Preliminary
CEQA Drainage Study

Lago De San Marcos

July 22, 2004
(Revised: January 25, 2005)
(Revised: June 10, 2005)
(Revised: August 16, 2005)
(Revised: January 16, 2006)

PREPARED FOR

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PROJECT ENGINEER

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Declaration of Responsible Charge

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in Section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

William Lundstrom
Registered Civil Engineer 61630
Exp. Date: 06/30/09

Date

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Table of Contents

Table of Exhibits

List of Tables

Table of Appendices

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Introduction

Purpose and Scope

To provide guidelines for preparation and review of hydrology/ drainage study associated with discretionary projects under various County Ordinances.

Development of permanent improved drainage facilities relies in part, on early identification of any adverse drainage conditions that are caused or worsened by new development projects. To avoid sub-standard drainage facilities (difficult and costly to replace) sufficient information is needed early, when the project is being considered for approval. The City/County subdivision, zoning and other related ordinances and County of San Diego Flood Control Act provides for incorporation of drainage facility protection in design of private projects from early start. The County's application process provides for a preliminary hydrology/ drainage study on all development projects at time of application. This study provides the needed information to ensure proposed drainage facilities are located appropriately. The preliminary hydrology/ drainage study is also part of the full CEQA and public hearing reviews on all discretionary projects. This eliminates the need for later CEQA reviews when proposed drainage facilities conform to that previously reviewed and circumstances have not changed.

Section 1. Project Information

1.1. Project Description

1.1.1 Project Location

The project site is located in the City of San Marcos, California. The project is located south of SR-78 and is situated on the south corner of Lake San Marcos Drive and Rancho Santa Fe Road (reference Thomas Bros. 1128-C2). **Exhibit A** provides a location map for the site.

1.1.2 Project Activities Description

The site is presently a vacant professional office. The project proposes the subdivision of an approximate 1.97-acre parcel into 1 lot, which will be a residential condominium development consisting of 42 units. In addition to the high-density residential housing units there will be a recreational facility area and parking areas.

1.2. 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.

1.2.1 Watershed

The project site is located on the 12,665-acre (19.8-square mile) Richland Hydrologic Sub-Area (HSA 904.52), which is part of the San Marcos Hydrologic Area (HA 904.50) and Carlsbad Hydrologic Unit (HU 904.00). The 2-acre project accounts for approximately 0.016 percent of the local watershed area. **Table 1-1** compares the project site to the local watershed area. **Exhibit B** illustrates the project site in the context of the watershed.

Table 1-1 Comparison of Watershed Areas.

	Area (acres)	**12,665**	**2**	**1**
Richland HSA 904.52	**12,665**	100%	-	-
Property	**2**	0.016%	100%	-
Impervious Area (Estimate)	**1.3**	0.008%	50%	100%

1.2.2 Topography

The site currently drains to the northeastern direction onto Lake San Marcos Drive. There are two runoff outlet locations currently for the site. The western outlet location drains approximately 0.97-acres of the vacant office building and parking lot area. This portion drains over a distance of approximately 340 feet from an elevation of 618 feet

MSL to an elevation of 601 feet MSL for an average grade of approximately 5 percent. The eastern portion consists of the approximately 1-acre is currently vacant land. This portion drains over a distance of approximately 460 feet from an elevation of 604 feet MSL to an elevation of 581 feet MSL for an average grade of approximately 5 percent. Runoff generated from the site drain easterly in the direction of Lake San Marcos.

1.2.3 FEMA Flood Insurance Rate Map

The Lago De San Marcos project site is located in Zone X of the Flood Insurance Rate Map (FIRM) Panel 06073C0789 G, effective date June 16, 1999. Zone X is described to be "other areas designated to be outside the 500-Yr floodplain". **Exhibit C** illustrates the project site within Flood Zone X.

1.2.4 Current and Adjacent Land Use

The project site currently consists of a abandoned office building and an asphalt parking lot. The majority of the site is vacant. The surrounding neighborhood is residential in character with a mix of condominiums, duplexes and small-lot single family dwellings.

1.2.5 Soil and Vegetation Conditions

No soils report has been prepared at this preliminary stage of the project. Therefore, the Soil Survey for the San Diego Area by the Soil Conservation Service (1973) forms the basis of this discussion.

The Soil Survey indicates that the site is on Las Flores loamy fine sand with 2 to 9 percent slopes. The project site consists of SCS Hydrologic Soil Type D.

The project site is categorized being developed as having non-native vegetation.

1.2.6 Existing Drainage Patterns and Facilities (Narrative)

Located on the project site is a vacant office building and parking lot. There are no storm drain facilities in the project site. **Exhibit B** illustrates the project site watershed. The majority of the existing runoff generated from the site drains onto Lake San Marcos Drive. Then is directed south on San Marino Drive. The runoff is intercepted by an existing curb inlet south of the San Marino and Hermosita Drive intersection. This existing curb inlet is located approximately 0.5 miles downstream from the project site. The runoff eventually discharges out into Lake San Marcos located approximately 0.6 miles east of the project site. **Exhibit D** illustrates the existing condition hydrology map for the project site.

1.2.7 Downstream Conditions

Runoff generated from the site is currently conveyed downstream toward Lake San Marcos via street sections and a storm drain system.

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1.3. Proposed Runoff Management Facilities

The proposed facilities managing runoff from the site include:

- Appropriate grading of pads to direct runoff away from structures on the site.
- A proposed storm drain system to convey runoff to the existing facilities downstream from the site.

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Section 2. Design Criteria and Methodology

This section summarizes the design criteria and methodology applied during drainage analysis of the project site. The design criteria and methodology follow the County of San Diego Hydrology Manual, Hydraulic Design and Procedure Manual, and Storm Water Standards as appropriate for the project site.

2.1. Hydrologic Design Methodology

2.1.1 Rational Method: Peak Flow

Runoff calculations for this study were accomplished using the 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:

$$Q = C\,i\,A$$

where ... Q = Peak discharge (cfs);
C = runoff coefficient, based on land use and soil type;
i = rainfall intensity (in/hr);
A = watershed area (acre)

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 is dependent on the land use coverage and soil type (**Table 2-1**).

For a typical drainage study, rainfall intensity varies with the watershed time of concentration. 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 calculated by equations in the San Diego County Hydrology Manual.

Table 2-1 Rational Method Runoff Coefficients.

		RUNOFF COEFFICIENT			
	(%)	Hydrologic Soil Type			
LAND USE (County Elements)	**Imperv.**	**A**	**B**	**C**	**D**
Permanent Open Space		0.20	0.25	0.30	0.35
Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Neighborhood Commercial	80	0.76	0.77	0.78	0.79
General Commercial	85	0.80	0.80	0.81	0.82
Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Limited Industrial	90	0.83	0.84	0.84	0.85
General Industrial	95	0.87	0.87	0.87	0.87

Rational Method calculations were accomplished using the Advanced Engineering Software Rational Method Analysis (Southern California County Methods) (AES-RATSCx) computer software packages. Peak discharges were computed for 100-year, 50-year, and 10-year hypothetical storm return frequencies. An impervious analysis for the site has illustrated 26% imperviousness for the existing condition and 55% imperviousness for the proposed condition. Therefore, the project site used a "C" coefficient value of 0.41 for pre-development and a "C" coefficient value of 0.71 for post-development.

2.1.2 Rational Method: Runoff Volume

For designs that are dependent on the total storm volume, a hydrograph must be generated to account for the entire volume of runoff from the 6-hour storm event. The hydrograph for the entire 6-hour storm event is generated by creating a rainfall distribution consisting of blocks of rain, creating an incremental hydrograph for each block of rain, and adding the hydrographs from each block of rain. This process creates a hydrograph that contains runoff from all the blocks of rain and accounts for the entire volume of runoff from the 6-hour storm event. The total volume under the resulting hydrograph is equal to the following equation:

$$VOL = CP_6A$$

Where: VOL = volume of runoff (acres-inches)

P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)

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Section 3. Characterization of Project Runoff

This section characterizes the quantities and location of storm water runoff from the project site and the pollutants that might potentially be present in the runoff from the project site.

3.1. Hydrologic Effects of Project

The proposed project will not significantly alter drainage patterns on the site. **Exhibit E** illustrates the proposed condition hydrology map. The project will add approximately 0.55-acres of impervious area, for a total of 1.07-acres (54.5 percent of the project site) in the form of rooftops, and streets. The project site "C" coefficient value will change from 0.41 for pre-development condition to 0.71 for post-development condition. **Table 3-1** summarizes the hydrologic effects of the project.

Table 3-1 Summary of Hydrology Analysis.

Outlet Location	Tributary Area		100-Year		50-Year		10-Year	
	Existing/Proposed (acre) / (acre)		Existing/Proposed (cfs)/(cfs)		Existing/Proposed (cfs)/(cfs)		Existing/Proposed (cfs)/(cfs)	
100	3.0	3.0	10.4	12.3	9.6	11.4	6.7	8.1
TOTAL	**3.0**	**3.0**	**10.4**	**12.3**	**9.6**	**11.4**	**6.7**	**8.1**

The Rational Method results illustrates that there is a negligible increase in the overall runoff for the project site. Proposed Basin 100 will convey runoff generated from the site by two (2) curb outlets onto the adjacent street. Thus, with a slight increase in the total flowrate discharging from the site, the existing curb inlet located approximately 0.5 mile downstream will not see this increase.

The existing gutter section, Lake San Marcos Drive, can convey the runoff from the proposed project with no negative impacts. The FlowMaster results illustrates that the gutter flow depth in Lake San Marcos Drive, with 12.3 cfs, is 0.25 ft (3 inches). Thus, there will be no negative impacts on the existing street section.

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Section 4. Summary and Conclusions

This hydrology and hydraulic study has evaluated the potential effects on runoff of the proposed project. In addition, the report has addressed the methodology used to analyze the pre- and post-construction condition, which was based on the San Diego County Hydrology and Design Manual. This section provides a summary discussion that evaluates the potential effects of the proposed project.

- The proposed project will not significantly alter drainage patterns on the site. The project will add approximately 0.55-acres of impervious area, for a total of 1.07-acres (54.5 percent of the project site) in the form of rooftops, and streets. The project site "C" coefficient value will change from 0.41 for pre-development condition to 0.71 for post-development condition.
- The Rational Method results illustrates that there is a negligible increase in the overall runoff for the project site. Proposed Basin 100 will convey runoff generated from the site by two (2) curb outlets onto the adjacent street. Thus, with a slight increase in the total flowrate discharging from the site, the existing curb inlet located approximately 0.5 mile downstream will not see this increase.
- The existing gutter section, Lake San Marcos Drive, can convey the runoff from the proposed project with no negative impacts. The FlowMaster results illustrates that the gutter flow depth in Lake San Marcos Drive, with 12.3 cfs, is 0.25 ft (3 inches). Thus, there will be no negative impacts on the existing street section.

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Section 5. References

San Diego County, 1993. San Diego County Flood Control District. (June 2003). Hydrology Manual and Design and Procedure Manual. Ref. SFC P3055.

SCS, 1973. Soil Conservation Service. (December, 1973). Soil Survey, San Diego Area, California.

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TABLE OF EXHIBITS

TABLE OF APPENDICES

EXHIBITS

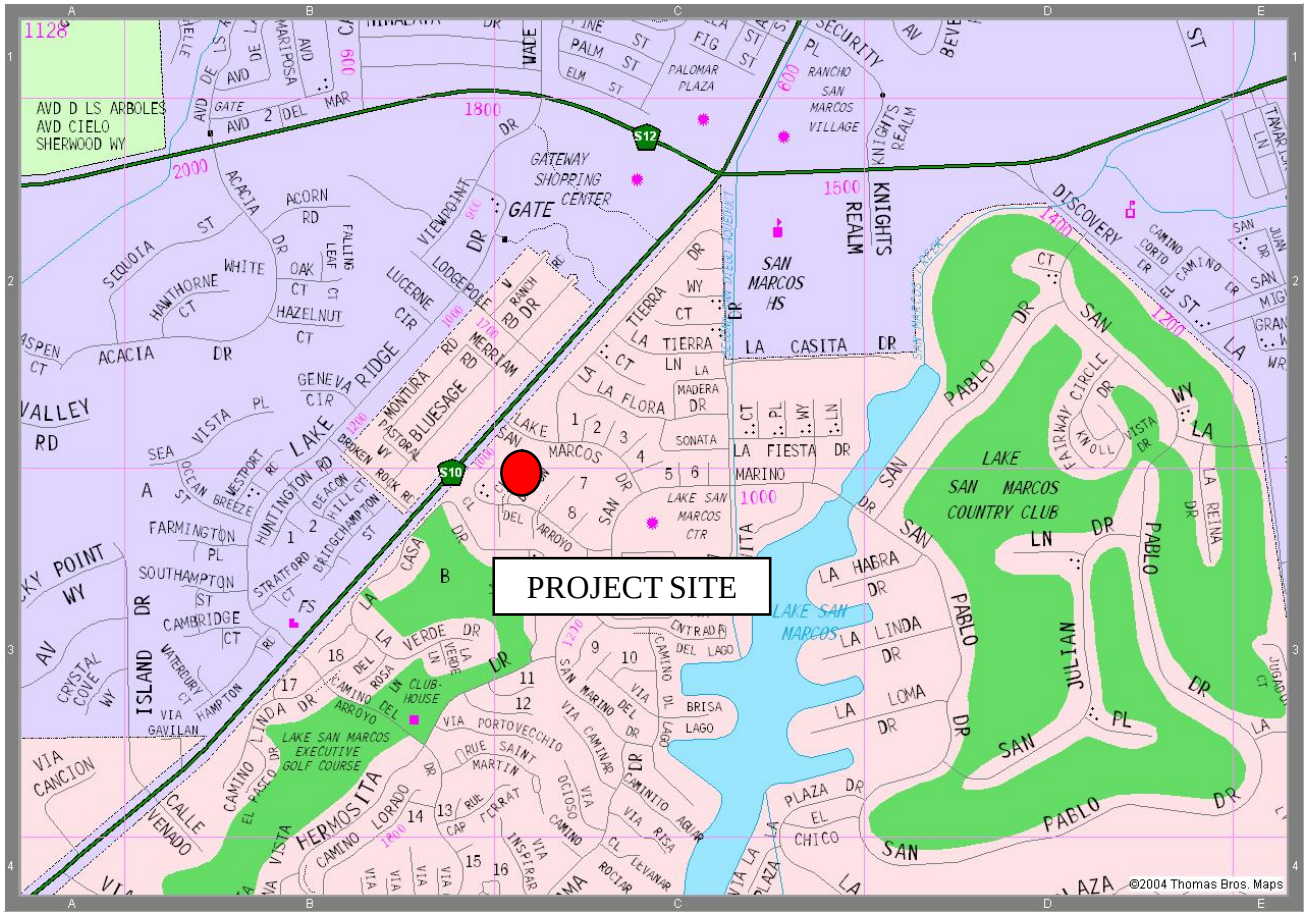

Exhibit A Vicinity Map (Reference Thomas Bros. 1128-C2).

APPENDIX A
Hydrologic Information

This Section Contains:

- Precipitation Analysis
- Soils Information
- Vegetation Information
- Impervious Area Analysis

Precipitation Analysis

Soils Information

Vegetation Information

Impervious Area Analysis

APPENDIX B
Drainage Calculations

This Section Contains:

- Existing Condition Analysis
- Proposed Condition Analysis

Existing Condition Analysis

Proposed Condition Analysis

Proposed Detention Analysis