53	152	48	253	866
08:45 AM	25	152	27	204	32	66	8	106	50	162	41	253	40	149	50	239	802
Total	86	692	112	890	128	272	35	435	199	800	228	1227	240	661	229	1130	3682
Grand Total	153	1519	227	1899	304	592	64	960	402	1580	383	2365	454	1318	507	2279	7503
Apprch %	8.1	80	12		31.7	61.7	6.7		17	66.8	16.2		19.9	57.8	22.2		
Total %	2	20.2	3	25.3	4.1	7.9	0.9	12.8	5.4	21.1	5.1	31.5	6.1	17.6	6.8	30.4	

	Harbor Boulevard Southbound				Garden Grove Boulevard Westbound				Harbor Boulevard Northbound				Garden Grove Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	12	**239**	26	277	**61**	97	8	**166**	55	205	44	304	45	**194**	77	316	1063
07:45 AM	**27**	222	**38**	**287**	45	**104**	**13**	162	55	252	57	364	**96**	192	**79**	**367**	**1180**
08:00 AM	14	187	24	225	35	65	7	107	**61**	**268**	**72**	**401**	76	167	65	308	1041
08:15 AM	24	178	35	237	30	71	10	111	44	189	62	295	71	193	66	330	973
Total Volume	77	826	123	1026	171	337	38	546	215	914	235	1364	288	746	287	1321	4257
% App. Total	7.5	80.5	12		31.3	61.7	7		15.8	67	17.2		21.8	56.5	21.7		
PHF	.713	.864	.809	.894	.701	.810	.731	.822	.881	.853	.816	.850	.750	.961	.908	.900	.902

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Garden Grove Boulevard
Weather: Clear

File Name : GRGHAGAAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:15 AM				07:30 AM				07:30 AM			
+0 mins.	18	204	25	247	40	67	4	111	55	205	44	304	45	**194**	77	316
+15 mins.	12	**239**	26	277	**61**	97	8	**166**	55	252	57	364	**96**	192	**79**	**367**
+30 mins.	**27**	222	**38**	**287**	45	**104**	**13**	162	**61**	**268**	**72**	**401**	76	167	65	308
+45 mins.	14	187	24	225	35	65	7	107	44	189	62	295	71	193	66	330
Total Volume	71	852	113	1036	181	333	32	546	215	914	235	1364	288	746	287	1321
% App. Total	6.9	82.2	10.9		33.2	61	5.9		15.8	67	17.2		21.8	56.5	21.7	
PHF	.657	.891	.743	.902	.742	.800	.615	.822	.881	.853	.816	.850	.750	.961	.908	.900

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Garden Grove Boulevard
Weather: Clear

File Name : GRGHAGAPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

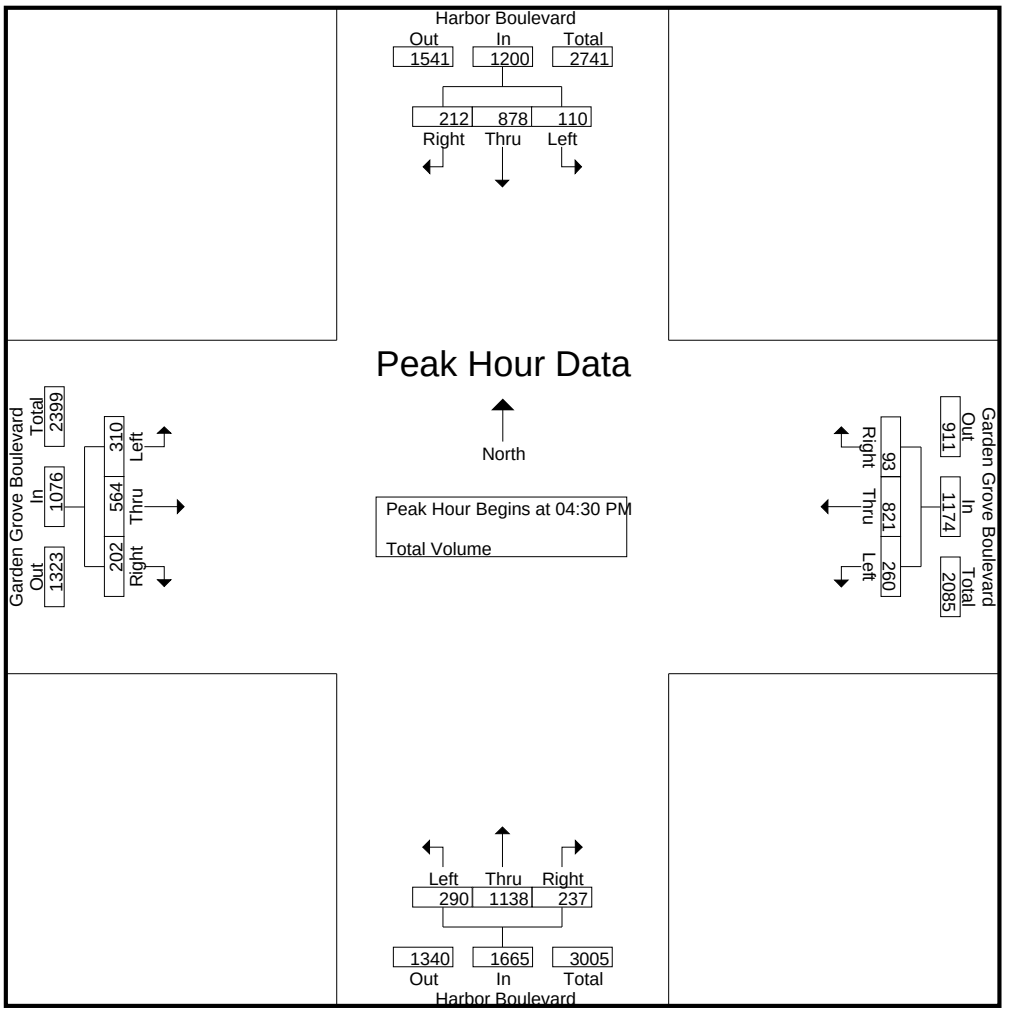
	Harbor Boulevard Southbound				Garden Grove Boulevard Westbound				Harbor Boulevard Northbound				Garden Grove Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	31	183	48	262	47	166	30	243	66	271	62	399	68	168	49	285	1189
04:15 PM	29	216	50	295	60	149	23	232	76	289	49	414	83	148	54	285	1226
04:30 PM	25	205	57	287	62	203	30	295	69	276	67	412	91	160	71	322	1316
04:45 PM	31	222	59	312	64	214	23	301	75	280	60	415	89	132	44	265	1293
Total	116	826	214	1156	233	732	106	1071	286	1116	238	1640	331	608	218	1157	5024
05:00 PM	29	215	48	292	61	198	18	277	75	307	54	436	57	141	45	243	1248
05:15 PM	25	236	48	309	73	206	22	301	71	275	56	402	73	131	42	246	1258
05:30 PM	22	195	46	263	57	174	26	257	81	300	59	440	82	154	50	286	1246
05:45 PM	32	223	58	313	61	197	18	276	67	283	94	444	65	137	46	248	1281
Total	108	869	200	1177	252	775	84	1111	294	1165	263	1722	277	563	183	1023	5033
Grand Total	224	1695	414	2333	485	1507	190	2182	580	2281	501	3362	608	1171	401	2180	10057
Apprch %	9.6	72.7	17.7		22.2	69.1	8.7		17.3	67.8	14.9		27.9	53.7	18.4		
Total %	2.2	16.9	4.1	23.2	4.8	15	1.9	21.7	5.8	22.7	5	33.4	6	11.6	4	21.7	

	Harbor Boulevard Southbound				Garden Grove Boulevard Westbound				Harbor Boulevard Northbound				Garden Grove Boulevard Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	25	205	57	287	62	203	**30**	295	69	276	**67**	412	**91**	**160**	**71**	**322**	**1316**
04:45 PM	**31**	222	**59**	**312**	64	**214**	23	**301**	**75**	280	60	415	89	132	44	265	1293
05:00 PM	29	215	48	292	61	198	18	277	75	**307**	54	**436**	57	141	45	243	1248
05:15 PM	25	**236**	48	309	**73**	206	22	301	71	275	56	402	73	131	42	246	1258
Total Volume	110	878	212	1200	260	821	93	1174	290	1138	237	1665	310	564	202	1076	5115
% App. Total	9.2	73.2	17.7		22.1	69.9	7.9		17.4	68.3	14.2		28.8	52.4	18.8		
PHF	.887	.930	.898	.962	.890	.959	.775	.975	.967	.927	.884	.955	.852	.881	.711	.835	.972

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Garden Grove Boulevard
Weather: Clear

File Name : GRGHAGAPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:30 PM				04:30 PM				05:00 PM				04:00 PM			
+0 mins.	25	205	57	287	62	203	**30**	295	75	**307**	54	436	68	**168**	49	285
+15 mins.	**31**	222	**59**	**312**	64	**214**	23	**301**	71	275	56	402	83	148	54	285
+30 mins.	29	215	48	292	61	198	18	277	**81**	300	59	440	**91**	160	**71**	**322**
+45 mins.	25	**236**	48	309	**73**	206	22	301	67	283	**94**	**444**	89	132	44	265
Total Volume	110	878	212	1200	260	821	93	1174	294	1165	263	1722	331	608	218	1157
% App. Total	9.2	73.2	17.7		22.1	69.9	7.9		17.1	67.7	15.3		28.6	52.5	18.8	
PHF	.887	.930	.898	.962	.890	.959	.775	.975	.907	.949	.699	.970	.909	.905	.768	.898

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Banner Dr/SR-22 Westbound Off Ramp
Weather: Clear

File Name : GRGHA22WAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

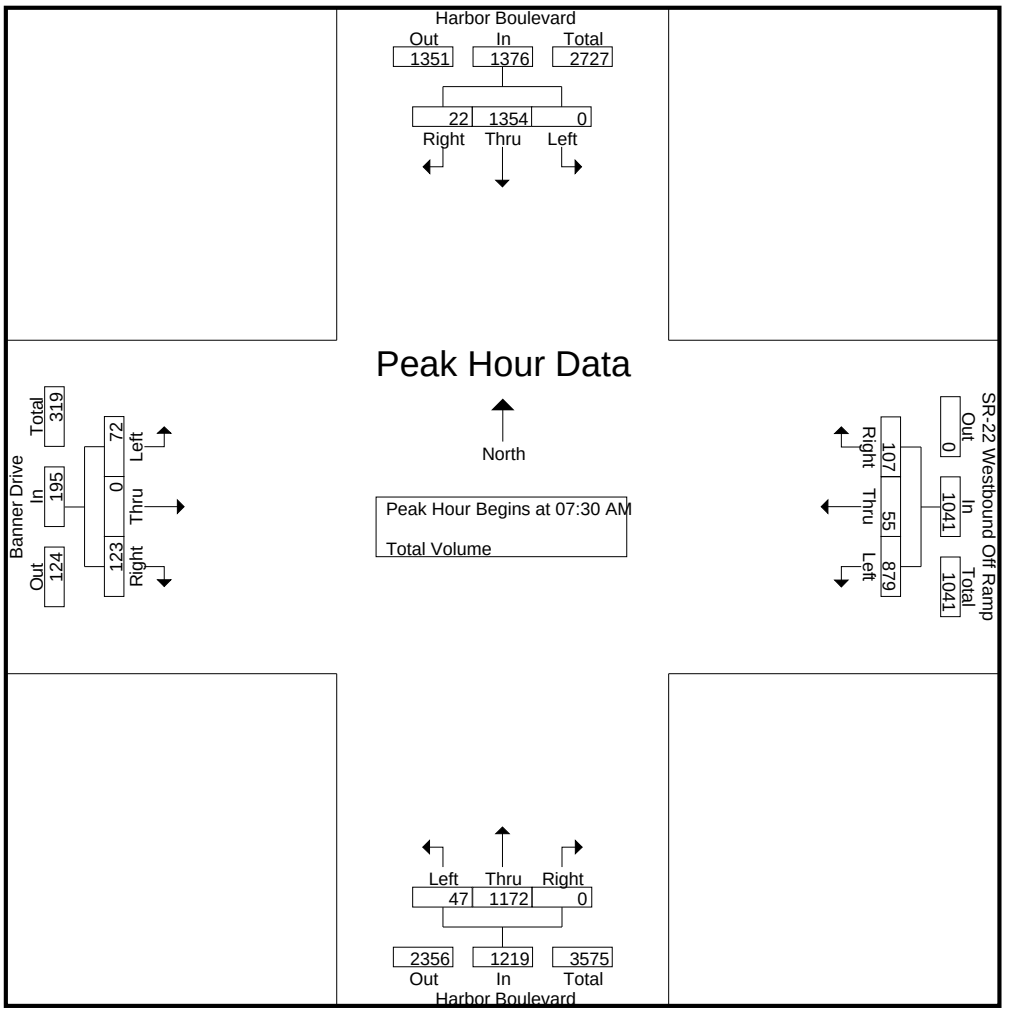
	Harbor Boulevard Southbound				SR-22 Westbound Off Ramp Westbound				Harbor Boulevard Northbound				Banner Drive Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	266	2	268	220	9	15	244	9	168	0	177	9	0	31	40	729
07:15 AM	0	318	5	323	218	14	29	261	7	233	0	240	9	0	29	38	862
07:30 AM	0	374	6	380	232	21	34	287	11	265	0	276	17	0	39	56	999
07:45 AM	0	378	7	385	189	16	31	236	14	249	0	263	20	0	29	49	933
Total	0	1336	20	1356	859	60	109	1028	41	915	0	956	55	0	128	183	3523
08:00 AM	0	322	1	323	247	9	27	283	10	356	0	366	20	0	28	48	1020
08:15 AM	0	280	8	288	211	9	15	235	12	302	0	314	15	0	27	42	879
08:30 AM	0	239	2	241	191	8	31	230	9	228	0	237	20	0	28	48	756
08:45 AM	0	251	5	256	201	6	29	236	11	246	0	257	11	0	26	37	786
Total	0	1092	16	1108	850	32	102	984	42	1132	0	1174	66	0	109	175	3441
Grand Total	0	2428	36	2464	1709	92	211	2012	83	2047	0	2130	121	0	237	358	6964
Apprch %	0	98.5	1.5		84.9	4.6	10.5		3.9	96.1	0		33.8	0	66.2		
Total %	0	34.9	0.5	35.4	24.5	1.3	3	28.9	1.2	29.4	0	30.6	1.7	0	3.4	5.1	

	Harbor Boulevard Southbound				SR-22 Westbound Off Ramp Westbound				Harbor Boulevard Northbound				Banner Drive Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	374	6	380	232	**21**	**34**	**287**	11	265	0	276	17	0	**39**	**56**	999
07:45 AM	0	**378**	7	**385**	189	16	31	236	**14**	249	0	263	**20**	0	29	49	933
08:00 AM	0	322	1	323	**247**	9	27	283	10	**356**	0	**366**	20	0	28	48	**1020**
08:15 AM	0	280	**8**	288	211	9	15	235	12	302	0	314	15	0	27	42	879
Total Volume	0	1354	22	1376	879	55	107	1041	47	1172	0	1219	72	0	123	195	3831
% App. Total	0	98.4	1.6		84.4	5.3	10.3		3.9	96.1	0		36.9	0	63.1		
PHF	.000	.896	.688	.894	.890	.655	.787	.907	.839	.823	.000	.833	.900	.000	.788	.871	.939

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Banner Dr/SR-22 Westbound Off Ramp
Weather: Clear

File Name : GRGHA22WAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:15 AM				07:30 AM				07:30 AM			
+0 mins.	0	318	5	323	218	14	29	261	11	265	0	276	17	0	**39**	**56**
+15 mins.	0	374	6	380	232	**21**	**34**	**287**	**14**	249	0	263	**20**	0	29	49
+30 mins.	0	**378**	**7**	**385**	189	16	31	236	10	**356**	0	**366**	20	0	28	48
+45 mins.	0	322	1	323	**247**	9	27	283	12	302	0	314	15	0	27	42
Total Volume	0	1392	19	1411	886	60	121	1067	47	1172	0	1219	72	0	123	195
% App. Total	0	98.7	1.3		83	5.6	11.3		3.9	96.1	0		36.9	0	63.1	
PHF	.000	.921	.679	.916	.897	.714	.890	.929	.839	.823	.000	.833	.900	.000	.788	.871

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City of Garden Grove
N/S: Harbor Boulevard
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Weather: Clear

File Name : GRGHA22WPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

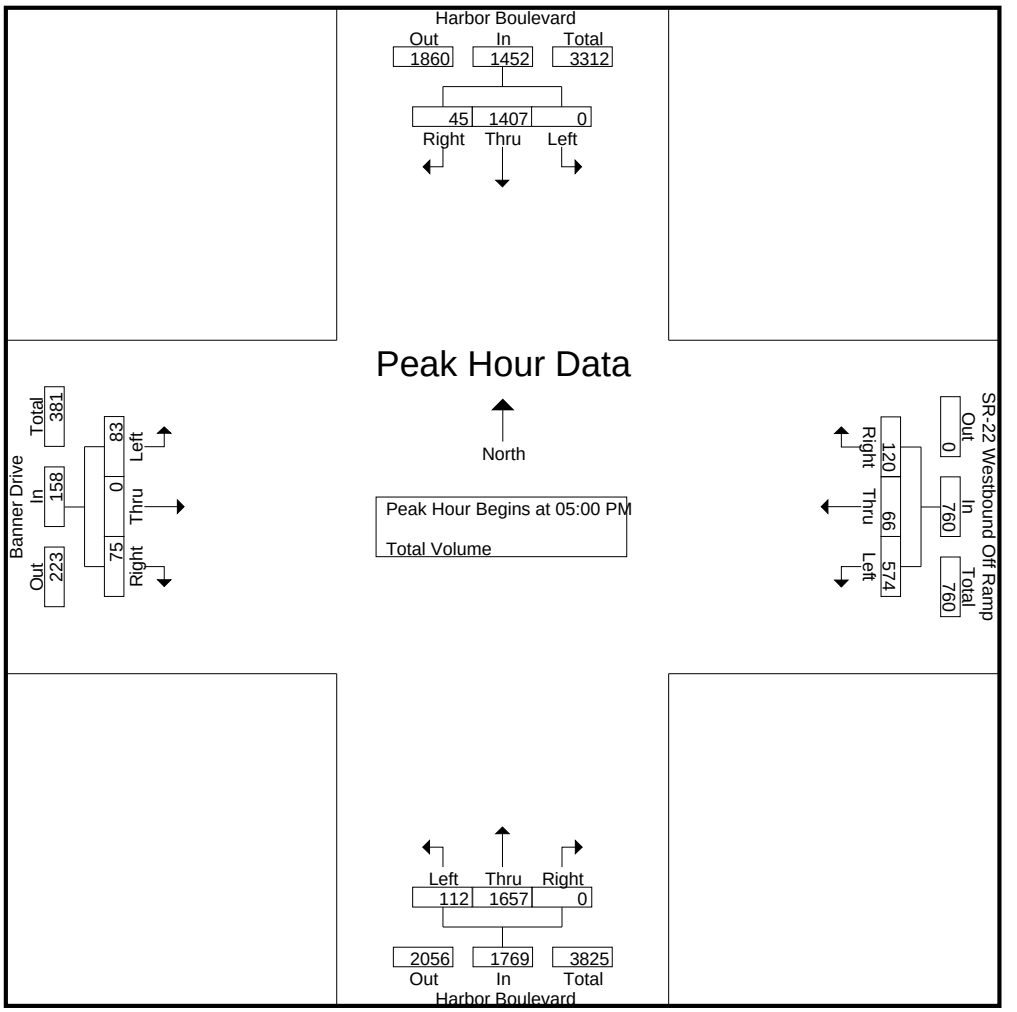
	Harbor Boulevard Southbound				SR-22 Westbound Off Ramp Westbound				Harbor Boulevard Northbound				Banner Drive Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	0	300	11	311	132	19	34	185	16	387	0	403	20	0	24	44	943
04:15 PM	0	329	14	343	140	25	35	200	18	393	0	411	20	0	15	35	989
04:30 PM	0	320	12	332	136	29	42	207	20	368	0	388	17	0	18	35	962
04:45 PM	0	342	9	351	161	12	41	214	24	397	0	421	21	0	15	36	1022
Total	0	1291	46	1337	569	85	152	806	78	1545	0	1623	78	0	72	150	3916
05:00 PM	0	356	10	366	112	14	29	155	22	410	0	432	17	0	18	35	988
05:15 PM	0	368	17	385	135	18	27	180	29	402	0	431	18	0	20	38	1034
05:30 PM	0	337	9	346	160	18	31	209	28	424	0	452	26	0	18	44	1051
05:45 PM	0	346	9	355	167	16	33	216	33	421	0	454	22	0	19	41	1066
Total	0	1407	45	1452	574	66	120	760	112	1657	0	1769	83	0	75	158	4139
Grand Total	0	2698	91	2789	1143	151	272	1566	190	3202	0	3392	161	0	147	308	8055
Apprch %	0	96.7	3.3		73	9.6	17.4		5.6	94.4	0		52.3	0	47.7		
Total %	0	33.5	1.1	34.6	14.2	1.9	3.4	19.4	2.4	39.8	0	42.1	2	0	1.8	3.8	

	Harbor Boulevard Southbound				SR-22 Westbound Off Ramp Westbound				Harbor Boulevard Northbound				Banner Drive Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	356	10	366	112	14	29	155	22	410	0	432	17	0	18	35	988
05:15 PM	0	**368**	**17**	**385**	135	**18**	27	180	29	402	0	431	18	0	**20**	38	1034
05:30 PM	0	337	9	346	160	18	31	209	28	**424**	0	452	**26**	0	18	**44**	1051
05:45 PM	0	346	9	355	**167**	16	**33**	**216**	**33**	421	0	**454**	22	0	19	41	**1066**
Total Volume	0	1407	45	1452	574	66	120	760	112	1657	0	1769	83	0	75	158	4139
% App. Total	0	96.9	3.1		75.5	8.7	15.8		6.3	93.7	0		52.5	0	47.5		
PHF	.000	.956	.662	.943	.859	.917	.909	.880	.848	.977	.000	.974	.798	.000	.938	.898	.971

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Banner Dr/SR-22 Westbound Off Ramp
Weather: Clear

File Name : GRGHA22WPM
Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	05:00 PM				04:00 PM				05:00 PM				05:00 PM			
+0 mins.	0	356	10	366	132	19	34	185	22	410	0	432	17	0	18	35
+15 mins.	0	**368**	**17**	**385**	140	25	35	200	29	402	0	431	18	0	**20**	38
+30 mins.	0	337	9	346	136	**29**	**42**	207	28	**424**	0	452	**26**	0	18	**44**
+45 mins.	0	346	9	355	**161**	12	41	**214**	**33**	421	0	**454**	22	0	19	41
Total Volume	0	1407	45	1452	569	85	152	806	112	1657	0	1769	83	0	75	158
% App. Total	0	96.9	3.1		70.6	10.5	18.9		6.3	93.7	0		52.5	0	47.5	
PHF	.000	.956	.662	.943	.884	.733	.905	.942	.848	.977	.000	.974	.798	.000	.938	.898

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Trask Avenue
Weather: Clear

File Name : GRGHATRAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

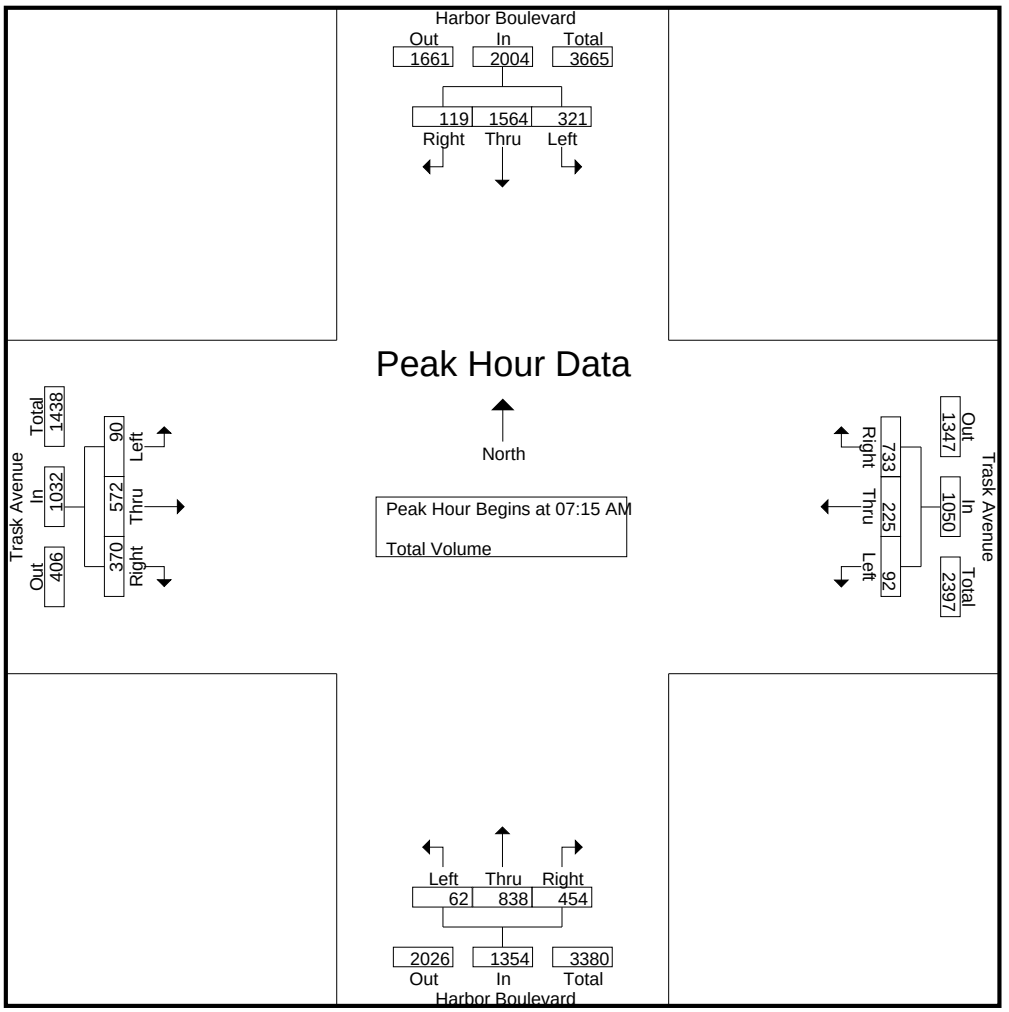
	Harbor Boulevard Southbound				Trask Avenue Westbound				Harbor Boulevard Northbound				Trask Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	57	337	30	424	37	27	132	196	10	136	87	233	12	111	119	242	1095
07:15 AM	69	435	27	531	21	34	134	189	6	236	110	352	17	114	77	208	1280
07:30 AM	82	384	33	499	21	54	186	261	17	199	97	313	12	151	96	259	1332
07:45 AM	90	349	23	462	25	73	184	282	23	200	148	371	26	163	78	267	1382
Total	298	1505	113	1916	104	188	636	928	56	771	442	1269	67	539	370	976	5089
08:00 AM	80	396	36	512	25	64	229	318	16	203	99	318	35	144	119	298	1446
08:15 AM	50	347	35	432	20	34	172	226	9	216	87	312	29	95	94	218	1188
08:30 AM	49	267	38	354	15	32	143	190	11	174	98	283	31	98	103	232	1059
08:45 AM	62	328	38	428	13	37	132	182	8	150	82	240	30	80	102	212	1062
Total	241	1338	147	1726	73	167	676	916	44	743	366	1153	125	417	418	960	4755
Grand Total	539	2843	260	3642	177	355	1312	1844	100	1514	808	2422	192	956	788	1936	9844
Apprch %	14.8	78.1	7.1		9.6	19.3	71.1		4.1	62.5	33.4		9.9	49.4	40.7		
Total %	5.5	28.9	2.6	37	1.8	3.6	13.3	18.7	1	15.4	8.2	24.6	2	9.7	8	19.7	

	Harbor Boulevard Southbound				Trask Avenue Westbound				Harbor Boulevard Northbound				Trask Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	69	**435**	27	**531**	21	34	134	189	6	**236**	110	352	17	114	77	208	1280
07:30 AM	82	384	33	499	21	54	186	261	17	199	97	313	12	151	96	259	1332
07:45 AM	**90**	349	23	462	**25**	**73**	184	282	**23**	200	**148**	**371**	26	**163**	78	267	1382
08:00 AM	80	396	**36**	512	25	64	**229**	**318**	16	203	99	318	**35**	144	**119**	**298**	**1446**
Total Volume	321	1564	119	2004	92	225	733	1050	62	838	454	1354	90	572	370	1032	5440
% App. Total	16	78	5.9		8.8	21.4	69.8		4.6	61.9	33.5		8.7	55.4	35.9		
PHF	.892	.899	.826	.944	.920	.771	.800	.825	.674	.888	.767	.912	.643	.877	.777	.866	.941

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N/S: Harbor Boulevard
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Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:15 AM				07:30 AM			
+0 mins.	69	**435**	27	**531**	21	54	186	261	6	**236**	110	352	12	151	96	259
+15 mins.	82	384	33	499	**25**	**73**	184	282	17	199	97	313	26	**163**	78	267
+30 mins.	**90**	349	23	462	25	64	**229**	**318**	**23**	200	**148**	**371**	**35**	144	**119**	**298**
+45 mins.	80	396	**36**	512	20	34	172	226	16	203	99	318	29	95	94	218
Total Volume	321	1564	119	2004	91	225	771	1087	62	838	454	1354	102	553	387	1042
% App. Total	16	78	5.9		8.4	20.7	70.9		4.6	61.9	33.5		9.8	53.1	37.1	
PHF	.892	.899	.826	.944	.910	.771	.842	.855	.674	.888	.767	.912	.729	.848	.813	.874

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City of Garden Grove
N/S: Harbor Boulevard
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Weather: Clear

File Name : GRGHATRPM
Site Code : 10516364
Start Date : 6/14/2016
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Groups Printed- Total Volume

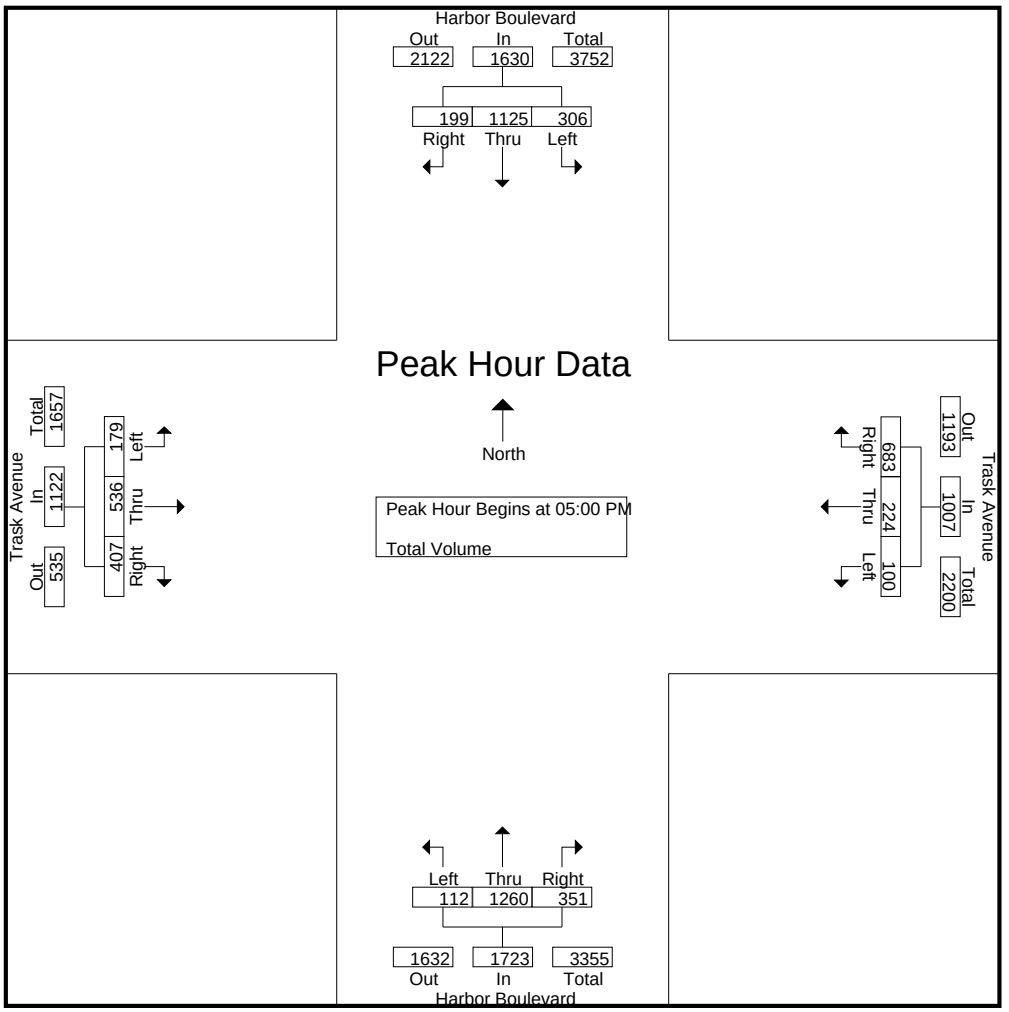
	Harbor Boulevard Southbound				Trask Avenue Westbound				Harbor Boulevard Northbound				Trask Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	87	285	56	428	20	31	157	208	18	325	96	439	32	101	99	232	1307
04:15 PM	65	271	49	385	23	45	153	221	27	335	96	458	29	149	98	276	1340
04:30 PM	83	334	42	459	17	51	178	246	23	298	92	413	41	112	86	239	1357
04:45 PM	60	298	59	417	21	46	176	243	24	307	104	435	47	136	101	284	1379
Total	295	1188	206	1689	81	173	664	918	92	1265	388	1745	149	498	384	1031	5383
05:00 PM	92	225	39	356	20	48	181	249	33	300	95	428	42	119	101	262	1295
05:15 PM	70	291	56	417	27	68	179	274	30	305	87	422	47	141	105	293	1406
05:30 PM	74	299	44	417	20	60	162	242	25	324	81	430	42	125	99	266	1355
05:45 PM	70	310	60	440	33	48	161	242	24	331	88	443	48	151	102	301	1426
Total	306	1125	199	1630	100	224	683	1007	112	1260	351	1723	179	536	407	1122	5482
Grand Total	601	2313	405	3319	181	397	1347	1925	204	2525	739	3468	328	1034	791	2153	10865
Apprch %	18.1	69.7	12.2		9.4	20.6	70		5.9	72.8	21.3		15.2	48	36.7		
Total %	5.5	21.3	3.7	30.5	1.7	3.7	12.4	17.7	1.9	23.2	6.8	31.9	3	9.5	7.3	19.8	

	Harbor Boulevard Southbound				Trask Avenue Westbound				Harbor Boulevard Northbound				Trask Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	**92**	225	39	356	20	48	**181**	249	**33**	300	**95**	428	42	119	101	262	1295
05:15 PM	70	291	56	417	27	**68**	179	**274**	30	305	87	422	47	141	**105**	293	1406
05:30 PM	74	299	44	417	20	60	162	242	25	324	81	430	42	125	99	266	1355
05:45 PM	70	**310**	**60**	**440**	**33**	48	161	242	24	**331**	88	**443**	**48**	**151**	102	**301**	**1426**
Total Volume	306	1125	199	1630	100	224	683	1007	112	1260	351	1723	179	536	407	1122	5482
% App. Total	18.8	69	12.2		9.9	22.2	67.8		6.5	73.1	20.4		16	47.8	36.3		
PHF	.832	.907	.829	.926	.758	.824	.943	.919	.848	.952	.924	.972	.932	.887	.969	.932	.961

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City of Garden Grove
N/S: Harbor Boulevard
E/W: Trask Avenue
Weather: Clear

File Name : GRGHATRPM
Site Code : 10516364
Start Date : 6/14/2016
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:30 PM				04:00 PM				05:00 PM			
+0 mins.	**87**	285	56	428	17	51	178	246	18	325	96	439	42	119	101	262
+15 mins.	65	271	49	385	21	46	176	243	**27**	**335**	96	**458**	47	141	**105**	293
+30 mins.	83	**334**	42	**459**	20	48	**181**	249	23	298	92	413	42	125	99	266
+45 mins.	60	298	**59**	417	**27**	**68**	179	**274**	24	307	**104**	435	**48**	**151**	102	**301**
Total Volume	295	1188	206	1689	85	213	714	1012	92	1265	388	1745	179	536	407	1122
% App. Total	17.5	70.3	12.2		8.4	21	70.6		5.3	72.5	22.2		16	47.8	36.3	
PHF	.848	.889	.873	.920	.787	.783	.986	.923	.852	.944	.933	.953	.932	.887	.969	.932

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City of Garden Grove
N/S: SR-22 Eastbound On Ramp
E/W: Trask Avenue
Weather: Clear

File Name : GRG22ETRAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

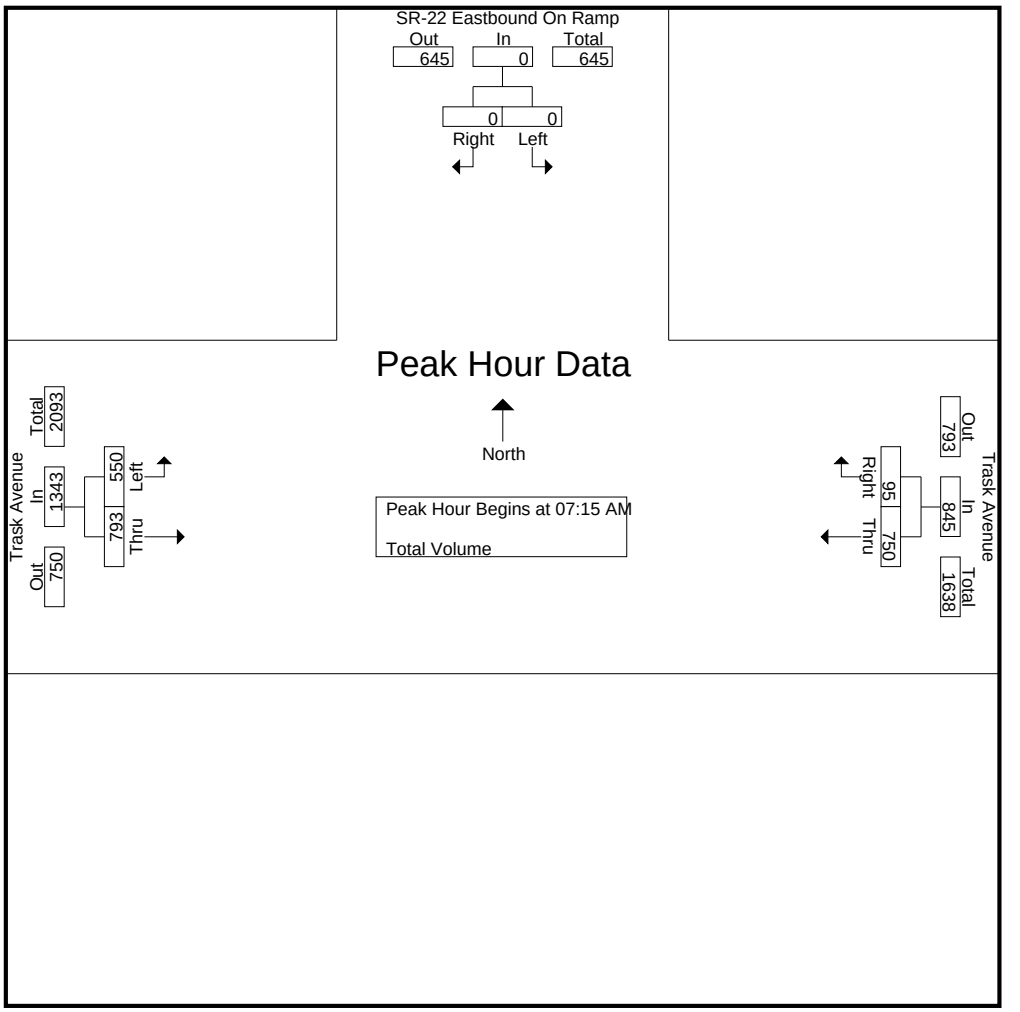
	SR-22 Eastbound On Ramp Southbound			Trask Avenue Westbound			Trask Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
07:00 AM	0	0	0	114	28	142	144	110	254	396
07:15 AM	0	0	0	116	34	150	142	146	288	438
07:30 AM	0	0	0	176	25	201	134	193	327	528
07:45 AM	0	0	0	233	12	245	114	302	416	661
Total	0	0	0	639	99	738	534	751	1285	2023
08:00 AM	0	0	0	225	24	249	160	152	312	561
08:15 AM	0	0	0	132	13	145	136	114	250	395
08:30 AM	0	0	0	102	10	112	159	78	237	349
08:45 AM	0	0	0	105	18	123	154	77	231	354
Total	0	0	0	564	65	629	609	421	1030	1659
Grand Total	0	0	0	1203	164	1367	1143	1172	2315	3682
Apprch %	0	0		88	12		49.4	50.6		
Total %	0	0	0	32.7	4.5	37.1	31	31.8	62.9	

	SR-22 Eastbound On Ramp Southbound			Trask Avenue Westbound			Trask Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:15 AM										
07:15 AM	0	0	0	116	**34**	150	142	146	288	438
07:30 AM	0	0	0	176	25	201	134	193	327	528
07:45 AM	0	0	0	**233**	12	245	114	**302**	**416**	**661**
08:00 AM	0	0	0	225	24	**249**	**160**	152	312	561
Total Volume	0	0	0	750	95	845	550	793	1343	2188
% App. Total	0	0		88.8	11.2		41	59		
PHF	.000	.000	.000	.805	.699	.848	.859	.656	.807	.828

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City of Garden Grove
N/S: SR-22 Eastbound On Ramp
E/W: Trask Avenue
Weather: Clear

File Name : GRG22ETRAM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 2



Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM			07:15 AM			07:15 AM		
+0 mins.	0	0	0	116	**34**	150	142	146	288
+15 mins.	0	0	0	176	25	201	134	193	327
+30 mins.	0	0	0	**233**	12	245	114	**302**	**416**
+45 mins.	0	0	0	225	24	**249**	**160**	152	312
Total Volume	0	0	0	750	95	845	550	793	1343
% App. Total	0	0		88.8	11.2		41	59	
PHF	.000	.000	.000	.805	.699	.848	.859	.656	.807

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E/W: Trask Avenue
Weather: Clear

File Name : GRG22ETRPM
Site Code : 10516364
Start Date : 6/14/2016
Page No : 1

Groups Printed- Total Volume

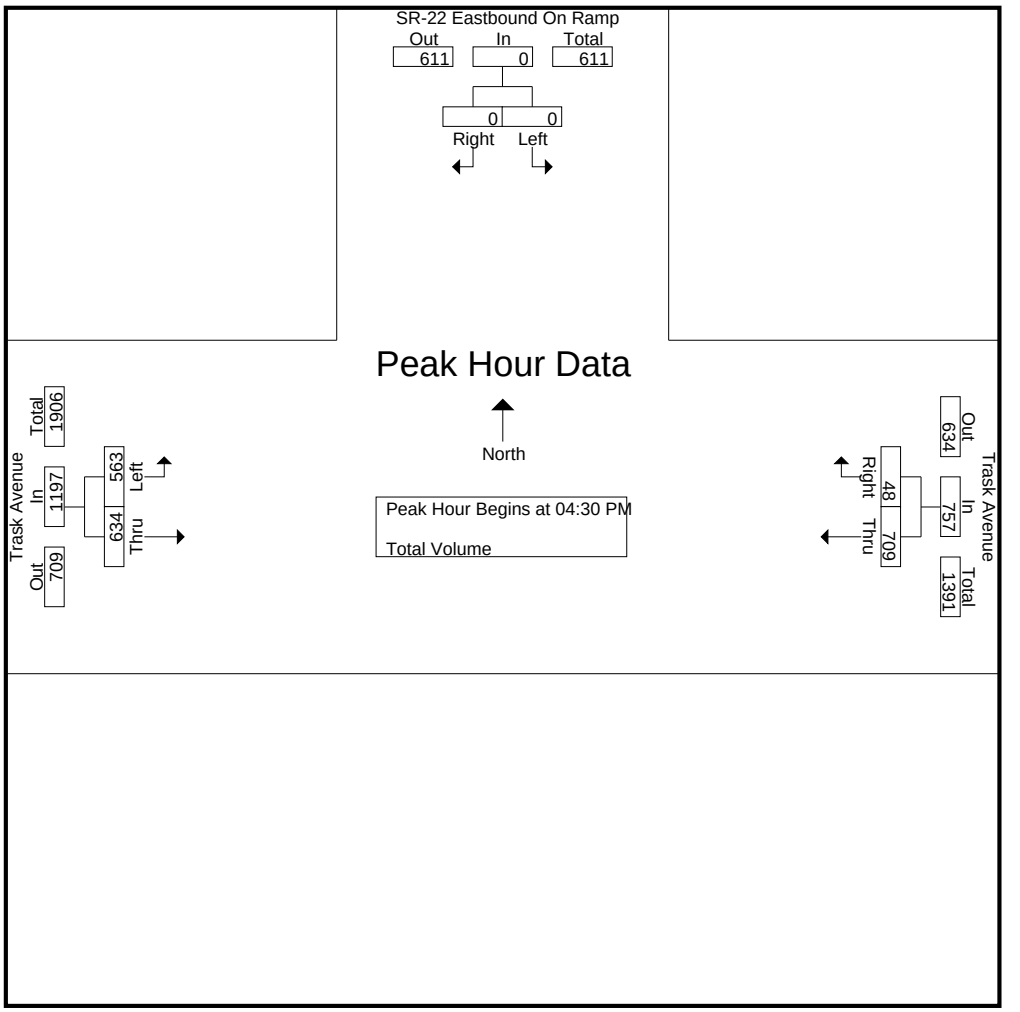
	SR-22 Eastbound On Ramp Southbound			Trask Avenue Westbound			Trask Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
04:00 PM	0	0	0	131	12	143	144	145	289	432
04:15 PM	0	0	0	145	8	153	156	159	315	468
04:30 PM	0	0	0	178	13	191	133	142	275	466
04:45 PM	0	0	0	176	12	188	147	164	311	499
Total	0	0	0	630	45	675	580	610	1190	1865
05:00 PM	0	0	0	169	9	178	149	158	307	485
05:15 PM	0	0	0	186	14	200	134	170	304	504
05:30 PM	0	0	0	162	8	170	131	148	279	449
05:45 PM	0	0	0	169	16	185	118	186	304	489
Total	0	0	0	686	47	733	532	662	1194	1927
Grand Total	0	0	0	1316	92	1408	1112	1272	2384	3792
Apprch %	0	0		93.5	6.5		46.6	53.4		
Total %	0	0	0	34.7	2.4	37.1	29.3	33.5	62.9	

	SR-22 Eastbound On Ramp Southbound			Trask Avenue Westbound			Trask Avenue Eastbound			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	0	0	0	178	13	191	133	142	275	466
04:45 PM	0	0	0	176	12	188	147	164	**311**	499
05:00 PM	0	0	0	169	9	178	**149**	158	307	485
05:15 PM	0	0	0	**186**	**14**	**200**	134	**170**	304	**504**
Total Volume	0	0	0	709	48	757	563	634	1197	1954
% App. Total	0	0		93.7	6.3		47	53		
PHF	.000	.000	.000	.953	.857	.946	.945	.932	.962	.969

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File Name : GRG22ETRPM
Site Code : 10516364
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Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM			04:30 PM			04:15 PM		
+0 mins.	0	0	0	178	13	191	**156**	159	**315**
+15 mins.	0	0	0	176	12	188	133	142	275
+30 mins.	0	0	0	169	9	178	147	**164**	311
+45 mins.	0	0	0	**186**	**14**	**200**	149	158	307
Total Volume	0	0	0	709	48	757	585	623	1208
% App. Total	0	0		93.7	6.3		48.4	51.6	
PHF	.000	.000	.000	.953	.857	.946	.938	.950	.959

Appendix B

MUTCD Traffic Signal Warrant Analysis Worksheets

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1866**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

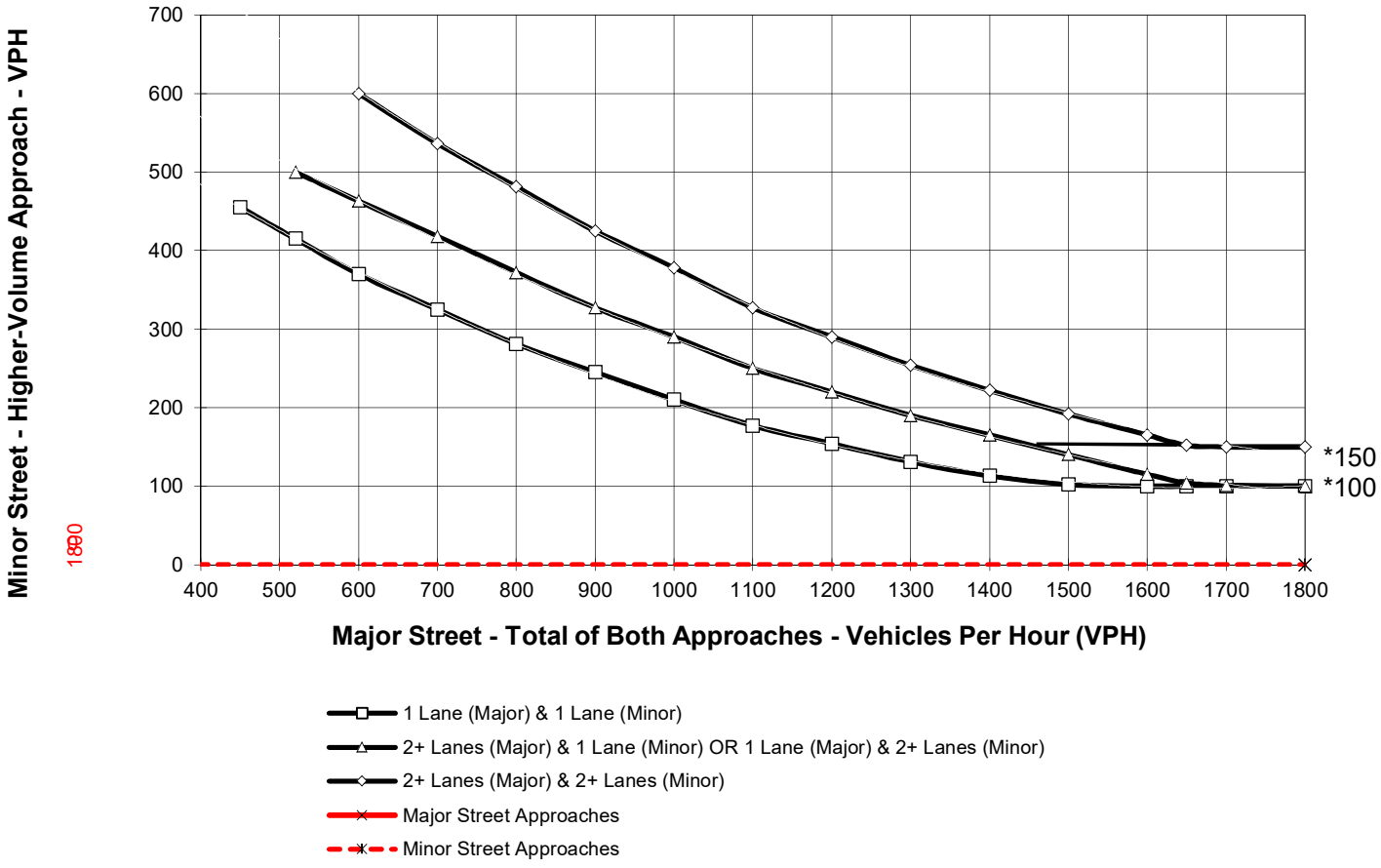
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **0**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2382**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

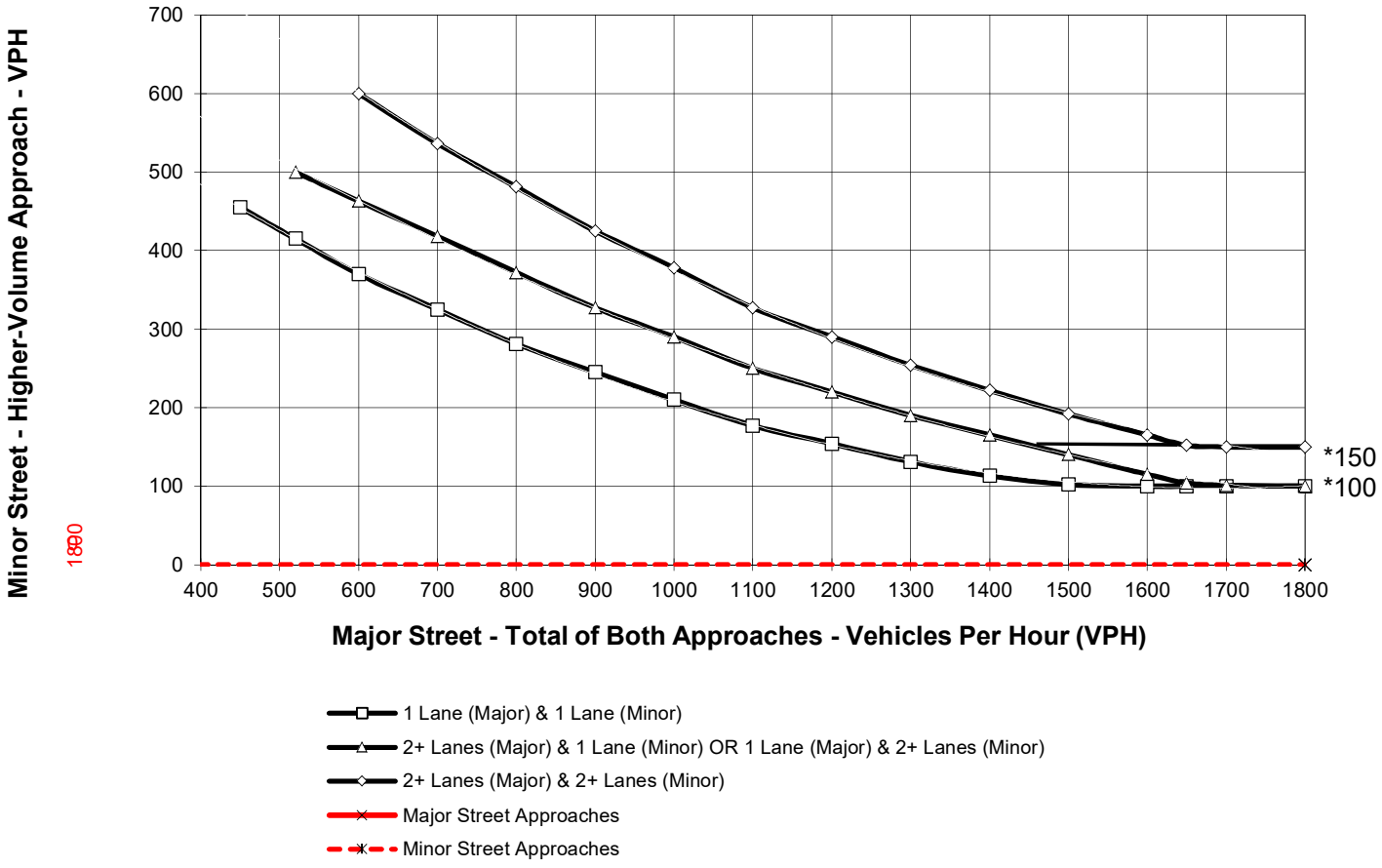
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **0**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1988**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

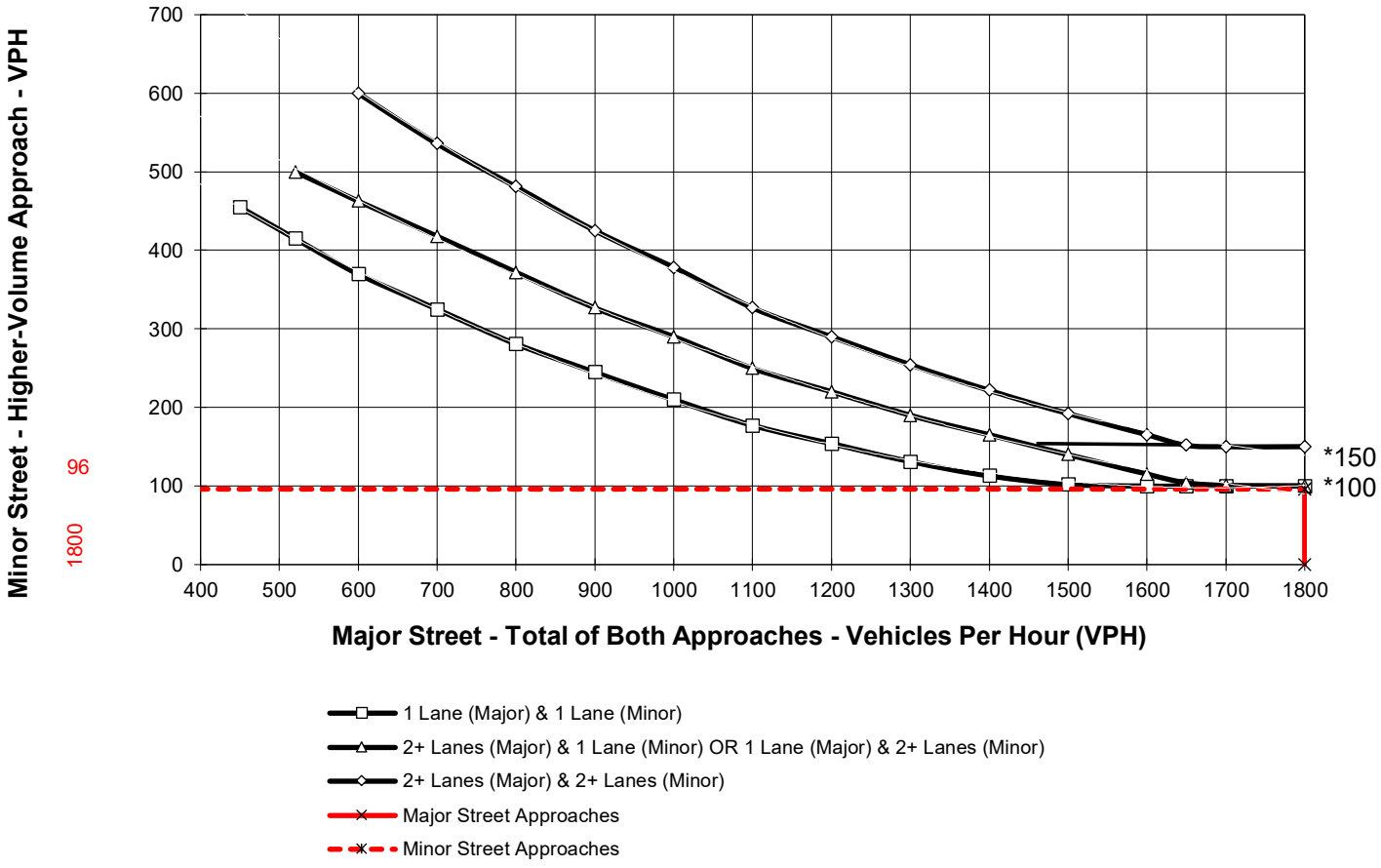
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **96**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2563**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

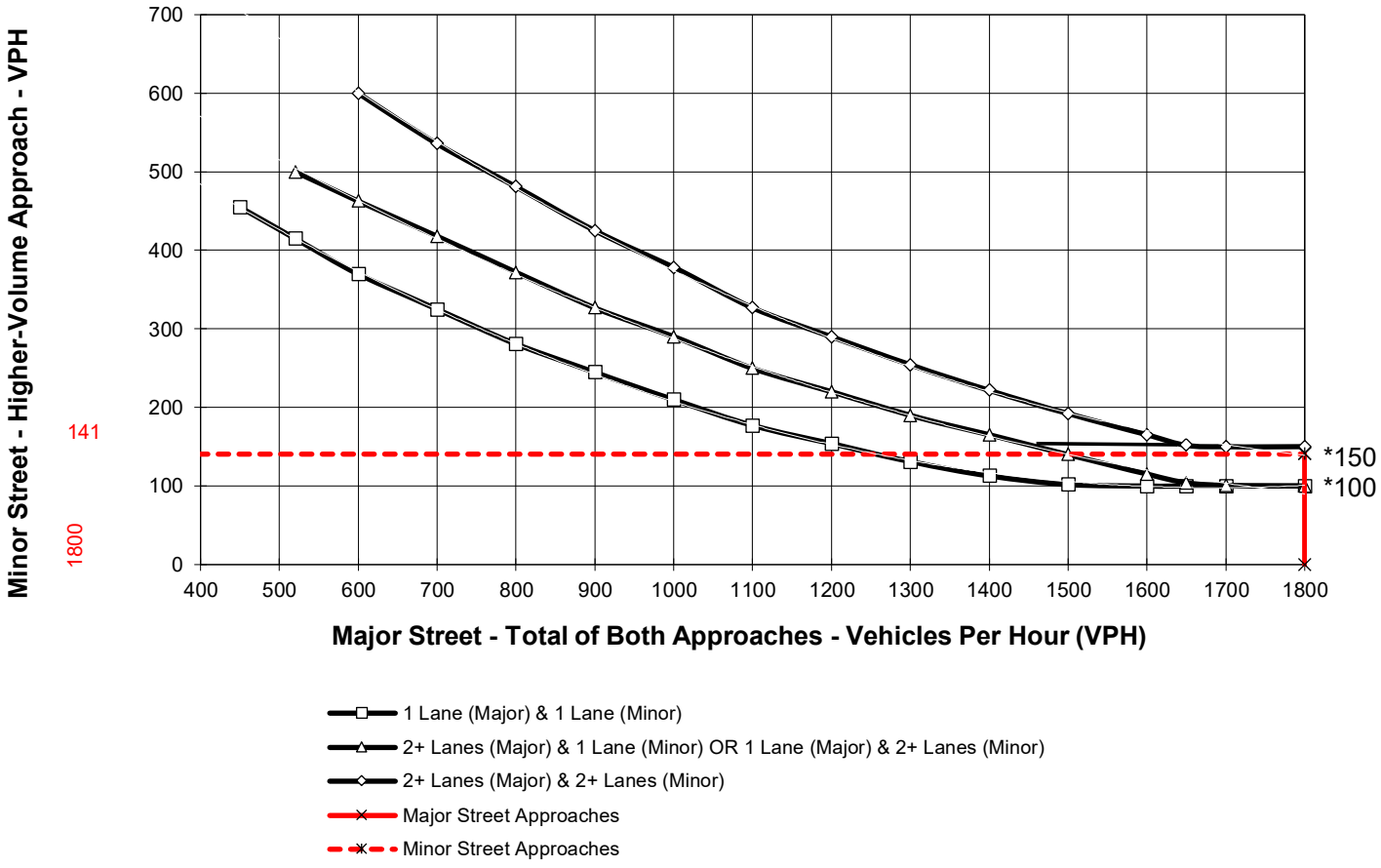
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **141**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2472**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

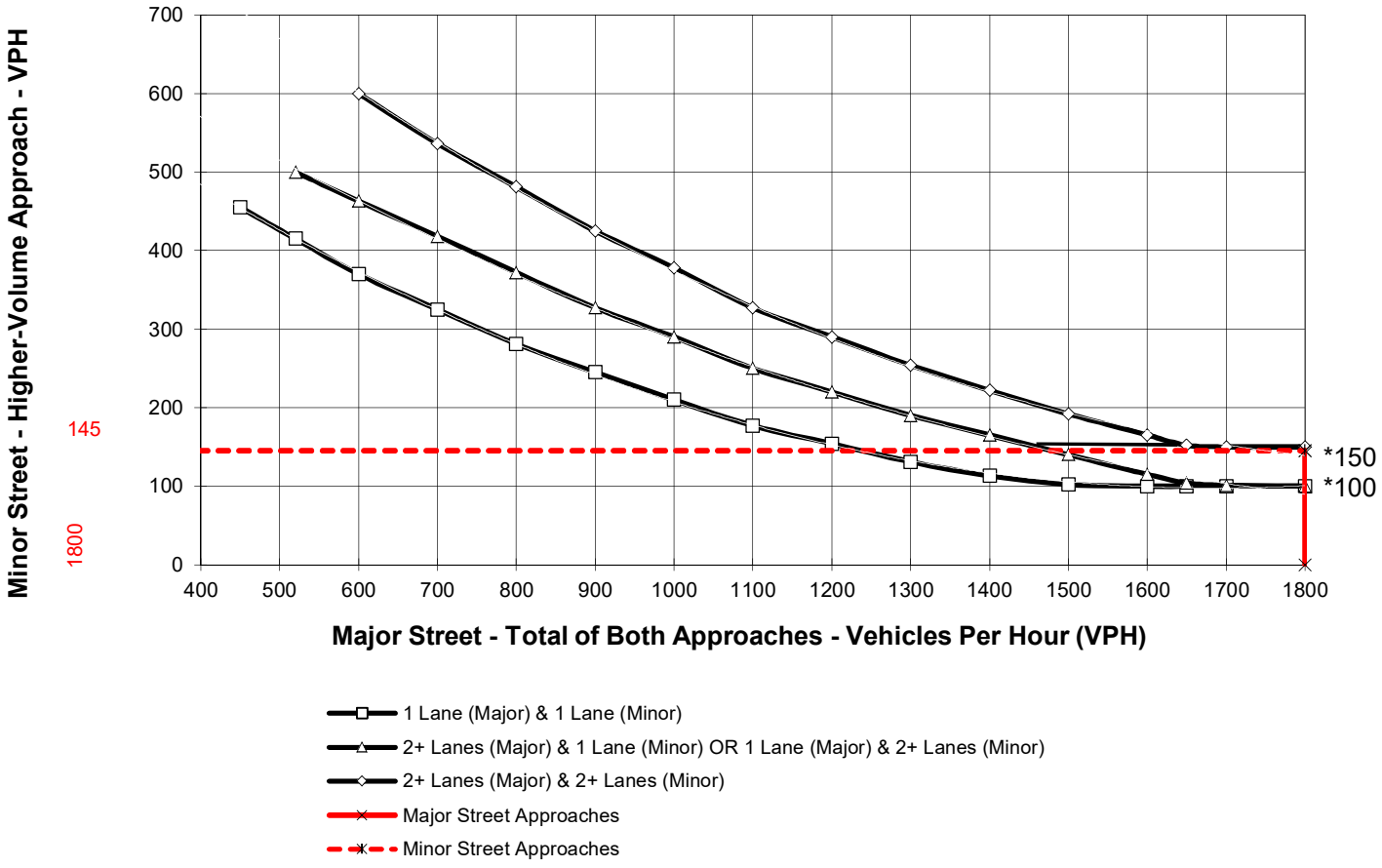
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **145**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **3094**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

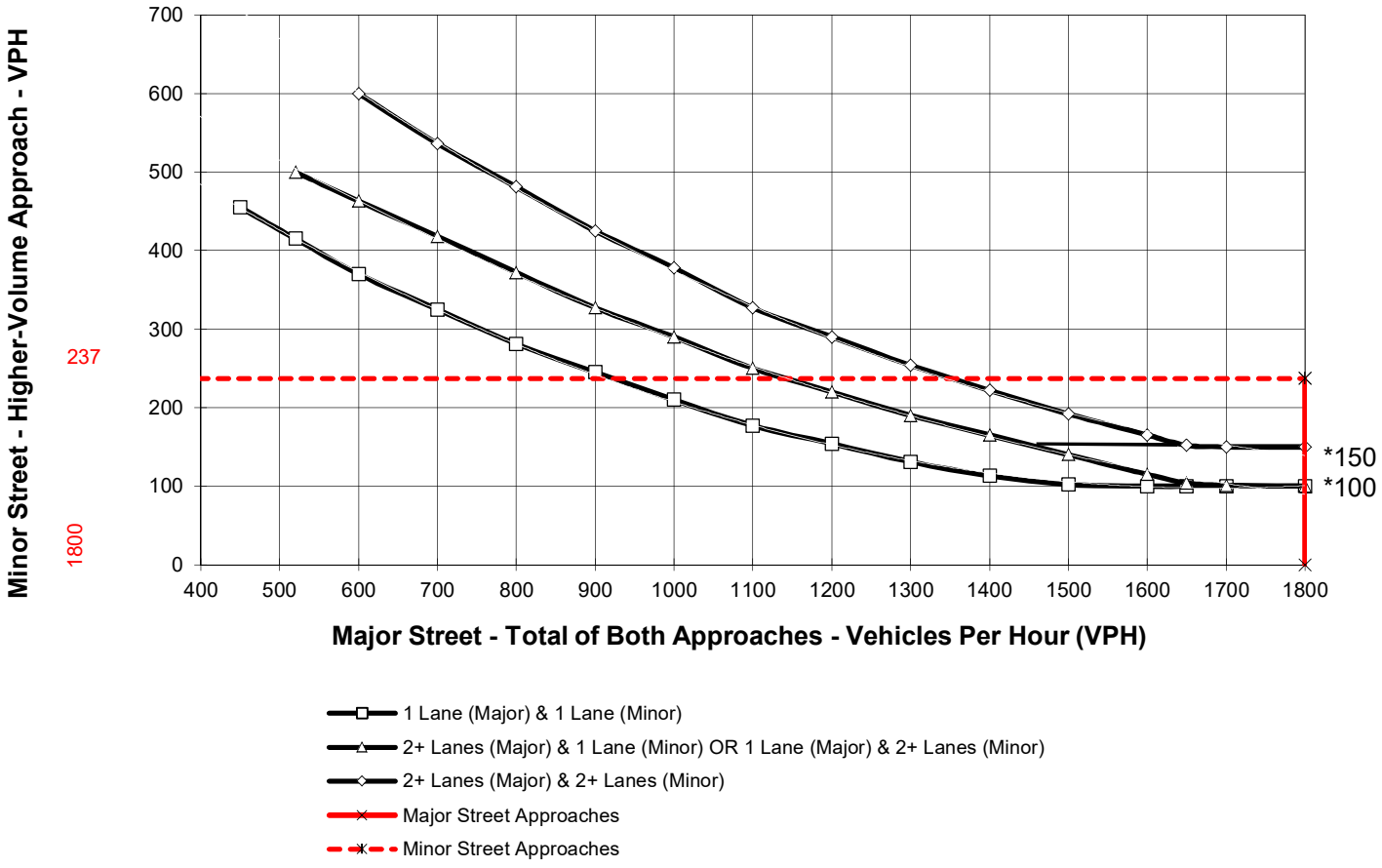
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **237**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2594**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

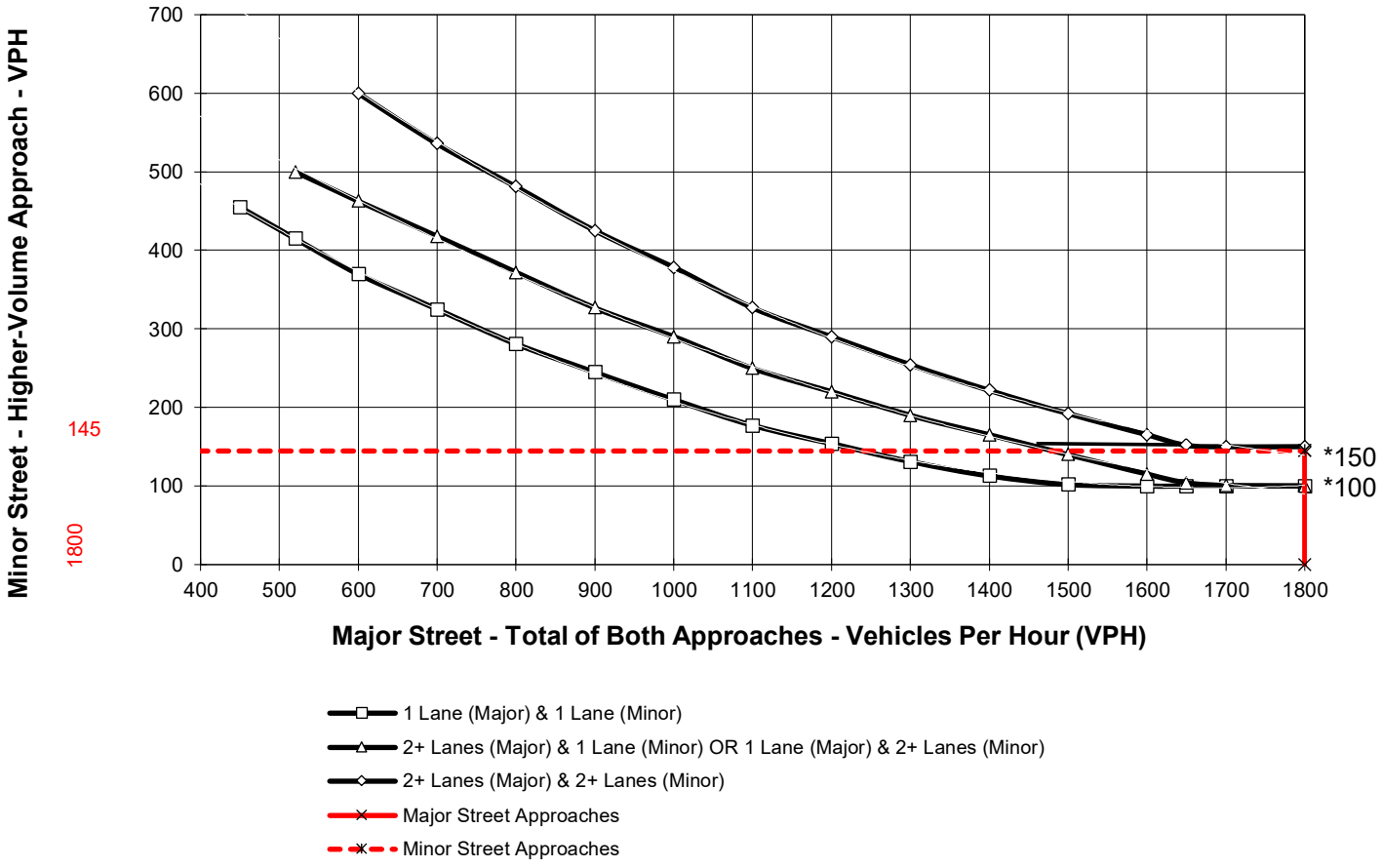
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **145**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **3275**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

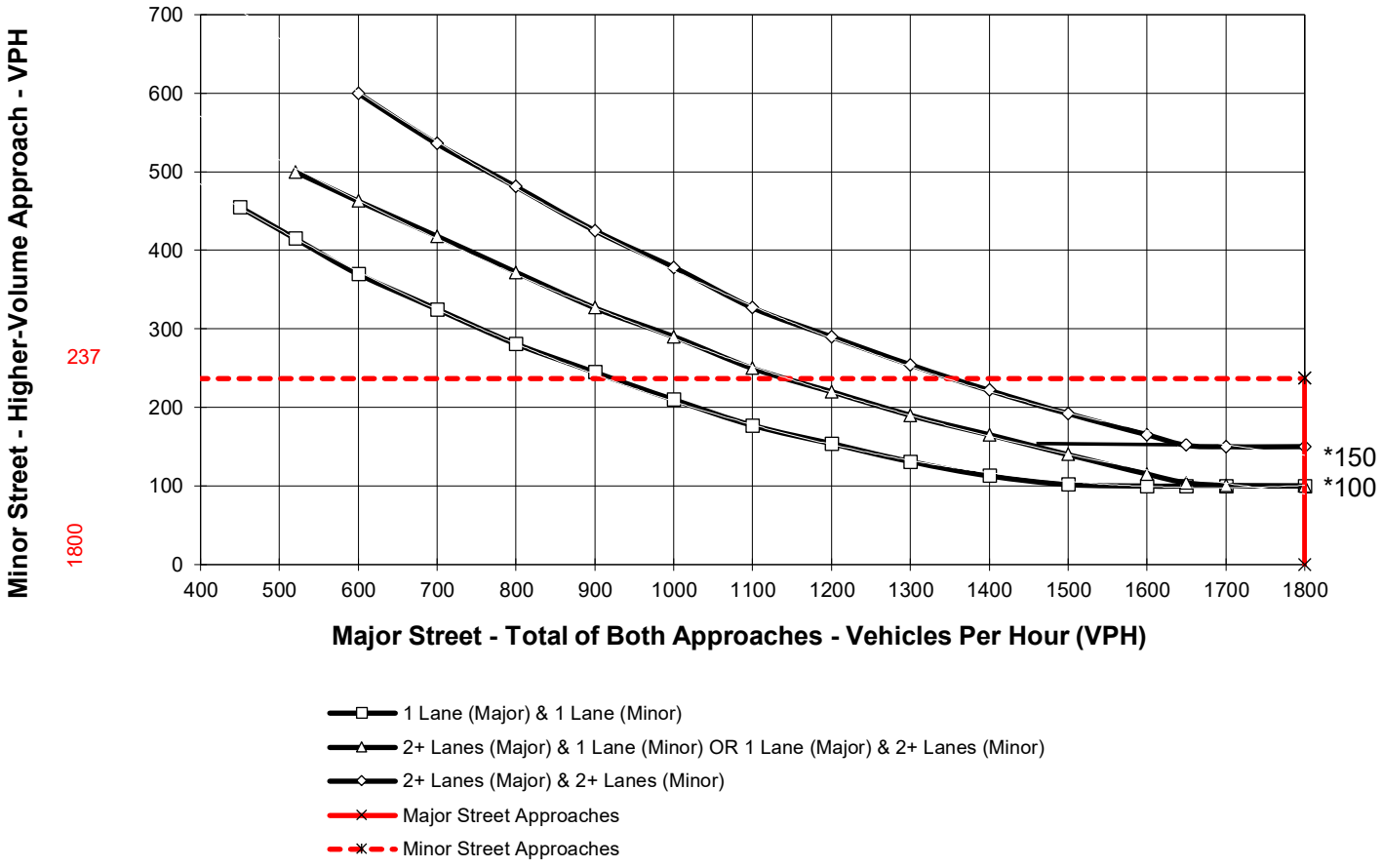
Minor Street Name = **Project Access**

High Volume Approach (VPH) = **237**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1879**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

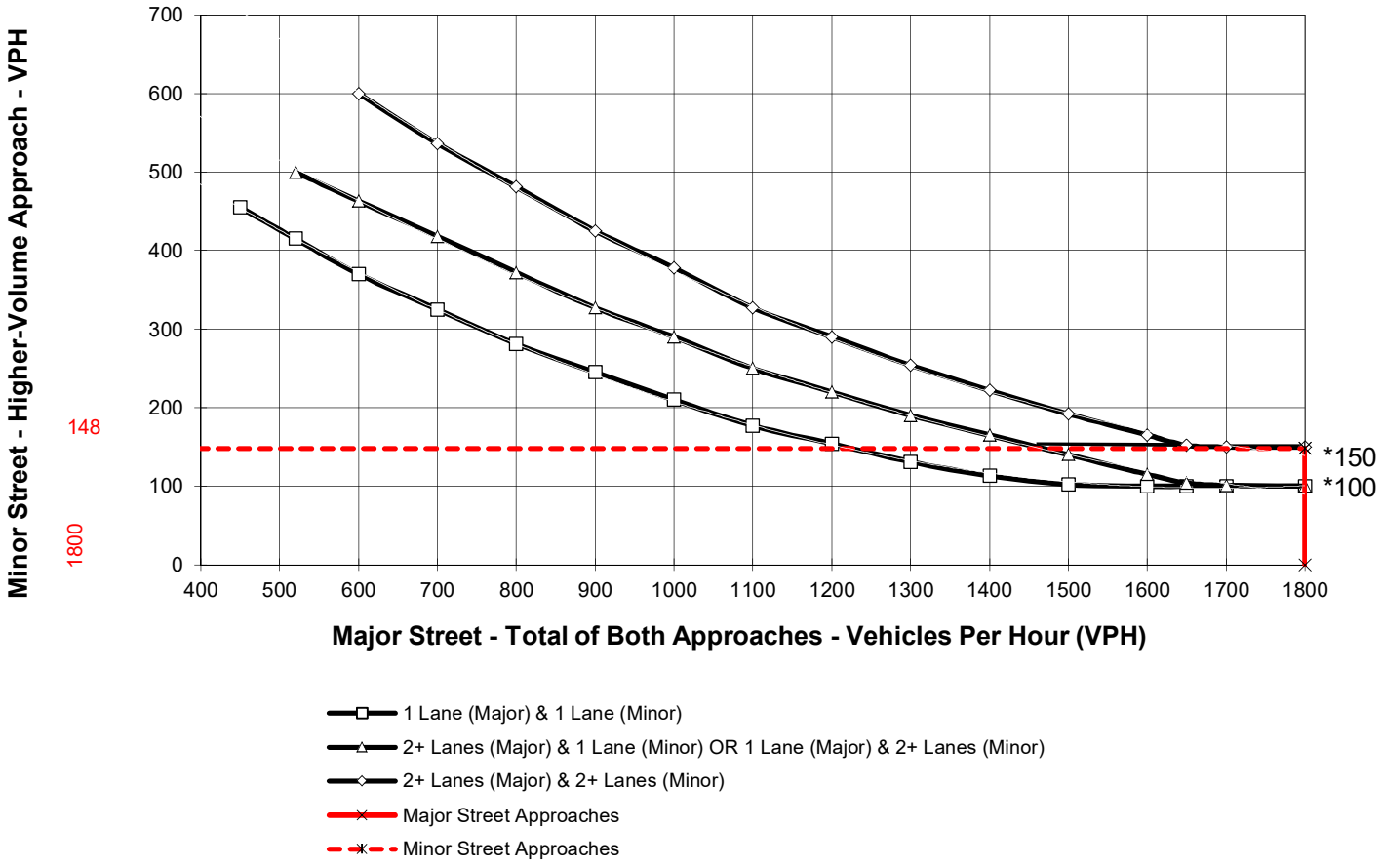
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **148**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2437**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

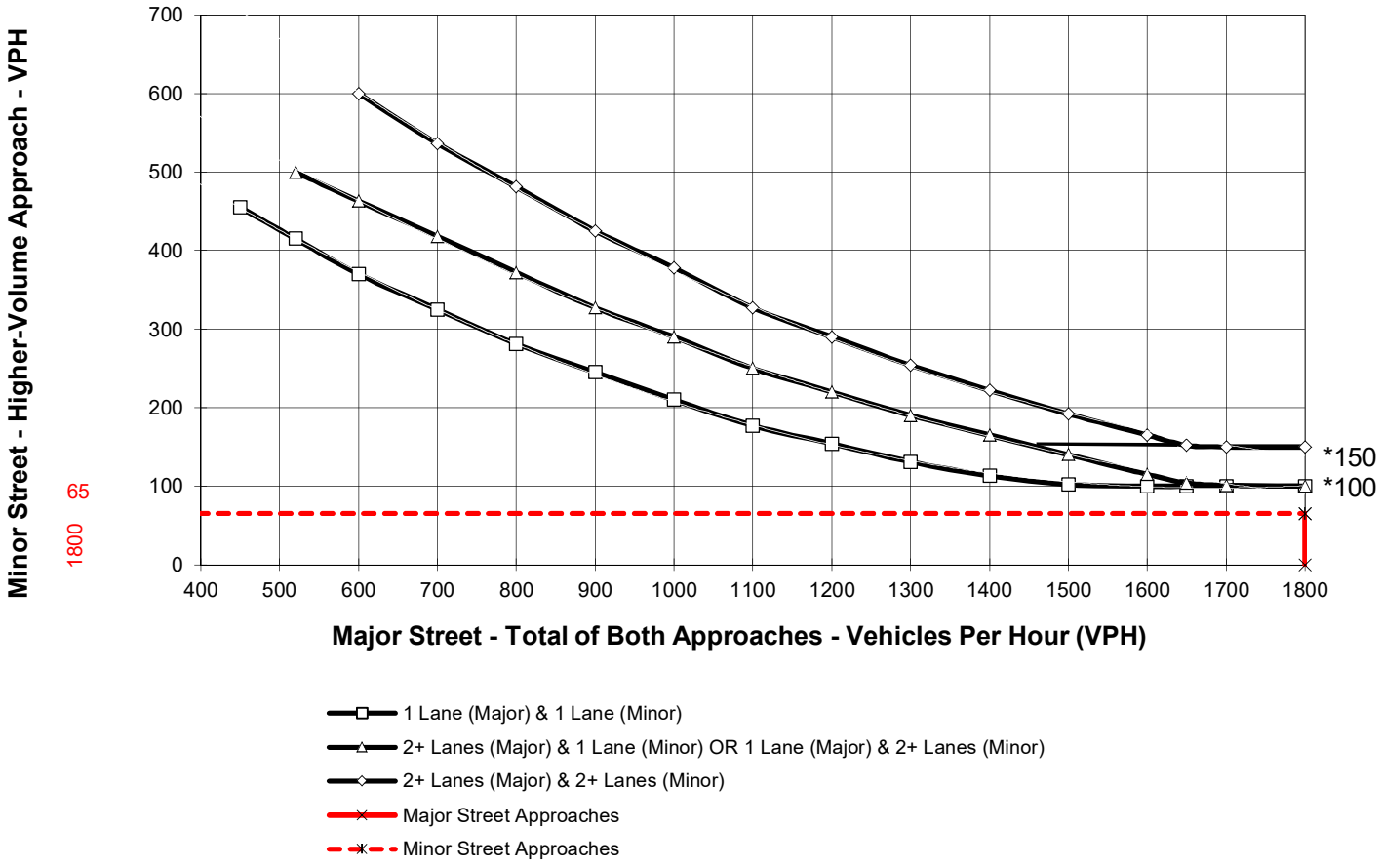
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **65**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1988**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

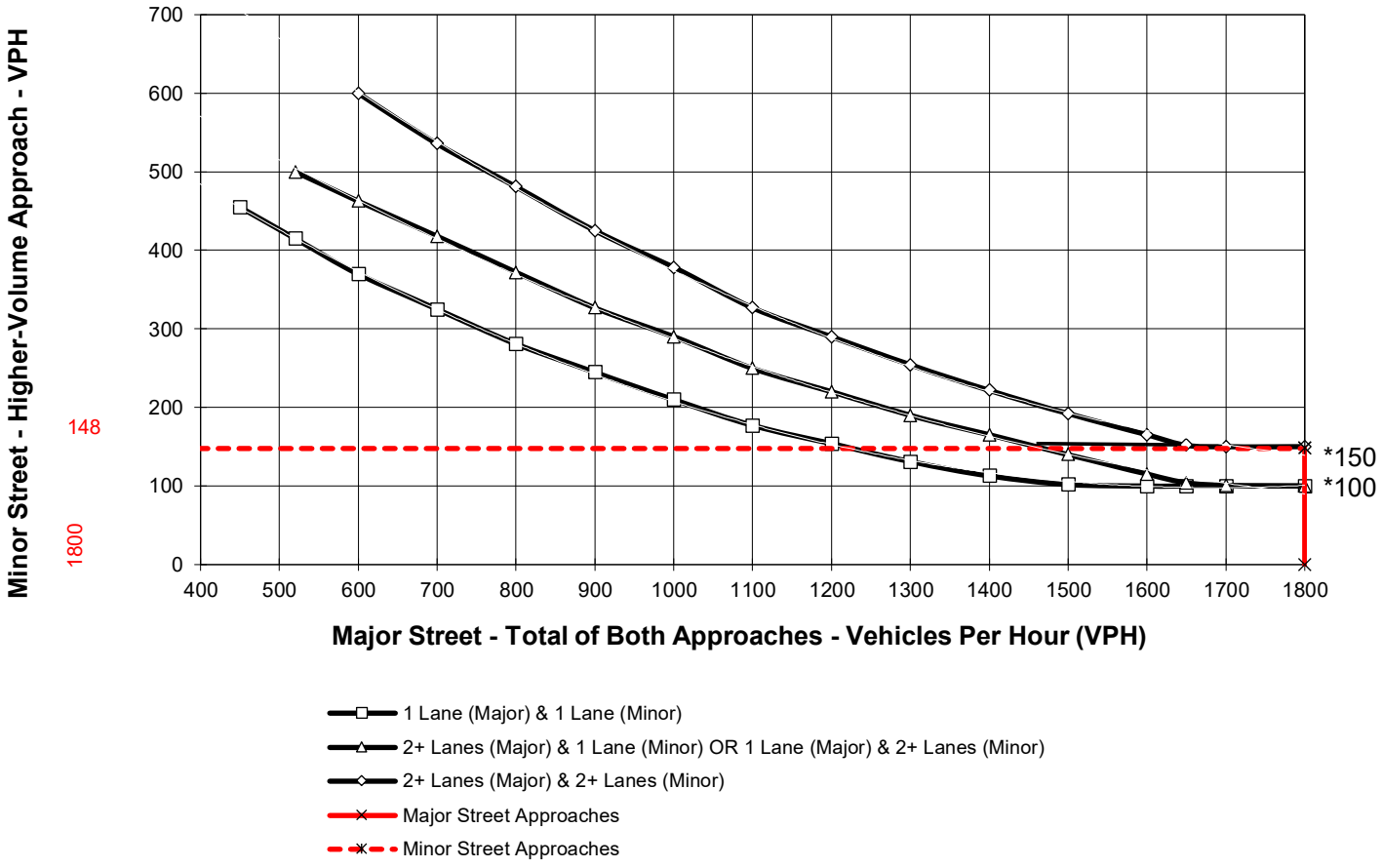
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **148**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2599**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

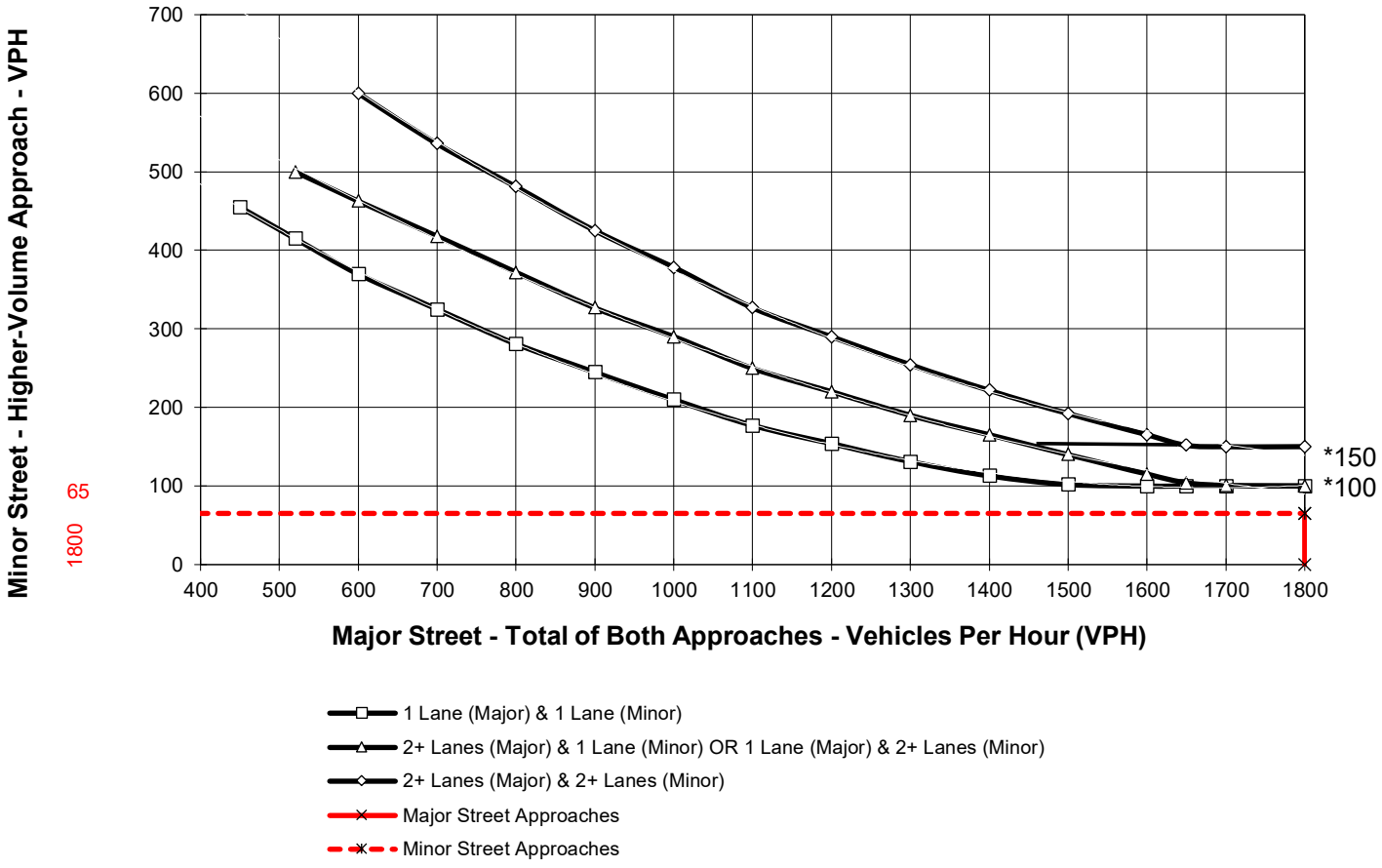
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **65**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2428**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

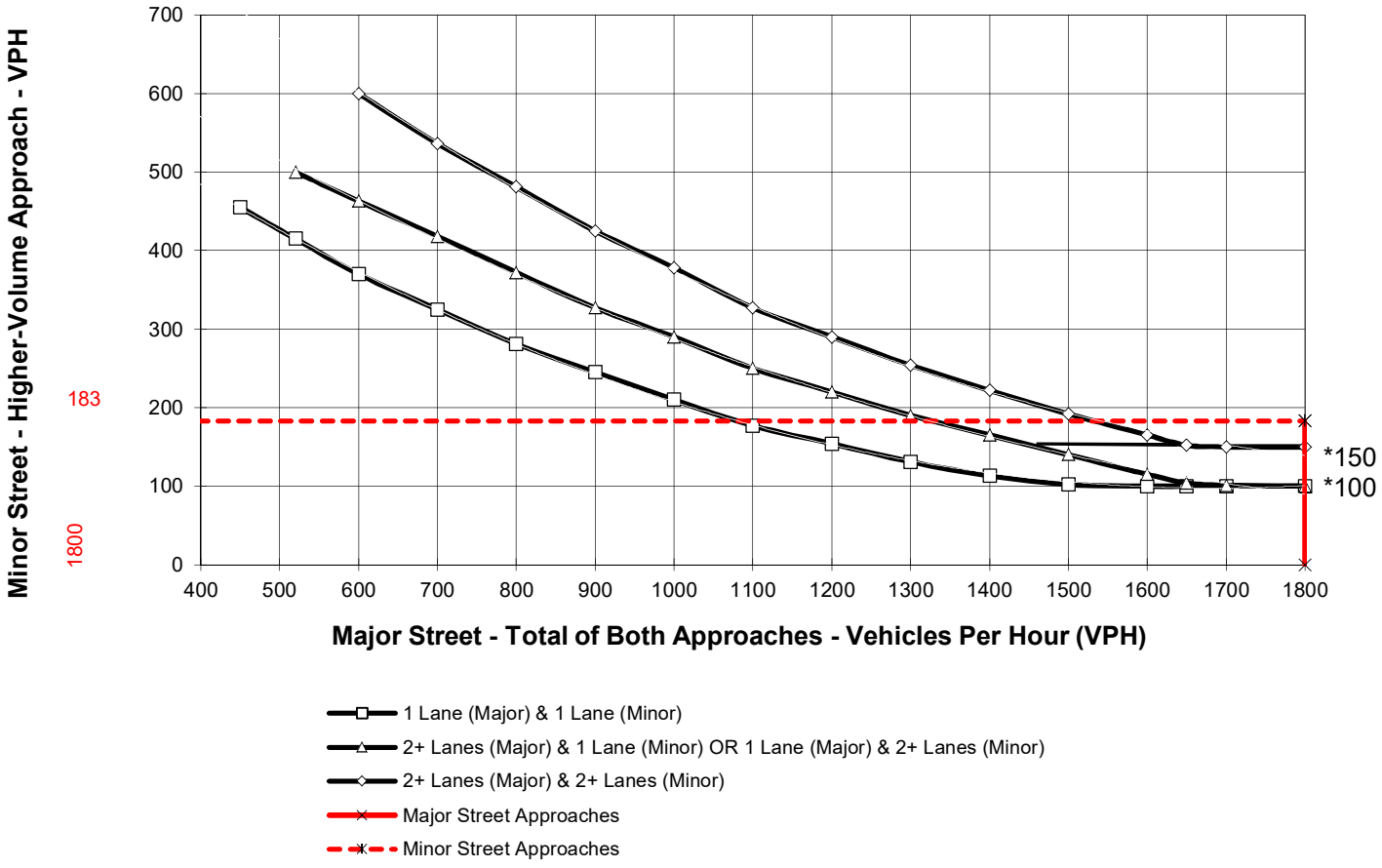
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **183**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **3101**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

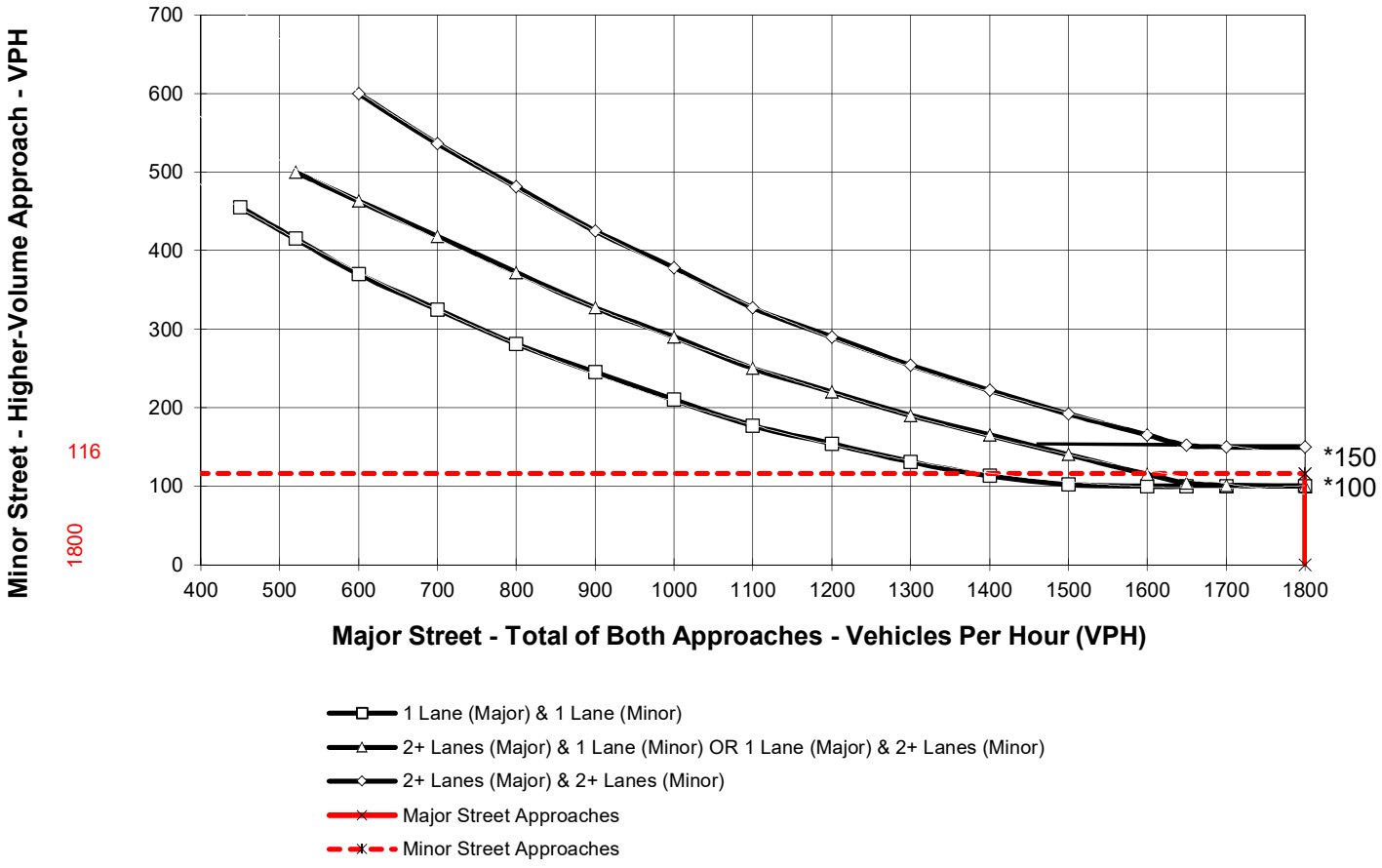
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **116**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2537**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

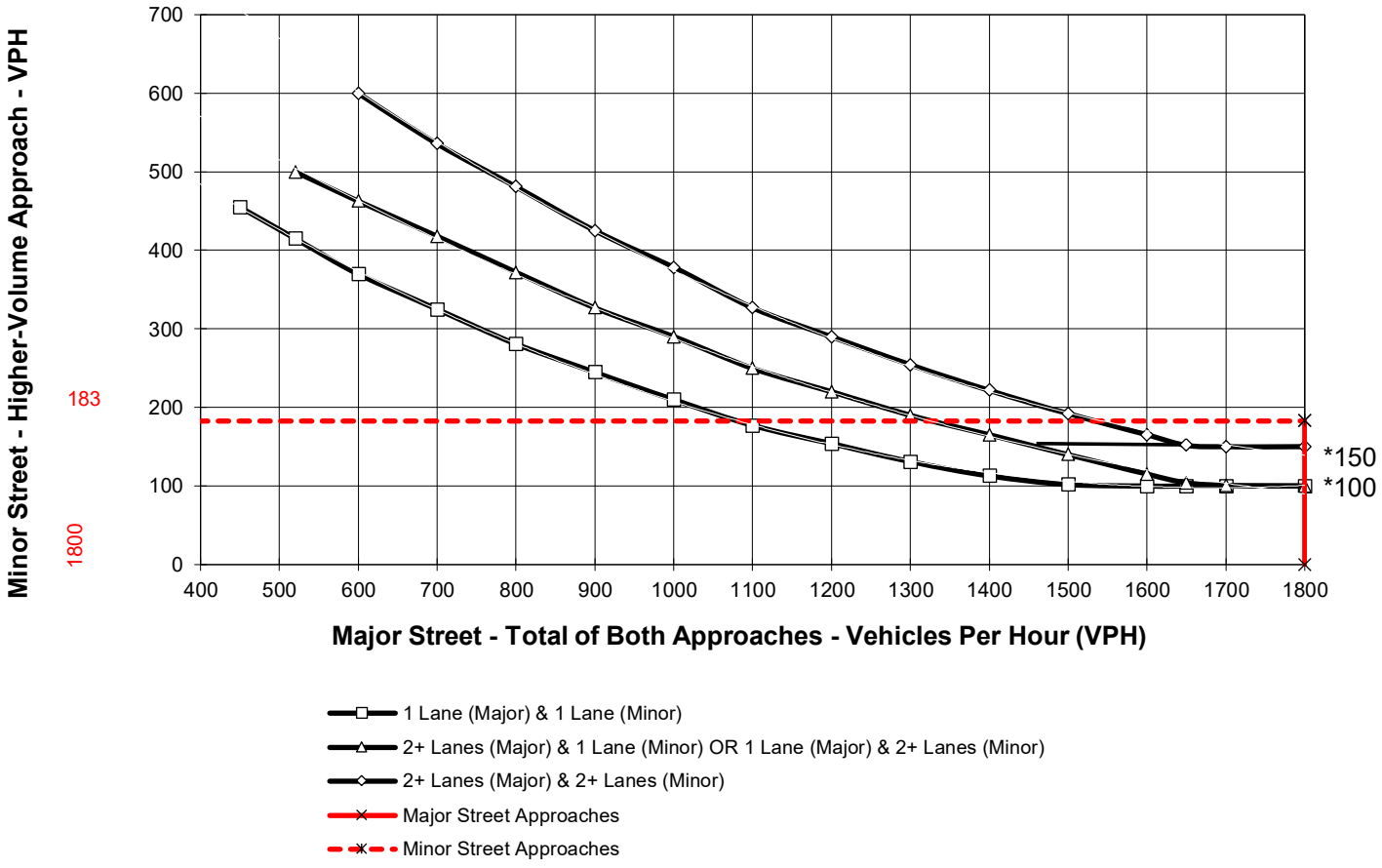
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **183**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **3261**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

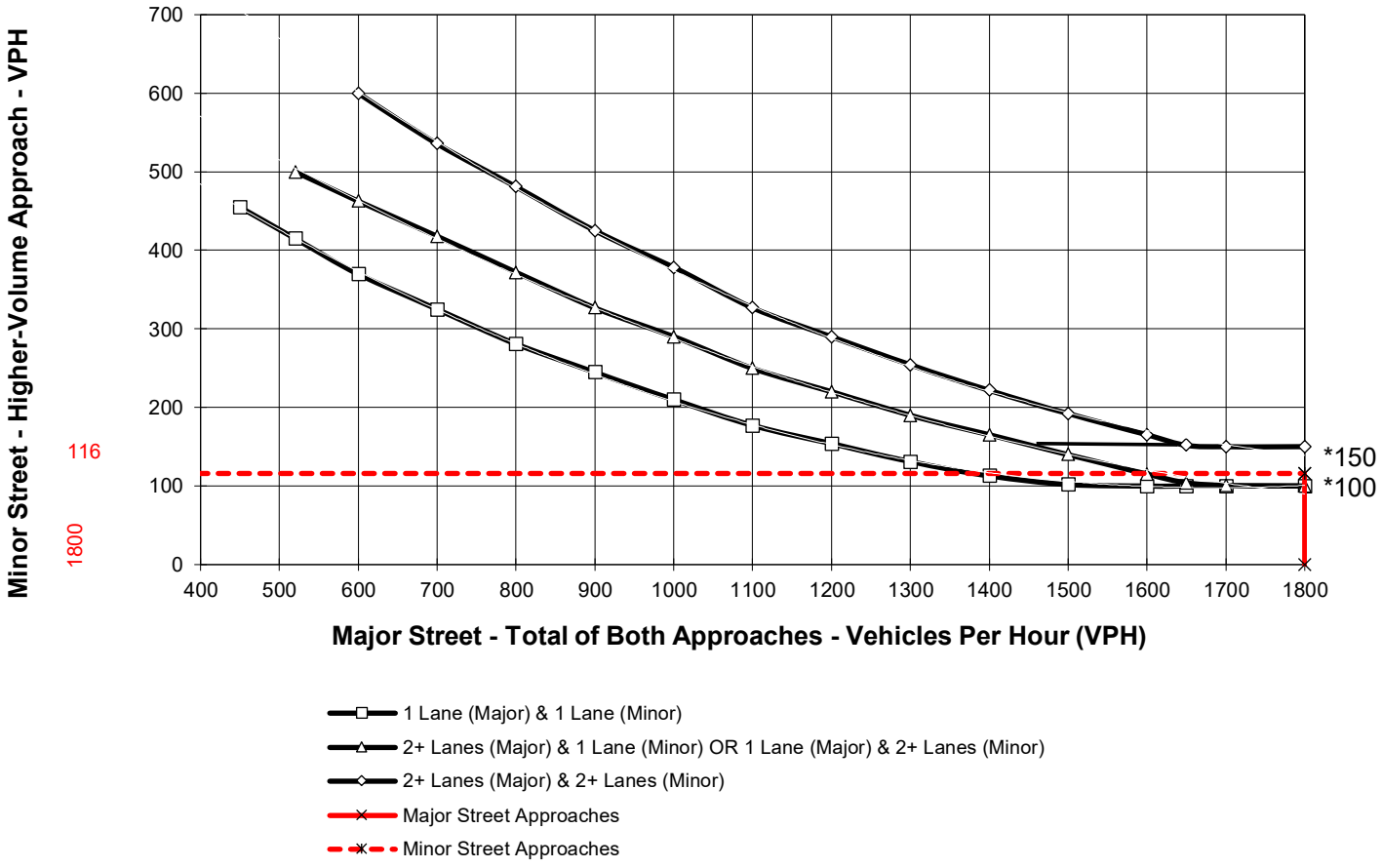
Minor Street Name = **Twintree Lane**

High Volume Approach (VPH) = **116**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

WARRANTED FOR A SIGNAL



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1425**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

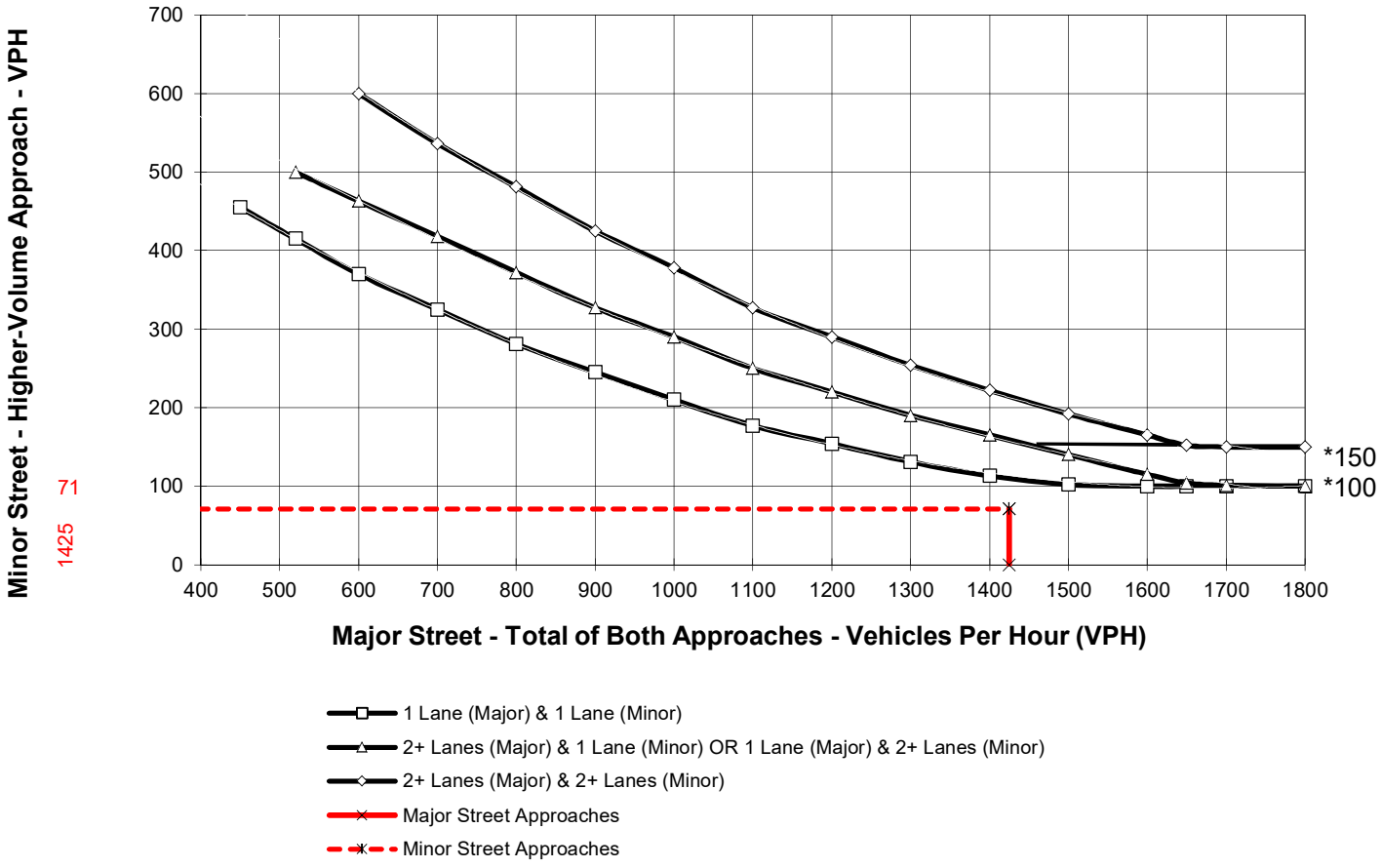
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **71**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2391**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

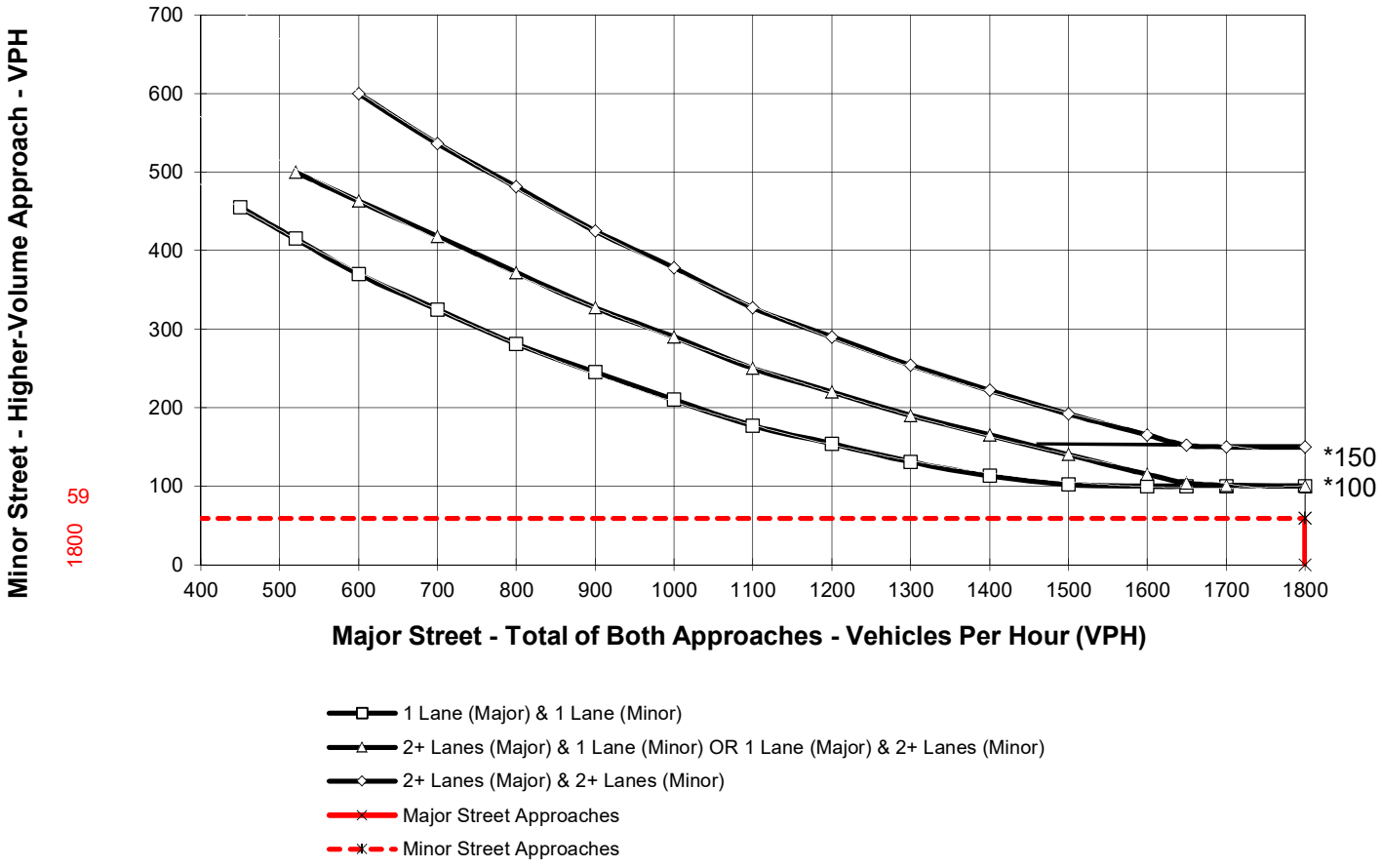
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **59**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1502**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

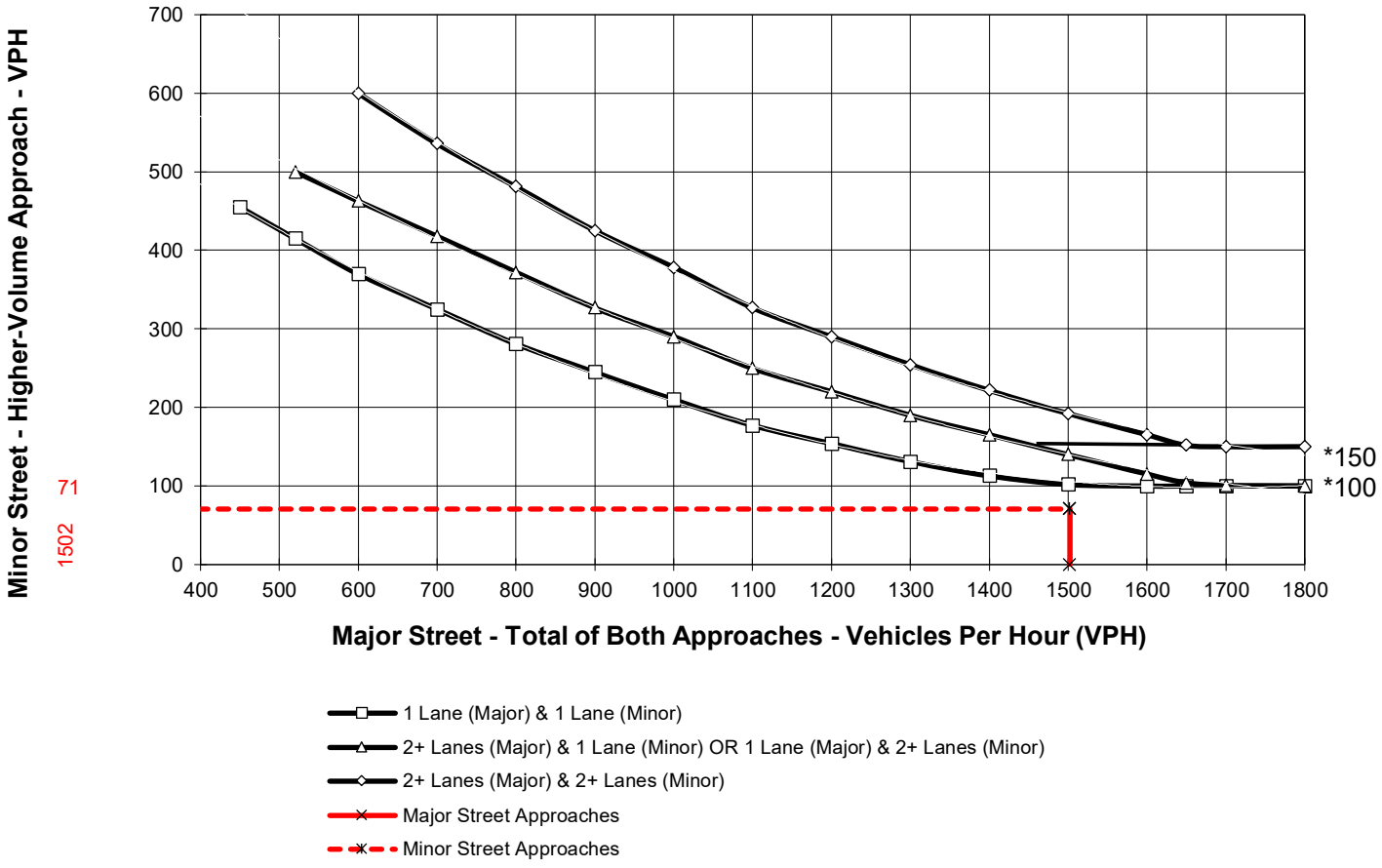
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **71**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Existing Plus Project Conditions PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2503**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

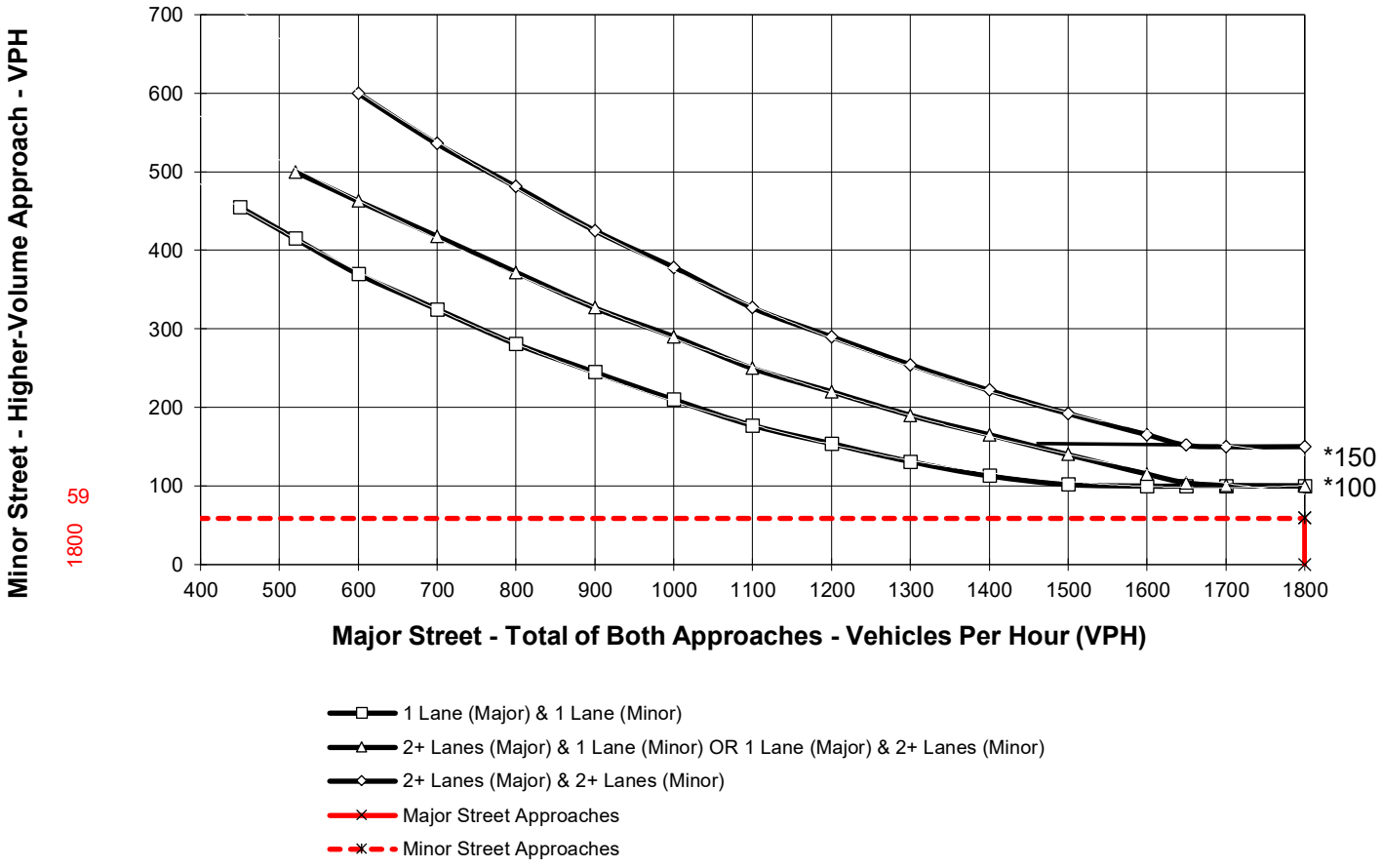
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **59**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1818**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

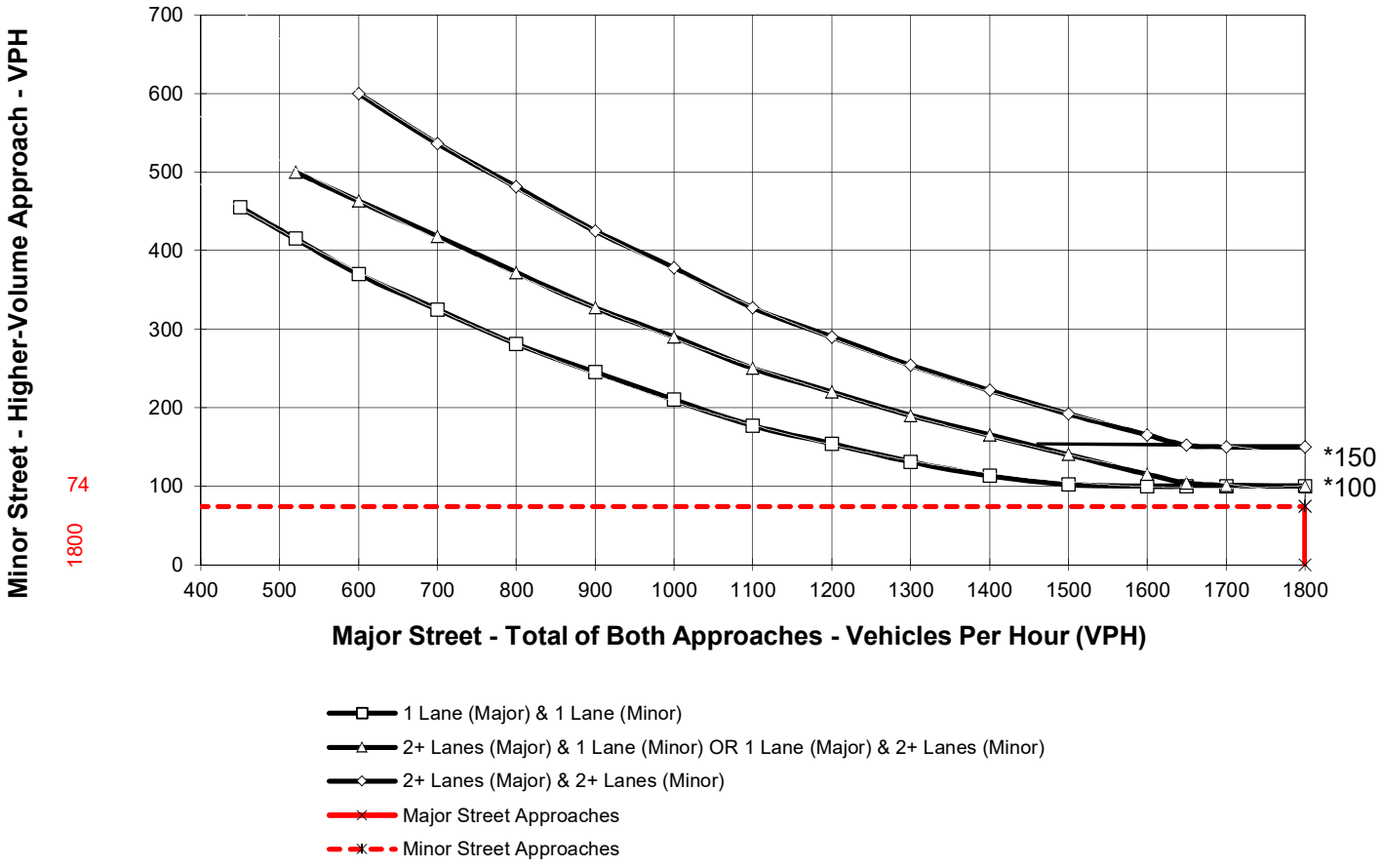
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **74**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) No Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **2904**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

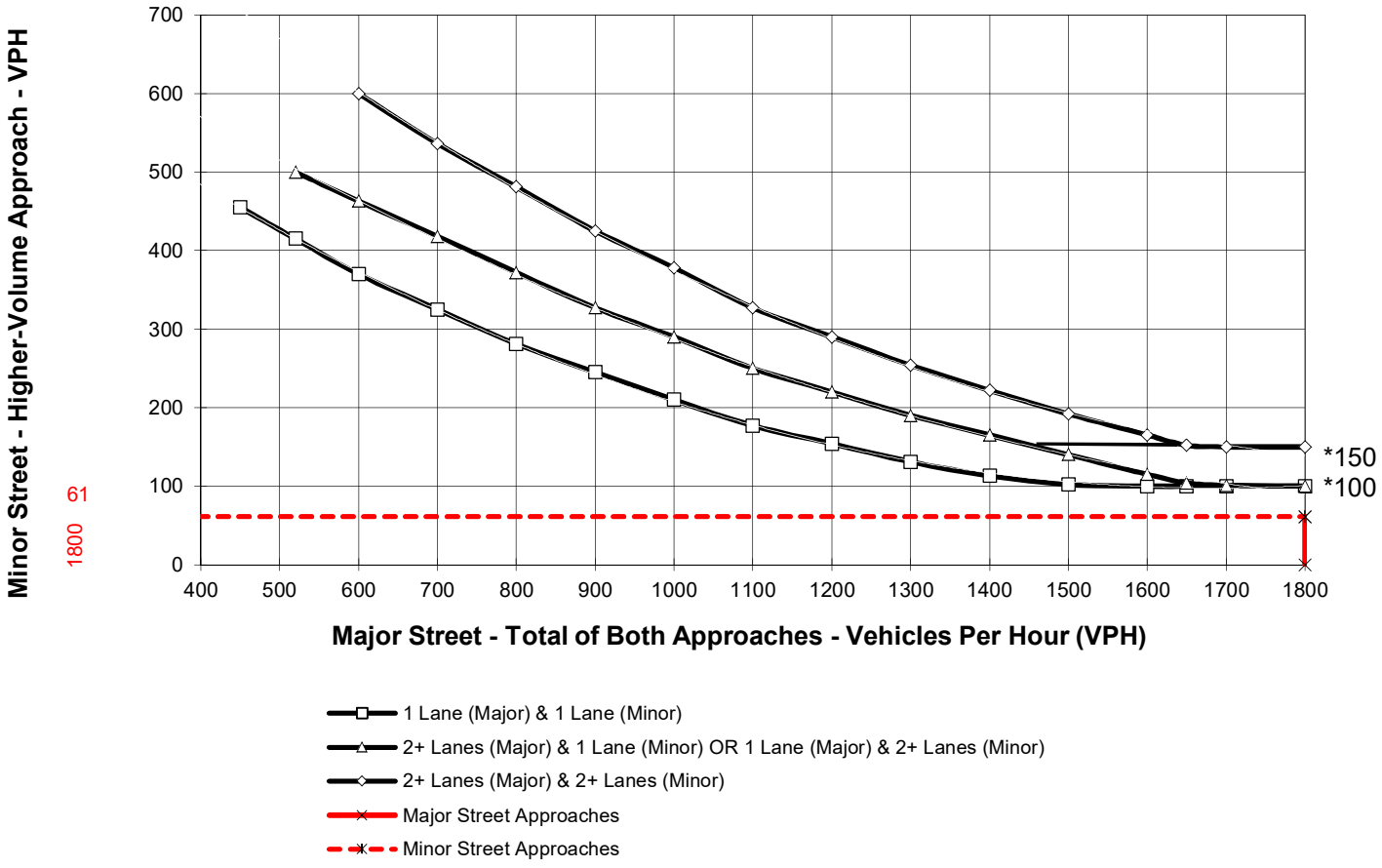
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **61**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project AM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **1895**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

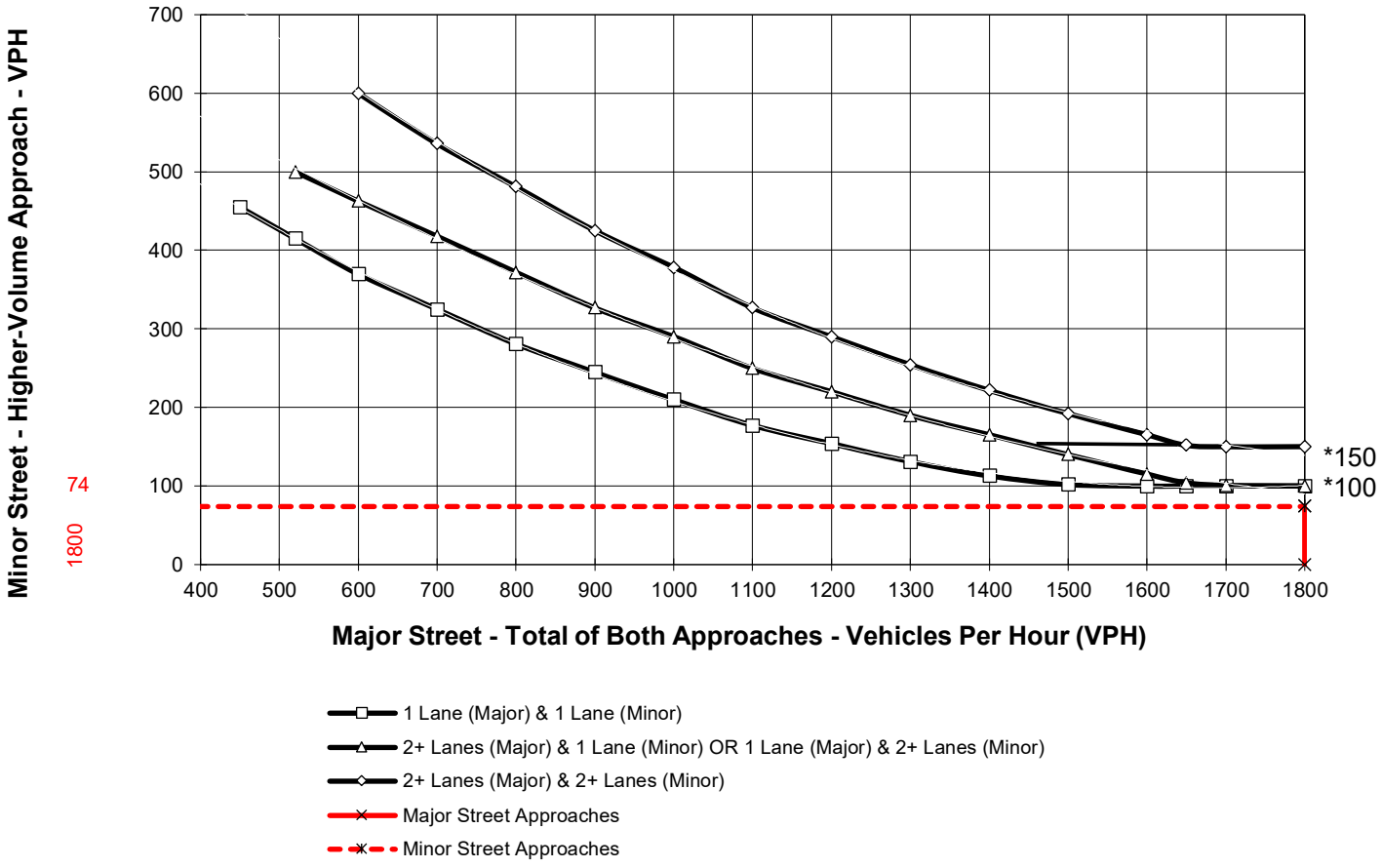
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **74**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2014 Edition

WARRANT 3, PEAK HOUR
(Urban Areas)

Traffic Conditions = **Project Buildout Year (2025) With Project PM**

Major Street Name = **Harbor Boulevard**

Total of Both Approaches (VPH) = **3017**

Number of Approach Lanes on Major Street = **2**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

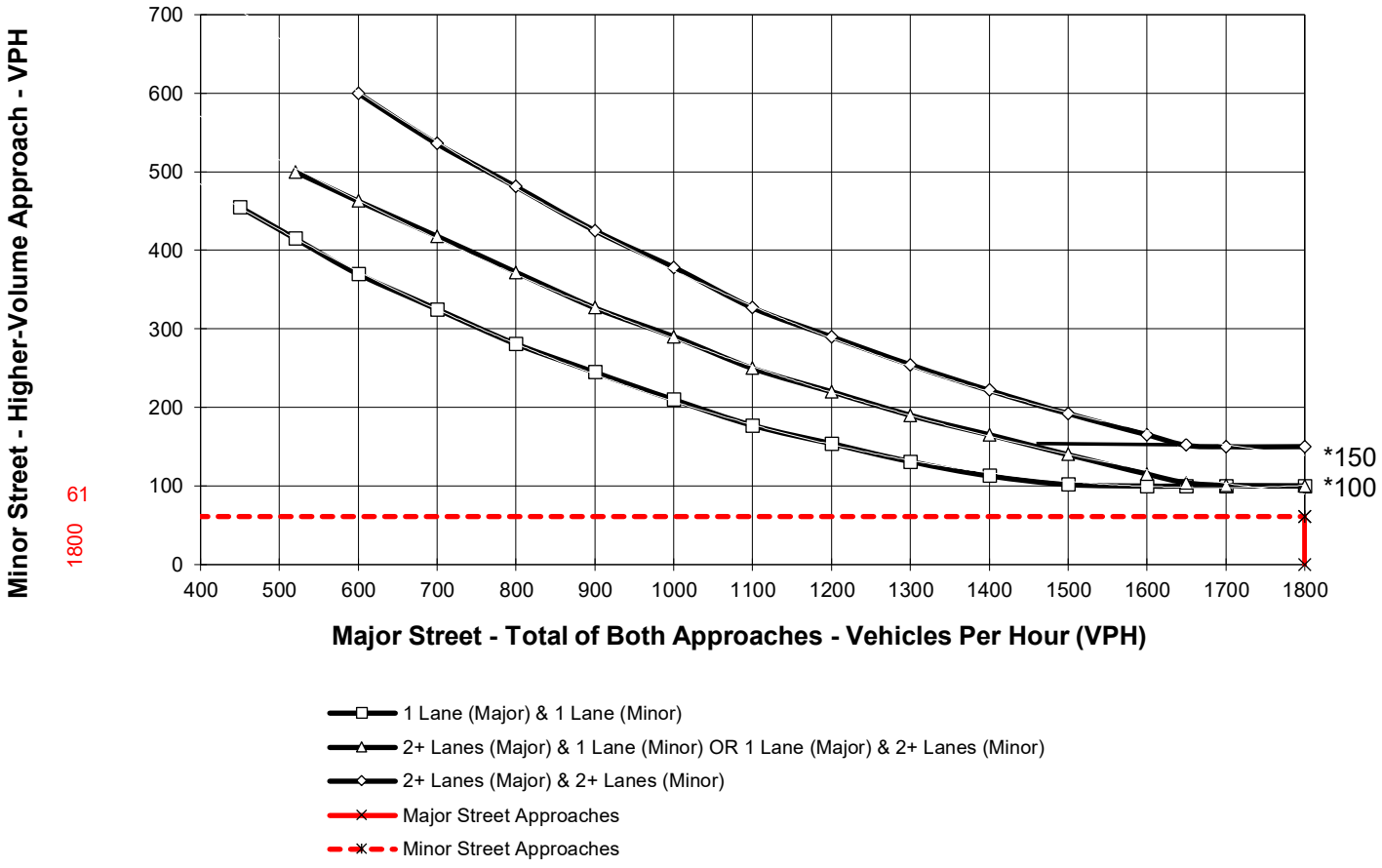
Minor Street Name = **Blue Spruce Avenue**

High Volume Approach (VPH) = **61**

Number of Approach Lanes On Minor Street = **1**

Enter 1 for 1 Lane or 2 for 2 or More Lanes

SIGNAL WARRANT NOT SATISFIED



* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Appendix C

Existing Conditions
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.453
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Ovl			Ovl			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	132	593	214	55	595	180	160	853	152	272	650	99
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	132	593	214	55	595	180	160	853	152	272	650	99
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	132	593	214	55	595	180	160	853	152	272	650	99
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	132	593	214	55	595	180	160	853	152	272	650	99
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	132	593	214	55	595	180	160	853	152	272	650	99
OvlAdjVol:			78			100			86			71
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.12	0.13	0.02	0.12	0.11	0.05	0.17	0.09	0.08	0.13	0.06
OvlAdjV/S:			0.05			0.06			0.05			0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.594
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	28	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	1 0	1 1	0	1 0	1 1	0
Volume Module:												
Base Vol:	74	762	191	111	527	55	81	688	55	124	271	141
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	74	762	191	111	527	55	81	688	55	124	271	141
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	74	762	191	111	527	55	81	688	55	124	271	141
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	74	762	191	111	527	55	81	688	55	124	271	141
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	74	762	191	111	527	55	81	688	55	124	271	141
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.40	0.60	1.00	2.72	0.28	1.00	1.85	0.15	1.00	1.32	0.68
Final Sat.:	1700	4078	1022	1700	4618	482	1700	3148	252	1700	2236	1164
Capacity Analysis Module:												
Vol/Sat:	0.04	0.19	0.19	0.07	0.11	0.11	0.05	0.22	0.22	0.07	0.12	0.12
Crit Moves:		****		****				****		****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.719
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	39	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	67	344	87		140	334	67		152	1321	89		77	521	164	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	67	344	87		140	334	67		152	1321	89		77	521	164	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	67	344	87		140	334	67		152	1321	89		77	521	164	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	67	344	87		140	334	67		152	1321	89		77	521	164	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	67	344	87		140	334	67		152	1321	89		77	521	164	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.60	0.40		1.00	1.67	0.33		1.00	1.87	0.13		1.00	2.00	1.00	
Final Sat.:	1700	2714	686		1700	2832	568		1700	3185	215		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.13	0.13		0.08	0.12	0.12		0.09	0.41	0.41		0.05	0.15	0.10	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.633
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	84	719	191	110	542	119	132	1266	120	128	511	76
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	84	719	191	110	542	119	132	1266	120	128	511	76
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	84	719	191	110	542	119	132	1266	120	128	511	76
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	84	719	191	110	542	119	132	1266	120	128	511	76
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	84	719	191	110	542	119	132	1266	120	128	511	76
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.02	0.14	0.11	0.03	0.11	0.07	0.04	0.37	0.07	0.04	0.15	0.04
Crit Moves:		****		****				****		****		

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.651
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	121	437	132	144	701	190	165	1388	140	88	440	60
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	121	437	132	144	701	190	165	1388	140	88	440	60
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	121	437	132	144	701	190	165	1388	140	88	440	60
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	121	437	132	144	701	190	165	1388	140	88	440	60
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	121	437	132	144	701	190	165	1388	140	88	440	60
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.13	0.08	0.08	0.21	0.11	0.10	0.27	0.08	0.05	0.13	0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.752
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	44	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1 0	1 0	1		1	0 1	1 0		1	0 2	1 0		1	0 2	0 1	
Volume Module:																
Base Vol:	59	293	174		53	538	33		113	1274	200		357	518	77	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	59	293	174		53	538	33		113	1274	200		357	518	77	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	59	293	174		53	538	33		113	1274	200		357	518	77	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	59	293	174		53	538	33		113	1274	200		357	518	77	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	59	293	174		53	538	33		113	1274	200		357	518	77	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.00	1.00		1.00	1.88	0.12		1.00	2.59	0.41		1.00	2.00	1.00	
Final Sat.:	1700	1700	1700		1700	3204	196		1700	4408	692		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.03	0.17	0.10		0.03	0.17	0.17		0.07	0.29	0.29		0.21	0.15	0.05	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.227
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	45	385	166	21	613	20	0	0	0	94	73	249
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	45	385	166	21	613	20	0	0	0	94	73	249
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	45	385	0	21	613	20	0	0	0	94	73	249
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	45	385	0	21	613	20	0	0	0	94	73	249
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	45	385	0	21	613	20	0	0	0	94	73	249
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.69	1.31	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	2871	2229	3400
Capacity Analysis Module:												
Vol/Sat:	0.01	0.06	0.00	0.01	0.09	0.01	0.00	0.00	0.00	0.03	0.03	0.07
Crit Moves:	****			****								****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.229
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	4 1	0	0 0	4 0	1	1 0	1 0	2	0 0	0 0	0
Volume Module:												
Base Vol:	0	556	5	0	518	213	32	136	348	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	556	5	0	518	213	32	136	348	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	556	5	0	518	0	32	136	348	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	556	5	0	518	0	32	136	348	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	556	5	0	518	0	32	136	348	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.96	0.04	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8424	76	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.07	0.07	0.00	0.08	0.00	0.02	0.08	0.10	0.00	0.00	0.00
Crit Moves:	****			****					****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.463
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Ovl			Ovl			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	88	430	212	137	520	166	120	998	79	305	506	89
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	88	430	212	137	520	166	120	998	79	305	506	89
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	88	430	212	137	520	166	120	998	79	305	506	89
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	88	430	212	137	520	166	120	998	79	305	506	89
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	88	430	212	137	520	166	120	998	79	305	506	89
OvlAdjVol:			0			106			35			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.08	0.06	0.04	0.10	0.10	0.04	0.20	0.05	0.09	0.10	0.05
OvlAdjV/S:			0.00			0.06			0.02			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12
Grade (%)	0%			0%		0%	
Storage Length (ft)	0	0	90		150		50
Storage Lanes	1	0	1		1		1
Taper Length (ft)	25		25		25		
Lane Util. Factor	1.00	1.00	1.00	0.91	1.00	0.91	1.00
Ped Bike Factor							
Frt							
Flt Protected							
Satd. Flow (prot)	1863	0	1863	5085	1863	5085	1863
Flt Permitted							
Satd. Flow (perm)	1863	0	1863	5085	1863	5085	1863
Link Speed (mph)	30			30		30	
Link Distance (ft)	423			491		921	
Travel Time (s)	9.6			11.2		20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Traffic Volume (vph)	0	0	0	1114	0	752	0
Future Volume (vph)	0	0	0	1114	0	752	0
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%		0%	
Adj. Flow (vph)	0	0	0	1211	0	817	0
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	0	1211	0	817	0

Intersection Summary

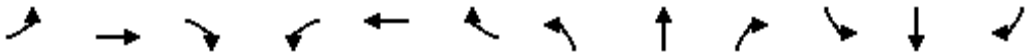
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Traffic Vol, veh/h	0	0	0	1114	0	752	0
Future Vol, veh/h	0	0	0	1114	0	752	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	90	-	150	-	50
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1211	0	817	0

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	1301	409	817	0	884	-	0
Stage 1	817	-	-	-	-	-	-
Stage 2	484	-	-	-	-	-	-
Critical Hdwy	5.74	7.14	5.34	-	5.64	-	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	3.12	-	2.32	-	-
Pot Cap-1 Maneuver	218	506	479	-	510	-	-
Stage 1	312	-	-	-	-	-	-
Stage 2	535	-	-	-	-	-	-
Platoon blocked, %				-		-	-
Mov Cap-1 Maneuver	218	506	479	-	510	-	-
Mov Cap-2 Maneuver	218	-	-	-	-	-	-
Stage 1	312	-	-	-	-	-	-
Stage 2	535	-	-	-	-	-	-

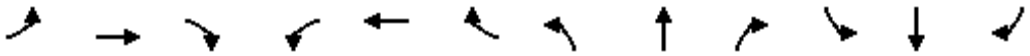
Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBU	SBT	SBR
Capacity (veh/h)	479	-	-	510	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.930			0.935			0.991			0.996	
Flt Protected		0.991			0.985		0.950			0.950		
Satd. Flow (prot)	0	1717	0	0	1716	0	1770	5040	0	1770	5065	0
Flt Permitted		0.991			0.985		0.950			0.950		
Satd. Flow (perm)	0	1717	0	0	1716	0	1770	5040	0	1770	5065	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	18	28	50	45	31	72	36	1025	65	39	694	20
Future Volume (vph)	18	28	50	45	31	72	36	1025	65	39	694	20
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	18	29	51	46	32	73	37	1046	66	40	708	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	151	0	37	1112	0	40	728	0

Intersection Summary

Intersection	
Int Delay, s/veh	36.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	28	50	45	31	72	36	1025	65	39	694	20
Future Vol, veh/h	18	28	50	45	31	72	36	1025	65	39	694	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	29	51	46	32	73	37	1046	66	40	708	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1306	1984	364	1531	1961	556	728	0	0	1112	0	0
Stage 1	798	798	-	1153	1153	-	-	-	-	-	-	-
Stage 2	508	1186	-	378	808	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	168	61	540	123	63	406	528	-	-	345	-	-
Stage 1	275	396	-	156	270	-	-	-	-	-	-	-
Stage 2	471	260	-	564	392	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	62	50	540	54	52	406	528	-	-	345	-	-
Mov Cap-2 Maneuver	62	50	-	54	52	-	-	-	-	-	-	-
Stage 1	256	350	-	145	251	-	-	-	-	-	-	-
Stage 2	314	242	-	415	347	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	155.2	$ 411.5	0.4	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	528	-	-	102	92	345	-	-
HCM Lane V/C Ratio	0.07	-	-	0.96	1.642	0.115	-	-
HCM Control Delay (s)	12.3	-	-	155.2	$ 411.5	16.8	-	-
HCM Lane LOS	B	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	-	5.8	12.1	0.4	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.455
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	1 0	1 0	1	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	51	406	69	86	469	103	94	268	96	83	189	60
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	51	406	69	86	469	103	94	268	96	83	189	60
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	51	406	69	86	469	103	94	268	96	83	189	60
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	51	406	69	86	469	103	94	268	96	83	189	60
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	51	406	69	86	469	103	94	268	96	83	189	60
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.71	0.29	1.00	1.64	0.36	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	2906	494	1700	2788	612	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.14	0.14	0.05	0.17	0.17	0.06	0.16	0.06	0.05	0.11	0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.561
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	27	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	66	943	174		58	702	23		49	304	65		135	174	33	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	66	943	174		58	702	23		49	304	65		135	174	33	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	66	943	174		58	702	23		49	304	65		135	174	33	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	66	943	174		58	702	23		49	304	65		135	174	33	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	66	943	174		58	702	23		49	304	65		135	174	33	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.53	0.47		1.00	2.90	0.10		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	4306	794		1700	4938	162		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.22	0.22		0.03	0.14	0.14		0.03	0.18	0.04		0.08	0.10	0.02	
Crit Moves:		****				****					****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

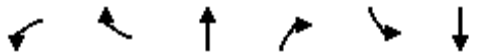
Cycle (sec):	100	Critical Vol./Cap.(X):	0.581
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	28	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	90	435	54	168	799	80	119	311	116	102	99	176
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	90	435	54	168	799	80	119	311	116	102	99	176
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	90	435	54	168	799	80	119	311	116	102	99	176
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	90	435	54	168	799	80	119	311	116	102	99	176
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	90	435	54	168	799	80	119	311	116	102	99	176
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.13	0.03	0.10	0.24	0.05	0.07	0.18	0.07	0.06	0.06	0.10
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.946		0.997			
Flt Protected	0.971				0.950	
Satd. Flow (prot)	1711	0	5070	0	1770	5085
Flt Permitted	0.971				0.950	
Satd. Flow (perm)	1711	0	5070	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	43	28	727	15	14	669
Future Volume (vph)	43	28	727	15	14	669
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	44	29	749	15	14	690
Shared Lane Traffic (%)						
Lane Group Flow (vph)	73	0	764	0	14	690

Intersection Summary

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	28	727	15	14	669
Future Vol, veh/h	43	28	727	15	14	669
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	29	749	15	14	690

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1061	382	0	0	764	0
Stage 1	757	-	-	-	-	-
Stage 2	304	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	289	526	-	-	508	-
Stage 1	339	-	-	-	-	-
Stage 2	662	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	281	526	-	-	508	-
Mov Cap-2 Maneuver	281	-	-	-	-	-
Stage 1	339	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	344	508	-
HCM Lane V/C Ratio	-	-	0.213	0.028	-
HCM Control Delay (s)	-	-	18.3	12.3	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.255
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Permitted				Permitted			
Rights:	Include				Include				Include				Ovl			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 2	1	0	0	0 1!	0	0	0	1 0	0	1
Volume Module:																
Base Vol:	12	609	13		60	594	52		41	15	14		8	37	99	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	12	609	13		60	594	52		41	15	14		8	37	99	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	12	609	13		60	594	52		41	15	14		8	37	99	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	12	609	13		60	594	52		41	15	14		8	37	99	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	12	609	13		60	594	52		41	15	14		8	37	99	
OvlAdjVol:															39	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	2.76	0.24		0.59	0.21	0.20		0.18	0.82	1.00	
Final Sat.:	1700	5100	1700		1700	4689	411		996	364	340		302	1398	1700	
Capacity Analysis Module:																
Vol/Sat:	0.01	0.12	0.01		0.04	0.13	0.13		0.02	0.04	0.04		0.00	0.03	0.06	
OvlAdjV/S:															0.02	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.619
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	2 0	2 1	0	2 0	2 1	0
Volume Module:												
Base Vol:	226	961	247	81	868	129	303	784	302	180	354	40
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	226	961	247	81	868	129	303	784	302	180	354	40
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	226	961	247	81	868	129	303	784	302	180	354	40
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	226	961	247	81	868	129	303	784	302	180	354	40
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	226	961	247	81	868	129	303	784	302	180	354	40
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	2.00	2.17	0.83	2.00	2.70	0.30
Final Sat.:	1700	5100	1700	1700	5100	1700	3400	3682	1418	3400	4582	518
Capacity Analysis Module:												
Vol/Sat:	0.13	0.19	0.15	0.05	0.17	0.08	0.09	0.21	0.21	0.05	0.08	0.08
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.727
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	40	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	0	0 2	1	0	1	0	0	0 1	1	1	0	0 1
Volume Module:																
Base Vol:	49	1232	0	0	1423	23			76	0	129		924	58	112	
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	49	1232	0	0	1423	23			76	0	129		924	58	112	
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	49	1232	0	0	1423	23			76	0	129		924	58	112	
Reduct Vol:	0	0	0	0	0	0			0	0	0		0	0	0	
Reduced Vol:	49	1232	0	0	1423	23			76	0	129		924	58	112	
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	49	1232	0	0	1423	23			76	0	129		924	58	112	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700			1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00	0.00	2.95	0.05			1.00	0.00	1.00		1.88	0.12	1.00	
Final Sat.:	1700	5100	1700	0	5019	81			1700	0	1700		3199	201	1700	
Capacity Analysis Module:																
Vol/Sat:	0.03	0.24	0.00	0.00	0.28	0.28			0.04	0.00	0.08		0.29	0.29	0.07	
Crit Moves:	****				****						****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.758
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	44	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:		Ovl				Include				Include				Ovl		
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	1	0 2	0	1	1	0 1	0	2
Volume Module:																
Base Vol:	65	881	477		337	1644	125		95	601	389		97	236	770	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	65	881	477		337	1644	125		95	601	389		97	236	770	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	65	881	477		337	1644	125		95	601	389		97	236	770	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	65	881	477		337	1644	125		95	601	389		97	236	770	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	65	881	477		337	1644	125		95	601	389		97	236	770	
OvlAdjVol:			380												96	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		1.00	2.00	1.00		1.00	1.00	2.00	
Final Sat.:	1700	5100	1700		1700	5100	1700		1700	3400	1700		1700	1700	3400	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.17	0.28		0.20	0.32	0.07		0.06	0.18	0.23		0.06	0.14	0.23	
OvlAdjV/S:			0.22												0.03	
Crit Moves:			****		****						****		****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.540
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	52	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	0	0	0	0	2	0	1	0	0	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	578	833	0	0	788	100
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	0	0	0	578	833	0	0	788	100
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	578	833	0	0	788	100
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	578	833	0	0	788	100
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	578	833	0	0	788	100
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.77	0.23
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3017	383
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.49	0.00	0.00	0.26	0.26
Crit Moves:								****				

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.576
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	27	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Ovl			Ovl			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	151	687	241	50	666	185	199	957	121	321	1491	108
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	151	687	241	50	666	185	199	957	121	321	1491	108
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	151	687	241	50	666	185	199	957	121	321	1491	108
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	151	687	241	50	666	185	199	957	121	321	1491	108
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	151	687	241	50	666	185	199	957	121	321	1491	108
OvlAdjVol:			80			86			46			83
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.13	0.14	0.01	0.13	0.11	0.06	0.19	0.07	0.09	0.29	0.06
OvlAdjV/S:			0.05			0.05			0.03			0.05
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.620
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	101	815	213		122	877	85		46	466	87		214	795	123	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	101	815	213		122	877	85		46	466	87		214	795	123	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	101	815	213		122	877	85		46	466	87		214	795	123	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	101	815	213		122	877	85		46	466	87		214	795	123	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	101	815	213		122	877	85		46	466	87		214	795	123	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.38	0.62		1.00	2.73	0.27		1.00	1.69	0.31		1.00	1.73	0.27	
Final Sat.:	1700	4043	1057		1700	4649	451		1700	2865	535		1700	2944	456	
Capacity Analysis Module:																
Vol/Sat:	0.06	0.20	0.20		0.07	0.19	0.19		0.03	0.16	0.16		0.13	0.27	0.27	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.665
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	1 0	1 0	1	1 0	1 0	1	1 0	1 0	2	0 1
Volume Module:												
Base Vol:	109	398	69	135	403	87	98	826	69	129	1159	183
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	109	398	69	135	403	87	98	826	69	129	1159	183
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	109	398	69	135	403	87	98	826	69	129	1159	183
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	109	398	69	135	403	87	98	826	69	129	1159	183
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	109	398	69	135	403	87	98	826	69	129	1159	183
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.70	0.30	1.00	1.64	0.36	1.00	1.85	0.15	1.00	2.00	1.00
Final Sat.:	1700	2898	502	1700	2796	604	1700	3138	262	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.14	0.14	0.08	0.14	0.14	0.06	0.26	0.26	0.08	0.34	0.11
Crit Moves:		****			****			****			****	

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.650
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	238	913	243	210	746	170	119	829	133	201	1103	150
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	238	913	243	210	746	170	119	829	133	201	1103	150
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	238	913	243	210	746	170	119	829	133	201	1103	150
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	238	913	243	210	746	170	119	829	133	201	1103	150
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	238	913	243	210	746	170	119	829	133	201	1103	150
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.18	0.14	0.06	0.15	0.10	0.04	0.24	0.08	0.06	0.32	0.09
Crit Moves:		****			****			****			****	

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.880
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	76	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	198	662	104	171	796	256	222	948	170	181	1186	149
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	198	662	104	171	796	256	222	948	170	181	1186	149
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	198	662	104	171	796	256	222	948	170	181	1186	149
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	198	662	104	171	796	256	222	948	170	181	1186	149
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	198	662	104	171	796	256	222	948	170	181	1186	149
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.19	0.06	0.10	0.23	0.15	0.13	0.19	0.10	0.11	0.35	0.09
Crit Moves:	****				****		****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.881
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	77	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1 0	1	1 0	1 1	0	1 0	2 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	198	546	365	92	331	86	123	897	121	266	1303	225
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	198	546	365	92	331	86	123	897	121	266	1303	225
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	198	546	365	92	331	86	123	897	121	266	1303	225
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	198	546	365	92	331	86	123	897	121	266	1303	225
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	198	546	365	92	331	86	123	897	121	266	1303	225
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.59	0.41	1.00	2.64	0.36	1.00	2.00	1.00
Final Sat.:	1700	1700	1700	1700	2699	701	1700	4494	606	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.32	0.21	0.05	0.12	0.12	0.07	0.20	0.20	0.16	0.38	0.13
Crit Moves:		****		****			****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.393
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	159	722	413	11	1023	16	0	0	0	51	497	243
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	159	722	413	11	1023	16	0	0	0	51	497	243
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	159	722	0	11	1023	16	0	0	0	51	497	243
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	159	722	0	11	1023	16	0	0	0	51	497	243
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	159	722	0	11	1023	16	0	0	0	51	497	243
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.00	2.00	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	1700	3400	3400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.11	0.00	0.01	0.15	0.01	0.00	0.00	0.00	0.03	0.15	0.07
Crit Moves:	****			****						****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.285
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	17	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	4 1	0	0 0	4 0	1	1 0	1 0	2	0 0	0 0	0
Volume Module:												
Base Vol:	0	1229	40	0	706	367	56	131	293	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	1229	40	0	706	367	56	131	293	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	1229	40	0	706	0	56	131	293	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	1229	40	0	706	0	56	131	293	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	1229	40	0	706	0	56	131	293	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.84	0.16	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8232	268	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.15	0.15	0.00	0.10	0.00	0.03	0.08	0.09	0.00	0.00	0.00
Crit Moves:		****			****				****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.521
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	161	748	605	109	690	272	235	1160	70	207	1048	93
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	161	748	605	109	690	272	235	1160	70	207	1048	93
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	161	748	605	109	690	272	235	1160	70	207	1048	93
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	161	748	605	109	690	272	235	1160	70	207	1048	93
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	161	748	605	109	690	272	235	1160	70	207	1048	93
OvlAdjVol:			398			155			0			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.15	0.18	0.03	0.14	0.16	0.07	0.23	0.04	0.06	0.21	0.05
OvlAdjV/S:			0.12			0.09			0.00			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12
Grade (%)	0%			0%		0%	
Storage Length (ft)	0	0	90		150		50
Storage Lanes	1	0	1		1		1
Taper Length (ft)	25		25		25		
Lane Util. Factor	1.00	1.00	1.00	0.91	1.00	0.91	1.00
Ped Bike Factor							
Frt							
Flt Protected							
Satd. Flow (prot)	1863	0	1863	5085	1863	5085	1863
Flt Permitted							
Satd. Flow (perm)	1863	0	1863	5085	1863	5085	1863
Link Speed (mph)	30			30		30	
Link Distance (ft)	423			491		921	
Travel Time (s)	9.6			11.2		20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Traffic Volume (vph)	0	0	0	1350	0	1032	0
Future Volume (vph)	0	0	0	1350	0	1032	0
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%		0%	
Adj. Flow (vph)	0	0	0	1467	0	1122	0
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	0	0	1467	0	1122	0

Intersection Summary

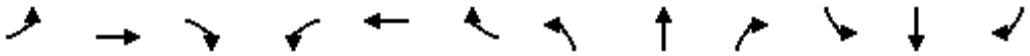
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Traffic Vol, veh/h	0	0	0	1350	0	1032	0
Future Vol, veh/h	0	0	0	1350	0	1032	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	90	-	150	-	50
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1467	0	1122	0

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	1709	561	1122	0	1071	-	0
Stage 1	1122	-	-	-	-	-	-
Stage 2	587	-	-	-	-	-	-
Critical Hdwy	5.74	7.14	5.34	-	5.64	-	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	3.12	-	2.32	-	-
Pot Cap-1 Maneuver	134	403	342	-	401	-	-
Stage 1	204	-	-	-	-	-	-
Stage 2	473	-	-	-	-	-	-
Platoon blocked, %				-		-	-
Mov Cap-1 Maneuver	134	403	342	-	401	-	-
Mov Cap-2 Maneuver	134	-	-	-	-	-	-
Stage 1	204	-	-	-	-	-	-
Stage 2	473	-	-	-	-	-	-

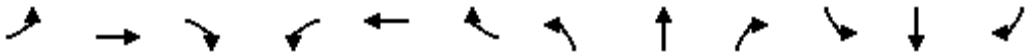
Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBU	SBT	SBR
Capacity (veh/h)	342	-	-	401	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	-	0	0	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.932			0.913			0.993			0.997	
Flt Protected		0.983			0.989		0.950			0.950		
Satd. Flow (prot)	0	1707	0	0	1682	0	1770	5050	0	1770	5070	0
Flt Permitted		0.983			0.989		0.950			0.950		
Satd. Flow (perm)	0	1707	0	0	1682	0	1770	5050	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	11	5	16	14	9	42	47	1297	61	34	975	23
Future Volume (vph)	11	5	16	14	9	42	47	1297	61	34	975	23
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	12	5	17	15	10	45	51	1395	66	37	1048	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	34	0	0	70	0	51	1461	0	37	1073	0

Intersection Summary

Intersection	
Int Delay, s/veh	11

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	5	16	14	9	42	47	1297	61	34	975	23
Future Vol, veh/h	11	5	16	14	9	42	47	1297	61	34	975	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	5	17	15	10	45	51	1395	66	37	1048	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1800	2698	537	2026	2677	731	1073	0	0	1461	0	0
Stage 1	1135	1135	-	1530	1530	-	-	-	-	-	-	-
Stage 2	665	1563	-	496	1147	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	84	21	418	61	22	312	361	-	-	233	-	-
Stage 1	160	275	-	84	177	-	-	-	-	-	-	-
Stage 2	378	171	-	479	272	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	30	15	418	34	16	312	361	-	-	233	-	-
Mov Cap-2 Maneuver	30	15	-	34	16	-	-	-	-	-	-	-
Stage 1	137	231	-	72	152	-	-	-	-	-	-	-
Stage 2	260	147	-	377	229	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	223.1	292.6	0.6	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	361	-	-	43	59	233	-	-
HCM Lane V/C Ratio	0.14	-	-	0.8	1.185	0.157	-	-
HCM Control Delay (s)	16.6	-	-	223.1	292.6	23.3	-	-
HCM Lane LOS	C	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0.5	-	-	3.1	5.8	0.5	-	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.472
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	67	356	66		44	401	45		63	350	87		78	349	107	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	67	356	66		44	401	45		63	350	87		78	349	107	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	67	356	66		44	401	45		63	350	87		78	349	107	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	67	356	66		44	401	45		63	350	87		78	349	107	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	67	356	66		44	401	45		63	350	87		78	349	107	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.69	0.31		1.00	1.80	0.20		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	2868	532		1700	3057	343		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.12	0.12		0.03	0.13	0.13		0.04	0.21	0.05		0.05	0.21	0.06	
Crit Moves:	****				****				****				****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.642
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	32	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	109	1376	178	56	944	61	60	240	76	193	362	84
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	109	1376	178	56	944	61	60	240	76	193	362	84
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	109	1376	178	56	944	61	60	240	76	193	362	84
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	109	1376	178	56	944	61	60	240	76	193	362	84
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	109	1376	178	56	944	61	60	240	76	193	362	84
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.66	0.34	1.00	2.82	0.18	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	4516	584	1700	4790	310	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.30	0.30	0.03	0.20	0.20	0.04	0.14	0.04	0.11	0.21	0.05
Crit Moves:		****		****				****		****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

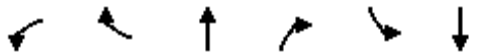
Cycle (sec):	100	Critical Vol./Cap.(X):	0.729
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	41	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	100	714	54	97	867	136	139	248	82	211	482	147
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	100	714	54	97	867	136	139	248	82	211	482	147
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	100	714	54	97	867	136	139	248	82	211	482	147
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	100	714	54	97	867	136	139	248	82	211	482	147
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	100	714	54	97	867	136	139	248	82	211	482	147
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.21	0.03	0.06	0.26	0.08	0.08	0.15	0.05	0.12	0.28	0.09
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.927		0.994			
Flt Protected	0.978				0.950	
Satd. Flow (prot)	1689	0	5055	0	1770	5085
Flt Permitted	0.978				0.950	
Satd. Flow (perm)	1689	0	5055	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	27	32	1348	52	30	961
Future Volume (vph)	27	32	1348	52	30	961
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	29	34	1434	55	32	1022
Shared Lane Traffic (%)						
Lane Group Flow (vph)	63	0	1489	0	32	1022

Intersection Summary

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	32	1348	52	30	961
Future Vol, veh/h	27	32	1348	52	30	961
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	34	1434	55	32	1022

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1935	745	0	0	1489	0
Stage 1	1462	-	-	-	-	-
Stage 2	473	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	101	306	-	-	226	-
Stage 1	125	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	87	306	-	-	226	-
Mov Cap-2 Maneuver	87	-	-	-	-	-
Stage 1	125	-	-	-	-	-
Stage 2	465	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	49	0	0.7
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	142	226	-
HCM Lane V/C Ratio	-	-	0.442	0.141	-
HCM Control Delay (s)	-	-	49	23.5	-
HCM Lane LOS	-	-	E	C	-
HCM 95th %tile Q(veh)	-	-	2	0.5	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.446
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	36	1126	27	90	795	105	138	45	28	8	62	133
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	36	1126	27	90	795	105	138	45	28	8	62	133
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	36	1126	27	90	795	105	138	45	28	8	62	133
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	36	1126	27	90	795	105	138	45	28	8	62	133
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	36	1126	27	90	795	105	138	45	28	8	62	133
OvlAdjVol:												43
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.65	0.35	0.66	0.21	0.13	0.11	0.89	1.00
Final Sat.:	1700	5100	1700	1700	4505	595	1112	363	226	194	1506	1700
Capacity Analysis Module:												
Vol/Sat:	0.02	0.22	0.02	0.05	0.18	0.18	0.08	0.12	0.12	0.00	0.04	0.08
OvlAdjV/S:												0.03
Crit Moves:	****			****			****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.695
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	37	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	2 0	2 1	0	2 0	2 1	0
Volume Module:												
Base Vol:	305	1196	249	116	923	223	326	593	212	273	863	98
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	305	1196	249	116	923	223	326	593	212	273	863	98
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	305	1196	249	116	923	223	326	593	212	273	863	98
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	305	1196	249	116	923	223	326	593	212	273	863	98
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	305	1196	249	116	923	223	326	593	212	273	863	98
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	2.00	2.21	0.79	2.00	2.69	0.31
Final Sat.:	1700	5100	1700	1700	5100	1700	3400	3757	1343	3400	4580	520
Capacity Analysis Module:												
Vol/Sat:	0.18	0.23	0.15	0.07	0.18	0.13	0.10	0.16	0.16	0.08	0.19	0.19
Crit Moves:	****				****		****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.667
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	0	0 2	1	0	1	0	0	0 1	1	1	0	0 1
Volume Module:																
Base Vol:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	118	1742	0	0	1479	47	87	0	79	603	69	126				
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	118	1742	0	0	1479	47	87	0	79	603	69	126				
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	3.00	1.00	0.00	2.91	0.09	1.00	0.00	1.00	1.79	0.21	1.00				
Final Sat.:	1700	5100	1700	0	4943	157	1700	0	1700	3051	349	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.34	0.00	0.00	0.30	0.30	0.05	0.00	0.05	0.20	0.20	0.07				
Crit Moves:	****				****		****				****					

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.813
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	55	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	1 0	2 0	1	1 0	1 0	2
Volume Module:												
Base Vol:	118	1324	369	322	1182	209	188	563	428	105	235	718
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	118	1324	369	322	1182	209	188	563	428	105	235	718
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	118	1324	369	322	1182	209	188	563	428	105	235	718
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	118	1324	369	322	1182	209	188	563	428	105	235	718
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	118	1324	369	322	1182	209	188	563	428	105	235	718
OvlAdjVol:			264									74
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.07	0.26	0.22	0.19	0.23	0.12	0.11	0.17	0.25	0.06	0.14	0.21
OvlAdjV/S:			0.16									0.02
Crit Moves:		****			****				****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.458
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	592	666	0	0	745	50
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	0	0	0	592	666	0	0	745	50
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	592	666	0	0	745	50
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	592	666	0	0	745	50
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	592	666	0	0	745	50
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.87	0.13
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3186	214
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.39	0.00	0.00	0.23	0.23
Crit Moves:							****				****	

Appendix D

Existing Plus Project Conditions
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.458
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	132	593	214	55	595	180	160	853	152	272	650	99
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	132	593	214	55	595	180	160	853	152	272	650	99
Added Vol:	5	10	5	0	12	0	0	0	6	6	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	137	603	219	55	607	180	160	853	158	278	650	99
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	137	603	219	55	607	180	160	853	158	278	650	99
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	137	603	219	55	607	180	160	853	158	278	650	99
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	137	603	219	55	607	180	160	853	158	278	650	99
OvlAdjVol:			80			100			89			71
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.12	0.13	0.02	0.12	0.11	0.05	0.17	0.09	0.08	0.13	0.06
OvlAdjV/S:			0.05			0.06			0.05			0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.604
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	29	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0	2	1	0	1	0	2	1	0	1	0	1	0	1	1	0
Volume Module:																
Base Vol:	74	762	191		111	527	55		81	688	55		124	271	141	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	74	762	191		111	527	55		81	688	55		124	271	141	
Added Vol:	5	19	5		0	24	0		0	0	6		6	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	79	781	196		111	551	55		81	688	61		130	271	141	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	79	781	196		111	551	55		81	688	61		130	271	141	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	79	781	196		111	551	55		81	688	61		130	271	141	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	79	781	196		111	551	55		81	688	61		130	271	141	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.40	0.60		1.00	2.73	0.27		1.00	1.84	0.16		1.00	1.32	0.68	
Final Sat.:	1700	4077	1023		1700	4637	463		1700	3123	277		1700	2236	1164	
Capacity Analysis Module:																
Vol/Sat:	0.05	0.19	0.19		0.07	0.12	0.12		0.05	0.22	0.22		0.08	0.12	0.12	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.724
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	40	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	67	344	87		140	334	67		152	1321	89		77	521	164	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	67	344	87		140	334	67		152	1321	89		77	521	164	
Added Vol:	0	0	0		6	0	0		0	6	0		0	5	5	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	67	344	87		146	334	67		152	1327	89		77	526	169	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	67	344	87		146	334	67		152	1327	89		77	526	169	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	67	344	87		146	334	67		152	1327	89		77	526	169	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	67	344	87		146	334	67		152	1327	89		77	526	169	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.60	0.40		1.00	1.67	0.33		1.00	1.87	0.13		1.00	2.00	1.00	
Final Sat.:	1700	2714	686		1700	2832	568		1700	3186	214		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.13	0.13		0.09	0.12	0.12		0.09	0.42	0.42		0.05	0.15	0.10	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.643
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	32	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	84	719	191	110	542	119	132	1266	120	128	511	76
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	84	719	191	110	542	119	132	1266	120	128	511	76
Added Vol:	10	29	10	0	37	0	0	0	12	12	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	94	748	201	110	579	119	132	1266	132	140	511	76
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	94	748	201	110	579	119	132	1266	132	140	511	76
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	94	748	201	110	579	119	132	1266	132	140	511	76
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	94	748	201	110	579	119	132	1266	132	140	511	76
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.15	0.12	0.03	0.11	0.07	0.04	0.37	0.08	0.04	0.15	0.04
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.653
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	0	1	1	0 2	0	1	1	0 3	0	1	1	0 2	0	1
Volume Module:																
Base Vol:	121	437	132		144	701	190		165	1388	140		88	440	60	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	121	437	132		144	701	190		165	1388	140		88	440	60	
Added Vol:	0	0	0		0	0	0		0	10	0		0	12	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	121	437	132		144	701	190		165	1398	140		88	452	60	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	121	437	132		144	701	190		165	1398	140		88	452	60	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	121	437	132		144	701	190		165	1398	140		88	452	60	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	121	437	132		144	701	190		165	1398	140		88	452	60	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.00	1.00		1.00	2.00	1.00		1.00	3.00	1.00		1.00	2.00	1.00	
Final Sat.:	1700	3400	1700		1700	3400	1700		1700	5100	1700		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.13	0.08		0.08	0.21	0.11		0.10	0.27	0.08		0.05	0.13	0.04	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.754
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	44	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1 0	1	1 0	1 1	0	1 0	2 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	59	293	174	53	538	33	113	1274	200	357	518	77
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	59	293	174	53	538	33	113	1274	200	357	518	77
Added Vol:	0	0	0	0	0	0	0	10	0	0	12	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	59	293	174	53	538	33	113	1284	200	357	530	77
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	59	293	174	53	538	33	113	1284	200	357	530	77
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	59	293	174	53	538	33	113	1284	200	357	530	77
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	59	293	174	53	538	33	113	1284	200	357	530	77
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.88	0.12	1.00	2.60	0.40	1.00	2.00	1.00
Final Sat.:	1700	1700	1700	1700	3204	196	1700	4413	687	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.17	0.10	0.03	0.17	0.17	0.07	0.29	0.29	0.21	0.16	0.05
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.228
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	45	385	166	21	613	20	0	0	0	94	73	249
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	45	385	166	21	613	20	0	0	0	94	73	249
Added Vol:	0	5	0	0	6	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	45	390	166	21	619	20	0	0	0	94	73	249
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	45	390	0	21	619	20	0	0	0	94	73	249
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	45	390	0	21	619	20	0	0	0	94	73	249
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	45	390	0	21	619	20	0	0	0	94	73	249
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.69	1.31	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	2871	2229	3400
Capacity Analysis Module:												
Vol/Sat:	0.01	0.06	0.00	0.01	0.09	0.01	0.00	0.00	0.00	0.03	0.03	0.07
Crit Moves:	****			****								****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.229	
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx	
Optimal Cycle:	16	Level Of Service:	A	

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	4 1	0	0 0	4 0	1	1 0	1 0	2	0 0	0 0	0
Volume Module:												
Base Vol:	0	556	5	0	518	213	32	136	348	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	556	5	0	518	213	32	136	348	0	0	0
Added Vol:	0	5	0	0	6	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	561	5	0	524	213	32	136	348	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	561	5	0	524	0	32	136	348	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	561	5	0	524	0	32	136	348	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	561	5	0	524	0	32	136	348	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.96	0.04	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8425	75	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.07	0.07	0.00	0.08	0.00	0.02	0.08	0.10	0.00	0.00	0.00
Crit Moves:	****			****					****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.464
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Ovl			Ovl			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	88	430	212	137	520	166	120	998	79	305	506	89
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	88	430	212	137	520	166	120	998	79	305	506	89
Added Vol:	0	0	0	0	0	6	5	5	0	0	6	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	88	430	212	137	520	172	125	1003	79	305	512	89
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	88	430	212	137	520	172	125	1003	79	305	512	89
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	88	430	212	137	520	172	125	1003	79	305	512	89
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	88	430	212	137	520	172	125	1003	79	305	512	89
OvlAdjVol:			0			110			35			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.08	0.06	0.04	0.10	0.10	0.04	0.20	0.05	0.09	0.10	0.05
OvlAdjV/S:			0.00			0.06			0.02			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12
Grade (%)	0%			0%		0%	
Storage Length (ft)	0	0	90		150		50
Storage Lanes	1	0	1		1		1
Taper Length (ft)	25		25		25		
Lane Util. Factor	1.00	1.00	1.00	0.91	1.00	0.91	1.00
Ped Bike Factor							
Frt	0.932						0.850
Flt Protected	0.976		0.950				
Satd. Flow (prot)	1694	0	1770	5085	1863	5085	1583
Flt Permitted	0.976		0.950				
Satd. Flow (perm)	1694	0	1770	5085	1863	5085	1583
Link Speed (mph)	30			30		30	
Link Distance (ft)	423			491		921	
Travel Time (s)	9.6			11.2		20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Traffic Volume (vph)	48	48	61	1114	0	752	61
Future Volume (vph)	48	48	61	1114	0	752	61
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%		0%	
Adj. Flow (vph)	52	52	66	1211	0	817	66
Shared Lane Traffic (%)							
Lane Group Flow (vph)	104	0	66	1211	0	817	66

Intersection Summary

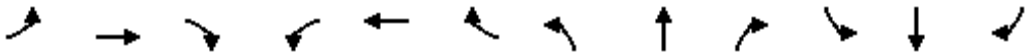
Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Traffic Vol, veh/h	48	48	61	1114	0	752	61
Future Vol, veh/h	48	48	61	1114	0	752	61
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	90	-	150	-	50
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	52	52	66	1211	0	817	66

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	1433	409	883	0	884	-	0
Stage 1	817	-	-	-	-	-	-
Stage 2	616	-	-	-	-	-	-
Critical Hdwy	5.74	7.14	5.34	-	5.64	-	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	3.12	-	2.32	-	-
Pot Cap-1 Maneuver	187	506	446	-	510	-	-
Stage 1	312	-	-	-	-	-	-
Stage 2	457	-	-	-	-	-	-
Platoon blocked, %				-		-	-
Mov Cap-1 Maneuver	159	506	446	-	510	-	-
Mov Cap-2 Maneuver	159	-	-	-	-	-	-
Stage 1	266	-	-	-	-	-	-
Stage 2	457	-	-	-	-	-	-

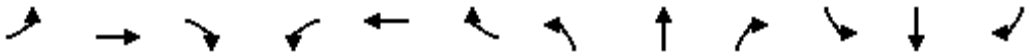
Approach	EB	NB	SB
HCM Control Delay, s	30.7	0.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBU	SBT	SBR
Capacity (veh/h)	446	-	242	510	-	-
HCM Lane V/C Ratio	0.149	-	0.431	-	-	-
HCM Control Delay (s)	14.5	-	30.7	0	-	-
HCM Lane LOS	B	-	D	A	-	-
HCM 95th %tile Q(veh)	0.5	-	2	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.930			0.935			0.992			0.996	
Flt Protected		0.991			0.985		0.950			0.950		
Satd. Flow (prot)	0	1717	0	0	1716	0	1770	5045	0	1770	5065	0
Flt Permitted		0.991			0.985		0.950			0.950		
Satd. Flow (perm)	0	1717	0	0	1716	0	1770	5045	0	1770	5065	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	18	28	50	45	31	72	36	1086	65	39	742	20
Future Volume (vph)	18	28	50	45	31	72	36	1086	65	39	742	20
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	18	29	51	46	32	73	37	1108	66	40	757	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	151	0	37	1174	0	40	777	0

Intersection Summary

Intersection	
Int Delay, s/veh	53.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	28	50	45	31	72	36	1086	65	39	742	20
Future Vol, veh/h	18	28	50	45	31	72	36	1086	65	39	742	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	29	51	46	32	73	37	1108	66	40	757	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1380	2095	389	1612	2072	587	777	0	0	1174	0	0
Stage 1	847	847	-	1215	1215	-	-	-	-	-	-	-
Stage 2	533	1248	-	397	857	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	152	52	521	110	53	388	501	-	-	322	-	-
Stage 1	254	376	-	141	252	-	-	-	-	-	-	-
Stage 2	455	243	-	549	372	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	43	42	521	~ 39	43	388	501	-	-	322	-	-
Mov Cap-2 Maneuver	43	42	-	~ 39	43	-	-	-	-	-	-	-
Stage 1	235	329	-	131	233	-	-	-	-	-	-	-
Stage 2	295	225	-	396	326	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	259.1	$ 630.8	0.4	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	501	-	-	81	72	322	-	-
HCM Lane V/C Ratio	0.073	-	-	1.209	2.098	0.124	-	-
HCM Control Delay (s)	12.8	-	-	259.1	$ 630.8	17.8	-	-
HCM Lane LOS	B	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	-	7.2	13.9	0.4	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.458
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	0	1 0	1	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	51	406	69	86	469	103	94	268	96	83	189	60
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	51	406	69	86	469	103	94	268	96	83	189	60
Added Vol:	0	0	0	0	0	0	0	6	0	0	5	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	51	406	69	86	469	103	94	274	96	83	194	60
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	51	406	69	86	469	103	94	274	96	83	194	60
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	51	406	69	86	469	103	94	274	96	83	194	60
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	51	406	69	86	469	103	94	274	96	83	194	60
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.71	0.29	1.00	1.64	0.36	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	2906	494	1700	2788	612	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.14	0.14	0.05	0.17	0.17	0.06	0.16	0.06	0.05	0.11	0.04
Crit Moves:	****			****			****			****		

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.576
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	27	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2	1 0	1 0	2	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	66	943	174	58	702	23	49	304	65	135	174	33
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	66	943	174	58	702	23	49	304	65	135	174	33
Added Vol:	0	43	0	10	34	5	6	0	0	0	0	12
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	66	986	174	68	736	28	55	304	65	135	174	45
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	66	986	174	68	736	28	55	304	65	135	174	45
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	66	986	174	68	736	28	55	304	65	135	174	45
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	66	986	174	68	736	28	55	304	65	135	174	45
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.55	0.45	1.00	2.89	0.11	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	4335	765	1700	4913	187	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.23	0.23	0.04	0.15	0.15	0.03	0.18	0.04	0.08	0.10	0.03
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

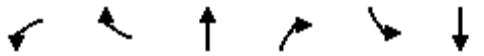
Cycle (sec):	100	Critical Vol./Cap.(X):	0.587
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	28	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	90	435	54	168	799	80	119	311	116	102	99	176
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	90	435	54	168	799	80	119	311	116	102	99	176
Added Vol:	6	0	0	0	0	0	0	5	5	0	6	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	96	435	54	168	799	80	119	316	121	102	105	176
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	96	435	54	168	799	80	119	316	121	102	105	176
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	96	435	54	168	799	80	119	316	121	102	105	176
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	96	435	54	168	799	80	119	316	121	102	105	176
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.13	0.03	0.10	0.24	0.05	0.07	0.19	0.07	0.06	0.06	0.10
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.946		0.997			
Flt Protected	0.971				0.950	
Satd. Flow (prot)	1711	0	5070	0	1770	5085
Flt Permitted	0.971				0.950	
Satd. Flow (perm)	1711	0	5070	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	43	28	770	15	14	703
Future Volume (vph)	43	28	770	15	14	703
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	44	29	794	15	14	725
Shared Lane Traffic (%)						
Lane Group Flow (vph)	73	0	809	0	14	725

Intersection Summary

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	28	770	15	14	703
Future Vol, veh/h	43	28	770	15	14	703
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	29	794	15	14	725

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1120	405	0	0	809	0
Stage 1	802	-	-	-	-	-
Stage 2	318	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	270	509	-	-	483	-
Stage 1	319	-	-	-	-	-
Stage 2	651	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	262	509	-	-	483	-
Mov Cap-2 Maneuver	262	-	-	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	632	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.3	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	324	483	-
HCM Lane V/C Ratio	-	-	0.226	0.03	-
HCM Control Delay (s)	-	-	19.3	12.7	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.264
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	17	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	12	609	13	60	594	52	41	15	14	8	37	99
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	12	609	13	60	594	52	41	15	14	8	37	99
Added Vol:	0	43	0	0	34	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	12	652	13	60	628	52	41	15	14	8	37	99
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	12	652	13	60	628	52	41	15	14	8	37	99
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	12	652	13	60	628	52	41	15	14	8	37	99
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	12	652	13	60	628	52	41	15	14	8	37	99
OvlAdjVol:												39
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.77	0.23	0.59	0.21	0.20	0.18	0.82	1.00
Final Sat.:	1700	5100	1700	1700	4710	390	996	364	340	302	1398	1700
Capacity Analysis Module:												
Vol/Sat:	0.01	0.13	0.01	0.04	0.13	0.13	0.02	0.04	0.04	0.00	0.03	0.06
OvlAdjV/S:												0.02
Crit Moves:	****			****			****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.624
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0	3	0	1	1	0	3	0	1	2	0	2	1	0	
Volume Module:																
Base Vol:	226	961	247		81	868	129		303	784	302		180	354	40	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	226	961	247		81	868	129		303	784	302		180	354	40	
Added Vol:	0	30	0		5	24	5		6	0	0		0	0	6	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	226	991	247		86	892	134		309	784	302		180	354	46	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	226	991	247		86	892	134		309	784	302		180	354	46	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	226	991	247		86	892	134		309	784	302		180	354	46	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	226	991	247		86	892	134		309	784	302		180	354	46	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		2.00	2.17	0.83		2.00	2.66	0.34	
Final Sat.:	1700	5100	1700		1700	5100	1700		3400	3682	1418		3400	4514	587	
Capacity Analysis Module:																
Vol/Sat:	0.13	0.19	0.15		0.05	0.17	0.08		0.09	0.21	0.21		0.05	0.08	0.08	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.732
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	41	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 3	0 1		0	0 2	1 0		1	0	0 0	1	1	1 0	0 1	
Volume Module:																
Base Vol:	49	1232	0	0	1423	23	76	0	129	924	58	112				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	49	1232	0	0	1423	23	76	0	129	924	58	112				
Added Vol:	0	18	0	0	24	0	0	0	0	0	0	12				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	49	1250	0	0	1447	23	76	0	129	924	58	124				
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	49	1250	0	0	1447	23	76	0	129	924	58	124				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	49	1250	0	0	1447	23	76	0	129	924	58	124				
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	49	1250	0	0	1447	23	76	0	129	924	58	124				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	3.00	1.00	0.00	2.95	0.05	1.00	0.00	1.00	1.88	0.12	1.00				
Final Sat.:	1700	5100	1700	0	5020	80	1700	0	1700	3199	201	1700				
Capacity Analysis Module:																
Vol/Sat:	0.03	0.25	0.00	0.00	0.29	0.29	0.04	0.00	0.08	0.29	0.29	0.07				
Crit Moves:	****				****				****		****					

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.764
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	45	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:		Ovl				Include				Include				Ovl		
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	1	0 2	0	1	1	0 1	0	2
Volume Module:																
Base Vol:	65	881	477		337	1644	125		95	601	389		97	236	770	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	65	881	477		337	1644	125		95	601	389		97	236	770	
Added Vol:	0	6	0		10	5	0		0	0	0		0	0	12	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	65	887	477		347	1649	125		95	601	389		97	236	782	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	65	887	477		347	1649	125		95	601	389		97	236	782	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	65	887	477		347	1649	125		95	601	389		97	236	782	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	65	887	477		347	1649	125		95	601	389		97	236	782	
OvlAdjVol:			380												88	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		1.00	2.00	1.00		1.00	1.00	2.00	
Final Sat.:	1700	5100	1700		1700	5100	1700		1700	3400	1700		1700	1700	3400	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.17	0.28		0.20	0.32	0.07		0.06	0.18	0.23		0.06	0.14	0.23	
OvlAdjV/S:			0.22												0.03	
Crit Moves:			****		****						****		****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.540
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	52	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	578	833	0	0	788	100
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	0	0	0	578	833	0	0	788	100
Added Vol:	0	0	0	0	0	0	10	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	588	833	0	0	788	100
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	588	833	0	0	788	100
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	588	833	0	0	788	100
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	588	833	0	0	788	100
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.77	0.23
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3017	383
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.49	0.00	0.00	0.26	0.26
Crit Moves:								****				

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.581
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	28	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	151	687	241	50	666	185	199	957	121	321	1491	108
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	151	687	241	50	666	185	199	957	121	321	1491	108
Added Vol:	7	14	7	0	18	0	0	0	9	9	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	158	701	248	50	684	185	199	957	130	330	1491	108
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	158	701	248	50	684	185	199	957	130	330	1491	108
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	158	701	248	50	684	185	199	957	130	330	1491	108
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	158	701	248	50	684	185	199	957	130	330	1491	108
OvlAdjVol:			83			86			51			83
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.14	0.15	0.01	0.13	0.11	0.06	0.19	0.08	0.10	0.29	0.06
OvlAdjV/S:			0.05			0.05			0.03			0.05
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.627
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	101	815	213		122	877	85		46	466	87		214	795	123	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	101	815	213		122	877	85		46	466	87		214	795	123	
Added Vol:	7	28	7		0	36	0		0	0	9		9	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	108	843	220		122	913	85		46	466	96		223	795	123	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	108	843	220		122	913	85		46	466	96		223	795	123	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	108	843	220		122	913	85		46	466	96		223	795	123	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	108	843	220		122	913	85		46	466	96		223	795	123	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.38	0.62		1.00	2.74	0.26		1.00	1.66	0.34		1.00	1.73	0.27	
Final Sat.:	1700	4044	1056		1700	4666	434		1700	2819	581		1700	2944	456	
Capacity Analysis Module:																
Vol/Sat:	0.06	0.21	0.21		0.07	0.20	0.20		0.03	0.17	0.17		0.13	0.27	0.27	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.673
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	109	398	69	135	403	87	98	826	69	129	1159	183				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	109	398	69	135	403	87	98	826	69	129	1159	183				
Added Vol:	0	0	0	9	0	0	0	9	0	0	7	7				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	109	398	69	144	403	87	98	835	69	129	1166	190				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	109	398	69	144	403	87	98	835	69	129	1166	190				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	109	398	69	144	403	87	98	835	69	129	1166	190				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	109	398	69	144	403	87	98	835	69	129	1166	190				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	1.70	0.30	1.00	1.64	0.36	1.00	1.85	0.15	1.00	2.00	1.00				
Final Sat.:	1700	2898	502	1700	2796	604	1700	3140	260	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.06	0.14	0.14	0.08	0.14	0.14	0.06	0.27	0.27	0.08	0.34	0.11				
Crit Moves:	****			****			****				****					

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.658
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	2	0 3	0	1	2	0 3	0	1	2	0 2	0	1	2	0 2	0	1
Volume Module:																
Base Vol:	238	913	243		210	746	170		119	829	133		201	1103	150	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	238	913	243		210	746	170		119	829	133		201	1103	150	
Added Vol:	14	42	14		0	54	0		0	0	18		18	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	252	955	257		210	800	170		119	829	151		219	1103	150	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	252	955	257		210	800	170		119	829	151		219	1103	150	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	252	955	257		210	800	170		119	829	151		219	1103	150	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	252	955	257		210	800	170		119	829	151		219	1103	150	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	3.00	1.00		2.00	3.00	1.00		2.00	2.00	1.00		2.00	2.00	1.00	
Final Sat.:	3400	5100	1700		3400	5100	1700		3400	3400	1700		3400	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.19	0.15		0.06	0.16	0.10		0.04	0.24	0.09		0.06	0.32	0.09	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.885
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	79	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 2	0 1	1	0 2	0 1	1	0 3	0 1	1	0 2	0 1
Volume Module:												
Base Vol:	198	662	104	171	796	256	222	948	170	181	1186	149
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	198	662	104	171	796	256	222	948	170	181	1186	149
Added Vol:	0	0	0	0	0	0	0	14	0	0	18	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	198	662	104	171	796	256	222	962	170	181	1204	149
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	198	662	104	171	796	256	222	962	170	181	1204	149
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	198	662	104	171	796	256	222	962	170	181	1204	149
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	198	662	104	171	796	256	222	962	170	181	1204	149
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.19	0.06	0.10	0.23	0.15	0.13	0.19	0.10	0.11	0.35	0.09
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.886
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	79	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	0	1	1	0 1	1	0	1	0 2	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	198	546	365		92	331	86		123	897	121		266	1303	225	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	198	546	365		92	331	86		123	897	121		266	1303	225	
Added Vol:	0	0	0		0	0	0		0	14	0		0	18	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	198	546	365		92	331	86		123	911	121		266	1321	225	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	198	546	365		92	331	86		123	911	121		266	1321	225	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	198	546	365		92	331	86		123	911	121		266	1321	225	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	198	546	365		92	331	86		123	911	121		266	1321	225	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.00	1.00		1.00	1.59	0.41		1.00	2.65	0.35		1.00	2.00	1.00	
Final Sat.:	1700	1700	1700		1700	2699	701		1700	4502	598		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.12	0.32	0.21		0.05	0.12	0.12		0.07	0.20	0.20		0.16	0.39	0.13	
Crit Moves:		****				****				****				****		

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.395
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	159	722	413	11	1023	16	0	0	0	51	497	243
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	159	722	413	11	1023	16	0	0	0	51	497	243
Added Vol:	0	7	0	0	9	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	159	729	413	11	1032	16	0	0	0	51	497	243
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	159	729	0	11	1032	16	0	0	0	51	497	243
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	159	729	0	11	1032	16	0	0	0	51	497	243
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	159	729	0	11	1032	16	0	0	0	51	497	243
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.00	2.00	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	1700	3400	3400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.11	0.00	0.01	0.15	0.01	0.00	0.00	0.00	0.03	0.15	0.07
Crit Moves:	****			****							****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.286	
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx	
Optimal Cycle:	17	Level Of Service:	A	

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0 4	1 0	0	0 4	0 1	1	0 1	0 2	0	0 0	0 0
Volume Module:												
Base Vol:	0	1229	40	0	706	367	56	131	293	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	1229	40	0	706	367	56	131	293	0	0	0
Added Vol:	0	7	0	0	9	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	1236	40	0	715	367	56	131	293	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	1236	40	0	715	0	56	131	293	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	1236	40	0	715	0	56	131	293	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	1236	40	0	715	0	56	131	293	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.84	0.16	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8234	266	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.15	0.15	0.00	0.11	0.00	0.03	0.08	0.09	0.00	0.00	0.00
Crit Moves:		****			****				****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.522
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	161	748	605	109	690	272	235	1160	70	207	1048	93
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	161	748	605	109	690	272	235	1160	70	207	1048	93
Added Vol:	0	0	0	0	0	9	7	7	0	0	9	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	161	748	605	109	690	281	242	1167	70	207	1057	93
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	161	748	605	109	690	281	242	1167	70	207	1057	93
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	161	748	605	109	690	281	242	1167	70	207	1057	93
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	161	748	605	109	690	281	242	1167	70	207	1057	93
OvlAdjVol:			398			160			0			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.15	0.18	0.03	0.14	0.17	0.07	0.23	0.04	0.06	0.21	0.05
OvlAdjV/S:			0.12			0.09			0.00			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12
Grade (%)	0%			0%		0%	
Storage Length (ft)	0	0	90		150		50
Storage Lanes	1	0	1		1		1
Taper Length (ft)	25		25		25		
Lane Util. Factor	1.00	1.00	1.00	0.91	1.00	0.91	1.00
Ped Bike Factor							
Frt	0.932						0.850
Flt Protected	0.976		0.950				
Satd. Flow (prot)	1694	0	1770	5085	1863	5085	1583
Flt Permitted	0.976		0.950				
Satd. Flow (perm)	1694	0	1770	5085	1863	5085	1583
Link Speed (mph)	30			30		30	
Link Distance (ft)	423			491		921	
Travel Time (s)	9.6			11.2		20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Traffic Volume (vph)	70	71	91	1350	0	1032	90
Future Volume (vph)	70	71	91	1350	0	1032	90
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%		0%	
Adj. Flow (vph)	76	77	99	1467	0	1122	98
Shared Lane Traffic (%)							
Lane Group Flow (vph)	153	0	99	1467	0	1122	98

Intersection Summary

Intersection	
Int Delay, s/veh	13.2

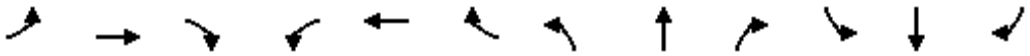
Movement	EBL	EBR	NBL	NBT	SBU	SBT	SBR
Lane Configurations							
Traffic Vol, veh/h	70	71	91	1350	0	1032	90
Future Vol, veh/h	70	71	91	1350	0	1032	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	-	None
Storage Length	0	-	90	-	150	-	50
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	76	77	99	1467	0	1122	98

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	1907	561	1220	0	1071	-	0
Stage 1	1122	-	-	-	-	-	-
Stage 2	785	-	-	-	-	-	-
Critical Hdwy	5.74	7.14	5.34	-	5.64	-	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	3.12	-	2.32	-	-
Pot Cap-1 Maneuver	105	403	306	-	401	-	-
Stage 1	204	-	-	-	-	-	-
Stage 2	372	-	-	-	-	-	-
Platoon blocked, %				-		-	-
Mov Cap-1 Maneuver	~ 71	403	306	-	401	-	-
Mov Cap-2 Maneuver	~ 71	-	-	-	-	-	-
Stage 1	138	-	-	-	-	-	-
Stage 2	372	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	238.1	1.4	0
HCM LOS	F		

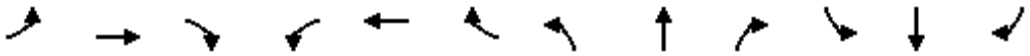
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBU	SBT	SBR
Capacity (veh/h)	306	-	121	401	-	-
HCM Lane V/C Ratio	0.323	-	1.267	-	-	-
HCM Control Delay (s)	22.3	-	238.1	0	-	-
HCM Lane LOS	C	-	F	A	-	-
HCM 95th %tile Q(veh)	1.4	-	9.9	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.932			0.913			0.994			0.997	
Flt Protected		0.983			0.989		0.950			0.950		
Satd. Flow (prot)	0	1707	0	0	1682	0	1770	5055	0	1770	5070	0
Flt Permitted		0.983			0.989		0.950			0.950		
Satd. Flow (perm)	0	1707	0	0	1682	0	1770	5055	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	11	5	16	14	9	42	47	1388	61	34	1046	23
Future Volume (vph)	11	5	16	14	9	42	47	1388	61	34	1046	23
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	12	5	17	15	10	45	51	1492	66	37	1125	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	34	0	0	70	0	51	1558	0	37	1150	0

Intersection Summary

Intersection	
Int Delay, s/veh	18.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	5	16	14	9	42	47	1388	61	34	1046	23
Future Vol, veh/h	11	5	16	14	9	42	47	1388	61	34	1046	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	5	17	15	10	45	51	1492	66	37	1125	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1916	2872	575	2154	2851	779	1150	0	0	1558	0	0
Stage 1	1212	1212	-	1627	1627	-	-	-	-	-	-	-
Stage 2	704	1660	-	527	1224	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	72	16	395	51	17	291	331	-	-	209	-	-
Stage 1	142	253	-	72	159	-	-	-	-	-	-	-
Stage 2	358	153	-	459	250	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	16	11	395	24	12	291	331	-	-	209	-	-
Mov Cap-2 Maneuver	16	11	-	24	12	-	-	-	-	-	-	-
Stage 1	120	208	-	61	135	-	-	-	-	-	-	-
Stage 2	238	129	-	352	206	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 483.4	$ 494.9	0.6	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	331	-	-	27	44	209	-	-
HCM Lane V/C Ratio	0.153	-	-	1.274	1.588	0.175	-	-
HCM Control Delay (s)	17.8	-	-	$ 483.4	$ 494.9	25.8	-	-
HCM Lane LOS	C	-	-	F	F	D	-	-
HCM 95th %tile Q(veh)	0.5	-	-	4.1	7	0.6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.478
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	0	1 0	1	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	67	356	66	44	401	45	63	350	87	78	349	107
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	67	356	66	44	401	45	63	350	87	78	349	107
Added Vol:	0	0	0	0	0	0	0	9	0	0	7	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	67	356	66	44	401	45	63	359	87	78	356	107
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	67	356	66	44	401	45	63	359	87	78	356	107
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	67	356	66	44	401	45	63	359	87	78	356	107
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	67	356	66	44	401	45	63	359	87	78	356	107
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.69	0.31	1.00	1.80	0.20	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	2868	532	1700	3057	343	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.12	0.12	0.03	0.13	0.13	0.04	0.21	0.05	0.05	0.21	0.06
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.663
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	109	1376	178		56	944	61		60	240	76		193	362	84	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	109	1376	178		56	944	61		60	240	76		193	362	84	
Added Vol:	0	63	0		14	49	7		9	0	0		0	0	18	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	109	1439	178		70	993	68		69	240	76		193	362	102	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	109	1439	178		70	993	68		69	240	76		193	362	102	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	109	1439	178		70	993	68		69	240	76		193	362	102	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	109	1439	178		70	993	68		69	240	76		193	362	102	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.67	0.33		1.00	2.81	0.19		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	4539	561		1700	4773	327		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.06	0.32	0.32		0.04	0.21	0.21		0.04	0.14	0.04		0.11	0.21	0.06	
Crit Moves:		****				****					****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

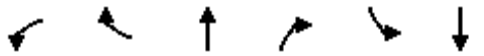
Cycle (sec):	100	Critical Vol./Cap.(X):	0.740
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	42	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	100	714	54	97	867	136	139	248	82	211	482	147
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	100	714	54	97	867	136	139	248	82	211	482	147
Added Vol:	9	0	0	0	0	0	0	7	7	0	9	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	109	714	54	97	867	136	139	255	89	211	491	147
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	109	714	54	97	867	136	139	255	89	211	491	147
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	109	714	54	97	867	136	139	255	89	211	491	147
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	109	714	54	97	867	136	139	255	89	211	491	147
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.21	0.03	0.06	0.26	0.08	0.08	0.15	0.05	0.12	0.29	0.09
Crit Moves:	****			****			****				****	



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.927		0.995			
Flt Protected	0.978				0.950	
Satd. Flow (prot)	1689	0	5060	0	1770	5085
Flt Permitted	0.978				0.950	
Satd. Flow (perm)	1689	0	5060	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	27	32	1411	52	30	1010
Future Volume (vph)	27	32	1411	52	30	1010
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	29	34	1501	55	32	1074
Shared Lane Traffic (%)						
Lane Group Flow (vph)	63	0	1556	0	32	1074

Intersection Summary

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	32	1411	52	30	1010
Future Vol, veh/h	27	32	1411	52	30	1010
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	34	1501	55	32	1074

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2023	778	0	0	1556	0
Stage 1	1529	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	91	291	-	-	209	-
Stage 1	114	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	77	291	-	-	209	-
Mov Cap-2 Maneuver	77	-	-	-	-	-
Stage 1	114	-	-	-	-	-
Stage 2	448	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	57.6	0	0.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	128	209	-
HCM Lane V/C Ratio	-	-	0.49	0.153	-
HCM Control Delay (s)	-	-	57.6	25.3	-
HCM Lane LOS	-	-	F	D	-
HCM 95th %tile Q(veh)	-	-	2.3	0.5	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.458
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	36	1126	27	90	795	105	138	45	28	8	62	133
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	36	1126	27	90	795	105	138	45	28	8	62	133
Added Vol:	0	63	0	0	49	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	36	1189	27	90	844	105	138	45	28	8	62	133
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	36	1189	27	90	844	105	138	45	28	8	62	133
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	36	1189	27	90	844	105	138	45	28	8	62	133
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	36	1189	27	90	844	105	138	45	28	8	62	133
OvlAdjVol:												43
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.67	0.33	0.66	0.21	0.13	0.11	0.89	1.00
Final Sat.:	1700	5100	1700	1700	4536	564	1112	363	226	194	1506	1700
Capacity Analysis Module:												
Vol/Sat:	0.02	0.23	0.02	0.05	0.19	0.19	0.08	0.12	0.12	0.00	0.04	0.08
OvlAdjV/S:												0.03
Crit Moves:	****			****			****				****	

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.706
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	38	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	2	0 2	1	0	2	0 2	1	0
Volume Module:																
Base Vol:	305	1196	249		116	923	223		326	593	212		273	863	98	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	305	1196	249		116	923	223		326	593	212		273	863	98	
Added Vol:	0	45	0		7	35	7		9	0	0		0	0	9	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	305	1241	249		123	958	230		335	593	212		273	863	107	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	305	1241	249		123	958	230		335	593	212		273	863	107	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	305	1241	249		123	958	230		335	593	212		273	863	107	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	305	1241	249		123	958	230		335	593	212		273	863	107	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		2.00	2.21	0.79		2.00	2.67	0.33	
Final Sat.:	1700	5100	1700		1700	5100	1700		3400	3757	1343		3400	4537	563	
Capacity Analysis Module:																
Vol/Sat:	0.18	0.24	0.15		0.07	0.19	0.14		0.10	0.16	0.16		0.08	0.19	0.19	
Crit Moves:	****					****			****					****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.674
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	35	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 3	0 1		0	0 2	1 0		1	0	0 0	1	1	1 0	0 1	
Volume Module:																
Base Vol:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Added Vol:	0	27	0	0	35	0	0	0	0	0	0	18				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	118	1769	0	0	1514	47	87	0	79	603	69	144				
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	118	1769	0	0	1514	47	87	0	79	603	69	144				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	118	1769	0	0	1514	47	87	0	79	603	69	144				
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	118	1769	0	0	1514	47	87	0	79	603	69	144				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	3.00	1.00	0.00	2.91	0.09	1.00	0.00	1.00	1.79	0.21	1.00				
Final Sat.:	1700	5100	1700	0	4946	154	1700	0	1700	3051	349	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.35	0.00	0.00	0.31	0.31	0.05	0.00	0.05	0.20	0.20	0.08				
Crit Moves:	****				****		****				****					

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.823
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	57	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	1 0	2 0	1	1 0	1 0	2
Volume Module:												
Base Vol:	118	1324	369	322	1182	209	188	563	428	105	235	718
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	118	1324	369	322	1182	209	188	563	428	105	235	718
Added Vol:	0	9	0	14	7	0	0	0	0	0	0	18
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	118	1333	369	336	1189	209	188	563	428	105	235	736
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	118	1333	369	336	1189	209	188	563	428	105	235	736
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	118	1333	369	336	1189	209	188	563	428	105	235	736
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	118	1333	369	336	1189	209	188	563	428	105	235	736
OvlAdjVol:			264									64
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.07	0.26	0.22	0.20	0.23	0.12	0.11	0.17	0.25	0.06	0.14	0.22
OvlAdjV/S:			0.16									0.02
Crit Moves:	****			****					****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.462
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	22	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	0	0	0	0	2	0	1	0	0	1	1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	592	666	0	0	745	50
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	0	0	0	592	666	0	0	745	50
Added Vol:	0	0	0	0	0	0	14	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	606	666	0	0	745	50
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	606	666	0	0	745	50
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	606	666	0	0	745	50
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	606	666	0	0	745	50
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.87	0.13
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3186	214
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.39	0.00	0.00	0.23	0.23
Crit Moves:							****				****	

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Appendix E

Existing Plus Project Conditions With Improvements
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #10 HARBOR BOULEVARD (NS) / PROJECT ACCESS 1 (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.325
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	18	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	0	1 0	3 0	1	0 0	1! 0	0	0 0	0 0	0
Volume Module:												
Base Vol:	0	1114	0	0	752	0	0	0	0	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	1114	0	0	752	0	0	0	0	0	0	0
Added Vol:	61	0	0	0	0	61	48	0	48	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	61	1114	0	0	752	61	48	0	48	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	61	1114	0	0	752	61	48	0	48	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	61	1114	0	0	752	61	48	0	48	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	61	1114	0	0	752	61	48	0	48	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	0.00	1.00	3.00	1.00	0.50	0.00	0.50	0.00	0.00	0.00
Final Sat.:	1700	5100	0	1700	5100	1700	850	0	850	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.04	0.22	0.00	0.00	0.15	0.04	0.03	0.00	0.06	0.00	0.00	0.00
Crit Moves:		****			****				****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
AM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #11 HARBOR BOULEVARD (NS) / TWINTREE LANE - TWINTREE AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.442
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	21	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	36	1025	65	39	694	20	18	28	50	45	31	72
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	36	1025	65	39	694	20	18	28	50	45	31	72
Added Vol:	0	61	0	0	48	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	36	1086	65	39	742	20	18	28	50	45	31	72
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	36	1086	65	39	742	20	18	28	50	45	31	72
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	36	1086	65	39	742	20	18	28	50	45	31	72
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	36	1086	65	39	742	20	18	28	50	45	31	72
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.83	0.17	1.00	2.92	0.08	0.19	0.29	0.52	0.30	0.21	0.49
Final Sat.:	1700	4812	288	1700	4966	134	319	496	885	517	356	827
Capacity Analysis Module:												
Vol/Sat:	0.02	0.23	0.23	0.02	0.15	0.15	0.06	0.06	0.06	0.09	0.09	0.09
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #10 HARBOR BOULEVARD (NS) / PROJECT ACCESS 1 (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.398
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	0	1 0	3 0	1	0 0	1! 0	0	0 0	0 0	0
Volume Module:												
Base Vol:	0	1350	0	0	1032	0	0	0	0	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	1350	0	0	1032	0	0	0	0	0	0	0
Added Vol:	91	0	0	0	0	90	70	0	71	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	91	1350	0	0	1032	90	70	0	71	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	91	1350	0	0	1032	90	70	0	71	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	91	1350	0	0	1032	90	70	0	71	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	91	1350	0	0	1032	90	70	0	71	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	0.00	1.00	3.00	1.00	0.50	0.00	0.50	0.00	0.00	0.00
Final Sat.:	1700	5100	0	1700	5100	1700	844	0	856	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.05	0.26	0.00	0.00	0.20	0.05	0.04	0.00	0.08	0.00	0.00	0.00
Crit Moves:		****			****				****			

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
EXISTING PLUS PROJECT CONDITONS
PM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #11 HARBOR BOULEVARD (NS) / TWINTREE LANE - TWINTREE AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.411
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	47	1297	61	34	975	23	11	5	16	14	9	42
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	47	1297	61	34	975	23	11	5	16	14	9	42
Added Vol:	0	91	0	0	71	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	47	1388	61	34	1046	23	11	5	16	14	9	42
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	47	1388	61	34	1046	23	11	5	16	14	9	42
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	47	1388	61	34	1046	23	11	5	16	14	9	42
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	47	1388	61	34	1046	23	11	5	16	14	9	42
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.87	0.13	1.00	2.94	0.06	0.34	0.16	0.50	0.21	0.14	0.65
Final Sat.:	1700	4885	215	1700	4990	110	584	266	850	366	235	1098
Capacity Analysis Module:												
Vol/Sat:	0.03	0.28	0.28	0.02	0.21	0.21	0.02	0.02	0.02	0.04	0.04	0.04
Crit Moves:		****			****			****				****

Appendix F

Project Buildout Year (2025) Without Project Conditions
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.495
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	132	593	214	55	595	180	160	853	152	272	650	99
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	137	617	223	57	619	187	166	888	158	283	676	103
Added Vol:	16	77	16	0	80	0	0	0	20	20	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	153	694	239	57	699	187	166	888	178	303	676	103
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	153	694	239	57	699	187	166	888	178	303	676	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	153	694	239	57	699	187	166	888	178	303	676	103
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	153	694	239	57	699	187	166	888	178	303	676	103
OvlAdjVol:			87			104			101			74
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.14	0.14	0.02	0.14	0.11	0.05	0.17	0.10	0.09	0.13	0.06
OvlAdjV/S:			0.05			0.06			0.06			0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.670
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	74	762	191		111	527	55		81	688	55		124	271	141	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	77	793	199		116	548	57		84	716	57		129	282	147	
Added Vol:	27	108	27		0	120	0		0	0	32		32	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	104	901	226		116	668	57		84	716	89		161	282	147	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	104	901	226		116	668	57		84	716	89		161	282	147	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	104	901	226		116	668	57		84	716	89		161	282	147	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	104	901	226		116	668	57		84	716	89		161	282	147	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.40	0.60		1.00	2.76	0.24		1.00	1.78	0.22		1.00	1.32	0.68	
Final Sat.:	1700	4078	1022		1700	4698	402		1700	3023	377		1700	2236	1164	
Capacity Analysis Module:																
Vol/Sat:	0.06	0.22	0.22		0.07	0.14	0.14		0.05	0.24	0.24		0.09	0.13	0.13	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.765
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	46	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	67	344	87		140	334	67		152	1321	89		77	521	164	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	70	358	91		146	348	70		158	1375	93		80	542	171	
Added Vol:	0	0	0		14	0	0		0	35	0		0	31	10	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	70	358	91		160	348	70		158	1410	93		80	573	181	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	70	358	91		160	348	70		158	1410	93		80	573	181	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	70	358	91		160	348	70		158	1410	93		80	573	181	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	70	358	91		160	348	70		158	1410	93		80	573	181	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.60	0.40		1.00	1.67	0.33		1.00	1.88	0.12		1.00	2.00	1.00	
Final Sat.:	1700	2714	686		1700	2832	568		1700	3190	210		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.13	0.13		0.09	0.12	0.12		0.09	0.44	0.44		0.05	0.17	0.11	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.733
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	41	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	84	719	191	110	542	119	132	1266	120	128	511	76
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	87	748	199	114	564	124	137	1317	125	133	532	79
Added Vol:	69	163	30	50	134	0	0	13	37	87	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	156	911	229	164	698	124	137	1330	162	220	532	79
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	156	911	229	164	698	124	137	1330	162	220	532	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	156	911	229	164	698	124	137	1330	162	220	532	79
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	156	911	229	164	698	124	137	1330	162	220	532	79
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.18	0.13	0.05	0.14	0.07	0.04	0.39	0.10	0.06	0.16	0.05
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.684
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	36	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	121	437	132	144	701	190	165	1388	140	88	440	60
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	126	455	137	150	729	198	172	1444	146	92	458	62
Added Vol:	0	0	0	0	0	0	0	43	0	0	51	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	126	455	137	150	729	198	172	1487	146	92	509	62
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	126	455	137	150	729	198	172	1487	146	92	509	62
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	126	455	137	150	729	198	172	1487	146	92	509	62
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	126	455	137	150	729	198	172	1487	146	92	509	62
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.13	0.08	0.09	0.21	0.12	0.10	0.29	0.09	0.05	0.15	0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.789
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	50	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1 0	1	1 0	1 1	0	1 0	2 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	59	293	174	53	538	33	113	1274	200	357	518	77
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	61	305	181	55	560	34	118	1326	208	371	539	80
Added Vol:	0	0	0	0	0	0	0	43	0	0	51	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	61	305	181	55	560	34	118	1369	208	371	590	80
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	61	305	181	55	560	34	118	1369	208	371	590	80
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	61	305	181	55	560	34	118	1369	208	371	590	80
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	61	305	181	55	560	34	118	1369	208	371	590	80
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.88	0.12	1.00	2.60	0.40	1.00	2.00	1.00
Final Sat.:	1700	1700	1700	1700	3204	196	1700	4427	673	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.18	0.11	0.03	0.17	0.17	0.07	0.31	0.31	0.22	0.17	0.05
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.236
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	45	385	166	21	613	20	0	0	0	94	73	249
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	47	401	173	22	638	21	0	0	0	98	76	259
Added Vol:	0	10	30	0	14	0	0	0	0	16	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	47	411	203	22	652	21	0	0	0	114	76	259
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	47	411	0	22	652	21	0	0	0	114	76	259
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	47	411	0	22	652	21	0	0	0	114	76	259
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	47	411	0	22	652	21	0	0	0	114	76	259
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.80	1.20	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	3059	2041	3400
Capacity Analysis Module:												
Vol/Sat:	0.01	0.06	0.00	0.01	0.10	0.01	0.00	0.00	0.00	0.04	0.04	0.08
Crit Moves:	****			****								****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.245
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	4 1	0	0 0	4 0	1	1 0	1 0	2	0 0	0 0	0
Volume Module:												
Base Vol:	0	556	5	0	518	213	32	136	348	0	0	0
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	579	5	0	539	222	33	142	362	0	0	0
Added Vol:	0	39	0	0	30	0	0	0	16	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	618	5	0	569	222	33	142	378	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	618	5	0	569	0	33	142	378	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	618	5	0	569	0	33	142	378	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	618	5	0	569	0	33	142	378	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.96	0.04	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8429	71	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.07	0.07	0.00	0.08	0.00	0.02	0.08	0.11	0.00	0.00	0.00
Crit Moves:	****			****					****			

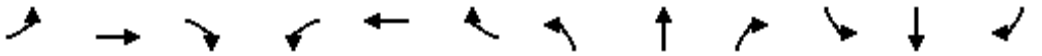
GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

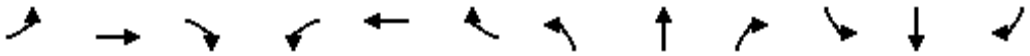
Cycle (sec):	100	Critical Vol./Cap.(X):	0.493
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	88	430	212	137	520	166	120	998	79	305	506	89
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	92	447	221	143	541	173	125	1039	82	317	527	93
Added Vol:	0	30	30	0	32	14	10	33	0	0	37	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	92	477	251	143	573	187	135	1072	82	317	564	93
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	92	477	251	143	573	187	135	1072	82	317	564	93
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	92	477	251	143	573	187	135	1072	82	317	564	93
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	92	477	251	143	573	187	135	1072	82	317	564	93
OvlAdjVol:			0			119			36			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.09	0.07	0.04	0.11	0.11	0.04	0.21	0.05	0.09	0.11	0.05
OvlAdjV/S:			0.00			0.07			0.02			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	150		50
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	1.00
Ped Bike Factor												
Frt					0.946			0.991				
Flt Protected					0.971					0.950		
Satd. Flow (prot)	0	1863	0	0	1711	0	1863	5040	0	1770	5085	1863
Flt Permitted					0.971					0.950		
Satd. Flow (perm)	0	1863	0	0	1711	0	1863	5040	0	1770	5085	1863
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		423			516			491			921	
Travel Time (s)		9.6			11.7			11.2			20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	87	0	58	0	1319	83	162	908	0
Future Volume (vph)	0	0	0	87	0	58	0	1319	83	162	908	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	95	0	63	0	1434	90	176	987	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	158	0	0	1524	0	176	987	0

Intersection Summary

Intersection	
Int Delay, s/veh	160.8

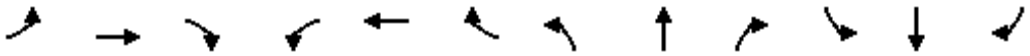
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	87	0	58	0	1319	83	162	908	0
Future Vol, veh/h	0	0	0	87	0	58	0	1319	83	162	908	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	150	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	95	0	63	0	1434	90	176	987	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1913	2863	494	2226	2818	762	987	0	0	1524	0	0
Stage 1	1339	1339	-	1479	1479	-	-	-	-	-	-	-
Stage 2	574	1524	-	747	1339	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	72	16	446	~ 46	18	298	397	-	-	217	-	-
Stage 1	115	220	-	~ 92	188	-	-	-	-	-	-	-
Stage 2	430	179	-	337	220	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	18	3	446	~ 15	3	298	397	-	-	217	-	-
Mov Cap-2 Maneuver	18	3	-	~ 15	3	-	-	-	-	-	-	-
Stage 1	115	42	-	~ 92	188	-	-	-	-	-	-	-
Stage 2	339	179	-	~ 64	42	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	$ 2826.1	0	10.3
HCM LOS	A	F		

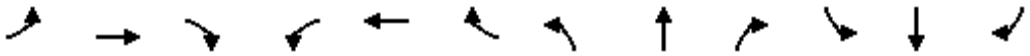
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	397	-	-	-	24	217	-	-
HCM Lane V/C Ratio	-	-	-	-	6.567	0.811	-	-
HCM Control Delay (s)	0	-	-	$	$ 2826.1	67.8	-	-
HCM Lane LOS	A	-	-	A	F	F	-	-
HCM 95th %tile Q(veh)	0	-	-	-	19.7	6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.930			0.931			0.990			0.997	
Flt Protected		0.991			0.985		0.950			0.950		
Satd. Flow (prot)	0	1717	0	0	1708	0	1770	5034	0	1770	5070	0
Flt Permitted		0.991			0.985		0.950			0.950		
Satd. Flow (perm)	0	1717	0	0	1708	0	1770	5034	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	19	29	52	57	32	94	37	1299	96	55	920	21
Future Volume (vph)	19	29	52	57	32	94	37	1299	96	55	920	21
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	19	30	53	58	33	96	38	1326	98	56	939	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	102	0	0	187	0	38	1424	0	56	960	0

Intersection Summary

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	29	52	57	32	94	37	1299	96	55	920	21
Future Vol, veh/h	19	29	52	57	32	94	37	1299	96	55	920	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	19	30	53	58	33	96	38	1326	98	56	939	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1685	2562	480	1954	2523	712	960	0	0	1424	0	0
Stage 1	1062	1062	-	1451	1451	-	-	-	-	-	-	-
Stage 2	623	1500	-	503	1072	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	99	~ 26	455	68	~ 27	322	409	-	-	243	-	-
Stage 1	180	298	-	96	194	-	-	-	-	-	-	-
Stage 2	401	184	-	474	295	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 18	455	-	~ 19	322	409	-	-	243	-	-
Mov Cap-2 Maneuver	-	~ 18	-	-	~ 19	-	-	-	-	-	-	-
Stage 1	163	229	-	87	176	-	-	-	-	-	-	-
Stage 2	208	167	-	281	227	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.4	1.3
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	409	-	-	-	-	243	-	-
HCM Lane V/C Ratio	0.092	-	-	-	-	0.231	-	-
HCM Control Delay (s)	14.7	-	-	-	-	24.2	-	-
HCM Lane LOS	B	-	-	-	-	C	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-	-	0.9	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.492
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	1 0	1 0	1	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	51	406	69	86	469	103	94	268	96	83	189	60
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	53	422	72	89	488	107	98	279	100	86	197	62
Added Vol:	0	0	0	0	0	0	0	36	0	0	33	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	53	422	72	89	488	107	98	315	100	86	230	62
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	53	422	72	89	488	107	98	315	100	86	230	62
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	53	422	72	89	488	107	98	315	100	86	230	62
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	53	422	72	89	488	107	98	315	100	86	230	62
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.71	0.29	1.00	1.64	0.36	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	2906	494	1700	2788	612	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.15	0.15	0.05	0.18	0.18	0.06	0.19	0.06	0.05	0.14	0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.655
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2	1 0	1 0	2	1 0	1 0	1	0 1	1 0	1	0 1
Volume Module:												
Base Vol:	66	943	174	58	702	23	49	304	65	135	174	33
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	69	981	181	60	731	24	51	316	68	140	181	34
Added Vol:	3	165	13	46	133	29	33	0	2	19	1	62
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	72	1146	194	106	864	53	84	316	70	159	182	96
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	72	1146	194	106	864	53	84	316	70	159	182	96
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	72	1146	194	106	864	53	84	316	70	159	182	96
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	72	1146	194	106	864	53	84	316	70	159	182	96
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.57	0.43	1.00	2.83	0.17	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	4362	738	1700	4805	295	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.26	0.26	0.06	0.18	0.18	0.05	0.19	0.04	0.09	0.11	0.06
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

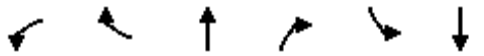
Cycle (sec):	100	Critical Vol./Cap.(X):	0.640
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	32	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	90	435	54	168	799	80	119	311	116	102	99	176
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	94	453	56	175	831	83	124	324	121	106	103	183
Added Vol:	14	0	0	0	0	0	0	50	10	0	68	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	108	453	56	175	831	83	124	374	131	106	171	183
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	108	453	56	175	831	83	124	374	131	106	171	183
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	108	453	56	175	831	83	124	374	131	106	171	183
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	108	453	56	175	831	83	124	374	131	106	171	183
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.06	0.13	0.03	0.10	0.24	0.05	0.07	0.22	0.08	0.06	0.10	0.11
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.947		0.998			
Flt Protected	0.971				0.950	
Satd. Flow (prot)	1713	0	5075	0	1770	5085
Flt Permitted	0.971				0.950	
Satd. Flow (perm)	1713	0	5075	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	45	29	937	16	15	850
Future Volume (vph)	45	29	937	16	15	850
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	46	30	966	16	15	876
Shared Lane Traffic (%)						
Lane Group Flow (vph)	76	0	982	0	15	876

Intersection Summary

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	29	937	16	15	850
Future Vol, veh/h	45	29	937	16	15	850
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	30	966	16	15	876

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1354	491	0	0	982	0
Stage 1	974	-	-	-	-	-
Stage 2	380	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	205	448	-	-	399	-
Stage 1	251	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	197	448	-	-	399	-
Mov Cap-2 Maneuver	197	-	-	-	-	-
Stage 1	251	-	-	-	-	-
Stage 2	582	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.4	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	252	399	-
HCM Lane V/C Ratio	-	-	0.303	0.039	-
HCM Control Delay (s)	-	-	25.4	14.4	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	1.2	0.1	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.299
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	17	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	12	609	13	60	594	52	41	15	14	8	37	99
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	12	634	14	62	618	54	43	16	15	8	39	103
Added Vol:	0	180	0	0	154	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	12	814	14	62	772	54	43	16	15	8	39	103
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	12	814	14	62	772	54	43	16	15	8	39	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	12	814	14	62	772	54	43	16	15	8	39	103
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	12	814	14	62	772	54	43	16	15	8	39	103
OvlAdjVol:												41
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.80	0.20	0.59	0.21	0.20	0.18	0.82	1.00
Final Sat.:	1700	5100	1700	1700	4766	334	996	364	340	302	1398	1700
Capacity Analysis Module:												
Vol/Sat:	0.01	0.16	0.01	0.04	0.16	0.16	0.03	0.04	0.04	0.00	0.03	0.06
OvlAdjV/S:												0.02
Crit Moves:	****			****			****				****	

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.675
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	35	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	2	0 2	1	0	2	0 2	1	0
Volume Module:																
Base Vol:	226	961	247		81	868	129		303	784	302		180	354	40	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	235	1000	257		84	903	134		315	816	314		187	368	42	
Added Vol:	7	148	0		10	129	16		19	10	6		0	12	14	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	242	1148	257		94	1032	150		334	826	320		187	380	56	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	242	1148	257		94	1032	150		334	826	320		187	380	56	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	242	1148	257		94	1032	150		334	826	320		187	380	56	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	242	1148	257		94	1032	150		334	826	320		187	380	56	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		2.00	2.16	0.84		2.00	2.62	0.38	
Final Sat.:	1700	5100	1700		1700	5100	1700		3400	3675	1425		3400	4449	651	
Capacity Analysis Module:																
Vol/Sat:	0.14	0.23	0.15		0.06	0.20	0.09		0.10	0.22	0.22		0.06	0.09	0.09	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.782
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	48	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Permitted			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	0 0	2 1	0	1 0	0 0	1	1 1	0 0	1
Volume Module:												
Base Vol:	49	1232	0	0	1423	23	76	0	129	924	58	112
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	51	1282	0	0	1481	24	79	0	134	962	60	117
Added Vol:	0	126	0	0	134	0	0	0	0	3	0	28
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	51	1408	0	0	1615	24	79	0	134	965	60	145
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	51	1408	0	0	1615	24	79	0	134	965	60	145
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	51	1408	0	0	1615	24	79	0	134	965	60	145
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	51	1408	0	0	1615	24	79	0	134	965	60	145
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	0.00	2.96	0.04	1.00	0.00	1.00	1.88	0.12	1.00
Final Sat.:	1700	5100	1700	0	5026	74	1700	0	1700	3200	200	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.28	0.00	0.00	0.32	0.32	0.05	0.00	0.08	0.30	0.30	0.09
Crit Moves:	****				****					****	****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.799
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	52	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Include			Include			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	1 0	2 0	1	1 0	1 0	2
Volume Module:												
Base Vol:	65	881	477	337	1644	125	95	601	389	97	236	770
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	68	917	496	351	1711	130	99	625	405	101	246	801
Added Vol:	0	102	3	19	98	0	0	0	0	3	0	28
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	68	1019	499	370	1809	130	99	625	405	104	246	829
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	68	1019	499	370	1809	130	99	625	405	104	246	829
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	68	1019	499	370	1809	130	99	625	405	104	246	829
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	68	1019	499	370	1809	130	99	625	405	104	246	829
OvlAdjVol:			395									90
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.04	0.20	0.29	0.22	0.35	0.08	0.06	0.18	0.24	0.06	0.14	0.24
OvlAdjV/S:			0.23									0.03
Crit Moves:			****	****					****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.560
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	60	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	578	833	0	0	788	100
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	0	0	0	0	0	601	867	0	0	820	104
Added Vol:	0	0	0	0	0	0	22	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	623	867	0	0	820	104
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	623	867	0	0	820	104
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	623	867	0	0	820	104
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	623	867	0	0	820	104
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.77	0.23
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3017	383
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.51	0.00	0.00	0.27	0.27
Crit Moves:								****				

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.622
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	151	687	241	50	666	185	199	957	121	321	1491	108
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	157	715	251	52	693	193	207	996	126	334	1552	112
Added Vol:	20	80	20	0	97	0	0	0	24	24	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	177	795	271	52	790	193	207	996	150	358	1552	112
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	177	795	271	52	790	193	207	996	150	358	1552	112
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	177	795	271	52	790	193	207	996	150	358	1552	112
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	177	795	271	52	790	193	207	996	150	358	1552	112
OvlAdjVol:			92			89			61			86
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.16	0.16	0.02	0.15	0.11	0.06	0.20	0.09	0.11	0.30	0.07
OvlAdjV/S:			0.05			0.05			0.04			0.05
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.694
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	37	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	101	815	213		122	877	85		46	466	87		214	795	123	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	105	848	222		127	913	88		48	485	91		223	827	128	
Added Vol:	29	120	29		0	145	0		0	0	34		34	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	134	968	251		127	1058	88		48	485	125		257	827	128	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	134	968	251		127	1058	88		48	485	125		257	827	128	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	134	968	251		127	1058	88		48	485	125		257	827	128	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	134	968	251		127	1058	88		48	485	125		257	827	128	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.38	0.62		1.00	2.77	0.23		1.00	1.59	0.41		1.00	1.73	0.27	
Final Sat.:	1700	4051	1049		1700	4706	394		1700	2705	695		1700	2944	456	
Capacity Analysis Module:																
Vol/Sat:	0.08	0.24	0.24		0.07	0.22	0.22		0.03	0.18	0.18		0.15	0.28	0.28	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.711
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	38	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	109	398	69		135	403	87		98	826	69		129	1159	183	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	113	414	72		140	419	91		102	860	72		134	1206	190	
Added Vol:	1	0	0		20	0	0		0	37	1		0	31	16	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	114	414	72		160	419	91		102	897	73		134	1237	206	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	114	414	72		160	419	91		102	897	73		134	1237	206	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	114	414	72		160	419	91		102	897	73		134	1237	206	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	114	414	72		160	419	91		102	897	73		134	1237	206	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.70	0.30		1.00	1.64	0.36		1.00	1.85	0.15		1.00	2.00	1.00	
Final Sat.:	1700	2898	502		1700	2796	604		1700	3145	255		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.14	0.14		0.09	0.15	0.15		0.06	0.29	0.29		0.08	0.36	0.12	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.719
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	39	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	238	913	243	210	746	170	119	829	133	201	1103	150
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	248	950	253	219	776	177	124	863	138	209	1148	156
Added Vol:	70	178	42	32	180	0	0	8	48	84	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	318	1128	295	251	956	177	124	871	186	293	1148	156
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	318	1128	295	251	956	177	124	871	186	293	1148	156
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	318	1128	295	251	956	177	124	871	186	293	1148	156
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	318	1128	295	251	956	177	124	871	186	293	1148	156
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.09	0.22	0.17	0.07	0.19	0.10	0.04	0.26	0.11	0.09	0.34	0.09
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.931
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	110	Level Of Service:	E

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	198	662	104	171	796	256	222	948	170	181	1186	149
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	206	689	108	178	828	266	231	986	177	188	1234	155
Added Vol:	0	0	0	0	0	0	0	50	0	0	60	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	206	689	108	178	828	266	231	1036	177	188	1294	155
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	206	689	108	178	828	266	231	1036	177	188	1294	155
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	206	689	108	178	828	266	231	1036	177	188	1294	155
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	206	689	108	178	828	266	231	1036	177	188	1294	155
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.20	0.06	0.10	0.24	0.16	0.14	0.20	0.10	0.11	0.38	0.09
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.932
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	110	Level Of Service:	E

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1 0	1	1 0	1 1	0	1 0	2 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	198	546	365	92	331	86	123	897	121	266	1303	225
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	206	568	380	96	344	89	128	933	126	277	1356	234
Added Vol:	0	0	0	0	0	0	0	50	0	0	60	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	206	568	380	96	344	89	128	983	126	277	1416	234
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	206	568	380	96	344	89	128	983	126	277	1416	234
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	206	568	380	96	344	89	128	983	126	277	1416	234
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	206	568	380	96	344	89	128	983	126	277	1416	234
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.59	0.41	1.00	2.66	0.34	1.00	2.00	1.00
Final Sat.:	1700	1700	1700	1700	2699	701	1700	4521	579	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.33	0.22	0.06	0.13	0.13	0.08	0.22	0.22	0.16	0.42	0.14
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.410
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	159	722	413	11	1023	16	0	0	0	51	497	243
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	165	751	430	11	1065	17	0	0	0	53	517	253
Added Vol:	0	16	24	0	20	0	0	0	0	33	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	165	767	454	11	1085	17	0	0	0	86	517	253
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	165	767	0	11	1085	17	0	0	0	86	517	253
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	165	767	0	11	1085	17	0	0	0	86	517	253
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	165	767	0	11	1085	17	0	0	0	86	517	253
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.00	2.00	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	1700	3400	3400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.11	0.00	0.01	0.16	0.01	0.00	0.00	0.00	0.05	0.15	0.07
Crit Moves:	****			****							****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.309
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	18	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Ignore				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	0	0 4	1	0	0	0 4	0	1	1	0 1	0	2	0	0 0	0	0
Volume Module:																
Base Vol:	0	1229	40		0	706	367		56	131	293		0	0	0	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	0	1279	42		0	735	382		58	136	305		0	0	0	
Added Vol:	0	39	0		0	53	0		0	0	33		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	1318	42		0	788	382		58	136	338		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	0	1318	42		0	788	0		58	136	338		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	1318	42		0	788	0		58	136	338		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	1318	42		0	788	0		58	136	338		0	0	0	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	4.85	0.15		0.00	4.00	1.00		1.00	1.00	2.00		0.00	0.00	0.00	
Final Sat.:	0	8240	260		0	6800	1700		1700	1700	3400		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	0.00	0.16	0.16		0.00	0.12	0.00		0.03	0.08	0.10		0.00	0.00	0.00	
Crit Moves:		****				****					****					

Traffix 8.0.0715 (c) 2008 Dowling Assoc. Licensed to RK ENGINEERING GROUP

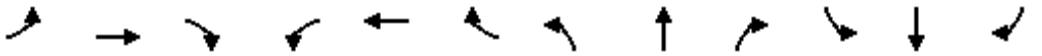
GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

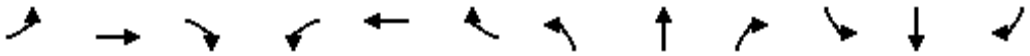
Cycle (sec):	100	Critical Vol./Cap.(X):	0.552
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	26	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	161	748	605	109	690	272	235	1160	70	207	1048	93
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	168	778	630	113	718	283	245	1207	73	215	1091	97
Added Vol:	0	24	24	0	67	20	16	34	0	0	40	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	168	802	654	113	785	303	261	1241	73	215	1131	97
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	168	802	654	113	785	303	261	1241	73	215	1131	97
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	168	802	654	113	785	303	261	1241	73	215	1131	97
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	168	802	654	113	785	303	261	1241	73	215	1131	97
OvlAdjVol:			438			173			0			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.16	0.19	0.03	0.15	0.18	0.08	0.24	0.04	0.06	0.22	0.06
OvlAdjV/S:			0.13			0.10			0.00			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	150		50
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	1.00
Ped Bike Factor												
Frt					0.946			0.989				
Flt Protected					0.971					0.950		
Satd. Flow (prot)	0	1863	0	0	1711	0	1863	5029	0	1770	5085	1863
Flt Permitted					0.971					0.950		
Satd. Flow (perm)	0	1863	0	0	1711	0	1863	5029	0	1770	5085	1863
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		423			516			491			921	
Travel Time (s)		9.6			11.7			11.2			20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	142	0	95	0	1566	119	210	1199	0
Future Volume (vph)	0	0	0	142	0	95	0	1566	119	210	1199	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	154	0	103	0	1702	129	228	1303	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	257	0	0	1831	0	228	1303	0

Intersection Summary

Intersection	
Int Delay, s/veh	19.6

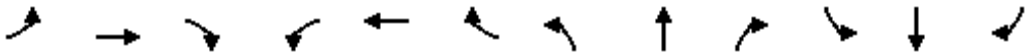
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	142	0	95	0	1566	119	210	1199	0
Future Vol, veh/h	0	0	0	142	0	95	0	1566	119	210	1199	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	150	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	154	0	103	0	1702	129	228	1303	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2440	3590	652	2744	3526	916	1303	0	0	1831	0	0
Stage 1	1759	1759	-	1767	1767	-	-	-	-	-	-	-
Stage 2	681	1831	-	977	1759	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	34	5	352	~ 21	6	236	279	-	-	~ 152	-	-
Stage 1	58	137	-	~ 57	135	-	-	-	-	-	-	-
Stage 2	370	126	-	243	137	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	0	352	-	0	236	279	-	-	~ 152	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	58	0	-	~ 57	135	-	-	-	-	-	-	-
Stage 2	208	126	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0		0	46.4
HCM LOS	A	-		

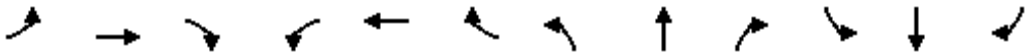
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	279	-	-	-	-	~ 152	-	-
HCM Lane V/C Ratio	-	-	-	-	-	1.502	-	-
HCM Control Delay (s)	0	-	-	0	-$	311.1	-	-
HCM Lane LOS	A	-	-	A	-	F	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	15.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.931			0.911			0.991			0.997	
Flt Protected		0.983			0.987		0.950			0.950		
Satd. Flow (prot)	0	1705	0	0	1675	0	1770	5040	0	1770	5070	0
Flt Permitted		0.983			0.987		0.950			0.950		
Satd. Flow (perm)	0	1705	0	0	1675	0	1770	5040	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	11	5	17	31	9	76	49	1607	103	55	1263	24
Future Volume (vph)	11	5	17	31	9	76	49	1607	103	55	1263	24
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	12	5	18	33	10	82	53	1728	111	59	1358	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	0	125	0	53	1839	0	59	1384	0

Intersection Summary

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	5	17	31	9	76	49	1607	103	55	1263	24
Future Vol, veh/h	11	5	17	31	9	76	49	1607	103	55	1263	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	5	18	33	10	82	53	1728	111	59	1358	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2291	3434	692	2554	3392	920	1384	0	0	1839	0	0
Stage 1	1489	1489	-	1890	1890	-	-	-	-	-	-	-
Stage 2	802	1945	-	664	1502	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	42	7	331	~ 28	~ 7	234	254	-	-	151	-	-
Stage 1	90	186	-	46	117	-	-	-	-	-	-	-
Stage 2	312	110	-	379	183	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 3	331	-	~ 3	234	254	-	-	151	-	-
Mov Cap-2 Maneuver	-	~ 3	-	-	~ 3	-	-	-	-	-	-	-
Stage 1	71	113	-	36	93	-	-	-	-	-	-	-
Stage 2	144	87	-	208	111	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.6	1.8
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	254	-	-	-	-	151	-	-
HCM Lane V/C Ratio	0.207	-	-	-	-	0.392	-	-
HCM Control Delay (s)	22.8	-	-	-	-	43.4	-	-
HCM Lane LOS	C	-	-	-	-	E	-	-
HCM 95th %tile Q(veh)	0.8	-	-	-	-	1.7	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.513
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	67	356	66		44	401	45		63	350	87		78	349	107	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	70	370	69		46	417	47		66	364	91		81	363	111	
Added Vol:	1	1	0		0	1	0		0	39	1		0	32	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	71	371	69		46	418	47		66	403	92		81	395	111	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	71	371	69		46	418	47		66	403	92		81	395	111	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	71	371	69		46	418	47		66	403	92		81	395	111	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	71	371	69		46	418	47		66	403	92		81	395	111	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.69	0.31		1.00	1.80	0.20		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	2869	531		1700	3058	342		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.13	0.13		0.03	0.14	0.14		0.04	0.24	0.05		0.05	0.23	0.07	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.757
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	44	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	109	1376	178	56	944	61	60	240	76	193	362	84
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	113	1432	185	58	982	63	62	250	79	201	377	87
Added Vol:	3	198	22	61	173	29	34	2	4	18	0	65
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	116	1630	207	119	1155	92	96	252	83	219	377	152
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	116	1630	207	119	1155	92	96	252	83	219	377	152
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	116	1630	207	119	1155	92	96	252	83	219	377	152
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	116	1630	207	119	1155	92	96	252	83	219	377	152
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.66	0.34	1.00	2.78	0.22	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	4525	575	1700	4722	378	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.36	0.36	0.07	0.24	0.24	0.06	0.15	0.05	0.13	0.22	0.09
Crit Moves:		****			****				****		****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

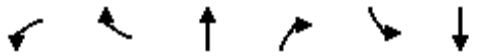
Cycle (sec):	100	Critical Vol./Cap.(X):	0.806
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	53	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	100	714	54	97	867	136	139	248	82	211	482	147
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	104	743	56	101	902	142	145	258	85	220	502	153
Added Vol:	20	0	0	0	0	0	0	69	16	0	64	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	124	743	56	101	902	142	145	327	101	220	566	153
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	124	743	56	101	902	142	145	327	101	220	566	153
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	124	743	56	101	902	142	145	327	101	220	566	153
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	124	743	56	101	902	142	145	327	101	220	566	153
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.22	0.03	0.06	0.27	0.08	0.09	0.19	0.06	0.13	0.33	0.09
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.927		0.995			
Flt Protected	0.977				0.950	
Satd. Flow (prot)	1687	0	5060	0	1770	5085
Flt Permitted	0.977				0.950	
Satd. Flow (perm)	1687	0	5060	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	28	33	1625	54	31	1194
Future Volume (vph)	28	33	1625	54	31	1194
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	30	35	1729	57	33	1270
Shared Lane Traffic (%)						
Lane Group Flow (vph)	65	0	1786	0	33	1270

Intersection Summary

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	33	1625	54	31	1194
Future Vol, veh/h	28	33	1625	54	31	1194
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	35	1729	57	33	1270

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2332	893	0	0	1786	0
Stage 1	1758	-	-	-	-	-
Stage 2	574	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	62	244	-	-	160	-
Stage 1	81	-	-	-	-	-
Stage 2	480	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	49	244	-	-	160	-
Mov Cap-2 Maneuver	49	-	-	-	-	-
Stage 1	81	-	-	-	-	-
Stage 2	381	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	123	0	0.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	86	160	-
HCM Lane V/C Ratio	-	-	0.755	0.206	-
HCM Control Delay (s)	-	-	123	33.2	-
HCM Lane LOS	-	-	F	D	-
HCM 95th %tile Q(veh)	-	-	3.8	0.7	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.512
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	36	1126	27	90	795	105	138	45	28	8	62	133
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	37	1172	28	94	827	109	144	47	29	8	65	138
Added Vol:	0	222	0	0	194	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	37	1394	28	94	1021	109	144	47	29	8	65	138
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	37	1394	28	94	1021	109	144	47	29	8	65	138
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	37	1394	28	94	1021	109	144	47	29	8	65	138
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	37	1394	28	94	1021	109	144	47	29	8	65	138
OvlAdjVol:												45
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.71	0.29	0.66	0.21	0.13	0.11	0.89	1.00
Final Sat.:	1700	5100	1700	1700	4607	493	1112	363	226	194	1506	1700
Capacity Analysis Module:												
Vol/Sat:	0.02	0.27	0.02	0.06	0.22	0.22	0.08	0.13	0.13	0.00	0.04	0.08
OvlAdjV/S:												0.03
Crit Moves:	****			****				****		****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.772
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	47	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	2	0 2	1	0	2	0 2	1	0
Volume Module:																
Base Vol:	305	1196	249		116	923	223		326	593	212		273	863	98	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	317	1245	259		121	960	232		339	617	221		284	898	102	
Added Vol:	11	177	0		16	157	22		25	13	8		0	12	20	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	328	1422	259		137	1117	254		364	630	229		284	910	122	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	328	1422	259		137	1117	254		364	630	229		284	910	122	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	328	1422	259		137	1117	254		364	630	229		284	910	122	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	328	1422	259		137	1117	254		364	630	229		284	910	122	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		2.00	2.20	0.80		2.00	2.65	0.35	
Final Sat.:	1700	5100	1700		1700	5100	1700		3400	3742	1358		3400	4497	603	
Capacity Analysis Module:																
Vol/Sat:	0.19	0.28	0.15		0.08	0.22	0.15		0.11	0.17	0.17		0.08	0.20	0.20	
Crit Moves:	****					****			****					****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.726
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	40	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	0	0 2	1	0	1	0	0	0 1	1	1	0	0 1
Volume Module:																
Base Vol:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04				
Initial Bse:	123	1813	0	0	1539	49	91	0	82	627	72	131				
Added Vol:	0	145	0	0	164	0	0	0	0	4	0	40				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	123	1958	0	0	1703	49	91	0	82	631	72	171				
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	123	1958	0	0	1703	49	91	0	82	631	72	171				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	123	1958	0	0	1703	49	91	0	82	631	72	171				
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	123	1958	0	0	1703	49	91	0	82	631	72	171				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	3.00	1.00	0.00	2.92	0.08	1.00	0.00	1.00	1.80	0.20	1.00				
Final Sat.:	1700	5100	1700	0	4958	142	1700	0	1700	3053	347	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.38	0.00	0.00	0.34	0.34	0.05	0.00	0.05	0.21	0.21	0.10				
Crit Moves:	****				****		****			****						

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.886
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	79	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	1 0	2 0	1	1 0	1 0	2
Volume Module:												
Base Vol:	118	1324	369	322	1182	209	188	563	428	105	235	718
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	123	1378	384	335	1230	217	196	586	445	109	245	747
Added Vol:	0	109	4	32	105	0	0	0	0	4	0	40
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	123	1487	388	367	1335	217	196	586	445	113	245	787
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	123	1487	388	367	1335	217	196	586	445	113	245	787
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	123	1487	388	367	1335	217	196	586	445	113	245	787
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	123	1487	388	367	1335	217	196	586	445	113	245	787
OvlAdjVol:			275									53
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.07	0.29	0.23	0.22	0.26	0.13	0.12	0.17	0.26	0.07	0.14	0.23
OvlAdjV/S:			0.16									0.02
Crit Moves:	****			****					****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITHOUT PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.485
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	592	666	0	0	745	50
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	0	0	0	0	0	616	693	0	0	775	52
Added Vol:	0	0	0	0	0	0	36	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	652	693	0	0	775	52
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	652	693	0	0	775	52
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	652	693	0	0	775	52
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	652	693	0	0	775	52
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.87	0.13
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3186	214
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.41	0.00	0.00	0.24	0.24
Crit Moves:							****				****	

Appendix G

Project Buildout Year (2025) With Project Conditions
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.501
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0 3	0 1	2	0 3	0 1	2	0 3	0 1	2	0 3	0 1
Volume Module:												
Base Vol:	132	593	214	55	595	180	160	853	152	272	650	99
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	137	617	223	57	619	187	166	888	158	283	676	103
Added Vol:	21	86	21	0	92	0	0	0	26	26	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	158	703	244	57	711	187	166	888	184	309	676	103
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	158	703	244	57	711	187	166	888	184	309	676	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	158	703	244	57	711	187	166	888	184	309	676	103
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	158	703	244	57	711	187	166	888	184	309	676	103
OvlAdjVol:			89			104			105			74
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.14	0.14	0.02	0.14	0.11	0.05	0.17	0.11	0.09	0.13	0.06
OvlAdjV/S:			0.05			0.06			0.06			0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.680
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	35	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	74	762	191		111	527	55		81	688	55		124	271	141	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	77	793	199		116	548	57		84	716	57		129	282	147	
Added Vol:	32	127	32		0	144	0		0	0	38		38	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	109	920	231		116	692	57		84	716	95		167	282	147	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	109	920	231		116	692	57		84	716	95		167	282	147	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	109	920	231		116	692	57		84	716	95		167	282	147	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	109	920	231		116	692	57		84	716	95		167	282	147	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.40	0.60		1.00	2.77	0.23		1.00	1.77	0.23		1.00	1.32	0.68	
Final Sat.:	1700	4077	1023		1700	4711	389		1700	3001	399		1700	2236	1164	
Capacity Analysis Module:																
Vol/Sat:	0.06	0.23	0.23		0.07	0.15	0.15		0.05	0.24	0.24		0.10	0.13	0.13	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.770
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	46	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	1 0	1 0	1	1 0	1 0	1	1 0	1 0	2	0 1
Volume Module:												
Base Vol:	67	344	87	140	334	67	152	1321	89	77	521	164
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	70	358	91	146	348	70	158	1375	93	80	542	171
Added Vol:	0	0	0	20	0	0	0	41	0	0	35	14
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	70	358	91	166	348	70	158	1416	93	80	577	185
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	70	358	91	166	348	70	158	1416	93	80	577	185
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	70	358	91	166	348	70	158	1416	93	80	577	185
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	70	358	91	166	348	70	158	1416	93	80	577	185
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.60	0.40	1.00	1.67	0.33	1.00	1.88	0.12	1.00	2.00	1.00
Final Sat.:	1700	2714	686	1700	2832	568	1700	3191	209	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.04	0.13	0.13	0.10	0.12	0.12	0.09	0.44	0.44	0.05	0.17	0.11
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.743
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	42	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	84	719	191	110	542	119	132	1266	120	128	511	76
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	87	748	199	114	564	124	137	1317	125	133	532	79
Added Vol:	79	192	40	50	170	0	0	13	49	100	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	166	940	239	164	734	124	137	1330	174	233	532	79
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	166	940	239	164	734	124	137	1330	174	233	532	79
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	166	940	239	164	734	124	137	1330	174	233	532	79
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	166	940	239	164	734	124	137	1330	174	233	532	79
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.18	0.14	0.05	0.14	0.07	0.04	0.39	0.10	0.07	0.16	0.05
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.686
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	36	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	121	437	132	144	701	190	165	1388	140	88	440	60
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	126	455	137	150	729	198	172	1444	146	92	458	62
Added Vol:	0	0	0	0	0	0	0	52	0	0	63	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	126	455	137	150	729	198	172	1496	146	92	521	62
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	126	455	137	150	729	198	172	1496	146	92	521	62
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	126	455	137	150	729	198	172	1496	146	92	521	62
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	126	455	137	150	729	198	172	1496	146	92	521	62
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.13	0.08	0.09	0.21	0.12	0.10	0.29	0.09	0.05	0.15	0.04
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.790
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	50	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	0	1	1	0 1	1	0	1	0 2	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	59	293	174		53	538	33		113	1274	200		357	518		77
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04		1.04
Initial Bse:	61	305	181		55	560	34		118	1326	208		371	539		80
Added Vol:	0	0	0		0	0	0		0	52	0		0	63		0
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0		0
Initial Fut:	61	305	181		55	560	34		118	1378	208		371	602		80
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
PHF Volume:	61	305	181		55	560	34		118	1378	208		371	602		80
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0		0
Reduced Vol:	61	305	181		55	560	34		118	1378	208		371	602		80
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
FinalVolume:	61	305	181		55	560	34		118	1378	208		371	602		80
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700		1700
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
Lanes:	1.00	1.00	1.00		1.00	1.88	0.12		1.00	2.61	0.39		1.00	2.00		1.00
Final Sat.:	1700	1700	1700		1700	3204	196		1700	4431	669		1700	3400		1700
Capacity Analysis Module:																
Vol/Sat:	0.04	0.18	0.11		0.03	0.17	0.17		0.07	0.31	0.31		0.22	0.18		0.05
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.237
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	16	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	45	385	166	21	613	20	0	0	0	94	73	249
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	47	401	173	22	638	21	0	0	0	98	76	259
Added Vol:	0	14	30	0	20	0	0	0	0	16	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	47	415	203	22	658	21	0	0	0	114	76	259
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	47	415	0	22	658	21	0	0	0	114	76	259
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	47	415	0	22	658	21	0	0	0	114	76	259
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	47	415	0	22	658	21	0	0	0	114	76	259
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.80	1.20	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	3059	2041	3400
Capacity Analysis Module:												
Vol/Sat:	0.01	0.06	0.00	0.01	0.10	0.01	0.00	0.00	0.00	0.04	0.04	0.08
Crit Moves:	****			****								****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.246	
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx	
Optimal Cycle:	16	Level Of Service:	A	

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	4 1	0	0 0	4 0	1	1 0	1 0	2	0 0	0 0	0
Volume Module:												
Base Vol:	0	556	5	0	518	213	32	136	348	0	0	0
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	579	5	0	539	222	33	142	362	0	0	0
Added Vol:	0	44	0	0	36	0	0	0	16	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	623	5	0	575	222	33	142	378	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	623	5	0	575	0	33	142	378	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	623	5	0	575	0	33	142	378	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	623	5	0	575	0	33	142	378	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.96	0.04	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8430	70	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.07	0.07	0.00	0.08	0.00	0.02	0.08	0.11	0.00	0.00	0.00
Crit Moves:	****			****					****			

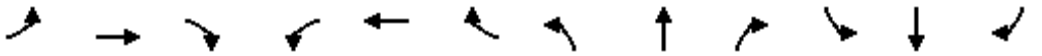
GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

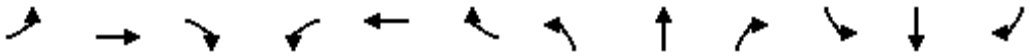
Cycle (sec):	100	Critical Vol./Cap.(X):	0.494
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	88	430	212	137	520	166	120	998	79	305	506	89
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	92	447	221	143	541	173	125	1039	82	317	527	93
Added Vol:	0	30	30	0	32	20	14	38	0	0	43	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	92	477	251	143	573	193	139	1077	82	317	570	93
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	92	477	251	143	573	193	139	1077	82	317	570	93
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	92	477	251	143	573	193	139	1077	82	317	570	93
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	92	477	251	143	573	193	139	1077	82	317	570	93
OvlAdjVol:			0			123			36			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.09	0.07	0.04	0.11	0.11	0.04	0.21	0.05	0.09	0.11	0.05
OvlAdjV/S:			0.00			0.07			0.02			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	150		50
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	1.00
Ped Bike Factor												
Frt		0.932			0.946			0.991				0.850
Flt Protected		0.976			0.971		0.950			0.950		
Satd. Flow (prot)	0	1694	0	0	1711	0	1770	5040	0	1770	5085	1583
Flt Permitted		0.976			0.971		0.950			0.950		
Satd. Flow (perm)	0	1694	0	0	1711	0	1770	5040	0	1770	5085	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		423			516			491			921	
Travel Time (s)		9.6			11.7			11.2			20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	48	0	48	87	0	58	61	1319	83	162	908	61
Future Volume (vph)	48	0	48	87	0	58	61	1319	83	162	908	61
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	52	0	52	95	0	63	66	1434	90	176	987	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	158	0	66	1524	0	176	987	66

Intersection Summary

Intersection	
Int Delay, s/veh	285.5

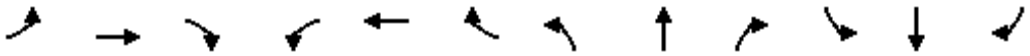
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	0	48	87	0	58	61	1319	83	162	908	61
Future Vol, veh/h	48	0	48	87	0	58	61	1319	83	162	908	61
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	150	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	52	0	52	95	0	63	66	1434	90	176	987	66

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2045	2995	494	2358	3016	762	1053	0	0	1524	0	0
Stage 1	1339	1339	-	1611	1611	-	-	-	-	-	-	-
Stage 2	706	1656	-	747	1405	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	60	13	446	~ 38	13	298	369	-	-	217	-	-
Stage 1	115	220	-	~ 74	162	-	-	-	-	-	-	-
Stage 2	357	154	-	337	204	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 14	2	446	~ 10	2	298	369	-	-	217	-	-
Mov Cap-2 Maneuver	~ 14	2	-	~ 10	2	-	-	-	-	-	-	-
Stage 1	94	42	-	~ 61	133	-	-	-	-	-	-	-
Stage 2	231	126	-	~ 56	39	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 1587.5	$ 4449.1	0.7	9.7
HCM LOS	F	F		

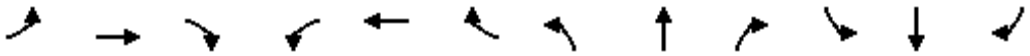
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	369	-	-	27	16	217	-	-
HCM Lane V/C Ratio	0.18	-	-	3.865	9.851	0.811	-	-
HCM Control Delay (s)	16.9	-	-	$ 1587.5	$ 4449.1	67.8	-	-
HCM Lane LOS	C	-	-	F	F	F	-	-
HCM 95th %tile Q(veh)	0.6	-	-	12.7	20.6	6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.930			0.931			0.990			0.997	
Flt Protected		0.991			0.985		0.950			0.950		
Satd. Flow (prot)	0	1717	0	0	1708	0	1770	5034	0	1770	5070	0
Flt Permitted		0.991			0.985		0.950			0.950		
Satd. Flow (perm)	0	1717	0	0	1708	0	1770	5034	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	19	29	52	57	32	94	37	1360	96	55	968	21
Future Volume (vph)	19	29	52	57	32	94	37	1360	96	55	968	21
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	19	30	53	58	33	96	38	1388	98	56	988	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	102	0	0	187	0	38	1486	0	56	1009	0

Intersection Summary

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	29	52	57	32	94	37	1360	96	55	968	21
Future Vol, veh/h	19	29	52	57	32	94	37	1360	96	55	968	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	19	30	53	58	33	96	38	1388	98	56	988	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1759	2673	505	2035	2634	743	1009	0	0	1486	0	0
Stage 1	1111	1111	-	1513	1513	-	-	-	-	-	-	-
Stage 2	648	1562	-	522	1121	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	89	~ 22	439	60	~ 23	307	388	-	-	226	-	-
Stage 1	167	283	-	87	181	-	-	-	-	-	-	-
Stage 2	387	171	-	462	280	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 15	439	-	~ 16	307	388	-	-	226	-	-
Mov Cap-2 Maneuver	-	~ 15	-	-	~ 16	-	-	-	-	-	-	-
Stage 1	151	213	-	78	163	-	-	-	-	-	-	-
Stage 2	192	154	-	263	211	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.4	1.4
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	388	-	-	-	-	226	-	-
HCM Lane V/C Ratio	0.097	-	-	-	-	0.248	-	-
HCM Control Delay (s)	15.3	-	-	-	-	26.1	-	-
HCM Lane LOS	C	-	-	-	-	D	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-	-	0.9	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.496
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	51	406	69		86	469	103		94	268	96		83	189	60	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	53	422	72		89	488	107		98	279	100		86	197	62	
Added Vol:	0	0	0		0	0	0		0	42	0		0	38	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	53	422	72		89	488	107		98	321	100		86	235	62	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	53	422	72		89	488	107		98	321	100		86	235	62	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	53	422	72		89	488	107		98	321	100		86	235	62	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	53	422	72		89	488	107		98	321	100		86	235	62	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.71	0.29		1.00	1.64	0.36		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	2906	494		1700	2788	612		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.03	0.15	0.15		0.05	0.18	0.18		0.06	0.19	0.06		0.05	0.14	0.04	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.669
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	66	943	174		58	702	23		49	304	65		135	174	33	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	69	981	181		60	731	24		51	316	68		140	181	34	
Added Vol:	3	207	13		56	166	34		39	0	2		19	1	74	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	72	1188	194		116	897	58		90	316	70		159	182	108	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	72	1188	194		116	897	58		90	316	70		159	182	108	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	72	1188	194		116	897	58		90	316	70		159	182	108	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	72	1188	194		116	897	58		90	316	70		159	182	108	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.58	0.42		1.00	2.82	0.18		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	4384	716		1700	4790	310		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.27	0.27		0.07	0.19	0.19		0.05	0.19	0.04		0.09	0.11	0.06	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

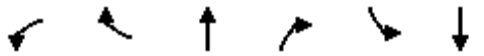
Cycle (sec):	100	Critical Vol./Cap.(X):	0.646
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	32	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	90	435	54	168	799	80	119	311	116	102	99	176
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	94	453	56	175	831	83	124	324	121	106	103	183
Added Vol:	20	0	0	0	0	0	0	54	14	0	75	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	114	453	56	175	831	83	124	378	135	106	178	183
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	114	453	56	175	831	83	124	378	135	106	178	183
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	114	453	56	175	831	83	124	378	135	106	178	183
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	114	453	56	175	831	83	124	378	135	106	178	183
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.07	0.13	0.03	0.10	0.24	0.05	0.07	0.22	0.08	0.06	0.10	0.11
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.947		0.998			
Flt Protected	0.971				0.950	
Satd. Flow (prot)	1713	0	5075	0	1770	5085
Flt Permitted	0.971				0.950	
Satd. Flow (perm)	1713	0	5075	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	45	29	980	16	15	884
Future Volume (vph)	45	29	980	16	15	884
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	46	30	1010	16	15	911
Shared Lane Traffic (%)						
Lane Group Flow (vph)	76	0	1026	0	15	911

Intersection Summary

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	45	29	980	16	15	884
Future Vol, veh/h	45	29	980	16	15	884
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	30	1010	16	15	911

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1412	513	0	0	1026	0
Stage 1	1018	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	191	433	-	-	380	-
Stage 1	236	-	-	-	-	-
Stage 2	595	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	184	433	-	-	380	-
Mov Cap-2 Maneuver	184	-	-	-	-	-
Stage 1	236	-	-	-	-	-
Stage 2	572	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.1	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	238	380	-
HCM Lane V/C Ratio	-	-	0.321	0.041	-
HCM Control Delay (s)	-	-	27.1	14.9	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	1.3	0.1	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.307
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	18	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	12	609	13	60	594	52	41	15	14	8	37	99
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	12	634	14	62	618	54	43	16	15	8	39	103
Added Vol:	0	223	0	0	188	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	12	857	14	62	806	54	43	16	15	8	39	103
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	12	857	14	62	806	54	43	16	15	8	39	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	12	857	14	62	806	54	43	16	15	8	39	103
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	12	857	14	62	806	54	43	16	15	8	39	103
OvlAdjVol:												41
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.81	0.19	0.59	0.21	0.20	0.18	0.82	1.00
Final Sat.:	1700	5100	1700	1700	4779	321	996	364	340	302	1398	1700
Capacity Analysis Module:												
Vol/Sat:	0.01	0.17	0.01	0.04	0.17	0.17	0.03	0.04	0.04	0.00	0.03	0.06
OvlAdjV/S:												0.02
Crit Moves:	****			****			****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.679
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	35	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	1	0 3	0	1	2	0 2	1	0	2	0 2	1	0
Volume Module:																
Base Vol:	226	961	247		81	868	129		303	784	302		180	354	40	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	235	1000	257		84	903	134		315	816	314		187	368	42	
Added Vol:	7	178	0		14	153	20		25	10	6		0	12	20	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	242	1178	257		98	1056	154		340	826	320		187	380	62	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	242	1178	257		98	1056	154		340	826	320		187	380	62	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	242	1178	257		98	1056	154		340	826	320		187	380	62	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	242	1178	257		98	1056	154		340	826	320		187	380	62	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	3.00	1.00		1.00	3.00	1.00		2.00	2.16	0.84		2.00	2.58	0.42	
Final Sat.:	1700	5100	1700		1700	5100	1700		3400	3675	1425		3400	4389	711	
Capacity Analysis Module:																
Vol/Sat:	0.14	0.23	0.15		0.06	0.21	0.09		0.10	0.22	0.22		0.06	0.09	0.09	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.786
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	49	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Permitted			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	0 0	2 1	0	1 0	0 0	1	1 1	0 0	1
Volume Module:												
Base Vol:	49	1232	0	0	1423	23	76	0	129	924	58	112
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	51	1282	0	0	1481	24	79	0	134	962	60	117
Added Vol:	0	145	0	0	158	0	0	0	0	3	0	40
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	51	1427	0	0	1639	24	79	0	134	965	60	157
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	51	1427	0	0	1639	24	79	0	134	965	60	157
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	51	1427	0	0	1639	24	79	0	134	965	60	157
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	51	1427	0	0	1639	24	79	0	134	965	60	157
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	0.00	2.96	0.04	1.00	0.00	1.00	1.88	0.12	1.00
Final Sat.:	1700	5100	1700	0	5027	73	1700	0	1700	3200	200	1700
Capacity Analysis Module:												
Vol/Sat:	0.03	0.28	0.00	0.00	0.33	0.33	0.05	0.00	0.08	0.30	0.30	0.09
Crit Moves:	****				****				****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.805
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	53	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	1 0	2 0	1	1 0	1 0	2
Volume Module:												
Base Vol:	65	881	477	337	1644	125	95	601	389	97	236	770
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	68	917	496	351	1711	130	99	625	405	101	246	801
Added Vol:	0	108	3	29	103	0	0	0	0	3	0	40
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	68	1025	499	380	1814	130	99	625	405	104	246	841
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	68	1025	499	380	1814	130	99	625	405	104	246	841
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	68	1025	499	380	1814	130	99	625	405	104	246	841
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	68	1025	499	380	1814	130	99	625	405	104	246	841
OvlAdjVol:			395									82
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.04	0.20	0.29	0.22	0.36	0.08	0.06	0.18	0.24	0.06	0.14	0.25
OvlAdjV/S:			0.23									0.02
Crit Moves:			****	****					****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.560
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	60	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	578	833	0	0	788	100
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	0	0	0	0	0	601	867	0	0	820	104
Added Vol:	0	0	0	0	0	0	32	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	633	867	0	0	820	104
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	633	867	0	0	820	104
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	633	867	0	0	820	104
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	633	867	0	0	820	104
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.77	0.23
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3017	383
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.51	0.00	0.00	0.27	0.27
Crit Moves:								****				

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 HARBOR BOULEVARD (NS) / KATELLA AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.628
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ovl			Ovl			Ovl			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0 3	0 1	2	0 3	0 1	2	0 3	0 1	2	0 3	0 1
Volume Module:												
Base Vol:	151	687	241	50	666	185	199	957	121	321	1491	108
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	157	715	251	52	693	193	207	996	126	334	1552	112
Added Vol:	27	94	27	0	115	0	0	0	33	33	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	184	809	278	52	808	193	207	996	159	367	1552	112
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	184	809	278	52	808	193	207	996	159	367	1552	112
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	184	809	278	52	808	193	207	996	159	367	1552	112
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	184	809	278	52	808	193	207	996	159	367	1552	112
OvlAdjVol:			94			89			67			86
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.16	0.16	0.02	0.16	0.11	0.06	0.20	0.09	0.11	0.30	0.07
OvlAdjV/S:			0.06			0.05			0.04			0.05
Crit Moves:	****			****			****			****		

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 HARBOR BOULEVARD (NS) / ORANGEWOOD AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.709
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	38	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 2	1	0	1	0 2	1	0	1	0 1	1	0	1	0 1	1	0
Volume Module:																
Base Vol:	101	815	213		122	877	85		46	466	87		214	795	123	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	105	848	222		127	913	88		48	485	91		223	827	128	
Added Vol:	36	148	36		0	181	0		0	0	43		43	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	141	996	258		127	1094	88		48	485	134		266	827	128	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	141	996	258		127	1094	88		48	485	134		266	827	128	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	141	996	258		127	1094	88		48	485	134		266	827	128	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	141	996	258		127	1094	88		48	485	134		266	827	128	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.38	0.62		1.00	2.78	0.22		1.00	1.57	0.43		1.00	1.73	0.27	
Final Sat.:	1700	4052	1048		1700	4718	382		1700	2666	734		1700	2944	456	
Capacity Analysis Module:																
Vol/Sat:	0.08	0.25	0.25		0.07	0.23	0.23		0.03	0.18	0.18		0.16	0.28	0.28	
Crit Moves:		****				****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 WEST STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.719
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	39	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	1	0	1	0 2	0	1
Volume Module:																
Base Vol:	109	398	69		135	403	87		98	826	69		129	1159	183	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	113	414	72		140	419	91		102	860	72		134	1206	190	
Added Vol:	1	0	0		29	0	0		0	46	1		0	39	23	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	114	414	72		169	419	91		102	906	73		134	1245	213	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	114	414	72		169	419	91		102	906	73		134	1245	213	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	114	414	72		169	419	91		102	906	73		134	1245	213	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	114	414	72		169	419	91		102	906	73		134	1245	213	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.70	0.30		1.00	1.64	0.36		1.00	1.85	0.15		1.00	2.00	1.00	
Final Sat.:	1700	2898	502		1700	2796	604		1700	3147	253		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.14	0.14		0.10	0.15	0.15		0.06	0.29	0.29		0.08	0.37	0.13	
Crit Moves:		****				****				****				****		

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GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 HARBOR BOULEVARD (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.720
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	39	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	1	2 0	3 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	238	913	243	210	746	170	119	829	133	201	1103	150
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	248	950	253	219	776	177	124	863	138	209	1148	156
Added Vol:	84	220	56	32	235	0	0	8	67	102	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	332	1170	309	251	1011	177	124	871	205	311	1148	156
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	332	1170	309	251	1011	177	124	871	205	311	1148	156
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	332	1170	309	251	1011	177	124	871	205	311	1148	156
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	332	1170	309	251	1011	177	124	871	205	311	1148	156
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3400	5100	1700	3400	5100	1700	3400	3400	1700	3400	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.10	0.23	0.18	0.07	0.20	0.10	0.04	0.26	0.12	0.09	0.34	0.09
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #5 HASTER STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.937
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	115	Level Of Service:	E

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	3 0	1	1 0	2 0	1
Volume Module:												
Base Vol:	198	662	104	171	796	256	222	948	170	181	1186	149
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	206	689	108	178	828	266	231	986	177	188	1234	155
Added Vol:	0	0	0	0	0	0	0	64	0	0	78	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	206	689	108	178	828	266	231	1050	177	188	1312	155
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	206	689	108	178	828	266	231	1050	177	188	1312	155
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	206	689	108	178	828	266	231	1050	177	188	1312	155
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	206	689	108	178	828	266	231	1050	177	188	1312	155
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	5100	1700	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.20	0.06	0.10	0.24	0.16	0.14	0.21	0.10	0.11	0.39	0.09
Crit Moves:	****			****			****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #6 LEWIS STREET (NS) / CHAPMAN AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.938
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	116	Level Of Service:	E

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1 0	1	1 0	1 1	0	1 0	2 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	198	546	365	92	331	86	123	897	121	266	1303	225
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	206	568	380	96	344	89	128	933	126	277	1356	234
Added Vol:	0	0	0	0	0	0	0	64	0	0	78	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	206	568	380	96	344	89	128	997	126	277	1434	234
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	206	568	380	96	344	89	128	997	126	277	1434	234
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	206	568	380	96	344	89	128	997	126	277	1434	234
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	206	568	380	96	344	89	128	997	126	277	1434	234
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	1.59	0.41	1.00	2.66	0.34	1.00	2.00	1.00
Final Sat.:	1700	1700	1700	1700	2699	701	1700	4528	572	1700	3400	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.33	0.22	0.06	0.13	0.13	0.08	0.22	0.22	0.16	0.42	0.14
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #7 STATE COLLEGE BOULEVARD (NS) / I-5 NB RAMPS - ANAHEIM WAY (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.412
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	1 0	4 0	1	0 0	0 0	0	1 1	1 0	2
Volume Module:												
Base Vol:	159	722	413	11	1023	16	0	0	0	51	497	243
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	165	751	430	11	1065	17	0	0	0	53	517	253
Added Vol:	0	23	24	0	29	0	0	0	0	33	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	165	774	454	11	1094	17	0	0	0	86	517	253
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	165	774	0	11	1094	17	0	0	0	86	517	253
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	165	774	0	11	1094	17	0	0	0	86	517	253
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	165	774	0	11	1094	17	0	0	0	86	517	253
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	1.00	4.00	1.00	0.00	0.00	0.00	1.00	2.00	2.00
Final Sat.:	3400	6800	1700	1700	6800	1700	0	0	0	1700	3400	3400
Capacity Analysis Module:												
Vol/Sat:	0.05	0.11	0.00	0.01	0.16	0.01	0.00	0.00	0.00	0.05	0.15	0.07
Crit Moves:	****			****							****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #8 STATE COLLEGE BOULEVARD - THE CITY DRIVE (NS) / I-5 SB RAMPS (EW

Cycle (sec):	100	Critical Vol./Cap.(X):	0.310	
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx	
Optimal Cycle:	18	Level Of Service:	A	

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Ignore			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0 4	1 0	0	0 4	0 1	1	0 1	0 2	0	0 0	0 0
Volume Module:												
Base Vol:	0	1229	40	0	706	367	56	131	293	0	0	0
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	1279	42	0	735	382	58	136	305	0	0	0
Added Vol:	0	46	0	0	62	0	0	0	33	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	1325	42	0	797	382	58	136	338	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	1325	42	0	797	0	58	136	338	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	1325	42	0	797	0	58	136	338	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	1325	42	0	797	0	58	136	338	0	0	0
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	4.85	0.15	0.00	4.00	1.00	1.00	1.00	2.00	0.00	0.00	0.00
Final Sat.:	0	8241	259	0	6800	1700	1700	1700	3400	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.16	0.16	0.00	0.12	0.00	0.03	0.08	0.10	0.00	0.00	0.00
Crit Moves:		****			****				****			

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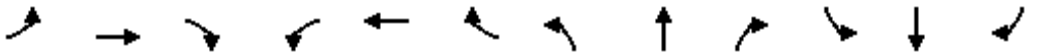
GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #9 THE CITY DRIVE (NS) / CHAPMAN AVENUE (EW)

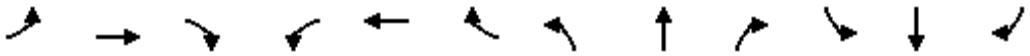
Cycle (sec):	100	Critical Vol./Cap.(X):	0.555
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	26	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Ovl			Ovl			Include	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	3 0	2	2 0	3 0	1	2 0	3 0	1	2 0	3 0	1
Volume Module:												
Base Vol:	161	748	605	109	690	272	235	1160	70	207	1048	93
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	168	778	630	113	718	283	245	1207	73	215	1091	97
Added Vol:	0	24	24	0	67	29	23	41	0	0	49	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	168	802	654	113	785	312	268	1248	73	215	1140	97
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	168	802	654	113	785	312	268	1248	73	215	1140	97
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	168	802	654	113	785	312	268	1248	73	215	1140	97
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	168	802	654	113	785	312	268	1248	73	215	1140	97
OvlAdjVol:			438			178			0			
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	3.00	2.00	2.00	3.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00
Final Sat.:	3400	5100	3400	3400	5100	1700	3400	5100	1700	3400	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.05	0.16	0.19	0.03	0.15	0.18	0.08	0.24	0.04	0.06	0.22	0.06
OvlAdjV/S:			0.13			0.10			0.00			
Crit Moves:	****			****			****			****		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	150		50
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	1.00
Ped Bike Factor												
Frt		0.932			0.946			0.989				0.850
Flt Protected		0.976			0.971		0.950			0.950		
Satd. Flow (prot)	0	1694	0	0	1711	0	1770	5029	0	1770	5085	1583
Flt Permitted		0.976			0.971		0.950			0.950		
Satd. Flow (perm)	0	1694	0	0	1711	0	1770	5029	0	1770	5085	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		423			516			491			921	
Travel Time (s)		9.6			11.7			11.2			20.9	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	70	0	71	142	0	95	91	1566	119	210	1199	90
Future Volume (vph)	70	0	71	142	0	95	91	1566	119	210	1199	90
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	76	0	77	154	0	103	99	1702	129	228	1303	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	153	0	0	257	0	99	1831	0	228	1303	98

Intersection Summary

Intersection	
Int Delay, s/veh	18.6

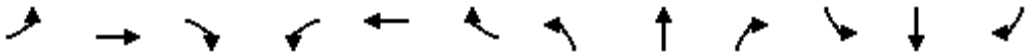
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	70	0	71	142	0	95	91	1566	119	210	1199	90
Future Vol, veh/h	70	0	71	142	0	95	91	1566	119	210	1199	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	150	-	50
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	76	0	77	154	0	103	99	1702	129	228	1303	98

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2638	3788	652	2942	3822	916	1401	0	0	1831	0	0
Stage 1	1759	1759	-	1965	1965	-	-	-	-	-	-	-
Stage 2	879	2029	-	977	1857	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	~ 25	4	352	~ 16	4	236	249	-	-	~ 152	-	-
Stage 1	~ 58	137	-	~ 41	107	-	-	-	-	-	-	-
Stage 2	280	100	-	243	122	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	0	352	-	0	236	249	-	-	~ 152	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	~ 35	0	-	~ 25	64	-	-	-	-	-	-	-
Stage 2	95	60	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			1.5	43.6
HCM LOS	-	-		

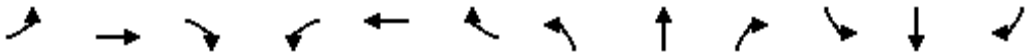
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	249	-	-	-	-	~ 152	-	-
HCM Lane V/C Ratio	0.397	-	-	-	-	1.502	-	-
HCM Control Delay (s)	28.7	-	-	-	-	$ 311.1	-	-
HCM Lane LOS	D	-	-	-	-	F	-	-
HCM 95th %tile Q(veh)	1.8	-	-	-	-	15.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	90		0	75		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Ped Bike Factor												
Frt		0.931			0.911			0.991			0.997	
Flt Protected		0.983			0.987		0.950			0.950		
Satd. Flow (prot)	0	1705	0	0	1675	0	1770	5040	0	1770	5070	0
Flt Permitted		0.983			0.987		0.950			0.950		
Satd. Flow (perm)	0	1705	0	0	1675	0	1770	5040	0	1770	5070	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		685			663			2032			491	
Travel Time (s)		15.6			15.1			46.2			11.2	

Intersection Summary	
Area Type:	Other



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	11	5	17	31	9	76	49	1697	103	55	1333	24
Future Volume (vph)	11	5	17	31	9	76	49	1697	103	55	1333	24
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	12	5	18	33	10	82	53	1825	111	59	1433	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	0	125	0	53	1936	0	59	1459	0

Intersection Summary

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	5	17	31	9	76	49	1697	103	55	1333	24
Future Vol, veh/h	11	5	17	31	9	76	49	1697	103	55	1333	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	90	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	5	18	33	10	82	53	1825	111	59	1433	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2405	3606	730	2681	3564	968	1459	0	0	1936	0	0
Stage 1	1564	1564	-	1987	1987	-	-	-	-	-	-	-
Stage 2	841	2042	-	694	1577	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	7.14	6.44	6.54	7.14	5.34	-	-	5.34	-	-
Critical Hdwy Stg 1	7.34	5.54	-	7.34	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.74	5.54	-	6.74	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Cap-1 Maneuver	35	~ 5	313	~ 24	~ 6	218	233	-	-	135	-	-
Stage 1	80	171	-	39	105	-	-	-	-	-	-	-
Stage 2	295	98	-	363	168	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 2	313	-	~ 3	218	233	-	-	135	-	-
Mov Cap-2 Maneuver	-	~ 2	-	-	~ 3	-	-	-	-	-	-	-
Stage 1	62	96	-	~ 30	81	-	-	-	-	-	-	-
Stage 2	125	76	-	182	95	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.7	2
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	233	-	-	-	-	135	-	-
HCM Lane V/C Ratio	0.226	-	-	-	-	0.438	-	-
HCM Control Delay (s)	24.9	-	-	-	-	51	-	-
HCM Lane LOS	C	-	-	-	-	F	-	-
HCM 95th %tile Q(veh)	0.8	-	-	-	-	1.9	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #12 WEST STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.519
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Prot+Permit				Prot+Permit				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 1	1	0	1	0 1	1	0	1	0 1	0	1	1	0 1	0	1
Volume Module:																
Base Vol:	67	356	66		44	401	45		63	350	87		78	349	107	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	70	370	69		46	417	47		66	364	91		81	363	111	
Added Vol:	1	1	0		0	1	0		0	48	1		0	39	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	71	371	69		46	418	47		66	412	92		81	402	111	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	71	371	69		46	418	47		66	412	92		81	402	111	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	71	371	69		46	418	47		66	412	92		81	402	111	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	71	371	69		46	418	47		66	412	92		81	402	111	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	1.69	0.31		1.00	1.80	0.20		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	2869	531		1700	3058	342		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.04	0.13	0.13		0.03	0.14	0.14		0.04	0.24	0.05		0.05	0.24	0.07	
Crit Moves:	****					****				****				****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #13 HARBOR BOULEVARD (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.778
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	48	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	T	R		L	T	R		L	T	R		L	T	R	
Control:	Protected				Protected				Prot+Permit				Prot+Permit			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0	2	1	0	1	0	2	1	0	1	0	1	1	0	1
Volume Module:																
Base Vol:	109	1376	178		56	944	61		60	240	76		193	362	84	
Growth Adj:	1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04		1.04	1.04	1.04	
Initial Bse:	113	1432	185		58	982	63		62	250	79		201	377	87	
Added Vol:	3	261	22		76	222	36		43	2	4		18	0	83	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	116	1693	207		134	1204	99		105	252	83		219	377	170	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	116	1693	207		134	1204	99		105	252	83		219	377	170	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	116	1693	207		134	1204	99		105	252	83		219	377	170	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	116	1693	207		134	1204	99		105	252	83		219	377	170	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.67	0.33		1.00	2.77	0.23		1.00	1.00	1.00		1.00	1.00	1.00	
Final Sat.:	1700	4544	556		1700	4711	389		1700	1700	1700		1700	1700	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.37	0.37		0.08	0.26	0.26		0.06	0.15	0.05		0.13	0.22	0.10	
Crit Moves:		****				****					****			****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #14 HASTER STREET (NS) / LAMPSON AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.817
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	56	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Prot+Permit			Prot+Permit			Prot+Permit			Prot+Permit		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	100	714	54	97	867	136	139	248	82	211	482	147
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	104	743	56	101	902	142	145	258	85	220	502	153
Added Vol:	29	0	0	0	0	0	0	76	23	0	73	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	133	743	56	101	902	142	145	334	108	220	575	153
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	133	743	56	101	902	142	145	334	108	220	575	153
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	133	743	56	101	902	142	145	334	108	220	575	153
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	133	743	56	101	902	142	145	334	108	220	575	153
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	1700	1700
Capacity Analysis Module:												
Vol/Sat:	0.08	0.22	0.03	0.06	0.27	0.08	0.09	0.20	0.06	0.13	0.34	0.09
Crit Moves:	****			****			****			****		



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	90	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	0.91
Ped Bike Factor						
Frt	0.927		0.995			
Flt Protected	0.977				0.950	
Satd. Flow (prot)	1687	0	5060	0	1770	5085
Flt Permitted	0.977				0.950	
Satd. Flow (perm)	1687	0	5060	0	1770	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	751		1732			2032
Travel Time (s)	17.1		39.4			46.2

Intersection Summary	
Area Type:	Other



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	28	33	1688	54	31	1244
Future Volume (vph)	28	33	1688	54	31	1244
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	30	35	1796	57	33	1323
Shared Lane Traffic (%)						
Lane Group Flow (vph)	65	0	1853	0	33	1323

Intersection Summary

Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	33	1688	54	31	1244
Future Vol, veh/h	28	33	1688	54	31	1244
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	90	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	30	35	1796	57	33	1323

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2420	927	0	0	1853	0
Stage 1	1825	-	-	-	-	-
Stage 2	595	-	-	-	-	-
Critical Hdwy	5.74	7.14	-	-	5.34	-
Critical Hdwy Stg 1	6.64	-	-	-	-	-
Critical Hdwy Stg 2	6.04	-	-	-	-	-
Follow-up Hdwy	3.82	3.92	-	-	3.12	-
Pot Cap-1 Maneuver	55	232	-	-	148	-
Stage 1	74	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	43	232	-	-	148	-
Mov Cap-2 Maneuver	43	-	-	-	-	-
Stage 1	74	-	-	-	-	-
Stage 2	364	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	154.2	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	77	148	-
HCM Lane V/C Ratio	-	-	0.843	0.223	-
HCM Control Delay (s)	-	-	154.2	36.2	-
HCM Lane LOS	-	-	F	E	-
HCM 95th %tile Q(veh)	-	-	4.2	0.8	-

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #16 HARBOR BOULEVARD (NS) / PALM STREET (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.525
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	2 1	0	0 0	1! 0	0	0 1	0 0	1
Volume Module:												
Base Vol:	36	1126	27	90	795	105	138	45	28	8	62	133
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	37	1172	28	94	827	109	144	47	29	8	65	138
Added Vol:	0	285	0	0	244	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	37	1457	28	94	1071	109	144	47	29	8	65	138
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	37	1457	28	94	1071	109	144	47	29	8	65	138
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	37	1457	28	94	1071	109	144	47	29	8	65	138
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	37	1457	28	94	1071	109	144	47	29	8	65	138
OvlAdjVol:												45
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	2.72	0.28	0.66	0.21	0.13	0.11	0.89	1.00
Final Sat.:	1700	5100	1700	1700	4628	472	1112	363	226	194	1506	1700
Capacity Analysis Module:												
Vol/Sat:	0.02	0.29	0.02	0.06	0.23	0.23	0.08	0.13	0.13	0.00	0.04	0.08
OvlAdjV/S:												0.03
Crit Moves:	****			****				****		****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #17 HARBOR BOULEVARD (NS) / GARDEN GROVE BOULEVARD (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.783
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	49	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	3 0	1	1 0	3 0	1	2 0	2 1	0	2 0	2 1	0
Volume Module:												
Base Vol:	305	1196	249	116	923	223	326	593	212	273	863	98
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	317	1245	259	121	960	232	339	617	221	284	898	102
Added Vol:	11	222	0	23	192	29	34	13	8	0	12	29
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	328	1467	259	144	1152	261	373	630	229	284	910	131
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	328	1467	259	144	1152	261	373	630	229	284	910	131
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	328	1467	259	144	1152	261	373	630	229	284	910	131
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	328	1467	259	144	1152	261	373	630	229	284	910	131
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	2.00	2.20	0.80	2.00	2.62	0.38
Final Sat.:	1700	5100	1700	1700	5100	1700	3400	3742	1358	3400	4458	642
Capacity Analysis Module:												
Vol/Sat:	0.19	0.29	0.15	0.08	0.23	0.15	0.11	0.17	0.17	0.08	0.20	0.20
Crit Moves:	****			****			****				****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #18 HARBOR BOULEVARD (NS) / CA-SR 22 WB RAMPS - BANNER DRIVE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.733
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	41	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Permitted				Split Phase				Split Phase			
Rights:	Ignore				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0 3	0	1	0	0 2	1	0	1	0	0	0 1	1	1	0	0 1
Volume Module:																
Base Vol:	118	1742	0	0	1479	47	87	0	79	603	69	126				
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04				
Initial Bse:	123	1813	0	0	1539	49	91	0	82	627	72	131				
Added Vol:	0	172	0	0	199	0	0	0	0	4	0	58				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	123	1985	0	0	1738	49	91	0	82	631	72	189				
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	123	1985	0	0	1738	49	91	0	82	631	72	189				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	123	1985	0	0	1738	49	91	0	82	631	72	189				
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	123	1985	0	0	1738	49	91	0	82	631	72	189				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	3.00	1.00	0.00	2.92	0.08	1.00	0.00	1.00	1.80	0.20	1.00				
Final Sat.:	1700	5100	1700	0	4960	140	1700	0	1700	3053	347	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.39	0.00	0.00	0.35	0.35	0.05	0.00	0.05	0.21	0.21	0.11				
Crit Moves:	****				****		****			****						

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #19 HARBOR BOULEVARD (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.896
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	84	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:		Ovl			Include			Include			Ovl	
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 3	0 1	1	0 3	0 1	1	0 2	0 1	1	0 1	0 2
Volume Module:												
Base Vol:	118	1324	369	322	1182	209	188	563	428	105	235	718
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	123	1378	384	335	1230	217	196	586	445	109	245	747
Added Vol:	0	118	4	46	112	0	0	0	0	4	0	58
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	123	1496	388	381	1342	217	196	586	445	113	245	805
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	123	1496	388	381	1342	217	196	586	445	113	245	805
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	123	1496	388	381	1342	217	196	586	445	113	245	805
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	123	1496	388	381	1342	217	196	586	445	113	245	805
OvlAdjVol:			275									43
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00
Final Sat.:	1700	5100	1700	1700	5100	1700	1700	3400	1700	1700	1700	3400
Capacity Analysis Module:												
Vol/Sat:	0.07	0.29	0.23	0.22	0.26	0.13	0.12	0.17	0.26	0.07	0.14	0.24
OvlAdjV/S:			0.16									0.01
Crit Moves:		****		****					****	****		

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #20 CA-SR 22 EB RAMPS (NS) / TRASK AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.489
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	23	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0 0	0 0	0	0 0	0 0	0	2 0	1 0	0	0 0	1 1	0
Volume Module:												
Base Vol:	0	0	0	0	0	0	592	666	0	0	745	50
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	0	0	0	0	0	616	693	0	0	775	52
Added Vol:	0	0	0	0	0	0	50	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	0	0	0	0	0	666	693	0	0	775	52
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	0	0	0	0	0	666	693	0	0	775	52
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	0	0	0	0	0	666	693	0	0	775	52
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	0	0	0	0	0	666	693	0	0	775	52
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	0.00	0.00	1.87	0.13
Final Sat.:	0	0	0	0	0	0	3400	1700	0	0	3186	214
Capacity Analysis Module:												
Vol/Sat:	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.41	0.00	0.00	0.24	0.24
Crit Moves:							****				****	

Appendix H

Project Buildout Year (2025) With Project Conditions With Improvements
LOS Analysis Worksheets

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #10 HARBOR BOULEVARD (NS) / PROJECT ACCESS 1 (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.517
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 3	0 1	1	0 3	0 1	0	0 1!	0 0	0	0 1!	0 0
Volume Module:												
Base Vol:	0	1114	0	0	752	0	0	0	0	0	0	0
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	1159	0	0	783	0	0	0	0	0	0	0
Added Vol:	61	160	83	162	125	61	48	0	48	87	0	58
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	61	1319	83	162	908	61	48	0	48	87	0	58
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	61	1319	83	162	908	61	48	0	48	87	0	58
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	61	1319	83	162	908	61	48	0	48	87	0	58
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	61	1319	83	162	908	61	48	0	48	87	0	58
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	0.50	0.00	0.50	0.60	0.00	0.40
Final Sat.:	1700	5100	1700	1700	5100	1700	850	0	850	1020	0	680
Capacity Analysis Module:												
Vol/Sat:	0.04	0.26	0.05	0.10	0.18	0.04	0.03	0.00	0.06	0.05	0.00	0.09
Crit Moves:		****			****			****				****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
AM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #11 HARBOR BOULEVARD (NS) / TWINTREE LANE - TWINTREE AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.534
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	36	1025	65	39	694	20	18	28	50	45	31	72
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	37	1067	68	41	722	21	19	29	52	47	32	75
Added Vol:	0	293	28	14	246	0	0	0	0	10	0	19
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	37	1360	96	55	968	21	19	29	52	57	32	94
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	37	1360	96	55	968	21	19	29	52	57	32	94
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	37	1360	96	55	968	21	19	29	52	57	32	94
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	37	1360	96	55	968	21	19	29	52	57	32	94
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.80	0.20	1.00	2.94	0.06	0.19	0.29	0.52	0.31	0.18	0.51
Final Sat.:	1700	4765	335	1700	4993	107	319	496	885	528	300	872
Capacity Analysis Module:												
Vol/Sat:	0.02	0.29	0.29	0.03	0.19	0.19	0.06	0.06	0.06	0.11	0.11	0.11
Crit Moves:		****			****			****			****	

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #10 HARBOR BOULEVARD (NS) / PROJECT ACCESS 1 (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.661
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 3	0 1	1	0 3	0 1	0	0 1!	0 0	0	0 1!	0 0
Volume Module:												
Base Vol:	0	1350	0	0	1032	0	0	0	0	0	0	0
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	0	1405	0	0	1074	0	0	0	0	0	0	0
Added Vol:	91	161	119	210	125	90	70	0	71	142	0	95
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	91	1566	119	210	1199	90	70	0	71	142	0	95
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	91	1566	119	210	1199	90	70	0	71	142	0	95
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	91	1566	119	210	1199	90	70	0	71	142	0	95
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	91	1566	119	210	1199	90	70	0	71	142	0	95
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	3.00	1.00	1.00	3.00	1.00	0.50	0.00	0.50	0.60	0.00	0.40
Final Sat.:	1700	5100	1700	1700	5100	1700	844	0	856	1019	0	681
Capacity Analysis Module:												
Vol/Sat:	0.05	0.31	0.07	0.12	0.24	0.05	0.04	0.00	0.08	0.08	0.00	0.14
Crit Moves:		****			****			****				****

GARDEN GROVE HOTEL SITE B-2 TIS (JN: 2250-2020-01)
PROJECT BUILDOUT YEAR (2025) WITH PROJECT CONDITIONS
PM PEAK HOUR - MITIGATED

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #11 HARBOR BOULEVARD (NS) / TWINTREE LANE - TWINTREE AVENUE (EW)

Cycle (sec):	100	Critical Vol./Cap.(X):	0.523
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	2 1	0	1 0	2 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	47	1297	61	34	975	23	11	5	16	14	9	42
Growth Adj:	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Initial Bse:	49	1350	63	35	1015	24	11	5	17	15	9	44
Added Vol:	0	347	40	20	318	0	0	0	0	16	0	32
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	49	1697	103	55	1333	24	11	5	17	31	9	76
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	49	1697	103	55	1333	24	11	5	17	31	9	76
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	49	1697	103	55	1333	24	11	5	17	31	9	76
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	49	1697	103	55	1333	24	11	5	17	31	9	76
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	2.83	0.17	1.00	2.95	0.05	0.34	0.16	0.50	0.26	0.08	0.66
Final Sat.:	1700	4807	293	1700	5010	90	584	266	850	449	138	1113
Capacity Analysis Module:												
Vol/Sat:	0.03	0.35	0.35	0.03	0.27	0.27	0.02	0.02	0.02	0.07	0.07	0.07
Crit Moves:		****			****			****			****	

Traffix 8.0.0715 (c) 2008 Dowling Assoc. Licensed to RK ENGINEERING GROUP

Appendix I

OCTA Bus Routes & Schedules

15 minutes (or less)

WEEKDAY RUSH HOUR FREQUENCY

OC BUS

Local Bus Route Service

- 26 Fullerton to Placentia (via various streets...)
- 29 La Habra to Huntington Beach (via Beach Blvd.)
- 37 La Habra to Fountain Valley (via Euclid St.)
- 38 Lakewood to Anaheim Hills (via La Palma Ave.)
- 47 Fullerton to Balboa (via various streets...)
- 50 Long Beach to Orange (via Katella Ave.)
- 53 Anaheim to Irivine (via Main St.)
- 54 Garden Grove to Orange (via Chapman Avenue)
- 55 Santa Ana to Newport Beach (via various streets...)
- 66 Huntington Beach to Irivine (via McFadden Ave.)
- 70 Sunset Beach to Tustin (via Edinger Ave.)

Express Stop Service

- 53X Anaheim to Costa Mesa (via Katella Ave. and Main St.)
- 57X Anaheim to Costa Mesa (via Bristol St. and State College Blvd.)
- 64X Huntington Beach to Tustin (via Bolsa and First St.)

BRAVO! Limited Stop Service

- 529 Fullerton to Huntington Beach (BRAVO) (via Beach Blvd.)
- 543 Fullerton to Santa Ana (BRAVO) (via Harbor Blvd.)
- 560 Long Beach to Santa Ana (BRAVO) (via Westminster and 17th St.)

Rail Stations

OC BUS Transit Centers



2/10/19

OCBUS

RIDE GUIDE

WELCOME!

¡BIENVENIDOS!

GUÍA DE VIAJE

OCBUS



Riding OC Bus is simple, convenient, and an inexpensive way to travel. Here are some basic tips and information to make your trip even easier!

Viajar en OC Bus es una forma fácil, cómoda y barata de viajar. Estos son algunos consejos básicos e información para que ¡su viaje sea aún más fácil!





Effective October 12, 2019 **OCbus.com**

Efectivo el 13 de Octubre de 2019 **OCbus.com**

WHERE CAN WE TAKE YOU?

OC Bus is perfect for shopping, work, or visiting friends and family. With 59 routes and over 5,000 bus stops we have you covered.

ONLINE AND MOBILE PLANNING
Trip planning assistance, along with details on fares, passes, and schedules can be found at OCbus.com, or your smartphone via the OC Bus Mobile app.

CALL 714-636-RIDE Customer service reps are also available to assist you!

PLAN



¿A DÓNDE PODEMOS LLEVARLE?

OC Bus es el modo perfecto para ir de compras, trabajar o visitar a amigos y familiares. Con 59 rutas y más de 5,000 paradas de autobús, lo tenemos todo cubierto.

PLANIFICACIÓN EN LÍNEA Y MÓVIL En OCbus.com o a través de la aplicación OC Bus Mobile en su teléfono inteligente puede encontrar ayuda para la planificación de viajes, así como información sobre las tarifas, los pases y los horarios.

LLAME AL 714 636-RIDE ¡También tenemos representantes de servicio de atención al cliente disponibles para ayudarle!

THE SMART WAY TO PAY!

OC BUS MOBILE APP The same passes available at the supermarket are also available for purchase on your smartphone with OC Bus Mobile! It is amazingly easy...and convenient.

SPECIAL FARES OC Bus Mobile also offers reduced fares for youth, college students, seniors and persons with disabilities.

PAY WHEN BOARDING When you board, simply hold your activated ticket under our validator and you are good to go when you see the checkmark!

PAY



¡LA FORMA INTELIGENTE DE PAGAR!

APLICACIÓN OC BUS MOBILE
¡Los mismos pases disponibles en los supermercados también están disponibles para su compra en su teléfono inteligente con OC Bus Mobile! Es increíblemente sencillo…y conveniente.

TARIFAS ESPECIALES OC Bus Mobile también ofrece tarifas reducidas para jóvenes, estudiantes universitarios, personas mayores y personas con discapacidades.

PAGO AL ABORDAR ¡Al abordar, simplemente pone el boleto activado bajo el validador y procede una vez que ve la marca de verificación!

COME PREPARED. RIDE RELAXED!

ARRIVE EARLY Be at your stop 10 minutes before the bus is scheduled to depart, and check the route number!

BOARD PREPARED Have exact change or your pass ready before boarding. If using OC Bus Mobile, have your ticket ready to scan.

RIDE SAFELY Your safety is our top priority. Please use the handrails when boarding and the signal cord or button when you wish to leave.

RIDE!



VENGA PREPARADO. ¡VIAJE RELAJADO!

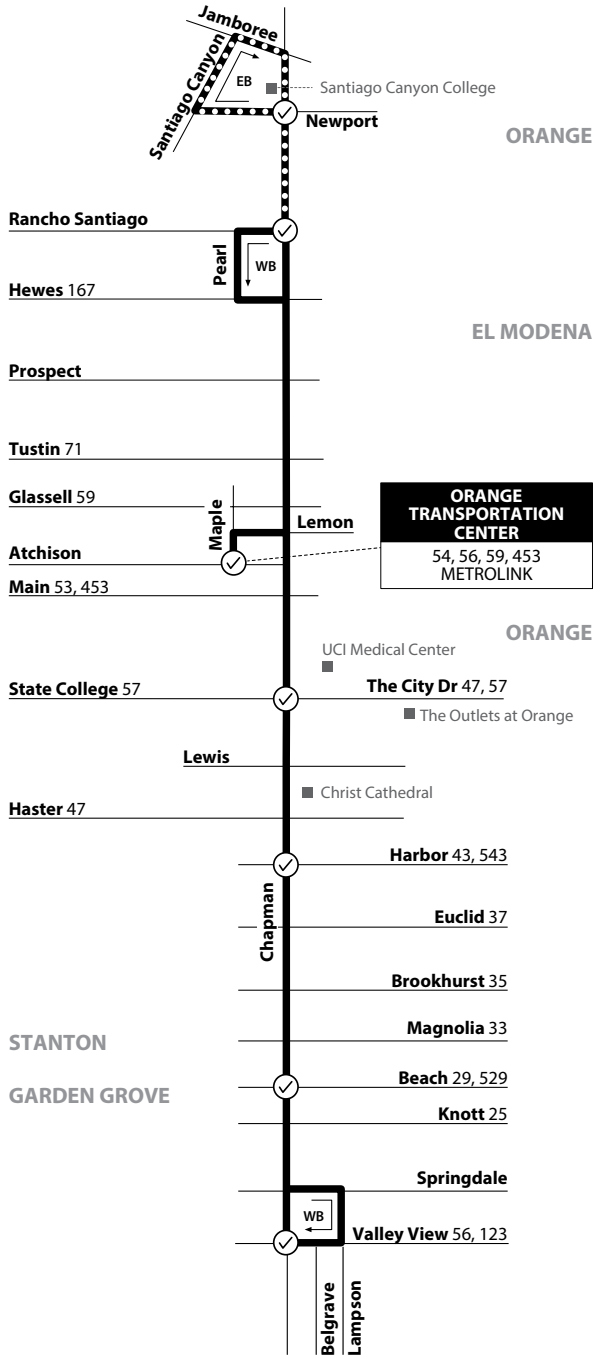
LLEGUE TEMPRANO Llegue a su parada 10 minutos antes de la hora programada de salida del autobús, y ¡verifique el número de ruta!

VAYA PREPARADO PARA ABORDAR Lleve el cambio exacto o su pase listo antes de abordar. Si utiliza OC Bus Mobile, tenga el boleto listo para ser escaneado.

VIAJE SEGURO Su seguridad es nuestra principal prioridad. Use el pasamanos al abordar y el cable o botón de aviso cuando desee bajarse.

54 Garden Grove to Orange
via Chapman Ave

NOTE: This route does not operate east of Rancho Santiago St. on Sundays.
NOTA: *Esta ruta no opera al este de Rancho Santiago St. los domingos.*



LEGEND / ***LEYENDA***
Scheduled Departure | Regular Routing | Monday-Saturday Only
Route 054/111519
METRO = Los Angeles Metro | RTA = Riverside Transit Agency
LBT = Long Beach Transit | ART = Anaheim Resort Transit
Numbers on streets indicate transfers. *Números en la calle indican transbordos.*
N — MAP NOT TO SCALE

Monday-Friday
EASTBOUND To: Orange

Chapman & Valley View	Chapman & Beach	Chapman & Brookhurst	Chapman & Harbor	Chapman & City Drive	Orange Transportation Center	Rancho Santiago & Chapman	Chapman & Rancho Santiago	Santiago Canyon College
5:01	5:08	5:15	5:24	5:31	5:41	•••••	5:56	6:10
5:34	5:41	5:48	5:57	6:04	6:14	6:29		
6:04	6:11	6:18	6:27	6:34	6:44	•••••	6:59	7:13
6:24	6:31	6:38	6:47	6:54	7:04	7:22		
6:44	6:51	6:58	7:07	7:14	7:24	•••••	7:39	7:53
7:01	7:09	7:17	7:27	7:34	7:45	8:03		
7:21	7:29	7:37	7:47	7:54	8:05	•••••	8:21	8:35
7:41	7:49	7:57	8:07	8:14	8:25	8:43		
8:04	8:12	8:20	8:30	8:37	8:48	•••••	9:04	9:18
8:24	8:32	8:40	8:50	8:57	9:08	9:26		
8:47	8:55	9:03	9:13	9:20	9:31	•••••	9:47	10:01
9:17	9:25	9:33	9:43	9:50	10:01	•••••	10:17	10:31
9:47	9:55	10:03	10:13	10:20	10:31	•••••	10:47	11:01
10:17	10:25	10:33	10:43	10:50	11:02	•••••	11:18	11:33
10:47	10:55	11:03	11:13	11:20	11:32	•••••	11:48	**12:03**
11:17	11:25	11:33	11:43	11:50	**12:02**	•••••	**12:18**	**12:33**
11:47	11:55	**12:03**	**12:13**	**12:20**	**12:32**	•••••	**12:48**	**1:03**
12:16	**12:24**	**12:32**	**12:43**	**12:50**	**1:02**	•••••	**1:19**	**1:34**
12:46	**12:54**	**1:02**	**1:13**	**1:20**	**1:32**	•••••	**1:49**	**2:04**
1:16	**1:24**	**1:32**	**1:43**	**1:50**	**2:02**	•••••	**2:19**	**2:34**
1:46	**1:54**	**2:02**	**2:13**	**2:20**	**2:32**	•••••	**2:49**	**3:04**
2:16	**2:24**	**2:32**	**2:43**	**2:50**	**3:02**	•••••	**3:19**	**3:34**
2:36	**2:44**	**2:52**	**3:03**	**3:10**	**3:22**	•••••	**3:39**	**3:54**
2:58	**3:06**	**3:14**	**3:25**	**3:32**	**3:44**	•••••	**4:01**	**4:16**
3:26	**3:34**	**3:42**	**3:53**	**4:00**	**4:12**	**4:30**		
3:45	**3:54**	**4:03**	**4:13**	**4:20**	**4:31**	•••••	**4:48**	**5:04**
4:07	**4:16**	**4:25**	**4:35**	**4:42**	**4:53**	**5:11**		
4:22	**4:31**	**4:40**	**4:50**	**4:57**	**5:08**	•••••	**5:25**	**5:41**
4:40	**4:49**	**4:58**	**5:08**	**5:15**	**5:26**	**5:44**		
5:00	**5:09**	**5:18**	**5:28**	**5:35**	**5:46**	•••••	**6:03**	**6:19**
5:20	**5:29**	**5:38**	**5:48**	**5:55**	**6:06**	**6:24**		
5:40	**5:49**	**5:58**	**6:08**	**6:15**	**6:26**	•••••	**6:43**	**6:59**
6:12	**6:21**	**6:30**	**6:40**	**6:47**	**6:58**	•••••	**7:15**	**7:31**
6:47	**6:54**	**7:01**	**7:10**	**7:16**	**7:26**	•••••	**7:39**	**7:51**
7:17	**7:24**	**7:31**	**7:40**	**7:46**	**7:56**	•••••	**8:09**	**8:21**
7:47	**7:54**	**8:01**	**8:10**	**8:16**	**8:26**	•••••	**8:39**	**8:51**
8:17	**8:24**	**8:31**	**8:40**	**8:46**	**8:56**	•••••	**9:09**	**9:21**
8:47	**8:54**	**9:01**	**9:10**	**9:16**	**9:26**	•••••	**9:39**	**9:51**
9:17	**9:24**	**9:31**	**9:40**	**9:46**	**9:56**	•••••	**10:09**	**10:21**
9:47	**9:54**	**10:01**	**10:10**	**10:16**	**10:26**	•••••	**10:39**	**10:51**

SERVICE TO / SERVICIO A

El Modena
Orange
- El Modena High School
- Santiago Canyon College
- Orange Public Library
- Orange Civic Center
- Orange Transportation Center (Metrolink)
- The Plaza
- The Outlets at Orange
- UCI Medical Center
- Lamoreaux Justice Center
- Portola Middle School

Stanton
Garden Grove
- Christ Cathedral
- Garden Grove Resort District
- Izaak Walton Intermediate School
- Dr. Walter C. Ralston Intermediate School
- Alamitos Intermediate School
- Garden Grove Promenade
- Chapman Library
- Garden Grove West Library
- Pacifica High School
- Hilton D. Bell Intermediate School

NOTE: This route does not operate east of Rancho Santiago St. on Sundays.
***NOTA:** Esta ruta no opera al este de Rancho Santiago St. los domingos.*

Garden Grove to Orange
via Chapman Ave

54

Monday-Friday
WESTBOUND To: Garden Grove

Santiago Canyon College	Chapman & Rancho Santiago	Rancho Santiago & Chapman	Orange Transportation Center	Chapman & City Drive	Chapman & Harbor	Chapman & Brookhurst	Chapman & Beach	Chapman & Valley View
4:42	4:48	·····	5:02	5:12	5:18	5:26	5:33	5:45
5:12	5:18	·····	5:32	5:42	5:48	5:56	6:03	6:15
		5:45	6:02	6:12	6:18	6:26	6:33	6:45
6:02	6:08	·····	6:22	6:32	6:38	6:46	6:53	7:05
		6:23	6:41	6:51	6:58	7:08	7:16	7:30
6:42	6:49	·····	7:05	7:15	7:22	7:32	7:40	7:54
		7:03	7:21	7:31	7:38	7:48	7:56	8:10
7:25	7:32	·····	7:48	7:58	8:05	8:15	8:23	8:37
		7:53	8:11	8:21	8:28	8:38	8:46	9:00
8:08	8:15	·····	8:31	8:41	8:48	8:58	9:06	9:20
		8:34	8:51	9:01	9:08	9:18	9:26	9:40
8:48	8:55	·····	9:11	9:21	9:28	9:38	9:46	10:00
9:16	9:22	·····	9:40	9:51	9:58	10:08	10:17	10:31
9:46	9:52	·····	10:10	10:21	10:28	10:38	10:47	11:01
10:16	10:22	·····	10:40	10:51	10:58	11:08	11:17	11:31
10:46	10:52	·····	11:10	11:21	11:28	11:38	11:47	**12:01**
11:16	11:22	·····	11:40	11:51	11:58	**12:08**	**12:17**	**12:31**
11:46	11:52	·····	**12:10**	**12:21**	**12:28**	**12:38**	**12:47**	**1:01**
12:16	**12:22**	·····	**12:40**	**12:51**	**12:58**	**1:08**	**1:17**	**1:31**
12:46	**12:52**	·····	**1:10**	**1:21**	**1:28**	**1:38**	**1:48**	**2:02**
1:16	**1:22**	·····	**1:40**	**1:51**	**1:58**	**2:08**	**2:18**	**2:32**
1:46	**1:52**	·····	**2:10**	**2:21**	**2:28**	**2:38**	**2:48**	**3:02**
2:16	**2:22**	·····	**2:40**	**2:51**	**2:58**	**3:08**	**3:18**	**3:32**
2:46	**2:52**	·····	**3:10**	**3:21**	**3:28**	**3:38**	**3:48**	**4:02**
		3:07	**3:27**	**3:40**	**3:48**	**3:58**	**4:08**	**4:22**
3:22	**3:28**	·····	**3:47**	**4:00**	**4:08**	**4:18**	**4:28**	**4:42**
		3:47	**4:07**	**4:20**	**4:28**	**4:38**	**4:48**	**5:02**
4:02	**4:08**	·····	**4:27**	**4:40**	**4:48**	**4:58**	**5:08**	**5:22**
		4:27	**4:47**	**5:00**	**5:08**	**5:18**	**5:28**	**5:42**
4:42	**4:48**	·····	**5:07**	**5:20**	**5:28**	**5:38**	**5:48**	**6:02**
		5:07	**5:27**	**5:40**	**5:48**	**5:58**	**6:08**	**6:22**
5:29	**5:35**	·····	**5:51**	**6:01**	**6:08**	**6:17**	**6:25**	**6:37**
		5:54	**6:11**	**6:21**	**6:28**	**6:37**	**6:45**	**6:57**
6:09	**6:15**	·····	**6:31**	**6:41**	**6:48**	**6:57**	**7:05**	**7:17**
6:39	**6:45**	·····	**7:01**	**7:11**	**7:18**	**7:27**	**7:35**	**7:47**
7:09	**7:15**	·····	**7:31**	**7:41**	**7:48**	**7:57**	**8:05**	**8:17**
7:41	**7:47**	·····	**8:03**	**8:13**	**8:20**	**8:29**	**8:37**	**8:49**
8:11	**8:17**	·····	**8:33**	**8:43**	**8:50**	**8:59**	**9:07**	**9:19**
8:44	**8:50**	·····	**9:03**	**9:13**	**9:20**	**9:29**	**9:36**	**9:48**
9:14	**9:20**	·····	**9:33**	**9:43**	**9:50**	**9:59**	**10:06**	**10:18**
9:44	**9:50**	·····	**10:03**	**10:13**	**10:20**	**10:29**	**10:36**	**10:48**

Saturday
EASTBOUND To: Orange

Chapman & Valley View	Chapman & Beach	Chapman & Brookhurst	Chapman & Harbor	Chapman & City Drive	Orange Transportation Center	Chapman & Rancho Santiago	Santiago Canyon College
6:15	6:22	6:30	6:39	6:46	6:57	7:13	7:23
6:45	6:52	7:00	7:09	7:16	7:27	7:43	7:53
7:15	7:22	7:30	7:39	7:46	7:57	8:13	8:23
7:45	7:52	8:00	8:09	8:16	8:27	8:43	8:53
8:15	8:22	8:30	8:39	8:46	8:57	9:13	9:23
8:45	8:52	9:00	9:09	9:16	9:27	9:43	9:53
9:14	9:21	9:29	9:39	9:46	9:59	10:16	10:26
9:44	9:51	9:59	10:09	10:16	10:29	10:46	10:56
10:11	10:19	10:27	10:39	10:47	10:59	11:16	11:26
10:41	10:49	10:57	11:09	11:17	11:29	11:46	11:56
11:11	11:19	11:27	11:39	11:47	11:59	**12:16**	**12:26**
11:41	11:49	11:57	**12:09**	**12:17**	**12:29**	**12:46**	**12:56**
12:11	**12:19**	**12:27**	**12:39**	**12:47**	**12:59**	**1:16**	**1:26**
12:40	**12:49**	**12:58**	**1:09**	**1:17**	**1:29**	**1:48**	**1:58**
1:10	**1:19**	**1:28**	**1:39**	**1:47**	**1:59**	**2:18**	**2:28**
1:40	**1:49**	**1:58**	**2:09**	**2:17**	**2:29**	**2:48**	**2:58**
2:10	**2:19**	**2:28**	**2:39**	**2:47**	**2:59**	**3:18**	**3:28**
2:40	**2:49**	**2:58**	**3:09**	**3:17**	**3:29**	**3:48**	**3:58**
3:10	**3:19**	**3:28**	**3:39**	**3:47**	**3:59**	**4:18**	**4:28**
3:40	**3:49**	**3:58**	**4:09**	**4:17**	**4:29**	**4:48**	**4:58**
4:11	**4:20**	**4:28**	**4:39**	**4:47**	**4:57**	**5:14**	**5:24**
4:41	**4:50**	**4:58**	**5:09**	**5:17**	**5:27**	**5:44**	**5:54**
5:12	**5:20**	**5:28**	**5:39**	**5:47**	**5:58**	**6:15**	**6:24**
5:42	**5:50**	**5:58**	**6:09**	**6:17**	**6:28**	**6:45**	**6:54**
6:12	**6:20**	**6:28**	**6:39**	**6:47**	**6:58**	**7:15**	**7:24**
6:45	**6:52**	**6:59**	**7:09**	**7:16**	**7:27**	**7:42**	**7:50**
7:15	**7:22**	**7:29**	**7:39**	**7:46**	**7:57**	**8:12**	**8:20**
7:45	**7:52**	**7:59**	**8:09**	**8:16**	**8:27**	**8:42**	**8:50**
8:15	**8:22**	**8:29**	**8:39**	**8:46**	**8:57**	**9:12**	**9:20**
9:00	**9:07**	**9:14**	**9:24**	**9:31**	**9:42**	**9:57**	**10:05**

54 Garden Grove to Orange

via Chapman Ave

NOTE: This route does not operate east of Rancho Santiago St. on Sundays.
NOTA: *Esta ruta no opera al este de Rancho Santiago St. los domingos.*

Saturday
WESTBOUND To: Garden Grove

Santiago Canyon College	Chapman & Rancho Santiago	Orange Transportation Center	Chapman & City Drive	Chapman & Harbor	Chapman & Brookhurst	Chapman & Beach	Chapman & Valley View
6:00	6:05	6:22	6:32	6:38	6:45	6:51	7:00
6:16	6:22	6:40	6:51	6:58	7:08	7:16	7:27
6:46	6:52	7:10	7:21	7:28	7:38	7:46	7:57
7:16	7:22	7:40	7:51	7:58	8:08	8:16	8:27
7:46	7:52	8:10	8:21	8:28	8:38	8:46	8:57
8:16	8:22	8:40	8:51	8:58	9:08	9:16	9:27
8:46	8:52	9:10	9:21	9:28	9:38	9:46	9:57
9:12	9:18	9:38	9:50	9:58	10:08	10:17	10:28
9:42	9:48	10:08	10:20	10:28	10:38	10:47	10:58
10:12	10:18	10:38	10:50	10:58	11:08	11:17	11:28
10:42	10:48	11:08	11:20	11:28	11:38	11:47	11:58
11:12	11:18	11:38	11:50	11:58	**12:08**	**12:17**	**12:28**
11:42	11:48	**12:08**	**12:20**	**12:28**	**12:38**	**12:47**	**12:58**
12:12	**12:18**	**12:38**	**12:50**	**12:58**	**1:08**	**1:17**	**1:28**
12:41	**12:47**	**1:07**	**1:19**	**1:28**	**1:38**	**1:48**	**1:59**
1:11	**1:17**	**1:37**	**1:49**	**1:58**	**2:08**	**2:18**	**2:29**
1:41	**1:47**	**2:07**	**2:19**	**2:28**	**2:38**	**2:48**	**2:59**
2:11	**2:17**	**2:37**	**2:49**	**2:58**	**3:08**	**3:18**	**3:29**
2:41	**2:47**	**3:07**	**3:19**	**3:28**	**3:38**	**3:48**	**3:59**
3:10	**3:17**	**3:36**	**3:49**	**3:58**	**4:09**	**4:18**	**4:28**
3:40	**3:47**	**4:06**	**4:19**	**4:28**	**4:39**	**4:48**	**4:58**
4:10	**4:17**	**4:36**	**4:49**	**4:58**	**5:09**	**5:18**	**5:28**
4:40	**4:47**	**5:06**	**5:19**	**5:28**	**5:39**	**5:48**	**5:58**
5:10	**5:17**	**5:36**	**5:49**	**5:58**	**6:09**	**6:18**	**6:28**
5:45	**5:51**	**6:09**	**6:21**	**6:28**	**6:38**	**6:47**	**6:57**
6:15	**6:21**	**6:39**	**6:51**	**6:58**	**7:08**	**7:17**	**7:27**
6:45	**6:51**	**7:09**	**7:21**	**7:28**	**7:38**	**7:47**	**7:57**
7:15	**7:21**	**7:39**	**7:51**	**7:58**	**8:08**	**8:17**	**8:27**
7:45	**7:51**	**8:09**	**8:21**	**8:28**	**8:38**	**8:47**	**8:57**
8:30	**8:36**	**8:54**	**9:06**	**9:13**	**9:23**	**9:32**	**9:42**

Sunday & Holiday
EASTBOUND To: Orange

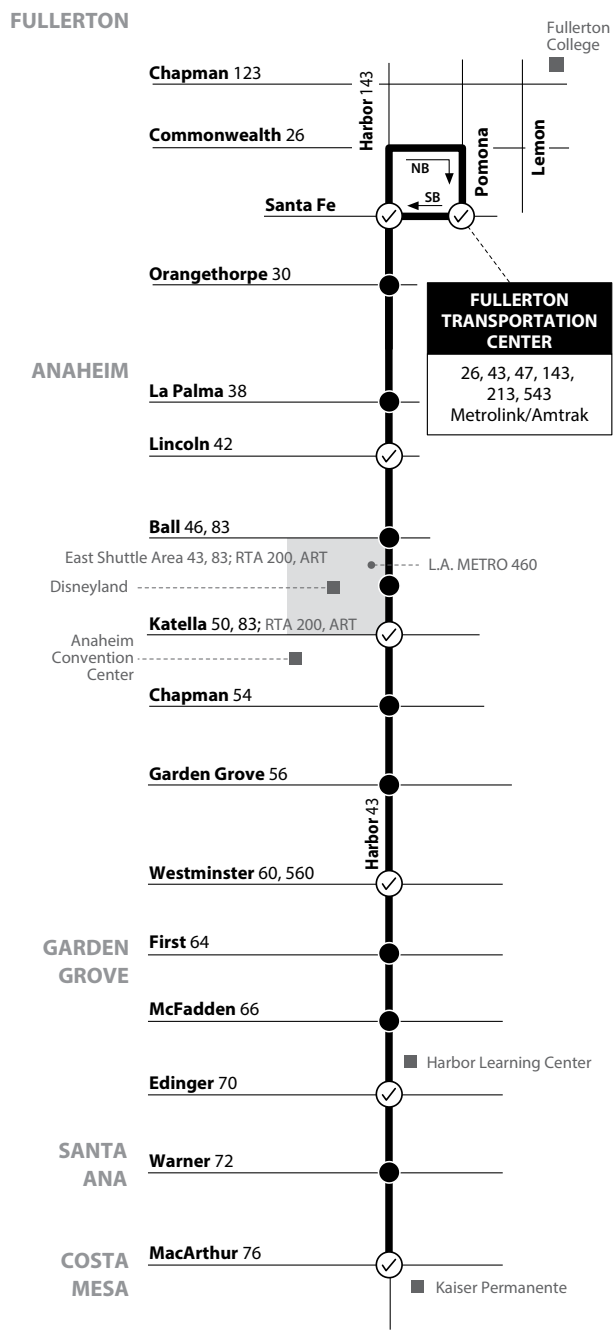
Chapman & alley View	Chapman & Beach	Chapman & Brookhurst	Chapman & Harbor	Chapman & City Drive	Orange Transportation Center	Rancho Santiago & Chapman
6:57	7:04	7:11	7:21	7:28	7:39	7:51
7:28	7:35	7:42	7:52	7:59	8:10	8:22
7:59	8:06	8:13	8:23	8:30	8:41	8:53
8:23	8:32	8:42	8:54	9:02	9:14	9:28
8:54	9:03	9:13	9:25	9:33	9:45	9:59
9:26	9:35	9:45	9:57	10:05	10:17	10:31
9:57	10:06	10:16	10:28	10:36	10:48	11:02
10:30	10:38	10:47	10:59	11:07	11:19	11:33
11:03	11:11	11:20	11:32	11:40	11:52	**12:09**
11:34	11:42	11:51	**12:03**	**12:11**	**12:23**	**12:40**
12:06	**12:14**	**12:23**	**12:35**	**12:43**	**12:55**	**1:12**
12:41	**12:49**	**12:57**	**1:08**	**1:16**	**1:28**	**1:45**
1:10	**1:18**	**1:26**	**1:37**	**1:45**	**1:57**	**2:14**
1:43	**1:51**	**1:59**	**2:10**	**2:18**	**2:30**	**2:47**
2:17	**2:25**	**2:33**	**2:44**	**2:52**	**3:04**	**3:21**
2:49	**2:57**	**3:05**	**3:16**	**3:24**	**3:36**	**3:52**
3:22	**3:30**	**3:38**	**3:48**	**3:56**	**4:07**	**4:23**
3:51	**3:59**	**4:07**	**4:17**	**4:25**	**4:36**	**4:52**
4:24	**4:32**	**4:40**	**4:50**	**4:58**	**5:09**	**5:25**
4:58	**5:06**	**5:14**	**5:24**	**5:32**	**5:43**	**5:59**
5:28	**5:35**	**5:43**	**5:53**	**6:00**	**6:11**	**6:24**
5:59	**6:06**	**6:14**	**6:24**	**6:31**	**6:42**	**6:55**
6:27	**6:34**	**6:42**	**6:52**	**6:59**	**7:10**	**7:23**
6:57	**7:04**	**7:12**	**7:22**	**7:29**	**7:40**	**7:53**
7:31	**7:38**	**7:46**	**7:56**	**8:03**	**8:14**	**8:27**
8:31	**8:38**	**8:46**	**8:56**	**9:03**	**9:14**	**9:27**
9:31	**9:38**	**9:46**	**9:56**	**10:03**	**10:14**	**10:27**

Sunday & Holiday
WESTBOUND To: Garden Grove

Rancho Santiago & Chapman	Orange Transportation Center	Chapman & City Drive	Chapman & Harbor	Chapman & Brookhurst	Chapman & Beach	Chapman & Valley View
6:29	6:45	6:55	7:02	7:10	7:17	7:26
7:06	7:22	7:34	7:42	7:52	8:01	8:11
7:36	7:52	8:04	8:12	8:22	8:31	8:41
8:06	8:22	8:34	8:42	8:52	9:01	9:11
8:37	8:53	9:05	9:13	9:23	9:32	9:42
9:08	9:24	9:36	9:44	9:54	10:03	10:13
9:43	9:59	10:11	10:19	10:29	10:38	10:48
10:14	10:30	10:42	10:50	11:00	11:09	11:19
10:44	11:02	11:14	11:22	11:32	11:41	11:51
11:17	11:35	11:47	11:55	**12:05**	**12:14**	**12:24**
11:48	**12:06**	**12:18**	**12:26**	**12:36**	**12:45**	**12:55**
12:21	**12:39**	**12:51**	**12:59**	**1:09**	**1:18**	**1:28**
12:55	**1:13**	**1:25**	**1:33**	**1:43**	**1:52**	**2:02**
1:28	**1:45**	**1:57**	**2:05**	**2:15**	**2:24**	**2:34**
2:00	**2:17**	**2:29**	**2:37**	**2:47**	**2:57**	**3:07**
2:29	**2:46**	**2:58**	**3:06**	**3:16**	**3:26**	**3:36**
3:02	**3:19**	**3:31**	**3:39**	**3:49**	**3:59**	**4:09**
3:37	**3:53**	**4:05**	**4:13**	**4:23**	**4:32**	**4:42**
4:08	**4:24**	**4:36**	**4:44**	**4:54**	**5:03**	**5:13**
4:39	**4:55**	**5:07**	**5:15**	**5:25**	**5:34**	**5:44**
5:08	**5:23**	**5:35**	**5:43**	**5:52**	**6:01**	**6:10**
5:40	**5:55**	**6:07**	**6:15**	**6:24**	**6:33**	**6:42**
6:14	**6:29**	**6:41**	**6:49**	**6:58**	**7:07**	**7:16**
6:39	**6:54**	**7:06**	**7:14**	**7:23**	**7:32**	**7:41**
7:10	**7:25**	**7:37**	**7:45**	**7:54**	**8:03**	**8:12**
7:38	**7:53**	**8:05**	**8:13**	**8:22**	**8:31**	**8:40**
8:38	**8:53**	**9:05**	**9:13**	**9:22**	**9:31**	**9:40**
9:38	**9:53**	**10:05**	**10:13**	**10:22**	**10:31**	**10:40**

Fullerton Transportation Center to Santa Ana via Harbor Blvd

543



Route 543 is a limited-stop route, making stops only at time check points ✓ and other designated stops ●.

LEGEND *LEYENDA*

Route 543/111519

✓ Scheduled Departure — Regular Routing

N MAP NOT TO SCALE

METRO = Los Angeles Metro

Numbers on streets indicate transfers. *Números en la calle indican transbordos.*

Monday-Friday
NORTHBOUND To:
Fullerton Transportation Center

Harbor & MacArthur	Harbor & Edinger	Harbor & Westminster	Harbor & Katella	Harbor & Lincoln	Fullerton Transportation Center
5:17	5:21	5:29	5:42	5:52	6:03
5:41	5:45	5:53	6:06	6:16	6:27
6:05	6:09	6:17	6:30	6:40	6:51
6:29	6:33	6:41	6:54	7:04	7:15
6:53	6:57	7:05	7:18	7:28	7:39
7:17	7:21	7:29	7:42	7:52	8:03
7:41	7:45	7:53	8:06	8:16	8:28
8:04	8:09	8:17	8:31	8:41	8:55
8:28	8:33	8:41	8:55	9:05	9:19
8:52	8:57	9:05	9:19	9:29	9:43
9:16	9:21	9:29	9:43	9:53	10:07
9:40	9:45	9:53	10:07	10:17	10:31
10:04	10:09	10:17	10:31	10:41	10:55
10:28	10:33	10:41	10:55	11:05	11:19
10:52	10:57	11:05	11:19	11:29	11:43
11:16	11:21	11:29	11:43	11:53	**12:07**
11:39	11:44	11:53	**12:08**	**12:18**	**12:32**
12:03	**12:08**	**12:17**	**12:32**	**12:42**	**12:56**
12:27	**12:32**	**12:41**	**12:56**	**1:06**	**1:20**
12:51	**12:56**	**1:05**	**1:20**	**1:30**	**1:44**
1:15	**1:20**	**1:29**	**1:44**	**1:54**	**2:08**
1:39	**1:44**	**1:53**	**2:08**	**2:18**	**2:32**
2:03	**2:08**	**2:17**	**2:32**	**2:42**	**2:56**
2:27	**2:32**	**2:41**	**2:56**	**3:06**	**3:20**
2:51	**2:56**	**3:05**	**3:20**	**3:30**	**3:44**
3:15	**3:20**	**3:29**	**3:44**	**3:54**	**4:08**
3:39	**3:44**	**3:53**	**4:08**	**4:18**	**4:32**
4:03	**4:08**	**4:17**	**4:32**	**4:42**	**4:56**
4:27	**4:32**	**4:41**	**4:56**	**5:06**	**5:20**
4:51	**4:56**	**5:05**	**5:21**	**5:31**	**5:44**
5:15	**5:20**	**5:29**	**5:45**	**5:55**	**6:08**
5:39	**5:44**	**5:53**	**6:09**	**6:19**	**6:32**
6:03	**6:08**	**6:17**	**6:33**	**6:43**	**6:56**
6:27	**6:32**	**6:41**	**6:57**	**7:07**	**7:20**

543

Fullerton Transportation Center to Santa Ana

via Harbor Blvd

Monday-Friday
SOUTHBOUND To:
Santa Ana

Fullerton Transportation Center	Harbor & Lincoln	Harbor & Katella	Harbor & Westminster	Harbor & Edinger	MacArthur & Harbor
5:20	5:31	5:45	5:58	6:06	6:11
5:44	5:55	6:09	6:22	6:30	6:35
6:08	6:19	6:33	6:46	6:54	6:59
6:32	6:43	6:57	7:10	7:18	7:23
6:56	7:07	7:21	7:34	7:42	7:47
7:20	7:31	7:45	7:58	8:06	8:11
7:44	7:55	8:09	8:22	8:30	8:35
8:08	8:19	8:33	8:46	8:54	8:59
8:32	8:43	8:57	9:10	9:18	9:23
8:56	9:07	9:21	9:34	9:42	9:47
9:20	9:31	9:45	9:58	10:06	10:11
9:44	9:55	10:09	10:22	10:30	10:35
10:08	10:19	10:33	10:46	10:54	10:59
10:32	10:43	10:57	11:10	11:18	11:23
10:55	11:10	11:21	11:34	11:42	11:47
11:19	11:34	11:45	11:58	**12:06**	**12:11**
11:43	11:58	**12:09**	**12:22**	**12:30**	**12:35**
12:07	**12:22**	**12:33**	**12:46**	**12:54**	**12:59**
12:31	**12:46**	**12:57**	**1:10**	**1:18**	**1:23**
12:54	**1:07**	**1:19**	**1:34**	**1:42**	**1:47**
1:18	**1:31**	**1:43**	**1:58**	**2:06**	**2:11**
1:42	**1:55**	**2:07**	**2:22**	**2:30**	**2:35**
2:06	**2:19**	**2:31**	**2:46**	**2:54**	**2:59**
2:30	**2:43**	**2:55**	**3:10**	**3:18**	**3:23**
2:54	**3:06**	**3:20**	**3:34**	**3:42**	**3:47**
3:18	**3:30**	**3:44**	**3:58**	**4:06**	**4:11**
3:42	**3:54**	**4:08**	**4:22**	**4:30**	**4:35**
4:06	**4:18**	**4:32**	**4:46**	**4:54**	**4:59**
4:33	**4:44**	**4:57**	**5:10**	**5:18**	**5:24**
4:57	**5:08**	**5:21**	**5:34**	**5:42**	**5:48**
5:21	**5:32**	**5:45**	**5:58**	**6:06**	**6:12**
5:45	**5:56**	**6:09**	**6:22**	**6:30**	**6:36**
6:09	**6:20**	**6:33**	**6:46**	**6:54**	**7:00**
6:33	**6:44**	**6:57**	**7:10**	**7:18**	**7:24**

Saturday, Sunday & Holiday
NORTHBOUND To:
Fullerton Transportation Center

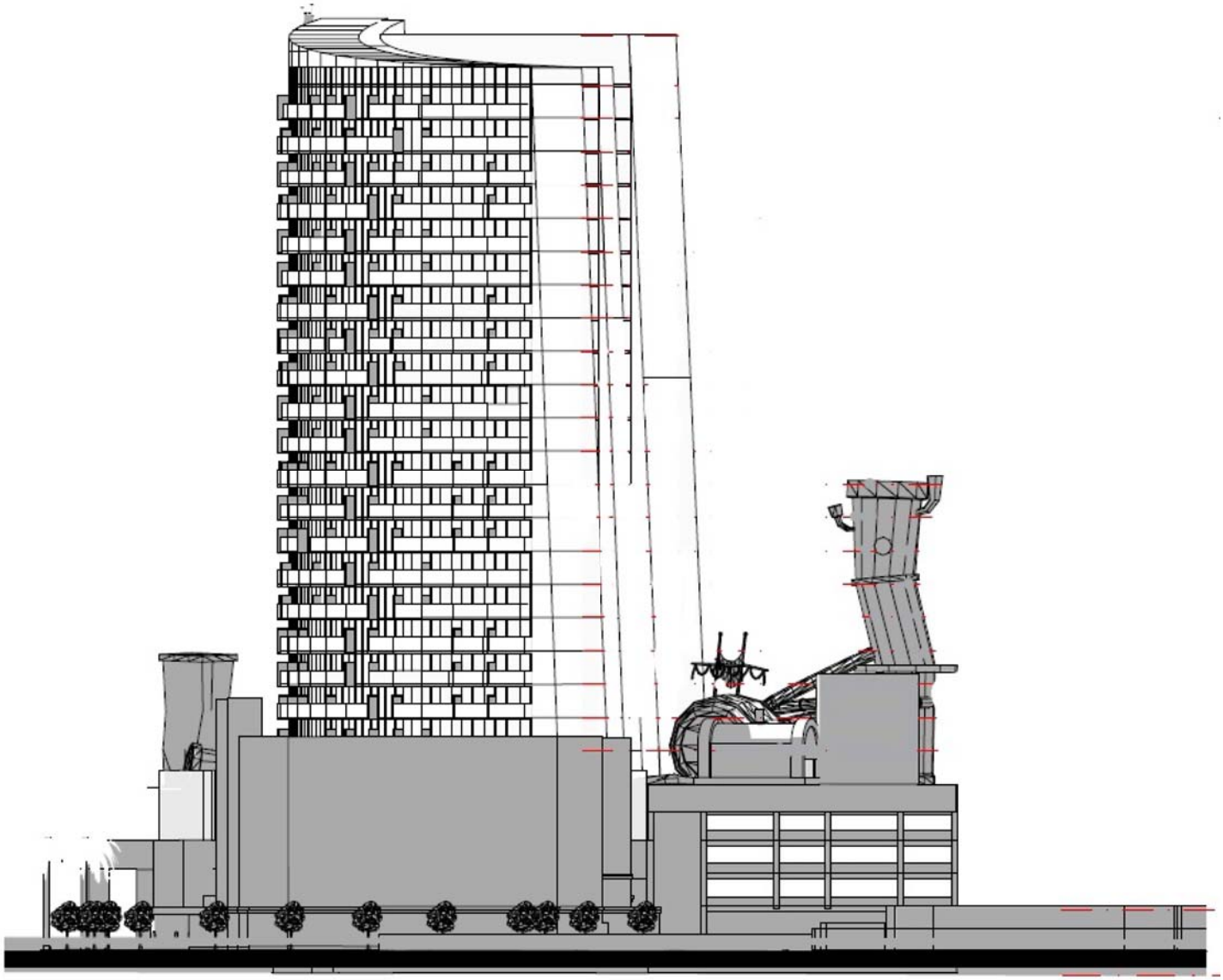
Harbor & MacArthur	Harbor & Edinger	Harbor & Westminster	Harbor & Katella	Harbor & Lincoln	Fullerton Transportation Center
6:52	6:56	7:04	7:17	7:27	7:38
7:18	7:22	7:30	7:43	7:53	8:05
7:44	7:48	7:56	8:09	8:19	8:31
8:09	8:14	8:22	8:36	8:46	9:00
8:35	8:40	8:48	9:02	9:12	9:26
9:01	9:06	9:14	9:28	9:38	9:52
9:26	9:31	9:39	9:53	10:03	10:17
9:52	9:57	10:05	10:19	10:29	10:43
10:18	10:23	10:31	10:45	10:55	11:09
10:44	10:49	10:57	11:11	11:21	11:35
11:10	11:15	11:23	11:37	11:47	**12:01**
11:34	11:39	11:48	**12:03**	**12:13**	**12:27**
12:02	**12:07**	**12:16**	**12:31**	**12:41**	**12:55**
12:28	**12:33**	**12:42**	**12:57**	**1:07**	**1:21**
12:54	**12:59**	**1:08**	**1:23**	**1:33**	**1:47**
1:20	**1:25**	**1:34**	**1:49**	**1:59**	**2:13**
1:46	**1:51**	**2:00**	**2:15**	**2:25**	**2:39**
2:12	**2:17**	**2:26**	**2:41**	**2:51**	**3:05**
2:38	**2:43**	**2:52**	**3:07**	**3:17**	**3:31**
3:04	**3:09**	**3:18**	**3:33**	**3:43**	**3:57**
3:30	**3:35**	**3:44**	**3:59**	**4:09**	**4:23**
3:56	**4:01**	**4:10**	**4:25**	**4:35**	**4:49**
4:22	**4:27**	**4:36**	**4:51**	**5:01**	**5:15**
4:48	**4:53**	**5:02**	**5:18**	**5:28**	**5:41**
5:14	**5:19**	**5:28**	**5:44**	**5:54**	**6:07**
5:40	**5:45**	**5:54**	**6:10**	**6:20**	**6:33**
6:06	**6:11**	**6:20**	**6:36**	**6:46**	**6:59**

Saturday, Sunday & Holiday
SOUTHBOUND To:
Santa Ana

Fullerton Transportation Center	Harbor & Lincoln	Harbor & Katella	Harbor & Westminster	Harbor & Edinger	MacArthur & Harbor
7:00	7:11	7:25	7:38	7:46	7:51
7:26	7:37	7:51	8:04	8:12	8:17
7:52	8:03	8:17	8:30	8:38	8:43
8:18	8:29	8:43	8:56	9:04	9:09
8:44	8:55	9:09	9:22	9:30	9:35
9:10	9:21	9:35	9:48	9:56	10:01
9:36	9:47	10:01	10:14	10:22	10:27
10:02	10:13	10:27	10:40	10:48	10:53
10:27	10:38	10:52	11:05	11:13	11:18
10:53	11:08	11:19	11:32	11:40	11:45
11:19	11:34	11:45	11:58	**12:06**	**12:11**
11:45	**12:00**	**12:11**	**12:24**	**12:32**	**12:37**
12:11	**12:26**	**12:37**	**12:50**	**12:58**	**1:03**
12:37	**12:52**	**1:03**	**1:16**	**1:24**	**1:29**
1:02	**1:15**	**1:27**	**1:42**	**1:50**	**1:55**
1:28	**1:41**	**1:53**	**2:08**	**2:16**	**2:21**
1:54	**2:07**	**2:19**	**2:34**	**2:42**	**2:47**
2:20	**2:33**	**2:45**	**3:00**	**3:08**	**3:13**
2:46	**2:59**	**3:11**	**3:26**	**3:34**	**3:39**
3:12	**3:24**	**3:38**	**3:52**	**4:00**	**4:05**
3:38	**3:50**	**4:04**	**4:18**	**4:26**	**4:31**
4:04	**4:16**	**4:30**	**4:44**	**4:52**	**4:57**
4:33	**4:44**	**4:57**	**5:10**	**5:18**	**5:24**
4:59	**5:10**	**5:23**	**5:36**	**5:44**	**5:50**
5:25	**5:36**	**5:49**	**6:02**	**6:10**	**6:16**
5:51	**6:02**	**6:15**	**6:28**	**6:36**	**6:42**
6:17	**6:28**	**6:41**	**6:54**	**7:02**	**7:08**

Appendix J
ULI Shared Parking Study

GARDEN GROVE HOTEL SITE B-2
ULI SHARED PARKING STUDY
City of Garden Grove



RK engineering group, inc.

April 25, 2022

Mr. Jerry Flores
AECOM
999 Town & Country Road
Orange, CA 928681

Subject: Garden Grove Hotel Site B-2 ULI Shared Parking Study, City of Garden Grove

Dear Mr. Flores:

Introduction

RK ENGINEERING GROUP, INC. (RK) is pleased to provide this shared parking study for the Garden Grove Resort Hotel Site B-2. The proposed project involves construction of a full-service high-rise (maximum height of 350 feet) resort hotel with hotel program entertainment/pool deck (height of approximately 61 feet) on a 3.72-acre site. The proposed hotel would include 500 guest suites with balconies; themed pool experience with lazy river; storage and loading area at 8,600 square feet maximum; event space with a 600 person maximum occupancy theater; a grand ballroom at 9,490 square feet; two (2) meeting rooms at 4,194 square feet and 4,031 square feet, respectively; a variety of food and beverage opportunities to be placed throughout the hotel totaling in a maximum area of 22,296 square feet; themed amenities totaling 13,238 square feet; a 7,000-square foot arcade; and a spa and fitness center at 8,532 square feet.

The proposed project would also include a five-level parking garage (four levels above grade and one level below grade) with a grand total of 528 spaces to serve the 500 guest suites, event space, commercial and retail uses, food, and beverage needs, as well as other amenities such as spa and fitness center (see Table 2). The approximately 51-foot-tall parking garage would be located under the hotel themed pool.

A total of 528 parking spaces will be provided as indicated below:

TABLE 1
Parking Summary

Parking Level	Number of Parking Spaces
Level 4 (52,206 SF)	110
Level 3 (52,206 SF)	110
Level 2 (52,206 SF)	110
Level 1 (40,656 SF)	84
Level B1 (52,206 SF)	114
Total Parking Spaces Provided	**528**
Total EV Parking Spaces Provided	28
Total ADA Spaces Provided	20

The location map for the project is included in Exhibit A and the site plan for the project is shown in Exhibit B.

The objective of the shared parking analysis is to determine the adequacy of parking for all uses onsite during all times of the year. This is accomplished by determining the peak parking demand period for all uses on site.

The shared parking model in this report utilizes the parking rates consistent with the Urban Land Institute (ULI), Third Edition published parking ratios, time-of-day factors for peak weekday and weekend conditions for all uses within the study area. This is a common method for projecting parking demands.

The shared parking analysis and corresponding conclusions presented in this parking needs analysis are based on recommendations and data presented by the Urban Land Institute (ULI), the International Council of Shopping Centers (ICSC), National Parking Association, and specifically the ULI shared parking methodology, using ULI-supplied data as presented in the current *ULI Shared Parking Model, Third Edition, published in 2020.*

The resort style project consists of compatible land uses that lend themselves well to shared parking. For example, people staying at the hotel are expected to be the primary users of the on-site amenities, including the restaurants, theatre, spa, and event space. Hence, guests would only need to park once to utilize multiple different uses on the site. As a result, the parking demand for the project is reduced.

This parking needs analysis utilizes the ULI Shared Parking methodology to help ensure that the project's parking demand can be accommodated during the busiest hours, days, and months out of the year.

Table 2 below includes a breakdown of land uses at the resort.

Table 2

Site B-2 Resort Hotel Project Land Use Summary

Land Use	Quantity	Units
Resort Hotel	500	Rooms
Meeting Rooms	8,225	Square Feet
Grand Ball Room	9,490	Square Feet
Nick Studio (Theatre)	7,039 SF / 600 Seats	Square Feet
Studio Hall	6,448	Square Feet
Restaurant	22,296	Square Feet
Retail	5,480	Square Feet
Spa	8,532	Square Feet

City parking requirements for the site will be established through the adoption of Planned Unit Development ("PUD") zoning based on the anticipated parking demand that will be generated by the project. Due to the mixed-use nature of the site, this study utilizes the ULI Shared Parking Third Edition time-of-day factors and parking ratios.

ULI Shared Parking Analysis

Shared parking methodology was developed in the 1980's and has been a widely accepted industry standard for determining parking demands for mixed use projects. Adopted by cities throughout the U.S., and codified in zoning ordinances as an acceptable practice, shared parking is endorsed by the ULI, the American Planning Association (APA), the National Parking Association (NPA), and International Council of Shopping Centers (ICSC), as an acceptable method of parking planning and management.

RK used the procedures developed by the ULI from its 2020 publication, *Shared Parking,* Third Edition. This document contains the latest procedures and data with respect to parking demand and shared parking. The parking demand rates for individual land uses are consistent with the ULI Shared Parking Third Edition for resort hotel developments.

Shared parking allows for the sharing of parking spaces among uses in a mixed-use environment—in lieu of providing a minimum number of parking spaces for each individual use. Shared parking commonly results in a reduction of required parking spaces. This reduction, which is sometimes significant, depends on the quantities, mix of uses, site operational characteristics, and local code requirements.

The ULI shared parking analysis evaluates the types of land uses, parking rates, monthly variations of parking demand by land use, differences between weekday and weekend parking demand, the hourly distribution of peak parking demand for each type of land use, and captive versus non-captive parking demand within the project site. The ULI procedures were utilized within this assessment to evaluate the peak parking demand that will occur at the proposed B-2 mixed use resort hotel development.

The following inputs were included within the shared parking computer program for each land use:

1. Peak parking demand by land use for visitors and employees.
2. Captive versus non-captive parking demand.
3. Adjustments for alternative modes of transportation.
4. Hourly Variations of parking demand.
5. Weekday versus weekend adjustment factor.
6. Monthly adjustment factors to account for variations of parking demand over the year.
7. ULI Third Edition parking ratios and adjustments consistent with resort style developments.

The peak parking demand was determined by utilizing the ULI Shared Parking model (Third Edition), evaluating peak demand during weekdays and weekends for all months throughout a year, and the operational characteristic of the proposed land uses within the site.

Appendix A includes the ULI Shared Parking Manual, Third Edition

ULI Shared Parking, Third Edition Calculations

As described in the above section, the ULI Shared Parking Model was used to evaluate the peak parking demand for the project. The model provides the following parking demand data: monthly variations for each land use, different peaking characteristics between weekday and weekend, hourly distribution of peak parking demand for each land use, modal adjustments, and captive versus non-captive parking demand.

The ULI Shared Parking model also proportions the parking rates between visitors and employees for weekday and weekend conditions, each with their own parking demand characteristics.

The parking rates, suggested driving ratios, and noncaptive adjustments are consistent with the ULI 3rd Edition Shared Parking "Suggested Mode and Noncaptive Adjustment Factors for Resort Hotels". This is an appropriate approach since the project is consistent with a resort style development as found in the ULI Shared Parking Third Edition, Model.

Driving Adjustment

The driving adjustment ratio represents the percentage of guests and employees that are expected to drive to the site in a personal vehicle and park on site. This excludes all non-single occupancy modes of transportation including shuttle, public transit, taxi, ride-hailing (Lyft/Uber), walking, and carpooling passengers who are not parking on site.

The driving adjustment ratios are consistent with the ULI Shared Parking Model, Third Edition suggestions for resort hotels. The project is located approximately 12 miles from John Wayne Airport, a major transportation hub that is expected to serve tourists to the site. A taxi ride to/from the airport is estimated to cost $38 one-way, and ride-hailing (Uber and Lyft) is estimated to cost around $32 one-way. The project also has direct access to public transit use along Harbor Boulevard, which is considered a high-

quality transit corridor and lends itself well to encourage bus transit ridership. The combination of short distance to the airport, the wide availability of public transit options, and the low costs of taxi and ride-hailing greatly increases the potential for driving adjustments at the site and reduced parking demand.

Noncaptive Ratio

The non-captive ratio represents the number of vehicles which are not counted for parking at the secondary land uses. For example, some hotel guests who are already parked on-site will utilize the restaurant, spa and/or banquet facilities. This eliminates double counting of parking space requirements. The ratio represents the number of vehicles parked exclusively for that use.

The guest and employee non-captive ratios are consistent with the ULI Shared Parking Manual Third Edition suggested adjustment factors for resort hotels.

Appendix B includes the Suggested Mode and Noncaptive Adjustment Factors for resort hotels.

ULI Shared Parking Results (Tables 3 & 4)

Most of the parking demand generated by the hotel development is expected to be driven by the 500 hotel guest rooms. Although several accessory uses are proposed to be built in conjunction with, and integrated into, the hotel development, many of these accessory uses will not yield a parking demand beyond what is generated by the hotel guest rooms (i.e., fitness center, pool amenities, arcade, etc.) These uses will be primarily utilized by hotel guests.

The objective of this analysis is to determine the parking supply and provide a reasonable recommendation for an adequate number of on-site parking spaces needed during all times of the year. The findings of the shared parking model are as follows:

1. The weekday estimated peak-hour parking demand is projected to occur in late December at 8:00 PM, as indicated in Table 3. The weekday peak parking demand requires a total of 471 parking spaces. Since the project provides a total of 528 parking spaces, there are a total of 57 parking spaces available at the peak parking demand time, which is approximately 11% of the total parking spaces.

2. The weekend estimated peak-hour parking demand is projected to occur in late December at 9:00 PM, as indicated in Table 3. The weekend peak parking demand requires a total of 480 parking spaces. Since the project provides a total of 528 parking spaces, there are a total of 48 parking spaces available at the peak parking demand time, which is approximately 9% of the total parking spaces.

3. Table 4 shows a summary of the projected monthly weekday and weekend peak parking demand for the project. As shown in Table 4, the peak parking demand

occurs during late December. The hotel can accommodate all guests and employees at all times of the year.

Valet Parking Plan

Even though the project has been projected to have an adequate amount of parking spaces during all times of the year, guests and visitors will be able to participate in the valet parking program established by the hotel operators. Valet parking can accommodate more than one (1) vehicle per space during operation due to the ability to double/tandem stack park vehicles.

If the valet parking configuration is needed, representatives of the project are planning to locate the valet parking on the ground floor and basement levels. This valet configuration would add parking for approximately 40 additional vehicles, and would bring the total parking capacity to approximately 568 vehicles.

Visitors and guests would enter the site from Harbor Boulevard and drop-off their vehicles at the valet station. Vehicles leaving the site would traverse directly onto Harbor Boulevard from the primary access point. A secondary access point located along Twintree Avenue is for emergency vehicles only and will not be available for visitors and guests. As guests or visitors leave the site, valet staff will deliver vehicles to a pickup/drop-off zone. It is recommended that additional valet parking be supplied during peak demand times. The following recommendations outline some key strategies for an on-going valet parking plan:

1. To avoid queuing for valet parking and self-parking, the project site's driveway entrance must be designed properly for vehicle circulation and not cause offsite queuing of vehicles.

2. Develop a valet parking plan that will encourage participation from hotel guests and visitors.

3. Representatives of the project should designate a portion of the parking structure for valet parking configuration during peak parking demand times. Valet parking locations and size may vary depending on the time of year, day, and event.

4. The valet parking plans should be adaptable and flexible to meet the parking demands of the project.

5. An effectively managed valet parking program can allow for double/tandem parking of vehicles, thereby allowing more vehicles to be efficiently parked within the parking structure. A good valet parking management plan can allow more than one vehicle per parking space.

6. The valet parking plan must be designed to sequentially fill parking spaces to minimize traffic conflicts during operation.

7. The valet parking plan must not block any major drive aisles or hinder the driving ability of emergency vehicles.

Conclusions & Recommendations

RK has completed the ULI Shared Parking Third Edition analysis. Based upon this study, RK has determined the peak parking demand and developed a shared parking assessment.

1. The project consists of a mix of resort hotel, banquet/meeting space, spa, live theater, restaurant uses, etc. which are compatible from a shared parking standpoint. Peak parking demand will not occur simultaneously for all uses.

2. The project would include a 5-level parking garage (4 levels above grade, 1 level below grade) with a grand total of 528 spaces to serve the hotel suites, event space, and hotel amenities.

3. The parking calculations utilize and are consistent with the ULI Shared Parking, Third Edition parking ratios and suggested adjustment factors for resort hotels.

4. Utilizing the shared parking concept, the parking demand for guests and employees has been estimated to be 471 parking spaces during peak weekday conditions at 8:00 PM and 480 parking spaces during peak weekend conditions at 9:00 PM. It is recommended that the project provide at least 528 parking spaces.

5. The primary parking demand generator for the site is the hotel room component of the project. All other uses are considered ancillary.

6. Based upon the shared parking analysis for the proposed mixed-use resort hotel project, the expected parking demand can be accommodated by the number of parking spaces provided on site.

7. Project operators may want to consider providing a valet parking program during peak parking demand times to increase the vehicle parking capacity onsite.

RK has completed the ULI shared parking analysis for the Garden Grove Site B-2 project. Based on the results of the analysis, the project has enough parking spaces to support the parking demand during all times of the year.

If you have any questions regarding this study, or need further review, please do not hesitate to call our office at (949) 474-0809.

Kind regards,



Rogier Goedecke
President

RK16763
JN:2250-2020-02

Exhibits

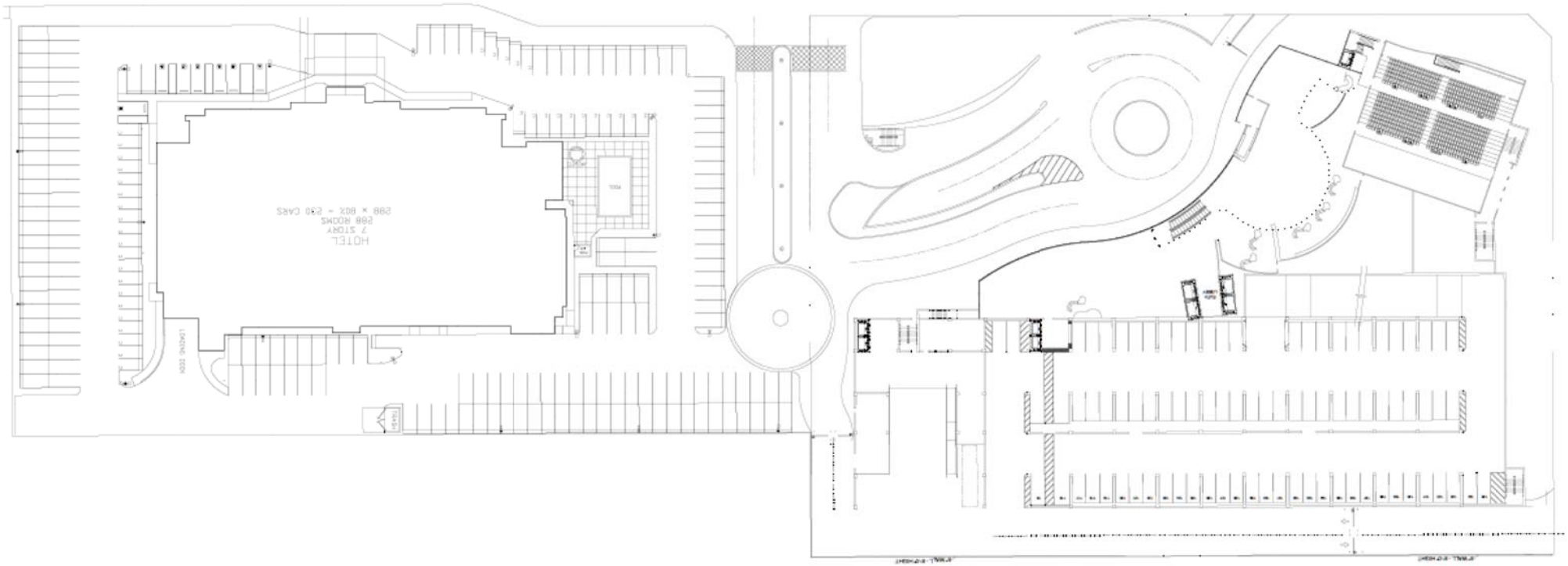
Exhibit A

Location Map



N

Exhibit B
Site Plan



N

Tables

TABLE 1
Parking Summary
Site B-2 Resort Hotel
NWC of Harbor Blvd and Twin Tree Ave, Garden Grove

Parking Level	Number of Parking Spaces
Level 4 (52,206 SF)	110
Level 3 (52,206 SF)	110
Level 2 (52,206 SF)	110
Level 1 (40,656 SF)	84
Level B1 (52,206 SF)	114
Total Parking Spaces Provided	**528**
Total EV Parking Spaces Provided	28
Total ADA Spaces Provided	20

TABLE 2
Site B-2 Resort Hotel
NWC of Harbor Blvd and Twin Tree Ave,
Garden Grove

Land Use	Quantity	Units
Resort Hotel	500	Rooms
Meeting Rooms	8,225	Square Feet
Grand Ball Room	9,490	Square Feet
Nick Studio (Theatre)	7,039 SF / 600 Seats	Square Feet
Studio Hall	6,448	Square Feet
Restaurant	22,296	Square Feet
Retail	5,480	Square Feet
Spa	8,532	Square Feet

[1] SF = Square Feet; GFA = Gross Floor Area

TABLE 3
Site B-2 Resort Hotel
Shared Parking Demand Summary
ULI Shared Parking, Third Edition[1]

Peak Month: LATE DECEMBER -- Peak Period: 9 PM, WEEKEND																		
Land Use	Project Data		Weekday					Weekend					Weekday			Weekend		
			Base Ratio	Driving Adj	Non-Captive Ratio	Project Ratio	Unit For Ratio	Base Ratio	Driving Adj	Non-Captive Ratio	Project Ratio	Unit For Ratio	Peak Hr Adj	Peak Mo Adj	Estimated Parking Demand	Peak Hr Adj	Peak Mo Adj	Estimated Parking Demand
	Quantity	Unit											8 PM	Late December		9 PM	Late December	
Retail																		
Retail (<400 ksf)	5,480	sf GLA	2.90	50%	59%	0.86	ksf GLA	3.20	50%	64%	1.02	ksf GLA	40%	85%	2	30%	85%	1
Employee			0.70	80%	100%	0.56		0.80	80%	100%	0.64		90%	95%	3	65%	95%	2
Entertainment																		
Family Entertainment/Studio Hall	6,448	sf GLA	1.80	50%	57%	0.52	ksf GLA	2.50	50%	67%	0.84	ksf GLA	0%	100%	0	65%	80%	3
Employee			0.20	80%	100%	0.16		0.25	80%	100%	0.20		10%	100%	0	75%	90%	1
Live Theater / Nick Studio	600	seats	0.30	50%	57%	0.09	seat	0.33	50%	67%	0.11	seat	100%	100%	52	100%	100%	67
Employee			0.07	80%	100%	0.06		0.07	80%	100%	0.06		100%	100%	34	100%	100%	34
Spa	8,532	sf GLA	6.60	50%	100%	3.30	ksf GLA	5.50	50%	100%	2.75	ksf GLA	80%	95%	22	10%	95%	2
Employee			0.40	80%	100%	0.32		0.25	80%	100%	0.20		50%	100%	2	20%	0%	0
Resort Hotel																		
Resort Hotel	500	keys	1.00	50%	100%	0.50	key	1.00	50%	100%	0.50	key	90%	100%	225	95%	100%	238
Hotel Employees	500	keys	0.15	80%	100%	0.12	key	0.15	80%	100%	0.12	key	20%	100%	12	20%	100%	12
Restaurant/Lounge	22,296	sf GLA	6.67	50%	90%	3.00	ksf GLA	7.67	50%	70%	2.68	ksf GLA	70%	95%	45	67%	95%	38
Meeting/Banquet (20 to 50 sq ft/key)	17,715	sf GLA	24.86	50%	25%	3.11	ksf GLA	14.86	50%	25%	1.86	ksf GLA	100%	100%	55	100%	100%	33
Restaurant/Meeting Employees	40,011	sf GLA	1.44	80%	100%	1.15	ksf GLA	1.51	80%	100%	1.21	ksf GLA	40%	100%	19	100%	100%	49
													Guest/Visitor		**401**	**Guest/Visitor**		**382**
													Employee		**70**	**Employee**		**98**
													Total Weekday Peak Parking Demand		**471**	**Total Weekend Peak Parking Demand**		**480**
													Total Number of Parking Spaces Provided		**528**	**Total Parking Provided**		**528**
													Number of Parking Spaces Available at Peak Demand Time		**57**	**Number of Parking Spaces Available at Peak Demand Time**		**48**
													Percent of Parking Spaces Available at Peak Demand Time[2]		**11%**	**Percent of Parking Spaces Available at Peak Demand Time[2]**		**9%**

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[1] The parking rates, suggested driving ratios, and noncaptive adjustments are consistent with the ULI 3rd Edition Shared Parking "Suggested Mode and Noncaptive Adjustment Factors for Resort Hotels".

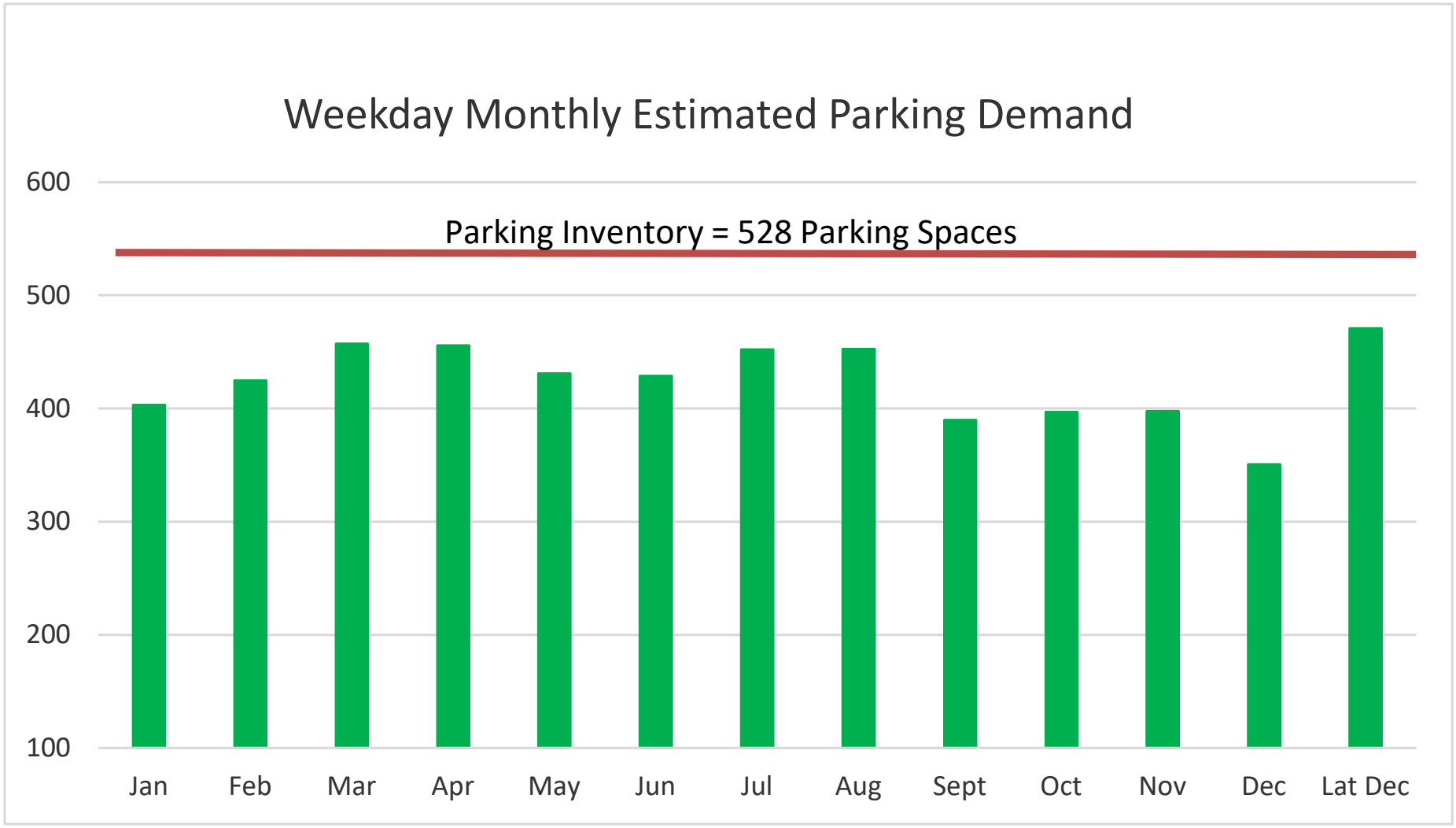
[2] Project operators may want to consider providing a valet parking program during peak parking demand times to increase the vehicle parking capacity onsite.

TABLE 4
Site B-2 Resort Hotel
Shared Parking Demand Summary

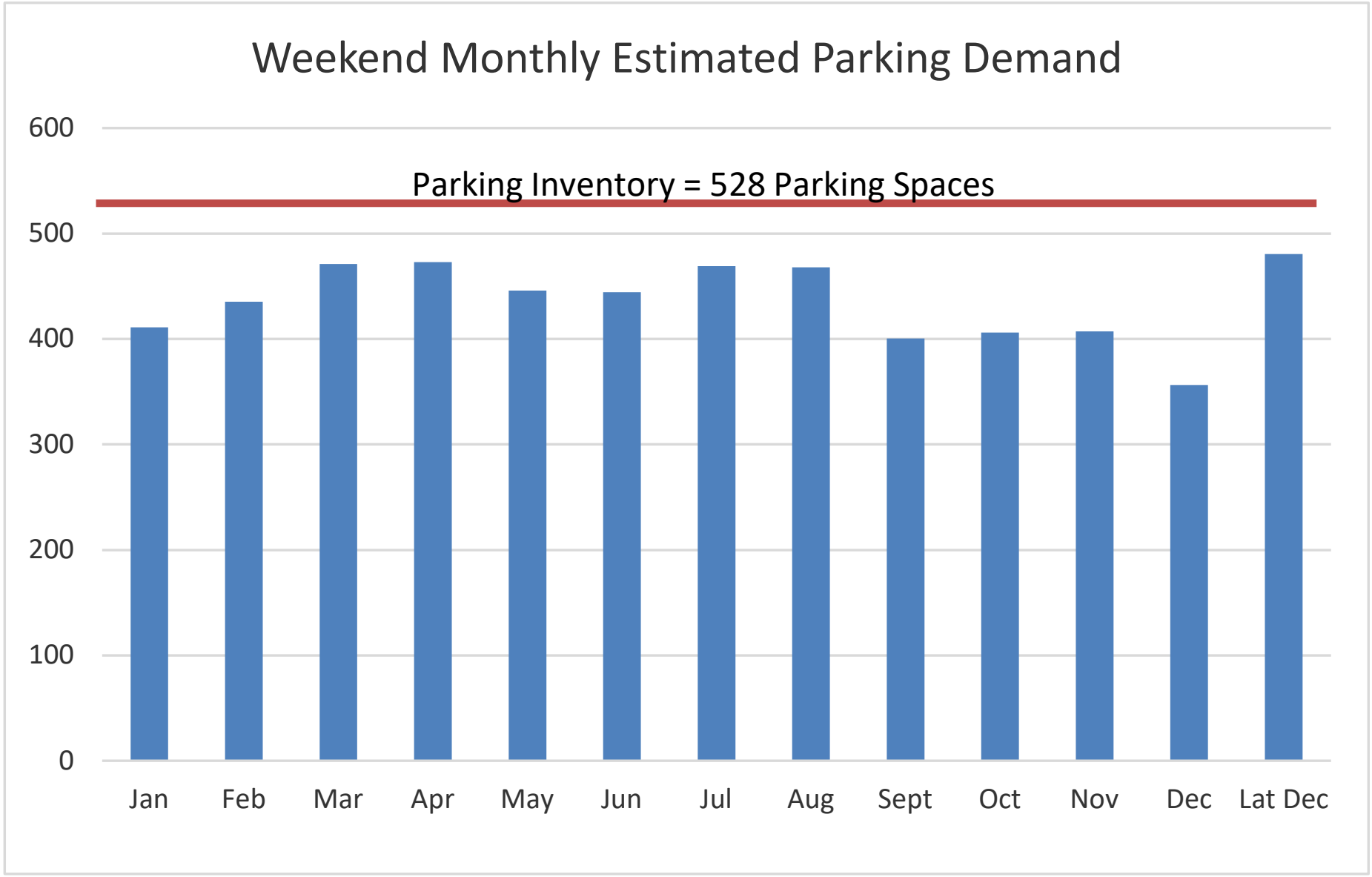
Monthly Comparison Summary		
Month	Weekday	
	Overall Pk	
	Time	Demand
January	8 PM	403
February	8 PM	425
March	8 PM	457
April	8 PM	456
May	8 PM	431
June	8 PM	429
July	8 PM	452
August	8 PM	452
September	8 PM	390
October	8 PM	397
November	8 PM	398
December	8 PM	351
Late December	8 PM	471
Number of Parking Spaces Provided		**528**
Peak Parking Demand		**471**
Number of Parking Spaces Available		**57**
Percent of Parking Spaces Available		**11%**

Monthly Comparison Summary		
Month	Weekend	
	Overall Pk	
	Time	Demand
January	9 PM	411
February	9 PM	435
March	9 PM	471
April	9 PM	473
May	9 PM	446
June	9 PM	444
July	9 PM	469
August	9 PM	468
September	9 PM	400
October	9 PM	406
November	9 PM	407
December	8 PM	356
Late December	9 PM	480
Number of Parking Spaces Provided		**528**
Peak Parking Demand		**480**
Number of Parking Spaces Available		**48**
Percent of Parking Spaces Available		**9%**

GRAPH 1


Weekday Monthly Estimated Parking Demand
600
500
400
300
200
100
Parking Inventory = 528 Parking Spaces
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
Lat Dec

GRAPH 2


Weekend Monthly Estimated Parking Demand
600
500
400
300
200
100
0
Parking Inventory = 528 Parking Spaces
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
Lat Dec

Appendices

Appendix A

Urban Land Institute (ULI)
Shared Parking, Third Edition



EXCEL MODEL INCLUDED

SHARED PARKING

THIRD EDITION

ICSC

NATIONAL PARKING ASSOCIATION

Urban Land Institute

SHARED PARKING

THIRD EDITION

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Avoid unnecessary costs and traffic by accurately estimating the parking requirements for mixed-use projects according to the types of tenants they will attract. Now in its third edition, this authoritative book has been updated throughout by author Mary S. Smith, a ULI member and leading parking expert, in collaboration with parking professionals and developers. It includes many additional land uses and revised parking ratios, and addresses trends such as increased use of ride sharing services and scooters. The Excel model version lets you plug in your project's land uses and calculates the number of parking spaces needed. This book is essential for developers, planners, government agencies, consultants, and engineers.

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CHAPTER 1

Introduction

Shared parking is the use of a parking space to serve two or more individual land uses without conflict or encroachment. The ability to share parking spaces is the result of two conditions:

- Variations in the accumulation of vehicles by hour, by day, or by season at the individual land uses; and
- Relationships among the land uses that result in visiting multiple land uses on the same automobile trip.

Although this methodology for shared parking analysis was developed in the early 1980s,[1] the concept of shared parking was already well established: a fundamental principle of downtown planning from the earliest days of the automobile—indeed from the days of the horse and buggy—has always been to share parking resources rather than to allocate parking for each use or building. The resurgence of many central cities resulting from the addition of vibrant residential, retail, restaurant, and entertainment developments continues to rely heavily on shared parking for economic viability. Shopping centers have benefited from the addition of significant dining and entertainment venues, which draw pedestrian traffic (and parking) at other times of the year than the holiday shopping season, taking advantage of shared parking between retail and dining/entertainment uses. In addition, mixed-use projects in many different settings have benefited from shared parking.

Parking is a key element of any site development plan. Parking can consume 50 percent or more of the building and land area of a development. An oversupply of parking can result in excess storm drainage impacts and unnecessarily high expenses (as of 2019, surface stalls can cost $3,500 to $6,000 per space, above-grade structured spaces $15,000 to $35,000, and underground parking spaces $30,000 to $50,000 or more). Insufficient parking can result in the intrusion of parking into neighborhoods or adjoining properties, excessive vehicle circulation, and unhappy users. Ultimately, great parking alone won't make a mixed-use project successful; however, inadequate or poorly designed parking can limit its potential success.

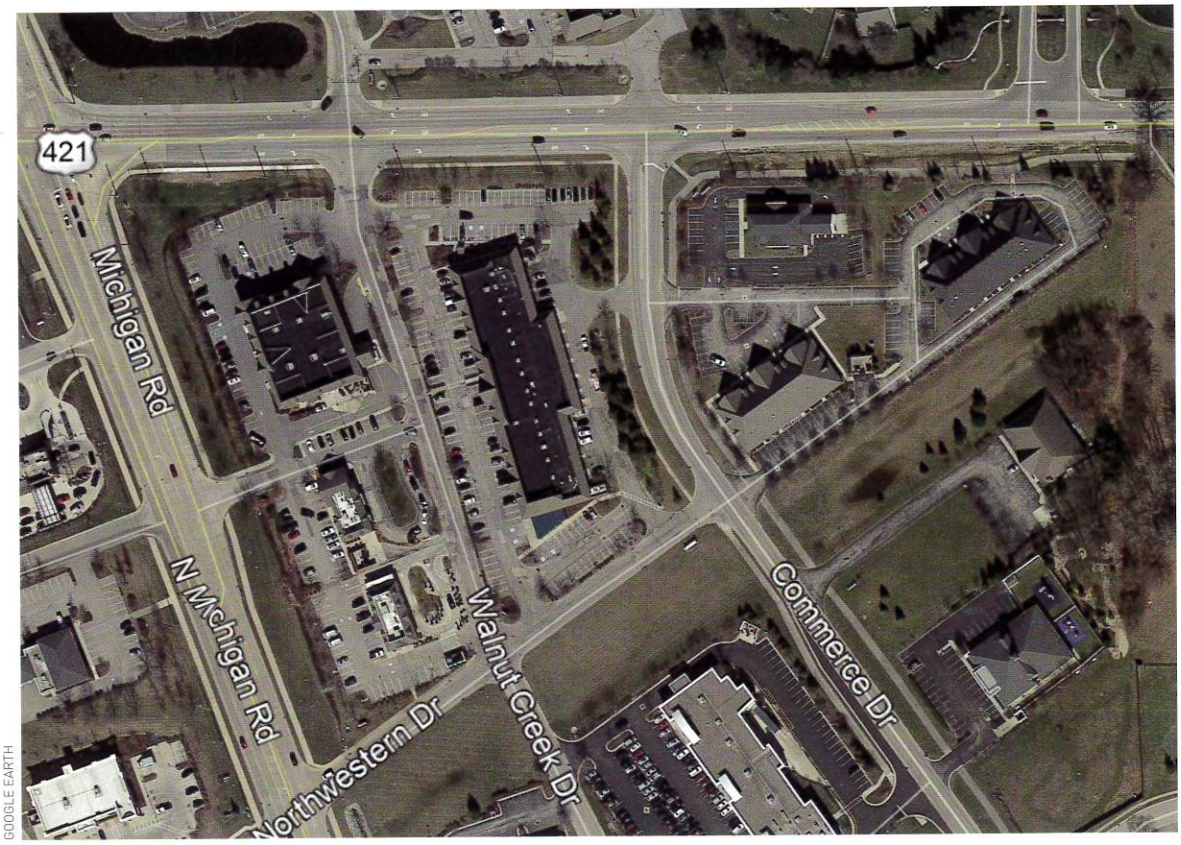
The most anti-sustainable approach of all is not to consider shared parking!

The triangular development in figure 1-1 has a "front row" of individual buildings including a pharmacy and two fast-food restaurants (toward the left in the photo); a middle row of strip retail (several of which are restaurants); and a third group of offices to the right that are primarily medical uses.

Reportedly, the local government required this design by forcing the developers to provide the two intermediate roads through the project, which extend for more than a mile through other commercial developments to the south.

A person who visits a doctor in the office buildings would drive and park at the pharmacy to pick up a prescription and then drive and park at the strip center to have lunch or pick up dry cleaning. If the exact same uses had been provided in a single two-story building, with the offices on the second floor over the retail at grade, the vehicle

FIGURE 1-1 **A Wasted Opportunity for Shared Parking**



GOOGLE EARTH

would have been parked only once. With shared parking between these uses, the site could have accommodated at least 50 percent more of each use with adequate parking. This might have slowed the creeping commercial development of farmland along this corridor that occurred over the past 25 years.

An increasing concern today is the potential for future reductions in parking demand. Ride-hailing services offered by transportation network companies (TNCs) such as Uber and Lyft are already affecting parking requirements for many land uses, and significant potential exists for reduction in parking required if autonomous vehicles (AVs) become common.

The key goal of shared parking analysis, then, is to find the balance between providing adequate parking to support a development from a commercial viewpoint while minimizing the negative aspects of excessive land area or resources devoted to parking and the potential for declining parking demand in the future. Mixed-use developments that share parking result in greater density, better pedestrian connections, and, in turn, reduced reliance on driving, typically because multiple destinations can be accessed by walking. Higher-density development, especially on infill sites in urban areas, is also more likely to support alternative modes of travel, including transit and carpools. Ironically, a critical element of pedestrian-oriented districts is adequate parking.

Concern for the negative impacts of growth stimulated a search for better ways to develop land. "Smart growth" is a collection of planning principles and strategies designed to facilitate economic development, strong communities, and

environmental health.[2] A particular focus of smart growth is to reduce sprawl. Smart growth projects typically are designed to create transportation options and reduce driving, especially for short trips. Walkable live/work/play environments, located near established mass transit connections and infrastructure in the city are central to the concept. Some communities are questioning the economic costs of abandoning infrastructure in the city only to rebuild it further out.[3] A recent publication by the American Planning Association[4] discusses the fiscal impacts for the community of urban density versus suburban low-density development and concludes as follows:

- Smart growth generally costs up to one-third less for upfront infrastructure.
- Smart growth saves an average of 10 percent in ongoing services such as police, ambulance, and fire service costs.
- Smart growth generates 10 times more tax revenue per acre.

A key principle of development today is known as "placemaking," which more strongly ties people to places. Placemaking typically focuses on the public spaces linking land uses to "capitalize on a local community's assets, inspiration, and potential, with the intention of creating public spaces that promote people's health, happiness, and well-being."[5] ULI has recently undertaken an initiative known as the Creative Placemaking Project to "help build strong, healthy cities by promoting the integration of arts and culture in community revitalization."[6]

Another significant development type today is transit-oriented development (TOD), which seeks to cluster development near transit stations. With housing located within walking distance of rail transit, some trips and, in turn, some parking spaces can be eliminated.

Shared parking is a critical factor in the success of all these development approaches, and thus the importance of shared parking will continue to grow in future years. This report aims to provide parking consultants, planners, engineers, developers, and agencies with tools to better quantify and understand how shared parking can be successful.

OBJECTIVE OF THE THIRD EDITION

The widely accepted methodology for shared parking analysis was established in 1983 with the publication of the first edition of *Shared Parking*. In 2005, ULI and ICSC published a second edition, particularly to update and expand the land use categories and default factors. A decade later, the Parking Consultants Council (PCC) of the National Parking Association (NPA) proposed to ULI and ICSC that another update was due, given changes in society, transportation, and mixed-use development trends. The consensus was that the underlying concept and methodology are still viable but that an update of the default factors and addition of more land uses would be appropriate. Therefore, NPA's PCC was appointed by ULI and ICSC to update the publication, with NPA managing the process of producing the document. Subsequent to the start of the project, the Institute of Transportation Engineers (ITE) joined the effort, with the intent to coordinate updates to both *Shared Parking* and ITE's *Parking Generation Manual*[7] (*PGM*, fifth edition, unless noted otherwise) database of observed parking ratios for individual land uses. Therefore, this third edition is truly a collaboration of the leading professionals in parking demand analysis as well as developers with a vested interest in "getting the number of parking spaces right." One might call this the "just enough, no regrets" parking supply for mixed-use developments.

Concededly, the number of parked cars per unit of land use on a design day falls within ranges, depending on the mix, types, and strength of the tenants of each land use. The recommendations herein are the *recommended parking supply* for these individual uses separately and when combined in a mixed-use project, particularly when planning and designing parking well before the development is fully leased.

As with any guidelines, the base ratios and other recommendations herein are a *starting point for analysis, subject to adjustment* to reflect professional judgment, market conditions, and regulatory requirements.

FIGURE 2-2 **Base Parking Ratios**

	Weekday (parking spaces/unit land use)		Weekend (parking spaces/unit land use)		Peak ratio	Units	Source
Land use	**Visitors**	**Employees**	**Visitors**	**Employees**			
Retail <400,000 sq ft	2.90	0.70	3.20	0.80	4.00	ksf GLA	1
Retail 400,000–400,000 sq ft	sliding scale between <400,000 and 600,000				scaled 4.00 to 4.50	ksf GLA	1
Retail 600,000–1 million sq ft	3.20	0.80	3.60	0.90	4.50	ksf GLA	1
Retail 1 million–2 million sq ft	sliding scale between 1 million and 2 million sq ft				scaled 4.00 to 4.50	ksf GLA	2
Retail >2 million sq ft	2.90	0.70	3.20	0.80	4.00	ksf GLA	2
Supermarket/grocery	4.00	0.75	4.00	0.75	4.75	ksf GLA	2,3
Pharmacy	3.00	0.40	3.00	0.40	3.40	ksf GLA	3
Discount stores/ superstores	3.40	0.85	3.80	0.95	4.75	ksf GLA	3
Home improvement stores/garden	3.10	0.80	3.45	0.90	4.35	ksf GLA	2
Fine/casual dining	13.25	2.25	15.25	2.50	17.75	ksf GLA	2,3
Family restaurant	15.25	2.15	15.00	2.10	17.10	ksf GLA	2,3
Fast casual/fast food	12.40	2.00	12.70	2.00	14.70	ksf GLA	3
Bar/lounge/nightclub	15.25	1.25	17.50	1.50	19.00	ksf GLA	2
Family entertainment	1.80	0.20	2.50	0.25	2.75	ksf GLA	2
Active entertainment	1.50	0.15	1.80	0.20	2.00	ksf GLA	2
Amusement park/ water park	3.00	0.30	3.70	0.37	4.07	ksf GLA	2
Adult active entertainment	9.00	1.00	10.00	1.20	11.20	ksf GLA	2
Cineplex	0.15	0.01	0.24	0.01	0.25	seat	2,3
Specialty movie theater	0.18	0.02	0.29	0.01	0.30	seat	2,3
Live theater	0.30	0.07	0.33	0.07	0.40	seat	2,3
Outdoor amphitheater	0.30	0.07	0.33	0.07	0.40	seat	2
Public park/ destination open space	4.00	0.40	5.00	0.50	5.50	acre	2
Museum/aquarium	4.00	0.40	4.50	0.50	5.00	ksf GLA	2
Public library	2.00	0.25	1.90	2.00	3.90	ksf GLA	2
Health club / Spa	6.60	0.40	5.50	0.25	7.00	ksf GLA	2,3
Daycare center	1.50	2.00			3.50	ksf GFA	2,3
Convention center	5.50	0.50	5.50	0.50	6.00	ksf GFA	2

(continued on next pagel

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FIGURE 2-2 (continued)

Land use	Weekday (parking spaces/unit land use)		Weekend (parking spaces/unit land use)		Peak ratio	Units	Source
	Visitors	Employees	Visitors	Employees			
Hotel-business	1.00	0.15	1.00	0.15	1.15	key	2.3
Hotel-leisure	1.00	0.15	1.00	0.15	1.15	key	2.3
Restaurant/lounge	6.67	1.20	7.67	1.33	9.00	ksf GLA	2.3
Meeting/banquet (0–20 sq ft/key)	scaled from 0 to 30	scaled from 0 to 2.0	scaled from Oto 20	scaled from 0 to 2.0	scaled from Oto 32	ksf GLA	2.3
Meeting/banquet (20–50 sq ft/keyl	scaled from 30 to 20	scaled from 2 to 1.5	scaled from 20 to 10	scaled from 2 to 1.5	scaled from 32 to 21.5	ksf GLA	2.3
Meeting/banquet (50–100 sq ft/key)	scaled from 20 to 10	scaled from 1.5 to 1.0	scaled from 10 to 5.5	scaled from 1.5 to 1.0	scaled from 21.5 to 11.1	ksf GLA	2.3
Convention [100–200 sq ft/key)	scaled from 10 to 5.5	scaled from 1 to 0.5	5.50	scaled from 1 to 0.5	scaled from 11.1 to 6	ksf GLA	2.3
Convention (>200 sq ft/key)	use convention center but adjust for captive on site						2.3
Residential							
Studio efficiency	0.10	0.85	0.15	0.85	1.00	unit	2.3
1 bedroom	0.10	0.90	0.15	0.90	1.05	unit	2.3
2 bedrooms	0.10	1.65	0.15	1.65	1.80	unit	2.3
3+ bedrooms	0.10	2.50	0.15	2.50	2.65	unit	2.3
Senior housing	0.55	0.30	0.42	0.30	0.85	unit	2.3
Office <25.000 sq ft	0.30	3.50	0.03	0.35	3.80	ksf GFA	3
Office 25,000–100.000 sq ft	sliding scale between <25,000 and 100,000				scaled from 3.8 to 3.4	ksf GFA	3
Office = 100,000 sq ft	0.25	3.15	0.03	0.32	3.40	ksf GFA	3
Office 100,000–500,000 sq ft	sliding scale between 100,000 and 200,000				scaled from 3.4 to 2.8	ksf GFA	3
Office >500.000 sq ft	0.20	2.60	0.02	0.26	2.80	ksf GFA	3
Open plan/ high-density office	0.25	5.75	0.03	0.58	6.00	ksf GFA	2
Medical/dental office	3.00	1.60	0.00	0.00	4.60	ksf GFA	2.3
Bank (drive-in branch)	3.50	2.50	3.00	1.75	6.00	ksft GFA	2.3
Arena	0.27	0.03	0.30	0.03	0.33	seat	2
Pro football stadium	0.30	0.01	0.30	0.01	0.31	seat	2
Pro baseball stadium	0.31	0.01	0.34	0.01	0.35	seat	2

Sources:

1. *Parking Requirements for Shopping Centers,* 2nd ed. (Washington, DC: ULI, 1999).
2. Developed by Team Members from a combination of sources.
3. *Parking Generation,* 5th ed. (Washington, DC: Institute of Transportation Engineers, 2019).

Note: New land uses and changes to second edition titles shown in bold. Changes or new ralios are highlighted in blue.

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Appendix B

Urban Land Institute (ULI)
Shared Parking, Third Edition
Suggested Mode and Noncaptive
Adjustment Factors for Hotels

FIGURE 4-18 **Suggested Mode and Noncaptive Adjustment Factors for Hotels**

Site B-2 ULI Calc

	Shared Parking, 2nd ed.		*Shared Parking*, 3rd ed.			
	Weekdays	Weekends	Weekdays	Weekends	Comment	
Guest rooms, driving adjustment						
Typical business hotel, suburban location	66%	77%	59%	69%	1	
Airport hotel	54%	59%	49%	53%	1	
Downtown hotel (with paid and/or valet parking!			40%	46%	2	
Resort hotel			50%	50%	3	MEETS
Restaurant, noncaptive						
Typical business hotel, suburban location	90%	30%	90%	30%	4	
Airport hotel	90%	70%	90%	70%	4	
Downtown hotel			90%	70%	3	
Resort hotel			90%	70%	3	MEETS
Restaurant driving ratio for noncaptive patrons						
Typical business hotel, suburban location	70%	60%	63%	54%	1	
Airport hotel	80%	80%	72%	72%	1	
Downtown hotel (with paid and/orvalel parking!			47%	40%	2	
Resort hotel			50%	50%	3	MEETS
Meeting/conference noncaptive						
Typical business hotel, suburban location	60%	70%	60%	70%	1	
Airport hotel	90%	90%	90%	90%	l	
Downtown hotel			60%	70%	3	
Resort hotel			25%	25%	4	MEETS
Meeting/conference driving ratio for noncaptive patrons						
Typical business hotel, suburban location	75%	75%	68%	68%	1	
Airport hotel	90%	40%	81%	36%	l	
Downtown hotel (with paid and/or valet parking)			45%	45%	2	
Resort hotel			50%	50%	3	MEETS

Note: *Shared Parking*, 2nd ed., did not have separate factors for downtown hotels and resort hotels.

1. Reduced by 10% due lo use of transportation network companies (TNCsl in lieu of rental cars, 2019.
2. Reduced from suburban by 33% due lo usea of TNC in lieu of rental cars, 2019.
3. Based on team experience/recommendation.
4. No change from second edition.