

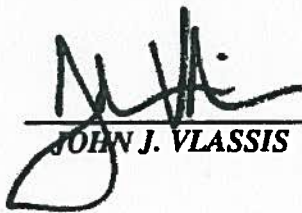
**STANDARD URBAN STORMWATER
MITIGATION PLAN (SUSMP)**

FOR

TENTATIVE TRACT MAP NO. 71742

**HARDY Engineering, Inc.
1552 Eighteenth Street
Santa Monica, CA 90404**

Prepared under the Supervision of:



JOHN J. VLASSIS

RCE 49830

EXP. 9/30/2014

DATE: 3-27-14

1. Introduction

1.1. Site Description

The subject property is located along the south side of Agoura Road approximately 200 feet from the westerly City Boundary in the City of Agoura Hills. The site is presently two undeveloped parcels totaling 7.1 acres that generally drains in a northerly direction with two natural drainage courses that cross Agoura Road with storm drains maintained by Los Angeles County.

Two senior apartment buildings are proposed for the site with graded pads, parking lots and driveways serving each of the two building. The graded pads are designed to avoid the natural drainage courses. The onsite runoff will be treated with a combination of infiltration basins and bioswales with the remaining outflow joining the existing natural drainage courses via the bioswales.

1.2. Regularity Jurisdiction

The area of the study site is under the jurisdiction of the City of Agoura Hills Department of Public Works. All values are calculated in accordance with the Los Angeles County Department of Public Works hydrological standards.

1.3. Watershed Hydrology Study

The main scope of this study is to determine the runoff and stormwater quality treatment volumes for each of the two sites.

The hydrology methodology will be the new modified rational method by the Los Angeles County Department of Public Works (LACDPW), Land Development Division. The computer program performing the calculations is LAR04, which is a text-based implementation of the modified rational method similar to F0601. LACDPW also provided a program to calculate time of concentration called TC-Calculator.

1.4. Hydrology Data

Site Area:	7.09 Acres
Frequency:	50-Year storm
Soil Classification:	No. 028
24-Hour Isohyet (50-Year Storm):	7.4
Proposed Proportion Impervious:	23% (Low-Density Single Family)

1.5. Conclusion

In the interest of clarity, the hydrologic calculations have been divided into two sections – Building A and Building B. The following summarizes the results:

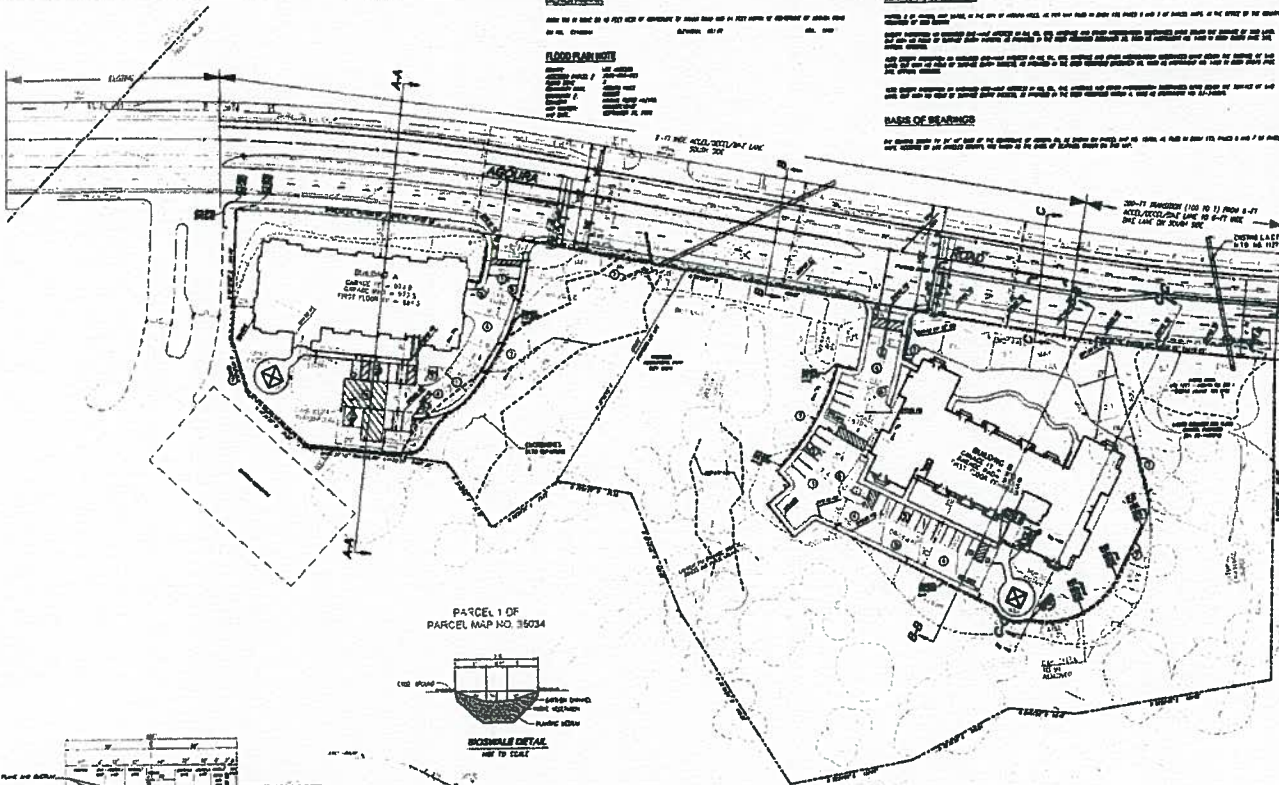
Building A

The Building A site includes a total area of 1.2 acres and the proposed project will result in 53% of the site as impervious area. The total treatment flow for this portion of the site is 0.15 cfs resulting in a treatment volume of 761 cubic feet.

Building B

The Building B site includes a total area of 5.9 acres and the proposed project will result in 16.6% of the site as impervious area. The total treatment flow for this portion of the site is 0.40 cfs resulting in a treatment volume of 2,420 cubic feet.

The total required treatment volume for this site is 3,181 cubic feet (118 cubic yards). The combination of infiltration basins and bioswales will be sized to handle the total required treatment flow and volumes.



PROVISIONS

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FLOOD PLAIN BOUNDARY

- 1. FLOOD PLAIN BOUNDARY
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- 10. FLOOD PLAIN BOUNDARY

LEGAL DESCRIPTION

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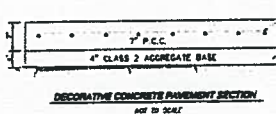
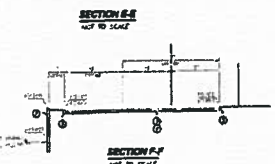
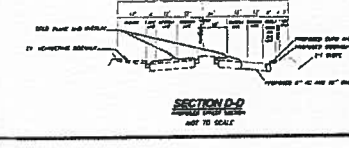
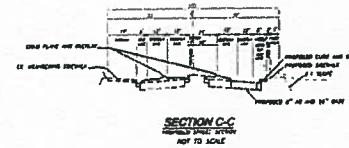
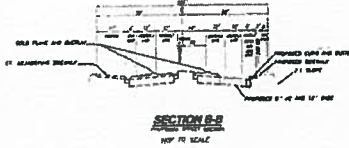
BASES OF BEARINGS

ALL BEARINGS ARE TO THE TRUE MERIDIAN UNLESS OTHERWISE SPECIFIED. ALL BEARINGS ARE TO THE TRUE MERIDIAN UNLESS OTHERWISE SPECIFIED.

VICINITY MAP



PARCEL 1 OF PARCEL MAP NO. 350734



CONSTRUCTION NOTES

1. EXISTING 2' WIDE OF ALL BAYS TO BE KEPT AS EXISTING.
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PROPOSED LAND USAGE & AREAS

PROPOSED LAND USAGE & AREAS
DATE: MARCH 2014

PARCEL	EXISTING	PROPOSED
PARCEL 1	RESIDENTIAL	RESIDENTIAL
PARCEL 2	RESIDENTIAL	RESIDENTIAL
PARCEL 3	RESIDENTIAL	RESIDENTIAL
PARCEL 4	RESIDENTIAL	RESIDENTIAL
PARCEL 5	RESIDENTIAL	RESIDENTIAL

ZONING NOTE

THE ZONING REGULATIONS OF THE CITY OF LOS ANGELES, CALIFORNIA, APPLY TO THIS PROJECT. THE ZONING REGULATIONS OF THE CITY OF LOS ANGELES, CALIFORNIA, APPLY TO THIS PROJECT.

PUBLIC UTILITIES / SERVICES

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- 10. PUBLIC UTILITIES / SERVICES

UTILITY NOTES

ALL UTILITIES SHOWN ON THIS PLAN ARE BASED ON THE RECORD DRAWINGS AND FIELD SURVEY. ALL UTILITIES SHOWN ON THIS PLAN ARE BASED ON THE RECORD DRAWINGS AND FIELD SURVEY.

BOUNDARY DATUM

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LEGEND

SYMBOL	DESCRIPTION
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HARDY ENGINEERS
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WWW.HARDYENGINEERS.COM



PROPOSED BY
PROPOSED BY
PROPOSED BY

VESTING TENTATIVE TRACT MAP NUMBER 71742
FOR CONVEYANCE PURPOSES
LOCATED IN A CORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA
MARCH 2014

34° 15' 00"

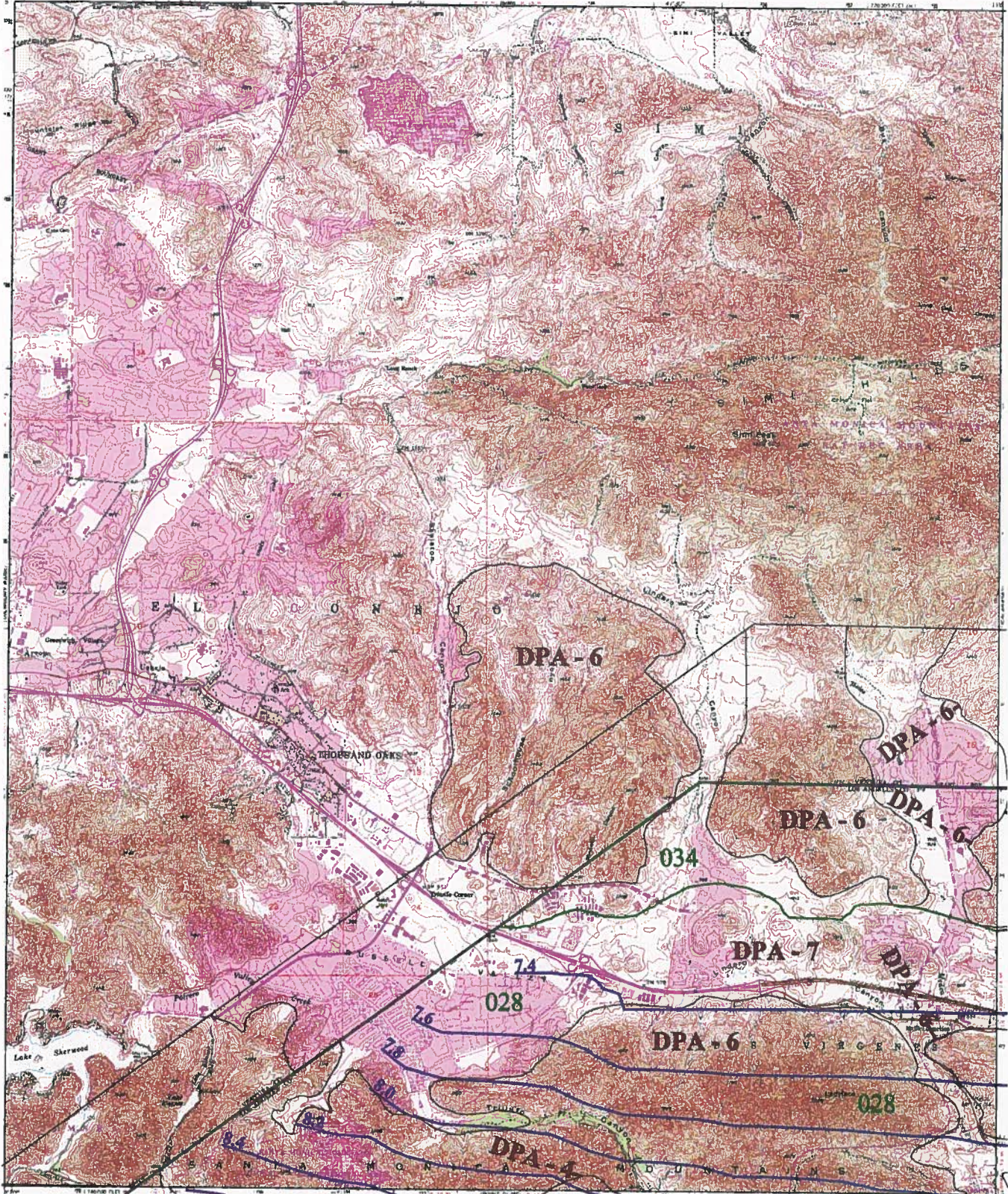
SIMI

-118° 52' 30"

NEWBURY PARK 1-HI.24A

CALABASAS 1-HI.25

-118° 45' 00"



POINT DUME 1-HI.14

34° 07' 30"



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

THOUSAND OAKS
50-YEAR 24-HOUR ISOHYET

1-HI.24



APPENDIX A VOLUME & FLOW RATE CALCULATIONS

A.1 METHOD FOR CALCULATING STANDARD URBAN STORMWATER MITIGATION PLAN FLOW RATES AND VOLUMES BASED ON 0.75-INCHES OF RAINFALL: WORKSHEET

PROJECT NAME

Senior Apartments Tentative Tract 71A-2

APPENDIX A VOLUME & FLOW RATE CALCULATIONS

NOMENCLATURE

A_I	=	Impervious Area (acres)
A_P	=	Pervious Area (acres)
A_U	=	Contributing Undeveloped Upstream Area (acres)
A_{Total}	=	Total Area of Development and Contributing Undeveloped Upstream Area (acres)
C_D	=	Developed Runoff Coefficient
C_U	=	Undeveloped Runoff Coefficient
I_X	=	Rainfall Intensity (inches / hour)
Q_{PM}	=	Peak Mitigation Flow Rate (cfs)
T_C	=	Time of Concentration (minutes, must be between 5-30 min.)
V_M	=	Mitigation Volume (ft ³)

EQUATIONS

$$\begin{aligned}A_{Total} &= A_I + A_P + A_U \\A_I &= (A_{Total} * \% \text{ of Development which is Impervious}) \\A_P &= (A_{Total} * \% \text{ of Development which is Pervious}) \\A_U &= (A_{Total} * \% \text{ of Contributing Undeveloped Upstream Area}^{***}) \\C_D &= (0.9 * Imp.) + [(1.0 - Imp.) * C_U] \quad \text{If } C_D < C_U, \text{ use } C_D = C_U \\Q_{PM} &= C_D * I_X * A_{Total} * (1 \text{ hour} / 3,600 \text{ seconds}) * (1 \text{ ft} / 12 \text{ inches}) * (43,560 \text{ ft}^2 / 1 \text{ acre}) \\&= C_D * I_X * A_{Total} * (1.008333 \text{ ft}^3\text{-hour} / \text{acre-inches-seconds}) \\T_C &= 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135} \\V_M &= (0.75 \text{ inches}) * [(A_I)(0.9) + (A_P + A_U)(C_U)] * (1 \text{ ft} / 12 \text{ inches}) * (43,560 \text{ ft}^2 / 1 \text{ acre}) \\&= (2,722.5 \text{ ft}^3 / \text{acre}) * [(A_I)(0.9) + (A_P + A_U)(C_U)]\end{aligned}$$

***** Contributing Undeveloped Upstream Area is an area where stormwater runoff from an undeveloped upstream area will flow directly or indirectly to the Post-Construction Best Management Practices (BMPs) proposed for the development. This additional flow must be included in the flow rate and volume calculations to appropriately size the BMPs.**

APPENDIX A VOLUME & FLOW RATE CALCULATIONS

In order to determine the volume (V_M) of stormwater runoff to be mitigated from the new development, use the following equation:

$$V_M = (2,722.5 \text{ ft}^3 / \text{acre}) * [(A_1)(0.9) + (A_p + A_U)(C_U)]$$

TABLE 1

INTENSITY - DURATION DATA FOR 0.75-INCHES OF RAINFALL
FOR ALL RAINFALL ZONES

Duration, T_c (min)	Rainfall Intensity, I_x (in/hr)
5	0.447
6	0.411
7	0.382
8	0.359
9	0.339
10	0.323
11	0.309
12	0.297
13	0.286
14	0.276
15	0.267
16	0.259
17	0.252
18	0.245
19	0.239
20	0.233
21	0.228
22	0.223
23	0.218
24	0.214
25	0.210
26	0.206
27	0.203
28	0.199
29	0.196
30	0.193

DETERMINING THE VOLUME (V_M)

$$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$$

Where: C_D = Developed Runoff Coefficient

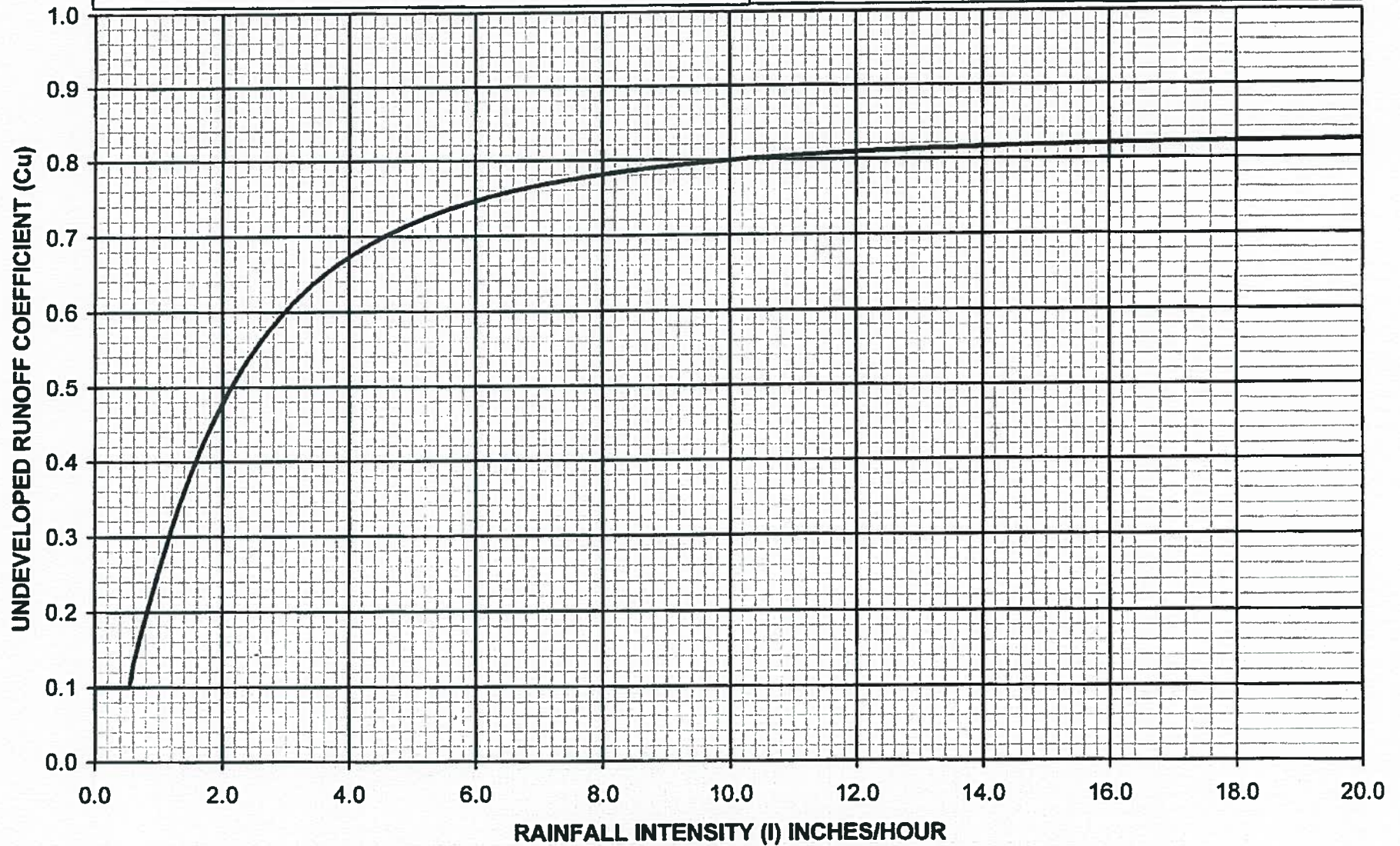
IMP = Proportion Impervious

C_U = Undeveloped runoff coefficient



Los Angeles County Department of Public Works

**RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 028**



APPENDIX A VOLUME & FLOW RATE CALCULATIONS

PROVIDE PROPOSED PROJECT CHARACTERISTICS

Building A

A_{Total} 1.2 Acres
Type of Development Senior Apartment
Predominate Soil Type # 28
% of Project Impervious 53%
% of Project Pervious 47%
% of Project Contributing Undeveloped Area _____
 A_i 0.2 Acres
 A_p 1.0 Acres
 A_u 0 Acres

AGOURA

(074.30TC)
(073.69F)

$D=08^{\circ}02'43''$ $R=1950.00'$ $L=273.01'$ $T=137.13'$

BUILDING A
GARAGE FF = 974.0
GARAGE PAD = 973.5
FIRST FLOOR FF = 984.5

IMPERVIOUS AREA

$N 02^{\circ}32'20'' E 121.78'$

SPA/
GAZEBO

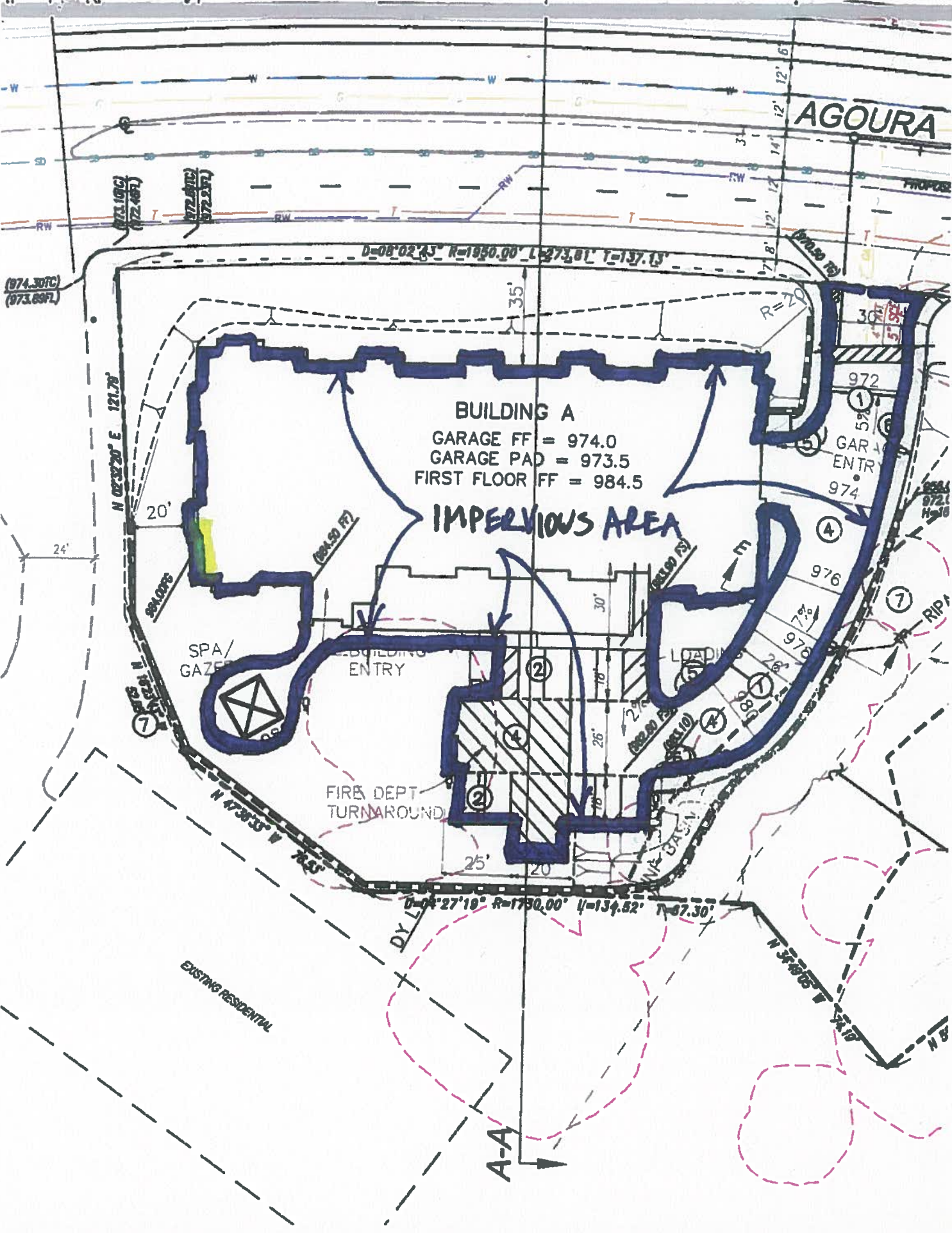
REBUILDING
ENTRY

FIRE DEPT
TURNAROUND

$D=04^{\circ}27'19''$ $R=1730.00'$ $L=134.52'$ $T=67.30'$

EXISTING RESIDENTIAL

A-A



Iteration Table
Proposed Conditions

Area A

Length = 442
Slope = 0.0407
Imp = 0.530536

Elev - Up 986
Elev - Down 968

$$T=(10)^{-0.507*(I_x)^{-0.519*(L)^{0.483*(S)^{-0.135}}$$

Iteration No.	Initial Tc (min.)	I _x (in/hr)	C _u	C _d	C _d *I _x (in/hr)	Calculated Tc (min)	Difference (min)
1	15	0.267	0.1	0.52	0.14	18.03	-3.03
2	18.03	0.245	0.1	0.52	0.13	18.86	-0.82
3	18.86	0.240	0.1	0.52	0.13	19.06	-0.20

T_c= 19 minutes

APPENDIX A VOLUME & FLOW RATE CALCULATIONS

PROVIDE PROPOSED PROJECT CHARACTERISTICS

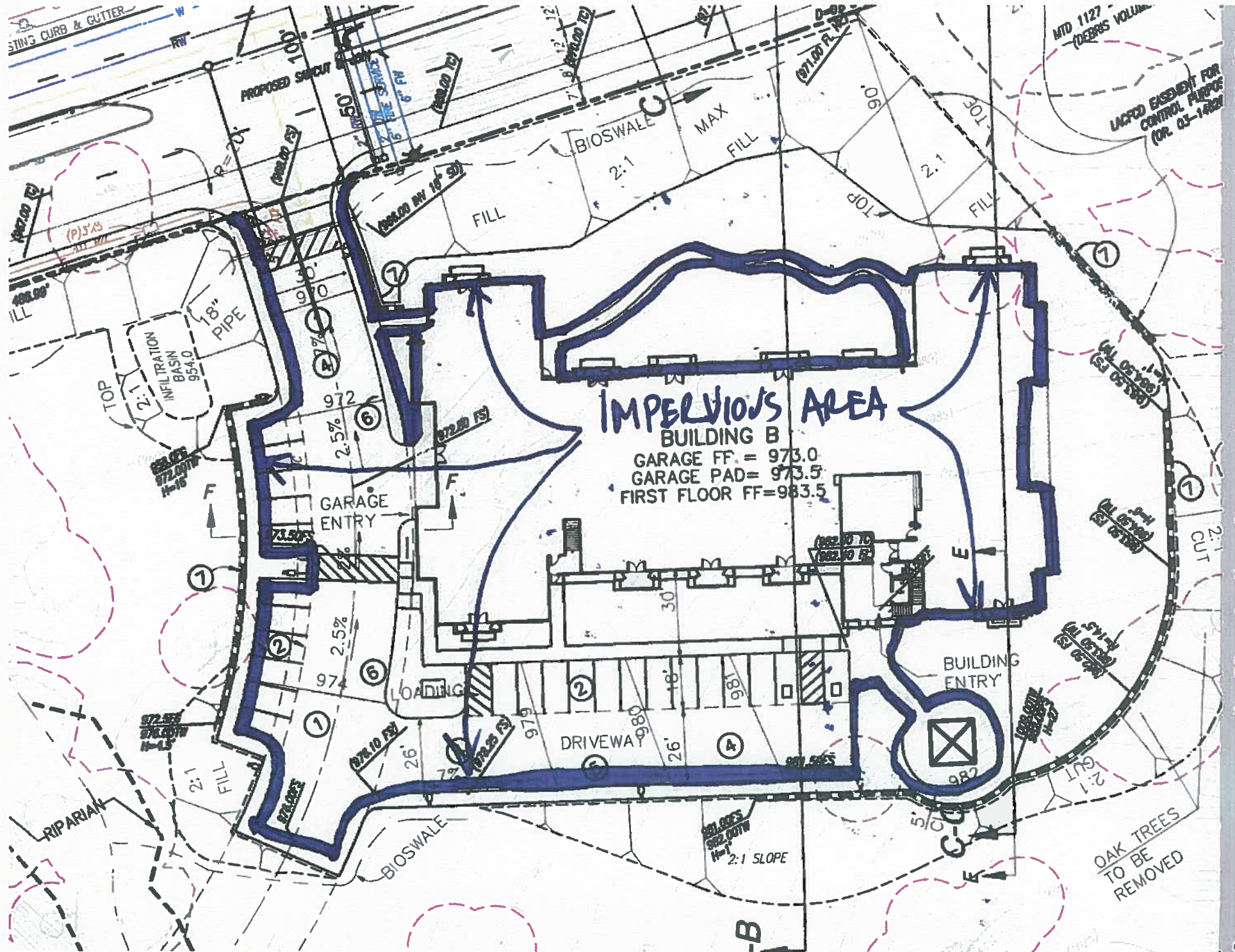
Building B

A_{Total} 5.89 Acres
Type of Development Senior Apartment
Predominate Soil Type # 28
% of Project Impervious 16.6%
% of Project Pervious 83.4%
% of Project Contributing Undeveloped Area _____
 A_1 0 Acres
 A_p 5.89 Acres
 A_U 3.0 Acres

STING CURB & GUTTER

MTD 1127 - (DEBRIS VOLUME)

LACED EASEMENT FOR CONTROL PURPOSE (OR. 03-1482)



IMPERVIOUS AREA

BUILDING B

GARAGE FF = 973.0
 GARAGE PAD = 973.5
 FIRST FLOOR FF = 983.5

GARAGE ENTRY

BUILDING ENTRY

DRIVEWAY

BIOSWALE

OAK TREES TO BE REMOVED

RIPARIAN

B

Iteration Table
Proposed Conditions

Area B

Length = 316
Slope = 0.1076
Imp = 0.166276

Elev - Up 994
Elev - Down 960

$$T=(10)^{-0.507*(ix)^{-0.519*(L)^{0.483*(S)^{-0.135}}$$

Iteration No.	Initial Tc (min.)	ix (in/hr)	Cu	Cd	Cd*ix (in/hr)	Calculated Tc (min)	Difference (min)
1	15	0.267	0.1	0.23	0.06	13.45	1.55
2	13.45	0.281	0.1	0.23	0.07	13.10	0.35

Tc= 13 minutes

Proposed SUSMP Flow Rates
Tentative Parcel Map 71742

Subarea	Storm Frequency	Soil Type	T _c (min.)	I _x (in/hr)	C _u	C _D	Area (Acres)	Q _{PM} (cfs)	imp	A _i (Acres)	A _p (Acres)	A _u (Acres)	V _M (ft ³)
A	50	28	19	0.24	0.10	0.524	1.20	0.15	0.17	0.20	1.00	0	761.28
B	50	28	13	0.29	0.10	0.233	5.89	0.40	0.00	0.00	5.89	3	2420.30