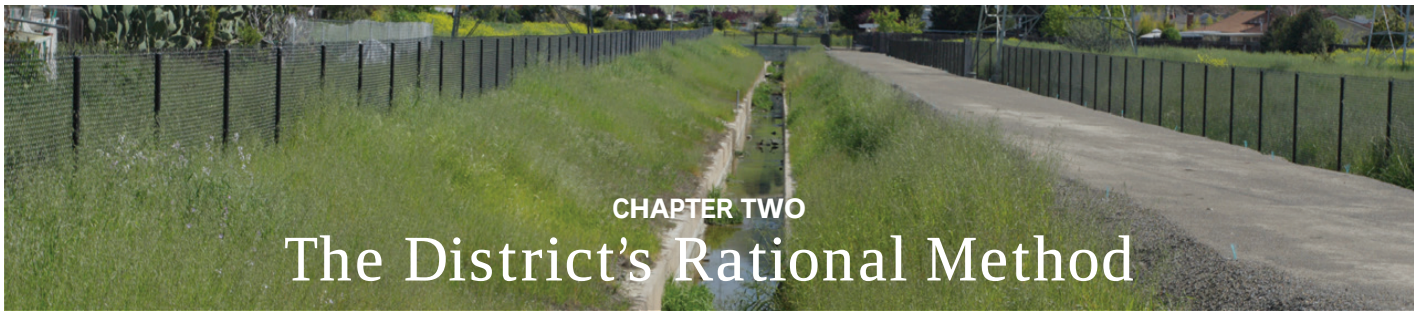
Flood Control & Water Conservation DISTRICT

Alameda County Hydrology & Hydraulics Manual



CHAPTER TWO

The District's Rational Method

The District uses a modified form of the Rational Method to determine the peak discharge of a watershed for areas up to 0.5 square miles (320 acres). Calculations for the District's Rational Method can be made using *Attachment 2* or an equivalent method for design of drainage facilities for urban development and roadway crossings.

To use this method, the overall watershed should be broken down into smaller areas that contribute to hydraulically significant points of concentration. The subcatchment boundaries should be established based on topographic boundaries such as ridges, streets, drainage systems, etc., using good engineering judgment. The peak design discharge or flow rate should be calculated using *Equation 1*, the District's Rational Formula.

EQUATION 1 DISTRICT'S RATIONAL FORMULA

$$Q = C'iA \quad (1)$$

where:

Q = *discharge (cfs)*
C' = *District's runoff coefficient (from* ***Equation 7)***
i = *rainfall intensity (inches/hr from* ***Equation 5)***
A = *drainage area (acres)*

(District 1989)

When using the District's Rational Method, it is critical to compare the peak discharge rate of a tributary area to the peak discharge in the main stem downstream of the tributary and use the greater of the two flow rates for the downstream drainage system.

TIME OF CONCENTRATION

The time of concentration (T_c) is the time required for the runoff from the most remote region of the watershed to reach the point of interest at which the flow is to be calculated. Calculate T_c using *Equation 2.*

EQUATION 2 TIME OF CONCENTRATION

$$T_c = t_o + t_{cond} \quad (2)$$

where:

T_c = *time of concentration (min)*
t_o = *roof-to-gutter and/or overland time of concentration (min, from* ***Equation 3*** *or* ***4)***
t_{cond} = *conduit time (min)*

(District 2015)

To design a drainage system, use a minimum time of concentration based on hydraulic conditions that maximize flow velocities.

Overland Time of Concentration

The overland time of concentration (t_o) is that time required for runoff to travel from the most remote point in the drainage area to the first point of concentration. Often, this first point of concentration is the furthest upstream inlet of the stormwater system or the upstream end of a defined ditch or swale. This time is seldom less than three minutes or more than 20 minutes. The overland time of concentration (t_o) depends on the surface conditions, i.e., whether the watershed is rural (undeveloped) or urban (developed).

For undeveloped watersheds, use *Equation 3* to determine t_o.

EQUATION 3 OVERLAND TIME OF CONCENTRATION — UNDEVELOPED WATERSHEDS

$$t_o = \frac{L_o}{60V_o} \quad (3)$$

where:

t_o = *roof-to-gutter and/or overland time of concentration (min)*
L_o = *overland flow length (ft)*
V_o = *overland flow velocity (ft/sec from* ***Attachment 3****)*

(NRCS 1986)

For urbanized watersheds, the t_o is "roof-to-gutter" time, plus the time required for the water to flow from the street gutter at the uppermost part of the drainage basin to the furthest upstream inlet of the stormwater system. For developed watersheds, use *Equation 4* to determine t_o.

EQUATION 4 OVERLAND TIME OF CONCENTRATION — DEVELOPED WATERSHEDS

$$t_o = t_{rg} + \frac{L_g}{60V_g} \quad (4)$$

where:

t_o = *roof-to-gutter and/or overland time of concentration (min)*
t_{rg} = *roof-to-gutter time (min from* ***Attachment 4****)*
L_g = *gutter flow length (ft)*
V_g = *gutter flow velocity (ft/sec from* ***Attachment 5****)*

(District 1989)

Roof-to-street gutter time is a function of ground slope and type of drainage facility, as determined from *Attachment 4*. Use sound engineering practices for other-than-typical residential areas. Then, estimate the time for the water to flow from the upstream end of the gutter to the first inlet based on the gutter flow velocity in *Attachment 5*. In other-than-typical residential situations, use Manning's equation (*Equation 15*) to estimate

velocity and travel time, or reference other charts, such as those for flow in small conduits or gullies.

Conduit Time

Conduit time (t_{cond}) is the length of time required for the water to flow from one point of concentration, or inlet, to the next. The calculated average velocity, or weighted incremental velocities, must accurately reflect the hydraulic conditions (i.e. closed conduit or open channel) within the stormwater system. Where the flow takes place in natural streams, channels, or closed conduits, use Manning's Equation to calculate the conduit time. For conduits under pressure, divide the discharge (Q) by the conduit cross-sectional area to determine the average flow velocity and conduit time.

RAINFALL INTENSITY AND DEPTH

Compute rainfall intensity for the appropriate time of concentration and storm recurrence interval using *Equation 5*:

EQUATION 5 RAINFALL INTENSITY

$$i_{ij} = \frac{D_{ij}}{t_d} \quad (5)$$

where:

i_{ij} = *rainfall intensity (inches/hr) for recurrence interval* j *and storm duration* i

D_{ij} = *design rainfall depth (inches) for recurrence interval* j *and storm duration* i *(from* ***Equation 6****)*

t_d = *storm duration (hr)* = $T_c/60$

T_c = *time of concentration (min)*

(District 2015)

Alternatively, in lieu of using *Equation 5*, rainfall intensity (i) may be determined from the tables in *Attachment 7*. Select the proper chart depending on recurrence interval, then use the time of concentration (T_c) and mean annual precipitation $(\overline{P})$ to select the rainfall intensity value from the chart.

EQUATION 6 RAINFALL DEPTH

$$D_{ij} = (0.32665 + 0.091144\overline{P})(1 + K_j\, CV)t_i^{0.43287} \quad (6)$$

where:

D_{ij} = *design rainfall depth (inches) for recurrence interval* j *and storm duration* i

$\overline{P}$ = *mean annual precipitation (inches)*

K_j = *frequency factor for recurrence interval* j *(from* ***Table 1*** *for storm durations up to 24 hours or* ***Attachment 12*** *for storm durations greater than 24 hours)*

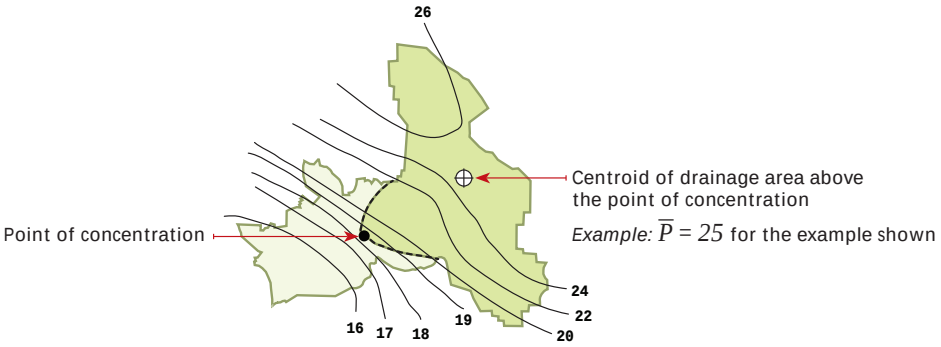
CV = *coefficient of variation (from* ***Attachment 12****)*

t_i = *consecutive time (days)*

(District 2015)

Determine the mean annual precipitation ($\overline{P}$) of a drainage area using the District's isohyetal map *Attachment 6*. The $\overline{P}$ to be used is located at the centroid of the drainage area above the point of concentration at which the flow rate is being determined, as shown in *Figure 2*.

FIGURE 2 DETERMINING MEAN ANNUAL PRECIPITATION



Note: Graphic for illustration purposes only.

TABLE 1 FREQUENCY FACTORS FOR SELECT RECURRENCE INTERVALS*

Recurrence interval *(yrs)*	2	5	10	15	25	100	200	500	1000
Frequency Factor, K_j	-0.210	0.719	1.339	1.684	2.108	3.211	3.745	4.417	4.955

*Table 1 presents frequency factors (K_j) for storm durations (t_d) up to 24 hours. See *Attachment 12* for storm durations greater than 24 hours.

(District 2015)

ATTACHMENT 9 - ADMINISTRATIVE RECORD
ATTACHMENT 5 - Admin Record
Page 1601 of 2986
Page 1495 of 2004

Alternatively, in lieu of using *Equation 6*, design rainfall depth (D_{ij}) may be determined from the tables in *Attachment 8*. Select the proper chart depending on recurrence interval, then use the mean annual precipitation ($\overline{P}$) and storm duration (t_d) to select the rainfall depth from the chart.

RUNOFF COEFFICIENT

The District requires the use of the District's runoff coefficient (C') for design of flood control facilities. Calculate the runoff coefficient using *Equation 7*. Each of the components that comprise C' is described below.

EQUATION 7 DISTRICT'S RUNOFF COEFFICIENT

$$C' = C + C_S + C_i \tag{7}$$

where:

C' = *District's runoff coefficient*
C = *basic runoff coefficient (from* ***Table 2****)*
C_s = *ground slope adjustment factor (from* ***Equation 8****)*
C_i = *rainfall intensity factor (from* ***Equation 9****)*

(District 1989)

Basic Runoff Coefficient

To design conveyance elements, choose the basic runoff coefficient (C) to reflect the proposed or ultimate development of the drainage area. Ultimate development is normally based on City/County general plans. If general plans are not available, make a reasonable estimate of ultimate land use.

The basic runoff coefficient (C) is a function of the percent of the watershed that is impervious and the hydrologic soil group. The percent impervious is normally based on land use category; however, it may be measured. To determine the appropriate C for any given drainage area, overlay the applicable land use onto the soil group maps provided in *Attachment 9*. Using the area of each land use category within each soil group, determine an area-weighted average C using the information provided in *Table 2*.

Table 2 applies to typical land use situations. For conditions not covered by *Table 2*, calculate an appropriate runoff coefficient based on impervious area, to be determined using aerial photographs and site plans. Calculate the runoff coefficient based on an area-weighted average using $C = 0.9$ for all impervious areas, and the appropriate pervious area C value for soil groups present from the first row of *Table 2*.

TABLE 2 BASIC RUNOFF COEFFICIENTS FOR PARTICULAR LAND USE AND SOIL TYPE

Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Undeveloped land, parks, and golf courses	0.10	0.15	0.20	0.25
Rural Residential (larger than 1 ac lot)	0.13	0.18	0.23	0.28
Residential 10,000 - 1 ac lot	0.20	0.25	0.30	0.35
Residential 1/4 ac (8,000 - 10,000 sf lot)	0.25	0.30	0.35	0.40
Residential 1/8 ac (5,000 - 8,000 sf lot)	0.27	0.32	0.37	0.42
Residential (3600 - 5000 sf lot)	0.28	0.33	0.38	0.43
Residential (2700 - 3600 sf lot)	0.29	0.34	0.39	0.44
Zero Lot Line Residential & Less than 2700 sf	0.34	0.39	0.44	0.49
Townhouse	0.44	0.49	0.54	0.59
Condominium	0.51	0.56	0.61	0.66
Industrials	0.58	0.63	0.68	0.73
Apartment	0.65	0.70	0.75	0.80
Commercial	0.69	0.74	0.79	0.84
Freeway*	0.72	0.77	0.82	0.87
Mobile Home Park*	0.34	0.39	0.44	0.49
School (large open space)	0.24	0.29	0.34	0.39
School (small open space)	0.44	0.49	0.54	0.59

* For freeways, use aerial imagery to estimate percent impervious area.
* * For mobile home parks, a minimum of 50% of the NCIA roof area should be counted as DCIA; for example, DCIA = 17+(37/2) = 35.5

(District 2015)

HYDROLOGIC SOIL GROUPS

Attachment 9 provides a map that shows the areas of hydrologic soil groups A, B, C, and D based on Natural Resource Conservation Service (NRCS – formerly Soil Conservation Service, SCS) mapping.

Soil Type A: Sand, loamy sand, or sandy loam. Low runoff potential and high infiltration rate even when thoroughly wetted. Primarily deep, well- to excessively-drained sand or gravel that has a high rate of water transmission.

Soil Type B: Silt loam or loam. Moderately low runoff potential and moderate infiltration rate when thoroughly wetted. Moderately deep to deep, moderately well- to well-drained soil with moderately fine to moderately coarse texture.

Soil Type C: Sandy clay loam. Moderately high runoff potential and low infiltration rate when thoroughly wetted that impedes downward movement of water. Soil with moderately fine to fine structure.

Soil Type D: Clay loam, silty clay loam, sandy clay, silty clay, or clay. High runoff potential and very low infiltration rate when thoroughly wetted. Consists chiefly of clay soil with a high swelling potential, soil with a permanent high water table, soil with a claypan or clay layer at or near the surface, and shallow soil over nearly impervious material.

Ground Slope Adjustment Factor

The ground slope adjustment factor (C_s) is used to adjust for increases in runoff as the average slope of the incremental drainage area increases. Use an area-weighted average slope (S) from the slope map provided in *Attachment 10* as a basis for determining C_s.

Rainfall Intensity Factor

The rainfall intensity factor (C_i) is used to account for the decrease in soil permeability that can be expected with an increase in ground slope and rainfall intensity.

EQUATION 8 GROUND SLOPE ADJUSTMENT FACTOR

$$C_s = \frac{(0.8 - C)[\ln(S - 1)]S^{0.5}}{56} \qquad (8)$$

$$C_s = 0 \text{ for } C \leq 0.8$$

where:

C_s = *ground slope adjustment factor*
C = *basic runoff coefficient*
S = *slope (percent from* ***Attachment 10****)*

(District 1989)

EQUATION 9 RAINFALL INTENSITY FACTOR

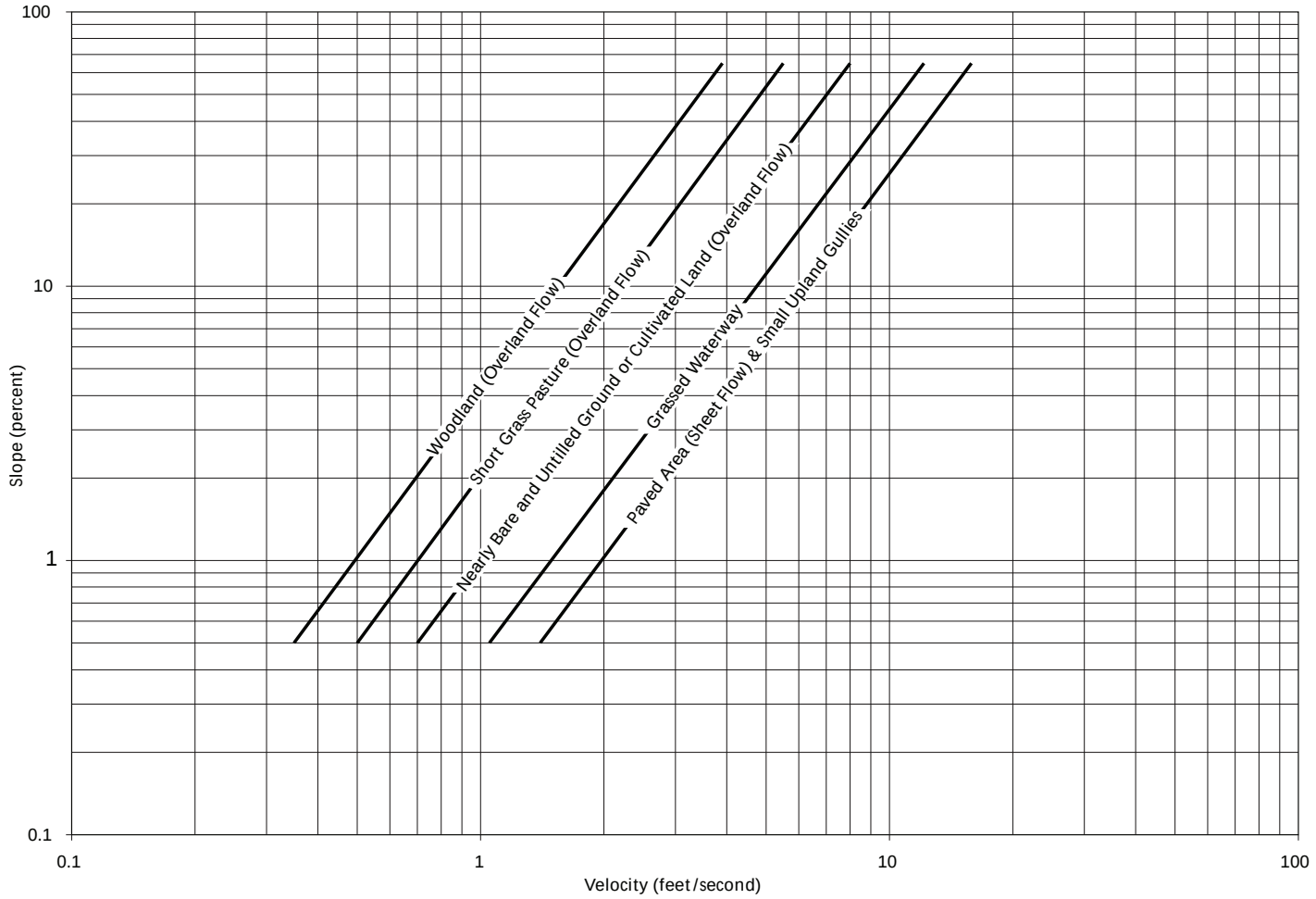
$$C_i = 0.8 - (C + C_s)\left(1 - \frac{1}{\frac{1}{e^i} + \ln(i+1)}\right) \qquad (9)$$

$$C_i = 0 \text{ for } C + C_s \leq 0.8$$

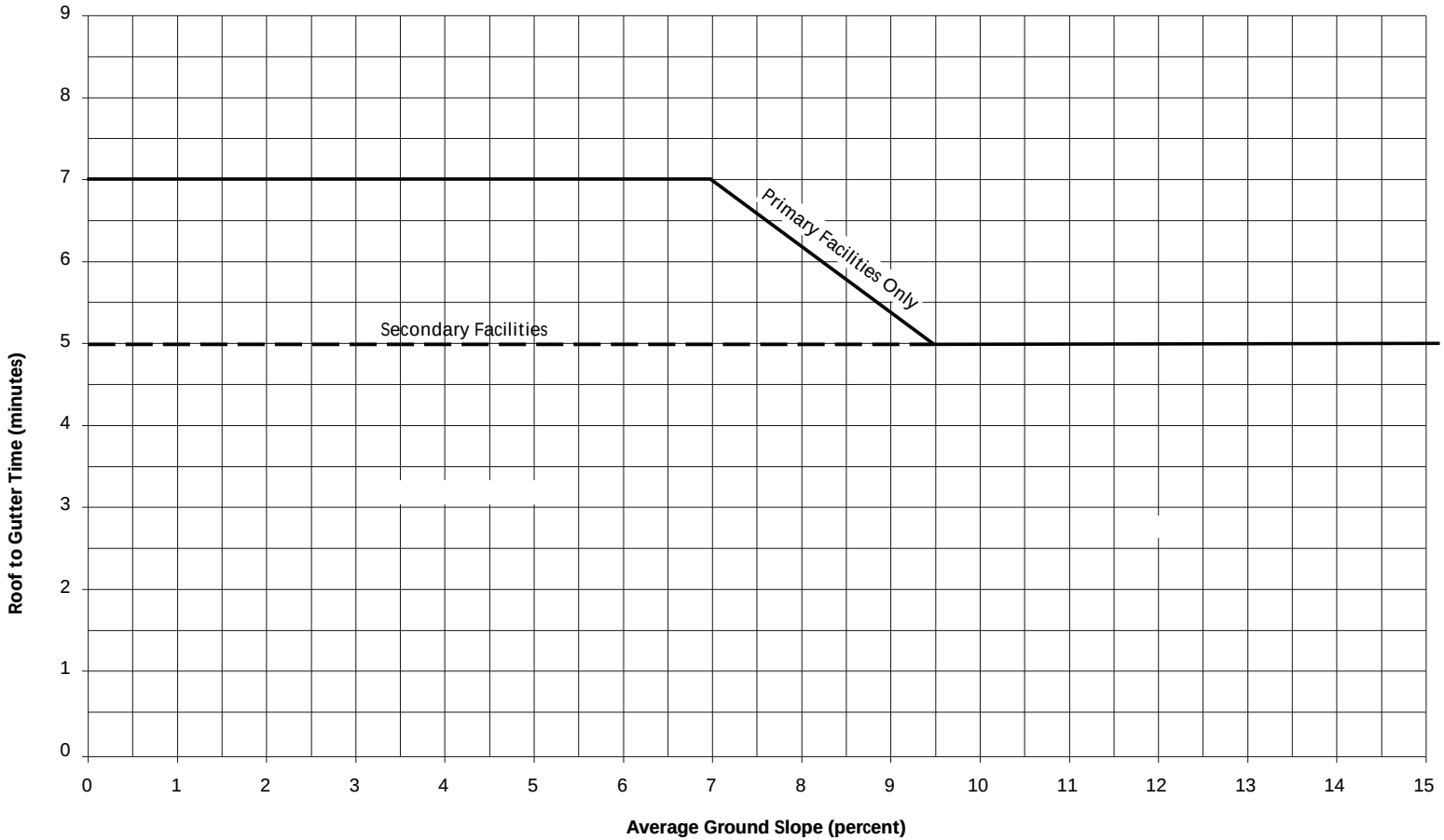
where:

C_i = *rainfall intensity factor*
C = *basic runoff coefficient*
C_s = *ground slope adjustment factor*
i = *rainfall intensity (inches/hr from* ***Equation 5*** *or* ***Attachment 7****)*

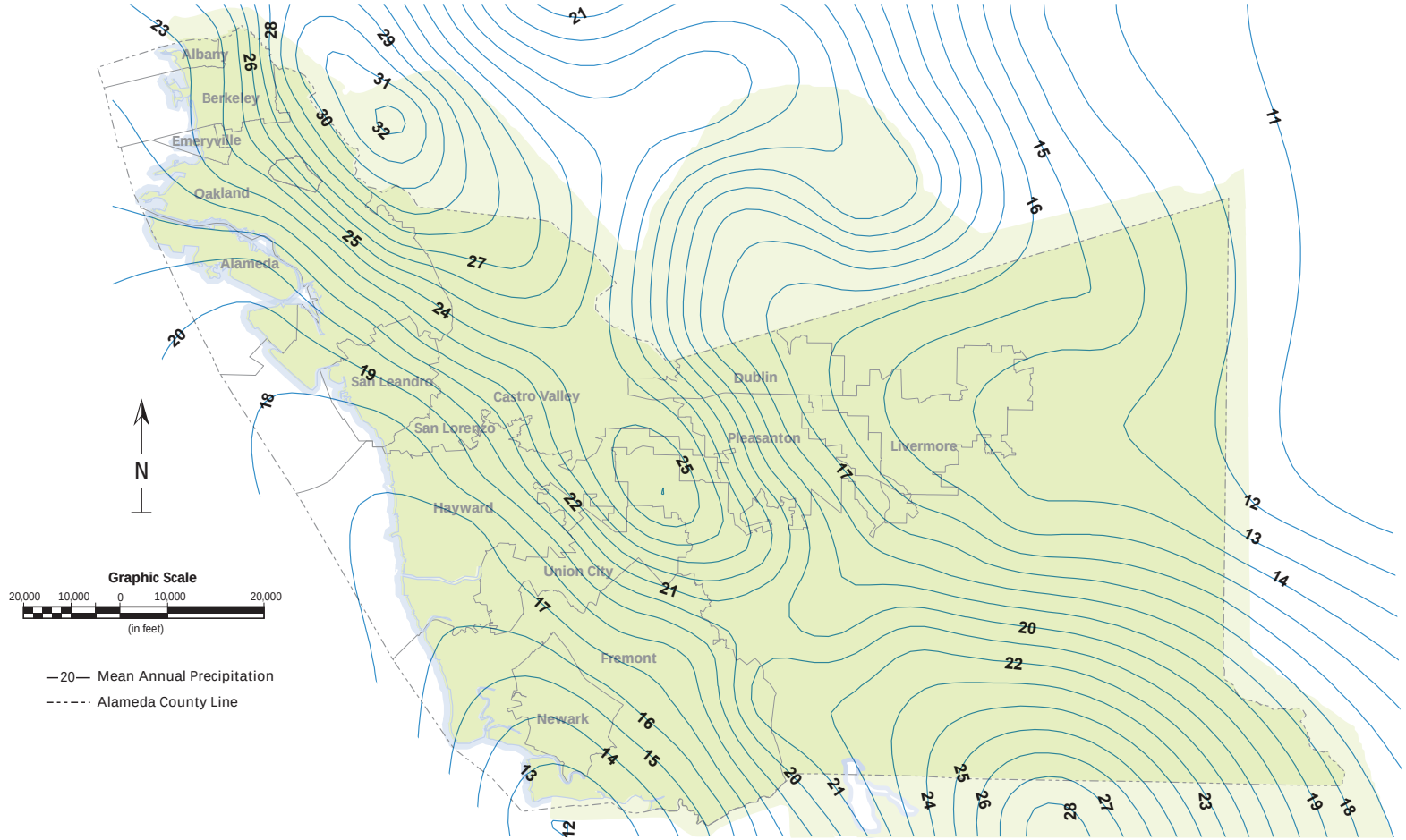
(District 1989)


100
10
1
0.1
Slope (percent)
0.1
1
10
100
Velocity (feet/second)
Woodland (Overland Flow)
Short Grass Pasture (Overland Flow)
Nearly Bare and Untilled Ground or Cultivated Land (Overland Flow)
Grassed Waterway
Paved Area (Sheet Flow) & Small Upland Gullies

(NRCS 2010)



(District 1989)



Attachment 6 available for download as a GIS file from the Alameda County Flood Control District website.

(District 2011)

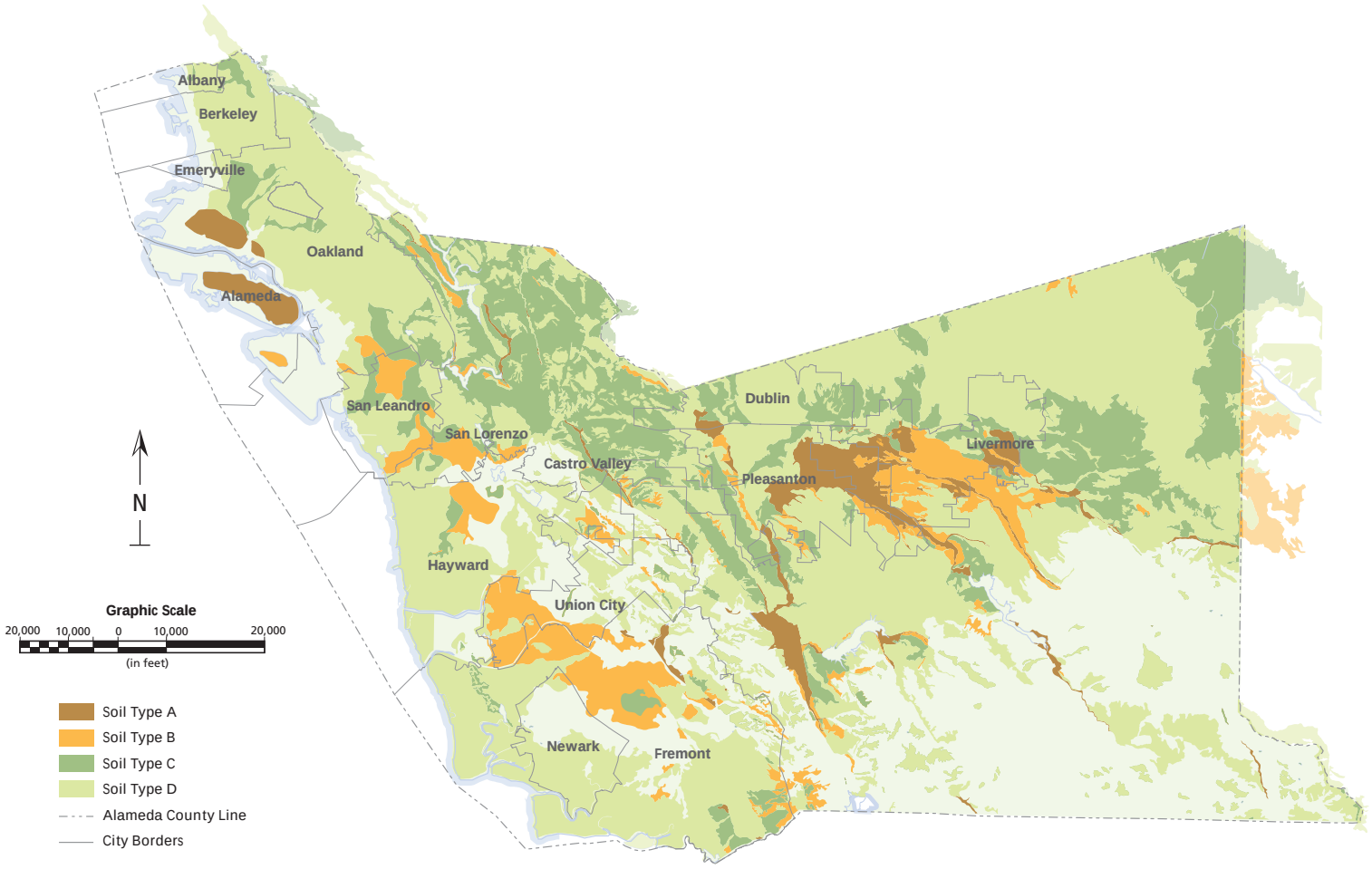
T_c (min)	Mean Annual Precipitation (in)																					
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	3.13	3.35	3.56	3.78	3.99	4.21	4.42	4.64	4.85	5.07	5.28	5.50	5.71	5.93	6.14	6.36	6.57	6.79	7.00	7.22	7.43	7.65
2	2.12	2.26	2.41	2.55	2.70	2.84	2.99	3.13	3.28	3.42	3.57	3.71	3.86	4.00	4.15	4.29	4.44	4.58	4.73	4.87	5.02	5.16
3	1.68	1.80	1.91	2.03	2.14	2.26	2.37	2.49	2.60	2.72	2.83	2.95	3.06	3.18	3.29	3.41	3.53	3.64	3.76	3.87	3.99	4.10
4	1.43	1.53	1.62	1.72	1.82	1.92	2.02	2.11	2.21	2.31	2.41	2.50	2.60	2.70	2.80	2.90	2.99	3.09	3.19	3.29	3.39	3.48
5	1.26	1.34	1.43	1.52	1.60	1.69	1.78	1.86	1.95	2.03	2.12	2.21	2.29	2.38	2.47	2.55	2.64	2.72	2.81	2.90	2.98	3.07
6	1.13	1.21	1.29	1.37	1.45	1.52	1.60	1.68	1.76	1.83	1.91	1.99	2.07	2.15	2.22	2.30	2.38	2.46	2.53	2.61	2.69	2.77
7	1.04	1.11	1.18	1.25	1.32	1.40	1.47	1.54	1.61	1.68	1.75	1.82	1.89	1.97	2.04	2.11	2.18	2.25	2.32	2.39	2.47	2.54
8	0.96	1.03	1.10	1.16	1.23	1.29	1.36	1.43	1.49	1.56	1.62	1.69	1.76	1.82	1.89	1.96	2.02	2.09	2.15	2.22	2.29	2.35
9	0.90	0.96	1.03	1.09	1.15	1.21	1.27	1.33	1.40	1.46	1.52	1.58	1.64	1.71	1.77	1.83	1.89	1.95	2.01	2.08	2.14	2.20
10	0.85	0.91	0.97	1.02	1.08	1.14	1.20	1.26	1.32	1.37	1.43	1.49	1.55	1.61	1.66	1.72	1.78	1.84	1.90	1.96	2.01	2.07
11	0.80	0.86	0.91	0.97	1.03	1.08	1.14	1.19	1.25	1.30	1.36	1.41	1.47	1.52	1.58	1.63	1.69	1.74	1.80	1.85	1.91	1.96
12	0.77	0.82	0.87	0.92	0.98	1.03	1.08	1.13	1.19	1.24	1.29	1.34	1.40	1.45	1.50	1.55	1.61	1.66	1.71	1.76	1.82	1.87
13	0.73	0.78	0.83	0.88	0.93	0.98	1.03	1.08	1.13	1.18	1.23	1.28	1.33	1.38	1.43	1.48	1.53	1.58	1.64	1.69	1.74	1.79
14	0.70	0.75	0.80	0.85	0.89	0.94	0.99	1.04	1.09	1.13	1.18	1.23	1.28	1.33	1.38	1.42	1.47	1.52	1.57	1.62	1.66	1.71
15	0.67	0.72	0.77	0.81	0.86	0.91	0.95	1.00	1.04	1.09	1.14	1.18	1.23	1.28	1.32	1.37	1.42	1.46	1.51	1.55	1.60	1.65
16	0.65	0.70	0.74	0.78	0.83	0.87	0.92	0.96	1.01	1.05	1.10	1.14	1.19	1.23	1.27	1.32	1.36	1.41	1.45	1.50	1.54	1.59
17	0.63	0.67	0.71	0.76	0.80	0.84	0.89	0.93	0.97	1.02	1.06	1.10	1.15	1.19	1.23	1.27	1.32	1.36	1.40	1.45	1.49	1.53
18	0.61	0.65	0.69	0.73	0.78	0.82	0.86	0.90	0.94	0.98	1.03	1.07	1.11	1.15	1.19	1.23	1.28	1.32	1.36	1.40	1.44	1.48
19	0.59	0.63	0.67	0.71	0.75	0.79	0.83	0.87	0.91	0.95	0.99	1.04	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.36	1.40	1.44
20	0.57	0.61	0.65	0.69	0.73	0.77	0.81	0.85	0.89	0.93	0.97	1.01	1.04	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.36	1.40
21	0.56	0.60	0.63	0.67	0.71	0.75	0.79	0.83	0.86	0.90	0.94	0.98	1.02	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.36
22	0.54	0.58	0.62	0.65	0.69	0.73	0.77	0.80	0.84	0.88	0.92	0.95	0.99	1.03	1.06	1.10	1.14	1.18	1.21	1.25	1.29	1.32
23	0.53	0.57	0.60	0.64	0.67	0.71	0.75	0.78	0.82	0.86	0.89	0.93	0.97	1.00	1.04	1.07	1.11	1.15	1.18	1.22	1.26	1.29
24	0.52	0.55	0.59	0.62	0.66	0.69	0.73	0.76	0.80	0.84	0.87	0.91	0.94	0.98	1.01	1.05	1.08	1.12	1.15	1.19	1.23	1.26
25	0.51	0.54	0.57	0.61	0.64	0.68	0.71	0.75	0.78	0.82	0.85	0.89	0.92	0.96	0.99	1.02	1.06	1.09	1.13	1.16	1.20	1.23
26	0.49	0.53	0.56	0.60	0.63	0.66	0.70	0.73	0.76	0.80	0.83	0.87	0.90	0.93	0.97	1.00	1.04	1.07	1.10	1.14	1.17	1.21
27	0.48	0.52	0.55	0.58	0.62	0.65	0.68	0.72	0.75	0.78	0.81	0.85	0.88	0.91	0.95	0.98	1.01	1.05	1.08	1.11	1.15	1.18
28	0.47	0.51	0.54	0.57	0.60	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86	0.90	0.93	0.96	0.99	1.03	1.06	1.09	1.12	1.16
29	0.46	0.50	0.53	0.56	0.59	0.62	0.66	0.69	0.72	0.75	0.78	0.81	0.85	0.88	0.91	0.94	0.97	1.01	1.04	1.07	1.10	1.13
30	0.46	0.49	0.52	0.55	0.58	0.61	0.64	0.67	0.71	0.74	0.77	0.80	0.83	0.86	0.89	0.92	0.96	0.99	1.02	1.05	1.08	1.11
31	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.85	0.88	0.91	0.94	0.97	1.00	1.03	1.06	1.09
32	0.44	0.47	0.50	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.74	0.77	0.80	0.83	0.86	0.89	0.92	0.95	0.98	1.01	1.04	1.07
33	0.43	0.46	0.49	0.52	0.55	0.58	0.61	0.64	0.67	0.70	0.73	0.76	0.79	0.82	0.85	0.88	0.90	0.93	0.96	0.99	1.02	1.05
34	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.69	0.72	0.74	0.77	0.80	0.83	0.86	0.89	0.92	0.95	0.98	1.01	1.04
35	0.42	0.45	0.47	0.50	0.53	0.56	0.59	0.62	0.65	0.67	0.70	0.73	0.76	0.79	0.82	0.85	0.88	0.90	0.93	0.96	0.99	1.02
36	0.41	0.44	0.47	0.50	0.52	0.55	0.58	0.61	0.64	0.66	0.69	0.72	0.75	0.78	0.80	0.83	0.86	0.89	0.92	0.95	0.97	1.00
37	0.40	0.43	0.46	0.49	0.52	0.54	0.57	0.60	0.63	0.65	0.68	0.71	0.74	0.76	0.79	0.82	0.85	0.88	0.90	0.93	0.96	0.99
38	0.40	0.43	0.45	0.48	0.51	0.53	0.56	0.59	0.62	0.64	0.67	0.70	0.73	0.75	0.78	0.81	0.84	0.86	0.89	0.92	0.94	0.97
39	0.39	0.42	0.45	0.47	0.50	0.53	0.55	0.58	0.61	0.63	0.66	0.69	0.72	0.74	0.77	0.80	0.82	0.85	0.88	0.90	0.93	0.96
40	0.39	0.41	0.44	0.47	0.49	0.52	0.55	0.57	0.60	0.63	0.65	0.68	0.71	0.73	0.76	0.78	0.81	0.84	0.86	0.89	0.92	0.94
41	0.38	0.41	0.43	0.46	0.49	0.51	0.54	0.56	0.59	0.62	0.64	0.67	0.70	0.72	0.75	0.77	0.80	0.83	0.85	0.88	0.90	0.93
42	0.38	0.40	0.43	0.45	0.48	0.51	0.53	0.56	0.58	0.61	0.63	0.66	0.69	0.71	0.74	0.76	0.79	0.81	0.84	0.87	0.89	0.92
43	0.37	0.40	0.42	0.45	0.47	0.50	0.52	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.86	0.88	0.91
44	0.37	0.39	0.42	0.44	0.47	0.49	0.52	0.54	0.57	0.59	0.62	0.64	0.67	0.69	0.72	0.74	0.77	0.79	0.82	0.84	0.87	0.89
45	0.36	0.39	0.41	0.44	0.46	0.49	0.51	0.54	0.56	0.59	0.61	0.63	0.66	0.68	0.71	0.73	0.76	0.78	0.81	0.83	0.86	0.88
46	0.36	0.38	0.41	0.43	0.46	0.48	0.50	0.53	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.72	0.75	0.77	0.80	0.82	0.85	0.87
47	0.35	0.38	0.40	0.43	0.45	0.47	0.50	0.52	0.55	0.57	0.60	0.62	0.64	0.67	0.69	0.72	0.74	0.76	0.79	0.81	0.84	0.86
48	0.35	0.37	0.40	0.42	0.44	0.47	0.49	0.52	0.54	0.56	0.59	0.61	0.64	0.66	0.68	0.71	0.73	0.76	0.78	0.80	0.83	0.85
49	0.34	0.37	0.39	0.42	0.44	0.46	0.49	0.51	0.53	0.56	0.58	0.60	0.63	0.65	0.68	0.70	0.72	0.75	0.77	0.79	0.82	0.84
50	0.34	0.36	0.39	0.41	0.43	0.46	0.48	0.50	0.53	0.55	0.57	0.60	0.62	0.64	0.67	0.69	0.71	0.74	0.76	0.78	0.81	0.83
51	0.34	0.36	0.38	0.41	0.43	0.45	0.48	0.50	0.52	0.55	0.57	0.59	0.61	0.64	0.66	0.68	0.71	0.73	0.75	0.78	0.80	0.82
52	0.33	0.36	0.38	0.40	0.42	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.61	0.63	0.65	0.68	0.70	0.72	0.74	0.77	0.79	0.81
53	0.33	0.35	0.38	0.40	0.42	0.44	0.47	0.49	0.51	0.53	0.56	0.58	0.60	0.62	0.65	0.67	0.69	0.71	0.74	0.76	0.78	0.80
54	0.33	0.35	0.37	0.39	0.42	0.44	0.46	0.48	0.51	0.53	0.55	0.57	0.59	0.62	0.64	0.66	0.68	0.71	0.73	0.75	0.77	0.80
55	0.32	0.35	0.37	0.39	0.41	0.43	0.46	0.48	0.50	0.52	0.54	0.57	0.59	0.61	0.63	0.66	0.68	0.70	0.72	0.74	0.77	0.79
56	0.32	0.34	0.36	0.39	0.41	0.43	0.45	0.47	0.50	0.52	0.54	0.56	0.58	0.60	0.63	0.65	0.67	0.69	0.71	0.74	0.76	0.78
57	0.32	0.34	0.36	0.38	0.40	0.42	0.45	0.47	0.49	0.51	0.53	0.56	0.58	0.60	0.62	0.64	0.66	0.69	0.71	0.73	0.75	0.77
58	0.31	0.33	0.36	0.38	0.40	0.42	0.44	0.46	0.49	0.51	0.53	0.55	0.57	0.59	0.61	0.64	0.66	0.68	0.70	0.72	0.74	0.76
59	0.31	0.33	0.35	0.37	0.40	0.42	0.44	0.46	0.48	0.50	0.52	0.54	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.71	0.74	0.76
60	0.31	0.33	0.35	0.37	0.39	0.41	0.43	0.45	0.48	0.50	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.67	0.69	0.71	0.73	0.75

(District 2011)

T_c (min)	Mean Annual Precipitation (in)																					
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	5.28	5.64	6.00	6.36	6.73	7.09	7.45	7.81	8.17	8.53	8.90	9.26	9.62	9.98	10.34	10.71	11.07	11.43	11.79	12.15	12.52	12.88
2	3.56	3.81	4.05	4.30	4.54	4.78	5.03	5.27	5.52	5.76	6.00	6.25	6.49	6.74	6.98	7.23	7.47	7.71	7.96	8.20	8.45	8.69
3	2.83	3.02	3.22	3.41	3.61	3.80	4.00	4.19	4.38	4.58	4.77	4.97	5.16	5.35	5.55	5.74	5.94	6.13	6.32	6.52	6.71	6.91
4	2.40	2.57	2.73	2.90	3.06	3.23	3.39	3.56	3.72	3.89	4.05	4.22	4.38	4.55	4.71	4.88	5.04	5.21	5.37	5.54	5.70	5.87
5	2.12	2.26	2.41	2.55	2.70	2.84	2.99	3.14	3.28	3.43	3.57	3.72	3.86	4.01	4.15	4.30	4.44	4.59	4.73	4.88	5.02	5.17
6	1.91	2.04	2.17	2.30	2.43	2.57	2.70	2.83	2.96	3.09	3.22	3.35	3.48	3.61	3.74	3.88	4.01	4.14	4.27	4.40	4.53	4.66
7	1.75	1.87	1.99	2.11	2.23	2.35	2.47	2.59	2.71	2.83	2.95	3.07	3.19	3.31	3.43	3.55	3.67	3.79	3.91	4.03	4.15	4.27
8	1.62	1.73	1.85	1.96	2.07	2.18	2.29	2.40	2.51	2.62	2.74	2.85	2.96	3.07	3.18	3.29	3.40	3.51	3.63	3.74	3.85	3.96
9	1.52	1.62	1.73	1.83	1.93	2.04	2.14	2.25	2.35	2.45	2.56	2.66	2.77	2.87	2.98	3.08	3.18	3.29	3.39	3.50	3.60	3.70
10	1.43	1.53	1.63	1.72	1.82	1.92	2.02	2.12	2.21	2.31	2.41	2.51	2.61	2.70	2.80	2.90	3.00	3.10	3.19	3.29	3.39	3.49
11	1.35	1.45	1.54	1.63	1.73	1.82	1.91	2.00	2.10	2.19	2.28	2.38	2.47	2.56	2.66	2.75	2.84	2.93	3.03	3.12	3.21	3.31
12	1.29	1.38	1.47	1.55	1.64	1.73	1.82	1.91	2.00	2.09	2.17	2.26	2.35	2.44	2.53	2.62	2.70	2.79	2.88	2.97	3.06	3.15
13	1.23	1.32	1.40	1.49	1.57	1.65	1.74	1.82	1.91	1.99	2.08	2.16	2.25	2.33	2.42	2.50	2.58	2.67	2.75	2.84	2.92	3.01
14	1.18	1.26	1.34	1.42	1.51	1.59	1.67	1.75	1.83	1.91	1.99	2.07	2.15	2.23	2.32	2.40	2.48	2.56	2.64	2.72	2.80	2.88
15	1.14	1.21	1.29	1.37	1.45	1.53	1.60	1.68	1.76	1.84	1.92	1.99	2.07	2.15	2.23	2.30	2.38	2.46	2.54	2.62	2.69	2.77
16	1.10	1.17	1.25	1.32	1.40	1.47	1.55	1.62	1.70	1.77	1.85	1.92	2.00	2.07	2.15	2.22	2.30	2.37	2.45	2.52	2.60	2.67
17	1.06	1.13	1.20	1.28	1.35	1.42	1.49	1.57	1.64	1.71	1.78	1.86	1.93	2.00	2.07	2.15	2.22	2.29	2.36	2.44	2.51	2.58
18	1.02	1.09	1.17	1.24	1.31	1.38	1.45	1.52	1.59	1.66	1.73	1.80	1.87	1.94	2.01	2.08	2.15	2.22	2.29	2.36	2.43	2.50
19	0.99	1.06	1.13	1.20	1.27	1.33	1.40	1.47	1.54	1.61	1.67	1.74	1.81	1.88	1.95	2.02	2.08	2.15	2.22	2.29	2.36	2.42
20	0.97	1.03	1.10	1.16	1.23	1.30	1.36	1.43	1.49	1.56	1.63	1.69	1.76	1.83	1.89	1.96	2.02	2.09	2.16	2.22	2.29	2.35
21	0.94	1.00	1.07	1.13	1.20	1.26	1.33	1.39	1.45	1.52	1.58	1.65	1.71	1.78	1.84	1.90	1.97	2.03	2.10	2.16	2.23	2.29
22	0.91	0.98	1.04	1.10	1.17	1.23	1.29	1.35	1.42	1.48	1.54	1.60	1.67	1.73	1.79	1.85	1.92	1.98	2.04	2.11	2.17	2.23
23	0.89	0.95	1.01	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50	1.56	1.63	1.69	1.75	1.81	1.87	1.93	1.99	2.05	2.11	2.18
24	0.87	0.93	0.99	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.65	1.71	1.77	1.83	1.88	1.94	2.00	2.06	2.12
25	0.85	0.91	0.97	1.03	1.08	1.14	1.20	1.26	1.32	1.38	1.43	1.49	1.55	1.61	1.67	1.73	1.78	1.84	1.90	1.96	2.02	2.08
26	0.83	0.89	0.95	1.00	1.06	1.12	1.17	1.23	1.29	1.34	1.40	1.46	1.52	1.57	1.63	1.69	1.74	1.80	1.86	1.92	1.97	2.03
27	0.81	0.87	0.93	0.98	1.04	1.09	1.15	1.20	1.26	1.32	1.37	1.43	1.48	1.54	1.60	1.65	1.71	1.76	1.82	1.87	1.93	1.99
28	0.80	0.85	0.91	0.96	1.02	1.07	1.13	1.18	1.23	1.29	1.34	1.40	1.45	1.51	1.56	1.62	1.67	1.73	1.78	1.84	1.89	1.95
29	0.78	0.84	0.89	0.94	1.00	1.05	1.10	1.16	1.21	1.26	1.32	1.37	1.43	1.48	1.53	1.59	1.64	1.69	1.75	1.80	1.85	1.91
30	0.77	0.82	0.87	0.92	0.98	1.03	1.08	1.13	1.19	1.24	1.29	1.35	1.40	1.45	1.50	1.56	1.61	1.66	1.71	1.77	1.82	1.87
31	0.75	0.80	0.86	0.91	0.96	1.01	1.06	1.11	1.17	1.22	1.27	1.32	1.37	1.42	1.48	1.53	1.58	1.63	1.68	1.73	1.79	1.84
32	0.74	0.79	0.84	0.89	0.94	0.99	1.04	1.09	1.14	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80
33	0.73	0.78	0.83	0.88	0.93	0.98	1.03	1.08	1.13	1.17	1.22	1.27	1.32	1.37	1.42	1.47	1.52	1.57	1.62	1.67	1.72	1.77
34	0.71	0.76	0.81	0.86	0.91	0.96	1.01	1.06	1.11	1.16	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.64	1.69	1.74
35	0.70	0.75	0.80	0.85	0.90	0.94	0.99	1.04	1.09	1.14	1.18	1.23	1.28	1.33	1.38	1.43	1.47	1.52	1.57	1.62	1.67	1.71
36	0.69	0.74	0.79	0.83	0.88	0.93	0.98	1.02	1.07	1.12	1.17	1.21	1.26	1.31	1.36	1.40	1.45	1.50	1.55	1.59	1.64	1.69
37	0.68	0.73	0.77	0.82	0.87	0.91	0.96	1.01	1.05	1.10	1.15	1.19	1.24	1.29	1.33	1.38	1.43	1.47	1.52	1.57	1.61	1.66
38	0.67	0.72	0.76	0.81	0.85	0.90	0.95	0.99	1.04	1.08	1.13	1.18	1.22	1.27	1.31	1.36	1.41	1.45	1.50	1.54	1.59	1.64
39	0.66	0.71	0.75	0.80	0.84	0.89	0.93	0.98	1.02	1.07	1.11	1.16	1.20	1.25	1.30	1.34	1.39	1.43	1.48	1.52	1.57	1.61
40	0.65	0.70	0.74	0.79	0.83	0.87	0.92	0.96	1.01	1.05	1.10	1.14	1.19	1.23	1.28	1.32	1.37	1.41	1.46	1.50	1.54	1.59
41	0.64	0.69	0.73	0.77	0.82	0.86	0.91	0.95	0.99	1.04	1.08	1.13	1.17	1.22	1.26	1.30	1.35	1.39	1.44	1.48	1.52	1.57
42	0.63	0.68	0.72	0.76	0.81	0.85	0.89	0.94	0.98	1.02	1.07	1.11	1.16	1.20	1.24	1.29	1.33	1.37	1.42	1.46	1.50	1.55
43	0.63	0.67	0.71	0.75	0.80	0.84	0.88	0.93	0.97	1.01	1.05	1.10	1.14	1.18	1.23	1.27	1.31	1.35	1.40	1.44	1.48	1.53
44	0.62	0.66	0.70	0.74	0.79	0.83	0.87	0.91	0.96	1.00	1.04	1.08	1.12	1.17	1.21	1.25	1.29	1.34	1.38	1.42	1.46	1.51
45	0.61	0.65	0.69	0.73	0.78	0.82	0.86	0.90	0.94	0.99	1.03	1.07	1.11	1.15	1.19	1.24	1.28	1.32	1.36	1.40	1.44	1.49
46	0.60	0.64	0.68	0.73	0.77	0.81	0.85	0.89	0.93	0.97	1.01	1.06	1.10	1.14	1.18	1.22	1.26	1.30	1.34	1.39	1.43	1.47
47	0.59	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00	1.04	1.08	1.12	1.17	1.21	1.25	1.29	1.33	1.37	1.41	1.45
48	0.59	0.63	0.67	0.71	0.75	0.79	0.83	0.87	0.91	0.95	0.99	1.03	1.07	1.11	1.15	1.19	1.23	1.27	1.31	1.35	1.39	1.43
49	0.58	0.62	0.66	0.70	0.74	0.78	0.82	0.86	0.90	0.94	0.98	1.02	1.06	1.10	1.14	1.18	1.22	1.26	1.30	1.34	1.38	1.42
50	0.57	0.61	0.65	0.69	0.73	0.77	0.81	0.85	0.89	0.93	0.97	1.01	1.05	1.09	1.13	1.16	1.20	1.24	1.28	1.32	1.36	1.40
51	0.57	0.61	0.65	0.68	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00	1.03	1.07	1.11	1.15	1.19	1.23	1.27	1.31	1.35	1.38
52	0.56	0.60	0.64	0.68	0.72	0.75	0.79	0.83	0.87	0.91	0.95	0.98	1.02	1.06	1.10	1.14	1.18	1.22	1.25	1.29	1.33	1.37
53	0.56	0.59	0.63	0.67	0.71	0.75	0.78	0.82	0.86	0.90	0.94	0.97	1.01	1.05	1.09	1.13	1.16	1.20	1.24	1.28	1.32	1.36
54	0.55	0.59	0.62	0.66	0.70	0.74	0.78	0.81	0.85	0.89	0.93	0.96	1.00	1.04	1.08	1.11	1.15	1.19	1.23	1.27	1.30	1.34
55	0.54	0.58	0.62	0.66	0.69	0.73	0.77	0.80	0.84	0.88	0.92	0.95	0.99	1.03	1.07	1.10	1.14	1.18	1.21	1.25	1.29	1.33
56	0.54	0.58	0.61	0.65	0.69	0.72	0.76	0.80	0.83	0.87	0.91	0.94	0.98	1.02	1.05	1.09	1.13	1.17	1.20	1.24	1.28	1.31
57	0.53	0.57	0.61	0.64	0.68	0.72	0.75	0.79	0.83	0.86	0.90	0.93	0.97	1.01	1.04	1.08	1.12	1.15	1.19	1.23	1.26	1.30
58	0.53	0.56	0.60	0.64	0.67	0.71	0.74	0.78	0.82	0.85	0.89	0.93	0.96	1.00	1.03	1.07	1.11	1.14	1.18	1.22	1.25	1.29
59	0.52	0.56	0.59	0.63	0.67	0.70	0.74	0.77	0.81	0.85	0.88	0.92	0.95	0.99	1.02	1.06	1.10	1.13	1.17	1.20	1.24	1.28
60	0.52	0.55	0.59	0.62	0.66	0.70	0.73	0.77	0.80	0.84	0.87	0.91	0.94	0.98	1.01	1.05	1.09	1.12	1.16	1.19	1.23	1.26

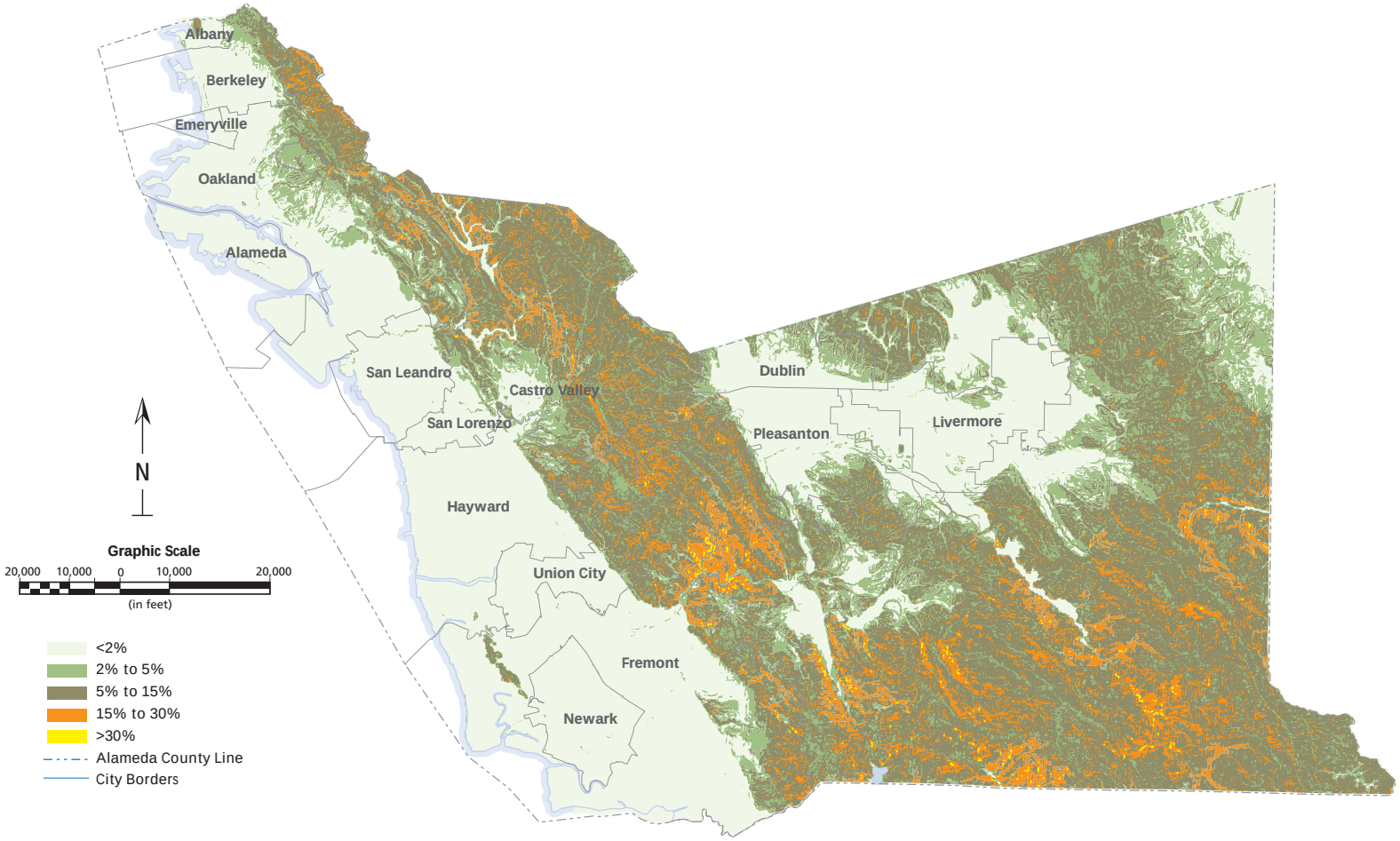
T_c (min)	Mean Annual Precipitation (in)																					
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	6.34	6.78	7.21	7.65	8.08	8.52	8.95	9.39	9.82	10.26	10.69	11.13	11.56	12.00	12.43	12.86	13.30	13.73	14.17	14.60	15.04	15.47
2	4.28	4.57	4.87	5.16	5.45	5.75	6.04	6.34	6.63	6.92	7.22	7.51	7.80	8.10	8.39	8.68	8.98	9.27	9.56	9.86	10.15	10.44
3	3.40	3.63	3.87	4.10	4.33	4.57	4.80	5.03	5.27	5.50	5.73	5.97	6.20	6.43	6.67	6.90	7.13	7.37	7.60	7.83	8.07	8.30
4	2.89	3.09	3.29	3.48	3.68	3.88	4.08	4.28	4.47	4.67	4.87	5.07	5.27	5.46	5.66	5.86	6.06	6.26	6.46	6.65	6.85	7.05
5	2.55	2.72	2.89	3.07	3.24	3.42	3.59	3.77	3.94	4.12	4.29	4.47	4.64	4.82	4.99	5.16	5.34	5.51	5.69	5.86	6.04	6.21
6	2.30	2.45	2.61	2.77	2.93	3.08	3.24	3.40	3.55	3.71	3.87	4.03	4.18	4.34	4.50	4.66	4.81	4.97	5.13	5.29	5.44	5.60
7	2.10	2.25	2.39	2.54	2.68	2.82	2.97	3.11	3.26	3.40	3.55	3.69	3.83	3.98	4.12	4.27	4.41	4.56	4.70	4.84	4.99	5.13
8	1.95	2.08	2.22	2.35	2.48	2.62	2.75	2.89	3.02	3.15	3.29	3.42	3.55	3.69	3.82	3.96	4.09	4.22	4.36	4.49	4.62	4.76
9	1.82	1.95	2.07	2.20	2.32	2.45	2.57	2.70	2.82	2.95	3.07	3.20	3.32	3.45	3.58	3.70	3.83	3.95	4.08	4.20	4.33	4.45
10	1.72	1.84	1.95	2.07	2.19	2.31	2.43	2.54	2.66	2.78	2.90	3.01	3.13	3.25	3.37	3.49	3.60	3.72	3.84	3.96	4.07	4.19
11	1.63	1.74	1.85	1.96	2.07	2.19	2.30	2.41	2.52	2.63	2.74	2.86	2.97	3.08	3.19	3.30	3.41	3.53	3.64	3.75	3.86	3.97
12	1.55	1.66	1.76	1.87	1.97	2.08	2.19	2.29	2.40	2.51	2.61	2.72	2.82	2.93	3.04	3.14	3.25	3.36	3.46	3.57	3.67	3.78
13	1.48	1.58	1.68	1.79	1.89	1.99	2.09	2.19	2.29	2.39	2.50	2.60	2.70	2.80	2.90	3.00	3.11	3.21	3.31	3.41	3.51	3.61
14	1.42	1.52	1.61	1.71	1.81	1.91	2.00	2.10	2.20	2.30	2.39	2.49	2.59	2.69	2.78	2.88	2.98	3.07	3.17	3.27	3.37	3.46
15	1.37	1.46	1.55	1.65	1.74	1.83	1.93	2.02	2.11	2.21	2.30	2.40	2.49	2.58	2.68	2.77	2.86	2.96	3.05	3.14	3.24	3.33
16	1.32	1.41	1.50	1.59	1.68	1.77	1.86	1.95	2.04	2.13	2.22	2.31	2.40	2.49	2.58	2.67	2.76	2.85	2.94	3.03	3.12	3.21
17	1.27	1.36	1.45	1.53	1.62	1.71	1.79	1.88	1.97	2.06	2.14	2.23	2.32	2.41	2.49	2.58	2.67	2.75	2.84	2.93	3.02	3.10
18	1.23	1.32	1.40	1.48	1.57	1.65	1.74	1.82	1.91	1.99	2.08	2.16	2.24	2.33	2.41	2.50	2.58	2.67	2.75	2.84	2.92	3.00
19	1.19	1.28	1.36	1.44	1.52	1.60	1.69	1.77	1.85	1.93	2.01	2.09	2.18	2.26	2.34	2.42	2.50	2.59	2.67	2.75	2.83	2.91
20	1.16	1.24	1.32	1.40	1.48	1.56	1.64	1.72	1.80	1.88	1.95	2.03	2.11	2.19	2.27	2.35	2.43	2.51	2.59	2.67	2.75	2.83
21	1.13	1.21	1.28	1.36	1.44	1.51	1.59	1.67	1.75	1.82	1.90	1.98	2.06	2.13	2.21	2.29	2.37	2.44	2.52	2.60	2.68	2.75
22	1.10	1.17	1.25	1.32	1.40	1.48	1.55	1.63	1.70	1.78	1.85	1.93	2.00	2.08	2.15	2.23	2.30	2.38	2.45	2.53	2.61	2.68
23	1.07	1.14	1.22	1.29	1.37	1.44	1.51	1.59	1.66	1.73	1.81	1.88	1.95	2.03	2.10	2.17	2.25	2.32	2.39	2.47	2.54	2.61
24	1.05	1.12	1.19	1.26	1.33	1.40	1.48	1.55	1.62	1.69	1.76	1.83	1.91	1.98	2.05	2.12	2.19	2.26	2.34	2.41	2.48	2.55
25	1.02	1.09	1.16	1.23	1.30	1.37	1.44	1.51	1.58	1.65	1.72	1.79	1.86	1.93	2.00	2.07	2.14	2.21	2.28	2.35	2.42	2.49
26	1.00	1.07	1.14	1.21	1.27	1.34	1.41	1.48	1.55	1.62	1.68	1.75	1.82	1.89	1.96	2.03	2.10	2.16	2.23	2.30	2.37	2.44
27	0.98	1.05	1.11	1.18	1.25	1.31	1.38	1.45	1.51	1.58	1.65	1.72	1.78	1.85	1.92	1.98	2.05	2.12	2.19	2.25	2.32	2.39
28	0.96	1.02	1.09	1.16	1.22	1.29	1.35	1.42	1.48	1.55	1.62	1.68	1.75	1.81	1.88	1.94	2.01	2.08	2.14	2.21	2.27	2.34
29	0.94	1.00	1.07	1.13	1.20	1.26	1.33	1.39	1.45	1.52	1.58	1.65	1.71	1.78	1.84	1.91	1.97	2.03	2.10	2.16	2.23	2.29
30	0.92	0.98	1.05	1.11	1.17	1.24	1.30	1.36	1.43	1.49	1.55	1.62	1.68	1.74	1.81	1.87	1.93	2.00	2.06	2.12	2.19	2.25
31	0.90	0.97	1.03	1.09	1.15	1.21	1.28	1.34	1.40	1.46	1.52	1.59	1.65	1.71	1.77	1.83	1.90	1.96	2.02	2.08	2.14	2.21
32	0.89	0.95	1.01	1.07	1.13	1.19	1.25	1.31	1.38	1.44	1.50	1.56	1.62	1.68	1.74	1.80	1.86	1.92	1.98	2.05	2.11	2.17
33	0.87	0.93	0.99	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.65	1.71	1.77	1.83	1.89	1.95	2.01	2.07	2.13
34	0.86	0.92	0.98	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.45	1.51	1.56	1.62	1.68	1.74	1.80	1.86	1.92	1.98	2.04	2.09
35	0.84	0.90	0.96	1.02	1.08	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.54	1.60	1.65	1.71	1.77	1.83	1.89	1.94	2.00	2.06
36	0.83	0.89	0.94	1.00	1.06	1.12	1.17	1.23	1.29	1.34	1.40	1.46	1.51	1.57	1.63	1.69	1.74	1.80	1.86	1.91	1.97	2.03
37	0.82	0.87	0.93	0.99	1.04	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.49	1.55	1.60	1.66	1.72	1.77	1.83	1.88	1.94	2.00
38	0.81	0.86	0.92	0.97	1.03	1.08	1.14	1.19	1.25	1.30	1.36	1.41	1.47	1.52	1.58	1.63	1.69	1.75	1.80	1.86	1.91	1.97
39	0.79	0.85	0.90	0.96	1.01	1.07	1.12	1.18	1.23	1.28	1.34	1.39	1.45	1.50	1.56	1.61	1.67	1.72	1.77	1.83	1.88	1.94
40	0.78	0.84	0.89	0.94	1.00	1.05	1.10	1.16	1.21	1.27	1.32	1.37	1.43	1.48	1.53	1.59	1.64	1.70	1.75	1.80	1.86	1.91
41	0.77	0.82	0.88	0.93	0.98	1.04	1.09	1.14	1.20	1.25	1.30	1.35	1.41	1.46	1.51	1.57	1.62	1.67	1.72	1.78	1.83	1.88
42	0.76	0.81	0.87	0.92	0.97	1.02	1.07	1.13	1.18	1.23	1.28	1.34	1.39	1.44	1.49	1.54	1.60	1.65	1.70	1.75	1.81	1.86
43	0.75	0.80	0.85	0.91	0.96	1.01	1.06	1.11	1.16	1.21	1.27	1.32	1.37	1.42	1.47	1.52	1.58	1.63	1.68	1.73	1.78	1.83
44	0.74	0.79	0.84	0.89	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.56	1.61	1.66	1.71	1.76	1.81
45	0.73	0.78	0.83	0.88	0.93	0.98	1.03	1.08	1.13	1.18	1.23	1.28	1.33	1.38	1.44	1.49	1.54	1.59	1.64	1.69	1.74	1.79
46	0.72	0.77	0.82	0.87	0.92	0.97	1.02	1.07	1.12	1.17	1.22	1.27	1.32	1.37	1.42	1.47	1.52	1.57	1.62	1.67	1.71	1.76
47	0.71	0.76	0.81	0.86	0.91	0.96	1.01	1.06	1.11	1.16	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.69	1.74
48	0.71	0.75	0.80	0.85	0.90	0.95	1.00	1.04	1.09	1.14	1.19	1.24	1.29	1.34	1.38	1.43	1.48	1.53	1.58	1.63	1.67	1.72
49	0.70	0.75	0.79	0.84	0.89	0.94	0.98	1.03	1.08	1.13	1.18	1.22	1.27	1.32	1.37	1.42	1.46	1.51	1.56	1.61	1.65	1.70
50	0.69	0.74	0.78	0.83	0.88	0.93	0.97	1.02	1.07	1.12	1.16	1.21	1.26	1.30	1.35	1.40	1.45	1.49	1.54	1.59	1.64	1.68
51	0.68	0.73	0.78	0.82	0.87	0.92	0.96	1.01	1.06	1.10	1.15	1.20	1.24	1.29	1.34	1.38	1.43	1.48	1.52	1.57	1.62	1.66
52	0.67	0.72	0.77	0.81	0.86	0.91	0.95	1.00	1.04	1.09	1.14	1.18	1.23	1.28	1.32	1.37	1.41	1.46	1.51	1.55	1.60	1.65
53	0.67	0.71	0.76	0.80	0.85	0.90	0.94	0.99	1.03	1.08	1.12	1.17	1.22	1.26	1.31	1.35	1.40	1.45	1.49	1.54	1.58	1.63
54	0.66	0.71	0.75	0.80	0.84	0.89	0.93	0.98	1.02	1.07	1.11	1.16	1.20	1.25	1.29	1.34	1.38	1.43	1.48	1.52	1.57	1.61
55	0.65	0.70	0.74	0.79	0.83	0.88	0.92	0.97	1.01	1.06	1.10	1.15	1.19	1.24	1.28	1.33	1.37	1.42	1.46	1.50	1.55	1.59
56	0.65	0.69	0.74	0.78	0.82	0.87	0.91	0.96	1.00	1.05	1.09	1.13	1.18	1.22	1.27	1.31	1.36	1.40	1.45	1.49	1.53	1.58
57	0.64	0.68	0.73	0.77	0.82	0.86	0.90	0.95	0.99	1.04	1.08	1.12	1.17	1.21	1.26	1.30	1.34	1.39	1.43	1.47	1.52	1.56
58	0.63	0.68	0.72	0.76	0.81	0.85	0.89	0.94	0.98	1.03	1.07	1.11	1.16	1.20	1.24	1.29	1.33	1.37	1.42	1.46	1.50	1.55
59	0.63	0.67	0.71	0.76	0.80	0.84	0.89	0.93	0.97	1.02	1.06	1.10	1.14	1.19	1.23	1.27	1.32	1.36	1.40	1.45	1.49	1.53
60	0.62	0.66	0.71	0.75	0.79	0.84	0.88	0.92	0.96	1.01	1.05	1.09	1.13	1.18	1.22	1.26	1.30	1.35	1.39	1.43	1.47	1.52

T_c (min)	Mean Annual Precipitation (in)																					
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	7.87	8.41	8.95	9.49	10.03	10.57	11.11	11.64	12.18	12.72	13.26	13.80	14.34	14.88	15.42	15.96	16.50	17.04	17.58	18.12	18.66	19.20
2	5.31	5.67	6.04	6.40	6.77	7.13	7.50	7.86	8.22	8.59	8.95	9.32	9.68	10.04	10.41	10.77	11.14	11.50	11.87	12.23	12.59	12.96
3	4.22	4.51	4.80	5.09	5.38	5.67	5.96	6.25	6.53	6.82	7.11	7.40	7.69	7.98	8.27	8.56	8.85	9.14	9.43	9.72	10.01	10.30
4	3.58	3.83	4.08	4.32	4.57	4.81	5.06	5.31	5.55	5.80	6.04	6.29	6.53	6.78	7.03	7.27	7.52	7.76	8.01	8.25	8.50	8.75
5	3.16	3.38	3.59	3.81	4.02	4.24	4.46	4.67	4.89	5.11	5.32	5.54	5.76	5.97	6.19	6.41	6.62	6.84	7.06	7.27	7.49	7.71
6	2.85	3.04	3.24	3.43	3.63	3.82	4.02	4.22	4.41	4.61	4.80	5.00	5.19	5.39	5.58	5.78	5.97	6.17	6.36	6.56	6.75	6.95
7	2.61	2.79	2.97	3.15	3.33	3.50	3.68	3.86	4.04	4.22	4.40	4.58	4.76	4.94	5.12	5.29	5.47	5.65	5.83	6.01	6.19	6.37
8	2.42	2.59	2.75	2.92	3.08	3.25	3.41	3.58	3.75	3.91	4.08	4.24	4.41	4.58	4.74	4.91	5.07	5.24	5.41	5.57	5.74	5.90
9	2.26	2.42	2.57	2.73	2.88	3.04	3.19	3.35	3.50	3.66	3.81	3.97	4.13	4.28	4.44	4.59	4.75	4.90	5.06	5.21	5.37	5.52
10	2.13	2.28	2.42	2.57	2.72	2.86	3.01	3.16	3.30	3.45	3.59	3.74	3.89	4.03	4.18	4.32	4.47	4.62	4.76	4.91	5.06	5.20
11	2.02	2.16	2.30	2.44	2.57	2.71	2.85	2.99	3.13	3.27	3.40	3.54	3.68	3.82	3.96	4.10	4.24	4.37	4.51	4.65	4.79	4.93
12	1.92	2.05	2.19	2.32	2.45	2.58	2.71	2.85	2.98	3.11	3.24	3.37	3.50	3.64	3.77	3.90	4.03	4.16	4.30	4.43	4.56	4.69
13	1.84	1.96	2.09	2.21	2.34	2.47	2.59	2.72	2.84	2.97	3.10	3.22	3.35	3.47	3.60	3.73	3.85	3.98	4.10	4.23	4.36	4.48
14	1.76	1.88	2.00	2.12	2.24	2.37	2.49	2.61	2.73	2.85	2.97	3.09	3.21	3.33	3.45	3.57	3.69	3.81	3.94	4.06	4.18	4.30
15	1.69	1.81	1.93	2.04	2.16	2.27	2.39	2.51	2.62	2.74	2.86	2.97	3.09	3.20	3.32	3.44	3.55	3.67	3.78	3.90	4.02	4.13
16	1.63	1.74	1.86	1.97	2.08	2.19	2.30	2.42	2.53	2.64	2.75	2.86	2.98	3.09	3.20	3.31	3.42	3.54	3.65	3.76	3.87	3.98
17	1.58	1.69	1.79	1.90	2.01	2.12	2.23	2.34	2.44	2.55	2.66	2.77	2.88	2.98	3.09	3.20	3.31	3.42	3.53	3.63	3.74	3.85
18	1.53	1.63	1.74	1.84	1.95	2.05	2.16	2.26	2.37	2.47	2.57	2.68	2.78	2.89	2.99	3.10	3.20	3.31	3.41	3.52	3.62	3.73
19	1.48	1.58	1.68	1.79	1.89	1.99	2.09	2.19	2.29	2.40	2.50	2.60	2.70	2.80	2.90	3.00	3.11	3.21	3.31	3.41	3.51	3.61
20	1.44	1.54	1.64	1.73	1.83	1.93	2.03	2.13	2.23	2.33	2.43	2.52	2.62	2.72	2.82	2.92	3.02	3.12	3.21	3.31	3.41	3.51
21	1.40	1.50	1.59	1.69	1.78	1.88	1.98	2.07	2.17	2.26	2.36	2.46	2.55	2.65	2.74	2.84	2.94	3.03	3.13	3.22	3.32	3.41
22	1.36	1.46	1.55	1.64	1.74	1.83	1.92	2.02	2.11	2.20	2.30	2.39	2.48	2.58	2.67	2.77	2.86	2.95	3.05	3.14	3.23	3.33
23	1.33	1.42	1.51	1.60	1.69	1.78	1.88	1.97	2.06	2.15	2.24	2.33	2.42	2.51	2.61	2.70	2.79	2.88	2.97	3.06	3.15	3.24
24	1.30	1.39	1.48	1.56	1.65	1.74	1.83	1.92	2.01	2.10	2.19	2.28	2.37	2.45	2.54	2.63	2.72	2.81	2.90	2.99	3.08	3.17
25	1.27	1.35	1.44	1.53	1.62	1.70	1.79	1.88	1.96	2.05	2.14	2.22	2.31	2.40	2.48	2.57	2.66	2.75	2.83	2.92	3.01	3.09
26	1.24	1.32	1.41	1.50	1.58	1.67	1.75	1.84	1.92	2.01	2.09	2.18	2.26	2.35	2.43	2.52	2.60	2.69	2.77	2.86	2.94	3.03
27	1.21	1.30	1.38	1.46	1.55	1.63	1.71	1.80	1.88	1.96	2.05	2.13	2.21	2.30	2.38	2.46	2.55	2.63	2.71	2.79	2.88	2.96
28	1.19	1.27	1.35	1.43	1.52	1.60	1.68	1.76	1.84	1.92	2.00	2.09	2.17	2.25	2.33	2.41	2.49	2.57	2.66	2.74	2.82	2.90
29	1.17	1.25	1.33	1.41	1.49	1.57	1.64	1.72	1.80	1.88	1.96	2.04	2.12	2.20	2.28	2.36	2.44	2.52	2.60	2.68	2.76	2.84
30	1.14	1.22	1.30	1.38	1.46	1.54	1.61	1.69	1.77	1.85	1.93	2.01	2.08	2.16	2.24	2.32	2.40	2.48	2.55	2.63	2.71	2.79
31	1.12	1.20	1.28	1.35	1.43	1.51	1.58	1.66	1.74	1.81	1.89	1.97	2.05	2.12	2.20	2.28	2.35	2.43	2.51	2.58	2.66	2.74
32	1.10	1.18	1.25	1.33	1.40	1.48	1.56	1.63	1.71	1.78	1.86	1.93	2.01	2.08	2.16	2.24	2.31	2.39	2.46	2.54	2.61	2.69
33	1.08	1.16	1.23	1.31	1.38	1.45	1.53	1.60	1.68	1.75	1.83	1.90	1.97	2.05	2.12	2.20	2.27	2.35	2.42	2.49	2.57	2.64
34	1.06	1.14	1.21	1.28	1.36	1.43	1.50	1.58	1.65	1.72	1.80	1.87	1.94	2.01	2.09	2.16	2.23	2.31	2.38	2.45	2.53	2.60
35	1.05	1.12	1.19	1.26	1.33	1.41	1.48	1.55	1.62	1.69	1.77	1.84	1.91	1.98	2.05	2.13	2.20	2.27	2.34	2.41	2.48	2.56
36	1.03	1.10	1.17	1.24	1.31	1.38	1.46	1.53	1.60	1.67	1.74	1.81	1.88	1.95	2.02	2.09	2.16	2.23	2.30	2.37	2.44	2.52
37	1.02	1.08	1.15	1.22	1.29	1.36	1.43	1.50	1.57	1.64	1.71	1.78	1.85	1.92	1.99	2.06	2.13	2.20	2.27	2.34	2.41	2.48
38	1.00	1.07	1.14	1.21	1.27	1.34	1.41	1.48	1.55	1.62	1.69	1.75	1.82	1.89	1.96	2.03	2.10	2.17	2.23	2.30	2.37	2.44
39	0.99	1.05	1.12	1.19	1.26	1.32	1.39	1.46	1.53	1.59	1.66	1.73	1.80	1.86	1.93	2.00	2.07	2.13	2.20	2.27	2.34	2.40
40	0.97	1.04	1.10	1.17	1.24	1.30	1.37	1.44	1.50	1.57	1.64	1.70	1.77	1.84	1.90	1.97	2.04	2.10	2.17	2.24	2.30	2.37
41	0.96	1.02	1.09	1.15	1.22	1.29	1.35	1.42	1.48	1.55	1.61	1.68	1.75	1.81	1.88	1.94	2.01	2.07	2.14	2.21	2.27	2.34
42	0.94	1.01	1.07	1.14	1.20	1.27	1.33	1.40	1.46	1.53	1.59	1.66	1.72	1.79	1.85	1.92	1.98	2.05	2.11	2.18	2.24	2.30
43	0.93	1.00	1.06	1.12	1.19	1.25	1.32	1.38	1.44	1.51	1.57	1.64	1.70	1.76	1.83	1.89	1.95	2.02	2.08	2.15	2.21	2.27
44	0.92	0.98	1.05	1.11	1.17	1.24	1.30	1.36	1.42	1.49	1.55	1.61	1.68	1.74	1.80	1.87	1.93	1.99	2.06	2.12	2.18	2.24
45	0.91	0.97	1.03	1.10	1.16	1.22	1.28	1.34	1.41	1.47	1.53	1.59	1.66	1.72	1.78	1.84	1.91	1.97	2.03	2.09	2.15	2.22
46	0.90	0.96	1.02	1.08	1.14	1.20	1.27	1.33	1.39	1.45	1.51	1.57	1.64	1.70	1.76	1.82	1.88	1.94	2.00	2.07	2.13	2.19
47	0.89	0.95	1.01	1.07	1.13	1.19	1.25	1.31	1.37	1.43	1.49	1.55	1.62	1.68	1.74	1.80	1.86	1.92	1.98	2.04	2.10	2.16
48	0.88	0.94	1.00	1.06	1.12	1.18	1.24	1.30	1.36	1.42	1.48	1.54	1.60	1.66	1.72	1.78	1.84	1.90	1.96	2.02	2.08	2.14
49	0.87	0.92	0.98	1.04	1.10	1.16	1.22	1.28	1.34	1.40	1.46	1.52	1.58	1.64	1.70	1.76	1.82	1.87	1.93	1.99	2.05	2.11
50	0.86	0.91	0.97	1.03	1.09	1.15	1.21	1.27	1.33	1.38	1.44	1.50	1.56	1.62	1.68	1.74	1.79	1.85	1.91	1.97	2.03	2.09
51	0.85	0.90	0.96	1.02	1.08	1.14	1.19	1.25	1.31	1.37	1.43	1.48	1.54	1.60	1.66	1.72	1.77	1.83	1.89	1.95	2.01	2.06
52	0.84	0.89	0.95	1.01	1.07	1.12	1.18	1.24	1.30	1.35	1.41	1.47	1.53	1.58	1.64	1.70	1.76	1.81	1.87	1.93	1.98	2.04
53	0.83	0.88	0.94	1.00	1.06	1.11	1.17	1.23	1.28	1.34	1.40	1.45	1.51	1.57	1.62	1.68	1.74	1.79	1.85	1.91	1.96	2.02
54	0.82	0.88	0.93	0.99	1.04	1.10	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.55	1.61	1.66	1.72	1.77	1.83	1.89	1.94	2.00
55	0.81	0.87	0.92	0.98	1.03	1.09	1.14	1.20	1.26	1.31	1.37	1.42	1.48	1.53	1.59	1.64	1.70	1.76	1.81	1.87	1.92	1.98
56	0.80	0.86	0.91	0.97	1.02	1.08	1.13	1.19	1.24	1.30	1.35	1.41	1.46	1.52	1.57	1.63	1.68	1.74	1.79	1.85	1.90	1.96
57	0.79	0.85	0.90	0.96	1.01	1.07	1.12	1.18	1.23	1.28	1.34	1.39	1.45	1.50	1.56	1.61	1.67	1.72	1.78	1.83	1.88	1.94
58	0.79	0.84	0.89	0.95	1.00	1.06	1.11	1.16	1.22	1.27	1.33	1.38	1.43	1.49	1.54	1.60	1.65	1.70	1.76	1.81	1.87	1.92
59	0.78	0.83	0.89	0.94	0.99	1.05	1.10	1.15	1.21	1.26	1.31	1.37	1.42	1.47	1.53	1.58	1.63	1.69	1.74	1.79	1.85	1.90
60	0.77	0.82	0.88	0.93	0.98	1.04	1.09	1.14	1.19	1.25	1.30	1.35	1.41	1.46	1.51	1.57	1.62	1.67	1.72	1.78	1.83	1.88



Attachment 9 available for download in GIS file from the Alameda County Flood Control District website.

(NRCS 2015) and (District 2015)



Attachment 10 available for download as a GIS file from the Alameda County Flood Control District website.

(District 2015)

Rational Method (Rantz 1971*)

*Rantz, S.E. 1971. *Suggested Criteria for Hydrologic Design of Storm Drainage Facilities in the San Francisco Bay Region, CA*. U.S. Geological Survey Open-File Report, Menlo Park, CA.

Q= CiA
where C= runoff coeff.;
i= rainfall intensity at duration equal to Tc;
A= drainage area, ac.

Watershed Areas

	A	B	C	D	E	F	G	H	I	J
Sq Ft	102,189.7	25,984.9	10,730.1	50,480.9	47,700.4	141,259.3	101,045.8	98,928.7	106,217.6	105,749.2
Sq Miles	0.0037	0.0009	0.0004	0.0018	0.0017	0.0051	0.0036	0.0035	0.0038	0.0038
Acres	2.35	0.60	0.25	1.16	1.10	3.24	2.32	2.27	2.44	2.43

For Watershed A

Area 2.35 Acres

a)Computing Time of Concentration

Overland flow = 430 ft slope = 0.43 %

@Q2	35 minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	27 minutes	for C= 0.40	
@25	25 minutes	for C= 0.52	
@Q100	21 minutes	for C =0.61	

Time of concentration Tc=

@Q2	35 minutes
@Q10	27 minutes
@25	25 minutes
@Q100	21 minutes

b)Runoff Coeff., C

Per Table 1 - impervious area for high end of medium density residential is 40% (Upper end of Med. Residential, or low end of Heavy Urbanization (apartments))

2 yr recurrence interval, C	**0.45**
10 yr recurrence interval, C	**0.55**
25 yr recurrence interval, C	**0.7**
100 yr recurrence interval, C	**0.76**

c) Precipitation Intensity, i MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.41 inch	**0.70 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.57 inch	**1.27 inches per hour**	
25 yr	0.65 inch	**1.56 inches per hour**	
100 yr	0.67 inch	**1.91 inches per hour**	

Therefore,

Q2	**0.76** cfs
Q10	**1.63** cfs
Q25	**2.56** cfs
Q100	**3.41** cfs

For Watershed B

Length 394.65 feet
Slope 0.01 %
Area 0.60 Acres

*Google earth elev change from 68 ft @ Curtis & Delaware to 66 ft at hearst & curtis

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5 minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7 minutes	for C= 0.40	
@25	6 minutes	for C= 0.52	
@Q100	5 minutes	for C =0.61	

Open channel flow (gutter flow) 394.653 slope 0.01 %

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.39 Sq ft
Wetted perimeter 2.87 ft

V 2.16 ft per second
therefore Channel travel time = L/(60V) 3.04 Minutes

Time of concentration Tc= Toverlandflow+ Tchnnelflow

10.54	minutes	for C as0.325	Q2
10.04	minutes	for C as0.40	Q10
9.04	minutes	for C as0.52	Q25
8.04	minutes	for C as0.61	Q100

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.325**
10 yr recurrence interval, C	**0.4**
25 yr recurrence interval, C	**0.52**
100 yr recurrence interval, C	**0.61**

c) Precipitation Intensity, i MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.23 inch	**1.32 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.34 inch	**2.04 inches per hour**	
25 yr	0.52 inch	**3.44 inches per hour**	
100 yr	0.57 inch	**4.21 inches per hour**	

Therefore,

Q2	**0.26** cfs
Q10	**0.49** cfs
Q25	**1.07** cfs
Q100	**1.53** cfs

For Watershed C

Length 253.91 feet
Slope 2.36 %
Area 0.25 Acres

*Google earth elev change from 66 ft to 60 ft

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5 minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7 minutes	for C= 0.40	
@25	6 minutes	for C= 0.52	
@Q100	5 minutes	for C =0.61	

Open channel flow (gutter flow) 253.91 slope 0.02 %

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.39 Sq ft
Wetted perimeter 2.87 ft

V 4.67 ft per second
therfore Channel travel time = L/(60V) 0.91 Minutes

Time of concentration Tc= Toverlandflow+ Tchnnelflow

8.41	minutes	for C as0.325	Q2
7.91	minutes	for C as0.40	Q10
6.91	minutes	for C as0.52	Q25
5.91	minutes	for C as0.61	Q100

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.325**
10 yr recurrence interval, C	**0.4**
25 yr recurrence interval, C	**0.52**
100 yr recurrence interval, C	**0.61**

c) Precipitation Intensity, i MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.12 inch	**0.86 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.292 inch	**2.22 inches per hour**	
25 yr	0.313 inch	**2.72 inches per hour**	
100 yr	0.328 inch	**3.33 inches per hour**	

Therefore,

Q2	**0.07** cfs
Q10	**0.22** cfs
Q25	**0.35** cfs
Q100	**0.50** cfs

For Watershed D

Length 395.81 feet
Slope 0.01 %
Area 1.16 Acres

*Google earth elev change from 68 ft @ Curtis & Delaware to 66 ft at hearst & curtis

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5 minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7 minutes	for C= 0.40	
@25	6 minutes	for C= 0.52	
@Q100	5 minutes	for C =0.61	

Open channel flow (gutter flow) 395.81 slope 0.01 %

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.39 Sq ft
Wetted perimeter 2.87 ft

V 2.16 ft per second
therefore Channel travel time = L/(60V) 3.06 Minutes

Time of concentration Tc= Toverlandflow+ Tchnnelflow

10.56	minutes	for C as0.325	Q2
10.06	minutes	for C as0.40	Q10
9.06	minutes	for C as0.52	Q25
8.06	minutes	for C as0.61	Q100

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.325**
10 yr recurrence interval, C	**0.4**
25 yr recurrence interval, C	**0.52**
100 yr recurrence interval, C	**0.61**

c) Precipitation Intensity, i MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.23 inch	**1.32 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.34 inch	**2.03 inches per hour**	
25 yr	0.37 inch	**2.48 inches per hour**	
100 yr	0.40 inch	**2.98 inches per hour**	

Therefore,

Q2	**0.50** cfs
Q10	**0.94** cfs
Q25	**1.50** cfs
Q100	**2.10** cfs

For Watershed E

Length 405.78 feet
Slope 0.02 %
Area 1.10 Acres

*Google earth elev change from 74 ft @Chestnut and Hearst to 66 ft at hearst & curtis

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5	minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7	minutes	for C= 0.40	
@25	6	minutes	for C= 0.52	
@Q100	5	minutes	for C =0.61	

Open channel flow (gutter flow) 405.783 slope 0.02 %

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.39 Sq ft
Wetted perimeter 2.87 ft

V 4.26 ft per second
therefore Channel travel time = L/(60V) 1.59 Minutes

Time of concentration Tc= Toverlandflow+ Tchnnelflow

9.09	minutes	for C as0.325	Q2
8.59	minutes	for C as0.40	Q10
7.59	minutes	for C as0.52	Q25
6.59	minutes	for C as0.61	Q100

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.325**
10 yr recurrence interval, C	**0.4**
25 yr recurrence interval, C	**0.52**
100 yr recurrence interval, C	**0.61**

c) Precipitation Intensity, i MAP from Alameda Cty C3= 22 inches

	Depth		
2 yr	0.21 inch	**1.39 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.31 inch	**2.15 inches per hour**	
25 yr	0.33 inch	**2.63 inches per hour**	
100 yr	0.35 inch	**3.20 inches per hour**	

Therefore,

Q2	**0.50 cfs**
Q10	**0.90 cfs**
Q25	**1.50 cfs**
Q100	**2.13 cfs**

For Watersheds F,G,H,I & J

Total Area **12.70 Acres**
Longest path 2,120.20 feet
Slope 1.98 %

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5	minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7	minutes	for C= 0.40	
@25	6	minutes	for C= 0.52	
@Q100	5	minutes	for C =0.61	

Open channel flow (gutter flow) 2,120.20 ft slope 0.02

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.3913 Sq ft
Wetted perimeter 2.8705 ft

Watershed J, Tc1 (elev change from Sac and Delaware to Short & Hearst = 116 to 98ft)
V 4.849458276 ft per second
Channel travel time = 2.424360137 Minutes

Watershed I, Tc2 (elev change = 98 to 92ft)
V 4.063458531 ft per second
Channel travel time = 1.373624617 Minutes

Watershed H, Tc3 (elev change = 92 to 86ft)
V 4.124376277 ft per second
Channel travel time = 1.313653177 Minutes

Watershed G, Tc4 (elev change = 86 to 81ft)
V 3.841120033 ft per second
Channel travel time = 1.35519153 Minutes

Watershed F, Tc4 (elev change =81 to 74ft)
V 3.838429429 ft per second
Channel travel time = 1.901260694 Minutes

Total time of concentration to reach c		
	15.87 minutes	**Q2**
	15.37 minutes	**Q10**
	14.37 minutes	**Q25**
	13.37 minutes	**Q100**

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.33**
10 yr recurrence interval, C	**0.40**
25 yr recurrence interval, C	**0.49**
100 yr recurrence interval, C	**0.61**

Precipitation Intensity MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.29 inch	**1.08 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.44 inch	**1.70 inches per hour**	
25 yr	0.52 inch	**2.16 inches per hour**	
100 yr	0.55 inch	**2.46 inches per hour**	

Therefore,

Q2	**4.47 cfs**
Q10	**8.65 cfs**
Q25	**13.50 cfs**
Q100	**19.04 cfs**

HEARST AVE. PROJECT: DESIGN PEAK DISCHARGES FOR LOWER HEARST AVE. DRAINAGE SYSTEM

Rational Method (Rantz 1971*)

*Rantz, S.E. 1971. *Suggested Criteria for Hydrologic Design of Storm Drainage Facilities in the San Francisco Bay Region, CA*. U.S. Geological Survey Open-File Report, Menlo Park, CA.

Q= CiA
where C= runoff coeff.;
i= rainfall intensity at duration equal to Tc;
A= drainage area, ac.

Watershed Areas

	A	B	C	D	E	F	G	H	I	J
Sq Ft	102,189.7	25,984.9	10,730.1	50,480.9	47,700.4	141,259.3	101,045.8	98,928.7	106,217.6	105,749.2
Sq Miles	0.0037	0.0009	0.0004	0.0018	0.0017	0.0051	0.0036	0.0035	0.0038	0.0038
Acres	2.35	0.60	0.25	1.16	1.10	3.24	2.32	2.27	2.44	2.43
Roadway	0	9875	6900	9850	10375	20600	31175	28925	30450	29725
Roadway acres	0	0.23	0.16	0.23	0.24	0.47	0.72	0.66	0.70	0.68
%roadway	0	0.38	0.64	0.20	0.22	0.15	0.31	0.29	0.29	0.28

For Watershed D

Length 395.81 feet
Slope 0.01 %
Area 1.16 Acres
Roadway 0.23 Acres

*Google earth elev change from 68 ft @ Curtis & Delaware to 66 ft at hearst & curtis

a)Computing Time of Concentration

Overland flow = 50 ft slope = 2%

@Q2	7.5 minutes	for C =0.325	From Fig 6 (Rantz1971)
@Q10	7 minutes	for C= 0.40	
@25	6 minutes	for C= 0.52	
@Q100	5 minutes	for C =0.61	

Open channel flow (gutter flow) 395.81 slope 0.01 %

Channel Travel time V= (1.49/n)*((A/WP)^(2/3))*S^(1/2)
Area of gutter flow from CAD 0.39 Sq ft
Wetted perimeter 2.87 ft

V 2.16 ft per second
therefore Channel travel time = L/(60V) 3.06 Minutes

Time of concentration Tc= Toverlandflow+ Tchnnelflow

10.56	minutes	for C as0.325	Q2
10.06	minutes	for C as0.40	Q10
9.06	minutes	for C as0.52	Q25
8.06	minutes	for C as0.61	Q100

b)Runoff Coeff., C

Per Table 1 - impervious area for medium density residential is 25%

2 yr recurrence interval, C	**0.325**
10 yr recurrence interval, C	**0.4**
25 yr recurrence interval, C	**0.52**
100 yr recurrence interval, C	**0.61**

Roadway, Per figure 6

2 yr recurrence interval, C	0.6
10 yr recurrence interval, C	0.75
25 yr recurrence interval, C	0.9
100 yr recurrence interval, C	0.95

Caculating Composite C

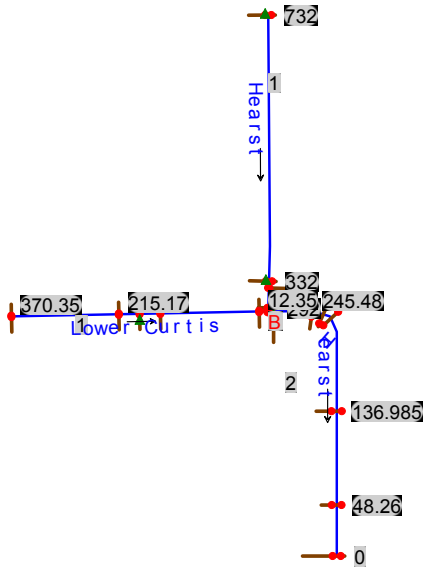
2 yr recurrence interval, C	**0.38**
10 yr recurrence interval, C	**0.47**
25 yr recurrence interval, C	**0.59**
100 yr recurrence interval, C	**0.68**

c) Precipitation Intensity, i MAP from Alameda Cty C3 22 inches

	Depth		
2 yr	0.23 inch	**1.32 inches per hour**	From Table 4(Rantz 1971)
10 yr	0.34 inch	**2.03 inches per hour**	
25 yr	0.37 inch	**2.48 inches per hour**	
100 yr	0.40 inch	**2.98 inches per hour**	

Therefore,

Q2	**0.58 cfs**
Q10	**1.10 cfs**
Q25	**1.71 cfs**
Q100	**2.33 cfs**



None of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

HEC-RAS Plan: Plan 03

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Hearst	2	0	Q2	12.24	52.13	52.68	52.90	53.46	0.030056	7.21	1.83	7.25	2.43
Hearst	2	0	Q10	21.71	52.13	52.82	53.09	53.76	0.024963	7.97	3.03	9.50	2.27
Hearst	2	0	Q25	26.75	52.13	52.88	53.18	53.89	0.023264	8.34	3.63	10.41	2.21
Hearst	2	0	Q100	33.98	52.13	52.96	53.26	54.06	0.021921	8.80	4.49	11.97	2.15
Hearst	2	48.26	Q2	11.91	53.55	54.06	54.23	54.72	0.022422	6.78	2.37	16.18	2.35
Hearst	2	48.26	Q10	21.14	53.55	54.15	54.34	54.95	0.024231	7.87	3.85	17.22	2.52
Hearst	2	48.26	Q25	26.06	53.55	54.19	54.41	55.06	0.024784	8.30	4.51	17.67	2.57
Hearst	2	48.26	Q100	33.12	53.55	54.23	54.49	55.24	0.026822	9.02	5.26	18.16	2.71
Hearst	2	136.985	Q2	11.91	56.28	56.70	56.93	57.78	0.053615	8.38	1.49	8.99	3.21
Hearst	2	136.985	Q10	21.14	56.28	56.80	57.07	58.05	0.048694	9.19	2.68	14.05	3.15
Hearst	2	136.985	Q25	26.06	56.28	56.84	57.15	58.21	0.048831	9.70	3.24	16.28	3.19
Hearst	2	136.985	Q100	33.12	56.28	56.90	57.22	58.31	0.042422	10.03	4.19	18.12	3.02
Hearst	2	225.71	Q2	11.91	58.17	58.64	58.64	58.76	0.004052	2.78	4.29	18.14	1.01
Hearst	2	225.71	Q10	21.14	58.17	58.76	58.76	58.92	0.003390	3.24	6.84	24.58	0.98
Hearst	2	225.71	Q25	26.06	58.17	58.82	58.82	58.99	0.002829	3.31	8.47	27.00	0.92
Hearst	2	225.71	Q100	33.12	58.17	58.88	58.88	59.07	0.002821	3.61	10.00	27.00	0.94
Hearst	2	234.6	Q2	11.91	57.91	58.76	58.43	58.78	0.000227	1.13	11.29	27.00	0.27
Hearst	2	234.6	Q10	21.14	57.91	58.91	58.56	58.94	0.000299	1.52	15.19	27.00	0.33
Hearst	2	234.6	Q25	26.06	57.91	58.96	58.62	59.01	0.000335	1.71	16.79	27.00	0.35
Hearst	2	234.6	Q100	33.12	57.91	59.04	58.69	59.09	0.000381	1.94	18.82	27.00	0.38
Hearst	2	245.48	Q2	11.91	58.14	58.69	58.73	58.86	0.004234	3.39	4.45	23.08	1.06
Hearst	2	245.48	Q10	21.14	58.14	58.85	58.85	59.02	0.002847	3.61	8.21	26.13	0.93
Hearst	2	245.48	Q25	26.06	58.14	58.91	58.91	59.09	0.002572	3.74	9.94	27.00	0.90
Hearst	2	245.48	Q100	33.12	58.14	58.98	58.98	59.18	0.002632	4.08	11.66	27.00	0.93
Hearst	2	282	Q2	11.91	58.43	58.92	58.92	59.00	0.002916	2.68	7.39	39.00	0.80
Hearst	2	282	Q10	21.14	58.43	59.04	59.00	59.12	0.002465	2.90	11.90	39.00	0.75
Hearst	2	282	Q25	26.06	58.43	59.10	59.03	59.19	0.002197	2.92	14.28	39.00	0.71
Hearst	2	282	Q100	33.12	58.43	59.19	59.08	59.27	0.001875	2.93	17.67	39.00	0.66
Hearst	1	292	Q2	11.26	58.51	59.00	58.73	59.01	0.000172	0.92	13.16	30.00	0.23
Hearst	1	292	Q10	20.01	58.51	59.11	58.81	59.14	0.000260	1.30	16.49	30.00	0.30
Hearst	1	292	Q25	24.66	58.51	59.17	58.84	59.20	0.000289	1.45	18.15	30.00	0.32
Hearst	1	292	Q100	31.36	58.51	59.25	58.89	59.28	0.000311	1.63	20.54	30.00	0.34
Hearst	1	322	Q2	11.26	59.10	59.26	59.38	59.71	0.041180	6.43	2.12	19.60	2.97
Hearst	1	322	Q10	20.01	59.10	59.32	59.47	59.93	0.039312	7.70	3.23	22.86	3.05
Hearst	1	322	Q25	24.66	59.10	59.38	59.50	59.80	0.019140	6.48	4.82	26.49	2.23
Hearst	1	322	Q100	31.36	59.10	59.30	59.55	61.10	0.122864	13.08	2.97	22.13	5.34
Hearst	1	332	Q2	9.08	59.26	59.60	59.71	60.00	0.019001	5.10	1.84	24.10	1.95
Hearst	1	332	Q10	16.10	59.26	59.68	59.77	60.23	0.019032	6.13	2.87	36.10	2.01
Hearst	1	332	Q25	19.79	59.26	59.80	59.80	59.92	0.003747	3.33	9.82	39.00	0.91
Hearst	1	332	Q100	25.17	59.26	59.59	59.85	63.00	0.171058	14.88	1.74	22.50	5.82
Hearst	1	732	Q2	9.08	67.24	67.57	67.69	67.99	0.021020	5.23	1.79	23.10	2.04
Hearst	1	732	Q10	16.10	67.24	67.65	67.75	68.23	0.021031	6.31	2.78	35.24	2.11
Hearst	1	732	Q25	19.79	67.24	67.68	67.78	68.33	0.021028	6.70	3.23	38.72	2.12
Hearst	1	732	Q100	25.17	67.24	67.83	67.83	67.96	0.003828	3.55	11.53	39.20	0.93
Lower Curtis	1	12.35	Q2	0.65	57.39	59.01		59.01	0.000000	0.02	36.22	40.00	0.00
Lower Curtis	1	12.35	Q10	1.13	57.39	59.13		59.13	0.000000	0.04	41.12	40.00	0.01
Lower Curtis	1	12.35	Q25	1.40	57.39	59.19		59.19	0.000000	0.04	43.60	40.00	0.01
Lower Curtis	1	12.35	Q100	1.76	57.39	59.28		59.28	0.000000	0.05	47.11	40.00	0.01
Lower Curtis	1	155.17	Q2	0.32	58.49	59.01		59.01	0.000037	0.26	2.01	12.54	0.07
Lower Curtis	1	155.17	Q10	0.56	58.49	59.13		59.13	0.000024	0.23	3.86	18.32	0.06
Lower Curtis	1	155.17	Q25	0.70	58.49	59.19		59.20	0.000020	0.22	5.12	22.13	0.05
Lower Curtis	1	155.17	Q100	0.88	58.49	59.28		59.28	0.000014	0.20	7.30	27.56	0.04
Lower Curtis	1	185.17	Q2	0.32	58.69	59.01	58.84	59.01	0.000023	0.19	3.91	24.80	0.07
Lower Curtis	1	185.17	Q10	0.56	58.69	59.13	58.87	59.13	0.000011	0.18	7.03	26.25	0.05
Lower Curtis	1	185.17	Q25	0.70	58.69	59.20	58.89	59.20	0.000009	0.18	8.68	26.99	0.05
Lower Curtis	1	185.17	Q100	0.88	58.69	59.28	58.91	59.28	0.000006	0.17	11.09	28.03	0.04
Lower Curtis	1	215.17	Q2	0.00	58.88	59.01	58.90	59.01	0.000000	0.01	0.04	0.46	0.01
Lower Curtis	1	215.17	Q10	0.00	58.88	59.13	58.90	59.13	0.000000	0.01	0.17	1.82	0.00
Lower Curtis	1	215.17	Q25	0.00	58.88	59.20	58.91	59.20	0.000000	0.01	0.33	3.75	0.00
Lower Curtis	1	215.17	Q100	0.00	58.88	59.28	58.92	59.28	0.000000	0.01	0.83	7.63	0.00
Lower Curtis	1	370.35	Q2	0.00	59.76	59.78	59.78	59.78	0.005005	0.38	0.00	0.15	0.65
Lower Curtis	1	370.35	Q10	0.00	59.76	59.78	59.78	59.79	0.016275	0.71	0.00	0.15	1.18

HEC-RAS Plan: Plan 03 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Curtis	1	370.35	Q25	0.00	59.76	59.79	59.79	59.80	0.012646	0.79	0.00	0.22	1.10
Lower Curtis	1	370.35	Q100	0.00	59.76	59.80	59.80	59.81	0.010047	0.79	0.00	0.26	1.01

Plan: Plan 03 Hearst 1 RS: 732 Profile: Q2

E.G. Elev (ft)	67.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	67.57	Reach Len. (ft)	400.00	400.00	400.00
Crit W.S. (ft)	67.69	Flow Area (sq ft)	0.07	1.72	
E.G. Slope (ft/ft)	0.021020	Area (sq ft)	0.07	1.72	0.72
Q Total (cfs)	9.08	Flow (cfs)	0.10	8.98	
Top Width (ft)	23.10	Top Width (ft)	2.62	8.46	12.02
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	1.48	5.23	
Max Chl Dpth (ft)	0.33	Hydr. Depth (ft)	0.03	0.20	
Conv. Total (cfs)	62.6	Conv. (cfs)	0.7	61.9	
Length Wtd. (ft)	400.00	Wetted Per. (ft)	2.62	9.69	
Min Ch El (ft)	67.24	Shear (lb/sq ft)	0.03	0.23	
Alpha	1.05	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)		Cum SA (acres)	0.04	0.08	0.12

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.

Plan: Plan 03 Hearst 1 RS: 732 Profile: Q10

E.G. Elev (ft)	68.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	67.65	Reach Len. (ft)	400.00	400.00	400.00
Crit W.S. (ft)	67.75	Flow Area (sq ft)	0.41	2.37	
E.G. Slope (ft/ft)	0.021031	Area (sq ft)	0.41	2.37	1.98
Q Total (cfs)	16.10	Flow (cfs)	1.17	14.93	
Top Width (ft)	35.24	Top Width (ft)	5.88	8.49	20.86
Vel Total (ft/s)	5.79	Avg. Vel. (ft/s)	2.82	6.31	
Max Chl Dpth (ft)	0.41	Hydr. Depth (ft)	0.07	0.28	
Conv. Total (cfs)	111.0	Conv. (cfs)	8.1	103.0	
Length Wtd. (ft)	400.00	Wetted Per. (ft)	5.89	10.08	
Min Ch El (ft)	67.24	Shear (lb/sq ft)	0.09	0.31	
Alpha	1.12	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	0.02	0.02
C & E Loss (ft)		Cum SA (acres)	0.07	0.08	0.21

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.

Plan: Plan 03 Hearst 1 RS: 732 Profile: Q25

E.G. Elev (ft)	68.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.64	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	67.68	Reach Len. (ft)	400.00	400.00	400.00
Crit W.S. (ft)	67.78	Flow Area (sq ft)	0.60	2.63	
E.G. Slope (ft/ft)	0.021028	Area (sq ft)	0.60	2.63	2.68
Q Total (cfs)	19.79	Flow (cfs)	2.15	17.64	
Top Width (ft)	38.72	Top Width (ft)	5.88	8.51	24.33
Vel Total (ft/s)	6.13	Avg. Vel. (ft/s)	3.59	6.70	
Max Chl Dpth (ft)	0.44	Hydr. Depth (ft)	0.10	0.31	
Conv. Total (cfs)	136.5	Conv. (cfs)	14.8	121.7	
Length Wtd. (ft)	400.00	Wetted Per. (ft)	5.92	10.24	
Min Ch El (ft)	67.24	Shear (lb/sq ft)	0.13	0.34	
Alpha	1.10	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	0.03	0.04
C & E Loss (ft)		Cum SA (acres)	0.07	0.08	0.23

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.

Plan: Plan 03 Hearst 1 RS: 732 Profile: Q100

E.G. Elev (ft)	67.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	67.83	Reach Len. (ft)	400.00	400.00	400.00
Crit W.S. (ft)	67.83	Flow Area (sq ft)	1.44	3.85	6.24
E.G. Slope (ft/ft)	0.003828	Area (sq ft)	1.44	3.85	6.24
Q Total (cfs)	25.17	Flow (cfs)	3.91	13.68	7.58
Top Width (ft)	39.20	Top Width (ft)	5.88	8.51	24.81
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)	2.71	3.55	1.22
Max Chl Dpth (ft)	0.59	Hydr. Depth (ft)	0.24	0.45	0.25
Conv. Total (cfs)	406.8	Conv. (cfs)	63.1	221.1	122.6
Length Wtd. (ft)	400.00	Wetted Per. (ft)	6.07	10.82	24.96
Min Ch El (ft)	67.24	Shear (lb/sq ft)	0.06	0.09	0.06
Alpha	1.77	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	1.55	Cum Volume (acre-ft)	0.01	0.03	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	0.08	0.18

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	Divided flow computed for this cross-section.

Errors Warnings and Notes (Continued)

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q2

E.G. Elev (ft)	60.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	59.60	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	59.71	Flow Area (sq ft)	0.09	1.75	
E.G. Slope (ft/ft)	0.019001	Area (sq ft)	0.09	1.75	0.81
Q Total (cfs)	9.08	Flow (cfs)	0.14	8.94	
Top Width (ft)	24.10	Top Width (ft)	2.98	8.26	12.85
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	1.53	5.10	
Max Chl Dpth (ft)	0.34	Hydr. Depth (ft)	0.03	0.21	
Conv. Total (cfs)	65.9	Conv. (cfs)	1.0	64.9	
Length Wtd. (ft)	10.00	Wetted Per. (ft)	2.98	9.53	
Min Ch El (ft)	59.26	Shear (lb/sq ft)	0.04	0.22	
Alpha	1.06	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	7.99	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q10

E.G. Elev (ft)	60.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	59.68	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	59.77	Flow Area (sq ft)	0.47	2.41	
E.G. Slope (ft/ft)	0.019032	Area (sq ft)	0.47	2.41	2.17
Q Total (cfs)	16.10	Flow (cfs)	1.36	14.74	
Top Width (ft)	36.10	Top Width (ft)	5.88	8.30	21.93
Vel Total (ft/s)	5.60	Avg. Vel. (ft/s)	2.91	6.13	
Max Chl Dpth (ft)	0.42	Hydr. Depth (ft)	0.08	0.29	
Conv. Total (cfs)	116.7	Conv. (cfs)	9.9	106.8	
Length Wtd. (ft)	10.00	Wetted Per. (ft)	5.90	9.93	
Min Ch El (ft)	59.26	Shear (lb/sq ft)	0.09	0.29	

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q10 (Continued)

Alpha	1.12	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	8.00	Cum Volume (acre-ft)	0.01	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q25

E.G. Elev (ft)	59.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.80	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	59.80	Flow Area (sq ft)	1.19	3.43	5.20
E.G. Slope (ft/ft)	0.003747	Area (sq ft)	1.19	3.43	5.20
Q Total (cfs)	19.79	Flow (cfs)	2.84	11.41	5.54
Top Width (ft)	39.00	Top Width (ft)	5.88	8.31	24.81
Vel Total (ft/s)	2.02	Avg. Vel. (ft/s)	2.38	3.33	1.07
Max Chl Dpth (ft)	0.54	Hydr. Depth (ft)	0.20	0.41	0.21
Conv. Total (cfs)	323.3	Conv. (cfs)	46.4	186.5	90.5
Length Wtd. (ft)	10.00	Wetted Per. (ft)	6.03	10.45	24.92
Min Ch El (ft)	59.26	Shear (lb/sq ft)	0.05	0.08	0.05
Alpha	1.85	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.01	0.00	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	0.00	0.01

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q100

E.G. Elev (ft)	63.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.41	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	59.59	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	59.85	Flow Area (sq ft)	0.06	1.67	
E.G. Slope (ft/ft)	0.171058	Area (sq ft)	0.06	1.67	0.69

Plan: Plan 03 Hearst 1 RS: 332 Profile: Q100 (Continued)

Q Total (cfs)	25.17	Flow (cfs)	0.26	24.91	
Top Width (ft)	22.50	Top Width (ft)	2.50	8.26	11.74
Vel Total (ft/s)	14.49	Avg. Vel. (ft/s)	4.09	14.88	
Max Chl Dpth (ft)	0.33	Hydr. Depth (ft)	0.03	0.20	
Conv. Total (cfs)	60.9	Conv. (cfs)	0.6	60.2	
Length Wtd. (ft)	10.00	Wetted Per. (ft)	2.50	9.48	
Min Ch El (ft)	59.26	Shear (lb/sq ft)	0.27	1.89	
Alpha	1.05	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	4.63	Cum Volume (acre-ft)	0.01	0.00	0.01
C & E Loss (ft)	0.33	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 1 RS: 322 Profile: Q2

E.G. Elev (ft)	59.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.26	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	59.38	Flow Area (sq ft)	1.46	0.29	0.37
E.G. Slope (ft/ft)	0.041180	Area (sq ft)	1.46	0.29	0.37
Q Total (cfs)	11.26	Flow (cfs)	7.30	1.89	2.07
Top Width (ft)	19.60	Top Width (ft)	14.60	2.01	2.99
Vel Total (ft/s)	5.30	Avg. Vel. (ft/s)	5.00	6.43	5.59
Max Chl Dpth (ft)	0.16	Hydr. Depth (ft)	0.10	0.15	0.12
Conv. Total (cfs)	55.5	Conv. (cfs)	36.0	9.3	10.2
Length Wtd. (ft)	30.00	Wetted Per. (ft)	14.60	2.01	3.12
Min Ch El (ft)	59.10	Shear (lb/sq ft)	0.26	0.38	0.30
Alpha	1.03	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 1 RS: 322 Profile: Q10

E.G. Elev (ft)	59.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.32	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	59.47	Flow Area (sq ft)	2.31	0.40	0.53
E.G. Slope (ft/ft)	0.039312	Area (sq ft)	2.31	0.40	0.53
Q Total (cfs)	20.01	Flow (cfs)	13.35	3.07	3.59
Top Width (ft)	22.86	Top Width (ft)	17.86	2.01	2.99
Vel Total (ft/s)	6.20	Avg. Vel. (ft/s)	5.79	7.70	6.83
Max Chl Dpth (ft)	0.22	Hydr. Depth (ft)	0.13	0.20	0.18
Conv. Total (cfs)	100.9	Conv. (cfs)	67.3	15.5	18.1
Length Wtd. (ft)	30.00	Wetted Per. (ft)	17.86	2.01	3.18
Min Ch El (ft)	59.10	Shear (lb/sq ft)	0.32	0.49	0.41
Alpha	1.04	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 1 RS: 322 Profile: Q25

E.G. Elev (ft)	59.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.38	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	59.50	Flow Area (sq ft)	3.57	0.53	0.72
E.G. Slope (ft/ft)	0.019140	Area (sq ft)	3.57	0.53	0.72
Q Total (cfs)	24.66	Flow (cfs)	17.09	3.42	4.15
Top Width (ft)	26.49	Top Width (ft)	21.49	2.01	2.99
Vel Total (ft/s)	5.12	Avg. Vel. (ft/s)	4.78	6.48	5.79
Max Chl Dpth (ft)	0.28	Hydr. Depth (ft)	0.17	0.26	0.24
Conv. Total (cfs)	178.2	Conv. (cfs)	123.6	24.7	30.0
Length Wtd. (ft)	30.00	Wetted Per. (ft)	21.49	2.01	3.24
Min Ch El (ft)	59.10	Shear (lb/sq ft)	0.20	0.31	0.26
Alpha	1.04	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.01	0.00	0.00
C & E Loss (ft)	0.03	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Hearst 1 RS: 322 Profile: Q100

E.G. Elev (ft)	61.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.80	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.30	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	59.55	Flow Area (sq ft)	2.10	0.37	0.49
E.G. Slope (ft/ft)	0.122864	Area (sq ft)	2.10	0.37	0.49
Q Total (cfs)	31.36	Flow (cfs)	20.79	4.90	5.67
Top Width (ft)	22.13	Top Width (ft)	17.13	2.01	2.99
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)	9.89	13.08	11.56
Max Chl Dpth (ft)	0.20	Hydr. Depth (ft)	0.12	0.19	0.16
Conv. Total (cfs)	89.5	Conv. (cfs)	59.3	14.0	16.2
Length Wtd. (ft)	30.00	Wetted Per. (ft)	17.13	2.01	3.16
Min Ch El (ft)	59.10	Shear (lb/sq ft)	0.94	1.43	1.19
Alpha	1.04	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	1.41	Cum Volume (acre-ft)	0.01	0.00	0.01
C & E Loss (ft)	0.48	Cum SA (acres)	0.01	0.00	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 1 RS: 292 Profile: Q2

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.00	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	58.73	Flow Area (sq ft)	6.61	1.14	5.42
E.G. Slope (ft/ft)	0.000172	Area (sq ft)	6.61	1.14	5.42
Q Total (cfs)	11.26	Flow (cfs)	5.97	1.04	4.24
Top Width (ft)	30.00	Top Width (ft)	13.60	2.38	14.02
Vel Total (ft/s)	0.86	Avg. Vel. (ft/s)	0.90	0.92	0.78
Max Chl Dpth (ft)	0.51	Hydr. Depth (ft)	0.49	0.48	0.39
Conv. Total (cfs)	858.9	Conv. (cfs)	455.4	79.7	323.8
Length Wtd. (ft)	10.00	Wetted Per. (ft)	14.11	2.38	14.32
Min Ch El (ft)	58.51	Shear (lb/sq ft)	0.01	0.01	0.00
Alpha	1.01	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Errors Warnings and Notes (Continued)

Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Hearst 1 RS: 292 Profile: Q10

E.G. Elev (ft)	59.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.11	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	58.81	Flow Area (sq ft)	8.12	1.40	6.97
E.G. Slope (ft/ft)	0.000260	Area (sq ft)	8.12	1.40	6.97
Q Total (cfs)	20.01	Flow (cfs)	10.29	1.82	7.91
Top Width (ft)	30.00	Top Width (ft)	13.60	2.38	14.02
Vel Total (ft/s)	1.21	Avg. Vel. (ft/s)	1.27	1.30	1.13
Max Chl Dpth (ft)	0.62	Hydr. Depth (ft)	0.60	0.59	0.50
Conv. Total (cfs)	1241.4	Conv. (cfs)	638.1	112.8	490.5
Length Wtd. (ft)	10.00	Wetted Per. (ft)	14.22	2.38	14.43
Min Ch El (ft)	58.51	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.01	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Hearst 1 RS: 292 Profile: Q25

E.G. Elev (ft)	59.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.17	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	58.84	Flow Area (sq ft)	8.87	1.53	7.75
E.G. Slope (ft/ft)	0.000289	Area (sq ft)	8.87	1.53	7.75
Q Total (cfs)	24.66	Flow (cfs)	12.53	2.22	9.91
Top Width (ft)	30.00	Top Width (ft)	13.60	2.38	14.02
Vel Total (ft/s)	1.36	Avg. Vel. (ft/s)	1.41	1.45	1.28
Max Chl Dpth (ft)	0.68	Hydr. Depth (ft)	0.65	0.64	0.55
Conv. Total (cfs)	1451.7	Conv. (cfs)	737.7	130.9	583.1
Length Wtd. (ft)	10.00	Wetted Per. (ft)	14.28	2.38	14.49
Min Ch El (ft)	58.51	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.01	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Errors Warnings and Notes (Continued)

Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Hearst 1 RS: 292 Profile: Q100

E.G. Elev (ft)	59.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (ft)	59.25	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	58.89	Flow Area (sq ft)	9.95	1.72	8.87
E.G. Slope (ft/ft)	0.000311	Area (sq ft)	9.95	1.72	8.87
Q Total (cfs)	31.36	Flow (cfs)	15.72	2.81	12.84
Top Width (ft)	30.00	Top Width (ft)	13.60	2.38	14.02
Vel Total (ft/s)	1.53	Avg. Vel. (ft/s)	1.58	1.63	1.45
Max Chl Dpth (ft)	0.76	Hydr. Depth (ft)	0.73	0.72	0.63
Conv. Total (cfs)	1777.9	Conv. (cfs)	891.1	159.0	727.7
Length Wtd. (ft)	10.00	Wetted Per. (ft)	14.36	2.38	14.57
Min Ch El (ft)	58.51	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.01	Stream Power (lb/ft s)	30.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Hearst 2 RS: 282 Profile: Q2

E.G. Elev (ft)	59.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.92	Reach Len. (ft)	36.52	36.52	36.52
Crit W.S. (ft)	58.92	Flow Area (sq ft)	0.83	2.92	3.64
E.G. Slope (ft/ft)	0.002916	Area (sq ft)	0.83	2.92	3.64
Q Total (cfs)	11.91	Flow (cfs)	1.36	7.83	2.71
Top Width (ft)	39.00	Top Width (ft)	5.88	8.31	24.81
Vel Total (ft/s)	1.61	Avg. Vel. (ft/s)	1.65	2.68	0.74
Max Chl Dpth (ft)	0.49	Hydr. Depth (ft)	0.14	0.35	0.15
Conv. Total (cfs)	220.6	Conv. (cfs)	25.3	145.1	50.2
Length Wtd. (ft)	36.52	Wetted Per. (ft)	5.96	10.18	24.86
Min Ch El (ft)	58.43	Shear (lb/sq ft)	0.03	0.05	0.03
Alpha	1.99	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.06	0.04

Errors Warnings and Notes

Errors Warnings and Notes (Continued)

	for the water surface and continued on with the calculations.
Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 2 RS: 282 Profile: Q10

E.G. Elev (ft)	59.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.04	Reach Len. (ft)	36.52	36.52	36.52
Crit W.S. (ft)	59.00	Flow Area (sq ft)	1.51	3.88	6.51
E.G. Slope (ft/ft)	0.002465	Area (sq ft)	1.51	3.88	6.51
Q Total (cfs)	21.14	Flow (cfs)	3.37	11.23	6.54
Top Width (ft)	39.00	Top Width (ft)	5.88	8.31	24.81
Vel Total (ft/s)	1.78	Avg. Vel. (ft/s)	2.24	2.90	1.00
Max Chl Dpth (ft)	0.61	Hydr. Depth (ft)	0.26	0.47	0.26
Conv. Total (cfs)	425.8	Conv. (cfs)	67.9	226.3	131.6
Length Wtd. (ft)	36.52	Wetted Per. (ft)	6.08	10.64	24.97
Min Ch El (ft)	58.43	Shear (lb/sq ft)	0.04	0.06	0.04
Alpha	1.76	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.07	0.05

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 2 RS: 282 Profile: Q25

E.G. Elev (ft)	59.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.10	Reach Len. (ft)	36.52	36.52	36.52
Crit W.S. (ft)	59.03	Flow Area (sq ft)	1.86	4.39	8.03
E.G. Slope (ft/ft)	0.002197	Area (sq ft)	1.86	4.39	8.03
Q Total (cfs)	26.06	Flow (cfs)	4.51	12.82	8.73
Top Width (ft)	39.00	Top Width (ft)	5.88	8.31	24.81
Vel Total (ft/s)	1.83	Avg. Vel. (ft/s)	2.42	2.92	1.09
Max Chl Dpth (ft)	0.67	Hydr. Depth (ft)	0.32	0.53	0.32
Conv. Total (cfs)	556.0	Conv. (cfs)	96.3	273.5	186.2
Length Wtd. (ft)	36.52	Wetted Per. (ft)	6.14	10.88	25.03
Min Ch El (ft)	58.43	Shear (lb/sq ft)	0.04	0.06	0.04

Plan: Plan 03 Hearst 2 RS: 282 Profile: Q25 (Continued)

Alpha	1.68	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.00	0.03	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.02	0.07	0.05

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 2 RS: 282 Profile: Q100

E.G. Elev (ft)	59.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.19	Reach Len. (ft)	36.52	36.52	36.52
Crit W.S. (ft)	59.08	Flow Area (sq ft)	2.38	5.11	10.19
E.G. Slope (ft/ft)	0.001875	Area (sq ft)	2.38	5.11	10.19
Q Total (cfs)	33.12	Flow (cfs)	6.19	14.96	11.97
Top Width (ft)	39.00	Top Width (ft)	5.88	8.31	24.81
Vel Total (ft/s)	1.87	Avg. Vel. (ft/s)	2.60	2.93	1.17
Max Chl Dpth (ft)	0.76	Hydr. Depth (ft)	0.40	0.61	0.41
Conv. Total (cfs)	765.0	Conv. (cfs)	142.9	345.5	276.5
Length Wtd. (ft)	36.52	Wetted Per. (ft)	6.23	11.23	25.12
Min Ch El (ft)	58.43	Shear (lb/sq ft)	0.04	0.05	0.05
Alpha	1.61	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.00	0.03	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.02	0.07	0.05

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q2

E.G. Elev (ft)	58.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.69	Reach Len. (ft)	23.36	10.88	0.75
Crit W.S. (ft)	58.73	Flow Area (sq ft)	0.03	3.28	1.14
E.G. Slope (ft/ft)	0.004234	Area (sq ft)	0.03	3.28	1.14
Q Total (cfs)	11.91	Flow (cfs)	0.02	11.11	0.78
Top Width (ft)	23.08	Top Width (ft)	1.08	10.31	11.69
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)	0.67	3.39	0.68
Max Chl Dpth (ft)	0.55	Hydr. Depth (ft)	0.03	0.32	0.10

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q2 (Continued)

Conv. Total (cfs)	183.0	Conv. (cfs)	0.3	170.7	12.0
Length Wtd. (ft)	10.64	Wetted Per. (ft)	1.08	10.65	11.74
Min Ch El (ft)	58.14	Shear (lb/sq ft)	0.01	0.08	0.03
Alpha	1.50	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.05	0.02

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q10

E.G. Elev (ft)	59.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.85	Reach Len. (ft)	23.36	10.88	0.75
Crit W.S. (ft)	58.85	Flow Area (sq ft)	0.43	4.85	2.93
E.G. Slope (ft/ft)	0.002847	Area (sq ft)	0.43	4.85	2.93
Q Total (cfs)	21.14	Flow (cfs)	0.57	17.52	3.04
Top Width (ft)	26.13	Top Width (ft)	4.13	10.31	11.69
Vel Total (ft/s)	2.57	Avg. Vel. (ft/s)	1.34	3.61	1.04
Max Chl Dpth (ft)	0.71	Hydr. Depth (ft)	0.10	0.47	0.25
Conv. Total (cfs)	396.2	Conv. (cfs)	10.7	328.4	57.0
Length Wtd. (ft)	10.65	Wetted Per. (ft)	4.14	10.65	11.90
Min Ch El (ft)	58.14	Shear (lb/sq ft)	0.02	0.08	0.04
Alpha	1.66	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.01	0.06	0.03

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q25

E.G. Elev (ft)	59.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.91	Reach Len. (ft)	23.36	10.88	0.75

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q25 (Continued)

Crit W.S. (ft)	58.91	Flow Area (sq ft)	0.73	5.52	3.69
E.G. Slope (ft/ft)	0.002572	Area (sq ft)	0.73	5.52	3.69
Q Total (cfs)	26.06	Flow (cfs)	1.18	20.65	4.23
Top Width (ft)	27.00	Top Width (ft)	5.00	10.31	11.69
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)	1.61	3.74	1.15
Max Chl Dpth (ft)	0.77	Hydr. Depth (ft)	0.15	0.54	0.32
Conv. Total (cfs)	513.8	Conv. (cfs)	23.2	407.2	83.4
Length Wtd. (ft)	10.71	Wetted Per. (ft)	5.03	10.65	11.96
Min Ch El (ft)	58.14	Shear (lb/sq ft)	0.02	0.08	0.05
Alpha	1.66	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.04	Cum SA (acres)	0.01	0.06	0.03

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 245.48 Profile: Q100

E.G. Elev (ft)	59.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.98	Reach Len. (ft)	23.36	10.88	0.75
Crit W.S. (ft)	58.98	Flow Area (sq ft)	1.05	6.18	4.43
E.G. Slope (ft/ft)	0.002632	Area (sq ft)	1.05	6.18	4.43
Q Total (cfs)	33.12	Flow (cfs)	2.15	25.18	5.79
Top Width (ft)	27.00	Top Width (ft)	5.00	10.31	11.69
Vel Total (ft/s)	2.84	Avg. Vel. (ft/s)	2.05	4.08	1.31
Max Chl Dpth (ft)	0.83	Hydr. Depth (ft)	0.21	0.60	0.38
Conv. Total (cfs)	645.6	Conv. (cfs)	41.9	490.9	112.8
Length Wtd. (ft)	10.82	Wetted Per. (ft)	5.09	10.65	12.03
Min Ch El (ft)	58.14	Shear (lb/sq ft)	0.03	0.10	0.06
Alpha	1.64	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.03	0.01
C & E Loss (ft)	0.05	Cum SA (acres)	0.01	0.06	0.04

Errors Warnings and Notes

Errors Warnings and Notes (Continued)

	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The cross section had to be extended vertically during the critical depth calculations.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q2

E.G. Elev (ft)	58.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.76	Reach Len. (ft)	18.87	8.89	0.90
Crit W.S. (ft)	58.43	Flow Area (sq ft)	0.80	10.09	0.40
E.G. Slope (ft/ft)	0.000227	Area (sq ft)	0.80	10.09	0.40
Q Total (cfs)	11.91	Flow (cfs)	0.41	11.43	0.07
Top Width (ft)	27.00	Top Width (ft)	5.00	18.88	3.12
Vel Total (ft/s)	1.05	Avg. Vel. (ft/s)	0.51	1.13	0.18
Max Chl Dpth (ft)	0.85	Hydr. Depth (ft)	0.16	0.53	0.13
Conv. Total (cfs)	790.0	Conv. (cfs)	27.0	758.1	4.9
Length Wtd. (ft)	9.04	Wetted Per. (ft)	5.04	18.93	3.24
Min Ch El (ft)	57.91	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.11	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.05	0.02

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q10

E.G. Elev (ft)	58.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.91	Reach Len. (ft)	18.87	8.89	0.90
Crit W.S. (ft)	58.56	Flow Area (sq ft)	1.53	12.81	0.85
E.G. Slope (ft/ft)	0.000299	Area (sq ft)	1.53	12.81	0.85
Q Total (cfs)	21.14	Flow (cfs)	1.33	19.52	0.29
Top Width (ft)	27.00	Top Width (ft)	5.00	18.88	3.12
Vel Total (ft/s)	1.39	Avg. Vel. (ft/s)	0.87	1.52	0.34

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q10 (Continued)

Max Chl Dpth (ft)	1.00	Hydr. Depth (ft)	0.31	0.68	0.27
Conv. Total (cfs)	1223.3	Conv. (cfs)	77.2	1129.4	16.7
Length Wtd. (ft)	9.15	Wetted Per. (ft)	5.18	18.93	3.39
Min Ch El (ft)	57.91	Shear (lb/sq ft)	0.01	0.01	0.00
Alpha	1.13	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.06	0.03

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q25

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.96	Reach Len. (ft)	18.87	8.89	0.90
Crit W.S. (ft)	58.62	Flow Area (sq ft)	1.82	13.93	1.03
E.G. Slope (ft/ft)	0.000335	Area (sq ft)	1.82	13.93	1.03
Q Total (cfs)	26.06	Flow (cfs)	1.88	23.76	0.42
Top Width (ft)	27.00	Top Width (ft)	5.00	18.88	3.12
Vel Total (ft/s)	1.55	Avg. Vel. (ft/s)	1.03	1.71	0.41
Max Chl Dpth (ft)	1.05	Hydr. Depth (ft)	0.36	0.74	0.33
Conv. Total (cfs)	1424.3	Conv. (cfs)	102.9	1298.5	22.9
Length Wtd. (ft)	9.23	Wetted Per. (ft)	5.24	18.93	3.44
Min Ch El (ft)	57.91	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	1.13	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.06	0.03

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q100

E.G. Elev (ft)	59.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.04	Reach Len. (ft)	18.87	8.89	0.90
Crit W.S. (ft)	58.69	Flow Area (sq ft)	2.20	15.35	1.27
E.G. Slope (ft/ft)	0.000381	Area (sq ft)	2.20	15.35	1.27

Plan: Plan 03 Hearst 2 RS: 234.6 Profile: Q100 (Continued)

Q Total (cfs)	33.12	Flow (cfs)	2.72	29.78	0.62
Top Width (ft)	27.00	Top Width (ft)	5.00	18.88	3.12
Vel Total (ft/s)	1.76	Avg. Vel. (ft/s)	1.24	1.94	0.49
Max Chl Dpth (ft)	1.13	Hydr. Depth (ft)	0.44	0.81	0.41
Conv. Total (cfs)	1697.9	Conv. (cfs)	139.4	1526.6	31.8
Length Wtd. (ft)	9.35	Wetted Per. (ft)	5.32	18.93	3.52
Min Ch El (ft)	57.91	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	1.13	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.06	0.04

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 225.71 Profile: Q2

E.G. Elev (ft)	58.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.		0.013	
W.S. Elev (ft)	58.64	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	58.64	Flow Area (sq ft)		4.29	
E.G. Slope (ft/ft)	0.004052	Area (sq ft)		4.29	
Q Total (cfs)	11.91	Flow (cfs)		11.91	
Top Width (ft)	18.14	Top Width (ft)		18.14	
Vel Total (ft/s)	2.78	Avg. Vel. (ft/s)		2.78	
Max Chl Dpth (ft)	0.47	Hydr. Depth (ft)		0.24	
Conv. Total (cfs)	187.1	Conv. (cfs)		187.1	
Length Wtd. (ft)	88.72	Wetted Per. (ft)		18.17	
Min Ch El (ft)	58.17	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)		0.01	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		0.05	0.02

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 2 RS: 225.71 Profile: Q10

E.G. Elev (ft)	58.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.76	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	58.76	Flow Area (sq ft)	0.15	6.44	0.25
E.G. Slope (ft/ft)	0.003390	Area (sq ft)	0.15	6.44	0.25
Q Total (cfs)	21.14	Flow (cfs)	0.12	20.85	0.16
Top Width (ft)	24.58	Top Width (ft)	3.34	18.92	2.32
Vel Total (ft/s)	3.09	Avg. Vel. (ft/s)	0.84	3.24	0.64
Max Chl Dpth (ft)	0.59	Hydr. Depth (ft)	0.04	0.34	0.11
Conv. Total (cfs)	363.1	Conv. (cfs)	2.1	358.2	2.8
Length Wtd. (ft)	88.73	Wetted Per. (ft)	3.34	18.95	2.43
Min Ch El (ft)	58.17	Shear (lb/sq ft)	0.01	0.07	0.02
Alpha	1.08	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.05	0.03

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Hearst 2 RS: 225.71 Profile: Q25

E.G. Elev (ft)	58.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.82	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	58.82	Flow Area (sq ft)	0.45	7.62	0.40
E.G. Slope (ft/ft)	0.002829	Area (sq ft)	0.45	7.62	0.40
Q Total (cfs)	26.06	Flow (cfs)	0.49	25.26	0.31
Top Width (ft)	27.00	Top Width (ft)	5.76	18.92	2.32
Vel Total (ft/s)	3.08	Avg. Vel. (ft/s)	1.10	3.31	0.78
Max Chl Dpth (ft)	0.65	Hydr. Depth (ft)	0.08	0.40	0.17
Conv. Total (cfs)	490.0	Conv. (cfs)	9.2	475.0	5.8
Length Wtd. (ft)	88.73	Wetted Per. (ft)	5.77	18.95	2.49
Min Ch El (ft)	58.17	Shear (lb/sq ft)	0.01	0.07	0.03
Alpha	1.13	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.05	0.03

Errors Warnings and Notes (Continued)

	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 225.71 Profile: Q100

E.G. Elev (ft)	59.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	58.88	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	58.88	Flow Area (sq ft)	0.77	8.70	0.53
E.G. Slope (ft/ft)	0.002821	Area (sq ft)	0.77	8.70	0.53
Q Total (cfs)	33.12	Flow (cfs)	1.22	31.41	0.49
Top Width (ft)	27.00	Top Width (ft)	5.76	18.92	2.32
Vel Total (ft/s)	3.31	Avg. Vel. (ft/s)	1.58	3.61	0.92
Max Chl Dpth (ft)	0.71	Hydr. Depth (ft)	0.13	0.46	0.23
Conv. Total (cfs)	623.5	Conv. (cfs)	22.9	591.4	9.2
Length Wtd. (ft)	88.73	Wetted Per. (ft)	5.83	18.95	2.55
Min Ch El (ft)	58.17	Shear (lb/sq ft)	0.02	0.08	0.04
Alpha	1.14	Stream Power (lb/ft s)	27.00	0.00	0.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.00	0.02	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.05	0.04

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q2

E.G. Elev (ft)	57.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	56.70	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	56.93	Flow Area (sq ft)		1.41	0.08
E.G. Slope (ft/ft)	0.053615	Area (sq ft)		1.41	0.08

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q2 (Continued)

Q Total (cfs)	11.91	Flow (cfs)		11.81	0.10
Top Width (ft)	8.99	Top Width (ft)		6.67	2.31
Vel Total (ft/s)	7.99	Avg. Vel. (ft/s)		8.38	1.22
Max Chl Dpth (ft)	0.42	Hydr. Depth (ft)		0.21	0.03
Conv. Total (cfs)	51.4	Conv. (cfs)		51.0	0.4
Length Wtd. (ft)	88.72	Wetted Per. (ft)		7.91	2.31
Min Ch El (ft)	56.28	Shear (lb/sq ft)		0.60	0.12
Alpha	1.09	Stream Power (lb/ft s)	24.96	0.00	0.00
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)		0.00	0.00
C & E Loss (ft)	0.10	Cum SA (acres)		0.02	0.02

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Program found supercritical flow starting at this cross section.

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q10

E.G. Elev (ft)	58.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	56.80	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	57.07	Flow Area (sq ft)		2.18	0.50
E.G. Slope (ft/ft)	0.048694	Area (sq ft)		2.18	0.50
Q Total (cfs)	21.14	Flow (cfs)		20.07	1.07
Top Width (ft)	14.05	Top Width (ft)		8.28	5.76
Vel Total (ft/s)	7.88	Avg. Vel. (ft/s)		9.19	2.14
Max Chl Dpth (ft)	0.52	Hydr. Depth (ft)		0.26	0.09
Conv. Total (cfs)	95.8	Conv. (cfs)		91.0	4.8
Length Wtd. (ft)	88.73	Wetted Per. (ft)		9.94	5.76
Min Ch El (ft)	56.28	Shear (lb/sq ft)		0.67	0.26
Alpha	1.30	Stream Power (lb/ft s)	24.96	0.00	0.00
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.11	Cum SA (acres)	0.00	0.02	0.02

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Program found supercritical flow starting at this cross section.

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q25

E.G. Elev (ft)	58.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.37	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	56.84	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	57.15	Flow Area (sq ft)	0.01	2.50	0.73
E.G. Slope (ft/ft)	0.048831	Area (sq ft)	0.01	2.50	0.73
Q Total (cfs)	26.06	Flow (cfs)	0.01	24.26	1.79
Top Width (ft)	16.28	Top Width (ft)	0.59	8.70	6.99
Vel Total (ft/s)	8.04	Avg. Vel. (ft/s)	1.17	9.70	2.44
Max Chl Dpth (ft)	0.56	Hydr. Depth (ft)	0.01	0.29	0.11
Conv. Total (cfs)	117.9	Conv. (cfs)	0.0	109.8	8.1
Length Wtd. (ft)	88.73	Wetted Per. (ft)	0.60	10.50	6.99
Min Ch El (ft)	56.28	Shear (lb/sq ft)	0.03	0.73	0.32
Alpha	1.36	Stream Power (lb/ft s)	24.96	0.00	0.00
Frctn Loss (ft)	0.65	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.02	0.02

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.
Note:	Program found supercritical flow starting at this cross section.

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q100

E.G. Elev (ft)	58.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	56.90	Reach Len. (ft)	88.73	88.73	88.73
Crit W.S. (ft)	57.22	Flow Area (sq ft)	0.04	2.98	1.17
E.G. Slope (ft/ft)	0.042422	Area (sq ft)	0.04	2.98	1.17
Q Total (cfs)	33.12	Flow (cfs)	0.14	29.88	3.10
Top Width (ft)	18.12	Top Width (ft)	0.59	8.70	8.83
Vel Total (ft/s)	7.91	Avg. Vel. (ft/s)	3.56	10.03	2.65
Max Chl Dpth (ft)	0.62	Hydr. Depth (ft)	0.07	0.34	0.13
Conv. Total (cfs)	160.8	Conv. (cfs)	0.7	145.1	15.1
Length Wtd. (ft)	88.73	Wetted Per. (ft)	0.66	10.72	8.83
Min Ch El (ft)	56.28	Shear (lb/sq ft)	0.16	0.74	0.35
Alpha	1.46	Stream Power (lb/ft s)	24.96	0.00	0.00
Frctn Loss (ft)	0.63	Cum Volume (acre-ft)	0.00	0.01	0.01

Plan: Plan 03 Hearst 2 RS: 136.985 Profile: Q100 (Continued)

C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.03	0.03

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.
Note:	Program found supercritical flow starting at this cross section.

Plan: Plan 03 Hearst 2 RS: 48.26 Profile: Q2

E.G. Elev (ft)	54.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	54.06	Reach Len. (ft)	48.26	48.26	48.26
Crit W.S. (ft)	54.23	Flow Area (sq ft)		1.61	0.76
E.G. Slope (ft/ft)	0.022422	Area (sq ft)		1.61	0.76
Q Total (cfs)	11.91	Flow (cfs)		10.89	1.02
Top Width (ft)	16.18	Top Width (ft)		6.22	9.96
Vel Total (ft/s)	5.03	Avg. Vel. (ft/s)		6.78	1.33
Max Chl Dpth (ft)	0.51	Hydr. Depth (ft)		0.26	0.08
Conv. Total (cfs)	79.5	Conv. (cfs)		72.8	6.8
Length Wtd. (ft)	48.26	Wetted Per. (ft)		6.45	10.01
Min Ch El (ft)	53.55	Shear (lb/sq ft)		0.35	0.11
Alpha	1.67	Stream Power (lb/ft s)	20.86	0.00	0.00
Frctn Loss (ft)	2.93	Cum Volume (acre-ft)		0.00	0.00
C & E Loss (ft)	0.13	Cum SA (acres)		0.01	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 48.26 Profile: Q10

E.G. Elev (ft)	54.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	54.15	Reach Len. (ft)	48.26	48.26	48.26
Crit W.S. (ft)	54.34	Flow Area (sq ft)		2.21	1.65
E.G. Slope (ft/ft)	0.024231	Area (sq ft)		2.21	1.65
Q Total (cfs)	21.14	Flow (cfs)		17.36	3.78

Plan: Plan 03 Hearst 2 RS: 48.26 Profile: Q10 (Continued)

Top Width (ft)	17.22	Top Width (ft)		7.26	9.96
Vel Total (ft/s)	5.49	Avg. Vel. (ft/s)		7.87	2.30
Max Chl Dpth (ft)	0.60	Hydr. Depth (ft)		0.30	0.17
Conv. Total (cfs)	135.8	Conv. (cfs)		111.5	24.3
Length Wtd. (ft)	48.26	Wetted Per. (ft)		7.50	10.10
Min Ch El (ft)	53.55	Shear (lb/sq ft)		0.45	0.25
Alpha	1.72	Stream Power (lb/ft s)	20.86	0.00	0.00
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.00	0.01	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 48.26 Profile: Q25

E.G. Elev (ft)	55.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.87	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	54.19	Reach Len. (ft)	48.26	48.26	48.26
Crit W.S. (ft)	54.41	Flow Area (sq ft)		2.49	2.02
E.G. Slope (ft/ft)	0.024784	Area (sq ft)		2.49	2.02
Q Total (cfs)	26.06	Flow (cfs)		20.67	5.39
Top Width (ft)	17.67	Top Width (ft)		7.71	9.96
Vel Total (ft/s)	5.77	Avg. Vel. (ft/s)		8.30	2.66
Max Chl Dpth (ft)	0.64	Hydr. Depth (ft)		0.32	0.20
Conv. Total (cfs)	165.5	Conv. (cfs)		131.3	34.2
Length Wtd. (ft)	48.26	Wetted Per. (ft)		7.94	10.14
Min Ch El (ft)	53.55	Shear (lb/sq ft)		0.49	0.31
Alpha	1.68	Stream Power (lb/ft s)	20.86	0.00	0.00
Frctn Loss (ft)	3.00	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.15	Cum SA (acres)	0.00	0.01	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The cross section had to be extended vertically during the critical depth calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 48.26 Profile: Q100

E.G. Elev (ft)	55.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.01	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	54.23	Reach Len. (ft)	48.26	48.26	48.26
Crit W.S. (ft)	54.49	Flow Area (sq ft)		2.82	2.44
E.G. Slope (ft/ft)	0.026822	Area (sq ft)		2.82	2.44
Q Total (cfs)	33.12	Flow (cfs)		25.48	7.64
Top Width (ft)	18.16	Top Width (ft)		8.20	9.96
Vel Total (ft/s)	6.29	Avg. Vel. (ft/s)		9.02	3.13
Max Chl Dpth (ft)	0.68	Hydr. Depth (ft)		0.34	0.25
Conv. Total (cfs)	202.2	Conv. (cfs)		155.6	46.7
Length Wtd. (ft)	48.26	Wetted Per. (ft)		8.44	10.18
Min Ch El (ft)	53.55	Shear (lb/sq ft)		0.56	0.40
Alpha	1.64	Stream Power (lb/ft s)	20.86	0.00	0.00
Frctn Loss (ft)	2.95	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.01	0.01

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The cross section had to be extended vertically during the critical depth calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
	method to find critical depth.

Plan: Plan 03 Hearst 2 RS: 0 Profile: Q2

E.G. Elev (ft)	53.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.		0.013	0.030
W.S. Elev (ft)	52.68	Reach Len. (ft)			
Crit W.S. (ft)	52.90	Flow Area (sq ft)		1.62	0.21
E.G. Slope (ft/ft)	0.030056	Area (sq ft)		1.62	0.21
Q Total (cfs)	12.24	Flow (cfs)		11.72	0.52
Top Width (ft)	7.25	Top Width (ft)		5.95	1.30
Vel Total (ft/s)	6.68	Avg. Vel. (ft/s)		7.21	2.49
Max Chl Dpth (ft)	0.55	Hydr. Depth (ft)		0.27	0.16
Conv. Total (cfs)	70.6	Conv. (cfs)		67.6	3.0
Length Wtd. (ft)		Wetted Per. (ft)		7.40	1.34
Min Ch El (ft)	52.13	Shear (lb/sq ft)		0.41	0.29
Alpha	1.12	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Errors Warnings and Notes (Continued)

Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 0 Profile: Q10

E.G. Elev (ft)	53.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	52.82	Reach Len. (ft)			
Crit W.S. (ft)	53.09	Flow Area (sq ft)	0.04	2.56	0.43
E.G. Slope (ft/ft)	0.024963	Area (sq ft)	0.04	2.56	0.43
Q Total (cfs)	21.71	Flow (cfs)	0.08	20.37	1.26
Top Width (ft)	9.50	Top Width (ft)	0.91	6.71	1.87
Vel Total (ft/s)	7.17	Avg. Vel. (ft/s)	2.17	7.97	2.89
Max Chl Dpth (ft)	0.69	Hydr. Depth (ft)	0.04	0.38	0.23
Conv. Total (cfs)	137.4	Conv. (cfs)	0.5	128.9	7.9
Length Wtd. (ft)		Wetted Per. (ft)	0.92	8.72	1.93
Min Ch El (ft)	52.13	Shear (lb/sq ft)	0.06	0.46	0.35
Alpha	1.17	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	1.19	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 0 Profile: Q25

E.G. Elev (ft)	53.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.01	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	52.88	Reach Len. (ft)			
Crit W.S. (ft)	53.18	Flow Area (sq ft)	0.11	2.97	0.56
E.G. Slope (ft/ft)	0.023264	Area (sq ft)	0.11	2.97	0.56
Q Total (cfs)	26.75	Flow (cfs)	0.34	24.72	1.68
Top Width (ft)	10.41	Top Width (ft)	1.58	6.71	2.12
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)	3.02	8.34	3.03
Max Chl Dpth (ft)	0.75	Hydr. Depth (ft)	0.07	0.44	0.26
Conv. Total (cfs)	175.4	Conv. (cfs)	2.3	162.1	11.0
Length Wtd. (ft)		Wetted Per. (ft)	1.59	8.97	2.18
Min Ch El (ft)	52.13	Shear (lb/sq ft)	0.10	0.48	0.37
Alpha	1.20	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	1.16	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes (Continued)

Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Hearst 2 RS: 0 Profile: Q100

E.G. Elev (ft)	54.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	52.96	Reach Len. (ft)			
Crit W.S. (ft)	53.26	Flow Area (sq ft)	0.28	3.48	0.73
E.G. Slope (ft/ft)	0.021921	Area (sq ft)	0.28	3.48	0.73
Q Total (cfs)	33.98	Flow (cfs)	1.01	30.62	2.35
Top Width (ft)	11.97	Top Width (ft)	2.84	6.71	2.43
Vel Total (ft/s)	7.57	Avg. Vel. (ft/s)	3.60	8.80	3.23
Max Chl Dpth (ft)	0.83	Hydr. Depth (ft)	0.10	0.52	0.30
Conv. Total (cfs)	229.5	Conv. (cfs)	6.8	206.8	15.9
Length Wtd. (ft)		Wetted Per. (ft)	2.84	9.27	2.50
Min Ch El (ft)	52.13	Shear (lb/sq ft)	0.13	0.51	0.40
Alpha	1.24	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
	need for additional cross sections.

Plan: Plan 03 Lower Curtis 1 RS: 370.35 Profile: Q2

E.G. Elev (ft)	59.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.013	
W.S. Elev (ft)	59.78	Reach Len. (ft)	155.18	155.18	155.18
Crit W.S. (ft)	59.78	Flow Area (sq ft)		0.00	
E.G. Slope (ft/ft)	0.005005	Area (sq ft)		0.00	
Q Total (cfs)	0.00	Flow (cfs)		0.00	
Top Width (ft)	0.15	Top Width (ft)		0.15	
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.38	
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.01	
Conv. Total (cfs)	0.0	Conv. (cfs)		0.0	
Length Wtd. (ft)	155.18	Wetted Per. (ft)		0.15	
Min Ch El (ft)	59.76	Shear (lb/sq ft)			
Alpha	1.00	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.01	0.05
C & E Loss (ft)		Cum SA (acres)	0.03	0.01	0.07

Plan: Plan 03 Lower Curtis 1 RS: 370.35 Profile: Q10

E.G. Elev (ft)	59.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.013	
W.S. Elev (ft)	59.78	Reach Len. (ft)	155.18	155.18	155.18
Crit W.S. (ft)	59.78	Flow Area (sq ft)		0.00	
E.G. Slope (ft/ft)	0.016275	Area (sq ft)		0.00	
Q Total (cfs)	0.00	Flow (cfs)		0.00	
Top Width (ft)	0.15	Top Width (ft)		0.15	
Vel Total (ft/s)	0.71	Avg. Vel. (ft/s)		0.71	
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.01	
Conv. Total (cfs)	0.0	Conv. (cfs)		0.0	
Length Wtd. (ft)	155.18	Wetted Per. (ft)		0.16	
Min Ch El (ft)	59.76	Shear (lb/sq ft)			
Alpha	1.00	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.08

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Lower Curtis 1 RS: 370.35 Profile: Q25

E.G. Elev (ft)	59.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.013	
W.S. Elev (ft)	59.79	Reach Len. (ft)	155.18	155.18	155.18
Crit W.S. (ft)	59.79	Flow Area (sq ft)		0.00	
E.G. Slope (ft/ft)	0.012646	Area (sq ft)		0.00	
Q Total (cfs)	0.00	Flow (cfs)		0.00	
Top Width (ft)	0.22	Top Width (ft)		0.22	
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)		0.79	
Max Chl Dpth (ft)	0.03	Hydr. Depth (ft)		0.02	
Conv. Total (cfs)	0.0	Conv. (cfs)		0.0	
Length Wtd. (ft)	155.18	Wetted Per. (ft)		0.23	
Min Ch El (ft)	59.76	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.08

Errors Warnings and Notes (Continued)

	for the water surface and continued on with the calculations.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Lower Curtis 1 RS: 370.35 Profile: Q100

E.G. Elev (ft)	59.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.013	
W.S. Elev (ft)	59.80	Reach Len. (ft)	155.18	155.18	155.18
Crit W.S. (ft)	59.80	Flow Area (sq ft)		0.00	
E.G. Slope (ft/ft)	0.010047	Area (sq ft)		0.00	
Q Total (cfs)	0.00	Flow (cfs)		0.00	
Top Width (ft)	0.26	Top Width (ft)		0.26	
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)		0.79	
Max Chl Dpth (ft)	0.04	Hydr. Depth (ft)		0.02	
Conv. Total (cfs)	0.0	Conv. (cfs)		0.0	
Length Wtd. (ft)	155.18	Wetted Per. (ft)		0.27	
Min Ch El (ft)	59.76	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.07
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	0.01	0.10

Errors Warnings and Notes

Warning:	The energy equation could not be balanced within the specified number of iterations. The program used critical depth
	for the water surface and continued on with the calculations.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
	water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
	defaulted to critical depth.

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q2

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.013	
W.S. Elev (ft)	59.01	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.90	Flow Area (sq ft)		0.04	
E.G. Slope (ft/ft)	0.000000	Area (sq ft)		0.04	
Q Total (cfs)	0.00	Flow (cfs)		0.00	
Top Width (ft)	0.46	Top Width (ft)		0.46	
Vel Total (ft/s)	0.01	Avg. Vel. (ft/s)		0.01	
Max Chl Dpth (ft)	0.13	Hydr. Depth (ft)		0.10	

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q2 (Continued)

Conv. Total (cfs)	0.9	Conv. (cfs)		0.9	
Length Wtd. (ft)	30.00	Wetted Per. (ft)		0.60	
Min Ch El (ft)	58.88	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.02	0.01	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.01	0.07

Errors Warnings and Notes

Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q10

E.G. Elev (ft)	59.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	
W.S. Elev (ft)	59.13	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.90	Flow Area (sq ft)	0.01	0.16	
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	0.01	0.16	
Q Total (cfs)	0.00	Flow (cfs)	0.00	0.00	
Top Width (ft)	1.82	Top Width (ft)	0.44	1.38	
Vel Total (ft/s)	0.01	Avg. Vel. (ft/s)	0.00	0.01	
Max Chl Dpth (ft)	0.25	Hydr. Depth (ft)	0.02	0.12	
Conv. Total (cfs)	3.8	Conv. (cfs)	0.1	3.7	
Length Wtd. (ft)	30.00	Wetted Per. (ft)	0.44	1.84	
Min Ch El (ft)	58.88	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.05	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.08

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q25

E.G. Elev (ft)	59.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.20	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.91	Flow Area (sq ft)	0.06	0.25	0.02
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	0.06	0.25	0.02

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q25 (Continued)

Q Total (cfs)	0.00	Flow (cfs)	0.00	0.00	0.00
Top Width (ft)	3.75	Top Width (ft)	1.24	1.39	1.13
Vel Total (ft/s)	0.01	Avg. Vel. (ft/s)	0.01	0.01	0.00
Max Chl Dpth (ft)	0.32	Hydr. Depth (ft)	0.05	0.18	0.02
Conv. Total (cfs)	8.1	Conv. (cfs)	0.9	7.1	0.1
Length Wtd. (ft)	30.00	Wetted Per. (ft)	1.24	1.99	1.13
Min Ch El (ft)	58.88	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.23	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.08

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Lower Curtis 1 RS: 215.17 Profile: Q100

E.G. Elev (ft)	59.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.28	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.92	Flow Area (sq ft)	0.22	0.37	0.24
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	0.22	0.37	0.24
Q Total (cfs)	0.00	Flow (cfs)	0.00	0.00	0.00
Top Width (ft)	7.63	Top Width (ft)	2.36	1.39	3.88
Vel Total (ft/s)	0.00	Avg. Vel. (ft/s)	0.00	0.01	0.00
Max Chl Dpth (ft)	0.40	Hydr. Depth (ft)	0.09	0.27	0.06
Conv. Total (cfs)	19.9	Conv. (cfs)	5.0	13.1	1.8
Length Wtd. (ft)	30.00	Wetted Per. (ft)	2.37	2.17	3.88
Min Ch El (ft)	58.88	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.64	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.07
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.09

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.

Plan: Plan 03 Lower Curtis 1 RS: 185.17 Profile: Q2

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.01	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.84	Flow Area (sq ft)	0.06	0.40	3.45
E.G. Slope (ft/ft)	0.000023	Area (sq ft)	0.06	0.40	3.45
Q Total (cfs)	0.32	Flow (cfs)	0.00	0.08	0.24
Top Width (ft)	24.80	Top Width (ft)	1.21	1.89	21.70
Vel Total (ft/s)	0.08	Avg. Vel. (ft/s)	0.07	0.19	0.07
Max Chl Dpth (ft)	0.32	Hydr. Depth (ft)	0.05	0.21	0.16
Conv. Total (cfs)	66.8	Conv. (cfs)	1.0	16.2	49.7
Length Wtd. (ft)	30.00	Wetted Per. (ft)	1.21	1.92	21.99
Min Ch El (ft)	58.69	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.89	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.02	0.01	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.01	0.06

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Plan: Plan 03 Lower Curtis 1 RS: 185.17 Profile: Q10

E.G. Elev (ft)	59.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.13	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.87	Flow Area (sq ft)	0.30	0.63	6.10
E.G. Slope (ft/ft)	0.000011	Area (sq ft)	0.30	0.63	6.10
Q Total (cfs)	0.56	Flow (cfs)	0.03	0.11	0.42
Top Width (ft)	26.25	Top Width (ft)	2.66	1.89	21.70
Vel Total (ft/s)	0.08	Avg. Vel. (ft/s)	0.09	0.18	0.07
Max Chl Dpth (ft)	0.44	Hydr. Depth (ft)	0.11	0.33	0.28
Conv. Total (cfs)	170.4	Conv. (cfs)	7.9	34.5	128.1
Length Wtd. (ft)	30.00	Wetted Per. (ft)	2.67	1.92	22.11
Min Ch El (ft)	58.69	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.64	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.07

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

Errors Warnings and Notes (Continued)

	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Plan: Plan 03 Lower Curtis 1 RS: 185.17 Profile: Q25

E.G. Elev (ft)	59.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.20	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.89	Flow Area (sq ft)	0.49	0.75	7.44
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	0.49	0.75	7.44
Q Total (cfs)	0.70	Flow (cfs)	0.04	0.13	0.52
Top Width (ft)	26.99	Top Width (ft)	3.40	1.89	21.70
Vel Total (ft/s)	0.08	Avg. Vel. (ft/s)	0.09	0.18	0.07
Max Chl Dpth (ft)	0.51	Hydr. Depth (ft)	0.14	0.40	0.34
Conv. Total (cfs)	238.9	Conv. (cfs)	15.1	45.8	178.1
Length Wtd. (ft)	30.00	Wetted Per. (ft)	3.41	1.92	22.17
Min Ch El (ft)	58.69	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.59	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.07

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Plan: Plan 03 Lower Curtis 1 RS: 185.17 Profile: Q100

E.G. Elev (ft)	59.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.28	Reach Len. (ft)	30.00	30.00	30.00
Crit W.S. (ft)	58.91	Flow Area (sq ft)	0.83	0.91	9.34
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	0.83	0.91	9.34
Q Total (cfs)	0.88	Flow (cfs)	0.08	0.16	0.64
Top Width (ft)	28.03	Top Width (ft)	4.44	1.89	21.70
Vel Total (ft/s)	0.08	Avg. Vel. (ft/s)	0.09	0.17	0.07
Max Chl Dpth (ft)	0.59	Hydr. Depth (ft)	0.19	0.48	0.43
Conv. Total (cfs)	354.1	Conv. (cfs)	30.8	63.8	259.5
Length Wtd. (ft)	30.00	Wetted Per. (ft)	4.46	1.92	22.26
Min Ch El (ft)	58.69	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.53	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.07

Plan: Plan 03 Lower Curtis 1 RS: 185.17 Profile: Q100 (Continued)

C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.08

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q2

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.01	Reach Len. (ft)	142.82	142.82	142.82
Crit W.S. (ft)		Flow Area (sq ft)	0.58	0.53	0.90
E.G. Slope (ft/ft)	0.000037	Area (sq ft)	0.58	0.53	0.90
Q Total (cfs)	0.32	Flow (cfs)	0.12	0.14	0.07
Top Width (ft)	12.54	Top Width (ft)	3.61	1.39	7.54
Vel Total (ft/s)	0.16	Avg. Vel. (ft/s)	0.20	0.26	0.07
Max Chl Dpth (ft)	0.52	Hydr. Depth (ft)	0.16	0.38	0.12
Conv. Total (cfs)	52.6	Conv. (cfs)	19.3	22.3	10.9
Length Wtd. (ft)	142.82	Wetted Per. (ft)	3.64	2.40	7.54
Min Ch El (ft)	58.49	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.75	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.02	0.01	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.01	0.05

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q10

E.G. Elev (ft)	59.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.13	Reach Len. (ft)	142.82	142.82	142.82
Crit W.S. (ft)		Flow Area (sq ft)	1.07	0.70	2.09
E.G. Slope (ft/ft)	0.000024	Area (sq ft)	1.07	0.70	2.09
Q Total (cfs)	0.56	Flow (cfs)	0.24	0.16	0.15
Top Width (ft)	18.32	Top Width (ft)	4.55	1.39	12.37
Vel Total (ft/s)	0.14	Avg. Vel. (ft/s)	0.23	0.23	0.07
Max Chl Dpth (ft)	0.64	Hydr. Depth (ft)	0.23	0.51	0.17
Conv. Total (cfs)	114.5	Conv. (cfs)	49.6	33.2	31.7

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q10 (Continued)

Length Wtd. (ft)	142.82	Wetted Per. (ft)	4.81	2.65	12.38
Min Ch El (ft)	58.49	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.87	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.01	0.06

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q25

E.G. Elev (ft)	59.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.19	Reach Len. (ft)	142.82	142.82	142.82
Crit W.S. (ft)		Flow Area (sq ft)	1.37	0.79	2.95
E.G. Slope (ft/ft)	0.000020	Area (sq ft)	1.37	0.79	2.95
Q Total (cfs)	0.70	Flow (cfs)	0.31	0.17	0.22
Top Width (ft)	22.13	Top Width (ft)	5.26	1.39	15.48
Vel Total (ft/s)	0.14	Avg. Vel. (ft/s)	0.23	0.22	0.07
Max Chl Dpth (ft)	0.70	Hydr. Depth (ft)	0.26	0.57	0.19
Conv. Total (cfs)	157.3	Conv. (cfs)	69.7	39.1	48.5
Length Wtd. (ft)	142.82	Wetted Per. (ft)	5.65	2.77	15.48
Min Ch El (ft)	58.49	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.94	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.06

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q100

E.G. Elev (ft)	59.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.28	Reach Len. (ft)	142.82	142.82	142.82
Crit W.S. (ft)		Flow Area (sq ft)	1.88	0.91	4.51
E.G. Slope (ft/ft)	0.000014	Area (sq ft)	1.88	0.91	4.51
Q Total (cfs)	0.88	Flow (cfs)	0.39	0.18	0.31
Top Width (ft)	27.56	Top Width (ft)	6.30	1.39	19.87

Plan: Plan 03 Lower Curtis 1 RS: 155.17 Profile: Q100 (Continued)

Vel Total (ft/s)	0.12	Avg. Vel. (ft/s)	0.21	0.20	0.07
Max Chl Dpth (ft)	0.79	Hydr. Depth (ft)	0.30	0.66	0.23
Conv. Total (cfs)	235.6	Conv. (cfs)	105.0	47.7	83.0
Length Wtd. (ft)	142.82	Wetted Per. (ft)	6.86	2.95	19.88
Min Ch El (ft)	58.49	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.98	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.01	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.01	0.07

Errors Warnings and Notes

Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
	This may indicate the need for additional cross sections.

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q2

E.G. Elev (ft)	59.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.01	Reach Len. (ft)	18.10	18.10	18.10
Crit W.S. (ft)		Flow Area (sq ft)	11.34	2.44	22.44
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	11.34	2.44	22.44
Q Total (cfs)	0.65	Flow (cfs)	0.27	0.06	0.32
Top Width (ft)	40.00	Top Width (ft)	16.41	1.89	21.70
Vel Total (ft/s)	0.02	Avg. Vel. (ft/s)	0.02	0.02	0.01
Max Chl Dpth (ft)	1.62	Hydr. Depth (ft)	0.69	1.29	1.03
Conv. Total (cfs)	2278.6	Conv. (cfs)	960.1	208.9	1109.6
Length Wtd. (ft)	18.10	Wetted Per. (ft)	17.80	3.75	22.50
Min Ch El (ft)	57.39	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.23	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.00	0.01
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q10

E.G. Elev (ft)	59.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.13	Reach Len. (ft)	18.10	18.10	18.10
Crit W.S. (ft)		Flow Area (sq ft)	13.35	2.67	25.10
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	13.35	2.67	25.10

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q10 (Continued)

Q Total (cfs)	1.13	Flow (cfs)	0.50	0.10	0.53
Top Width (ft)	40.00	Top Width (ft)	16.41	1.89	21.70
Vel Total (ft/s)	0.03	Avg. Vel. (ft/s)	0.04	0.04	0.02
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)	0.81	1.41	1.16
Conv. Total (cfs)	2830.2	Conv. (cfs)	1254.6	243.1	1332.5
Length Wtd. (ft)	18.10	Wetted Per. (ft)	17.92	3.75	22.62
Min Ch El (ft)	57.39	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.26	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.00	0.01
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q25

E.G. Elev (ft)	59.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.19	Reach Len. (ft)	18.10	18.10	18.10
Crit W.S. (ft)		Flow Area (sq ft)	14.37	2.79	26.44
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	14.37	2.79	26.44
Q Total (cfs)	1.40	Flow (cfs)	0.63	0.12	0.65
Top Width (ft)	40.00	Top Width (ft)	16.41	1.89	21.70
Vel Total (ft/s)	0.03	Avg. Vel. (ft/s)	0.04	0.04	0.02
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)	0.88	1.47	1.22
Conv. Total (cfs)	3126.5	Conv. (cfs)	1414.5	261.1	1450.9
Length Wtd. (ft)	18.10	Wetted Per. (ft)	17.98	3.75	22.68
Min Ch El (ft)	57.39	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.27	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.00	0.01
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q100

E.G. Elev (ft)	59.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.013	0.013	0.030
W.S. Elev (ft)	59.28	Reach Len. (ft)	18.10	18.10	18.10
Crit W.S. (ft)		Flow Area (sq ft)	15.81	2.95	28.35

Plan: Plan 03 Lower Curtis 1 RS: 12.35 Profile: Q100 (Continued)

E.G. Slope (ft/ft)	0.000000	Area (sq ft)	15.81	2.95	28.35
Q Total (cfs)	1.76	Flow (cfs)	0.82	0.14	0.80
Top Width (ft)	40.00	Top Width (ft)	16.41	1.89	21.70
Vel Total (ft/s)	0.04	Avg. Vel. (ft/s)	0.05	0.05	0.03
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)	0.96	1.56	1.31
Conv. Total (cfs)	3565.5	Conv. (cfs)	1653.1	287.5	1624.9
Length Wtd. (ft)	18.10	Wetted Per. (ft)	18.07	3.75	22.77
Min Ch El (ft)	57.39	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.28	Stream Power (lb/ft s)	40.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.00	0.01
C & E Loss (ft)	0.01	Cum SA (acres)			

Errors Warnings and Notes

Warning:	The cross-section end points had to be extended vertically for the computed water surface.

PIPE-BASED DRAINAGE SCENARIOS FOR HEARST AVE. PROJECT AND TOPOGRAPHIC DEPRESSION

Compute pipe discharge capacities for possible subsurface drainage of Hearst Ave. Project site:

For pipe flow: use Manning formula for full flow
Q=vA

Peak Q10 for Subwatersheds A + B= 3.65 cfs
Peak Q25 for Subwatersheds A + B= 4.51 cfs

v= (0.59/n)*(D^0.67)* (S^0.5) where: n= pipe hydraulic roughness (King et al. 1949)
D= pipe diameter, ft.
S= pipe slope, ft/ft. (for east boundary to Hearst Ave. outlet, S= 0.008)

For 4-inch, smooth wall pipe:
n= 0.011
D= 0.33 ft.
S= 0.008 ft/ft.
A= 0.085541

v= 2.282489
Q= 0.195246

Therefore, for 2@ 4-inch pipes, total capacity= 0.4 cfs, which is insufficient for site stormwater evacuation.

Try 6-inch, smooth wall pipe:
D= 0.5 ft.
S= 0.008 ft/ft.
A= 0.196375

v= 3.015187
Q= 0.592107

Therefore, for 2@ 6-inch pipes, total capacity= 1.18 cfs, still insufficient for site stormwater evacuation.

Also, 6-inch pipes will not fit physically between the sidewalk and 10-yr. HGL

Thus, analyze the potential for a shallow surface swale or various configurations (see FlowMaster computations).

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 11 2017

<Name>

Rectangular

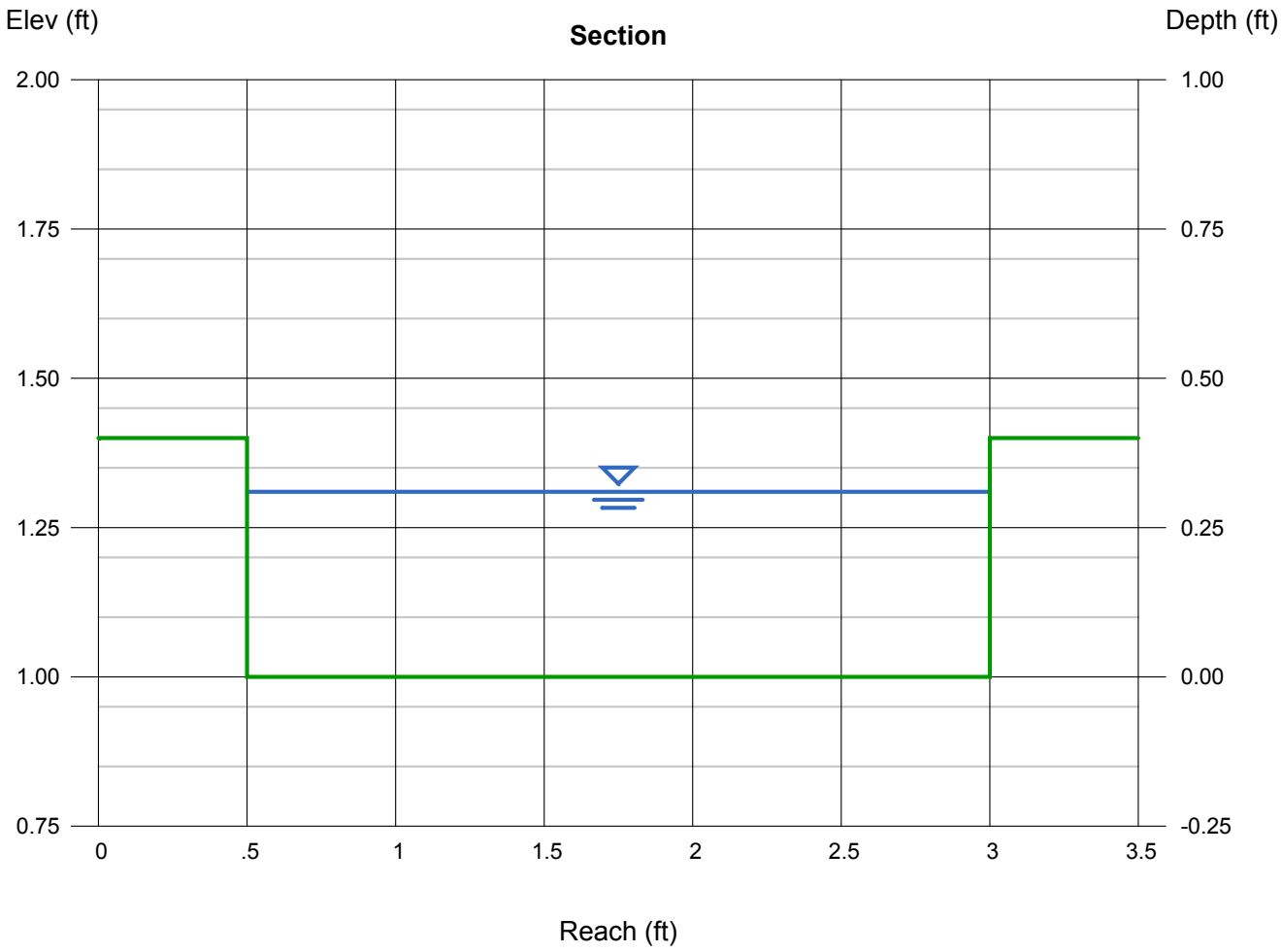
Bottom Width (ft)	= 2.50
Total Depth (ft)	= 0.40
Invert Elev (ft)	= 1.00
Slope (%)	= 0.80
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.65

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 3.650
Area (sqft)	= 0.77
Velocity (ft/s)	= 4.71
Wetted Perim (ft)	= 3.12
Crit Depth, Yc (ft)	= 0.40
Top Width (ft)	= 2.50
EGL (ft)	= 0.65



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 11 2017

<Name>

Trapezoidal

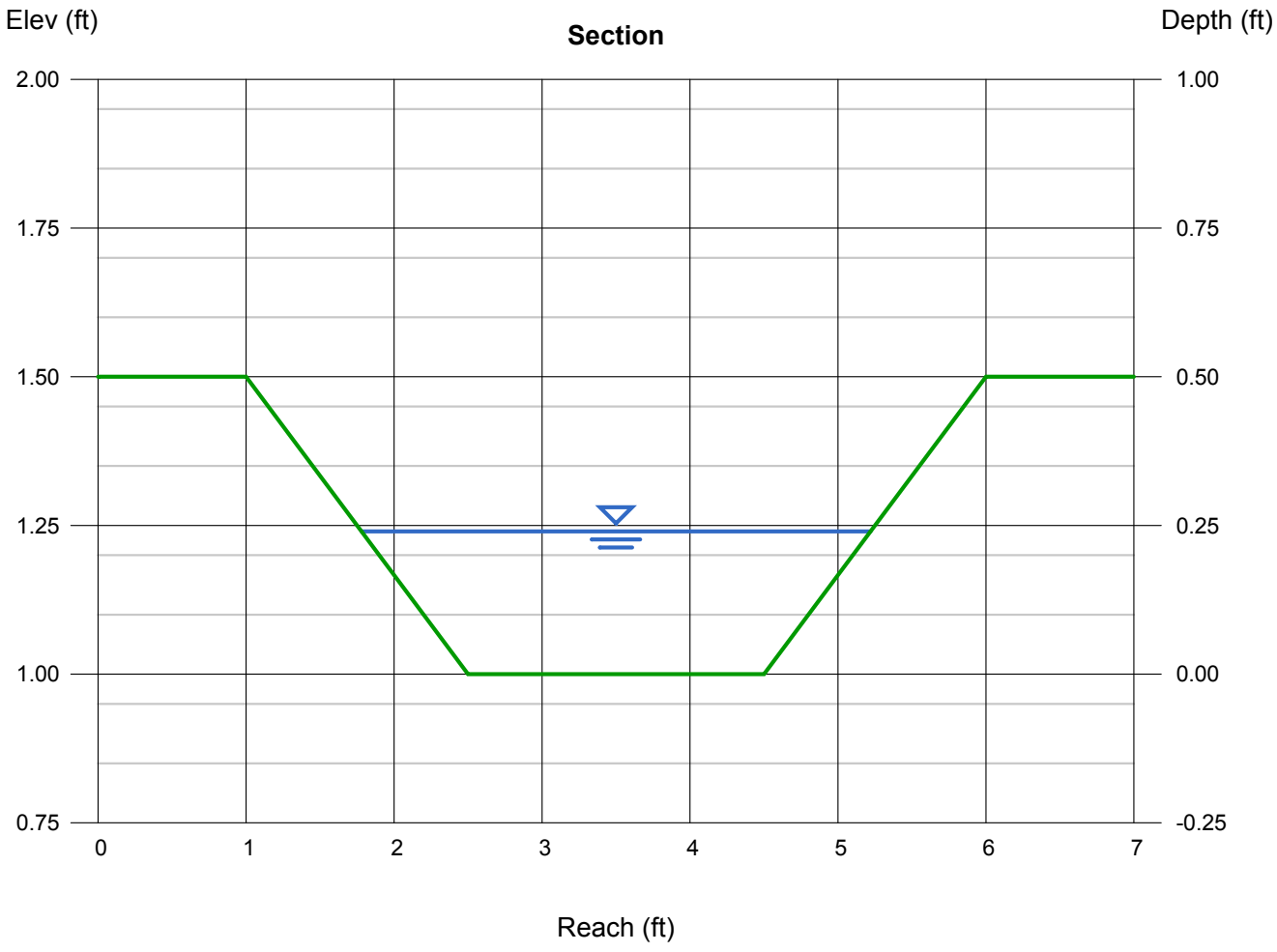
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.027

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.13

Highlighted

Depth (ft)	= 0.24
Q (cfs)	= 1.130
Area (sqft)	= 0.65
Velocity (ft/s)	= 1.73
Wetted Perim (ft)	= 3.52
Crit Depth, Yc (ft)	= 0.20
Top Width (ft)	= 3.44
EGL (ft)	= 0.29



HEARST AVE. PROJECT: PRE- VS. POST-PROJECT PEAK DISCHARGE COMPUTATIONS FOR PROJECT WATERSHED

Alameda County Flood Control & Water Conservation District. Hydrology and Hydraulics Manual 2016

Q= C'iA
where C= runoff coeff.;
i= rainfall intensity at duration equal to Tc;
A= drainage area, ac.

A= 21,673 sf: 0.5 acre

	Watershed Impervious Area	
	Exist.	Post-Project
Sq Ft	10,495.00	10,892.00
Acres	0.2409	0.2500
% Imperv.	0.48	0.50
% Incr.		0.02

For Site Watershed Existing Condition

Total Area	0.50	Acres	
Longest path	311.00	feet	[NE corner to NW corner, then south to SW prop. Corner]
Slope	0.80	%	(55.81-53.32)/311 ft/ft

a)Computing Time of Concentration, Tc

roof to gutter time

	10 yr recurrence interval	5	minutes	
	100 yr recurrence interval	5	minutes	
Overland flow =	311.00	ft	slope =	0.80
	Velocity=	0.75	ft/sec	
	10 yr recurrence interval	6.91	minutes	
	100 yr recurrence interval	6.91	minutes	

Time of concentration Tc=

10 yr recurrence interval	11.91	minutes
100 yr recurrence interval	11.91	minutes

b) Precipitation intensity, i

10 yr recurrence interval	2.34	in/hr
100 yr recurrence interval	3.52	in/hr

C)Runoff Coeff., C **Base Runoff**

			Impervious Area
10 yr recurrence interval, C	0.43	**10 yr recurrence interval, C**	0.9
100 yr recurrence interval, C	0.43	**100 yr recurrence interval, C**	0.9

Composite C

10 yr recurrence interval, C	**0.66**
100 yr recurrence interval, C	**0.66**

HEARST AVE. PROJECT: PRE- VS. POST-PROJECT PEAK DISCHARGE COMPUTATIONS FOR PROJECT WATERSHED

Ground Slope Adjustment

10 yr recurrence interval, C	0
100 yr recurrence interval, C	0

Rainfall Intensity Factor

10 yr recurrence interval, C	0.03
100 yr recurrence interval, C	0.05

Total

10 yr recurrence interval, C	0.69
100 yr recurrence interval, C	0.71

Q=CiA

10 yr recurrence interval, C	0.81	cfs
100 yr recurrence interval, C	1.25	cfs

For Site Watershed **Post-Project Condition**

Total Area	**0.50**	**Acres**	
Longest path	314.00	feet	[NE corner to rear of 1173 bldg., west to w. bdy, then south to SW prop. corner]
Slope	0.8	%	(55.81-53.32)/314 ft/ft

a)Computing Time of Concentration, Tc

roof to gutter time

10 yr recurrence interval		5	minutes
100 yr recurrence interval		5	minutes
Overland flow =	314.00 ft		slope =
Velocity=		0.75	ft/sec
10 yr recurrence interval		6.98	minutes
100 yr recurrence interval		6.98	minutes

Time of concentration Tc=

10 yr recurrence interval	11.98	minutes
100 yr recurrence interval	11.98	minutes

HEARST AVE. PROJECT: PRE- VS. POST-PROJECT PEAK DISCHARGE COMPUTATIONS FOR PROJECT WATERSHED

b) Precipitation intensity, i

Tc=12

10 yr recurrence interval	2.35	in/hr
100 yr recurrence interval	3.5	in/hr

C)Runoff Coeff., C

Base Runoff

		Impervious Area	
10 yr recurrence interval, C	0.43	**10 yr recurrence interval, C**	0.9
100 yr recurrence interval, C	0.43	**100 yr recurrence interval, C**	0.9

Composite C

10 yr recurrence interval, C	**0.67**
100 yr recurrence interval, C	**0.67**

Ground Slope Adjustment

10 yr recurrence interval, C	0
100 yr recurrence interval, C	0

Rainfall Intensity Factor

10 yr recurrence interval, C	0.03
100 yr recurrence interval, C	0.05

Total

10 yr recurrence interval, C	0.70	
100 yr recurrence interval, C	0.71	**0.01**

Q=CiA

10 yr recurrence interval, C	0.82	cfs
100 yr recurrence interval, C	1.25	cfs

HEARST AVE. PROJECT: VOLUMETRIC STORAGE REQUIRED TO MAINTAIN EXISTING SITE PEAK DISCHARGE- DESIGN Q10 RAINSTORM

Compute volumetric storage requirement for project modification of 10-yr. design rainstorm hydrograph:

Assume SCS triangular synthetic hydrograph:

Tp= hydrograph time to peak, min. =	0.6 Tc+0.5 D	where Tc= time of concentration for runoff, D= duration of rainfall
Tr= hydrograph recession time, min.=	1.67 Tp	excess for current analysis, D= Tc
Tb= hydrograph base time= Tp + Tr		

From Site Pre- vs. Post-Project Peak Discharge Computations:

D= 11.91 min.	for Q10 under existing conditions	(Note: there was no difference in the pre- vs. post
D= 11.98 min.	for Q10 under post-Project conditions	Q100 peak discharges.)

For existing condition:			For post-Project condition:	
Tp=	13.1	min.	Tp=	13.2
Tr=	21.9	min.	Tr=	22.0
Tb=	35.0	min.	Tb=	35.2

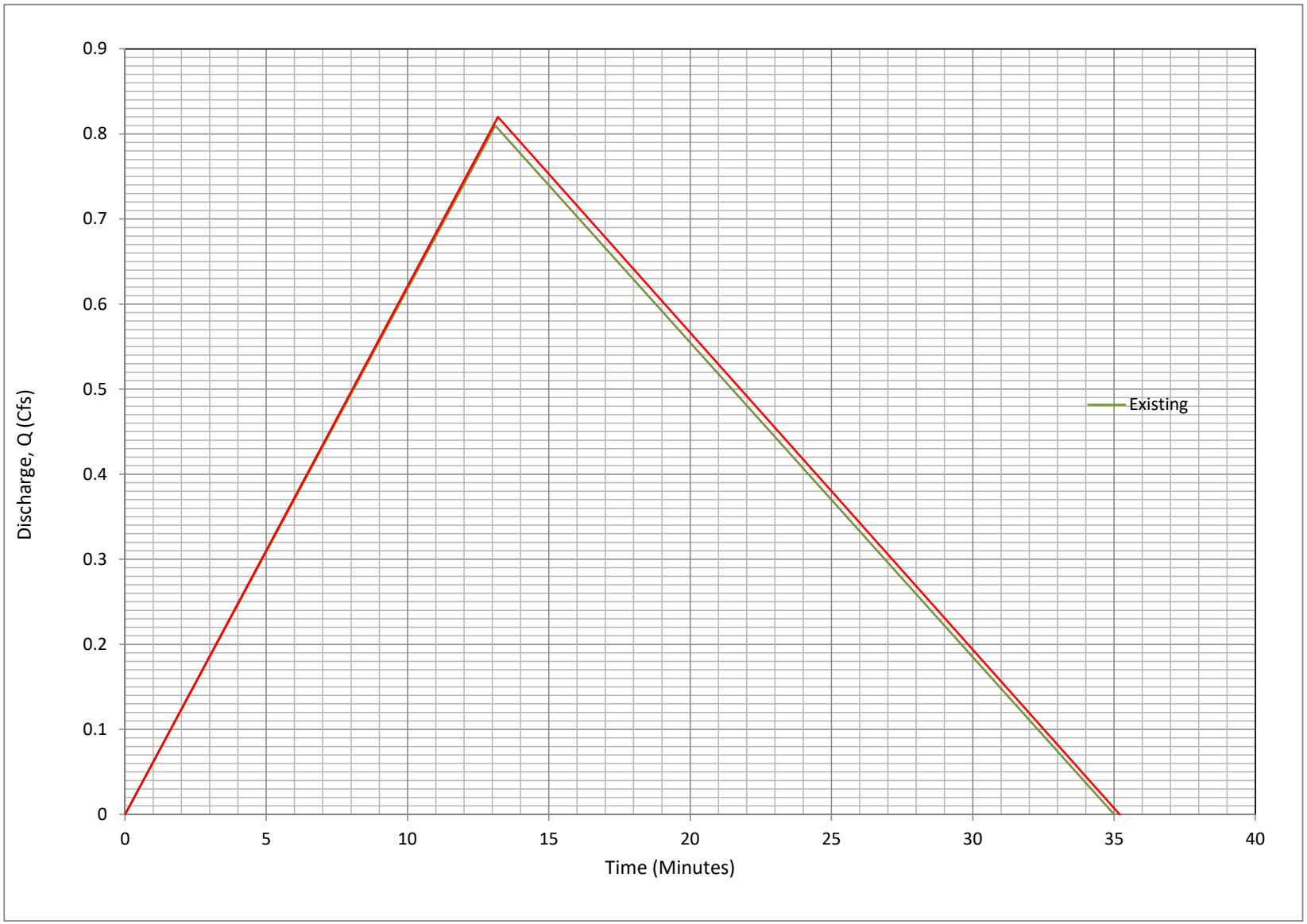
See superimposed hydrographs below for surcharge volume required to maintain existing Q10 peak discharge:

Volume of runoff:	ft^3	Gal		Gal
Exist Condition	850.0	6358.045	Increase Runoff	116.3
Post project	865.6	6474.369		

Volume of storage required= 116 gal

This volume can be captured and detained during runoff events by a rain cistern attached to the roof gutter of one of the Project buildings.

HEARST AVE. PROJECT: VOLUMETRIC STORAGE REQUIRED TO MAINTAIN EXISTING
SITE PEAK DISCHARGE AND RUNOFF VOLUME- DESIGN Q10 RAINSTORM



Mendez, Leslie

From: Mark Rhoades <mark@rhoadesplanninggroup.com>
Sent: Wednesday, July 19, 2017 9:59 PM
To: Mendez, Leslie
Cc: Mia Perkins
Subject: Hearst Ave Project Information

Dear Leslie,

We wanted to provide a status update on the information that you requested for Hearst. The hydrologist has finished revising the report based on the comments received from the peer review. We will send it shortly under separate email.

We had a meeting with the current tenants on 6/28/17 on site at 1173 Hearst to give them an update on the project and to answer any questions that they might have. We let them know that the 6 existing units were all subject to rent control and that would not change even when their units were renovated. The existing rental units will remain as rental units. We explained Berkeley's tenant relocation requirements and assured them that if/when they had to relocate for construction on their units, the owner would pay the rent differential for an in kind unit in Berkeley. We let them know that the current short term plan, after project approval and issuance of the building permit, is to construct the new buildings first and leave the existing units as they are until such time that owners decide to renovate and add on to the existing buildings. We explained that they would receive notice well in advance of the City's noticing requirements both before construction commenced on the new buildings as well as before they might be relocated for construction on their units.

The tenants had questions about parking, specifically about where they would park during construction. They also asked questions regarding the rent control status of their units now and after construction and whether all units would remain as rental (we let them know that all units would remain under rent control and all units would be rental).

We let them know that the project was going to the ZAB on 8/24/17.

We are planning to have a neighborhood meeting in a few weeks.

Thank you and please let us know if you have any questions.

Mark Rhoades

Planning and Development Department
Land Use Planning Division
1947 Center Street, 2nd Floor
Berkeley, CA 94704

Zoning Adjustments Board
NOTICE OF PUBLIC HEARING

SUBJECT: 1155-1173 HEARST AVENUE
Use Permit #ZP2016-0028

WHEN: Thursday, August 24, 2017.
Meeting starts at 7:00 pm.

WHERE: Council Chambers, Maudelle Shirek Bldg.
2134 Martin Luther King Jr. Way, 2nd Floor.
Wheelchair accessible.

«NAME1»
«NAME2»
«ADDRESS1»
«ADDRESS2», «ADDRESS3»

SUBJECT: 1155-1173 HEARST AVENUE
Use Permit #ZP2016-0028 to merge two lots, substantially rehabilitate seven existing dwelling units, and construct eleven new dwelling units.
CEQA STATUS: Categorically exempt under Section 15332 of the California Environmenal Quality Act (CEQA) Guidelines ("In-Fill Development Projects").

NOTICE CONCERNING YOUR LEGAL RIGHTS:
If you challenge the decision of the City in court, you may be limited to raising only those issues you or someone else raised at the public hearing or in written correspondence delivered to the Board at, or prior to, the public hearing.

All persons are welcome to attend the hearing and will be given an opportunity to address the Board. Comments may be made verbally at the public hearing and/or in writing before the hearing. The Board may limit the time granted to each speaker.

Send written comments to: Zoning Adjustments Board, 1947 Center Street, 2nd Floor, Berkeley, CA 94704, or e-mail to: ZAB@CityofBerkeley.info. To ensure inclusion in the packet, submit correspondence seven (7) days before the hearing. For any correspondence submitted less than seven days before the meeting, submit 15 copies for staff to deliver to the Board at its meeting. For more information, call the Land Use Planning division (510) 981-7410.

This meeting is being held in a wheelchair accessible location. To request a disability-related accommodation(s) to participate in the meeting, including auxiliary aids or services, please contact the Disability Services specialist at 981-6346(V) or 981-6345(TDD) at least three business days before the meeting date. Please refrain from wearing scented products to this meeting.

Post and Mail Date:
August 9, 2017

PLEASE NOTE: If your contact information is included in any communication to the Board, it will become part of the public record, and will be accessible on the City Website.

The Zoning Application for this project is available at the Permit Service Center, 1947 Center Street, Berkeley, and at our website:
http://www.cityofberkeley.info/zoningapplications

The agenda and staff report for this meeting will be available 3 to 5 days prior to this meeting at the Permit Service Center, 1947 Center Street, Berkeley, and at our website:
http://www.cityofberkeley.info/zoningadjustmentsboard

1155 Hearst Ave | 309 notices | mailed out 08-09-17

NAME1	NAME2	ADDRESS1	ADDRESS2	ADDRESS3
West Branch, Berkeley Public Library	WENDY HYMAN (OCCUPANT)	1125 UNIVERSITY AVE	BERKELEY	CA 94702
South Oceanview Neighborhood Association	ALLAN ACACIA (OCCUPANT)	1815 EIGHTH ST	BERKELEY	CA 94710
Addison-Acton Sreet Neighborhood Group	ALEXANDRA WHITE	1351 ADDISON ST	BERKELEY	CA 94702
Schoolhouse-Lincoln Creeks Watershed Neighborhood Assoc.	JENNIFER PEARSON	1546 MILVIA ST	BERKELEY	CA 94709
California Delaware McGee Neighborhood Association	MERRILIE MITCHELL	1612 DELAWARE ST	BERKELEY	CA 94703
Berkeley McGee Neighborhood Group	DEA LEE HARRISON	1627 BERKELEY WAY	BERKELEY	CA 94703
Milvia-King Alliance	ERIKA SHORE	1731 MILVIA ST	BERKELEY	CA 94709
University of California, Facilities Services	E. Marthinsen	A&E Building, Room 300	BERKELEY	CA 94720
Public Notice Journal	Philip Millenbah	PO Box 330356	San Francisco	CA 94133
Urban Creeks Council	CAROLE SCHEMMERLING (OPT)	861 REGAL RD	BERKELEY	CA 94708
Bananas Inc.	ARLYCE CURRIE	5232 CLAREMONT AVE	OAKLAND	CA 94618
Berkeley Central Library	MAIN REFERENCE DESK	2090 KITTREDGE STREET	BERKELEY	CA 94704
Adams Broadwell Joseph & Cardoza	Janet Laurain	601 GATEWAY BLVD. Su 1000	SOUTH SAN FRANCISCO	CA 94080
	COMMON AREA OF PM 7738 74 75 &	1126 DELAWARE ST	BERKELEY CA	94702
	COHEN MICHAEL B	1126 DELAWARE ST 3	BERKELEY CA	94702
	HAGEN KATHLEEN F TR	1128 DELAWARE ST	BERKELEY CA	94702
	VERGA RUFO	1129 HEARST AVE A	BERKELEY CA	94702
	MOORE WILLIAM H SR & LIUMOORE	1129 HEARST AVE B	BERKELEY CA	94702
	GREEN JEFFREY H & JAISSER ANNI	1129 HEARST AVE C	BERKELEY CA	94702
	GANESHALINGAM MOHAN & KAO JANI	1129 HEARST AVE D	BERKELEY CA	94702
	COMMON AREA PM 4294 43 THRU 45	1130 DELAWARE ST	BERKELEY CA	94702
	PICKARD REBEKAH & REBEKAH R	1131 HEARST AVE	BERKELEY CA	94702
	CHOW EMILY & HANSEN SVEN J	1132 DELAWARE ST	BERKELEY CA	94702
	BENNET YOHANNES	1134 HEARST AVE	BERKELEY CA	94702
	FREED ELLEN B	1139 DELAWARE ST	BERKELEY CA	94702
	WATANABE ANDREW T & CARL K & S	1140 1/2 DELAWARE ST	BERKELEY CA	94702
	COMMON AREA OF PM 6439 59 & 60	1140 DELAWARE ST	BERKELEY CA	94702
	RUDOY JOHN D & GUNASEKERA GESH	1140 DELAWARE ST 1	BERKELEY CA	94702
	CORY CAROLYN L	1141 HEARST AVE	BERKELEY CA	94702
	NITZ MARIE TR & PENA NICOLE TR	1142 DELAWARE ST	BERKELEY CA	94702
	KENDALL DAVID P & WATSON ERIN	1144 DELAWARE ST	BERKELEY CA	94702
	SHAIN PAUL L & GETZ BARBARA TR	1146 DELAWARE ST	BERKELEY CA	94702
	SHINDEL ALAN W & ROWEN TAMI S	1147 HEARST AVE	BERKELEY CA	94702
	ORMSBY PAMELA A TR	1148 DELAWARE ST	BERKELEY CA	94702
	COURTEMANCHE MATHIEU & KASSAM	1150 DELAWARE ST	BERKELEY CA	94702
	ALLEN EDISON JR & SIGRID	1151 DELAWARE ST	BERKELEY CA	94702
	GIANOPOULOS DENO	1151 HEARST AVE	BERKELEY CA	94702
	JOYNT PATRICK R & CHU KAREN T	1156 DELAWARE ST	BERKELEY CA	94702
	VONDELING JOHANNA E & GADELLE	1164 HEARST AVE	BERKELEY CA	94702
	SHAH REHMAN & RAZIA ETAL	1187 DELAWARE ST	BERKELEY CA	94702
	FRETZ MICHAEL T & BUCHANAN ELI	1191 DELAWARE ST	BERKELEY CA	94702
	CLINGMAN CURTIS D & THORESEN M	1195 HEARST AVE	BERKELEY CA	94702

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WONG BETTY	1198 HEARST AVE	BERKELEY CA	94702
SALAS FLOYD TR & ORTALDA CLAIR	1206 DELAWARE ST	BERKELEY CA	94702
COMMON AREA OF PM 6777 38 & 39	1209 HEARST AVE	BERKELEY CA	94702
WOOG SYLVIE & SPRAGUE CLAUDE T	1210 HEARST AVE	BERKELEY CA	94702
JACALA VINCE A & FERRER MARY Y	1211 HEARST AVE	BERKELEY CA	94702
COMMON AREA OF PM 5717 54 THRU	1256 QUEENS RD	BERKELEY CA	94708
SCHMIER ERIC S TR & SCHMIER KE	1475 POWELL ST 201	EMERYVILLE CA	94608
BASKENT DENIZ & SARAMPALIS ANA	1600 MACARTHUR BLVD	OAKLAND CA	94602
HARLEY GEORGE J & PAGE ALLYSON	1787 SONOMA AVE	BERKELEY CA	94707
RONQUILLO RAYMOND M TR & BATES	1801 CURTIS ST	BERKELEY CA	94702
HOTCHKISS CHRISTINE L & LOCKET	1801 CURTIS ST 1	BERKELEY CA	94702
RASTRULLO JACQUELINE M & NORON	1801 CURTIS ST 2	BERKELEY CA	94702
NAKAISHI MICHELLE & HILGERT JE	1801 CURTIS ST 3	BERKELEY CA	94702
HOENACK FRANK	1802 CURTIS ST	BERKELEY CA	94702
DALY LUCINDA A	1806 CURTIS ST	BERKELEY CA	94702
MASON CARRIE A	1810 CURTIS ST	BERKELEY CA	94702
AMES ALEXANDER K TR & BROOKES	1811 CURTIS ST	BERKELEY CA	94702
PRINS ALMA G & WOODLIEF BLAZE	1812 CURTIS ST	BERKELEY CA	94702
WILLIAMS ROLF S & MAJOR TEAL A	1814 CURTIS ST	BERKELEY CA	94702
CURRY DAMIEN X & BILLSTROM AMY	1815 CURTIS ST	BERKELEY CA	94702
SHULMAN STACEY R TR	1818 CURTIS ST	BERKELEY CA	94702
MICHAEL JOSEPH R	1819 1/2 CURTIS ST	BERKELEY CA	94702
CASEY GERALD J & KATHLEEN L	1819 CURTIS ST	BERKELEY CA	94702
REVSEN BRENDA J & LINDA	1820 CURTIS ST	BERKELEY CA	94702
SUSSMAN RAIN	1824 CURTIS ST	BERKELEY CA	94702
VENUGOPAL VIJAYAKUMAR	1826 CURTIS ST	BERKELEY CA	94702
HRDLICKA SANDRA L	1827 CURTIS ST	BERKELEY CA	94702
WADLE DAWN M	1828 CURTIS ST	BERKELEY CA	94702
COMMON AREA OF PM 5808 31 & 32	1901 CURTIS ST	BERKELEY CA	94702
KURZ PAMELA L	1901 CURTIS ST 1	BERKELEY CA	94702
ROBERTS WILLIAM E & RANDICE M	1905 CURTIS ST	BERKELEY CA	94702
PARSONS DAVID & KESSEL KRISTIN	1907 CURTIS ST	BERKELEY CA	94702
MORENO KATHY & DAVID TRS	1913 CURTIS ST	BERKELEY CA	94702
AKSOMBOON SOMCHAI & KWANRUAN T	1920 CURTIS ST	BERKELEY CA	94702
1931 SAN PABLO PARTNERS LLC	1931 SAN PABLO AVE 107	BERKELEY CA	94702
HEARST AVENUE COTTAGES LLC	1958 UNIVERSITY AVE A	BERKELEY CA	94704
COMMON AREA OF PM 7392 66 & 67	21 OCEAN VIEW RD	CAPE ELIZABETH ME	4107
MOK FRANNIE S TR	212 9TH ST 211	OAKLAND CA	94607
RESOURCES FOR COMMUNITY DEVELO	2220 OXFORD ST	BERKELEY CA	94704
WHELAN MICHAEL & CARTY PAUL	29 GREENWOOD CT	ORINDA CA	94563
SEYRANIAN COLLEEN & PALMER KEN	4144 REDWOOD RD	OAKLAND CA	94619
WYLDE RACHEL C & AIDAN G	4321 GILBERT ST	OAKLAND CA	94611
GREER GREGORY C & JAFFE FULL F	585 MANDANA BLVD	OAKLAND CA	94610

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FINK ROBERT W & FOX KIMBERLY S	5856 W 74TH ST	LOS ANGELES CA	90045
ROSENBERG CHARLES J & FAN WENH	6033 SHADYGROVE DR	CUPERTINO CA	95014
RITZ LLC	6149 VIEWCREST DR	OAKLAND CA	94619
CLARKE LYDIA J & TIMOTHY	743 COLUSA AVE	EL CERRITO CA	94530
ALAN WOFSY & ASSOCIATES	PO BOX 2210	SAN FRANCISCO CA	94126
AZIMI PARVIN H & AZIMI HOSS TR	PO BOX 2334	ORINDA CA	94563
OPPENHEIMER 1530 LLC	PO BOX 9395	BERKELEY CA	94709
Occupant	1123 HEARST AVE	Berkeley, CA	94702
Occupant	1125 HEARST AVE	Berkeley, CA	94702
Occupant	1126 DELAWARE ST 1	Berkeley, CA	94702
Occupant	1126 DELAWARE ST 2	Berkeley, CA	94702
Occupant	1127 HEARST AVE	Berkeley, CA	94702
Occupant	1130 1/2 DELAWARE ST	Berkeley, CA	94702
Occupant	1130 HEARST AVE	Berkeley, CA	94702
Occupant	1132 HEARST AVE	Berkeley, CA	94702
Occupant	1133 HEARST AVE	Berkeley, CA	94708
Occupant	1133 HEARST AVE A	Berkeley, CA	94702
Occupant	1133 HEARST AVE B	Berkeley, CA	94702
Occupant	1133 HEARST AVE C	Berkeley, CA	94702
Occupant	1133 HEARST AVE D	Berkeley, CA	94702
Occupant	1134 DELAWARE ST A	Berkeley, CA	94702
Occupant	1134 DELAWARE ST B	Berkeley, CA	94702
Occupant	1134 DELAWARE ST C	Berkeley, CA	94702
Occupant	1134 DELAWARE ST D	Berkeley, CA	94702
Occupant	1134 DELAWARE ST E	Berkeley, CA	94702
Occupant	1134 DELAWARE ST F	Berkeley, CA	94702
Occupant	1134 DELAWARE ST G	Berkeley, CA	94702
Occupant	1134 DELAWARE ST H	Berkeley, CA	94702
Occupant	1134 HEARST AVE	Berkeley, CA	94702
Occupant	1135 HEARST AVE	Berkeley, CA	94708
Occupant	1135 HEARST AVE A	Berkeley, CA	94702
Occupant	1135 HEARST AVE B	Berkeley, CA	94702
Occupant	1135 HEARST AVE C	Berkeley, CA	94702
Occupant	1135 HEARST AVE D	Berkeley, CA	94702
Occupant	1136 DELAWARE ST	Berkeley, CA	94702
Occupant	1136 DELAWARE ST A	Berkeley, CA	94702
Occupant	1136 DELAWARE ST B	Berkeley, CA	94702
Occupant	1136 DELAWARE ST C	Berkeley, CA	94702
Occupant	1136 DELAWARE ST D	Berkeley, CA	94702
Occupant	1136 HEARST AVE	Berkeley, CA	94702
Occupant	1136 HEARST AVE A	Berkeley, CA	94702
Occupant	1136 HEARST AVE B	Berkeley, CA	94702
Occupant	1136 HEARST AVE C	Berkeley, CA	94702

1155 Hearst Ave | 309 notices | mailed out 08-09-17

Occupant	1136 HEARST AVE D	Berkeley, CA	94702
Occupant	1137 HEARST AVE	Berkeley, CA	94708
Occupant	1137 HEARST AVE A	Berkeley, CA	94702
Occupant	1137 HEARST AVE B	Berkeley, CA	94702
Occupant	1137 HEARST AVE C	Berkeley, CA	94702
Occupant	1137 HEARST AVE D	Berkeley, CA	94702
Occupant	1138 DELAWARE ST	Berkeley, CA	94702
Occupant	1138 DELAWARE ST A	Berkeley, CA	94702
Occupant	1138 DELAWARE ST B	Berkeley, CA	94702
Occupant	1138 DELAWARE ST C	Berkeley, CA	94702
Occupant	1138 DELAWARE ST D	Berkeley, CA	94702
Occupant	1138 HEARST AVE A	Berkeley, CA	94702
Occupant	1138 HEARST AVE B	Berkeley, CA	94702
Occupant	1138 HEARST AVE C	Berkeley, CA	94702
Occupant	1138 HEARST AVE D	Berkeley, CA	94702
Occupant	1139 DELAWARE ST A	Berkeley, CA	94702
Occupant	1139 HEARST AVE	Berkeley, CA	94702
Occupant	1139 HEARST AVE A	Berkeley, CA	94702
Occupant	1139 HEARST AVE B	Berkeley, CA	94702
Occupant	1139 HEARST AVE C	Berkeley, CA	94702
Occupant	1139 HEARST AVE D	Berkeley, CA	94702
Occupant	1140 DELAWARE ST 2	Berkeley, CA	94702
Occupant	1140 HEARST AVE	Berkeley, CA	94702
Occupant	1140 HEARST AVE A	Berkeley, CA	94702
Occupant	1140 HEARST AVE B	Berkeley, CA	94702
Occupant	1140 HEARST AVE C	Berkeley, CA	94702
Occupant	1140 HEARST AVE D	Berkeley, CA	94702
Occupant	1141 1/2 HEARST AVE	Berkeley, CA	94702
Occupant	1141 HEARST AVE 1/2	Berkeley, CA	94702
Occupant	1142 DELAWARE ST A	Berkeley, CA	94702
Occupant	1142 DELAWARE ST B	Berkeley, CA	94702
Occupant	1142 HEARST AVE A	Berkeley, CA	94702
Occupant	1142 HEARST AVE B	Berkeley, CA	94702
Occupant	1142 HEARST AVE C	Berkeley, CA	94702
Occupant	1142 HEARST AVE D	Berkeley, CA	94702
Occupant	1143 HEARST AVE	Berkeley, CA	94702
Occupant	1144 1/2 DELAWARE ST	Berkeley, CA	94702
Occupant	1144 HEARST AVE	Berkeley, CA	94702
Occupant	1144 HEARST AVE A	Berkeley, CA	94702
Occupant	1144 HEARST AVE B	Berkeley, CA	94702
Occupant	1144 HEARST AVE C	Berkeley, CA	94702
Occupant	1144 HEARST AVE D	Berkeley, CA	94702
Occupant	1145 HEARST AVE	Berkeley, CA	94702

1155 Hearst Ave | 309 notices | mailed out 08-09-17

Occupant	1146 HEARST AVE A	Berkeley, CA	94702
Occupant	1146 HEARST AVE B	Berkeley, CA	94702
Occupant	1146 HEARST AVE C	Berkeley, CA	94702
Occupant	1146 HEARST AVE D	Berkeley, CA	94702
Occupant	1148 HEARST AVE A	Berkeley, CA	94702
Occupant	1148 HEARST AVE B	Berkeley, CA	94702
Occupant	1148 HEARST AVE C	Berkeley, CA	94702
Occupant	1148 HEARST AVE D	Berkeley, CA	94702
Occupant	1149 HEARST AVE	Berkeley, CA	94702
Occupant	1150 HEARST AVE	Berkeley, CA	94702
Occupant	1150 HEARST AVE B	Berkeley, CA	94702
Occupant	1150 HEARST AVE C	Berkeley, CA	94702
Occupant	1150 HEARST AVE D	Berkeley, CA	94702
Occupant	1151 HEARST AVE	Berkeley, CA	94702
Occupant	1153 DELAWARE ST	Berkeley, CA	94702
Occupant	1154 HEARST AVE A	Berkeley, CA	94702
Occupant	1154 HEARST AVE B	Berkeley, CA	94702
Occupant	1154 HEARST AVE C	Berkeley, CA	94702
Occupant	1154 HEARST AVE D	Berkeley, CA	94702
Occupant	1155 HEARST AVE	Berkeley, CA	94702
Occupant	1156 HEARST AVE	Berkeley, CA	94702
Occupant	1156 HEARST AVE A	Berkeley, CA	94702
Occupant	1156 HEARST AVE B	Berkeley, CA	94702
Occupant	1156 HEARST AVE C	Berkeley, CA	94702
Occupant	1156 HEARST AVE D	Berkeley, CA	94702
Occupant	1157 HEARST AVE	Berkeley, CA	94702
Occupant	1158 HEARST AVE A	Berkeley, CA	94702
Occupant	1158 HEARST AVE B	Berkeley, CA	94702
Occupant	1158 HEARST AVE C	Berkeley, CA	94702
Occupant	1158 HEARST AVE D	Berkeley, CA	94702
Occupant	1159 HEARST AVE	Berkeley, CA	94702
Occupant	1159 HEARST AVE A	Berkeley, CA	94702
Occupant	1159 HEARST AVE B	Berkeley, CA	94702
Occupant	1160 HEARST AVE	Berkeley, CA	94702
Occupant	1160 HEARST AVE A	Berkeley, CA	94702
Occupant	1160 HEARST AVE B	Berkeley, CA	94702
Occupant	1160 HEARST AVE C	Berkeley, CA	94702
Occupant	1160 HEARST AVE D	Berkeley, CA	94702
Occupant	1161 HEARST AVE	Berkeley, CA	94702
Occupant	1163 HEARST AVE	Berkeley, CA	94702
Occupant	1173 HEARST AVE	Berkeley, CA	94702
Occupant	1173 HEARST AVE B	Berkeley, CA	94702
Occupant	1175 UNIVERSITY AVE	Berkeley, CA	94702

1155 Hearst Ave | 309 notices | mailed out 08-09-17

Occupant	1177 DELAWARE ST	Berkeley, CA	94702
Occupant	1179 DELAWARE ST	Berkeley, CA	94702
Occupant	1181 DELAWARE ST	Berkeley, CA	94702
Occupant	1183 DELAWARE ST	Berkeley, CA	94702
Occupant	1193 DELAWARE ST	Berkeley, CA	94702
Occupant	1202 DELAWARE ST	Berkeley, CA	94702
Occupant	1204 DELAWARE ST	Berkeley, CA	94702
Occupant	1208 DELAWARE ST	Berkeley, CA	94702
Occupant	1803 CURTIS ST	Berkeley, CA	94702
Occupant	1804 CURTIS ST	Berkeley, CA	94702
Occupant	1805 CURTIS ST	Berkeley, CA	94702
Occupant	1807 CURTIS ST	Berkeley, CA	94702
Occupant	1809 CURTIS ST	Berkeley, CA	94702
Occupant	1813 CURTIS ST	Berkeley, CA	94702
Occupant	1815 CURTIS ST A	Berkeley, CA	94705
Occupant	1817 CURTIS ST	Berkeley, CA	94702
Occupant	1821 CURTIS ST	Berkeley, CA	94702
Occupant	1823 CURTIS ST	Berkeley, CA	94702
Occupant	1825 CURTIS ST	Berkeley, CA	94702
Occupant	1827 CURTIS ST A	Berkeley, CA	94702
Occupant	1827 CURTIS ST B	Berkeley, CA	94702
Occupant	1903 CURTIS ST A	Berkeley, CA	94702
Occupant	1903 CURTIS ST B	Berkeley, CA	94702
Occupant	1905 CURTIS ST A	Berkeley, CA	94702
Occupant	1905 CURTIS ST B	Berkeley, CA	94702
Occupant	1915 CURTIS ST	Berkeley, CA	94702
Occupant	1916 CURTIS ST	Berkeley, CA	94702
Occupant	1917 CURTIS ST	Berkeley, CA	94702
Occupant	1917 CURTIS ST A	Berkeley, CA	94702
Occupant	1917 CURTIS ST B	Berkeley, CA	94702
Occupant	1918 CURTIS ST	Berkeley, CA	94702
Occupant	1930 CURTIS ST	Berkeley, CA	94702
Occupant	1930 CURTIS ST 1	Berkeley, CA	94702
Occupant	1930 CURTIS ST 10	Berkeley, CA	94702
Occupant	1930 CURTIS ST 11	Berkeley, CA	94702
Occupant	1930 CURTIS ST 12	Berkeley, CA	94702
Occupant	1930 CURTIS ST 2	Berkeley, CA	94702
Occupant	1930 CURTIS ST 3	Berkeley, CA	94702
Occupant	1930 CURTIS ST 4	Berkeley, CA	94702
Occupant	1930 CURTIS ST 5	Berkeley, CA	94702
Occupant	1930 CURTIS ST 6	Berkeley, CA	94702
Occupant	1930 CURTIS ST 7	Berkeley, CA	94702
Occupant	1930 CURTIS ST 8	Berkeley, CA	94702

1155 Hearst Ave | 309 notices | mailed out 08-09-17

Occupant	1930 CURTIS ST 9	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 101	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 102	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 103	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 104	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 105	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 106	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 108	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 109	Berkeley, CA	94702
Occupant	1931 SAN PABLO AVE 110	Berkeley, CA	94702
Occupant	1935 SAN PABLO AVE	Berkeley, CA	94703
Occupant	1937 SAN PABLO AVE	Berkeley, CA	94703
Occupant	1941 SAN PABLO AVE	Berkeley, CA	94702
Occupant	1944 CURTIS ST	Berkeley, CA	94702
Occupant	1944 CURTIS ST 1	Berkeley, CA	94702
Occupant	1944 CURTIS ST 10	Berkeley, CA	94702
Occupant	1944 CURTIS ST 11	Berkeley, CA	94702
Occupant	1944 CURTIS ST 12	Berkeley, CA	94702
Occupant	1944 CURTIS ST 13	Berkeley, CA	94702
Occupant	1944 CURTIS ST 14	Berkeley, CA	94702
Occupant	1944 CURTIS ST 15	Berkeley, CA	94702
Occupant	1944 CURTIS ST 16	Berkeley, CA	94702
Occupant	1944 CURTIS ST 17	Berkeley, CA	94702
Occupant	1944 CURTIS ST 2	Berkeley, CA	94702
Occupant	1944 CURTIS ST 3	Berkeley, CA	94702
Occupant	1944 CURTIS ST 4	Berkeley, CA	94702
Occupant	1944 CURTIS ST 5	Berkeley, CA	94702
Occupant	1944 CURTIS ST 6	Berkeley, CA	94702
Occupant	1944 CURTIS ST 7	Berkeley, CA	94702
Occupant	1944 CURTIS ST 8	Berkeley, CA	94702
Occupant	1944 CURTIS ST 9	Berkeley, CA	94702
Occupant	1970 CURTIS ST	Berkeley, CA	94702
Occupant	1970 CURTIS ST 1	Berkeley, CA	94702
Occupant	1970 CURTIS ST 10	Berkeley, CA	94702
Occupant	1970 CURTIS ST 11	Berkeley, CA	94702
Occupant	1970 CURTIS ST 12	Berkeley, CA	94702
Occupant	1970 CURTIS ST 13	Berkeley, CA	94702
Occupant	1970 CURTIS ST 14	Berkeley, CA	94702
Occupant	1970 CURTIS ST 15	Berkeley, CA	94702
Occupant	1970 CURTIS ST 16	Berkeley, CA	94702
Occupant	1970 CURTIS ST 17	Berkeley, CA	94702
Occupant	1970 CURTIS ST 18	Berkeley, CA	94702
Occupant	1970 CURTIS ST 19	Berkeley, CA	94702

1155 Hearst Ave | 309 notices | mailed out 08-09-17

	Occupant	1970 CURTIS ST 2	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 3	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 4	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 5	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 6	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 7	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 8	Berkeley, CA	94702
	Occupant	1970 CURTIS ST 9	Berkeley, CA	94702
Hearst Avenue Cottages, LLC	c/o Rhoades Planning Group	46 Shattuck Square, Suite 11	Berkeley, CA 94704	

August 11, 2017

Ms. Leslie Mendez
Land Use Planning Division
City of Berkeley
1947 Center Street, 3rd Floor
Berkeley, California 94704

RE: Follow-up Peer Review of the Stormwater and Flooding Assessment for the Hearst Avenue Project, City of Berkeley

Dear Ms. Mendez:

I'd like to begin by again thanking you for your work to facilitate further review of the drainage analyses prepared for the Hearst Avenue Project ("Project"). You have provided two additional documents related to the site. These include a technical memorandum by Terraphase Engineering dated July 7, 2017 that provides a third-party review of the original Clearwater Hydrology report (dated January 7, 2016). The Terraphase technical memorandum includes comments and references based on my earlier peer review letter to you dated March 16, 2017. Additionally, you have forwarded a revised version of the Clearwater Report, dated July 12, 2017 (herein, "revised report"), which apparently was prepared, at least in part, to address items raised in the previous peer reviews.

I have completed my review of the revised report, with consideration of the information provided in the Terraphase memorandum. This letter summarizes my observations and comments related to the information presented therein.

The revised report presents significantly improved information about the stormwater management issues pertinent to the site, including adoption of several design parameters suggested in the earlier reviews. In important respects, the revised report is now based on a substantially more conservative estimate of peak runoff rates and, therefore, includes inherently higher factors of safety for the drainage design.

Follow-up Peer Review Comments

The following comments build on the issues I raised in my letter of March 16. In each case, I have used the topic heading and numbering to facilitate your assessment of how the earlier comments have been addressed.

1. *Soil Characteristics and Depth to Groundwater*. Section 2.3 of the revised report continues to note that information on soil properties and depth to groundwater has not yet been collected.

This is an unfortunate limitation, because the lack of definitive information on both subjects impacts several aspects of the drainage design, most notably the potential efficacy of the proposed permeable pavement surfaces to mitigate runoff quantity and quality. That said, the updated peak flow calculations included in the Technical Appendix to the revised report do explicitly include parameters based on characterization of the site soils as Hydrologic Soil Group D, consistent with published soil survey data and conservative for the purposes of estimating runoff.

2. *Design Guidance*. The revised report now includes runoff calculations using the rational method as applied in the Hydrology and Hydraulics Manual published by the Alameda County Flood Control and Water Conservation District ("ACFC"). This is a welcome addition that places the resulting estimates of peak flow much more in line with currently accepted practice in the region. The report now presents a clear comparison (Section 2.4.2) of the peak flow estimates for the ACFC methodology and those from the original report that utilized the Rantz method. The report also acknowledges that the resulting peak flow estimates per the ACFC framework are higher than those using the Rantz method. I would strongly suggest that peak flow estimates using the ACFC methodology are appropriately conservative and should be used as the design basis for the Project. My earlier review included comments on several factors, which include:

   a. Runoff Coefficients. The revised report correctly follows the modified runoff coefficient framework used by ACFC using a basic coefficient that is adjusted for slope and rainfall intensity.

   b. Impervious Cover. The updated report also includes a more explicit accounting of impervious cover, most clearly through the use of composite runoff coefficients that now account for the portion of each watershed that is roadway (see the Technical Appendix).[1]

   c. Time of Concentration. The Technical Appendix to the revised report includes the pertinent excerpts from the ACFC manual related to calculating times of concentration. However, the revised report appears to not strictly follow the methodology in this regard, particularly with respect to correct application of "roof to gutter" time and "overland flow" time. For example, the calculations of peak runoff for watersheds B through J use a time of concentration that is the sum of roof-to-gutter, overland flow, and open channel flow times. However, the ACFC methodology calls for a time of concentration in urban settings that is the sum of roof-to-gutter time and open channel flow time only (see Equation 4 in the manual excerpt in the Technical Appendix). This implies that the time of concentration for each of these watersheds is over-estimated by roughly 1.1 minutes. Conversely, for watershed A, where the point of concentration is the discharge to the gutter, the calculation should either use roof-to-gutter time or overland flow, but not both. Changes to times of concentration in this regard will generally lead to slightly higher peak flow estimates, and can readily be included in Project final design.

[1] A minor note is that the "%roadway" row in the first table on page 29 of the pdf as forwarded actually shows the fraction of each watershed that is roadway, e.g. the percentage divided by 100. However, the fraction is used correctly in the calculations.

d. Rainfall Intensity. The revised calculations use ACFC rainfall intensity information and are now significantly more conservative.

3. *HEC-RAS Modeling and Overflow from Curtis*. The only substantial change in the HEC-RAS modeling summarized in the report appears to be in the use of the higher peak flow estimates derived with the ACFC methodology. Thus, the revised report continues to lack clear definition of the amount of flow that might leave Curtis Street and flow through the adjacent yards toward the Project site. The report maintains that it is sufficiently conservative to assume that full diversion of the flow from watershed B represents the potential overflow from Curtis. This may indeed be true, but should definitely be confirmed during final design. The HEC-RAS model could readily be enhanced with lateral weir functionality to provide the required information. Design of drainage infrastructure to help alleviate localized flooding on the adjacent properties will need to be based on an appropriately conservative and defensible estimate of the potential overflow along Curtis.[2]

4. *Project Drainage*. Section 3 of the report includes welcome updates with respect to the on-site drainage design. This includes a shift to use of a concrete/steel drainage channel in lieu of the previously proposed gravel lined channel. The roughness values used to provide preliminary sizing information for the channel are now appropriate. Also, the suggestion of providing the drainage pathway along the western edge of the property appears to be a superior option in many regards.

5. *Changes in Peak Flow*. As noted in my earlier review, the drainage analyses are commendable for considering the impaired drainage conditions existing along the eastern boundary (flooding depths of up to 12 inches in adjoining yards). Two aspects in this regard were called out at the time and are revisited here:

   a. Loss of De Facto Detention Storage. The revised report does not include additional information as requested regarding the impact to peak flow leaving the site from the loss of de facto detention storage in the adjacent yards. Although the impact is likely relatively minor, the final Project documentation should include calculations to frame, at least in general terms, the magnitude of any increases in peak flow from enhanced drainage from the neighboring properties. If the change is relatively minor, then it should be practical to include additional on-site detention capacity, which would allow both reduced flooding in the adjacent yards and no increase in peak flow rates down Hearst.

   b. Post-project Impervious Cover. I noted in my review of March 16, that the very small increase in impervious cover associated with the Project was only achieved by treating the proposed permeable pavement areas (driveways, parking areas, and walkways) as pervious surfaces and that supporting documentation should be provided to substantiate this design assumption. The revised report does not provide the requested additional information. It would appear possible to provide adequate sub-grade storage, perhaps as little as a 6-inch course of gravel to achieve the desired performance. The final Project design should address that possibility, especially since it will be an important factor in determining whether the permeable pavement areas can be considered self-treating from a water-quality

[2] It is important to also note that the text discussion of the modeling results (Section 2.4.3) appears to reference the water surface elevations from the original HEC-RAS runs and not those using the updated peak flow estimates. The pertinent referenced water surface elevations should be updated in the final report.

perspective. In fact, an appropriately configured sub-grade could provide important on-site detention capacity, and this should also be considered in final Project design.

6. *C.3 Compliance*. My review of March 16 noted that the drainage design will need to show that the permeable pavement areas will need to have a sub-course capable of storing a quantity of runoff commensurate with the C.3 volume-based design guidance. This information was not found in the revised report, and will need to be provided in final design documentation to assure that the Project meets the requirements of the Municipal Regional Permit.

Closing

Thank you again for the opportunity to provide additional peer review comments related to stormwater management for the Hearst Avenue Project. The revised report information directly addresses many of the comments I made in my letter of March 16. The remaining unresolved points noted herein appear to be ones that can be readily resolved during final design, though it would be prudent to condition the Project to provide that information.

Do not hesitate to contact me if you have questions related to the scope of my review or the conclusions presented herein.

Sincerely,

BALANCE HYDROLOGICS, Inc.

Edward D. Ballman, P.E. 64095
Principal Engineer

PROJECT:

HEARST GARDENS
BERKELEY, CA 94702

DESCRIPTION:

DEVELOPMENT OF TWO EXISTING LOTS AT HEARST STREET BETWEEN SAN PABLO & CURTIS STREET. THE EXISTING LOTS ARE OVER 21,000 SF, AND CURRENTLY HAVE 7 RESIDENCES ON SITE. 6 OF THESE ARE TO BE MAINTAINED AND RENOVATED WHILE THE SOUTH EAST EXISTING BUILDING WILL BE DEMOLISHED AND REBUILT. THERE WILL BE 11 ADDITIONAL HOMES TO THE SITE, 5 OF WHICH ARE DENSITY BONUS. UNITS ARE ARRANGED AROUND A CENTRAL PASEO THAT PROVIDES ACCESS TO ALL UNITS AND AMPLE OPEN SPACE.

SITE ADDRESS:

1155, 1157, 1159, 1161, 1163 & 1173 HEARST AVE.
BERKELEY, CA 94704

ASSESSOR'S PARCEL #:

LOT 1173: 057 208601300
LOT 1157: 057 208601400

APPLICANT:

RHOADES PLANNING GROUP
1611 TELEGRAPH AVE. SUITE 200
OAKLAND, CA 94612
[510] 545-4341

ARCHITECT:

DEVI DUTTA-CHOUDHURY, AIA
DEVI DUTTA ARCHITECTURE INC.
1958A UNIVERSITY AVENUE
BERKELEY, CA 94704
[510] 705-1937
hello@devidutta.com

OWNER:

HEARST AVE COTTAGES, LLC
1958A UNIVERSITY AVENUE
BERKELEY, CA 94704

SHEET INDEX

A0.0	COVER SHEET
A0.00	SURVEY
A0.1	PROJECT INFORMATION
A0.2	BASELINE VS. DENSITY BONUS
A0.3	EXISTING PROJECT
A0.4	BASELINE PROJECT
A0.5	DENSITY BONUS TABLE
A0.6	LOT COVERAGE
A0.7	DIAGRAM - NEIGHBORHOOD CONTEXT
A0.8	VICINITY MAP
A0.9	STREET STRIP - HEARST AVENUE
A0.10	NEIGHBORHOOD PHOTOS
A0.11	SITE PHOTOS
A1.0	EXISTING SITE PLAN
A1.1	EXISTING PLANS & ELEVATIONS
A1.2	EXISTING PLANS & ELEVATIONS CAMELLIA
A1.3	EXISTING PLANS & ELEVATIONS FREESIA
A1.4	SITE PLAN, PROPOSED
A1.5	GROUND FLOOR
A1.6	SECOND FLOOR
A1.7	THIRD FLOOR
A1.8	ROOF PLAN
A2.0	SOUTH SITE ELEVATION FRONT
A2.1	NORTH SITE ELEVATION

SHEET INDEX (CONTINUED)

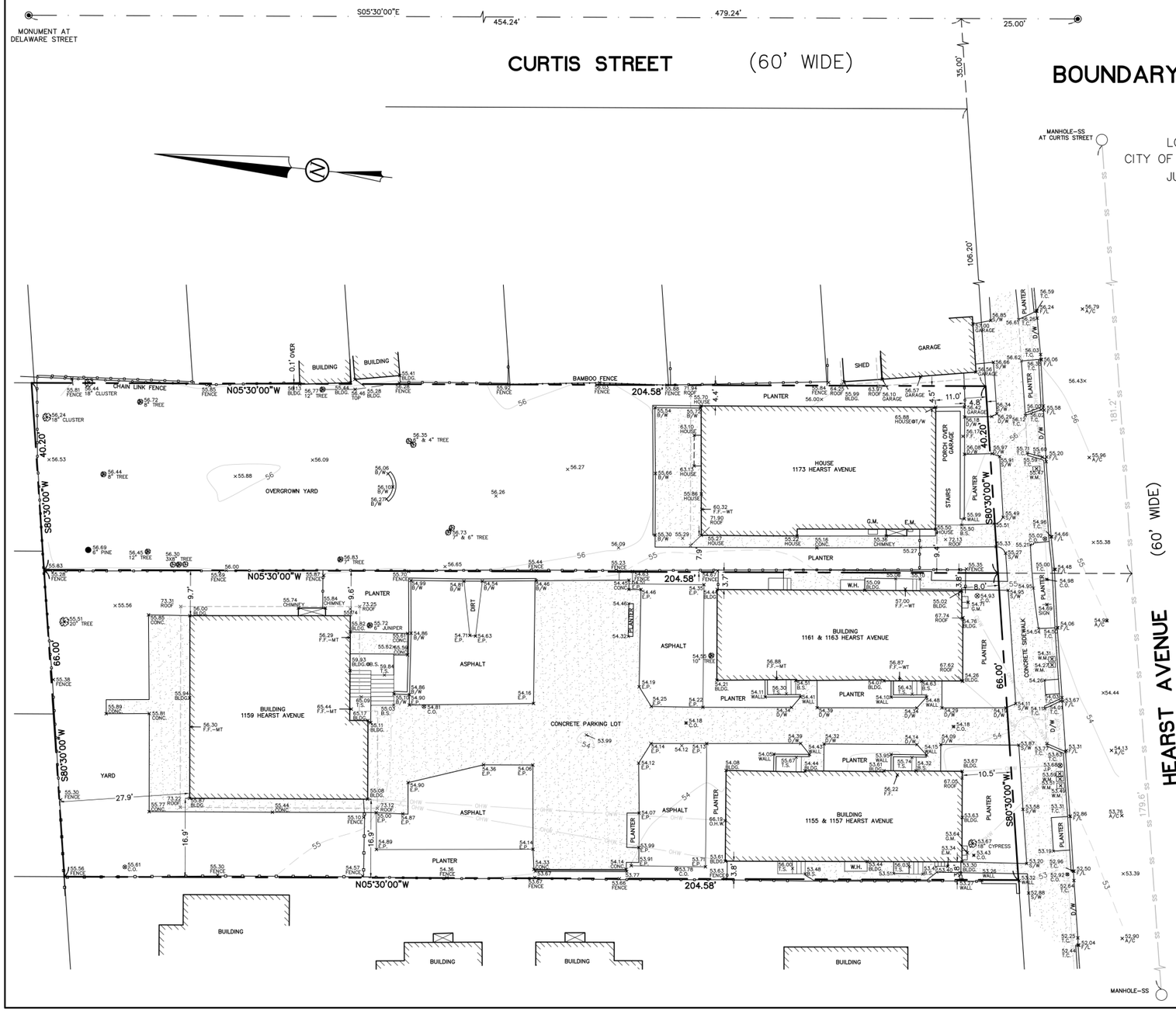
A2.2	EAST SITE ELEVATION
A2.3	WEST SITE ELEVATION
A3.0	SITE SECTIONS LOOKING WEST
A3.1	SITE SECTIONS LOOKING EAST
A3.2	SITE SECTIONS LOOKING NORTH
A3.3	SITE SECTIONS LOOKING SOUTH
A3.4	BUILDING SITE SECTIONS
A3.5	BUILDING SITE SECTIONS
A4.0	EAST DUPLEXES
A4.0A	EAST DUPLEXES ELEVATIONS
A4.0B	EAST DUPLEXES ELEVATIONS
A4.1	NORTH BUILDING - FREESIA
A4.1A	FREESIA ELEVATIONS
A4.1B	FREESIA ELEVATIONS
A4.1C	FREESIA ELEVATIONS - PERCENT PROPOSED
A4.1D	FREESIA ELEVATIONS - PERCENT PROPOSED (CONT.)
A4.2	PROPOSED TOWNHOMES @ HEARST - AZALEA
A4.2A	AZALEA ELEVATIONS
A4.2B	AZALEA ELEVATIONS
A4.2C	AZALEA ELEVATIONS - PERCENT PROPOSED
A4.3A	BEGONIA ELEVATIONS
A4.3B	BEGONIA ELEVATIONS
A4.3C	BEGONIA ELEVATIONS - PERCENT PROPOSED
A4.4	CAMELLIA BASEMENT & LEVEL 2 - PROPOSED

SHEET INDEX (CONTINUED)

A4.4A	CAMELLIA ELEVATIONS
A4.4B	CAMELLIA ELEVATIONS
A4.4C	CAMELLIA ELEVATIONS - PERCENT PROPOSED
A4.4D	CAMELLIA ELEVATIONS - PERCENT PROPOSED CONT.
A4.5	FENCE DETAIL
A4.6	BIKE STORAGE DETAILS
A5.0	RENDERING - HEARST LOOKING WEST
A5.2	RENDERING - PASEO NORTH @ BEGONIA BLDG.
A5.3	RENDERING - PASEO SOUTH @ DAFFODIL
A5.4	RENDERING - VIEW TO DAFFODILE & EDELWEISS
A5.5	RENDERING - PASEO LOOKING WEST @ GERANIUM
A5.6	RENDERING - VIEW TO SOUTH FROM BACK YARD
A5.7	RENDERING - VIEW WEST FROM ADJ. PROPERTY
A5.8	RENDERING - VIEW HEARST LOOKING EAST
A6.0	SHADOW STUDIES SUMMER SOLSTICE
A6.1	SHADOW STUDIES WINTER SOLSTICE
A6.2	SHADOW STUDIES OCTOBER 1ST
A6.3	SHADOW STUDIES JANUARY 15
A9.0	EMERGENCY ESCAPE AND RESCUE
A9.1	BUILDING CODE SUMMARY - GROUND PLAN
A9.2	BUILDING CODE SUMMARY - LEVEL 2

BOUNDARY AND TOPOGRAPHIC SURVEY

A PORTION OF BLOCK 2
MAP OF THE CURTIS TRACT (6 M 5)
LOCATED AT 1155–1173 HEARST AVENUE
CITY OF BERKELEY, COUNTY OF ALAMEDA, CALIFORNIA
JUNE 8 2015 SCALE: 1" = 10'



LEGEND

A/C	ASPHALT/CONCRETE
BLDG.	BUILDING
B.S.	BASE OF STEPS
B/W	BASE OF WALL
C.O.	CLEAN OUT
CONC.	CONCRETE
D/W	DRIVEWAY
ELECT.	ELECTRIC
E.M.	ELECTRIC METER(S)
E.P.	EDGE OF PAVEMENT
F.F.	FINISH FLOOR
F/L	FLOW LINE
G.M.	GAS METER(S)
J.P.	JOINT POLE
MT	METAL THRESHOLD
OHW	OVERHEAD WIRES
SS	SANITARY SEWER
S/W	SIDEWALK
T.C.	TOP OF CURB
TOP	TOP OF BANK
T.S.	TOP OF STEPS
W.H.	WATER HEATER
W.M.	WATER METER
WT	WOOD THRESHOLD
	FOUND MONUMENT
	WOOD FENCE

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 INCH = 10 FEET

REGISTERED LAND SURVEYOR JAMES S. MORAN 7881 STATE OF CALIFORNIA

MORAN ENGINEERING, INC.
CIVIL ENGINEERS \ LAND SURVEYORS
1930 SHATTUCK AVENUE, SUITE A
BERKELEY, CALIFORNIA 94704
(510) 848–1930

F.B. NO. 1529 HEARST–TOPO.DWG JOB NO. 15–9090

APPLICABLE CODES:

(INCLUDES LOCAL AMENDMENTS)

2013 California Building Code (CBC)
2013 California Residential Code (CRC)
2013 California Energy Code
2013 California Electrical Code (CEC)
2013 California Plumbing Code (CPC)
2013 California Mechanical Code (CMC)
2013 California Fire Code (CFC)
2013 CALGreen
BERKELEY MUNICIPAL CODE

HEIGHT & STORIES	ZONING:	EXISTING:	PROPOSED:
STORIES:	3 W/AUP	2	3
HEIGHT:	28' AVG 35' W/AUP	23'	35'
SETBACKS (MIN. DIMENSIONS SHOWN - SEE SITE PLAN)			
FRONT	15'	7'-10" EXISTING	7'-10" ADDITION
SIDE	4' @ 1ST STORY 4' @ 2ND STORY 6' @ 3RD STORY	3'-10" @ WEST 4'- 6" @ EAST	4' - 0" @ WEST (3 - STORY) 4' - 6" @ EAST (2 - STORY) 5' - 4" @ FREESIA ADDITION
BACK	15'	27'-10"	27'-10"
BUILDING SEPARATION	8' @ 1ST STORY 12' @ 2ND STORY 16' @ 3RD STORY	13'- 3"	9' - 2" - 25' - 6"
LOT AREA		21673 (MERGE 2 LOTS)	21673
LOT COVERAGE	3 - STORY: 35% 2 - STORY: 40%	4928 SF : 22.7%	8670 SF: 40.0%
GROSS FLOOR AREA		7,302 SF	20,010 SF 15,148 * 1.35 = 20,450 SF ALLOWABLE (INCLUDES DENSITY BONUS AREA, SEE A0.2)
PARKING: CARS			
RESIDENTIAL	1/UNIT 18 REQUIRED	7 (1 COVERED @ CAMELIA; 6 @ SURFACE LOT)	18 TOTAL 10 @ SURFACE LOT (1 ADA / ACCESSIBLE) 6 COVERED @ GERANIUM 2 TANDEM @ CAMELIA
PARKING: BIKE			
RESIDENTIAL		0	19

UNIT COUNT	ZONING:	EXISTING:	PROPOSED:
* NOTE: SEE SHEET A0.3 FOR UNIT MIX AND SIZES			
	1 / 1650 SF LOT AREA 21673/1650 = 13 UNITS	7 UNITS	5 ADDITIONAL UNITS 13 X 35% = 18 TOTAL (PER DENSITY BONUS)
OPEN SPACE (SEE SITE PLAN FOR DETAILS)			
	300 SF / UNIT	2560 SF + 5599 SF = 8,159 SF	18 UNITS = 6,128 SF PROPOSED (EXCEEDS THE 5,400 REQUIRED) REAR: 3,193 SF PASEO: 1,803 SF C/D: 410 SF D/E: 722 SF

BUILDING OCC.

R-2 @ 3 UNIT BUILDINGS
R-3 @ 1 & 2 UNIT BUILDINGS

PROPOSED CONSTRUCTION TYPE

NEW V-A STRUCTURES & REMODEL TO EXISTING DETACHED V-B RESIDENCE

EXCAVATION

APPROXIMATELY 55 CUBIC YARDS, FOR NEW FOUNDATIONS ONLY.

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

PROJECT:

1155 HEARST AVE
BERKELEY, CA 94702

ASSESSOR'S PARCEL #:

LOT 1173: 057 208601300
LOT 1157: 057 208601400

PROJECT DESCRIPTION:

THIS MULTIFAMILY PROJECT PROPOSES THREE NEW RESIDENTIAL STRUCTURES, AS WELL AS NEW SURFACE & COVERED PARKING, TWO STORY ADDITIONS TO THREE EXISTING SINGLE STORY RESIDENTIAL STRUCTURES, AND DEMOLITION TO SOUTH EAST EXISTING RESIDENTIAL STRUCTURE AND REPLACEMENT WITH NEW RESIDENTIAL STRUCTURE

A LANDSCAPED "PASEO" ACTS AS THE PRIMARY PEDESTRIAN LINK FROM HEARST AVE, TO ACCESS RESIDENCE ENTRANCES, PARKING, AND COMMON AMENITY AREAS AND OPEN SPACE.

ZONING INFORMATION:

ADDRESS:	1155 HEARST AVE BERKELEY, CA 94702
USE DESCRIPTION	CURRENT RESIDENTIAL PROPERTY CONVERTED TO 5 OR MORE UNITS SINGLE FAMILY RESIDENTIAL, USED AS SUCH.
GENERAL PLAN:	MDR
ZONING DISTRICT:	R-2A
FLOOD ZONE:	NO
FIRE ZONE:	1
ENV. MGMT. AREA:	NO
LANDMARK STRUCTURES MERIT:	NO
LOT AREA 1173: LOT AREA: 1157 TOTAL:	8,204 SF 13,469 SF 21,673 SF

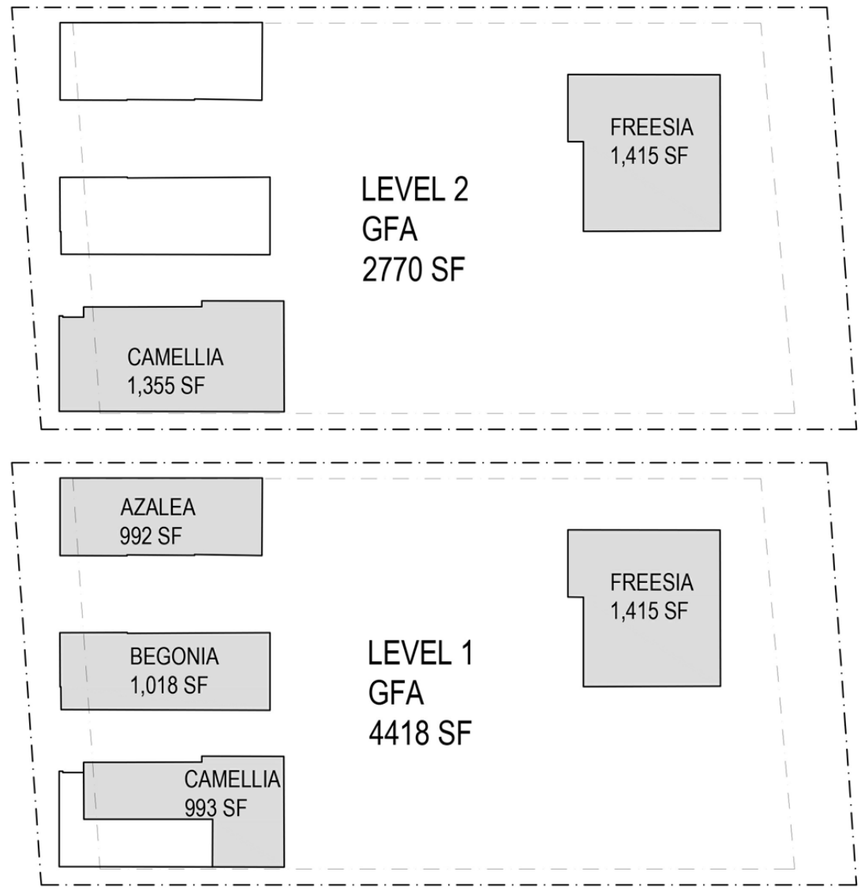
EXISTING CONDITIONS	
GROSS FLOOR AREA	7,188 GFA
AVERAGE UNIT SIZE	1,027 GFA
LOT AREA	21,673 SF (PER SURVEY)
LOT COVERAGE	4,847 SF
TOTAL ALLOWABLE AREA W/ DENSITY BONUS	N/A
PARKING	1 PER UNIT REQ'D. 7 PROVIDED.
OPEN SPACE	N/A
HEIGHT & STORIES	W/O USE PERMIT 2 STORIES PROVIDED ~23' EXISTING HEIGHT
SETBACKS	FRONT: 7'-10" EXISTING NON-CONFORMING SIDE: 3.8' EXISTING NON-CONFORMING REAR: 28' PROVIDED
EXISTING DWELLING UNITS	7

BASELINE DEVELOPMENT STANDARDS		
GROSS FLOOR AREA	15,148 GFA	
AVERAGE UNIT SIZE	1,165 GFA	
LOT AREA	21,673 SF (PER SURVEY)	
LOT COVERAGE	40% ALLOWED (8,670 SF)	40% PROVIDED (8,670 SF)
TOTAL ALLOWABLE AREA W/ DENSITY BONUS	N/A	
PARKING	1 PER UNIT REQ'D. (13)	13 PROVIDED
OPEN SPACE	300 SQ FT/ UNIT = 3,900 REQUIRED	3,900 PROVIDED
HEIGHT & STORIES	2 STORIES PERMITTED	28' HEIGHT ALLOWED
SETBACKS	PROVIDED: 15' FRONT YARD REQ'D 4' SIDE YARD REQ'D 15' BACK YARD REQ'D	
ALLOWED DWELLING UNITS	13	

DENSITY BONUS DEVELOPMENT STANDARDS		
GROSS FLOOR AREA	20,010 GFA (1% BELOW DENSITY BONUS ALLOWANCE OF 20,450 GFA)	
AVERAGE UNIT SIZE	1,112 GFA	
LOT AREA	21,673 SF (PER SURVEY)	
LOT COVERAGE	35% ALLOWED W/3 STORY (7,586 SF)	40% PROVIDED (8,670 SF)
TOTAL ALLOWABLE AREA W/ DENSITY BONUS	15,148 GFA*1.35 = 20,450 GFA ALLOWED	
CAR PARKING	(1) PER UNIT REQ'D. (18).	18 PROVIDED
OPEN SPACE	300 SQ FT/UNIT = 5,400 REQUIRED	6,128 SF PROVIDED
HEIGHT & STORIES	3 STORIES PERMITTED 3 STORIES PROVIDED	35' HEIGHT ALLOWED 35' HEIGHT SHOWN
SETBACKS	15' FRONT YARD REQ'D 4' SIDE YARD REQ'D LEVEL 1&2 6' SIDE YARD REQ'D LEVEL 3 15' BACK YARD REQ'D	7'-10" EXISTING NON-CONFORMING 3.8' EXISTING NON-CONFORMING 4' PROVIDED 28' PROVIDED
PROPOSED 35% DENSITY BONUS	18	

EXISTING CONDITIONS, 7 UNITS				
BUILDING	**UNIT #**	**UNIT TYPE**	**UNIT GROSS FLOOR AREA**	**EXISTING UNITS**
AZALEA	A101	1 BED, 1 BATH	496 GFA	(E) / BMR
	A102	1 BED, 1 BATH	496 GFA	(E) / BMR
BEGONIA	B101	1 BED, 1 BATH	509 GFA	(E) / BMR
	B102	1 BED, 1 BATH	509 GFA	(E) / BMR
CAMELLIA	C101	2 BED, 1 BATH	1,355 LVL2 + 993 BASEMENT = 2,348 GFA (PARKING EXCLUDED FROM GFA)	(E) (SINGLE FAMILY HOME)
FREESIA	F101	3 BED, 3 BATH	1,415 GFA	(E) / BMR
	F201	3 BED, 3 BATH	1,415 GFA	(E) / BMR
TOTALS	**7 UNITS**	N/A	7,188 GFA	N/A

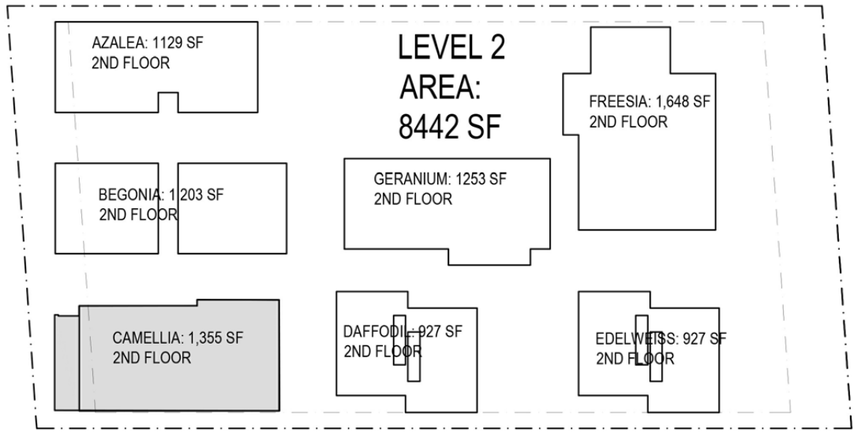
BMR = BELOW MARKET RATE

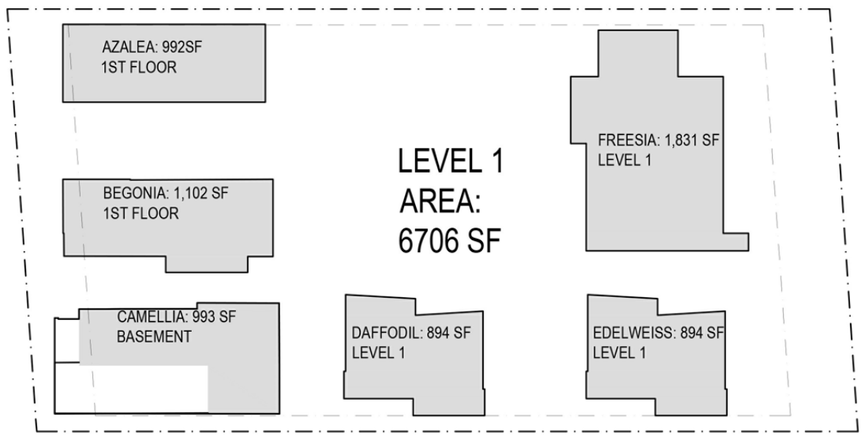


BASELINE PROJECT, 13 UNITS

BUILDING	UNIT #	UNIT TYPE	UNIT GROSS FLOOR AREA	EXISTING UNITS & NEW UNITS
AZALEA	A101	1 BED, 1 BATH	496 GFA	(E) / BMR
	A102	1 BED, 1 BATH	496 GFA	(E) / BMR
	A201	2 BED, 2.5 BATH	1129 GFA	NEW
BEGONIA	B101	1 BED, 1 BATH	551 GFA	(E) / BMR
	B102	1 BED, 1 BATH	551 GFA	(E) / BMR
	B201	2 BED, 2.5 BATH	1,203 GFA	NEW
CAMELLIA	C101	2 BED, 1 BATH	1,355 LVL 2+ 993 LVL 1 = 2,348 GFA	NEW
DAFFODIL	D101	2 BED, 2.5 BATH	894 GFA	NEW
	D201	2 BED, 2.5 BATH	927 GFA	NEW
EDELWEISS	E101	2 BED, 2.5 BATH	894 GFA	NEW
	E201	2 BED, 2.5 BATH	927 GFA	NEW
FREESIA	F101	3 BED, 3 BATH	1,831 GFA	(E) / BMR
	F201	3 BED, 3 BATH	1,648 GFA	(E) / BMR
GERANIUM	G201	2 BED, 2.5 BATH	1,253 GFA	NEW
TOTALS	**13 UNITS**	N/A	15,148 GFA	N/A

BMR = BELOW MARKET RATE

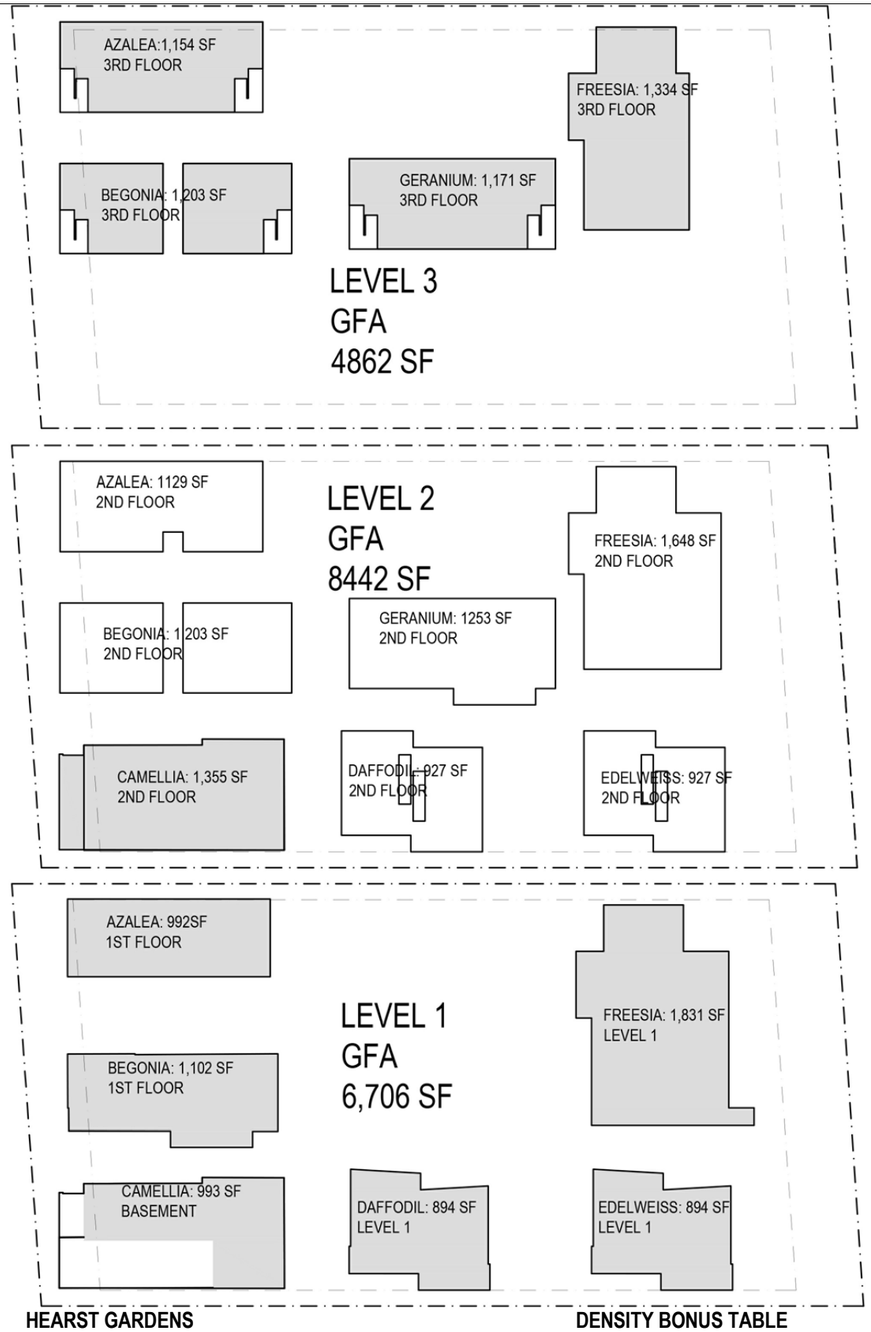


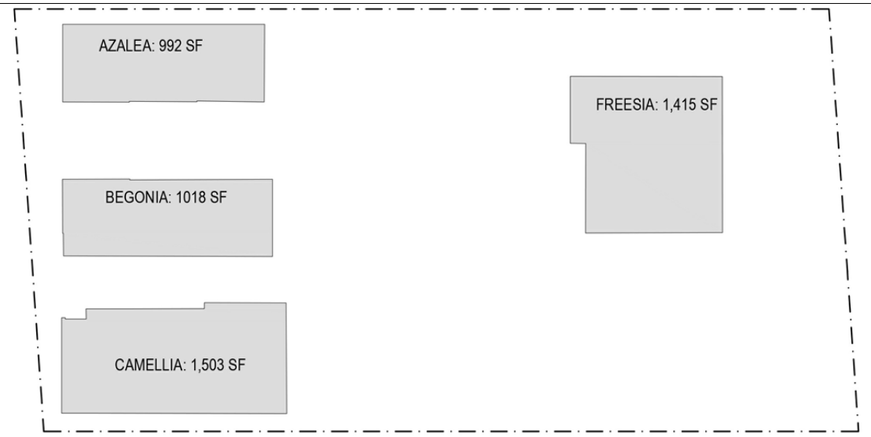


DENSITY BONUS PROJECT, 18 UNITS				
BUILDING	**UNIT #**	**UNIT TYPE**	**UNIT GROSS FLOOR AREA**	**EXISTING UNITS & NEW UNITS**
AZALEA	A101	1 BED, 1 BATH	496 GFA	(E) / BMR
AZALEA	A102	1 BED, 1 BATH	496 GFA	(E) / BMR
AZALEA	A201	2 BED, 2.5 BATH	1129GFA	NEW
AZALEA	A202	2 BED, 2.5 BATH	1154 GFA	NEW
BEGONIA	B101	1 BED, 1 BATH	551 GFA	(E) / BMR
BEGONIA	B102	1 BED, 1 BATH	551 GFA	(E) / BMR
BEGONIA	B201	2 BED, 2.5 BATH	1203 GFA	NEW
BEGONIA	B202	2 BED, 2.5 BATH	1203 GFA	NEW
CAMELLIA	C101	2 BED, 1 BATH	1,355 LVL2 + 993 LVL1 = 2,348 GFA (PARKING EXCLUDED FROM GFA) **	NEW
DAFFODIL	D101	2 BED, 2.5 BATH	894 GFA	NEW
DAFFODIL	D102	2 BED, 2.5 BATH	927 GFA	NEW
EDELWEISS	E101	2 BED, 2.5 BATH	894 GFA	NEW
EDELWEISS	E102	2 BED, 2.5 BATH	927 GFA	NEW
FREESIA	F101	3 BED, 3 BATH	1,831 GFA	(E) / BMR
FREESIA	F201	3 BED, 3 BATH	1,648 GFA	(E) / BMR
FREESIA	F301	3 BED, 3 BATH	1,334 GFA	NEW
GERANIUM	G201	2 BED, 2.5 BATH	1,253 GFA	NEW
GERANIUM	G202	2 BED, 2.5 BATH	1,171 GFA	NEW
TOTALS	**18 UNITS**	N/A	20,010 GFA	N/A

BMR = BELOW MARKET RATE

BASE PROJECT AREA X 35%
DENSITY BONUS AREA = 15148
X 1.35 = 20,450 ALLOWABLE
DENSITY BONUS AREA



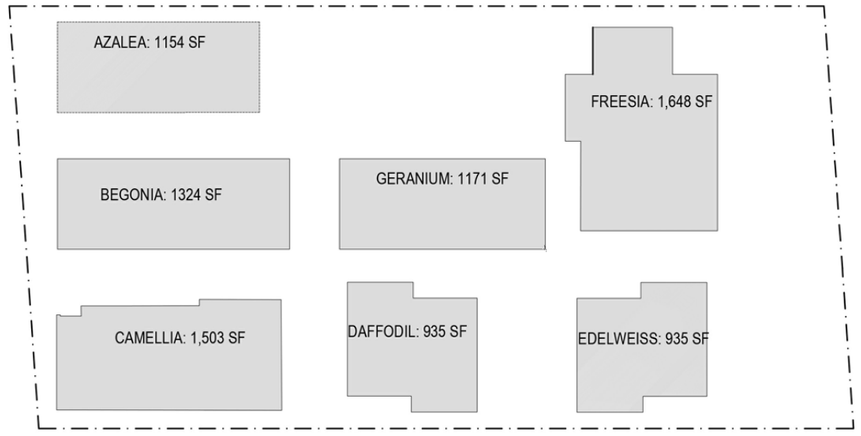


EXISTING LOT COVERAGE

LOT SF: 21,673 SF

40% OF LOT COVERAGE: 8,670 SF

EXISTING LOT COVERAGE: 4,928 SF



PROPOSED LOT COVERAGE

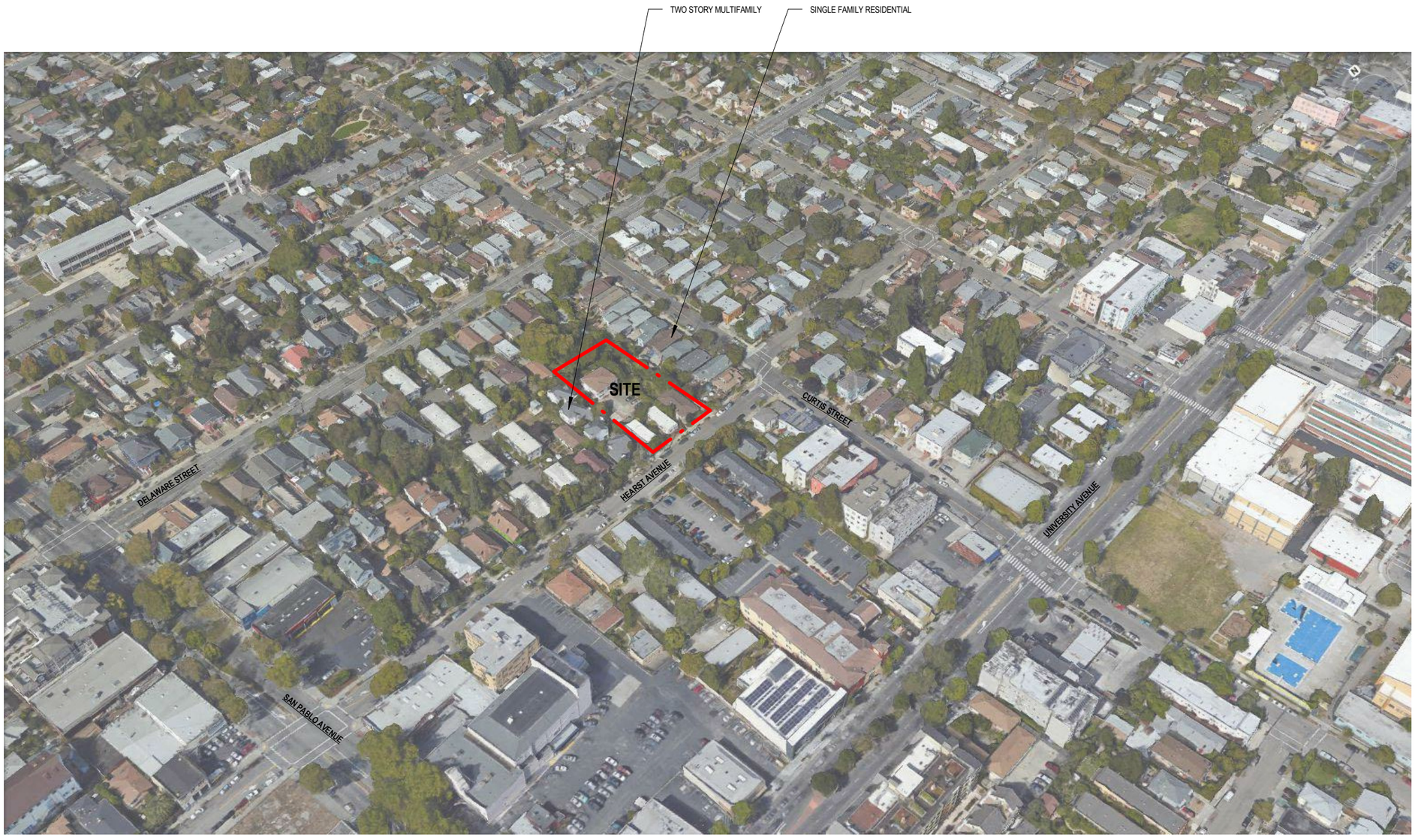
LOT SF: 21,673 SF

40% OF LOT COVERAGE: 8,670 SF

PROPOSED LOT COVERAGE: 8,664 SF

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA



ZAB	**HEARST GARDENS**	**DIAGRAM - NEIGHBORHOOD CONTEXT**
08.24.2017	DEVI DUTTA ARCHITECTURE INC.	SCALE:

A0.7

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

ZAB

08.24.2017

HEARST GARDENS

DEVI DUTTA ARCHITECTURE INC.

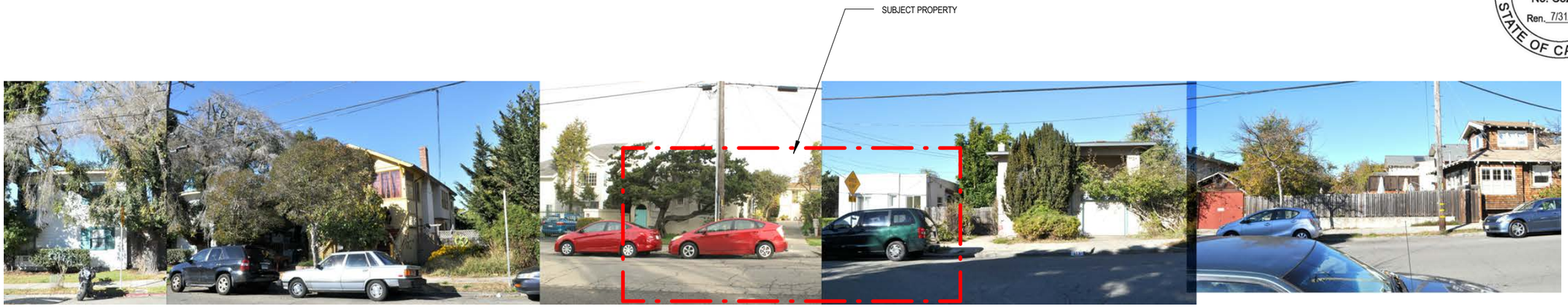
0 12.5' 25' 50' 100'

VICINITY MAP

SCALE: 1" = 50'-0"

A0.8

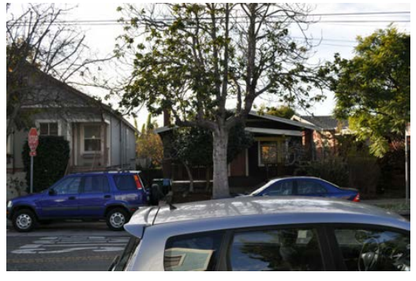
LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

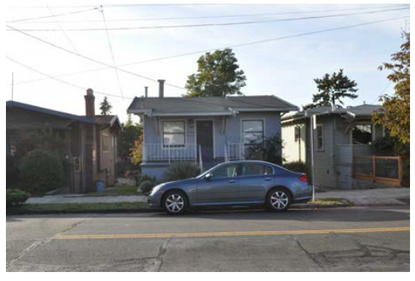


Existing Hearst Ave Strip, North

Proposed Hearst Ave Strip

Existing Hearst Ave Strip, South





CURTIS STREET HOMES (2-STORY @ REAR)

DELAWARE STREET

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

1155 HEARST - AZALEA

1161 HEARST - BEGONIA

1173 HEARST - CAMELLIA

1163 & 1157 HEARST - BEGONIA / AZALEA

1157 HEARST - AZALEA

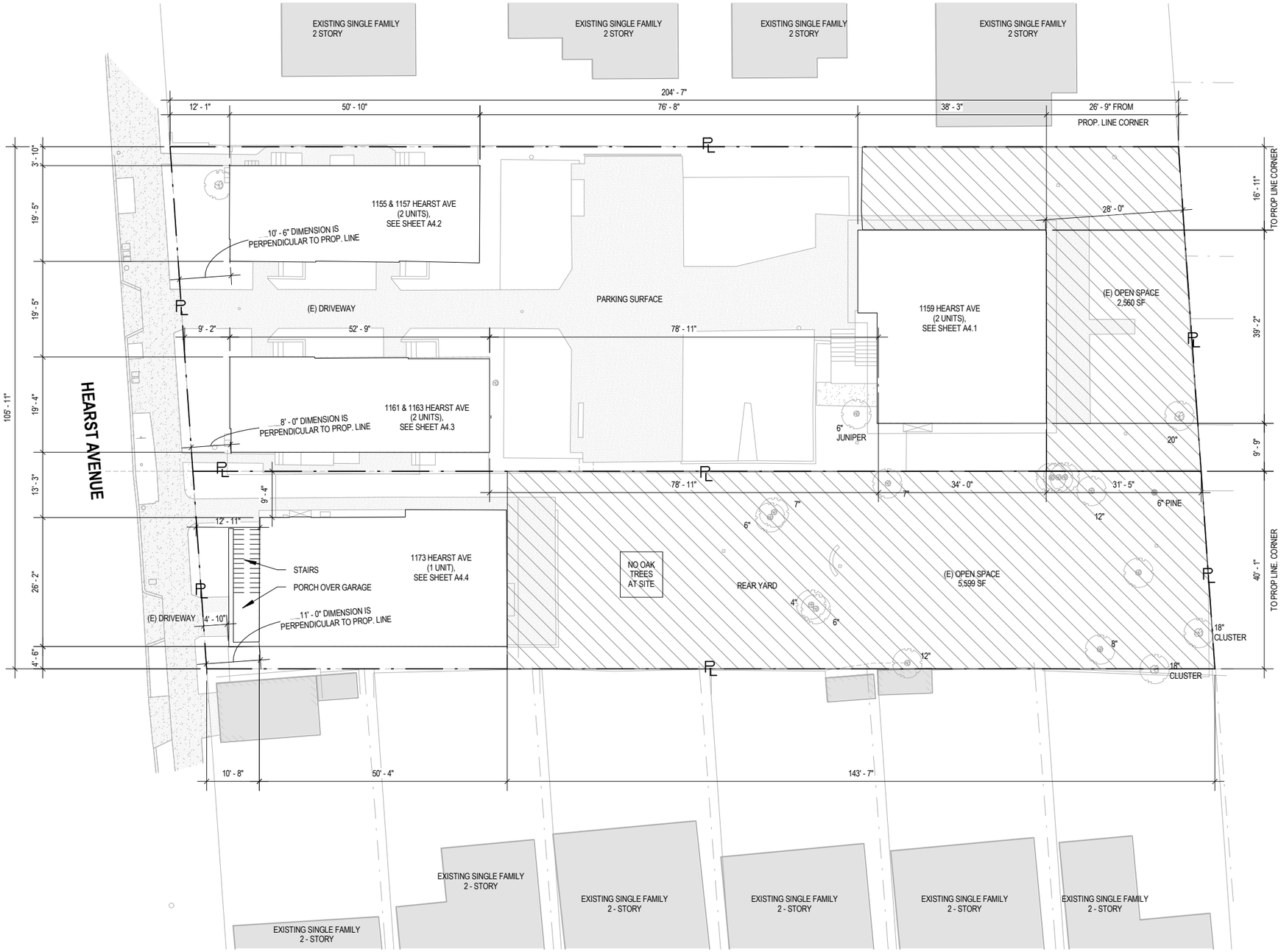
1157 HEARST - AZALEA

1155 HEARST - AZALEA

1179 HEARST - FREESIA

1179 HEARST - FREESIA

1179 HEARST - FREESIA



BACKYARD OF 1159 HEARST AVE.

BACKYARD OF 1173 HEARST AVE.

BACKYARD OF 1173 HEARST AVE.

BACKYARD OF 1173 HEARST AVE.

ZAB

08.24.2017

HEARST GARDENS

DEVI DUTTA ARCHITECTURE INC.

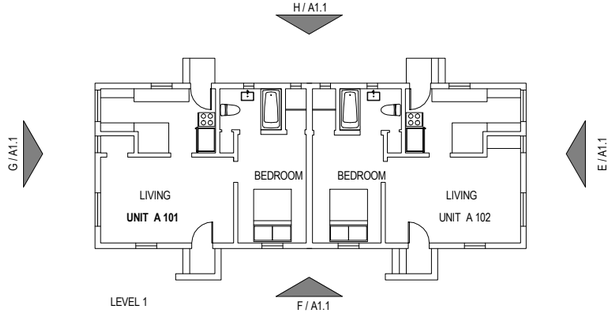
0 5 10 20 40

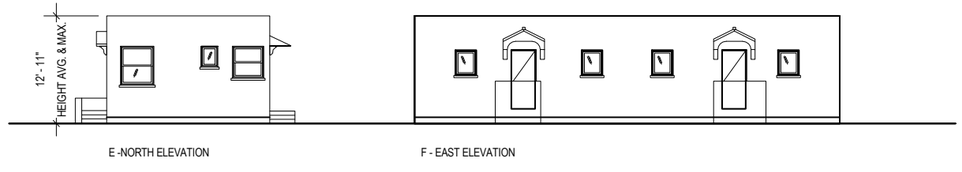
EXISTING SITE PLAN

SCALE: 1" = 20'-0"

N

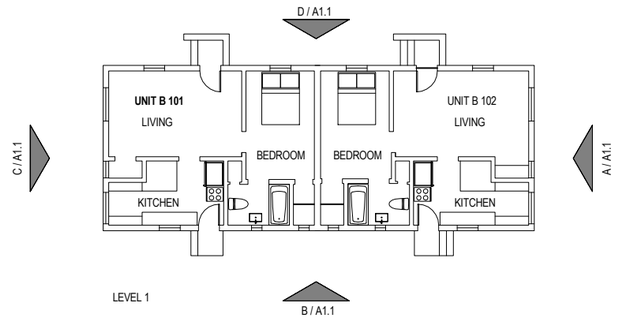
A1.0

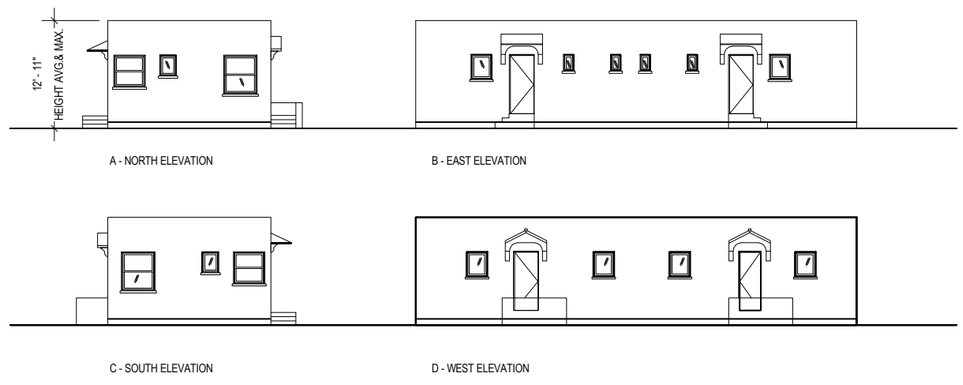




2 AZALEA 1155 & 1157 HEARST

1/16" = 1'-0"



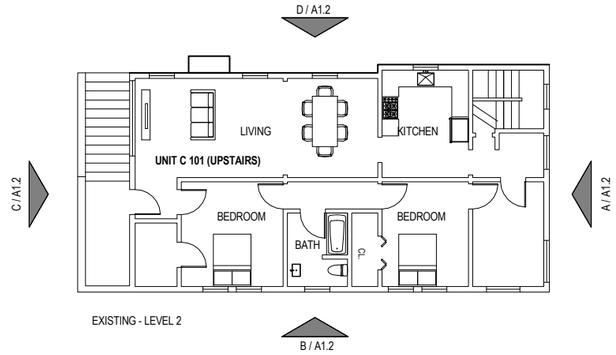


1 BEGONIA 1161 & 1163 HEARST

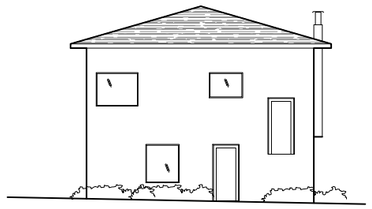
1/16" = 1'-0"

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

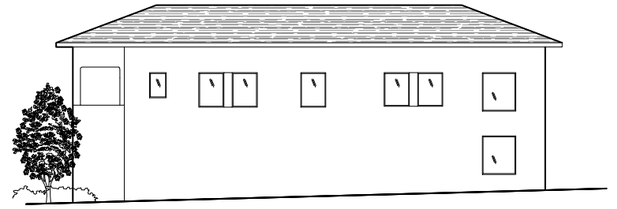
LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA



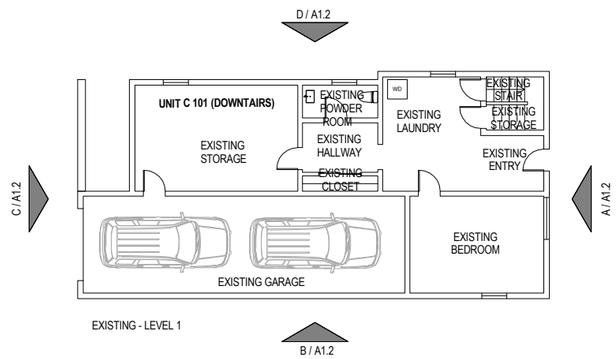
EXISTING - LEVEL 2



A - EXISTING NORTH ELEVATION

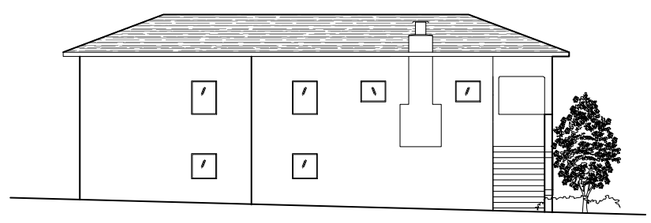


B - EXISTING EAST ELEVATION



EXISTING - LEVEL 1

C - EXISTING SOUTH ELEVATION



D - EXISTING WEST ELEVATION

1 EXISTING PLANS & ELEVATIONS - CAMELIA / 1173 HEARST

1/16" = 1'-0"

ZAB

08.24.2017

HEARST GARDENS

DEVI DUTTA ARCHITECTURE INC.

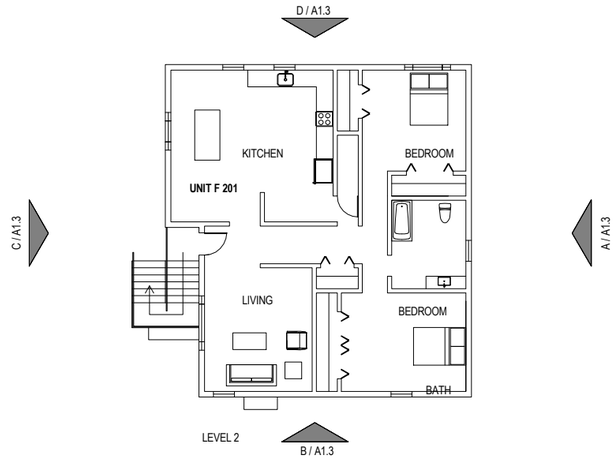
0 4' 8' 16' 32'

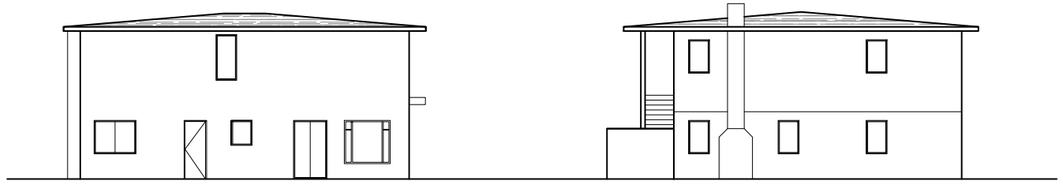
EXISTING PLANS & ELEVATIONS CAMELLIA

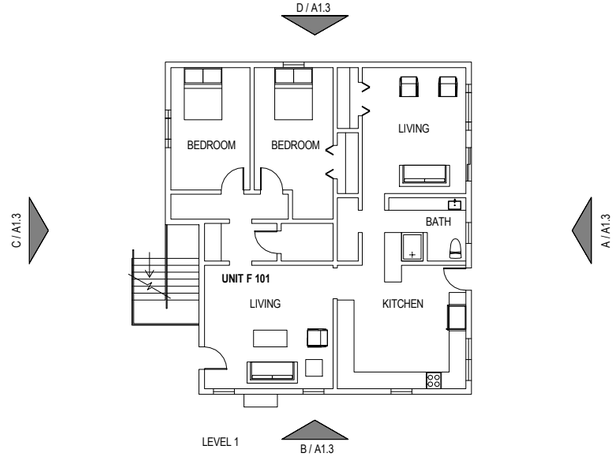
SCALE: 1/16" = 1'-0"

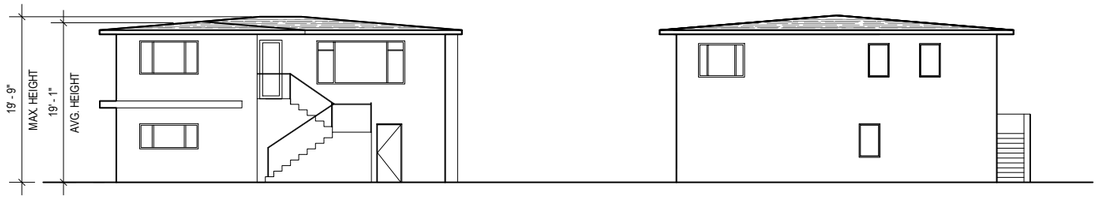
N

A1.2









1 EXISTING PLANS & ELEVATIONS - FREESIA / 1179 HEARST

1/16" = 1'-0"

ZAB

08.24.2017

HEARST GARDENS

DEVI DUTTA ARCHITECTURE INC.

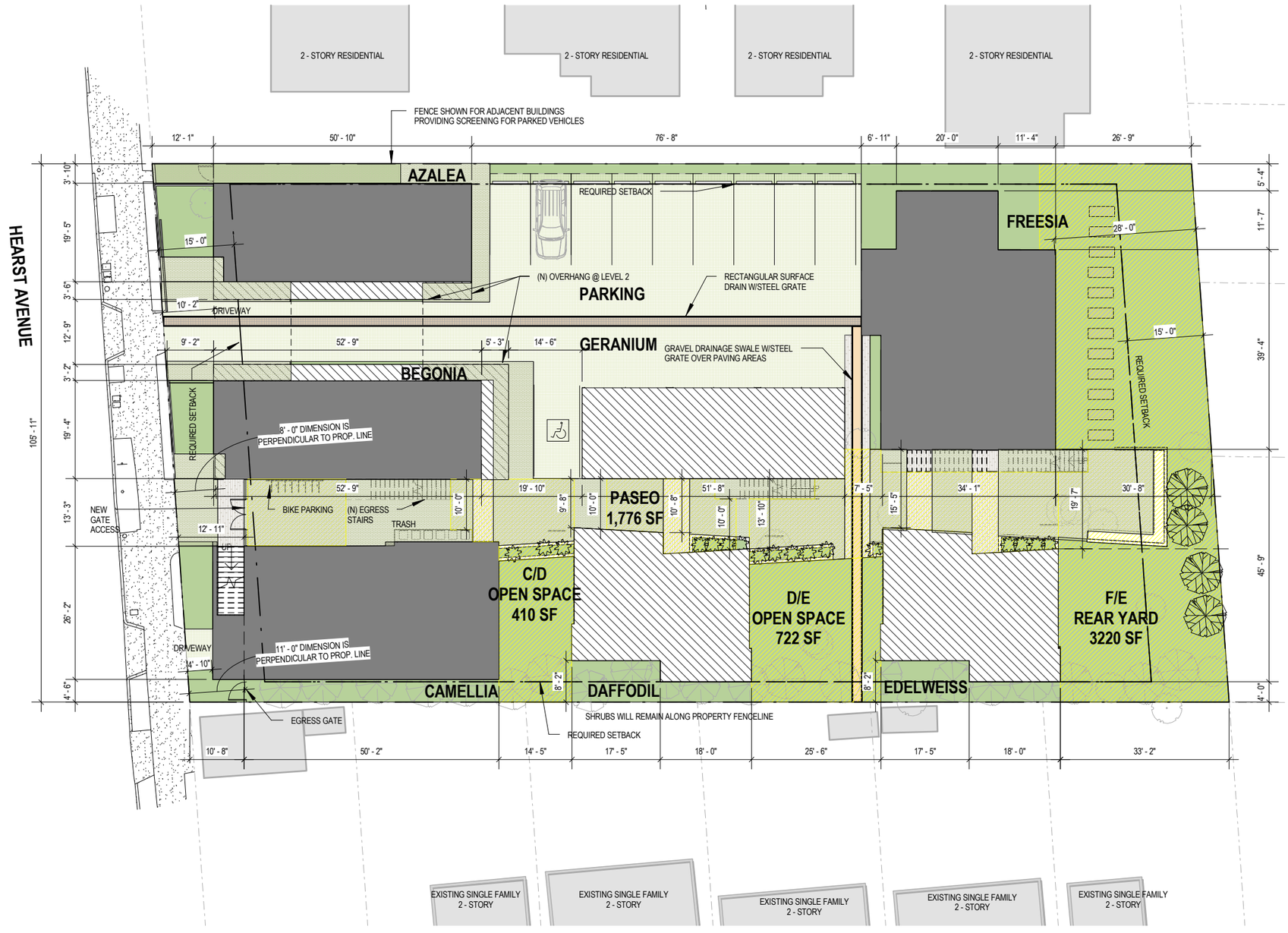
0 4' 8' 16' 32'

EXISTING PLANS & ELEVATIONS FREESIA

SCALE: 1/16" = 1'-0"

N

A1.3



LEGEND

- NEW BUILDING AREA
- RENOVATED BUILDING (e)
- OPEN SPACE

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

ZAB
08.24.2017

HEARST GARDENS
DEVI DUTTA ARCHITECTURE INC.

0 5 10 20 40

SITE PLAN, PROPOSED
SCALE: As indicated

N

A1.4

HEARST AVENUE

204' - 7"

12' - 1" | 50' - 10" | 76' - 8" | 6' - 11" | 20' - 0" | 11' - 4" | 26' - 9"

1 A3.4 | 1 2 A3.3 A3.2 | 2 A3.4 | 2 A3.3 1 A3.2

FENCE SHOWN FOR ADJACENT BUILDINGS PROVIDING SCREENING FOR PARKED VEHICLES

NEW FENCE @ FRONT YARD

EGRESS GATE

RENOVATE (E) RESIDENCES

SHORT GROUNDCOVER PLANTING @ SIDEYARD.

EDGE OF PARKING STALL

1/ A2.3

CURB STOP, ALLOWS VEHICLE TO EXTEND 18" OVER

NEW PARKING W/ PERMEABLE PAVERS

AVERAGE SETBACK = 4'
819 SF (AREA)/204' (LENGTH)

LEGEND
- NEW EXTERIOR WALL
- (E) WALL
- NEW INTERIOR WALL

NOTE: SEE SHEET A1.5 FOR OPEN SPACE

LICENSED ARCHITECT
DEVI DUTTA-CHOUDHURY
No. C32382
Ren. 7/31/2015
STATE OF CALIFORNIA

3' - 10" | 19' - 5" | 19' - 5" | 19' - 4" | 13' - 3" | 26' - 2" | 4' - 6"

105' - 11"

5' - 4" | 11' - 7" | 39' - 4" | 45' - 9" | 4' - 0"

AZALEA

UNIT A 101 | UNIT A 201

SLIDING GATE

10' - 6" @ LEVEL 2 - DIM. IS PERPENDICULAR TO PROP. LINE

1 2 3 4 5 6 7 8 9

14' - 0" | 18' - 0"

3' - 7" | 8' - 0" | 8' - 0" | 8' - 0" | 8' - 0" | 8' - 0" | 8' - 0" | 8' - 0" | 8' - 0" | 1' - 0"

RECTANGULAR SURFACE DRAIN W/STEEL GRATE

BIKE PARKING (2)

1 A3.0 | 1 A3.1

11' - 5" | 58' - 1" | 14' - 6" | 24' - 0" | 51' - 8" | 7' - 2"

DRIVEWAY | 52' - 9" | 2' - 4" | 8' - 0" | 9' - 0" | 71' - 7"

VAN OFFLOAD

BEGONIA

NEW COVERED PARKING

GERANIUM

GRAVEL DRAINAGE SWALE W/STEEL GRATE OVER PAVING AREAS

FREESIA

ADDITION

RENOVATE (E) RESIDENCES

UNIT F 101

1/ A2.0

1 A3.5

NEW GATE ACCESS

UNIT B 101 | UNIT B 102

8' - 0" DIMENSION IS PERPENDICULAR TO PROP. LINE

16 | 15 14 13 12 11 10 | 8' - 0" | 1' - 4" | 8' - 0" | 18' - 0"

VERTICAL BIKE PARKING (7)

RENOVATE (E) RESIDENCES

(N) EGRESS STAIRS

BUILDING OVERHANG SUPPORT POST

PASEO

BIKE PARKING (2)

GARBAGE SCREENING

UP

13' - 3" | 12' - 5" | 13' - 10"

UP

BIKE PARKING (2)

BIKE PARKING (2)

15' - 5" | 10' - 11"

CONTRASTING TEXTURE & COLOR @ UNIT ENTRIES

SEATING

STAMPED CONCRETE PATH

BIKE PARKING (2)

2 A3.0 | 2 A3.1

UNIT C 101

11' - 0" DIMENSION IS PERPENDICULAR TO PROP. LINE

18 | 17

UNIT D 101 (DOWNSTAIRS)

UNIT D 102 (DOWNSTAIRS)

PLANTING, TYP.

UNIT E 101 (DOWNSTAIRS)

UNIT E 102 (DOWNSTAIRS)

2 A3.5

4' - 10"

8' - 2" | 8' - 2"

CAMELLIA | DAFFODIL | EDELWEISS

EGRESS GATE

(E) TANDEM PARKING TO REMAIN

1 1/ A2.2

NEW DUPLEX

NEW DUPLEX

10' - 8" | 50' - 2" | 14' - 5" | 17' - 5" | 18' - 0" | 25' - 6" | 17' - 5" | 18' - 0" | 33' - 2"

N

ZAB
08.24.2017

HEARST GARDENS
DEVI DUTTA ARCHITECTURE INC.

0 4' 8' 16' 32'

GROUND FLOOR
SCALE: 1/16" = 1'-0"

A1.5

ZAB

08.24.2017

HEARST GARDENS

DEVI DUTTA ARCHITECTURE INC.

0 4' 8' 16' 32'

SECOND FLOOR

SCALE: 1/16" = 1'-0"

N

A1.6