



Preliminary Hydrology Study Huntington Beach Senior Living

PA 2021-0185, CUP 2021-024, VAR 2021-003, GPA 2021-004, ZMA 2021-003, EA 2021-004

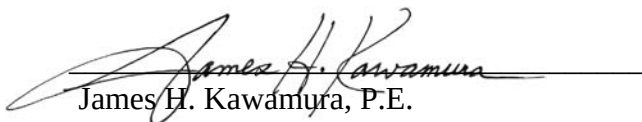
Huntington Beach, California

September 9, 2022

PW XX-XXX / XX-XXX

ATTESTATION

This Hydrology Study has been prepared by, and under the direction of, the undersigned, a duly Registered Civil Engineer in the State of California. Except as noted, the undersigned attests to the technical information contained herein, and has judged to be acceptable the qualifications of any technical specialists providing engineering data for this report, upon which findings conclusions and recommendations are based.


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Section 1 Purpose and Scope

This hydrology study presents an analysis of the hydrology associated with the proposed senior living development located southwest of the intersection of Warner Avenue and Bolsa Chica Street, in the City of Huntington Beach. The study details the general project characteristics, the design, criteria and methodology applied to the analysis of the area in terms of drainage and associated conveyance facilities.

The plans and specifications in the hydrology study are not for construction purposes; the contractor shall refer to final approved construction documents for plans and specifications.

Section 2 Project Information

2.1 Project Description

The proposed project, “*Huntington Beach Senior Living*” entails the demolition of an existing parking lot and existing buildings. The project totals 2.81 acres and includes a 5-story, 236 unit senior living development with 1-level of subterranean parking.

2.1.1 Project Location

Figure 1 below illustrates the aerial perspective of the project site and immediate surroundings and Figure 2 provides the conceptual site plan.



Figure 1 – Aerial Perspective of Project Site

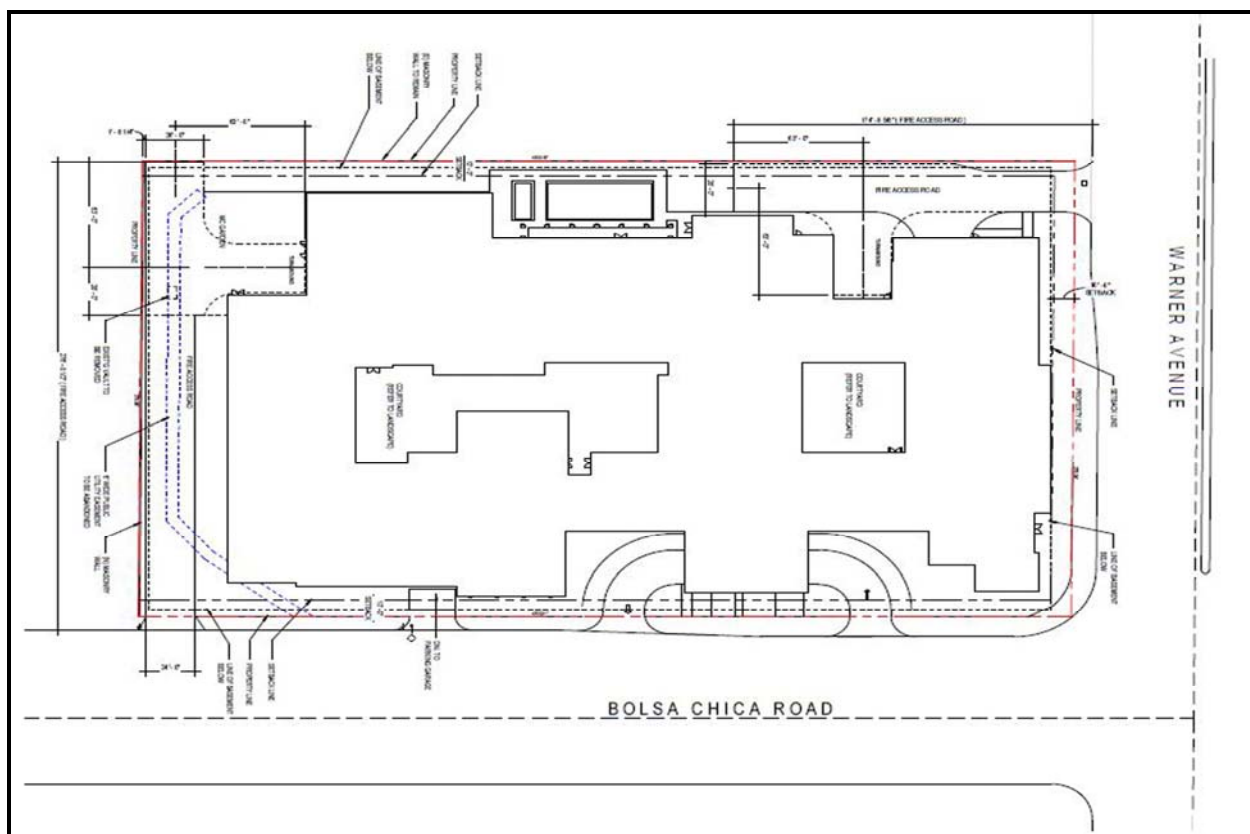


Figure 2 – Project Site

2.2 Hydrologic Setting

This section summarizes the project's size and location in the context of the larger watershed perspective, topography, soil and vegetation conditions, percent impervious area, natural and infrastructure drainage features, and other relevant hydrologic and environmental factors to be protected specific to the project area's watershed.

2.2.1 Watershed

Stormwater discharged from the site will be directed to a Municipal Separate Storm Sewer System (MS4) that discharges into the westerly flowing Sunset Channel. The Sunset Channel flows into Huntington Harbor and Anaheim Bay.

2.2.2 Existing Topography, Drainage Patterns, and Facilities (Narrative)

Warner Avenue slopes from west to east and Bolsa Chica Street slopes from south to north. Runoff on the property that flows easterly ultimately gets collected by an existing ribbon gutter and by one of the existing catch basins located on Bolsa Chica Street near the corner of Warner Avenue. The runoff will be collected by an existing 48" storm drain system located on Bolsa Chica Street flowing north, which increases in size to a 60-inch and then a 72-inch concrete pipe.

2.2.3 Adjacent Land Use

The project site is bounded by Warner Avenue to the north, Bolsa Chica Street to the east, and existing residential structures to the west and south.

2.2.4 Soil Conditions

According to the geotechnical report dated July 26, 2021 by Langan, Irvine, California (Attachment G), the site is underlain by fill underlain by alluvial deposits. The alluvial deposits were encountered in borings LB-1 through LB-3 and consisted of medium dense to dense fine sands with varying amounts of silts and clays extending to about 23 to 25 feet below grade. In LB-1 and LB-3, these soils were underlain by firm to very stiff clay with trace amounts of fine sands extending to approximately 35 feet below grade, underlain by medium dense to dense fine sand with some clay. In LB-2, medium dense sand layers with varying levels of silt and clay were encountered closer to the surface in the 30 feet and 35 feet samples, underlain by a stiff clay layer with some fine sand.

2.2.5 Downstream Conditions

This section summarizes the existing downstream conditions and any conditions of concern with respect to erosion and/or sedimentation due to the proposed project.

The City-owned catch basin on northeast corner of site (southwest corner of Warner Avenue and Bolsa Chica Street) connects to a northerly flowing 48-inch reinforced concrete pipe (RCP) storm drain in Bolsa Chica Street, which increases in size to a 60-inch concrete pipe and then a to 72-inch concrete pipe prior to discharging into the Sunset Channel. The Sunset Channel terminates in Huntington Harbour.

2.2.6 Impervious Cover

The proposed project will have a net increase in total impervious area compared to the existing condition of the site. Currently, the project site is being occupied by multiple existing buildings and a parking lot with a total imperviousness percentage of 92% and perviousness of 8%. The proposed project decreases the site's overall total imperviousness percentage to 85% and increases perviousness to 15%.

2.3 Proposed Runoff Management Facilities

The proposed facilities managing runoff from the area include:

- ☐ A proposed site will be collected by inlets, trench drain and multiple roof drains and will flow towards either a biofiltration planter or modular wetlands or a combination of both for treatment before connecting into an existing catch basin.

Section 3 Design Criteria and Methodology

This section summarizes the design criteria and methodology applied during the drainage analysis of the project site. The design criteria and methodology follows the Orange County Drainage Area Management Plan (DAMP 2003) and the Orange County Hydrology Manual (October 1986).

3.1 *Design Criteria*

3.1.1 *Drainage Design Criteria*

Local storm drain facilities have been designed to conform to standards found in the County of Los Angeles Drainage Design Manual.

3.2 *Methodology*

3.2.1 *Rational Method*

Runoff calculations for this study were accomplished using the Orange County Hydrology Rational Method. The Rational Method is a physically-based numerical method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage. Flows were computed based on the rational formula:

$$Q = 0.9 (I - F_m) A$$

Where:

Q = peak discharge (cfs, cubic feet per second)

C = runoff coefficient, based on land use and soil type

I = rainfall intensity (inches/hour)

A = watershed area (acres)

F_m = rate of runoff (inches/hour)

The watershed time of concentration at any given point is defined as the time it would theoretically take runoff to travel from the most upstream point in the watershed to a concentration point, as estimated by the Time of Concentration Nomograph for Initial Subarea (Figure D-4 within the Orange County Hydrology Manual and the appendix section of this report).

Intensity for this site was determined by the intensity-duration curves from the Orange County Hydrology Manuals Figure's B-3 and B-4. The runoff coefficient represents the ratio of rainfall that runs off the watershed versus the portion that infiltrates to the soil or is held in depression

storage. The runoff coefficient (C) is dependent on rainfall intensity (I), soil infiltration rate (Fp), and impervious/pervious area fractions (a_i and a_p).

Rational Method calculations were accomplished using hand calculations. Peak discharges were computed for both 25-year and 100-year hypothetical storm return frequencies and can be seen in the hydrology and drainage analysis section of this report. The output results of the calculations can be found in the Appendix section of this report.

Section 4 Hydrology and Drainage Analysis

This section summarizes the quantitative hydrologic analysis of the existing and proposed conditions of the site.

4.1 Summary of Drainage Delineation

To analyze the existing conditions, the site was broken into three subareas: A, B, and C (see Appendix for the Existing Hydrology Map). Runoff from subarea A sheet flows down along the existing gutter, curb, and gets collected by an existing open curb catch basin located on Bolsa Chica Street and into the public storm drain system. Subarea B flows northerly and then easterly within an existing ribbon gutter that discharges to Warner Avenue. Subarea C, sheet flows to the curb face within into Warner Avenue and Bolsa Chica Street. Warner Avenue drains easterly where it is collected by an existing catch basin. Once it is reached to the catch basin it is then routed to the city's existing 48" RCP storm drain and flows northerly along Bolsa Chica Avenue.

To analyze the proposed conditions, the site is broken into one subarea: A (see Appendix for the Proposed Hydrology Map). The runoff will be collected by inlets, trench drain and multiple roof drains before flowing to either a biofiltration planter or a modular wetland for treatment. Once treated, the runoff will flow towards an existing catch basin located on Warner Avenue where it will be collected into an existing 48" storm drain system.

4.2 Summary of Results

The existing and proposed conditions hydrology results for the 25-year and 100-year are summarized in **Table 1** and **Table 2**.

Table 1: Existing Conditions Hydrology

Subarea	Area (acres)	Q ₂₅ (cfs)	Q ₁₀₀ (cfs)
A	1.56	5.17	6.62
B	0.72	2.22	2.84
C	0.52	2.13	2.73
	2.81	9.52	12.19

Table 2: Proposed Conditions Hydrology

Proposed Hydrology			
Subarea	Area (acres)	Q₂₅ (cfs)	Q₁₀₀ (cfs)
A	2.81	9.26	11.87

4.3 Conclusion

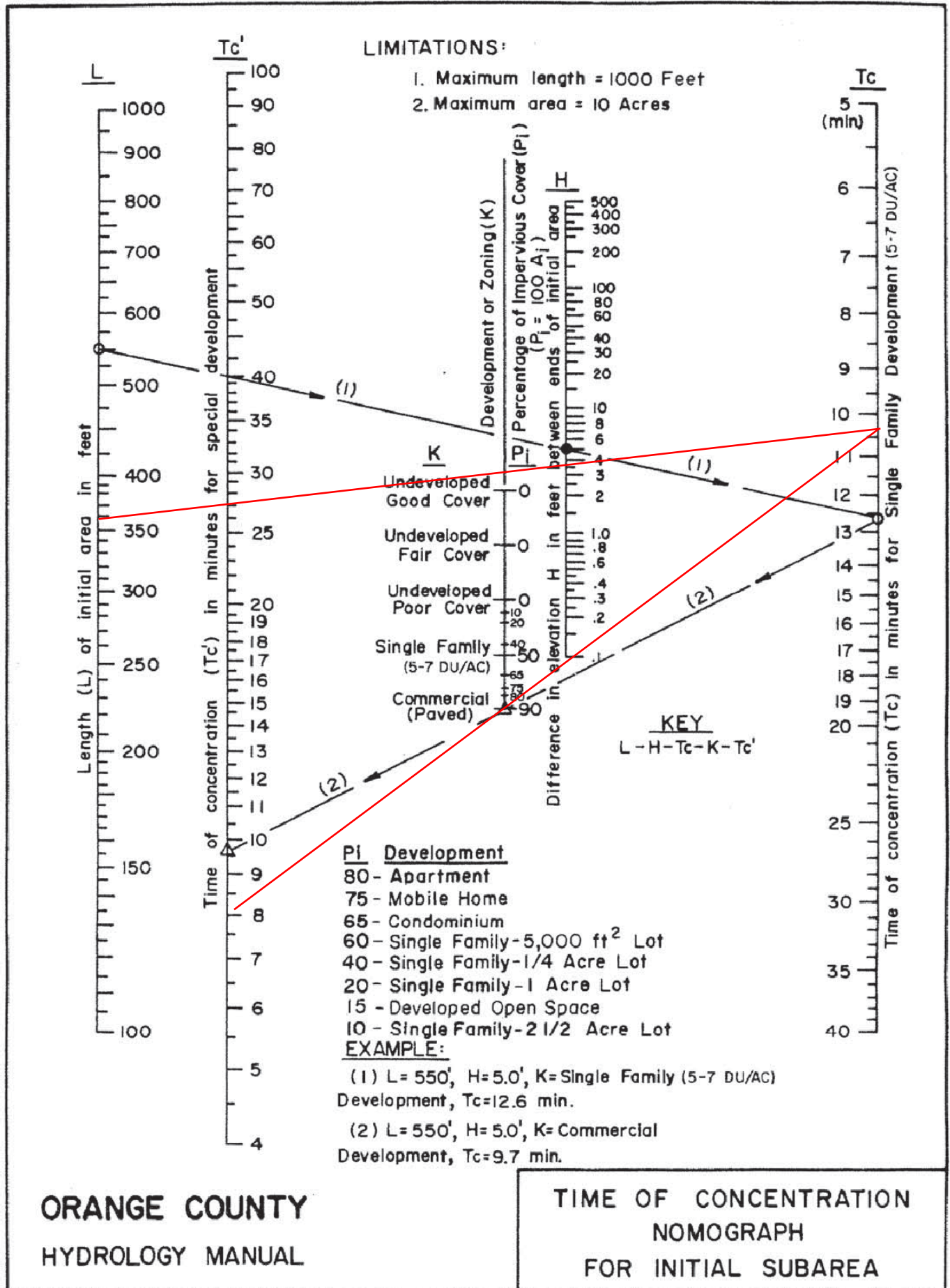
As shown in the Summary of Results, the proposed condition has a lower on-site flow rate of 9.26 cfs compared to the existing condition onsite flow rate of 9.52 cfs due to the increase in pervious areas. This will improve the existing storm drain system as it flows downstream along Bolsa Chica Street.

APPENDIX

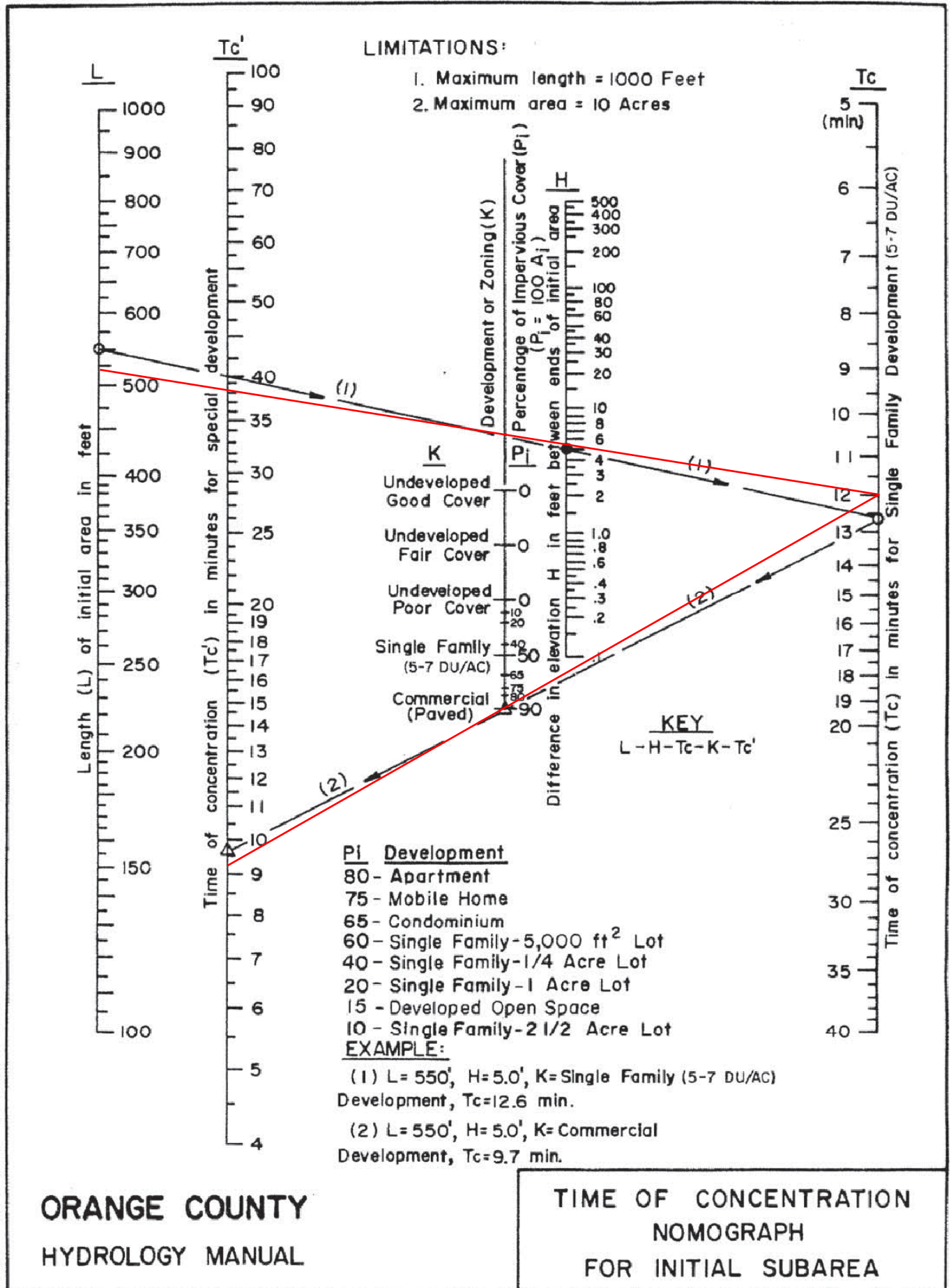
Appendix 1

Nomographs

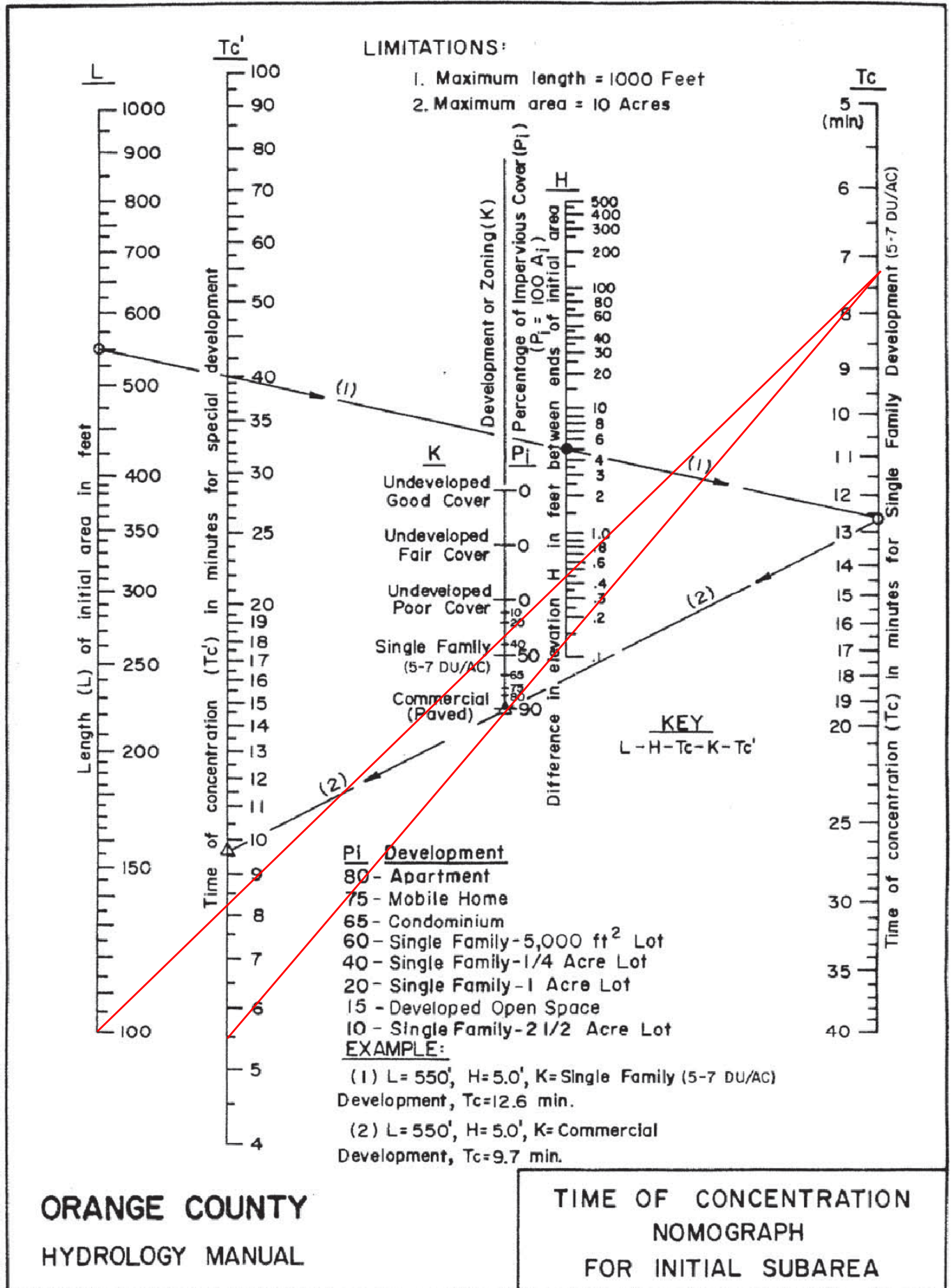
EXISTING CONDITIONS – AREA A



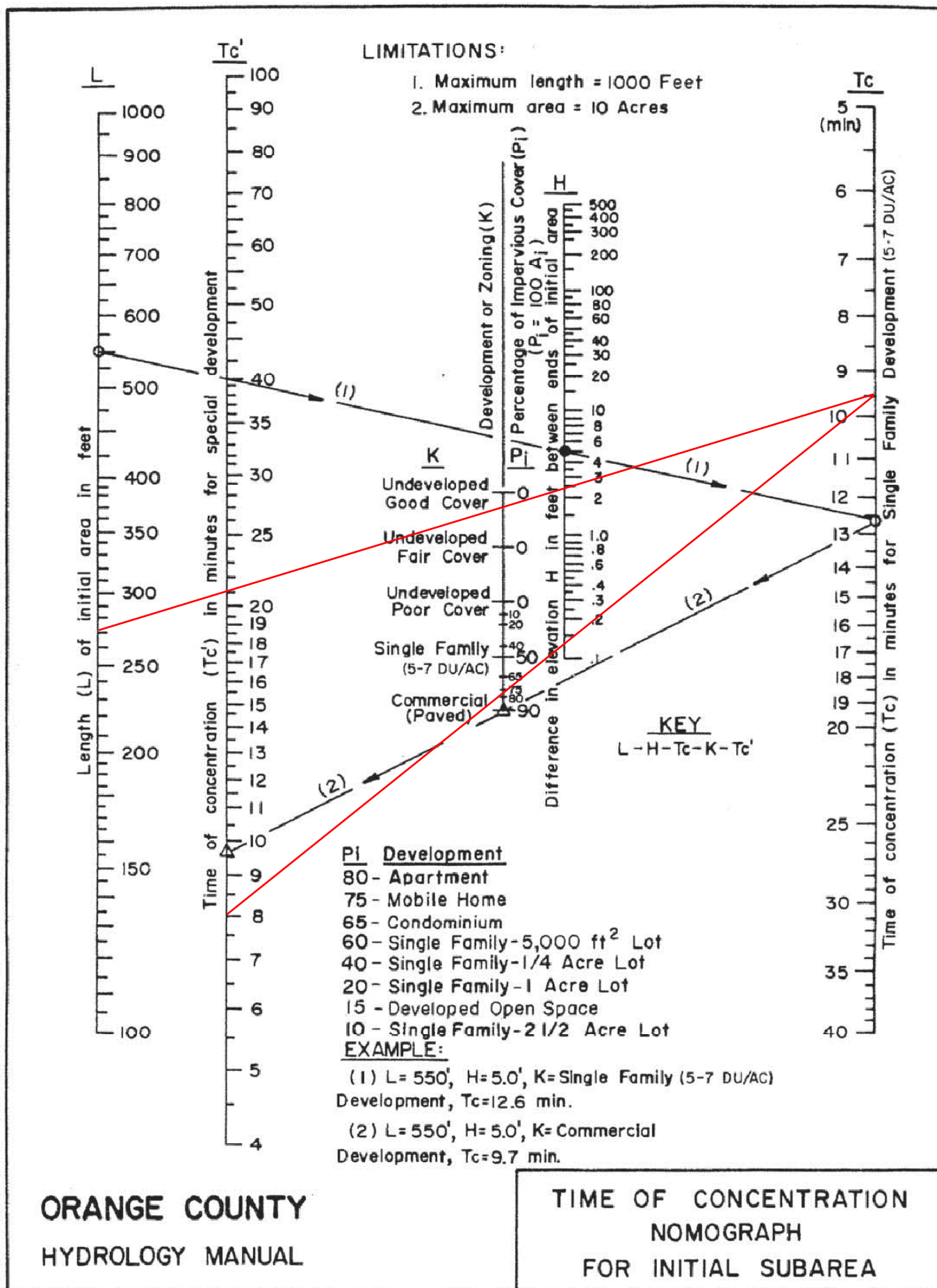
EXISTING CONDITIONS – AREA B



EXISTING CONDITIONS – AREA C



PROPOSED CONDITIONS - AREA A

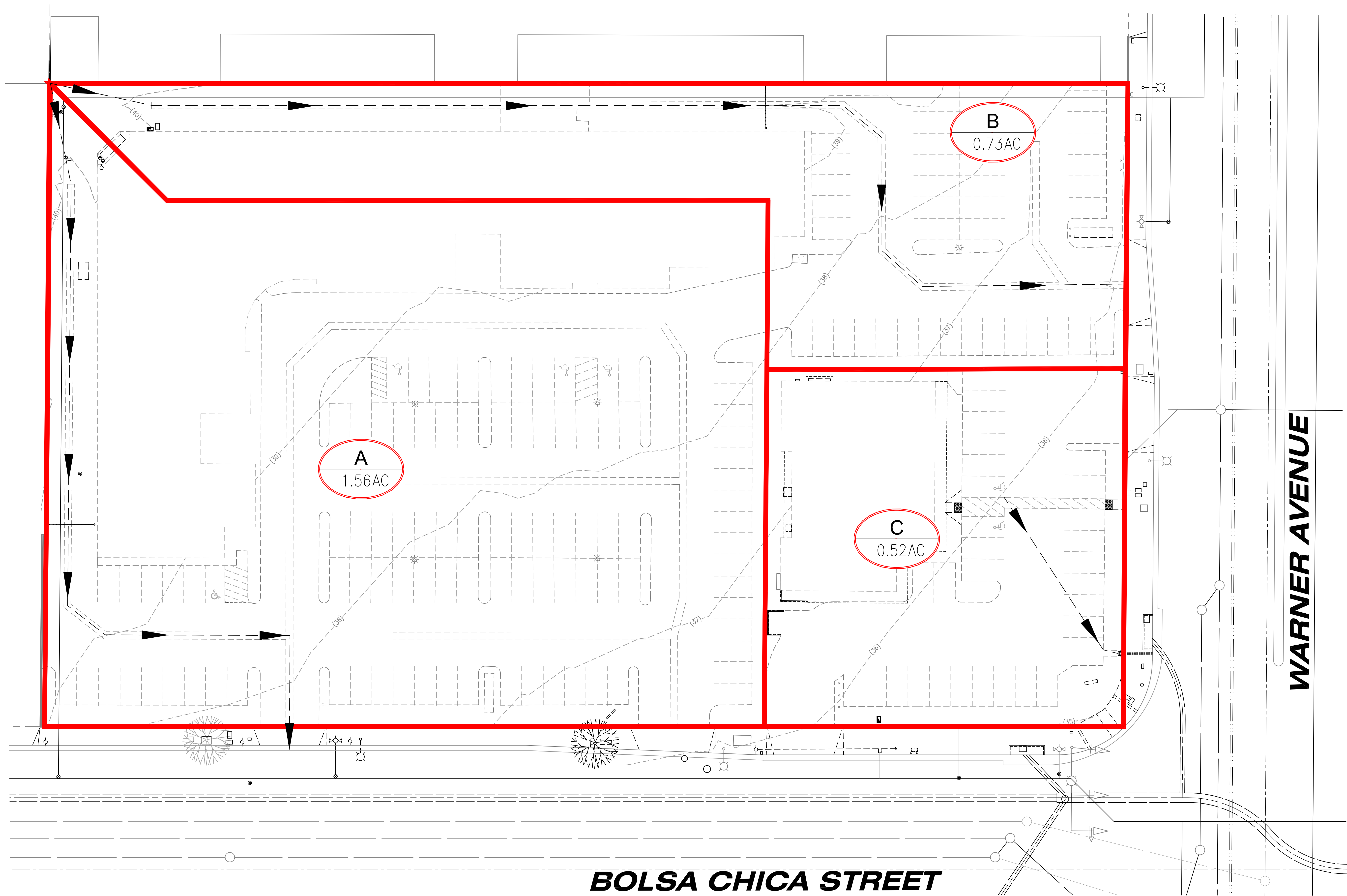


Appendix 2

Existing Hydrology Map

LEGEND

- SUBAREA BOUNDARY
— SURFACE FLOW PATH ONSITE
X
X.XXAC SUBAREA LABEL

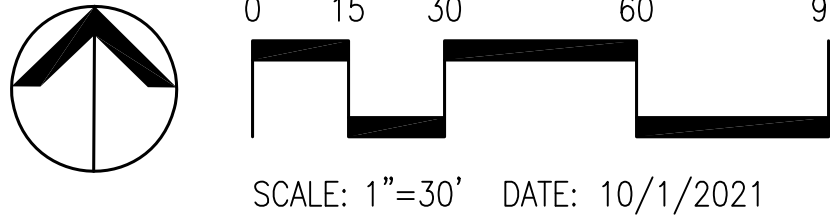


BOLSA CHICA STREET

WARNER AVENUE

HUNTINGTON BEACH SENIOR LIVING
HINES

EXISTING HYDROLOGY MAP
HUNTINGTON BEACH, CALIFORNIA



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Appendix 3

Existing Conditions Peak Flow Hydraulic Analysis

25 & 100 year storm

Q25 Rational Method Hydrology Calculations for Existing Improvements
Project: Huntington Beach Senior Living

Area No.	A (sqft)	A (ac)	ΣA (ac)	Soil type	Dev type	K _i	T _c (min)	I ₂₅ (in/hr)	F _m (in/hr)	F _p avg	F _m avg	a _i	a _p	Q ₂₅ (cfs)	S ₀	L (ft)	d (in)	n	K _{pipe}	D/d	D (ft)	V (fps)	T _t (min)	Description
A	68016	1.56	1.56	D	Commercial	0.298	8.0	3.7	0.02	0.20	0.02	0.92	0.08	5.17	1.00%	356.00								Surface Flow
B	31693	0.73	0.73	D	Commercial	0.298	9.3	3.4	0.02	0.20	0.02	0.92	0.08	2.22	1.00%	510.60								Surface Flow
C	22618	0.52	0.52	D	Commercial	0.298	5.5	4.6	0.02	0.20	0.02	0.89	0.11	2.13	0.60%	82.70								Surface Flow
														9.518										

Q₁₀₀ Rational Method Hydrology Calculations for Existing Improvements
Project: Huntington Beach Senior Living

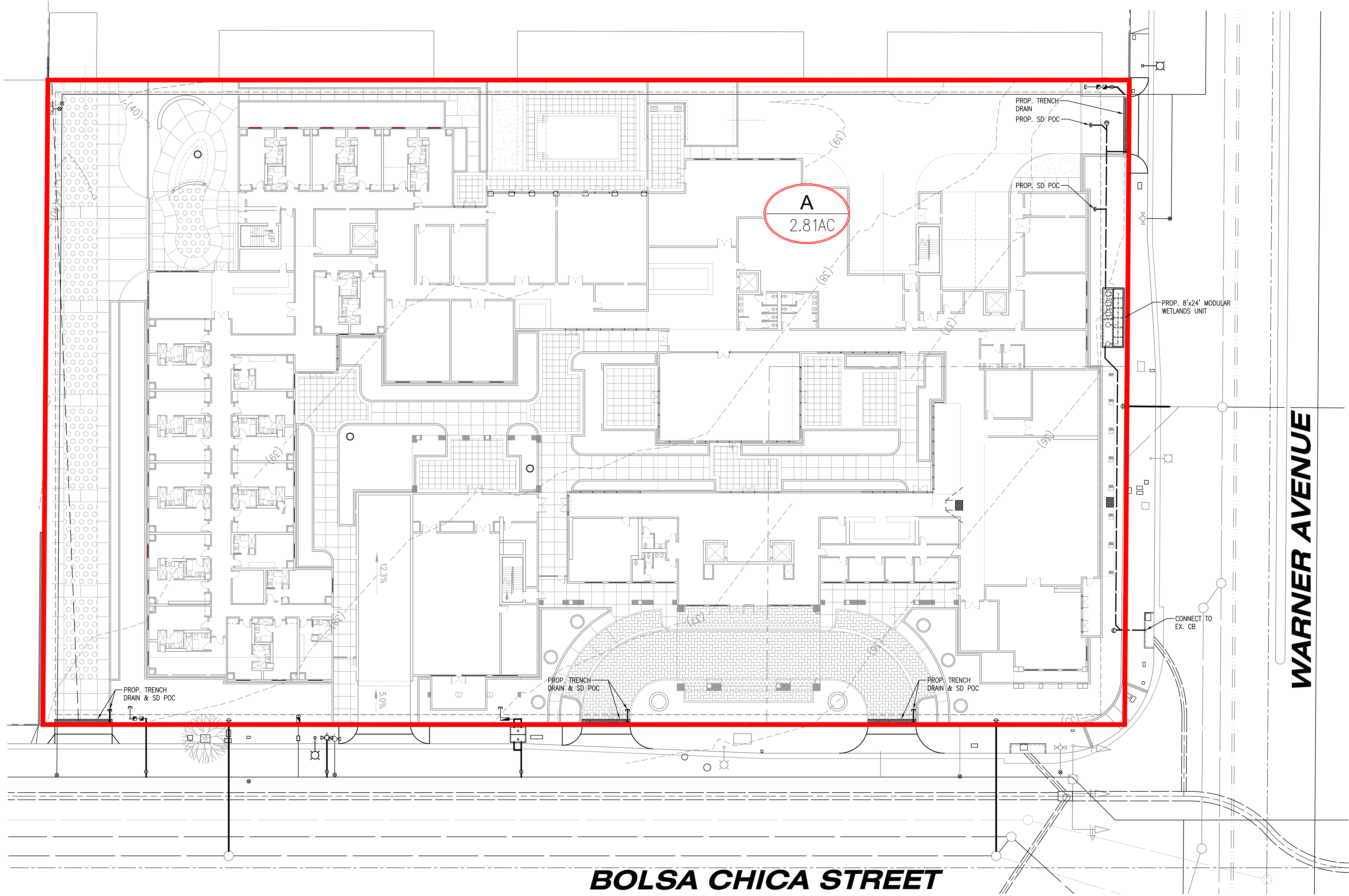
Area No.	A (sqft)	A (ac)	ΣA (ac)	Soil type	Dev type	K _i	T _c (min)	I ₁₀₀ (in/hr)	F _m (in/hr)	F _p avg	F _m avg	a _i	a _p	Q ₁₀₀ (cfs)	S ₀	L (ft)	d (in)	n	K _{pipe}	D/d	D (ft)	V (fps)	T _t (min)	Description
A	68016	1.56	1.56	D	Commercial	0.298	8.0	4.7	0.02	0.20	0.02	0.92	0.08	6.62	1.00%	356.00								Surface Flow
B	31693	0.73	0.73	D	Commercial	0.298	9.3	4.3	0.02	0.20	0.02	0.92	0.08	2.84	1.00%	510.60								Surface Flow
C	22618	0.52	0.52	D	Commercial	0.298	5.5	5.9	0.02	0.20	0.02	0.89	0.11	2.73	0.60%	82.70								Surface Flow
														12.185										

Appendix 4

Preliminary Proposed Hydrology Map

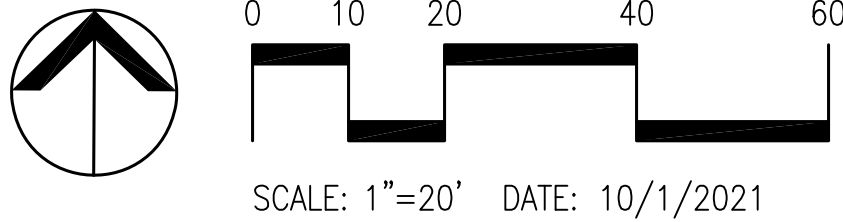
LEGEND

- SUBAREA BOUNDARY
— SURFACE FLOW PATH ONSITE
X
X.XXAC SUBAREA LABEL



HUNTINGTON BEACH SENIOR LIVING
HINES

PRELIMINARY PROPOSED HYDROLOGY MAP
HUNTINGTON BEACH, CALIFORNIA



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Appendix 5

Proposed Conditions Peak Flow Hydraulic Analysis

25 & 100 year storm

Q 25 Rational Method Hydrology Calculations for Proposed Development
Project: The Herald in Placentia, CA

Area	A	A	ΣA	Soil	Dev	K _i	T _c	I ₁₀	F _m	F _p	F _m	a _i	a _p	Q25	S ₀	L	d	n	K _{pipe}	D/d	D	V	T _i	Description	Pipe	Full Pipe	%	%	
No.	(sqft)	(ac)	(ac)	type	type		(min)	(in/hr)	(in/hr)	avg	avg			(cfs)		(ft)	(in)				(ft)	(fps)	(min)		Area	Q _{Full}	V _{Full}	Q	V
SYSTEM A																													
A1	122327.0	2.808	2.81	D	Apartments	0.325	8.0	3.7	0.03	0.20	0.03	0.85	0.15	9.26808	1.00%	270								AREA DRAIN					
							8.0	3.7						9.2681	1.00%	5	15	0.009	93.3	97%	1.21	8.7	0.0	Pipe	1.2	9.3	7.6	99%	114%
			2.81				8.0	3.7	0.03	0.20	0.01	0.85	0.15	9.2623															

Q 100 Rational Method Hydrology Calculations for Proposed Development
Project: The Herald at Placentia, CA

Area	A	A	ΣA	Soil	Dev	K _i	T _c	I ₁₀	F _m	F _p	F _m	a _i	a _p	Q100	S ₀	L	d	n	K _{pipe}	D/d	D	V	T _i	Description	Pipe	Full Pipe	%	%		
No.	(sqft)	(ac)	(ac)	type	type		(min)	(in/hr)	(in/hr)	avg	avg			(cfs)		(ft)	(in)					(ft)	(fps)	(min)		Area	Q _{Full}	V _{Full}	Q	V
SYSTEM A																														
A	122392.0	2.810	2.81	D	Apartments	0.325	8.0	4.7	0.03	0.20	0.03	0.85	0.15	11.87631	1.00%	270									AREA DRAIN					
							8.5	4.6						11.8763	1.00%	270	24	0.009	326.8	39%	0.78	9.6	0.5	Pipe	3.1	32.7	10.4	36%	92%	
			2.81				8.5	4.6	0.03	0.20	0.01	0.85	0.15	11.8763																