Appendix E.2 Hydrology Report

kpff *Consulting Engineers*

HYDROLOGY STUDY

HARVARD-WESTLAKE SCHOOL
PARKING STRUCTURE

3700 Coldwater Canyon
Studio City, CA 91604
KPFF Job # 109046

April 10, 2015

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I. INTRODUCTION

The project consists of the design and construction of a new parking structure with an athletic field for Harvard-Westlake School at 3700 Coldwater Canyon Avenue, in Studio City, California. The new parking structure will be on the west side of Coldwater Canyon Avenue and will be connected to the existing campus via a pedestrian bridge that will span over Coldwater Canyon Avenue. A new athletic field and small facilities building will be included on the top level of the parking structure.

The project includes reconfiguration of the existing main campus entrance on the east side of Coldwater Canyon Avenue, as required to accommodate the pedestrian bridge access tower and reconfigured entrance roadway.

II. HYDROLOGY

The drainage area tributary to the project site is approximately 15.34 acres. The site is on an ascending hill with areas of steep and gradual slopes, which generally sloped from southwest to northeast direction. The drainage area is currently composed of natural landscape, driveways, small building facilities and exposed soil. The existing drainage area is approximately 90-95 % pervious while the proposed drainage area is approximately 86% pervious and 14% impervious. The existing runoff drains towards the northeast direction to Coldwater Canyon Avenue (see attached Exhibits 1 and 2).

With the construction of the parking structure, new athletic field and small facilities building, the proposed drainage system of the area is described as follows:

The surface runoff will be collected at multiple points through catch basins with filter inserts. The runoff generated from the exposed surfaces will be collected by drains and directed into flow-through planters. The flow-through planters are sized to treat the first flush volume of storm water, which is the greater of the first 0.75 inches of rainfall and the 85^{th} percentile rainfall both multiplied by a factor of 1.5. The factor of 1.5 is a result of the infeasibility of infiltration due to the hillside grading ordinance. Flow-through planters are designed to treat and detain runoff without allowing seepage into the underlying soil. Pollutants are removed as the runoff passes through the soil layer and is collected in an underlying layer of gravel or drain rock. A perforated pipe underlain is piped to a storm drain which outlets to the street via 4" curb drain.

It is anticipated that in post construction, the new structure will not only help secure the previously exposed soil and natural landscaped areas from potential mudslides, but could also help slow high stormwater runoff flows from the adjacent hillside to Coldwater Canyon Avenue, especially during large storm events such as the Los Angeles County Capitol Flood 50 year storm. The new structure and supporting storm water management system infrastructure provide additional flood control and mudslide protection to Coldwater Canyon Avenue. Part of the mudslide infrastructure is a debris basin which is proposed to collect and provide temporary storage for 400 cubic yards per acre of mud/debris to meet Los Angeles Public - Building Code 2002-064. The debris basin is currently estimated to provide temporary storage for close to 8 acres. The area tributary to the basin is 7.38 acres. At the north end of the project, a swale to carry 10 cubic feet per second per acre is provided which will mitigate the supplementary required debris flow of 42.5 cubic feet per second. The swale to convey the supplementary debris flow has a capacity of 51.53 cubic feet per second at the flattest section with a slope of 4% (see attached Exhibits 3 and 4).

Deflection walls have been added at the northwest corner of the parking structure. The walls are slanted at 30 degree angle to the adjacent contours to assist in directing mud/debris into the debris channel.

III. METHODOLOGY

Except where specified elsewhere in this report, the procedures, criteria, and standards as set forth in the Los Angeles County Hydrology Manual are utilized to perform pre and post construction hydrology study. See Appendix C and D for the calculation results.

Los Angeles County TC Calculator based on the Rational Method has been used to compute the peak runoff at pre-determined design points. The runoff analysis is based on the proposed land use, topographic features and proposed grading for the area. The average land slopes and runoff coefficients were used for computing the peak runoff.

The runoff equation for the Rational Method is as follows:

$$Q = CIA$$

Where:

Q = Peak runoff rate (CFS)

C = Runoff coefficient

I = Average rainfall intensity (in/hr)

A = Drainage area (acres)

IV. SUPPORT DOCUMENTS

The following documents were used to prepare this report:

a. The drainage areas are determined using the topographic survey for the project site as well as publically available topographic maps for tributary run-on areas. The topographic survey was provided by Iacobellis and Associates, Inc dated July 1, 2009 and public information was obtained using Google Earth Pro.
b. The extent of project development is based on the site plan provided by Innovative Design Group dated October 7, 2014

V. RESULTS & CONCLUSIONS

Using the Rational Method per Los Angeles County Hydrology Manual, the calculated 50, 25, 10, and 2 year storm pre-construction runoff rates are approximately 60, 52, 38, and 11 cfs respectively. The calculated 50, 25, 10, and 2 year storm post-construction runoff rates are approximately 60, 52, 39, and 15 cfs respectively. The resulting flows indicate that the proposed development will not affect the runoff rates before and after the construction for 50 and 25 year storm events. For smaller storm frequency of 10 and 2 year, it shows a slight increase in runoff due to the increase in impervious surfaces. However, the peak mitigated runoff and volume from the proposed development areas will be captured and treated by appropriate Best Management Practices (BMPs) before discharging into the road. Refer to the project Low Impact Development (LID) for details.

EXHIBIT 1

PRE-DEVELOPMENT DRAINAGE AREAS

HARVARD-WESTLAKE SCHOOL PARKING STRUCTURE

EXHIBIT 1 - PRE-DEVELOPMENT DRAINAGE AREAS
04/10/15

SCALE: 1"=50'

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EXHIBIT 2

POST-DEVELOPMENT DRAINAGE AREAS

HARVARD-WESTLAKE SCHOOL PARKING STRUCTURE

EXHIBIT 2 - POST-DEVELOPMENT DRAINAGE AREAS
04/10/15

SCALE: 1"=50'

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EXHIBIT 3

PRELIMINARY GRADING PLAN

HARVARD-WESTLAKE SCHOOL PARKING STRUCTURE

EXHIBIT 3 - PRELIMINARY GRADING PLAN

04/10/15

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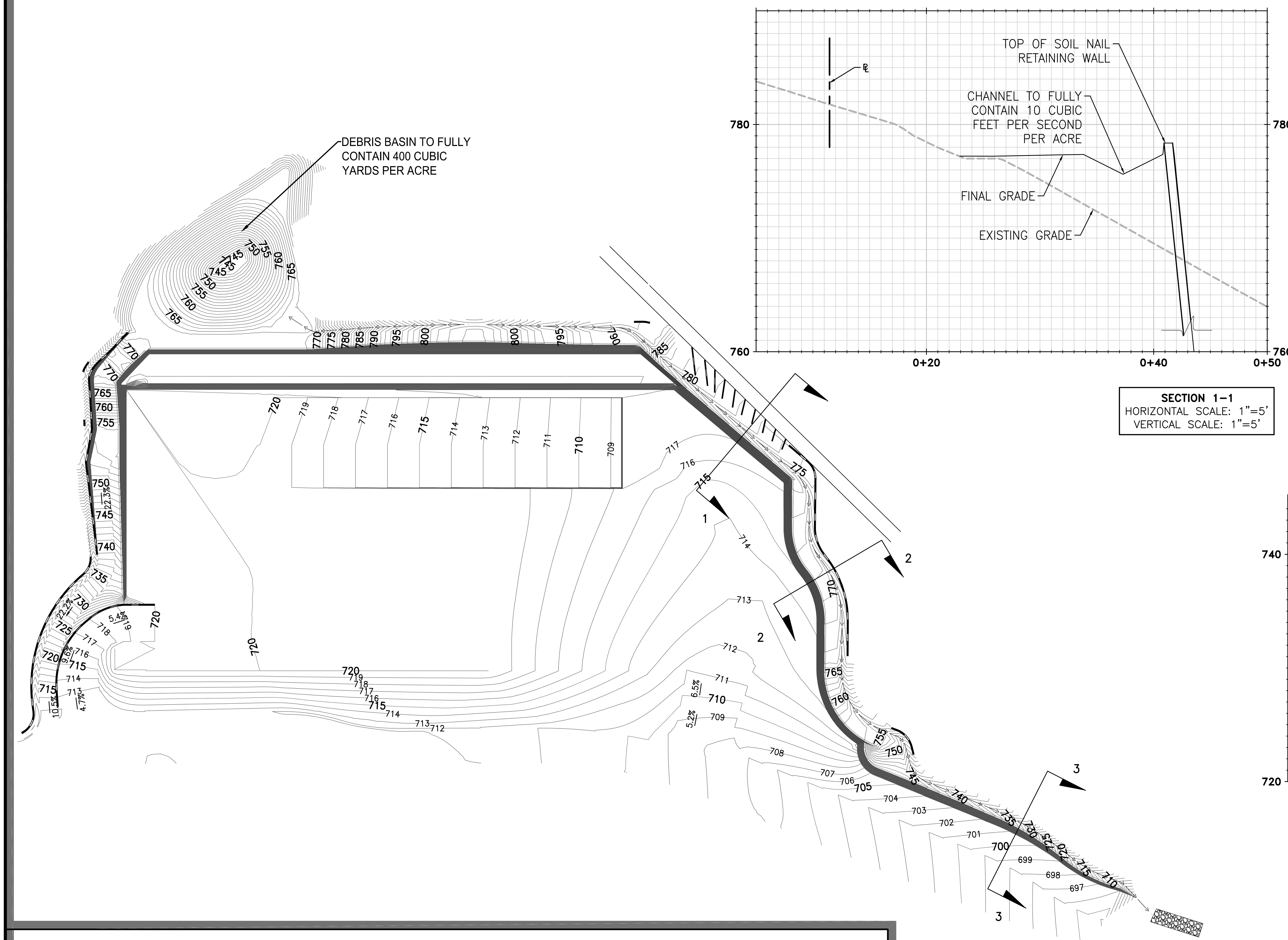
EXHIBIT 4

SECTIONS



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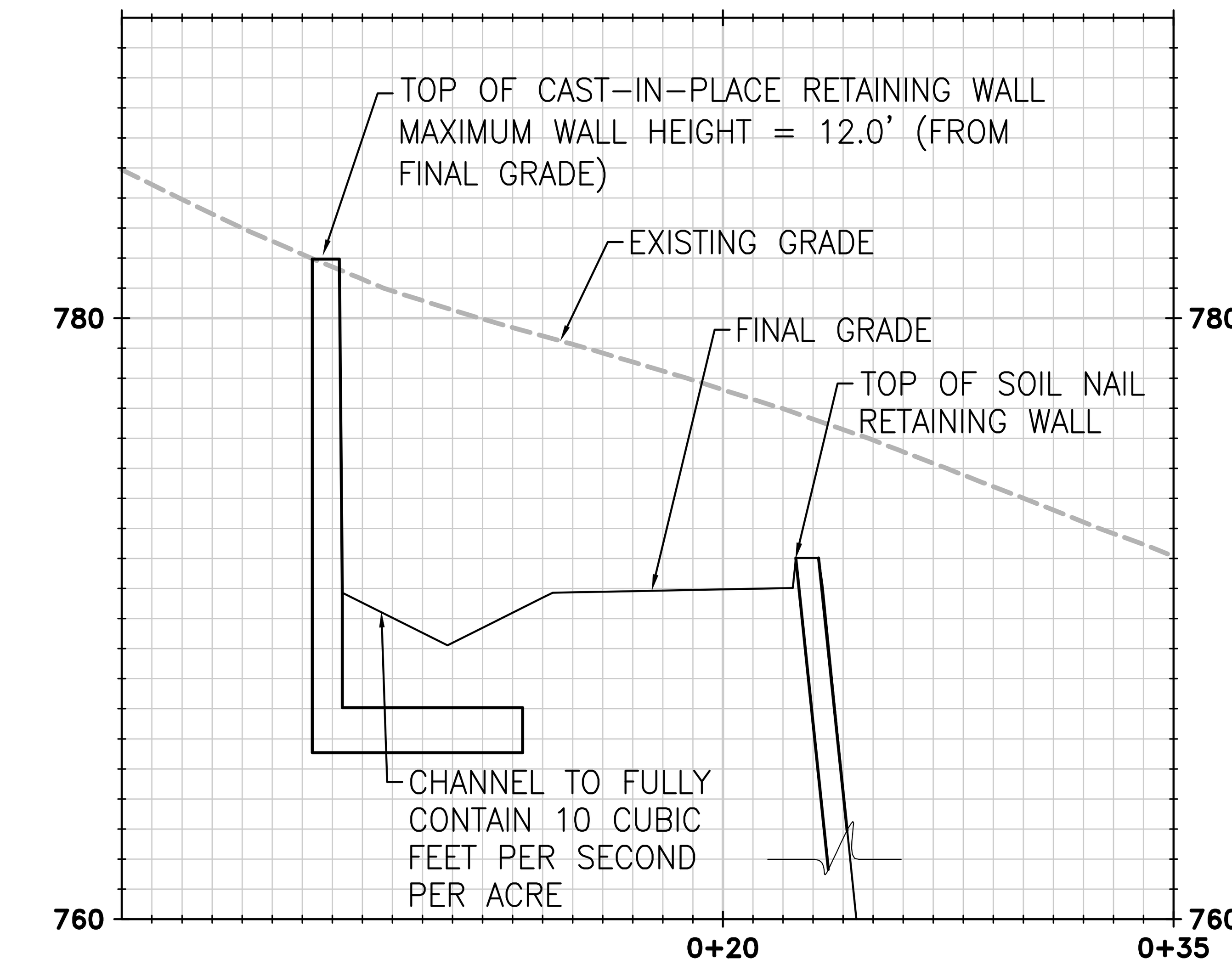
HORIZONTAL SCALE: 1"=5'
VERTICAL SCALE: 1"=5'



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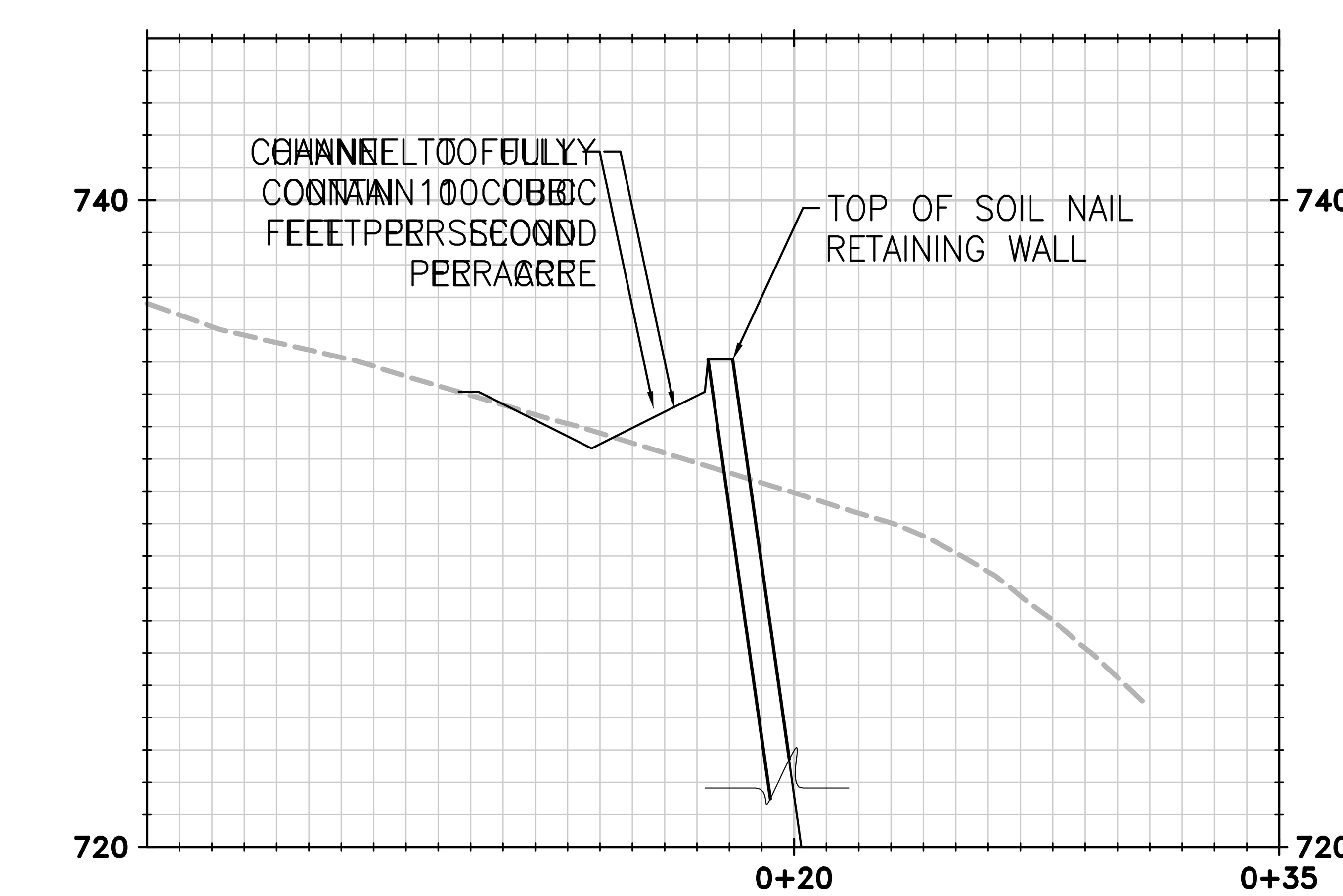
VERTICAL SCALE: 1"=5'



SECTION 3–3
HORIZONTAL SCALE: 1"=5'
VERTICAL SCALE: 1"=5'

HARVARD-WESTLAKE SCHOOL
PARKING STRUCTURE

EXHIBIT 4 - SECTIONS

04/10/15

0 20' 40'
SCALE: 1"=40'

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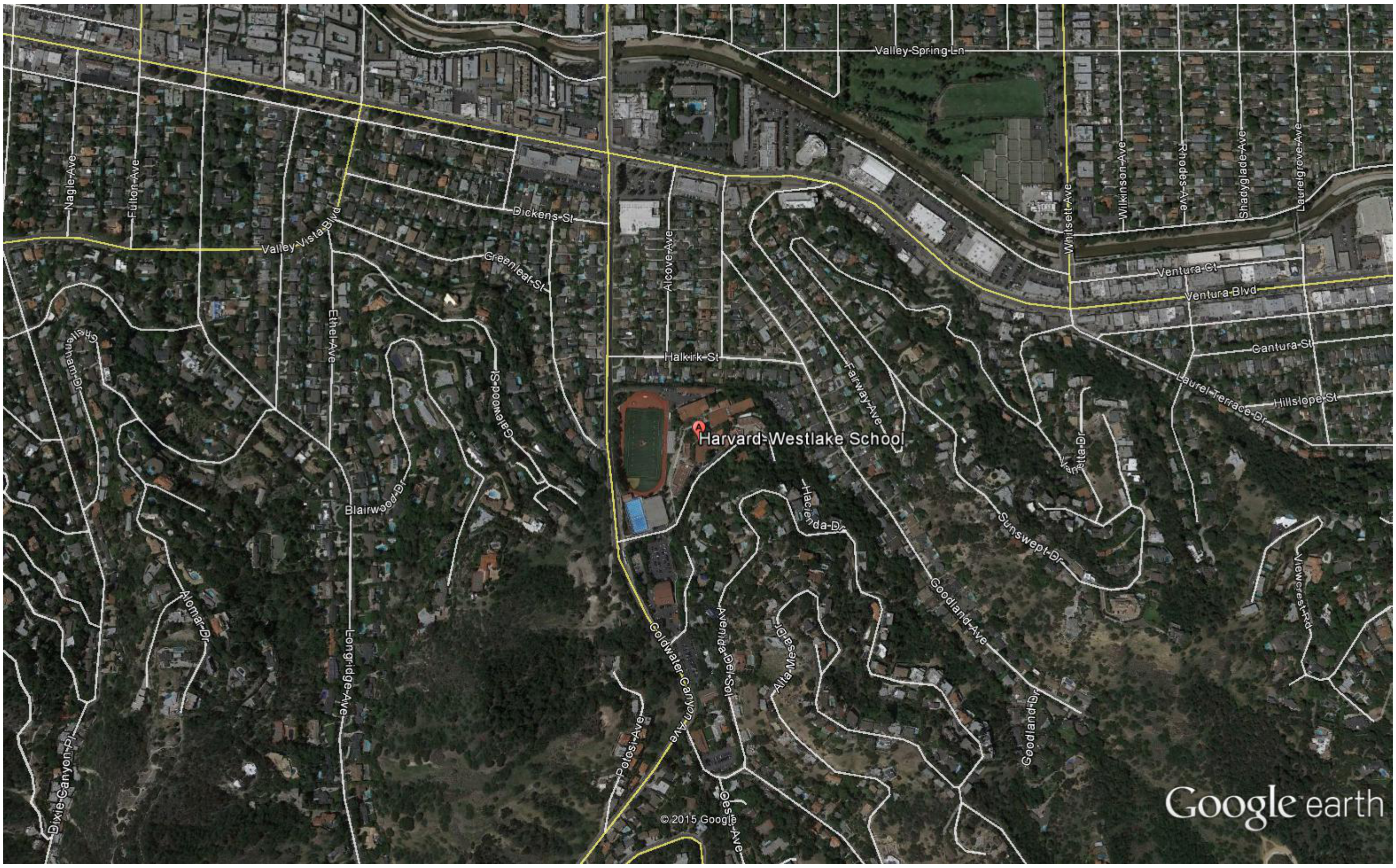
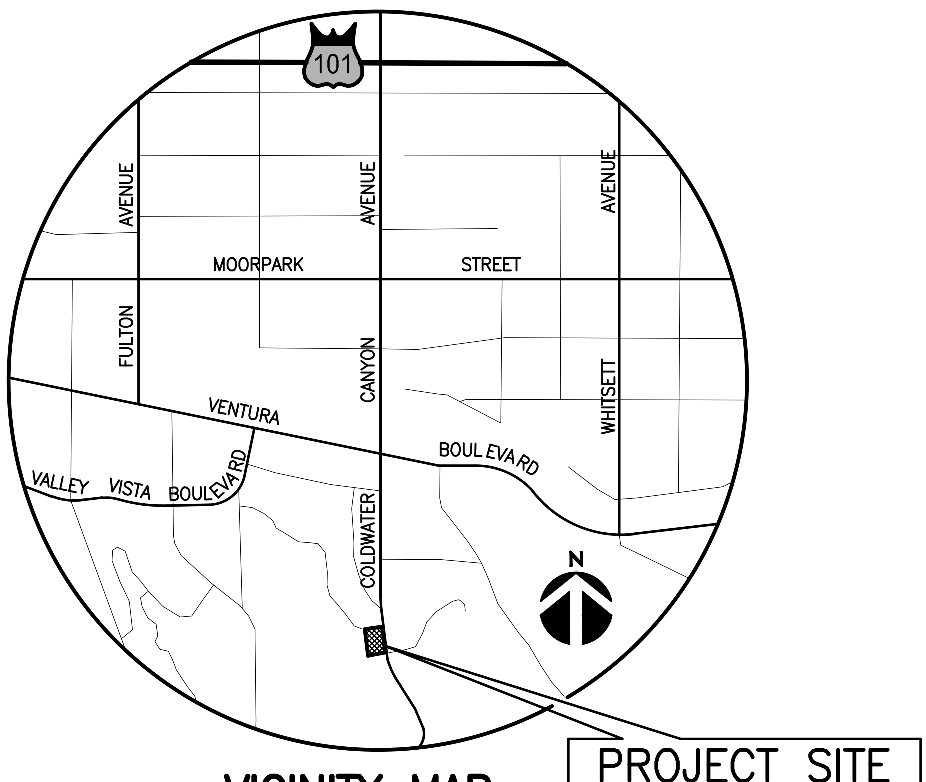
Appendix “A”

Vicinity Map





VICINITY MAP

NOT TO SCALE

THOMAS GUIDE **LOS ANGELES** EDITION

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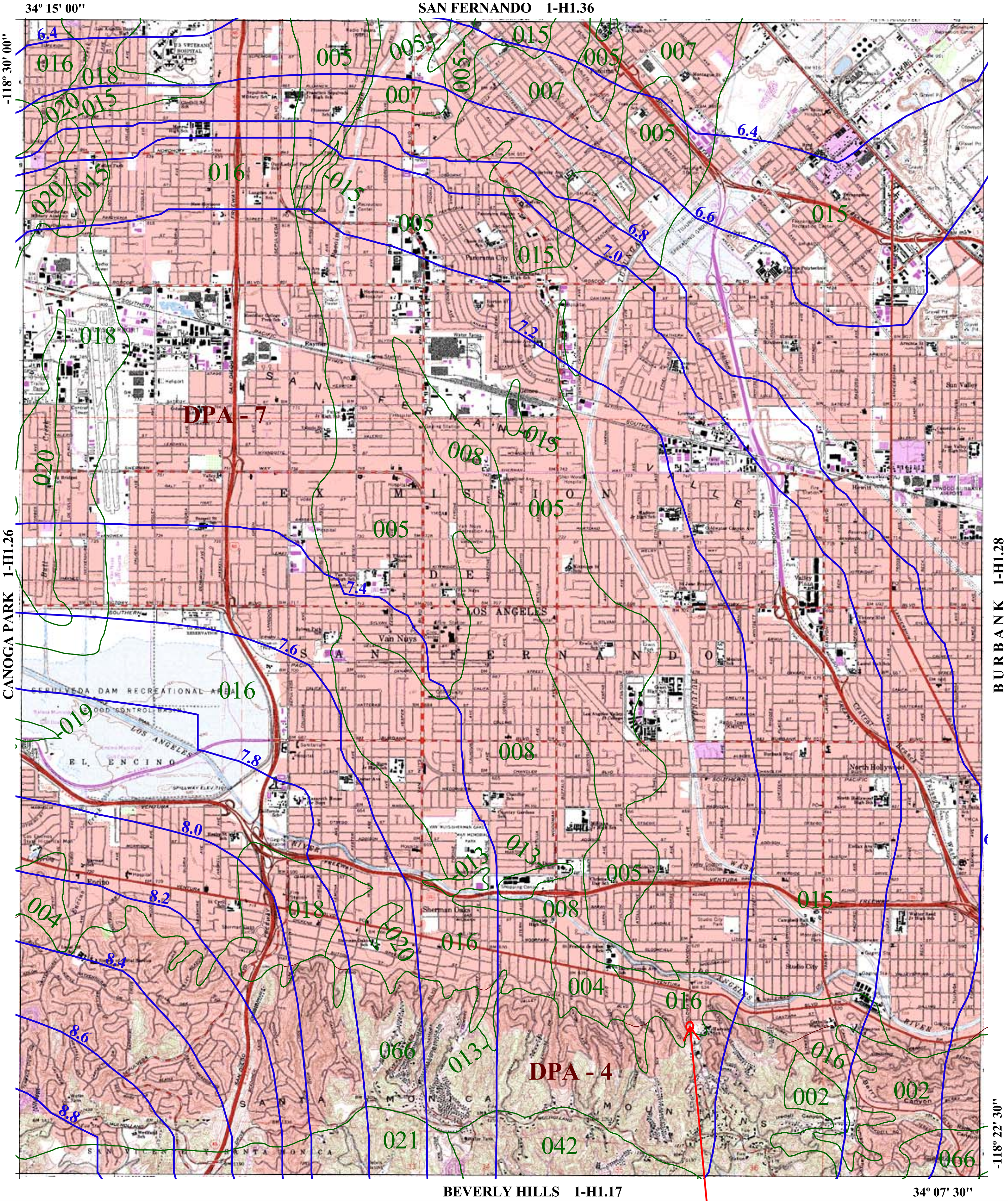
Appendix "B"

Los Angeles County 50-year 24-hour Isohyet



1 0 1 2 Miles

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878

10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

PROJECT SITE

VAN NUYS
50-YEAR 24-HOUR ISOHYET

1-H1.27

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

Appendix “C”

Pre-Construction Hydrology Calculation

(50 years, 25 years, 10 years, and 2 years)

Summary of TC - Calculator Results
Existing

2 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	9.36	0	2	16	980	0.5	2.8	12	1.11	0.57	0.57	5.92	0.31
2	4.65	0	2	16	615	0.36	2.8	9	1.27	0.61	0.61	3.6	0.15
3	1.34	0	2	16	240	0.5	2.8	5	1.67	0.7	0.7	1.57	0.04
											∑	11.09	0.5

10 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	9.36	0	10	16	980	0.5	5.2	6	2.85	0.84	0.84	22.41	0.73
2	4.65	0	10	16	615	0.36	5.2	5	3.1	0.85	0.85	12.25	0.37
3	1.34	0	10	16	240	0.5	5.2	5	3.1	0.85	0.85	3.53	0.11
											∑	38.19	1.21

25 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	9.36	0	25	16	980	0.5	6.4	5	3.82	0.89	0.89	31.82	1.02
2	4.65	0	25	16	615	0.36	6.4	5	3.82	0.89	0.89	15.81	0.51
3	1.34	0	25	16	240	0.5	6.4	5	3.82	0.89	0.89	4.56	0.15
											∑	52.19	1.68

50 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	9.36	0	50	16	980	0.5	7.25	5	4.33	0.9	0.9	36.48	1.25
2	4.65	0	50	16	615	0.36	7.25	5	4.33	0.9	0.9	18.12	0.62
3	1.34	0	50	16	240	0.5	7.25	5	4.33	0.9	0.9	5.22	0.18
											∑	59.82	2.05

Appendix “D”

Post-Construction Hydrology Calculation

(50 years, 25 years, 10 years, and 2 years)

Summary of TC - Calculator Results
Proposed

2 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	0.67	0	2	16	180	0.5	2.8	5	1.67	0.7	0.7	0.79	0.02
2	3.58	0	2	16	365	0.6	2.8	6	1.53	0.68	0.68	3.73	0.11
3	7.38	0	2	16	665	0.2	2.8	11	1.15	0.58	0.58	4.92	0.24
4	1.92	100	2	16	215	0.02	2.8	6	1.53	0.68	0.9	2.65	0.4
5	0.17	0	2	16	90	0.65	2.8	5	1.67	0.7	0.7	0.2	0.01
6	0.34	15	2	16	110	0.6	2.8	5	1.67	0.7	0.9	0.52	0.07
7	0.44	0	2	16	25	0.05	2.8	5	1.67	0.7	0.7	0.51	0.01
8	0.84	20	2	16	70	0.05	2.8	5	1.67	0.7	0.9	1.26	0.17
											∑	14.58	1.03

10 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	0.67	0	10	16	180	0.5	5.2	5	3.1	0.85	0.85	1.77	0.05
2	3.58	0	10	16	365	0.6	5.2	5	3.1	0.85	0.85	9.44	0.28
3	7.38	0	10	16	665	0.2	5.2	6	2.85	0.84	0.84	17.67	0.58
4	1.92	100	10	16	215	0.02	5.2	5	3.1	0.85	0.9	5.37	0.74
5	0.17	0	10	16	90	0.65	5.2	5	3.1	0.85	0.85	0.45	0.01
6	0.34	15	10	16	110	0.6	5.2	5	3.1	0.85	0.9	0.96	0.13
7	0.44	0	10	16	25	0.05	5.2	5	3.1	0.85	0.85	1.15	0.03
8	0.84	20	10	16	70	0.05	5.2	5	3.1	0.85	0.9	2.33	0.32
											∑	39.14	2.14

25 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	0.67	0	25	16	180	0.5	6.4	5	3.82	0.89	0.89	2.29	0.07
2	3.58	0	25	16	365	0.6	6.4	5	3.82	0.89	0.89	12.18	0.39
3	7.38	0	25	16	665	0.2	6.4	5	3.82	0.89	0.89	25.09	0.81
4	1.92	100	25	16	215	0.02	6.4	5	3.82	0.89	0.9	6.61	0.92
5	0.17	0	25	16	90	0.65	6.4	5	3.82	0.89	0.89	0.59	0.02
6	0.34	15	25	16	110	0.6	6.4	5	3.82	0.89	0.9	1.18	0.16
7	0.44	0	25	16	25	0.05	6.4	5	3.82	0.89	0.89	1.48	0.05
8	0.84	20	25	16	70	0.05	6.4	5	3.82	0.89	0.9	2.87	0.4
											∑	52.29	2.82

50 - Year Storm													
Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calc. (min.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (acre-ft)
1	0.67	0	50	16	180	0.5	7.25	5	4.33	0.9	0.9	2.62	0.09
2	3.58	0	50	16	365	0.6	7.25	5	4.33	0.9	0.9	13.97	0.48
3	7.38	0	50	16	665	0.2	7.25	5	4.33	0.9	0.9	28.76	0.99
4	1.92	100	50	16	215	0.02	7.25	5	4.33	0.9	0.9	7.5	1.04
5	0.17	0	50	16	90	0.65	7.25	5	4.33	0.9	0.9	0.67	0.02
6	0.34	15	50	16	110	0.6	7.25	5	4.33	0.9	0.9	1.34	0.19
7	0.44	0	50	16	25	0.05	7.25	5	4.33	0.9	0.9	1.7	0.06
8	0.84	20	50	16	70	0.05	7.25	5	4.33	0.9	0.9	3.26	0.45
											∑	59.82	3.32