PRELIMINARY DRAINAGE STUDY
FOR
PHAP VOUNG MONASTERY
715 VISTA AVENUE
ESCONDIDO, CA 92026

COUNTY OF SAN DIEGO
PDS2014-MUP-14-010

FIRST SUBMITTAL: JULY, 2016
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Prepared For:

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Prepared By: DP, SDD

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DECLARATION OF RESPONSIBLE CHARGE

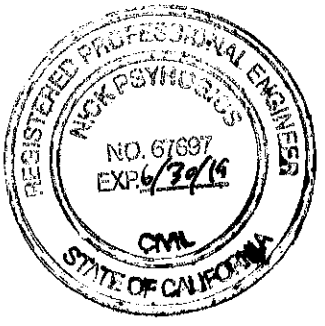
I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE CALIFORNIA BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT CITY OF VISTA STANDARDS. I AGREE THAT THE WORK PERFORMED BY ME COMPLIES WITH GENERALLY ACCEPTED STANDARDS AND PRACTICES OF MY TRADE OR PROFESSION. I FURTHER AGREE THAT THE WORK PERFORMED HEREIN IS IN ACCORDANCE WITH THE RULES AND REGULATIONS REQUIRED BY THE CITY OF VISTA. I AGREE THAT PLAN CHECK OR REVIEW OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF VISTA, IN ITS CAPACITY AS A PUBLIC ENTITY FOR THE PLANS PREPARED BY ME, IS CONFINED TO A REVIEW ONLY AND IS NOT A DETERMINATION BY THE CITY OF VISTA OF THE TECHNICAL SUFFICIENCY OR ADEQUACY OF THE PLANS OR DESIGN AND THEREFORE DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR THE PLANS OR DESIGN OF IMPROVEMENTS BASED THEREON.

I AGREE TO INDEMNIFY AND HOLD HARMLESS THE CITY OF VISTA, ITS OFFICERS, AGENTS, AND EMPLOYEES FROM PROPERTY DAMAGE OR BODILY INJURY ARISING SOLELY FROM NEGLIGENT ACTS, ERRORS, OR OMISSIONS OF THE ENGINEER, ITS AGENTS, OR ITS EMPLOYEES, ACTING WITHIN THE COURSE AND SCOPE OF SUCH AGENCY AND EMPLOYMENT, AND ARISING OUT OF THE WORK PERFORMED BY ME.

6/8/18

NICK PSYHOGIOS, PE DATE

C67697



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1. PROJECT DESCRIPTION

This purpose of this drainage study is to provide a hydrologic analysis for the proposed development for the Phap Vuong Monastery. This report has been prepared as part of the project's major use permit package being processed through the County of San Diego. The analysis contained herein will be used to size storm drain systems and detention basins on-site. The analysis of both existing and proposed site drainage conditions are contained in this report.

The subject property consists of approximately 8.9 acres and is located on the southwest corner of Vista Avenue and North Ash Street in an unincorporated area of Escondido. The jurisdiction of the project is the County of San Diego. The property is located in an RS zone (single-family residential) and is bounded to the north by Vista Avenue, to the east by North Ash, to the south by Hubbard Avenue, and to the west by single-family residential housing. See Vicinity Map in Appendix A.

The property has been previously graded and developed and consists of a dirt parking lot, a paved parking lot, and several structures. An asphalt paved access road is constructed leading from North Ash Street to the existing graded pad and is comprised of approximately 3,300 square feet. All existing structures are located in the northwest corner of the property and are to remain. The project proposes to construct a new monastery structure with two new parking lots (one paved parking area for accessible parking and one paved parking area for standard parking) as well as associated surface improvements consisting of sidewalks, stairs, ramps, small retaining walls, access roads, utilities, and associated grading. The new monastery structure and flatwork consists of an impervious footprint of approximately 18,150 square feet and the new paved accessible parking lot, access road, and associated surface improvements comprise an impervious footprint of approximately 12,650 square feet. The proposed parking area comprises approximately 25,350 square feet. All work to be done is anticipated to be located mostly in the northeast portion of the property. The proposed monastery structure is to be located on the previously graded pad located in the northeast portion of the property. Likewise, the proposed parking lot will be located on the previously graded pad located just south of the new monastery. See Area Map in Appendix B.

2. FEMA 100 YEAR BOUNDDARY

The project site does not propose any building within the 100-year flood hazard area (See exhibit below).

3. EXISTING SITE DRAINAGE CONDITIONS

The existing site flows primarily in two directions: to the northeast towards North Ash Street, and to the northwest towards Vista Avenue. The existing tributary that drains to the northeast is designated as **DMA-E1** and mostly flows towards an existing circular catch basin that is constructed at the northeast corner of the project site.

For the purpose of this report, North Ash Street generally flows northbound and Vista Avenue flows westbound at the project location.

For more information, see Existing Drainage Area Map in Appendix C.

4. PROPOSED SITE DRAINAGE CONDITIONS

The project development proposes little-to-no changes to existing site drainage patterns and outlet points will remain the same; however, the addition of approximately 37,000 square feet of impervious area requires detainment prior to being discharged from the site.

The new parking area will be constructed on the existing graded pad located in the center of the property and will drain primarily northeast towards North Ash Street. This drainage area is designated as proposed drainage area **DMA-P1**. Storm water runoff will be conveyed to proposed bioretention **Basin #1 (IMP #1)**.

As part of accessibility requirements, the project proposes the grading and construction of an accessible parking lot to be located on a separate graded pad just west of the new main parking lot. This proposed parking area, along with the proposed driveway to the parking area, are designated as proposed drainage area **DMA-P2,** and will drain down the driveway to the southeast to proposed bioretention **Basin #2 (IMP #2).**

The new monastery structure and associated improvements will be constructed on the previously graded pad located at the north end of the property. This drainage area is designated as proposed drainage area **DMA-P3**. Storm water runoff from this drainage area will be conveyed to proposed bioretention **Basin #3 (IMP #3)**.

Storm water run-off will be detained in these proposed basins--also called Integrated Management Practices (IMPs)--and percolate through engineered soil mixes before ultimately outletting via private storm drain to the North Ash Street surface drainage system. Overflows will be allowed to “spill over” the basin berms to the east at North Ash Street. Given the general impermeability of the onsite soils, these basins will be equipped with perforated underdrain pipes. Basins/IMPs have been designed to attenuate peak flows and comply with water quality per County of San Diego Hydrology Manual and County of San Diego BMP Design Manual. Additionally 36” pipe will be placed underneath the parking lot for hydromodification purposes. Refer to project-specific Preliminary Priority Development Project Stormwater Quality Management Plan for additional information and discussion of water quality and hydromodification.

For more information see Proposed Drainage Area Map in Appendix D.

5. HYDROLOGIC SETTING

5.1 TOPOGRAPHY

Site elevations range from approximately 729 feet mean sea level (MSL) to approximately 906 feet MSL.

5.2 WATERSHED INFORMATION

The project site is located near the northeastern-most, and upstream, portion of the Escondido Hydrologic Sub-Area of the Carlsbad Watershed. The Carlsbad Watershed is approximately 210 square miles, and the proposed project comprises a very small portion of the watershed.

The proposed storm drain systems that capture the project runoff will ultimately convey into the 36" RCP existing storm drain system within North Ash Street per Dwg no. D-1097, and then discharge into Reidy Canyon Creek located approximately 0.5 miles west of the project, then into Escondido Creek located approximately 1.8 miles south of the project, then into the San Elijo Lagoon located approximately 14.9 miles southwest of the project, before finally discharging to the Pacific Ocean. The San Eligo Lagoon is listed on the 2010 303(d) List for Sedimentation/Siltation, as well as for Eutrophic and Indicator Bacteria pollutants.

Refer to project-specific Preliminary Stormwater Quality Management Plan for additional information and discussion of water quality and hydromodification.

5.3 SOIL CHARACTERISTICS

According to the County of San Diego's *Hydrology Manual*, the project contains soil group C
For more information, see Soil Group Map in Appendix E.

6. METHODOLOGY

6.1 RUNOFF CALCULATIONS

Drainage basins are less than one square mile and therefore runoff was calculated using the Rational Method as outlined in chapter 3 of the County of San Diego Hydrology Manual. The Rational Method is given by the following equation:

$Q = C \times I \times A$

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)

Soil Type - Hydrologic soil group C was assumed for all areas consistent with the County Hydrology Manual. Soils have slow infiltration rate when thoroughly wetted; chiefly soils that have layer impeding

downward movement of water, or moderately fine textured to fine textured soils that have slow infiltration rate when dry. Rate of water transmission is slow.

Runoff coefficient ('C') values – existing or natural areas were assigned a 'C' value of 0.30. Composite 'C' values for developed areas were calculated using the formula below:

C = 0.90 * (% Impervious) + Cp * (1 - % Impervious)

Where:

Cp = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the Soil Group Map in Appendix E.

A hydrologic analysis of the pre- and post-construction conditions of the project site area was performed. Drainage areas to individual inlet points were delineated and then associated runoff coefficients, time of concentrations, intensities and peak flows calculated.

Runoff coefficients were developed using the methodology outline above. Time of concentrations, intensities, peak flows, and detention volumes were calculated as follows.

Since the project site primarily drains by overland surface flow, times of concentration for developed drainage areas were calculated based on initial or overland flow time to each inlet point, for both the pre- and post-development conditions. Initial time or overland flow time was calculated using the following equation:

Ti = [1.8 x (1.1 – C) x L^(1/2)] / S^(1/3)

Where:

Ti = Initial (Overland) time of concentration in minutes

C = Runoff coefficient

L = Length of travel of runoff in feet

S = Slope in percent

For more information refer to the Calculations in Appendix G.

6.2 OVERALL HYDROLOGIC ANALYSIS

Overall hydrologic calculations were performed to analyze pre and post-development peak flow rates to each Study Point. Consistent with the County of San Diego Hydrology Manual, this report analyzes the 50 and 100-year storm events.

Composite 'C' values and time of concentrations were determined to obtain peak flows values for the pre-development and post-development hydrologic conditions.

Rainfall intensities for the 50-year and 100-year storm events were calculated based on the Isopluvial Maps in Appendix F, and is consistent with methods outlined in the San Diego County Hydrology Manual. This method was then used to calculate rainfall intensities from the following equation:

$I = 7.44 \times P_6 \times (Tc^{-0.645})$

Where:

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

P_6 = Rainfall in inches for the 6-hour storm event

Tc = Time of concentration in minutes

This value was then used in conjunction with the other values calculated to compute discharge quantities (Q values) in units of cubic feet per second. See Calculations in Appendix G.

6.3 DETENTION BASIN DESIGN

Summary of discharge values (Q values) for the pre- and post- development conditions are below.

SUMMARY TABLE							
PRE-CONDITION "EXISTING"							
DMA (BASIN)	**ΔH (ft)**	**L (ft)**	**C**	**Tc (min)**	**I100 (in/hr)**	**AREA (ac)**	**Q100 (Cu.ft/s)**
E1	74	675	0.31	16.6	4.20	4.17	5.4

POST-CONDITION "PROPOSED UN-MITIGATED"							
DMA (BASIN)	**ΔH (ft)**	**L (ft)**	**C**	**Tc (min)**	**I100 (in/hr)**	**AREA (ac)**	**Q100 (Cu.ft/s)**
P1	39	300	0.4	9.3	6.11	1.06	2.6
P2	77	700	0.44	14.1	4.65	2.3	4.7
P3	33	400	0.47	11.2	5.42	1.01	2.6
						TOTAL	**9.9**

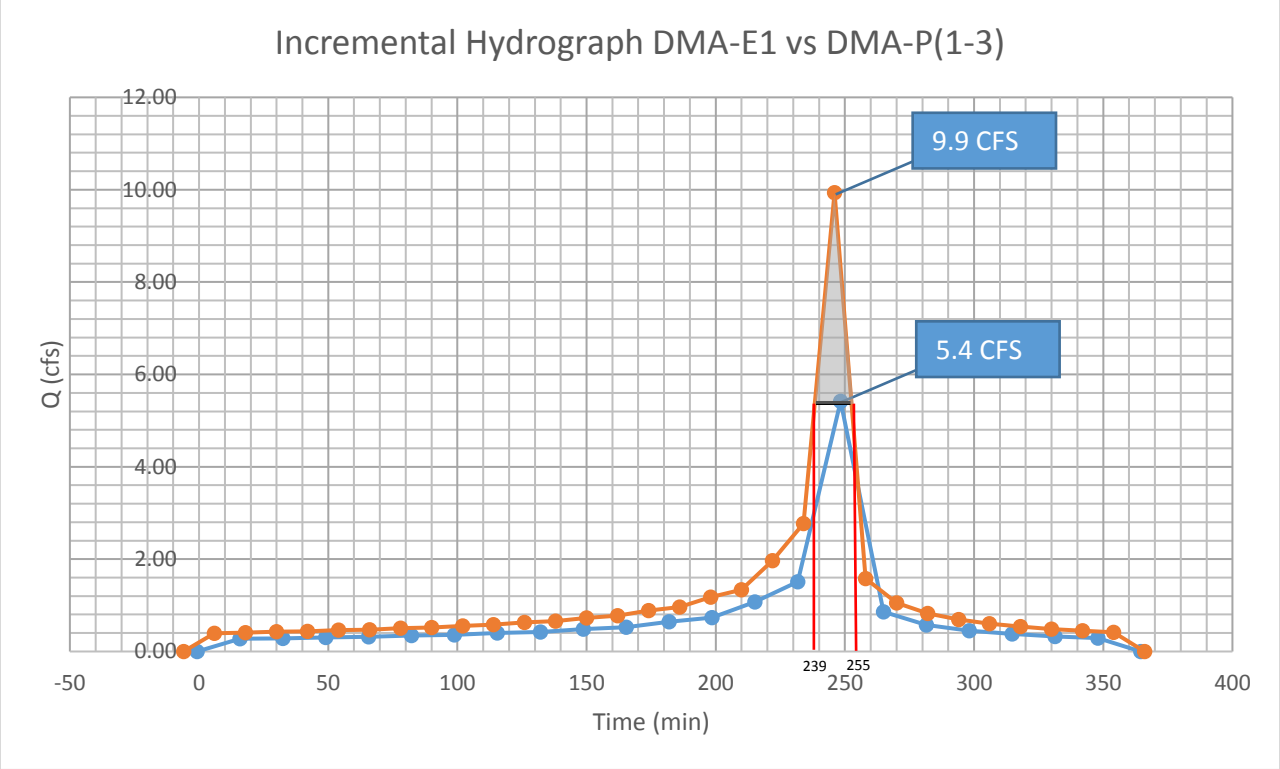
POST-CONDITION "PROPOSED MITIGATED"							
DMA (BASIN)	**ΔH (ft)**	**L (ft)**	**C**	**Tc * (min)**	**I100 (in/hr)**	**AREA (ac)**	**Q100 (Cu.ft/s)**
P1	39	300	0.4	24.06	3.30	1.06	1.40
P2	77	700	0.44	36.77	2.51	2.3	2.54
P3	33	400	0.47	28.93	2.93	1.01	1.39

TOTAL	5.33

*Tcs are increased due to temporary detention on biofiltration basin and underground pipes. See discussion below.

As depicted, the project proposes to increase the total discharge from 5.4 cfs to 9.9 cfs (for the 100-year storm event). The project proposes to incorporate three detention basins to detain the additional 4.5 cfs from the development.

Hydrographs were developed using rainfall distribution as explained in chapter 6 of the County of San Diego Hydrology Manual. Volume required to be detained for flood control purposes is determined by the area between pre-project and post-project hydrographs for the 100-year storm event as shown below.



Volume required for detention = Area between peak flows = Base*Height/2

= (255min -239min)*(60s/min)*(9.9CFS-5.4CFS)/2 = **2,160 CF**

Three proposed basins will have a volume of:

Volume proposed basins = Basin 1 + Basin 2 + Basin 3+ Underground Pipes

= 1,497CF + 3,180CF + 2,143CF + 2,968 CF = **9,788 CF**

Calculations for flood control detention show that the volume proposed for the basins are more than twice of the required volume.

See Proposed Drainage Map in Appendix D and Calculations in Appendix G for more details.

7. CONCLUSION AND SUMMARY

The analysis of the proposed development demonstrates that runoff will be effectively discharged from the site. All future storm drain systems on the property will be designed to convey the 100-year storm event primarily in overland flow and open channel. All pipe capacities are to be greater than the expected flow rates.

The proposed project would not alter the existing drainage pattern of the site or the total area. Furthermore, the proposed project does not alter streams or rivers in any matter. The project does not place any building within the 100-year flood hazard area as shown on the Flood Insurance Rate Map (FIRM).

The proposed land development and increased runoff associated with the future development of the Monastery will be mitigated by the use of detention facilities to match existing conditions. Basins 1, 2, and 3 shall be constructed and maintained in perpetuity as agreed to in the separate project-specific PDP SWQMP and Storm Water Maintenance Agreement (also separate). Basins 1, 2, and 3 will be constructed with this project and will effectively reduce peak flow rates to existing conditions. Overall, the design of storm drain facilities will be completed in accordance with County of San Diego Hydrology Manual requirements and no adverse impacts to adjacent properties and downstream systems are anticipated as a result of this project.