

# DRAINAGE STUDY

**Vista Hacienda**  
Permit Application#P24-0141  
APN 166-440-27-00

Vista, California

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## TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>2</b>
1.1 Project Description.....	2
1.2 Existing Conditions .....	2
1.3 Proposed Conditions .....	3
<b>2. METHODOLOGY .....</b>	<b>3</b>
2.1 Rational Method.....	3
2.2 Runoff Coefficient.....	3
2.3 Rainfall Intensity.....	4
2.4 Tributary Areas .....	4
2.5 Hydraulic Storm Drain Methodology.....	4
<b>3. CALCULATIONS/RESULTS.....</b>	<b>5</b>
3.1 Peak Flow Comparison .....	5
3.2 Storm Water Quality .....	5
3.3 Final Engineering Acknowledgement .....	5
<b>4.0 CONCLUSION.....</b>	<b>6</b>
Appendix 1 .....	Existing Conditions Hydrology Map
Appendix 2 .....	Proposed Conditions Hydrology Map
Appendix 3 .....	San Diego County Hydrology Excerpts
Appendix 4 .....	'C' Runoff Coefficient and Rational Method Calculations
Appendix 5 .....	Existing Conditions AES(Rational Method)
Appendix 6 .....	Proposed Conditions AES(Rational Method)
Appendix 7.....	Pond Report
Appendix 8 .....	FEMA Flood Insurance Rate Map
Appendix 9.....	Reference Plans
Appendix 10 .....	Hydraulic Analyses

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# 1. INTRODUCTION

The purpose of this preliminary drainage study is to support the SWQMP and compare the 100-year storm event for pre and post-project stormwater runoff flows. Per the City of Vista requirements, the criteria used for this drainage study is the 2003 San Diego County Hydrology Manual.

## 1.1 Project Description

The project proposes approximately 4.66 acres of development on an existing undeveloped site located at 1160 Hacienda Drive in the City of Vista, County of San Diego, California. The site is bordered by Highway 78 to the north, Hacienda Drive to the north. Vicinity Map below.

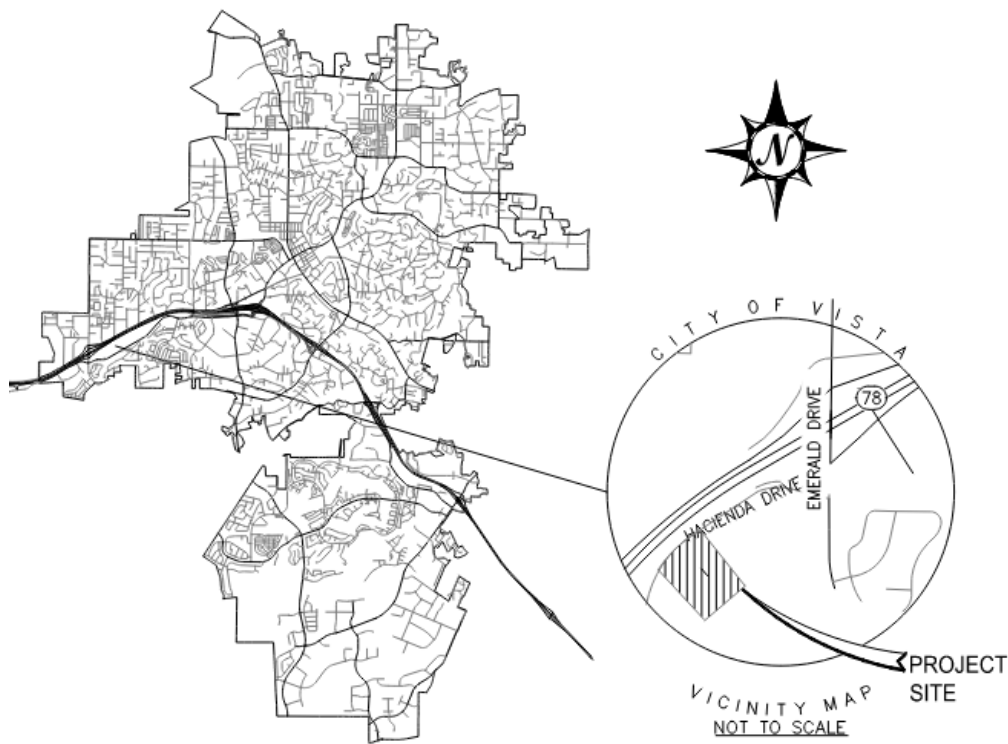


Figure 1 Vicinity Map

## 1.2 Existing Conditions

The existing site consists of a undeveloped site adjacent to Buena Vista Creek. The 4.66 acre site drains to the open channel. A portion of the existing site drains east and north directly to the Buena Vista Creek, while a portion of the site drains north to Hacienda Drive where it is collected and conveyed via storm drain inlets to the same Buena Vista Creek.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map locates the site in Flood Zone X, which is defined as an area of base flood elevations determined. See Appendix 5 for the FEMA Flood Insurance Rate Map.

Please refer to Appendix 1 for the Existing Drainage Map.

### 1.3 Proposed Conditions

The proposed conditions will maintain the existing drainage patterns to the max extent possible. The final outfall bill remains as the adjacent Buena Vista Creek. A brow ditch is proposed along the western property line to correct an existing issue of offsite runoff. In the proposed condition, the added impervious area will be treated and conveyed via a system of storm drain and utilize an existing storm drain connection to the Buena Vista Creek culvert under Hacienda Drive. A portion of the regraded slope along the eastern property line will retain its current flow pattern of sheet flowing to the Creek. This area is reduced from the current existing condition, so less flow will flow directly to the Creek. A biofiltration basin is proposed adjacent to Hacienda Drive that will provide underground detention, the storage capacity has been oversized from the hydromodification requirement to provide 100yr attenuation.

Refer to Hydraulic Analysis located in Appendix 9 of this report for Hec-RAS study of the Buena Vista Creek, and delineation of the 10-yr storm water surface elevations used for outlet control design for this project.

## 2. METHODOLOGY

### 2.1 Rational Method

Runoff on the project site was calculated using the Rational Method for the 100-year storm event as advised per the San Diego County Hydrology Manual, June 2003. The Rational Method includes the following equation to calculate stormwater runoff flow:

$$Q = C \times I \times A$$

Where:

Q = Flow rate in cubic feet per second (cfs)

C = Runoff coefficient

I = Rainfall Intensity in inches per hour (in/hr)

A = Drainage basin area in acres, (ac)

Time of concentration was assumed conservatively to be the minimum 5 minutes due to short flow length in order to provide a simplified conservative estimate of peak flowrates.

### 2.2 Runoff Coefficient

When appropriate, a weighted coefficient was determined for each basin in both existing proposed conditions using the following equation in the San Diego County Hydrology Manual:

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where  $C_p$  = Pervious coefficient runoff value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious).

Based on the geotechnical study prepared by Kleinfelder dated January 17, 2019, the project site is considered to be type 'C' yielding a  $C_p$  value of 0.30 per Table 3-1. See Appendix 3 of this study for the San Diego County Hydrology Excerpts and Appendix 4 for runoff coefficient results for reach basin.

## 2.3 Rainfall Intensity

Intensity-Duration Design Chart Template Figure 3-1 of Section 3 of the San Diego County Hydrology Manual can be found in this report. A 100-year storm event was used for this analysis. See Appendix 3 for Intensity-Duration Design Chart.

## 2.4 Tributary Areas

Drainage basins are delineated on the included Proposed Drainage Map Exhibit and graphically portray the tributary area for the drainage basin.

## 2.5 Hydraulic Storm Drain Methodology

The calculations were performed both by Bentley Flowmaster software, Autodesk Hydraflow & Autodesk Hydrographs.

Equations shown below:

$$Q = \frac{1.49}{n} AR^{2/3} S_f^{1/2}$$

where:

- Q = Discharge (ft<sup>3</sup>/s)
- n = Manning roughness coefficient (dimensionless)
- A = cross-sectional area of the flow (ft<sup>2</sup>)
- R = hydraulic radius (ft)
- S<sub>f</sub> = friction slope, typically assumed to be equivalent to longitudinal slope of storm drain (S<sub>o</sub>; ft/ft)

### 3. CALCULATIONS/RESULTS

#### 3.1 Peak Flow Comparison

Below is a table which summarize the calculations provided in the Appendix of this report.

HYDROLOGY SUMMARY			
	6 HOUR 100-YR DISCHARGE (CFS)		
BASIN	EXISTING	PROPOSED	PROPOSED MITIGATED
POC1	8.71	14.75	8.15

**Table 1. Peak Drainage Flow Rate Comparison**

Table 1 shows the comparison between existing and proposed conditions for the 100-year 6-hour rainfall event.

As shown in the table above, the proposed conditions do not increase flow being discharged from the site.

#### 3.2 Storm Water Quality

A more detailed discussion of the project’s storm water quality BMPs can be found in the project’s Storm Water Quality Management Plan (SQWMP) titled *Storm Water Quality Management Plan*.

#### 3.3 Final Engineering Acknowledgement

Fusco Engineering Inc. acknowledges that this project is proceeding at risk with the following pending cycle issues to be addressed at final engineering.

- Further delineation of sub-areas within project boundaries to give more accurate runoff coefficients rather than use of a global runoff coefficient.
- Offsite hydraulic analysis to be conducted for proposed storm drain connection.
- Drainage area specific inflow hydrographs to be used for routing analysis.
- Per the provided letter of recommendation by ALTA Geotech dated July 14, 2025, HSG D to be used for both pre and post development conditions.
- Engineered inlet calculations to be provided to ensure flow rate can be met while providing required 1’ minimum freeboard within proposed biofiltration basin.

## 4.0 CONCLUSION

As shown in this preliminary study, the proposed development will not negatively impact downstream facilities since the proposed drainage patterns mimic existing drainage patterns. The peak flow rates in the proposed conditions will be reduced via attenuation to match pre-developed conditions.

The development does not propose to dredge or fill any waters of the U.S.; therefore, the project is not required to obtain approval from the Regional Water Quality Control Board under Federal Clean Water Act section 401 or 404.