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W.O. 0421

February 18, 2008

Mr. Pete Ehlan
East Beach Ventures
401 East Haley Street
Santa Barbara, CA 93101

Subject: **Supplemental Drainage Evaluation for 210 Meigs Road**

Site: 210 Meigs Road
Santa Barbara, CA

Evaluation Requirements: Planning requires the evaluation of Pre and Post development drainage flows anticipated for a 25 year frequency storm. The City has requested that the off site flows and school flows be evaluated as well. Attachment A shows the contributory areas for each portion of the analysis. Area "A" is the proposed five lot subdivision, Area "B" is the school site and Area "C" is the contributory area of off site flow that will have to be routed through the project. The drainage issues associated with Area "A" are discussed in our August 24, 2007 drainage study, which looked at the drainage and retention requirements for the proposed five lot subdivision. This supplemental drainage evaluation will look at Area "B" the school site and Area "C" the off site contribution to the project. It is intended that the five lot subdivision have its own drainage collection and conveyance system that is independent of other drainage systems for this project.

The City is interested in the evaluation of two issues these are to look at the off site flows coming down Lighthouse Road and an evaluation of retention on the school portion of the project. The evaluation of the school is based on the conceptual layout prepared with the 08/03/07 submittal.

Drainage flowing onto site from Lighthouse Road, Drainage Area "C": The attached aerial topographic mapping dated April 10, 1995 (Attachment A) outlines the contributing area of drainage onto the site.

> Area "C" = 3.24 Ac
> Time of Concentration: 35' vertical, 860' horizontal >> Tc = 4.5min, use 12 minutes
> I = 3.17
> C = 0.72

EXHIBIT O

$$Q = CIA = (0.72)\ (3.17)\ (3.24) = 7.4\ cfs$$

Surface drainage flows down Lighthouse Road from Cliff Drive and from El Faro cul-de-sac onto Lighthouse Road, estimated to total 7.4 cfs. The drainage is currently reduced and intercepted by two grated inlets connected to a 14-inch flex pipe. As stated in the March 24, 2004 Drainage Evaluation, Additional Information, "Off site water quantity will remain unchanged with the proposed development and will not require retention. We recommend removal of the existing collection system at the base of Lighthouse Road and construction of a new collection facility. To convey this flow of water, we recommend an 18-inch storm drain with a minimum grade of 0.5% slope. We recommend two City standard drainage inlets, one located on either side of the street, at the end of Lighthouse Road. The proposed drainage facilities should be located consistent with pedestrian traffic flow so water is intercepted prior to cross walks. The 18" pipe would be extended through the school portion of the project and be used to collect and convey drainage for this lower portion of the project. Drainage will ultimately discharge to Meigs Road, where this drainage has historically gone, to be conveyed in existing drainage facilities.

School Site, Area "B": The existing site has entry drives and parking areas in the Eastern Portion of the area, with much of the western half as undeveloped and unpaved. The proposed site will utilize more of this Western area for offset parking areas.

Existing Drainage Areas
South of Proposed Wall to School Site (unchanged)

Site	Area (sf)	Area (Ac)
Paved Areas	19,520	0.45
Unpaved Areas	33,800	0.77
Total	53,320	1.22

Evaluate Pre-Development Flow: The County of Santa Barbara Flood Control method of hydrology calculations will be used to estimate runoff from the proposed development site.

To calculate this Figure 2 – Time of Concentration will be used estimate the time of concentration for the site. The site has 23' of fall over 550' of travel length. From Figure 2, the Time of Concentration Tc = 3.2 seconds. The County method uses a minimum Time of Concentration of 12 minutes. A **Tc = 12** minutes will be used for this evaluation.

Based on a Time of Concentration of 12 minutes, the rainfall intensity for a 25 year frequency storm is estimated from Figure 3 – Rainfall Intensity for the South Coast. Rainfall Intensity

I = 3.17 inches/hour

The pre-development runoff coefficients are estimated from Figure 4 – Runoff Coefficient for both paved and unpaved areas. From the graph,

| Paved | "Commercial" value | C=0.76 |
| Unpaved | "South Coast Agriculture" value | C=0.68 |

Using the rational method to estimate runoff flow of Q = CIA the following table estimate the flow for each lot and total flow from the development.

Pre-development Runoff

Site	Runoff Coeff.	Rainfall Intensity	Area (Ac)	Runoff Q (cfs)
Paved	0.76	3.17	0.45	1.08
Unpaved	0.68	3.17	0.77	1.66
Total	~	~		2.74

Evaluate Post-Development Flow: The County of Santa Barbara Flood Control method of hydrology calculations will be used to estimate runoff from the proposed development site.

To calculate this Figure 2 – Time of Concentration will be used estimate the time of concentration for the site. The site has 23' of fall over 550' of travel length. From Figure 2, the Time of Concentration Tc = 3.2 seconds. The County method uses a minimum Time of Concentration of 12 minutes. A **Tc = 12** minutes will be used for this evaluation.

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| Paved | "Commercial" value | C=0.76 |
| Unpaved | "South Coast Agriculture" value | C=0.68 |

Using the rational method to estimate runoff flow of Q = CIA the following table estimate the flow for each lot and total flow from the development.

Post-development Runoff

Site	Runoff Coeff.	Rainfall Intensity	Area (Ac)	Runoff Q (cfs)
Paved	0.76	3.17	0.82	1.98
Unpaved	0.68	3.17	0.40	0.86
Total	~	~		2.84

On-site Retention: If the City requires that this project retain the difference of the pre-development flow and the post-development flow on site, the following estimates the required volume of storage required on-site to meet this requirement. The difference in flow is:

Q post – Q pre = Q ret

2.84 cfs –2.74 cfs = 0.10 cfs

Estimate the volume of storage required to reduce the offsite flow to pre-development condition. Required storage is estimated in Figure 5 – Retention Storage Volume and based on that figure is estimated at 162 cubic feet. **V = 162 cubic feet**. This volume can be accommodated with a 3 foot diameter pipe 20 feet long or an open basin of equivalent volume plus free board.
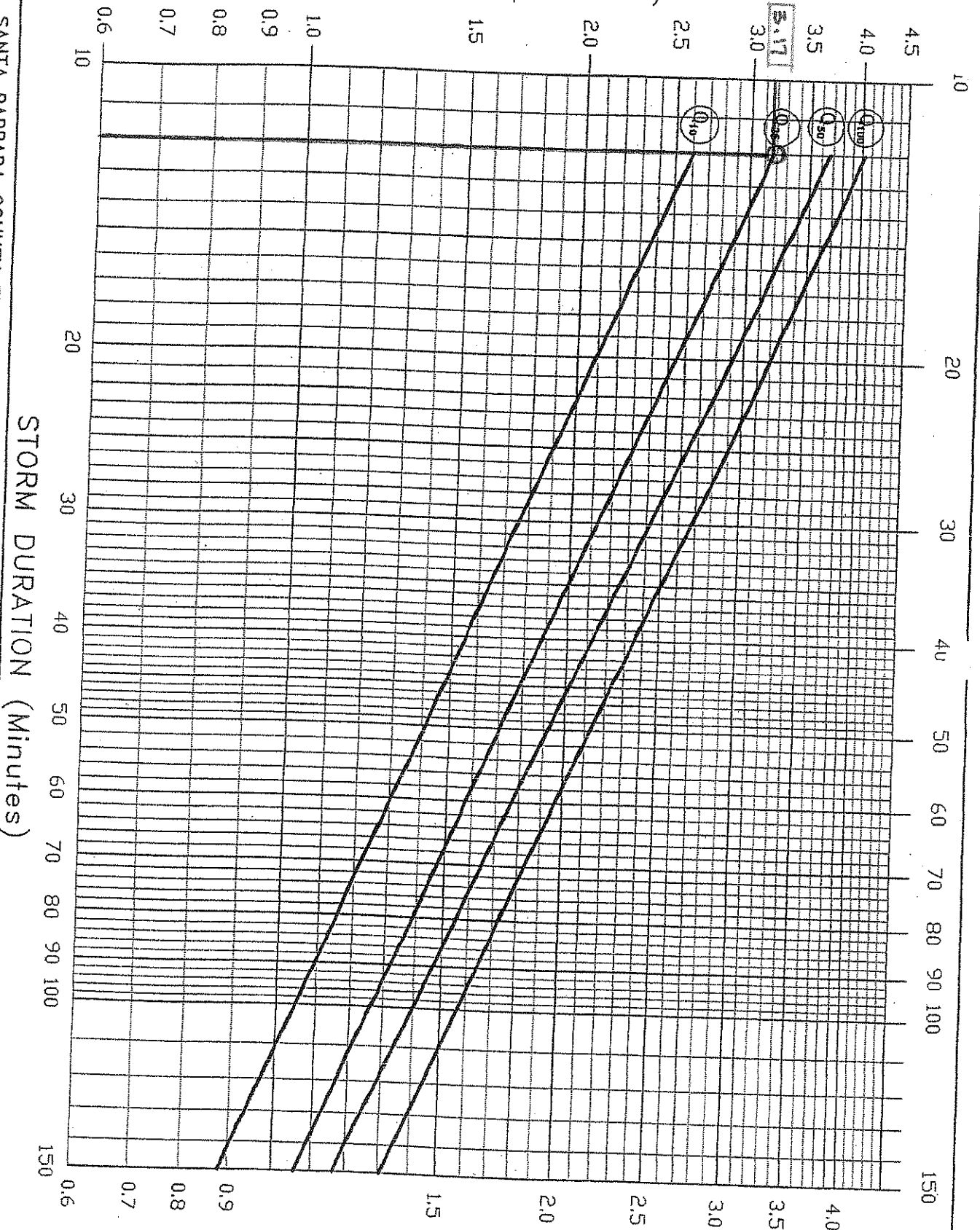
Sincerely,
FLOWERS & ASSOCIATES, INC.

By: _____
Eric L. Flavell, P.E.
Vice President

0421WSDrainageStudy_20080201.doc

AREA	AREA (SF)	AREA (Ac)
A	50,732	1.16 Ac
B	53,320	1.22 Ac
C	142,000	3.24 Ac

CLIFF DRIVE

EL FARO

LIGHTHOUSE ROAD

MEIGS

WASHINGTON ELEMENTARY SCHOOL

Asphalt Playground

Baseball Field

LA MESA PARK

MEIGS ROAD
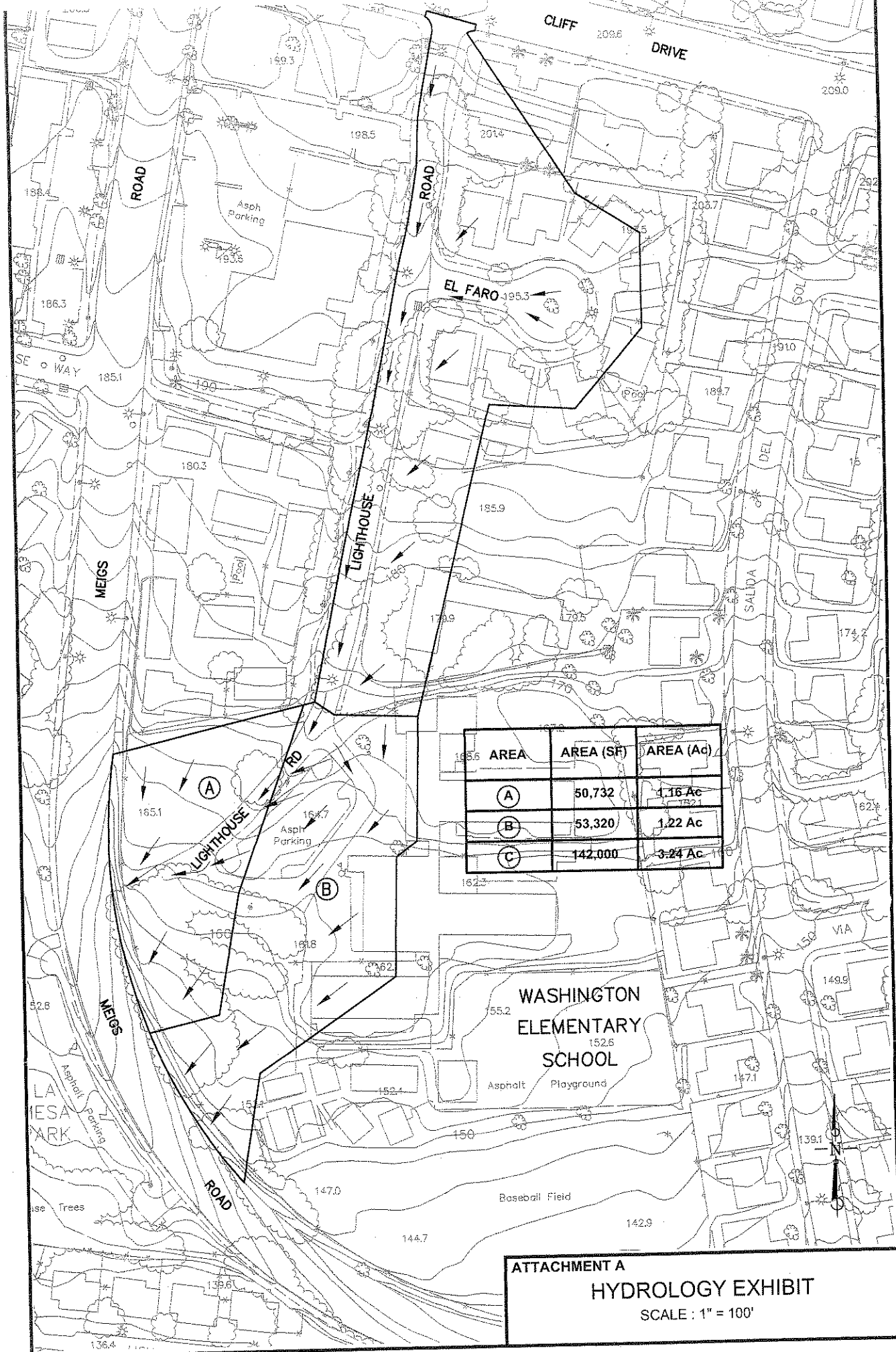
ATTACHMENT A

HYDROLOGY EXHIBIT

SCALE : 1" = 100'

RAINFALL INTENSITY
(inches per hour)

South Coast

RAINFALL INTENSITY-DURATION CURVES

SANTA BARBARA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Feb. 25, 2004

SHEET 5 OF 6

Approved by:

FLOOD CONTROL DISTRICT / DATE

3/2/04

FIGURE 3 - RAINFALL INTENSITY
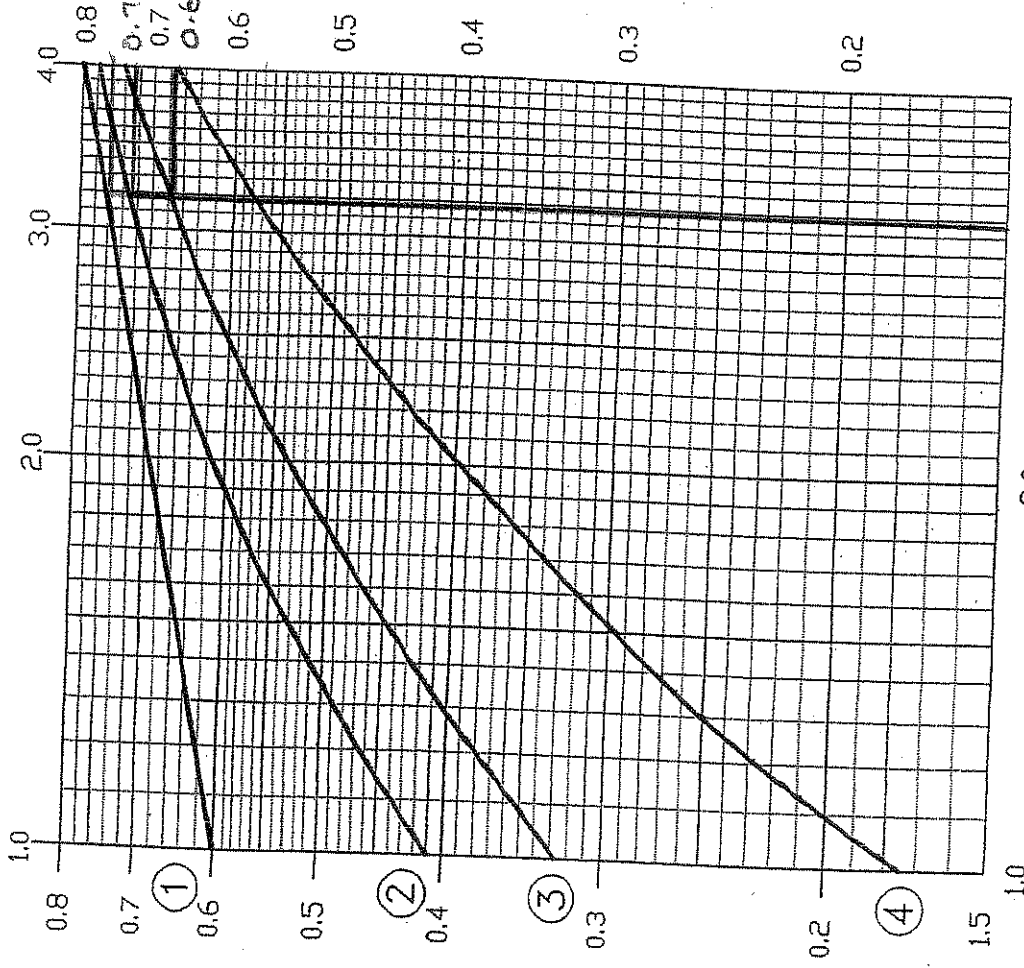
LEGEND

①	COMMERCIAL
②	SOUTH COAST SINGLE FAMILY*
③	NORTH COUNTY SINGLE FAMILY,* SOUTH COAST AGRICULTURE
④	NORTH COUNTY AGRICULTURE

* Single family lots with an average of 10,000 sq. ft. or more, interpolate between Single Family and Agriculture.

RUNOFF COEFFICIENTS

RAINFALL INTENSITY
(inches per hour)

"% PAVED

POST 0.72
PRE 0.68 UNPAVED

0.8
0.72
0.7
0.68
0.6
0.5
0.4
0.3
0.2

3.17

1.0 2.0 3.0 4.0

① 0.6
② 0.4
③ 0.3
④ 0.2

0.8
0.7
0.5
1.0
1.5

FIGURE 4   RUN-OFF COEFFICIENTS

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CIVIL ENGINEERS
500 E. Montecito Street
Santa Barbara, CA 93103
Telephone (805) 966-2224
Fax (805) 965-3372

By _____

Date _____

Chkd. By _____

Date _____

W.O. # _____

Ref. _____

_____

Sht. _____ of _____

$$V = (Q_{POST} - Q_{PRE})\ 3 T_C\ (\tfrac{1}{2})$$
$$\frac{}{(60\ \text{sec/min})(K)} \qquad K=1.5$$

$$V = (2.84 - 2.74)(3)(12)(\tfrac{1}{2})(60)(1.5)$$

$$V = 162.0\ CF$$
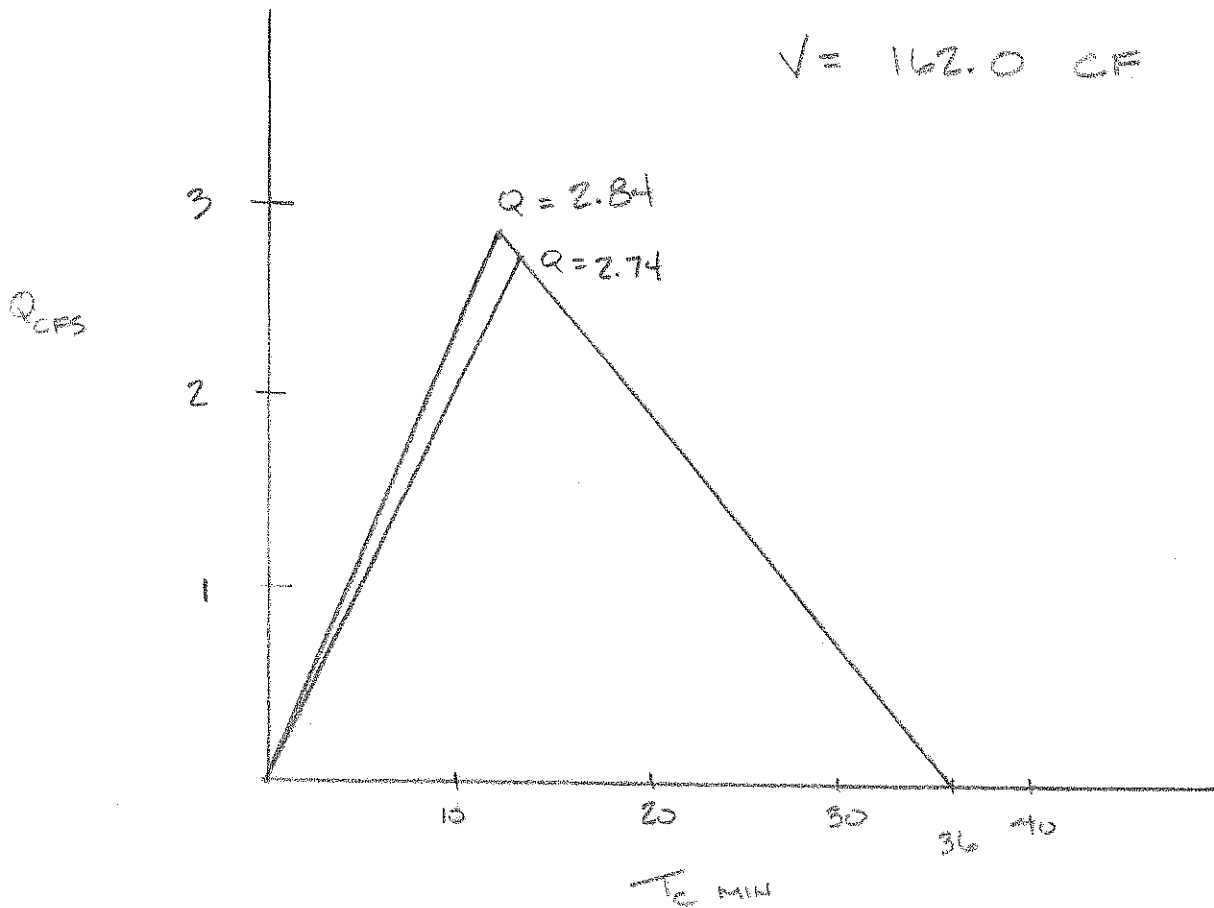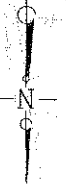

FIGURE 5 RETENTION STORAGE VALUE

SCALE : 1" = 30'

CONCEPTUAL DRAINAGE SYSTEM
MULTI-FAMILY RESIDENTIAL PROJECT
210 MEIGS ROAD
SANTA BARBARA, CA 93101

HYDROLOGY EXHIBIT

SCALE : 1" = 100'