

**PRELIMINARY DRAINAGE ANALYSIS
FOR
CASPERSON SUBDIVISION**

Revised July 16, 2002

Prepared By:

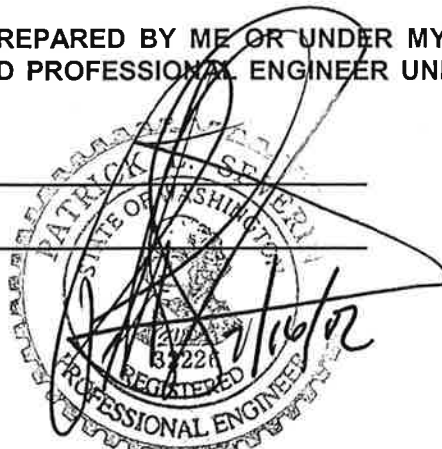
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Project No. 79-SDG-02

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WASHINGTON.

DATE: _____

BY: _____



EXPIRES 8/13/09

Introduction:

This drainage analysis examines existing and developed storm runoff rates for the proposed Casperson subdivision located in Section 24 of Township 31 North, Range 5 East, City of Arlington, Washington. The site is bordered on the north by the proposed Eagle Heights Subdivision, the east by the proposed access road for Eagle Heights, the south by 172 Street and the west by an existing single-family residence. See Attachment 1- Vicinity Map.

The following evaluation will consider the historic and developed storm water runoff conditions, defined as historic land use, and the land use for the proposed single-family residential development. Storm water runoff rates were calculated using the SBUH Method, as computed by the Water Works software, by Engenious Systems. Storm detention volumes and the orifice/weir structure designs were based on the release of one-half the existing 2-year storm event, and the 10- and 100-year storm event.

Existing Conditions

The 11.99 acre site is currently undeveloped and covered with grasslands, some 2nd-growth hardwoods and evergreens and an existing Type 3 Stream, with slopes ranging from 2-10%. See Attachment 2 – Existing Conditions and Basins.

The soils onsite are primarily the SCS soil classification “Tokul Gravelly Loam” with a hydrological classification of “C”. The storm intensities used to determine storm water runoff rates, can be found in Table 1.

Table 1. Storm Intensities

Storm	Intensity (Inches/Hour)
2-Year, 24-hour storm event	1.8
10-Year, 24-hour storm event	2.7
100-Year, 24-hour storm event	3.9

The existing site was divided into five sub-basins in order to determine the storage and weir design required for each basin, see Attachment 2. Basin B consists of the southeastern corner of the site. Storm water runoff from Basin B sheet/shallow flows east to west down slopes of 4-6% into the existing wetlands and eventually into Prairie Creek.

Basin C, approximately 5.63 acres, is made up of the northwestern portion of the site. Storm water runoff from Basin C sheet/shallow flows northeast to southwest down slopes of 4-10% to the existing wetlands.

Basin D, approximately 2.64 acres, is made up of the southwestern portion of the site. Storm water runoff from Basin D sheet/shallow flows southwest to northeast down slopes of 4-6% to the existing wetlands.

Basin E, approximately 0.54 acres, is made up of the northwestern portion of the site. Storm water runoff from Basin D sheet/shallow flows southwest to northeast down slopes of 2-4% to the existing wetlands.

Basin F, approximately 0.143 acres, is made of the most northwestern area of the site south of the wetland buffer area. Stormwater runoff from Basin F currently sheet flows north into the existing wetland at slopes of 0-2%. During the developed conditions, Basin F will continue to sheet flow into the existing ditch.

For existing times of concentration, please refer to Attachment 2 – Existing Conditions and Basins.

The existing storm water runoff rates can be found in Table 2 - Existing Peak Storm water Flows, and the Waterworks calculations for the existing basins can be found in Appendix A – Basin Summaries.

Table 2. Existing Peak Storm water Flows

Storm Interval	Basin B	Basin C	Basin D	Basin E
2-Year	0.10	0.74	0.32	0.05
10-Year	0.24	1.70	0.77	0.13
100-Year	0.45	3.18	1.45	0.24

Developed Conditions

The proposed development will create 37 single-family residential lots. 2,500 square feet of impervious surface was assumed for each of the lots created. The existing residence is to remain and the existing shop will be removed.

Runoff from the proposed residences and roads will be collected and routed to a series of swales which will provide water quality treatment. Orifice/weir structures will be installed in the swales to attenuate the flows. The swales will parallel the stream buffer.

The developed basin was divided into four sub-basins for the purpose of this evaluation. See Attachment 3 - Proposed Basins and Time of Concentrations. Basin B in the southeastern portion of the site includes Lots 22, 23 and 24. The storm water runoff from this basin will sheet flow west and enter the swale. Two weirs will be installed in this section of the swale to attenuate flows from this basin.

Basin C consists of the northeast portion of the site and includes Lots 1 through 21 and Road "A". Runoff from this basin will be routed to the swale beginning near lot 21. Runoff from Basin B will also be conveyed through this swale. Three orifice/weir structures will be installed in this swale to attenuate the flows. The swale will discharge to the existing stream near the northwest corner of the site.

Basin D consists of the southwest portion of the site and contains Lots 25 through 36 and a portion of Road "B". Flows from this basin will be directed to the swale on the west side of the stream. Two orifice/weir structures will be installed to control flows through this swale. The swale will discharge to the stream near Lot 36 as shown on Attachment 3.

Basin E consists of Lot 37 and a portion of Lot 36. Flows from this basin will be directed to the swale and discharged to the stream. These flows will receive water quality treatment in the swale, but will not be detained. The developed peak storm water runoff rates can be found in the Waterworks calculations in Appendix A – Basin Summaries.

As discussed above, Basin F will continue to sheet flow into the existing stream.

Table 3- Hydrograph Routing, East Swale, and Table 4 – Hydrograph Routing, West Swale show the routing of the various hydrographs through the orifice/weirs.

Table 3 – Hydrograph Routing, East Swale

Storm Interval	Basin	Flow (cfs)	After Weir 1	After Weir 2	Weir 2 release + Basin C	After Weir 4	After Weir 5	After Weir 6
2-Year	B	0.17	0.04	0.03	1.28	0.77	0.46	0.37
10-Year	B	0.34	0.24	0.04	2.36	2.36	1.36	1.23
100-Year	B	0.60	0.60	0.12	3.89	3.89	3.89	3.89

Table 4 – Hydrograph Routing, West Swale

Storm Interval	Basin	Flow (cfs)	After Weir 7	After Weir 8
2-Year	D	0.70	0.16	0.14
10-Year	D	1.09	0.92	0.24
100-Year	D	1.78	1.78	1.78

Table 5- Allowable Release Rates, combines the releases from the undeveloped basins to determine the allowable release rates.

Table 5 – Allowable Release Rates

Storm Interval	Basin B	Basin C	Basin D	Basin E	Total Existing Flow	Allowable Release (cfs)
----------------	---------	---------	---------	---------	---------------------	-------------------------

2-Year	0.10	0.74	0.32	0.03	1.21	0.61 (1/2)
10-Year	0.24	1.70	0.77	0.04	2.84	2.84
100-Year	0.45	3.18	1.45	0.12	5.32	5.32

Table- 6 Actual Release Rates, combines the release rates from the east and west swales and the undetained basin E flows to determine the actual release rates from the development.

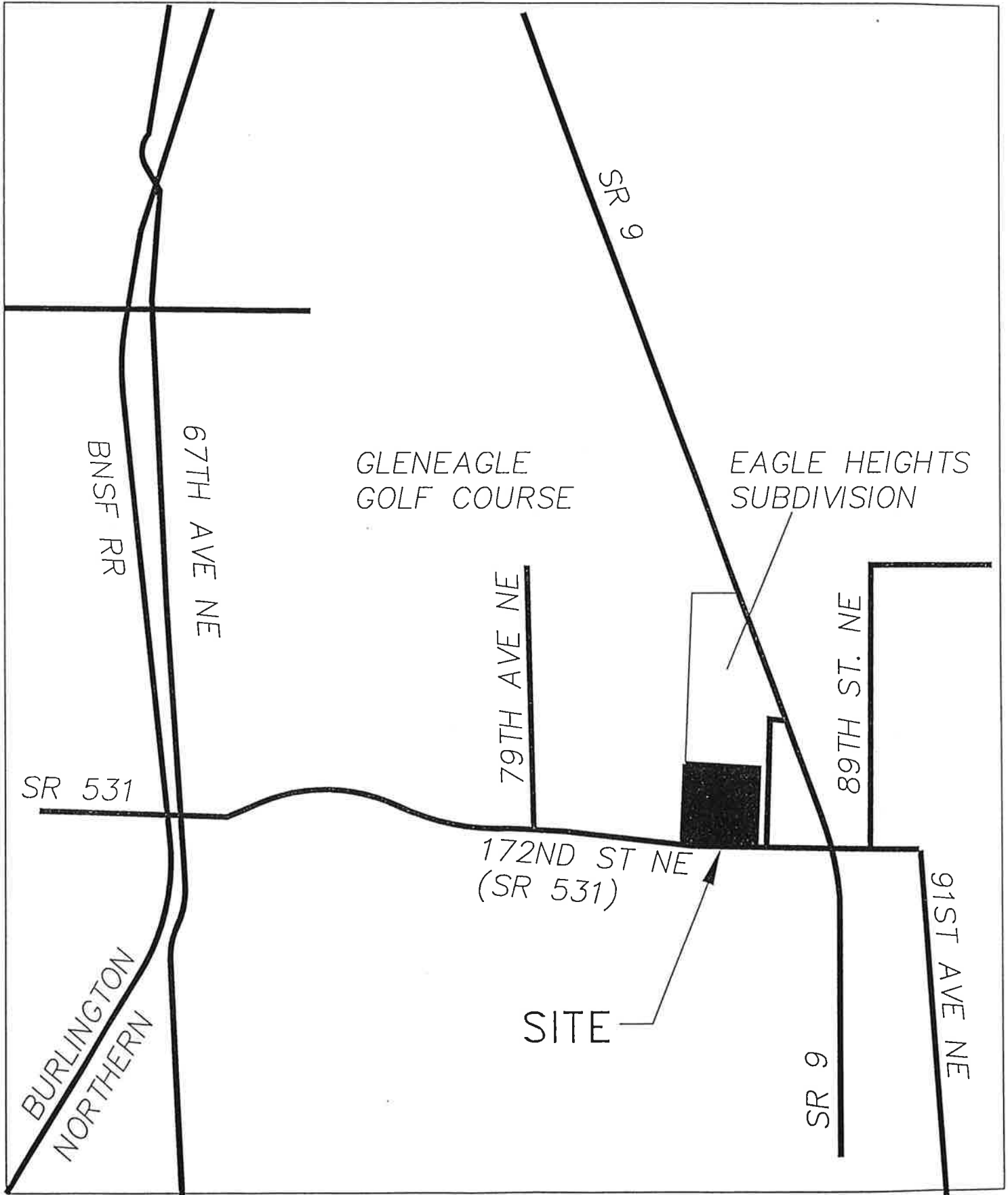
Table 6 – Actual Release Rates

Storm Interval	West Swale (cfs)	East Swale (cfs)	Basin E (cfs)	Actual Release (cfs)
2-Year	0.14	0.37	0.13	0.64
10-Year	0.24	1.23	0.22	1.69
100-Year	1.78	3.89	0.35	6.02

This is an innovative design which will take some modification during the final design process, but it is evident at this time that the conceptual design will be able to closely meet the D.O.E. requirements for stormwater treatment and runoff control. The swales will provide water quality and detention sufficient to discharge at one-half the peak 2-year storm event, and the 10- and 100-year storm event rates for existing conditions. The discharge will flow northwest into the existing type three stream.

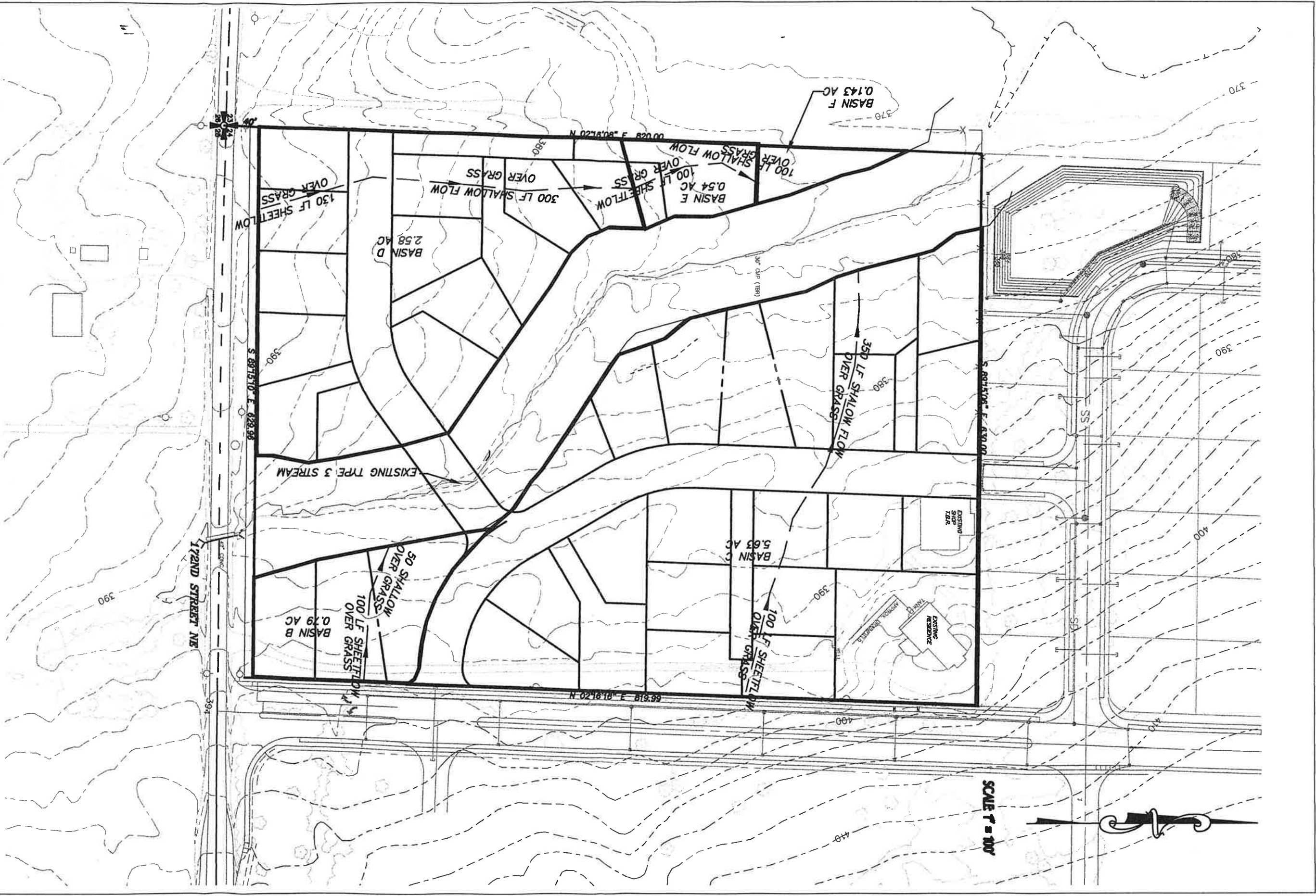
Conclusions

The proposed Casperson development will increase storm water runoff. It is proposed to treat and detain this water in a series of grass swales with orifice/weir structures. In addition to providing treatment and flow attenuation for stormwater runoff, the swales will provide an additional buffering effect to the type three stream. Upon development, stormwater discharge will closely meet the pre-development rates to the existing stream.

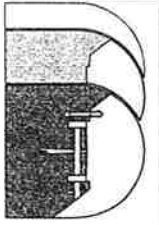


VICINITY MAP

ATTACHMENT 2
EXISTING CONDITIONS AND BASINS



ATTACHMENT 2 - EXISTING CONDITIONS



Sound Development Group

ENGINEERING & LAND DEVELOPMENT SERVICES
 160 Cascade Place, Suite 206
 Burlington, WA 98233
 Tel: 360-404-2010 Fax: 360-404-2008

SCALE 1"=100'
 DRAWN BY: TAZ
 CHECKED BY: PLS
 DATE: MAY '02

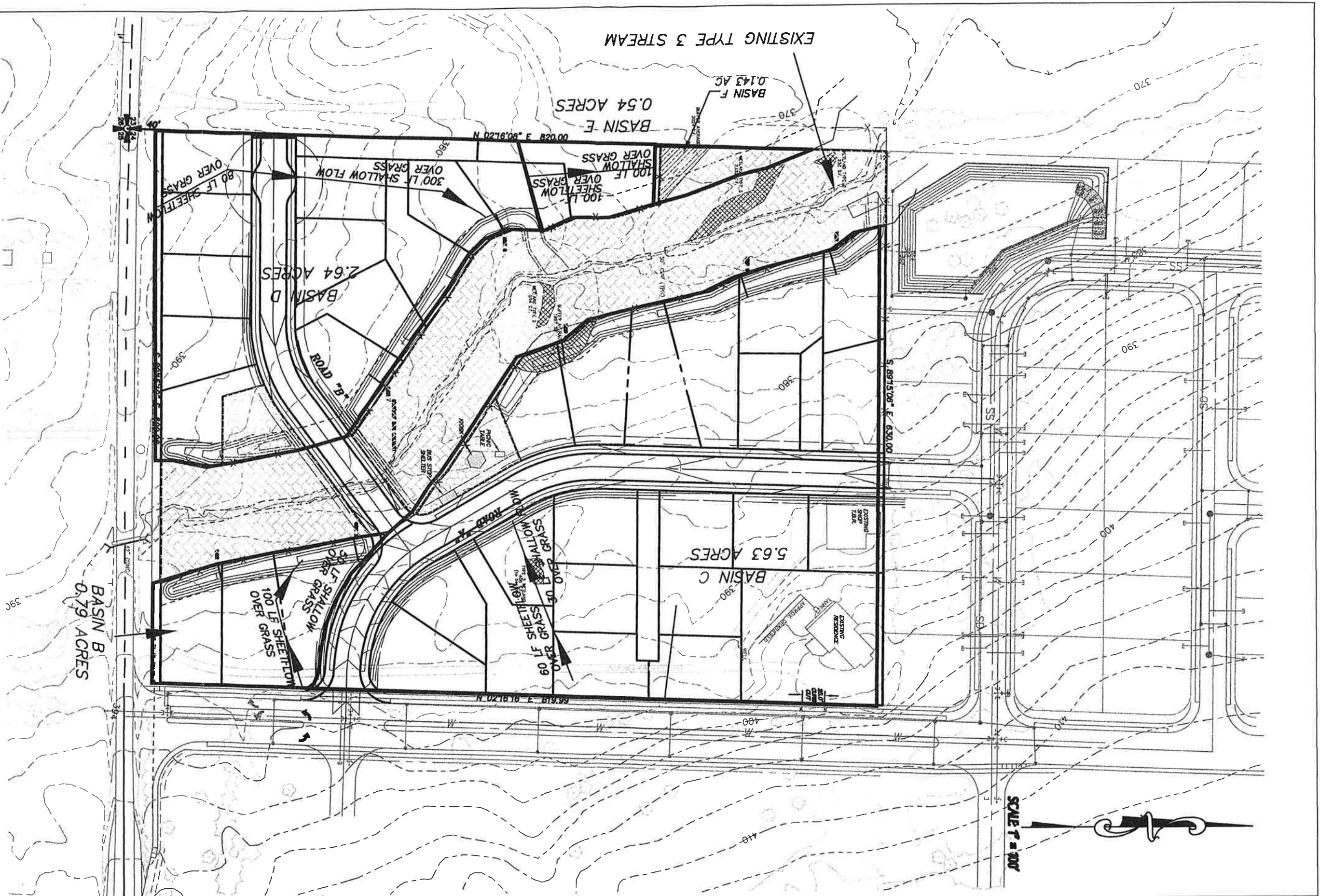
SHEET TITLE

**DRAINAGE ANALYSIS
 CASPERSON SUBDIVISION**

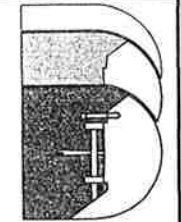
ARLINGTON, WASHINGTON

DRAWING NO.
 79.DWG
 JOB NO.
 79-SDG-02
 SHEET NO.
 1 OF 1

ATTACHMENT 4
SOILS INFORMATION



ATTACHMENT 3 - DEVELOPED CONDITIONS



Sound Development Group
 ENGINEERING & LAND DEVELOPMENT SERVICES
 160 Cascade Place, Suite 206
 Burlington, WA 98233
 Tel: 360-404-2010 Fax: 360-404-2008

SCALE: 1"=100'
 DRAWN BY: TAZ
 CHECKED BY: PLS
 DATE: MAY '02

SHEET TITLE:
DRAINAGE ANALYSIS
CASPERSON SUBDIVISION
 ARLINGTON, WASHINGTON

DRAWING NO.: 79.DWG
 JOB NO.: 79-SDG-02
 SHEET NO.: 1 OF 1

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth FE	Kind	Months
66----- Sultan	C	Rare-----	---	---	2.0-4.0	Apparent	Nov-Apr
67----- Sultan Variant	B	Rare-----	---	---	>6.0	---	---
68----- Sumas	C	Rare-----	---	---	2.0-3.0	Apparent	Nov-Apr
69*. Terric Medisaprists							
70, 71, <u>72</u> , 73, 74----- Tokul	<u>C</u>	None-----	---	---	1.5-3.0	Perched	Nov-May
75*, 76*: Tokul-----	C	None-----	---	---	1.5-3.0	Perched	Nov-May
Ogarty----- Rock outcrop.	C	None-----	---	---	>6.0	---	---
77*: Tokul-----	C	None-----	---	---	1.5-3.0	Perched	Nov-May
Winston-----	A	None-----	---	---	>6.0	---	---
78*. Urban land							
79----- Verlot	C	None-----	---	---	1.0-3.0	Perched	Nov-May
80, 81----- Winston	A	None-----	---	---	>6.0	---	---
82*. Xerorthents							

* See description of the map unit for composition and behavior characteristics of the map unit.

STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN

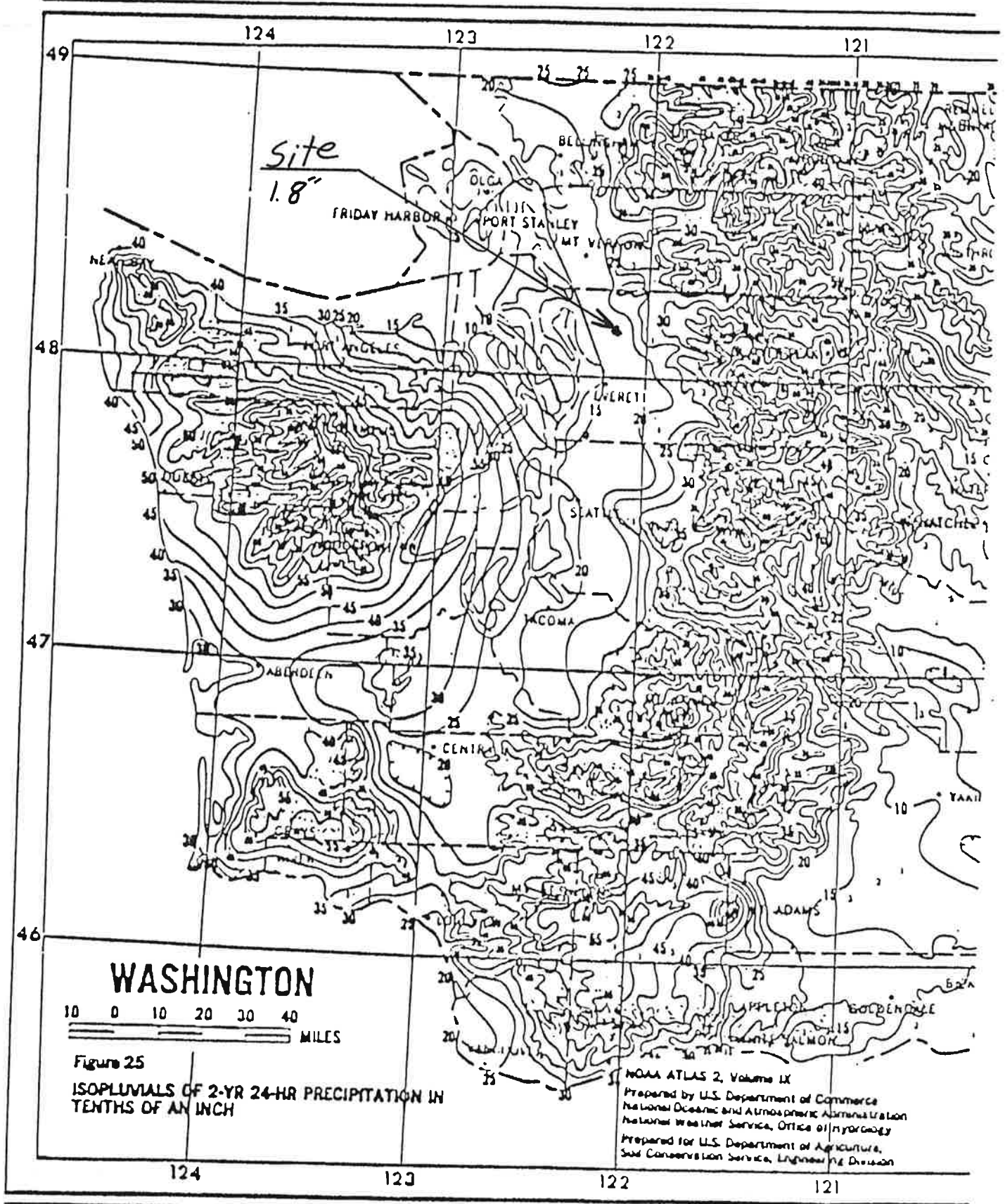
Table III-1.3 SCS Western Washington Runoff Curve Numbers
 (Published by SCS in 1982) Runoff curve numbers for selected agricultural,
 suburban and urban
 land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION	CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land(1): winter condition	86	91	94	95
Mountain open areas: low growing brush & grasslands	74	82	89	92
Meadow or pasture:	65	78	85	89
Wood or forest land: undisturbed	42	64	76	81
Wood or forest land: young second growth or brush	55	72	81	86
Orchard: with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.				
Good condition: grass cover on $\geq 75\%$ of the area	68	80	86	90
Fair condition: grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:	76	85	89	91
Dirt roads & parking lots:	72	82	87	89
Impervious surfaces, pavement, roofs etc.	98	98	98	98
Open water bodies: lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):				
Dwelling Unit/Gross Acre %Impervious(3)				
1.0 DU/GA				
1.5 DU/GA				
2.0 DU/GA				
2.5 DU/GA				
3.0 DU/GA				
3.5 DU/GA				
4.0 DU/GA				
4.5 DU/GA				
5.0 DU/GA				
5.5 DU/GA				
6.0 DU/GA				
6.5 DU/GA				
7.0 DU/GA				
PUD's, condos, apartments, commercial businesses & industrial areas				
				%impervious must be computed
				Separate curve number shall be selected for pervious & impervious portions of the site or basin

- (1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
- (2) Assumes roof and driveway runoff is directed into street/storm system.
- (3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

ATTACHMENT 5
RAINFALL DATA

STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN



WASHINGTON
 10 0 10 20 30 40
 MILES

Figure 25
 ISOPLUMIALS OF 2-YR 24-HR PRECIPITATION IN
 TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX
 Prepared by U.S. Department of Commerce
 National Oceanic and Atmospheric Administration
 National Weather Service, Office of Hydrology
 Prepared for U.S. Department of Agriculture,
 Soil Conservation Service, Engineering Division

STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN

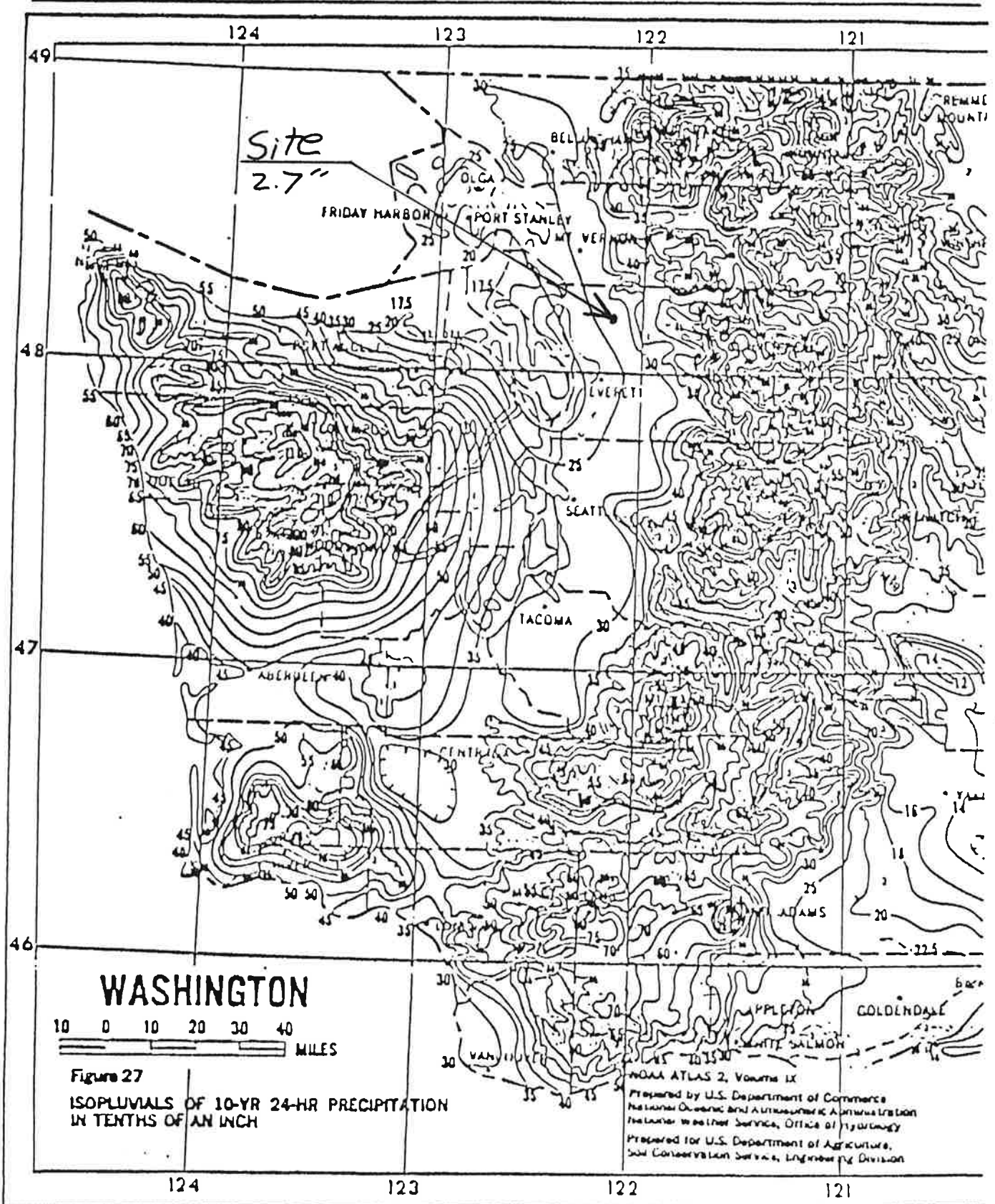


Figure 27
ISOPLUVIALS OF 10-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

NOAA ATLAS 2, VOLUME IX
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN

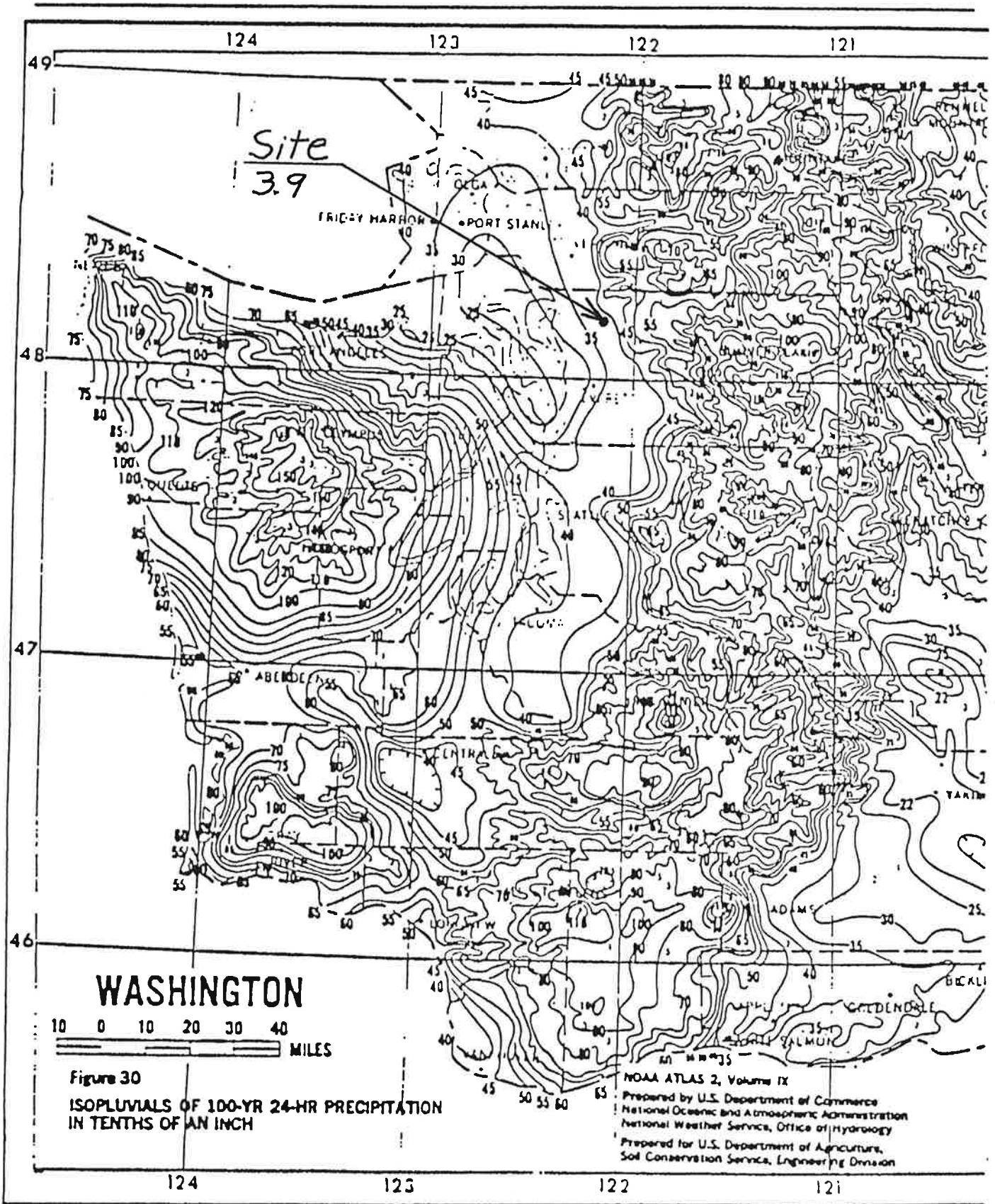


Figure 30
ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

APPENDIX A
BASIN SUMMARIES

By:Sound Developement Group

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BASIN SUMMARY

~~BASIN ID: 100AE NAME: 100 YR BASIN A EXISITNG~~
~~SCS METHODOLOGY~~
~~TOTAL AREA.....: 1.67 Acres BASEFLOWS: 0.00 cfs~~
~~RAINFALL TYPE.....: TYPE1A PERV IMP~~
~~PRECIPITATION.....: 3.90 inches AREA...: 1.67 Acres 0.00 Acres~~
~~TIME INTERVAL.....: 10.00 min CN.....: 81.00 0.00~~
~~TC.....: 15.75 min 0.00 min~~

~~ABSTRACTION COEFF: 0.20~~
~~TcReach - Sheet L: 80.00 ns:0.4000 p2yr: 2.00 s:0.0500~~
~~PEAK RATE: 0.73 cfs VOL: 0.27 Ac-ft TIME: 510 min~~

~~BASIN ID: 100AP NAME: 100 YR BASIN A PROPOSED~~
~~SCS METHODOLOGY~~
~~TOTAL AREA.....: 1.67 Acres BASEFLOWS: 0.00 cfs~~
~~RAINFALL TYPE.....: TYPE1A PERV IMP~~
~~PRECIPITATION.....: 3.90 inches AREA...: 0.59 Acres 1.08 Acres~~
~~TIME INTERVAL.....: 10.00 min CN.....: 86.00 98.00~~
~~TC.....: 5.06 min 5.50 min~~

~~ABSTRACTION COEFF: 0.20~~
~~TcReach - Sheet L: 20.00 ns:0.1500 p2yr: 2.00 s:0.0075~~
~~impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0100~~
~~impTcReach - Shallow L: 400.00 ks:27.00 s:0.0250~~
~~impTcReach - Channel L: 400.00 kc:42.00 s:0.0022~~
~~PEAK RATE: 1.28 cfs VOL: 0.44 Ac-ft TIME: 500 min~~

~~BASIN ID: 100BE NAME: 100 YR BASIN B EXISITNG~~
~~SCS METHODOLOGY~~
~~TOTAL AREA.....: 0.79 Acres BASEFLOWS: 0.00 cfs~~
~~RAINFALL TYPE.....: TYPE1A PERV IMP~~
~~PRECIPITATION.....: 3.90 inches AREA...: 0.74 Acres 0.05 Acres~~
~~TIME INTERVAL.....: 10.00 min CN.....: 85.00 98.00~~
~~TC.....: 9.77 min 5.00 min~~

~~ABSTRACTION COEFF: 0.20~~
~~TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400~~
~~TcReach - Shallow L: 50.00 ks:11.00 s:0.0400~~
~~impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0050~~
~~PEAK RATE: 0.45 cfs VOL: 0.16 Ac-ft TIME: 500 min~~

By:Sound-Development Group

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BASIN SUMMARY

BASIN ID: 100DE NAME: 100 YR BASIN D EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 2.58 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 3.90 inches AREA...: 2.58 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN....: 86.00 98.00
 TC....: 18.50 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 130.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 300.00 ks:11.00 s:0.0200
 PEAK RATE: 1.45 cfs VOL: 0.51 Ac-ft TIME: 510 min

BASIN ID: 100DP NAME: 100 YR BASIN D PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 2.58 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 3.90 inches AREA...: 1.53 Acres 1.05 Acres
 TIME INTERVAL....: 10.00 min CN....: 86.00 98.00
 TC....: 13.04 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 80.00 ns:0.1500 p2yr: 2.00 s:0.0210
 TcReach - Shallow L: 300.00 ks:11.00 s:0.0250
 impTcReach - Sheet L: 30.00 ns:0.0110 p2yr: 2.00 s:0.0155
 impTcReach - Shallow L: 150.00 ks:27.00 s:0.0200
 PEAK RATE: 1.78 cfs VOL: 0.61 Ac-ft TIME: 510 min

BASIN ID: 100EE NAME: 100 YR BASIN E EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 3.90 inches AREA...: 0.45 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN....: 85.00 98.00
 TC....: 14.54 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 200.00 ks:11.00 s:0.0200
 PEAK RATE: 0.24 cfs VOL: 0.09 Ac-ft TIME: 510 min

By: Sound-Developement Group

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BASIN SUMMARY

BASIN ID: 100EP NAME: 100 YR BASIN E PROPOSED
SCS METHODOLOGY
TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE.....: TYPE1A PERV IMP
PRECIPITATION.....: 3.90 inches AREA..: 0.15 Acres 0.30 Acres
TIME INTERVAL.....: 10.00 min CN.....: 86.00 98.00
TC.....: 13.46 min 5.00 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
TcReach - Shallow L: 100.00 ks:11.00 s:0.0200
impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 2.00 s:0.0150
impTcReach - Shallow L: 150.00 ks:27.00 s:0.0150
PEAK RATE: 0.35 cfs VOL: 0.12 Ac-ft TIME: 510 min

BASIN ID: 10AE NAME: 10 YR BASIN A EXISITNG
SCS METHODOLOGY
TOTAL AREA.....: 1.67 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE.....: TYPE1A PERV IMP
PRECIPITATION.....: 2.70 inches AREA..: 1.67 Acres 0.00 Acres
TIME INTERVAL.....: 10.00 min CN.....: 81.00 0.00
TC.....: 15.75 min 0.00 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 80.00 ns:0.4000 p2yr: 2.00 s:0.0500
PEAK RATE: 0.34 cfs VOL: 0.15 Ac-ft TIME: 510 min

BASIN ID: 10AP NAME: 10 YR BASIN A PROPOSED
SCS METHODOLOGY
TOTAL AREA.....: 1.67 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE.....: TYPE1A PERV IMP
PRECIPITATION.....: 2.70 inches AREA..: 0.59 Acres 1.08 Acres
TIME INTERVAL.....: 10.00 min CN.....: 86.00 98.00
TC.....: 5.06 min 5.50 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 20.00 ns:0.1500 p2yr: 2.00 s:0.0075
impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0100
impTcReach - Shallow L: 400.00 ks:27.00 s:0.0250
impTcReach - Channel L: 400.00 kc:42.00 s:0.0022
PEAK RATE: 0.82 cfs VOL: 0.28 Ac-ft TIME: 500 min

By:Sound-Development Group

=====

BASIN SUMMARY

BASIN ID: 10BE NAME: 10 YR BASIN B EXISITNG
SCS METHODOLOGY
TOTAL AREA.....: 0.79 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE....: TYPE1A PERV IMP
PRECIPITATION....: 2.70 inches AREA...: 0.74 Acres 0.05 Acres
TIME INTERVAL....: 10.00 min CN....: 85.00 98.00
 TC....: 9.77 min 5.00 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400
TcReach - Shallow L: 50.00 ks:11.00 s:0.0400
impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0050
PEAK RATE: 0.24 cfs VOL: 0.09 Ac-ft TIME: 500 min

BASIN ID: 10BP NAME: 10 YR BASIN B PROPOSED
SCS METHODOLOGY
TOTAL AREA.....: 0.94 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE....: TYPE1A PERV IMP
PRECIPITATION....: 2.70 inches AREA...: 0.74 Acres 0.20 Acres
TIME INTERVAL....: 10.00 min CN....: 86.00 98.00
 TC....: 9.77 min 5.00 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400
TcReach - Shallow L: 50.00 ks:11.00 s:0.0400
impTcReach - Sheet L: 100.00 ns:0.0110 p2yr: 2.00 s:0.0050
PEAK RATE: 0.34 cfs VOL: 0.12 Ac-ft TIME: 500 min

BASIN ID: 10CE NAME: 10 YR BASIN C EXISITNG
SCS METHODOLOGY
TOTAL AREA.....: 5.63 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE....: TYPE1A PERV IMP
PRECIPITATION....: 2.70 inches AREA...: 5.24 Acres 0.39 Acres
TIME INTERVAL....: 10.00 min CN....: 85.00 98.00
 TC....: 12.23 min 5.00 min

ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400
TcReach - Shallow L: 350.00 ks:11.00 s:0.0350
impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 2.00 s:0.0050
PEAK RATE: 1.70 cfs VOL: 0.64 Ac-ft TIME: 510 min

By:Sound -Development Group

=====

BASIN SUMMARY

BASIN ID: 10CP NAME: 10 YR BASIN C PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 5.63 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 2.70 inches AREA...: 3.48 Acres 2.15 Acres
 TIME INTERVAL....: 10.00 min CN.....: 86.00 98.00
 TC.....: 7.85 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 60.00 ns:0.1500 p2yr: 2.00 s:0.0250
 TcReach - Shallow L: 30.00 ks:11.00 s:0.0200
 impTcReach - Sheet L: 40.00 ns:0.0110 p2yr: 2.00 s:0.0155
 impTcReach - Shallow L: 300.00 ks:27.00 s:0.0200
 PEAK RATE: 2.34 cfs VOL: 0.82 Ac-ft TIME: 500 min

BASIN ID: 10DE NAME: 10 YR BASIN D EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 2.58 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 2.70 inches AREA...: 2.58 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN.....: 86.00 98.00
 TC.....: 18.50 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 130.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 300.00 ks:11.00 s:0.0200
 PEAK RATE: 0.77 cfs VOL: 0.29 Ac-ft TIME: 510 min

BASIN ID: 10DP NAME: 10 YR BASIN D PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 2.58 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 2.70 inches AREA...: 1.53 Acres 1.05 Acres
 TIME INTERVAL....: 10.00 min CN.....: 86.00 98.00
 TC.....: 13.04 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 80.00 ns:0.1500 p2yr: 2.00 s:0.0210
 TcReach - Shallow L: 300.00 ks:11.00 s:0.0250
 impTcReach - Sheet L: 30.00 ns:0.0110 p2yr: 2.00 s:0.0155
 impTcReach - Shallow L: 150.00 ks:27.00 s:0.0200
 PEAK RATE: 1.09 cfs VOL: 0.38 Ac-ft TIME: 510 min

By:Sound-Development Group

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BASIN SUMMARY

BASIN ID: 10EE NAME: 10 YR BASIN E EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 2.70 inches AREA...: 0.45 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN....: 85.00 98.00
 TC....: 14.54 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 200.00 ks:11.00 s:0.0200
 PEAK RATE: 0.13 cfs VOL: 0.05 Ac-ft TIME: 510 min

BASIN ID: 10EP NAME: 10 YR BASIN E PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 2.70 inches AREA...: 0.15 Acres 0.30 Acres
 TIME INTERVAL....: 10.00 min CN....: 86.00 98.00
 TC....: 13.46 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 100.00 ks:11.00 s:0.0200
 impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 2.00 s:0.0150
 impTcReach - Shallow L: 150.00 ks:27.00 s:0.0150
 PEAK RATE: 0.22 cfs VOL: 0.08 Ac-ft TIME: 510 min

BASIN ID: 2AE NAME: 2 YR BASIN A EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 1.67 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 1.80 inches AREA...: 1.67 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN....: 81.00 0.00
 TC....: 15.75 min 0.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 80.00 ns:0.4000 p2yr: 2.00 s:0.0500
 PEAK RATE: 0.10 cfs VOL: 0.06 Ac-ft TIME: 510 min

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BASIN SUMMARY

BASIN ID: 2AP NAME: 2 YR BASIN A PROPOSED

SCS METHODOLOGY

TOTAL AREA.....:	1.67 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A	PERV		IMP
PRECIPITATION.....:	1.80 inches	AREA...:	0.59 Acres	1.08 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	86.00	98.00
		TC.....:	5.06 min	5.50 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 20.00 ns:0.1500 p2yr: 2.00 s:0.0075

impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0100

impTcReach - Shallow L: 400.00 ks:27.00 s:0.0250

impTcReach - Channel L: 400.00 kc:42.00 s:0.0022

PEAK RATE: 0.49 cfs VOL: 0.17 Ac-ft TIME: 500 min

BASIN ID: 2BE NAME: 2 YR BASIN B EXISITNG

SCS METHODOLOGY

TOTAL AREA.....:	0.79 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A	PERV		IMP
PRECIPITATION.....:	1.80 inches	AREA...:	0.74 Acres	0.05 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	85.00	98.00
		TC.....:	9.77 min	5.00 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400

TcReach - Shallow L: 50.00 ks:11.00 s:0.0400

impTcReach - Sheet L: 20.00 ns:0.0110 p2yr: 2.00 s:0.0050

PEAK RATE: 0.10 cfs VOL: 0.05 Ac-ft TIME: 500 min

BASIN ID: 2BP NAME: 2 YR BASIN B PROPOSED

SCS METHODOLOGY

TOTAL AREA.....:	0.94 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A	PERV		IMP
PRECIPITATION.....:	1.80 inches	AREA...:	0.74 Acres	0.20 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	86.00	98.00
		TC.....:	9.77 min	5.00 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400

TcReach - Shallow L: 50.00 ks:11.00 s:0.0400

impTcReach - Sheet L: 100.00 ns:0.0110 p2yr: 2.00 s:0.0050

PEAK RATE: 0.17 cfs VOL: 0.07 Ac-ft TIME: 500 min

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BASIN SUMMARY

BASIN ID: 2CE NAME: 2 YR BASIN C EXISITNG

SCS METHODOLOGY

TOTAL AREA.....:	5.63 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	1.80 inches	AREA...:	5.24 Acres	0.39 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	85.00	98.00
		TC.....:	12.23 min	5.00 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0400

TcReach - Shallow L: 350.00 ks:11.00 s:0.0350

impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 2.00 s:0.0050

PEAK RATE: 0.74 cfs VOL: 0.32 Ac-ft TIME: 510 min

BASIN ID: 2CP NAME: 2 YR BASIN C PROPOSED

SCS METHODOLOGY

TOTAL AREA.....:	5.63 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	1.80 inches	AREA...:	3.48 Acres	2.15 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	86.00	98.00
		TC.....:	7.85 min	5.00 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 60.00 ns:0.1500 p2yr: 2.00 s:0.0250

TcReach - Shallow L: 30.00 ks:11.00 s:0.0200

impTcReach - Sheet L: 40.00 ns:0.0110 p2yr: 2.00 s:0.0155

impTcReach - Shallow L: 300.00 ks:27.00 s:0.0200

PEAK RATE: 1.27 cfs VOL: 0.47 Ac-ft TIME: 500 min

BASIN ID: 2DE NAME: 2 YR BASIN D EXISITNG

SCS METHODOLOGY

TOTAL AREA.....:	2.58 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	1.80 inches	AREA...:	2.58 Acres	0.00 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	86.00	98.00
		TC.....:	18.50 min	5.00 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 130.00 ns:0.1500 p2yr: 2.00 s:0.0200

TcReach - Shallow L: 300.00 ks:11.00 s:0.0200

PEAK RATE: 0.32 cfs VOL: 0.15 Ac-ft TIME: 510 min

By: Sound-Development Group

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BASIN SUMMARY

BASIN ID: 2DP NAME: 2 YR BASIN D PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 2.58 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 1.80 inches AREA...: 1.53 Acres 1.05 Acres
 TIME INTERVAL....: 10.00 min CN.....: 86.00 98.00
 TC.....: 13.04 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 80.00 ns:0.1500 p2yr: 2.00 s:0.0210
 TcReach - Shallow L: 300.00 ks:11.00 s:0.0250
 impTcReach - Sheet L: 30.00 ns:0.0110 p2yr: 2.00 s:0.0155
 impTcReach - Shallow L: 150.00 ks:27.00 s:0.0200
 PEAK RATE: 0.60 cfs VOL: 0.22 Ac-ft TIME: 510 min

BASIN ID: 2EE NAME: 2 YR BASIN E EXISITNG
 SCS METHODOLOGY
 TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 1.80 inches AREA...: 0.45 Acres 0.00 Acres
 TIME INTERVAL....: 10.00 min CN.....: 85.00 98.00
 TC.....: 14.54 min 5.00 min

ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 200.00 ks:11.00 s:0.0200
 PEAK RATE: 0.05 cfs VOL: 0.02 Ac-ft TIME: 510 min

BASIN ID: 2EP NAME: 2 YR BASIN E PROPOSED
 SCS METHODOLOGY
 TOTAL AREA.....: 0.45 Acres BASEFLOWS: 0.00 cfs
 RAINFALL TYPE....: TYPE1A PERV IMP
 PRECIPITATION....: 1.80 inches AREA...: 0.15 Acres 0.30 Acres
 TIME INTERVAL....: 10.00 min CN.....: 86.00 98.00
 TC.....: 13.46 min 5.00 min

 ABSTRACTION COEFF: 0.20
 TcReach - Sheet L: 100.00 ns:0.1500 p2yr: 2.00 s:0.0200
 TcReach - Shallow L: 100.00 ks:11.00 s:0.0200
 impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 2.00 s:0.0150
 impTcReach - Shallow L: 150.00 ks:27.00 s:0.0150
 PEAK RATE: 0.13 cfs VOL: 0.05 Ac-ft TIME: 510 min