SHARRAH DUNLAP SAWYER, INC.
Civil Engineering | Structural Engineering | Landscape Architecture | Planning | Surveying | Project Presentation Graphics
3161 Bechelli Lane, Suite 100, Redding, CA 96002 530.221.1792 voice 530.221.8369 fax info@sdsengineering.com

Panorama Planned Development

Storm Drainage Feasibility Analysis

August 9, 2007

Romar Homes, Inc.

Attachments:

- Soil conservation Service Map
- Shasta County Worksheets for Hydrology Analysis of Small Watersheds

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Panorama Planned Development- Storm Water Detention Feasibility Analysis

Purpose: Provide preliminary analysis of the major drainage basins that bisect the site and provide order of magnitude values for:

- Pre-development flow rates (25 yr & 100 yr)
- Post-development flow rates (25 yr & 100 yr)
- Volume of surface storage facilities for detention purposes (ac/ft)
- Define potential locations of detention facilities within the various drainage basins

Pre and Post Development Flows

Pre and post development flow where estimated utilizing Shasta County's hydrology analysis for small water sheds (TR-55 & TR-20) for the basins defined on the projects storm drainage map (see attached).

The following pre and post development flow rates were estimated for the drainage basins defined on the drainage map:

	Pre Development			Post Development		
Drainage Basin	Area (acres)	25-year (cfs)	100-year (cfs)	Area (acres)	25-year (cfs)	100-year (cfs)
A	202	33	76	217	58	129
B	49	12	22	49	16	36
C	19	5	10	19	8	19
D	23	6	16	34	16	37

Storm Drainage Detention Volume

Storm drainage detention facilities storage volumes were estimated using TR-55 and TR-20 methods. The volumes for the various basins for a 100 year event are:

Basin	Volume (Acre Feet)
A	7.2
B	1.2
C	0.4
D	1.3

Storm Drainage Map

Utilizing the projects preliminary grading plan and its definition of post development drainage patterns, the storm drainage plan was developed. This plan shows the following information:

Drainage Basins Boundary Calculations:
Along the ridge tops where future grading will alter the basins boundary the adjusted boundary is shown. It should be noted that the western most drainage basin has been reduced in area from its original size by diverting post development drainage to Basin A where it shall be detained.

Drainage Basin A:
Drainage Basin A was divided into two sub-basins (A-1 & A-2) to create two detention areas that could be located within the projects boundary. Preliminary analysis determined that due to the increased drainage area and the impervious nature of the diversions from the western basin the order of magnitude storage volume of Basin A is approximately 7.2 acre feet. The plan shows the location of these two detention areas (A-1 = 1.5 AF, A-2 = 6.0 AF).

In general the detention facilities will consist of a 10′ wide embankment with 3:1 side slopes and a control structure meeting County requirements. Access to these facilities will be via public trails capable of supporting maintenance vehicles.

It should be noted that the existing stock pond at the upper reaches of Basin A was investigated as to its potential as a detention facility. Preliminary calculations indicated that due to the limited area upstream (26 acres) this existing pond could not be developed as a detention facility.

Drainage Basins B, C, & D
These basins in the south easterly portion of the site are similar in nature due to the fact that the detention areas are all created by the future streets embankment and are contained within the open space between the up-slope lots. Access to the control facilities will be from the public street.

Basin B: The basin boundary is relatively unchanged from its pre-developed condition and its estimated storage volume is 1.5 acre feet.

Basin C: The basin boundary is only slightly increased from its pre-developed condition and its estimated storage volume is 0.6 acre feet.

Basin D: The basin area increases approximately 11 acres due to proposed development occurring in the north and east area adjacent to the basin. This basins estimated storage volume is 1.5 acre feet.

Subdivision Development South of ACID Channel

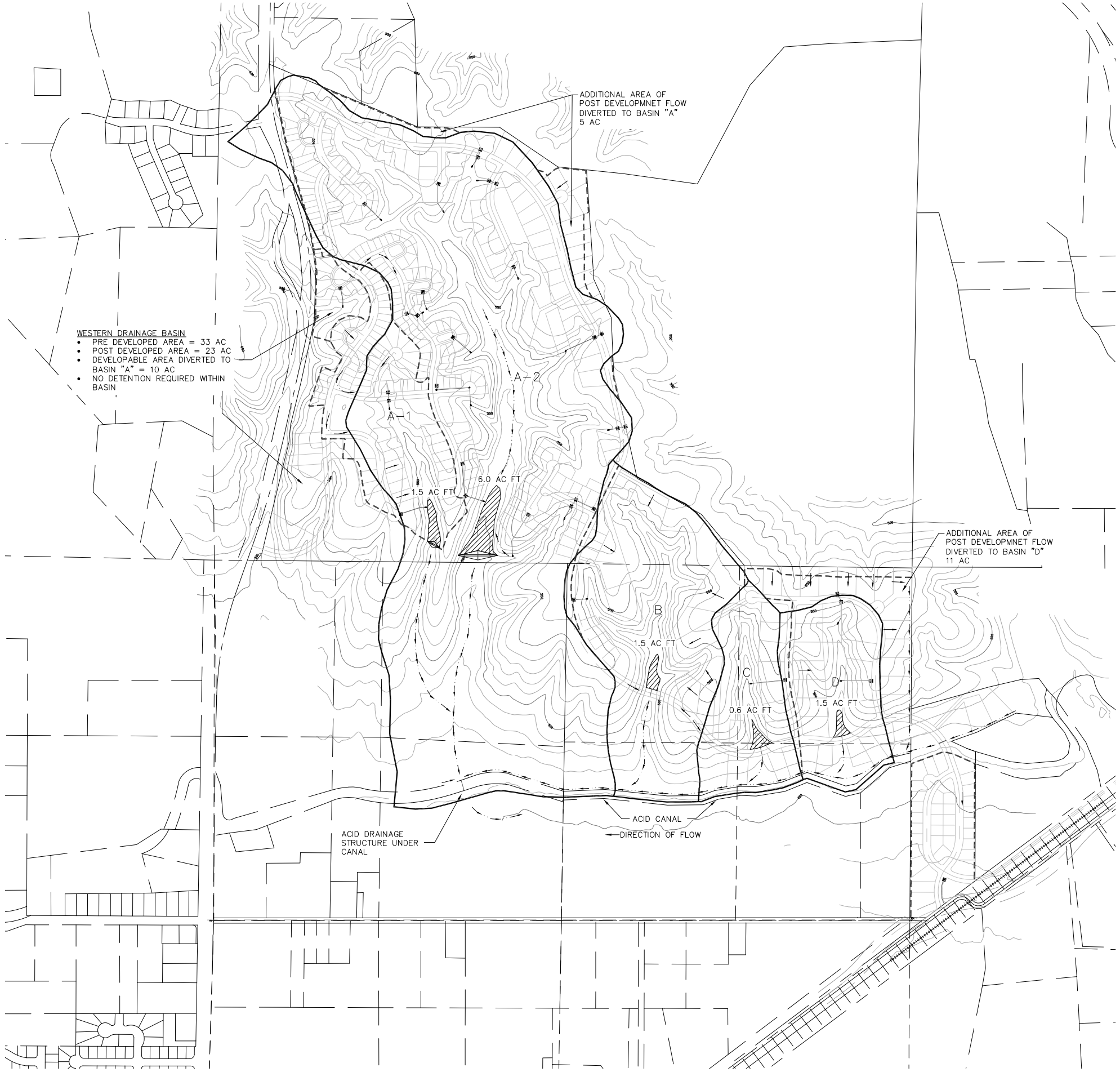
Pre and post development analysis of this portion of the project was not conducted. Due to the nature of the existing soils and its location with respect to other drainage facilities, if storm drainage detention is required it could easily be placed within the confines of the project.

Conclusion

As shown on the drainage plan, only a small portion of the open space areas with existing natural swales are utilized for storm water detention. If final drainage calculations indicate that more storm water detention facilities are required it can easily be accomplished.

Prepared by:

Frank E. Sawyer, P.E.
RCE 24037



LEGEND

A	DRAINAGE BASIN DESIGNATION
	DETENTION AREA AND APPROXIMATE VOLUME (AC–FT)
	EARTH EMBANKMENT OR ROAD EMBANKMENT WITH FLOW CONTROL APPARATUS (MAX HEIGHT – 15 FT)
	PROPOSED INLET STRUCTURE AND UNDERGROUND STORM DRAINAGE PIPING
	APPROXIMATE POST CONSTRUCTION DRAINAGE BASIN BOUNDARY
	APPROXIMATE PRE CONSTRUCTION DRAINAGE BASIN BOUNDARY
	SURFACE DRAINAGE – NATURAL SWALE OR POST–DEVELOPMENT CONSTRUCTED

N

400 0 200 400
1 INCH = 400 FEET

PANORAMA DEVELOPMENT DRAINAGE MAP FOR STORM DRAINAGE DETENTION FEASIBILITY ANALYSIS

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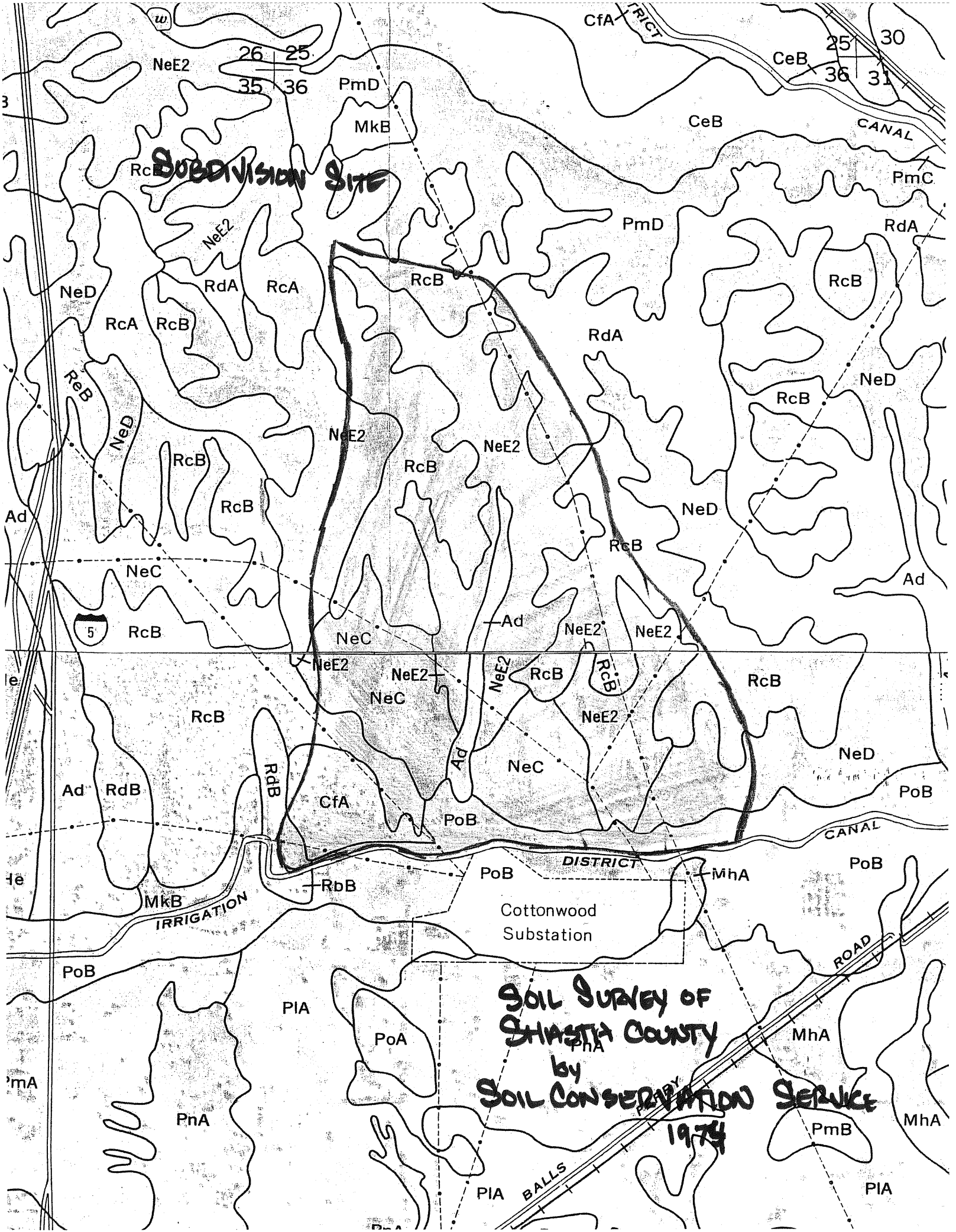
DATE: AUG 9, 2007 SCALE: 1"=400' SHEET 1 OF 1

FS/BW/RL P:\proj\p\06198\dwg\06198 DRAINAGE BASIN EXHIBIT.dwg 06.0198


SUBDIVISION SITE
CfA
CeB
PmD
MkB
PmC
RdA
RcA
RcB
NeD
NeE2
ReB
Ad
NeC
RdB
PoB
MhA
PnA
PlA
PoA
Cottonwood Substation
CANAL
DISTRICT
IRRIGATION
ROAD
BALLS
Soil Survey of Shasta County by Soil Conservation Service 1974

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST ROAD SUBDIVISION SHEET 1 OF _____

DRAINAGE AREA NO. A SCALE Pre CALC. BY KR DATE 11/7/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 201.7 ac.	A= 0.3 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 6700 ft.	L= 1.3 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 620 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$	H= 160 ft.	

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☒ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L_{ft}^3}{H_{ft}}^{0.20} = 0.84$$

K = 0.708

T_c = 0.84 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
Ad	B	Woodland	10	58	580
RcB, NeE2, NeC	C	Woodland	161.4	72	11620.8
RdA	D	Woodland	30.3	79	2393.7
		TOTALS $\sum$ A =	201.7	$\sum$A X CN =	14594.5

(b) $\bar{CN} = \frac{\sum(A \times CN)}{\sum A} = \frac{14594.5}{201.7}$ . . . . . $\bar{CN}$ = 72.4

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.0" $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.513

(b) P_{24-D} (24 hour precipitation) ② = 3.9"

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.4 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 23.5 ac-ft.

46

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{72.4} - 2}{4.0}$ . . . . . CP = 0.19

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 77 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D}$ = _____ . . . . . Q = 32.3 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST ROAD SUBDIVISION SHEET 3 OF _____

DRAINAGE AREA NO. A SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 201.7 ac.	A= 0.3 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 6700 ft.	L= 1.3 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 620 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$	H= 160 ft.	

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = 0.84$$

K= 0.708

T_c = 0.84 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

4 of

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
Ad	B	Woodland	10	58	580
RcB, NeE2, NeC	C	Woodland	161.4	72	11620.8
RdA	D	Woodland	30.3	79	2393.7

TOTALS $\sum A$ = 201.7 $\sum A \times CN$ = 14594.5

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN}$ = 72.4

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.61

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.5 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 25.2 ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{72.4} - 2}{4.1}$ . . . . . CP = 0.19

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 169 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D}$ = _____ . . . . . Q = 76 CFS

① See attachment no's 12 thru 14

5 of

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS
FOR
SMALL WATERSHEDS

PROJECT NAME LOCUST ROAD SUBDIVISION SHEET 5 OF _____

DRAINAGE AREA NO. A SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

		217 AC		0.34
(a)	TOTAL DRAINAGE AREA (A)	A= ~~201.7~~ ac.	=	A= ~~.315~~ mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 6320 ft.		L= 1.2 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 620 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ H= 160 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9L^3_{mi}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60}\left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = \frac{.1036}{60}\left(\frac{6320^3}{160}\right)^{.20}$$

$K = 0.50\left(\frac{70}{201.7}\right) + 0.708\left(\frac{131.7}{201.7}\right) = 0.1036$

T_c = 0.73 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* REVISION FOR ADDITIONAL FROM WESTERN BASIN = 10AC & NORTH BOUNDARY 5AC (TOTAL 15AC)

58.8 AC

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a)

SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
Ad	B	Woodland	10	58	580
RcB, NeE2, NeC	C	Woodland	17.6	72	8467.2
RcB, NeE2, NeC	C	⅛ acre	43.8	90	3942
RdA	D	Woodland	41	79	3239
RdA	D	¼ acre	26.2	87	2279.4
* TOTALS $\sum A$ =			217	$\sum A \times CN$ =	16,907.2

5292

16,907.2

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN}$ = 77 78 *

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2" $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.513 ✓

(b) P_{24-D} (24 hour precipitation) ② = 3.9" P_{24-D}

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.8 in. ✓

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 30.3 ac-ft. 32.6*

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{77} - 2}{3.9}$ . . . . . CP = 0.15 ✓

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 94 95 csm/in *

T_c = 0.78 Hrs

(d) $Q = q \times A_{mi}^2 \times R_{24-D}$ = _____ . . . . . Q = 49.1 CFS 58.1

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME Locust Rd. Subdivision SHEET 7 OF _____

DRAINAGE AREA NO. A SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

		217*		0.34*
(a)	TOTAL DRAINAGE AREA (A)	A= ~~201.7~~ ac.	=	A= ~~0.3~~ mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 6320 ft.		L= 1.2 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 620 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ H=160 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^{3}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L^3 ft}{H_{ft}}^{0.20} = \_\_\_\_$$

K= 0.636

T_c = 0.73 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
SEE	25-YR. CALCULATIONS				

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} =$ ~~77~~ 78*

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}} = 0.61$

(b) P_{24-D} (24 hour precipitation) ② = 4.1 P_{24-D}

(c) R_{24-D} ③ . . . . . $R_{24-D} = 1.9$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{\text{~~A ac.~~ 217}}{12}$ $V_{24-D} =$ ~~31.9~~ 34.3* ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{77} - 2}{4.1}$ . . . . . CP = 0.15 ✓

(c) FIND UNIT FLOW RATE (q)① . . . . . q = ~~194~~ 200 csm/in *

$T_C = 0.73$

(d) $Q = q \times A_{mi}^2 \times R_{24-D} =$ _____ . . . . . Q = ~~110.6~~ CFS

129 CFS *

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

9 OF

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 9 OF _____

DRAINAGE AREA NO. B SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 48.8 ac.	A= 0.08 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 2672 ft.	L= 0.51 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 580 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H= 120 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L^3 ft}{H_{ft}}^{0.20} = \frac{.708}{60} \left(\frac{2672^3}{120}\right)^{0.2}$$

K= 0.708

T_c = 0.52 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
RcB, NeE2, RB	C	Woodland	48.8	72	

TOTALS $\sum A$ = _____ $\sum A \times CN$ =

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A}$ = _____ . . . . . $\bar{CN}$ = 72

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.513

(b) P_{24-D} (24 hour precipitation) ② = 3.9

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.7 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 6.9 ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{72} - 2}{3.9}$ . . . . . CP = 0.2

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 90 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D}$ = _____ . . . . . Q = 12.2 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 11 OF _____

DRAINAGE AREA NO. B SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 48.8 ac.	A=0.08 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 2672 ft.	L=0.51 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 580 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H=120 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9L^3_{mi}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60}\left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

k = 0.708

T_c = 0.52 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
SEE	25-yr	calculations			

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 72$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}} = 0.61$

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . $R_{24-D} = 1.5$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ $V_{24-D} = 6.1$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} =$ _____ . . . . . CP = 0.20

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 182 csm/in

(d) $Q = q \times A_{mi^2} \times R_{24-D} =$ _____ . . . . . Q = 21.8 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS
FOR
SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 13 OF _____

DRAINAGE AREA NO. B SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 48.8 ac.	A=0.08 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 2272 ft.	L=0.4 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 580 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H=120 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^{3}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

K = 0.636

T_c = 0.42 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* NO CHANGE this BASIN

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
RcB, NeE2, PoB	C	WOODLAND	38.5	72	2772
RcB, NeE2, PoB	C	⅛ acre	10.3	90	927
		TOTALS $\sum$ A =	48.8	$\sum$A X CN =	3699

(b) $\bar{CN} = \frac{\sum(A \times CN)}{\sum A} = \frac{3699}{48.8}$ . . . . . $\bar{CN} = 75.8$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}} = 0.513$

(b) P_{24-D} (24 hour precipitation) ② = 3.9 P_{24-D}

(c) R_{24-D} ③ . . . . . $R_{24-D} = 1.7$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ $V_{24-D} = 6.9$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{75.8} - 2}{3.9}$ . . . . . CP = 0.16

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 114 csm/in

(d) $Q = q \times A_{mi}^2 \times R_{24-D}$ = _____ . . . . . Q = 15.5 CFS

① See attachment no's 12 thru 14

15 of

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 15 OF _____

DRAINAGE AREA NO. B SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 48.8 ac.	A= 0.08 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 2272 ft.	L= 0.4 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 580 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H= 120 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L^3 ft}{H_{ft}}^{0.20} = \_\_\_\_$$

K = 0.636

T_c = 0.42 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* NO CHANGE THIS BASIN

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
See	25-year Calculations				

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 75.8$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}} =$ $\frac{P_{6-D}}{P_{24-D}} = 0.61$

(b) P_{24-D} (24 hour precipitation) ② = 4.1 P_{24-D}

(c) R_{24-D} ③ . . . . . $R_{24-D} = 1.8$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ $V_{24-D} = 7.3$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} =$ _____ . . . . . CP = 0.16

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 253 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D} =$ _____ . . . . . Q = 36.4 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 17 OF _____

DRAINAGE AREA NO. C SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 19.4 ac.	A=0.03 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 1597 ft.	L= 0.3 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 570 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$	H= 110 ft.	

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9L^3_{mi}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60}\frac{L^3 ft}{H_{ft}}^{0.20} = \frac{.708}{60}\left(\frac{1597^3}{110}\right)^{.2}$$

k = 0.708

T_c = 0.39 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL[1]	HYDROLOGIC SOIL GROUP[2]	LAND USE[3]	AREA[4] ac.	CN[3]	AREA X CN
RcB, NcEZ, NcC, RnB	C	Woodland	19.4	72	

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 72$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME $V_{24\text{-}D}$)

(a) $P_{6\text{-}D}$ (6 hour precipitation) ① = 2 $\frac{P_{6\text{-}D}}{P_{24\text{-}D}} =$ $\frac{P_{6\text{-}D}}{P_{24\text{-}D}} = 0.513$

(b) $P_{24\text{-}D}$ (24 hour precipitation) ② = 3.9

(c) $R_{24\text{-}D}$ ③ . . . . . $R_{24\text{-}D} = 1.7$ in.

(d) $V_{24\text{-}D}$ (Total volume of runoff) = $R_{24\text{-}D} \times \frac{A \text{ ac.}}{12}$ $V_{24\text{-}D} = 2.7$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6\text{-}D}}{P_{24\text{-}D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6\text{-}D}}{P_{24\text{-}D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6\text{-}D}}{P_{24\text{-}D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24\text{-}D}} =$ _____ . . . . . CP = 0.20

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 100 csm/in

(d) $Q = q \times A_{mi}^2 \times R_{24\text{-}D} =$ _____ . . . . . Q = 5.1 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME Locust RD SUBDIVISION SHEET 19 OF _____

DRAINAGE AREA NO. C SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 19.4 ac.	A=0.03 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 1597 ft.	L= 0.3 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 570 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H= 110 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L^3 ft}{H_{ft}}^{0.20} = \_\_\_\_$$

k = 0.708

T_c = 0.39 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
See 25-yr Calculations					
TOTALS $\sum A$ =				$\sum A \times CN$ =	

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A}$ = _____ . . . . . $\bar{CN}$ = 72

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.61

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.5 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 2.4 ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}}$ = _____ . . . . . CP = 0.20

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 235 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D}$ = _____ . . . . . Q = 10.6 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

21 OF

HYDROLOGY ANALYSIS
FOR
SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 21 OF _____

DRAINAGE AREA NO. C SCALE Post CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a) TOTAL DRAINAGE AREA (A) — A= 19.4 ac. = A=0.03 mi.^{2}

(b) LENGTH OF WATERSHED (L) — L= 1157 ft. = L= 0.22 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 570 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ — H= 110 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9L^3_{mi}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60}\frac{L^3 ft}{H_{ft}}^{0.20} = \left(\frac{1.628}{60}\right)\left(\frac{1157^3}{110}\right)^{0.2}$$

$$K = 0.6\left(\frac{14.3}{19.4}\right) + 0.708\left(\frac{5.1}{19.4}\right) = 0.628$$

T_c = 0.28 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* INSIGNIFICANT BASIN SIZE INCREASE

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a)

SOIL SYMBOL[1]	HYDROLOGIC SOIL GROUP[2]	LAND USE[3]	AREA[4]	CN[3]	AREA X CN
	C	Woodland	5.1 ac.	72	367.2
	C	¼ acre	14.3	83	1186.9
TOTALS $\sum A$ =			19.4	$\sum A \times CN$ =	1554.1

(b) $\bar{CN} = \frac{\sum(A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN}$ = 80.1

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.513

(b) P_{24-D} (24 hour precipitation) ② = 3.9

(c) R_{24-D} ③ . . . . . R_{24-D} = 2.0 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 3.2 ac-ft.

① See attachment no's 4 thru 6
② See attachment no's 7 thru 9
③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{80.1} - 2}{3.9}$ . . . . . CP = 0.13

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 129 csm/in

(d) $Q = q \times A_{mi^2} \times R_{24-D}$ = _____ . . . . . Q = 7.7 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 23 OF _____

DRAINAGE AREA NO. C SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a) TOTAL DRAINAGE AREA (A) — A= 19.4 ac. = A=0.03 mi.^{2}

(b) LENGTH OF WATERSHED (L) — L= 1157 ft. = L=0.22 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 570 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 460 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ — H= 110 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^{3}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \frac{L^3 ft}{H_{ft}}^{0.20} = \_\_\_\_$$

K = 0.628

T_c = 0.28 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* INSIGNIFICANT BASIN SIZE INCREASE

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
See 25-yr Calculations					

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 80.1$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}} =$ $\frac{P_{6-D}}{P_{24-D}} = 0.61$

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . $R_{24-D} = 2.2$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ $V_{24-D} = 3.6$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} =$ _____ . . . . . CP = 0.13

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 283 csm/in

(d) $Q = q \times A_{mi}2 \times R_{24-D} =$ _____ . . . . . Q = 18.7 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

25 of

HYDROLOGY ANALYSIS
FOR
SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 25 OF _____

DRAINAGE AREA NO. D SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 22.6 ac.	A= 0.04 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 1471 ft.	L= 0.28 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 555 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 465 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$	H= 90 ft.	

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^{3}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

k = 0.708

T_c = 0.38 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{\bar{CN}}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
	C	Woodland	22.16	72	

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{\bar{CN}} = \frac{\sum(A \times CN)}{\sum A} =$ _____ . . . . . $\bar{\bar{CN}} = 72$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2 $\frac{P_{6-D}}{P_{24-D}} =$ $\frac{P_{6-D}}{P_{24-D}} = 0.513$

(b) P_{24-D} (24 hour precipitation) ② = 3.9

(c) R_{24-D} ③ . . . . . $R_{24-D} = 1.5$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ $V_{24-D} = 2.8$ ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} =$ _____ . . . . . CP = 0.20

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 100 csm/in

(d) $Q = q \times A_{mi^2} \times R_{24-D} =$ _____ . . . . . Q = 6.0 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

27 of

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 27 OF _____

DRAINAGE AREA NO. D SCALE Pre CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a)	TOTAL DRAINAGE AREA (A)	A= 22.6 ac.	A= 0.04 mi.^{2}
(b)	LENGTH OF WATERSHED (L)	L= 1471 ft.	L= 0.28 mi.
(c)	ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 555 ft.		
(d)	ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 465 ft.		
(e)	HEIGHT OF WATERSHED (H) = $E_h - E_l$		H= 90 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9L^3_{mi}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60}\left(\frac{L^3_{ft}}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

k = 0.708

T_c = 0.38 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
	See 25-yr		Calculations		

TOTALS $\sum A$ = _____ $\sum A \times CN$ =

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A}$ = _____ . . . . . $\bar{CN}$ = 72

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}}$ = $\frac{P_{6-D}}{P_{24-D}}$ = 0.61

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . R_{24-D} = 1.7 in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{A \text{ ac.}}{12}$ V_{24-D} = 3.2 ac-ft.

① See attachment no's 4 thru 6
② See attachment no's 7 thru 9
③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐ 2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}}$ = _____ . . . . . CP = 0.2

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 235 csm/in

(d) $Q = q \times A_{mi^2} \times R_{24-D}$ = _____ . . . . . Q = 16.0 CFS

① See attachment no's 12 thru 14

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS
FOR
SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 29 OF _____

DRAINAGE AREA NO. D SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a) TOTAL DRAINAGE AREA (A)	* 33.6 A= ~~22.6~~ ac.	=	* 0.53 A= ~~0.04~~ mi.^{2}
(b) LENGTH OF WATERSHED (L)	L= 1490 ft.		L= 0.28 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 555 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 465 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ H= 90 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☒
(3) or (6) or (2 and 5)	100 year design ☐

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^3}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \left(\frac{L_{ft}^3}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

k = 0.6

T_c = 0.33 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

* BASIN SIZE INCREASED = 11AC

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

33.6*

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④	CN③	AREA X CN
	C	1/4 acre	~~22.6~~	83	

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 83$ ✓

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2 $\frac{P_{6-D}}{P_{24-D}} =$ $\frac{P_{6-D}}{P_{24-D}} = 0.513$ ✓

(b) P_{24-D} (24 hour precipitation) ② = 3.9

(c) R_{24-D} ③ . . . . . $R_{24-D} = 2.3$ in. ✓

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{33.6 \text{ ac.}}{12}$ $V_{24-D} =$ ~~4.3~~ 6.44* ac-ft.

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☒ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☐ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{83} - 2}{3.9}$ . . . . . CP = 0.11 ✓

(c) FIND UNIT FLOW RATE (q)① . . . . . q = 130 csm/in ✓

(d) $Q = q \times A_{mi^2} \times R_{24-D} =$ _____ . . . . . Q = ~~12.0~~ CFS

.053

① See attachment no's 12 thru 14

* 15.8 CFS

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS AND WATER AGENCY

HYDROLOGY ANALYSIS FOR SMALL WATERSHEDS

PROJECT NAME LOCUST RD SUBDIVISION SHEET 31 OF _____

DRAINAGE AREA NO. D SCALE POST CALC. BY KR DATE 12/06

SOURCE _____ CK'D. BY _____ DATE _____
(Attach Copy)

STEP I - WATERSHED DATA

(a) TOTAL DRAINAGE AREA (A)	A= ~~22.6~~ * 33.6 ac.	=	A= ~~0.04~~ * 0.053 mi.^{2}
(b) LENGTH OF WATERSHED (L)	L= 1490 ft.		L= 0.28 mi.

(c) ELEV. OF HIGHEST POINT IN WATERSHED (E_h) = 555 ft.

(d) ELEV. OF LOWEST POINT IN WATERSHED (E_l) = 465 ft.

(e) HEIGHT OF WATERSHED (H) = $E_h - E_l$ H= 90 ft.

STEP II - SELECT DESIGN FREQUENCY

(a) CHECK APPROPRIATE BOXES

1. ☐ A<40ac.
2. ☐ 40ac.≤A≤4 mi.^{2}
3. ☐ A>4 mi.^{2}
4. ☐ Streets with curb and gutter
5. ☐ Roadway fills exceed 10 feet
6. ☐ Sumps or retention ponds

(b) BOXES CHECKED	USE
(1) only	10 year design ☐
(2) only or (1 and 4) or (1 and 5)	25 year design ☐
(3) or (6) or (2 and 5)	100 year design ☒

STEP III - FIND (T_c)

(a) FOR NATURAL DRAINAGE BASINS WHERE A>4 mi.^{2}

$$T_c = \frac{11.9 L_{mi}^{3}}{H_{ft}}^{0.385} = \_\_\_\_$$

(b) ALL OTHER BASINS

$$T_c^{②} = \frac{K^{①}}{60} \left(\frac{L^3 ft}{H_{ft}}\right)^{0.20} = \_\_\_\_$$

K = 0.6

T_c = 0.33 hrs.

① K = Land use constant (see attachment no. 1)
② Use 5 minute minimum

STEP IV - FIND WEIGHTED ($\bar{CN}$) CURVE NUMBER

(a) SOIL SYMBOL①	HYDROLOGIC SOIL GROUP②	LAND USE③	AREA④ ac.	CN③	AREA X CN
	See 25-yr	Calculations			

TOTALS $\sum A =$ _____ $\sum A \times CN =$

(b) $\bar{CN} = \frac{\sum (A \times CN)}{\sum A} =$ _____ . . . . . $\bar{CN} = 83$

① From "Soil Survey of Shasta County Area, Ca., "by the U.S. Dept. of Agriculture, S. C. S. and F. S., Aug. 1974.

② See attachment no. 2

③ See attachment no. 3

④ Include copy of soil survey map with soil boundaries delineated or other appropriate documentation.

STEP V - FIND RUNOFF VOLUME V_{24-D})

(a) P_{6-D} (6 hour precipitation) ① = 2.5 $\frac{P_{6-D}}{P_{24-D}} =$ $\frac{P_{6-D}}{P_{24-D}} = 0.61$

(b) P_{24-D} (24 hour precipitation) ② = 4.1

(c) R_{24-D} ③ . . . . . $R_{24-D} = 2.4$ in.

(d) V_{24-D} (Total volume of runoff) = $R_{24-D} \times \frac{3316 \text{ ac.}}{12}$ $V_{24-D} =$ ~~4.5~~ ac-ft.

* 6.7 AC-FT

① See attachment no's 4 thru 6

② See attachment no's 7 thru 9

③ See attachment no's 10 and 11

STEP VI - FIND PEAK FLOW RATE (Q) @ T_C

(a) SELECT CURVE TYPE ①

☐ 1A $\frac{P_{6-D}}{P_{24-D}} < 0.518$ ☒ 1 $0.518 \leq \frac{P_{6-D}}{P_{24-D}} \leq 0.639$ ☐2 $0.639 < \frac{P_{6-D}}{P_{24-D}} \leq .767$

(b) CALCULATE CURVE PARAMETER (CP)

$CP = \frac{\frac{200}{CN} - 2}{P_{24-D}} = \frac{\frac{200}{83} - 2}{4.1}$ . . . . . CP = 0.10

(c) FIND UNIT FLOW RATE (q)① . . . . . q = ~~288~~ * 290 csm/in

(d) $Q = q \times A_{mi}^2 \times R_{24-D} =$ _____ . . . . . Q = ~~27.6~~ CFS

* 36.8 CFS

① See attachment no's 12 thru 14

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PAGE ____ OF ____
JOB NO: 06.0198.000
CALC: KR CHKD: ____ DATE: 12/06
JOB NAME: Locust Rd Subdivision

Determine Preliminary Detention required for Basins A, B, C, & D

$V_{req'd} = (Q_{in} - Q_{all})(3)(T_{c\,post})(0.5)(60)(k)$ $\quad k = 1.5$

Basin A: $V_{25} = (49.1-32.3)(3)(43.8)(0.5)(60)(1.5) = 99338\ CF = 2.3\ ac\text{-}ft$

* $V_{100} = (110.6-76)(3)(43.8)(0.5)(60)(1.5) = 204590\ CF = 4.7\ ac\text{-}ft$

Basin B: $V_{25} = (15.5-12.2)(3)(25.2)(0.5)(60)(1.5) = 11227\ CF = 0.3\ ac\text{-}ft$

$V_{100} = (36.4-21.8)(3)(25.2)(0.5)(60)(1.5) = 49609\ CF = 1.2\ ac\text{-}ft$

Basin C: $V_{25} = (7.7-5.1)(3)(16.8)(0.5)(60)(1.5) = 5897\ CF = 0.2\ ac\text{-}ft$

$V_{100} = (18.7-10.6)(3)(16.8)(0.5)(60)(1.5) = 18371\ CF = 0.4\ ac\text{-}ft$

Basin D: $V_{25} = (12-6)(3)(19.8)(0.5)(60)(1.5) = 16038\ CF = 0.4\ ac\text{-}ft$

* $V_{100} = (27.6-16)(3)(19.8)(0.5)(60)(1.5) = 31007\ CF = 0.7\ ac\text{-}ft$

Tributary area to (e) pond = $\frac{1400 \times 800}{43560} = 25.7$ acres

$\frac{25.7}{201.7} = 12.7\%$ not enough area

* REVISIONS DUE TO POST DEVELOPMENT DRAINAGE BASIN INCREAS

BASIN "A"

$V_{100} = (129-76)(3)(43.8)(.5)(60)(1.5) = 313,389 = 7.2\ AC\text{-}FT$

BASIN "D"

$V_{100} = (36.8-16)(3)(19.8)(0.5)(60 \times 1.5) = 55,600\ SF = 1.3\ AC\ ft$