

Supplement to Storm Drainage Report

for

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Utilities Div.

Agra Shop Site *Arlington, Washington* *MN-01-028*

March 2002

Prepared for:

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APR 10 2002

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POE CONSTRUCTION

Roof Downspout System

Attached are the roof downspout design and calculations for the 60'x100' building and 60'x60' concrete pad at the Agra Shop Site in Arlington, Washington. The roof downspout system is an infiltration system BMP and is designed according to the "*Stormwater Management Manual for the Puget Sound Basin (February 1992) Department of Ecology.*"

Infiltration Rate Calculation for 60x100 Building:

$$Q = (Fd)(i)(As)$$

Q = Flowrate Infiltrated by BMP

Fd = Design Infiltration rate of soil = 4.1 in/hr (Fd = 0.0000949 ft/s)

(From Associated Earth Sciences Inc. Geotechnical Report.)

i = Hydraulic Gradient ~ 1 (Since groundwater table was not encountered.)

As = Surface Area of BMP (Proposed 25 Ft long x 4 Ft wide = 100 Ft²)

$$Q = (0.0000949 \text{ ft/s})(1)(100 \text{ ft}^2) = 0.00949 \text{ ft}^3/\text{s}$$

Flowrate Infiltrated by BMP = 0.009 ft³/s

Infiltration Trench Sizing Calculation

Trench Void Ratio = 0.3

Proposed Trench Depth = 3 ft

Proposed Trench Width = 4 ft

Proposed Trench Length = 25 ft

Proposed Trench Volume = (3 ft)(4 ft)(25 Ft)(0.3) = 90 ft³

Impervious Area = (60 ft)(100 ft) = 6000 ft² (3000 ft² per trench or 0.069 acres)

Precipitation 10-Year, 24-Hour = 2.5 in (1992 Ecology "Technical Manual")

CN = 98 (Roofs)

Tc = 5 Minutes (Min)

See Water Works Calculations - Proposed Infiltration Trench O.K.

Infiltration Trench = 3 ft Deep, 4 ft Wide, and 25 ft Long

Infiltration Rate Calculation for 60x60 Building:

$$Q = (Fd)(i)(As)$$

Q = Flowrate Infiltrated by BMP

Fd = Design Infiltration rate of soil = 4.1 in/hr (Fd = 0.0000949 ft/s)

(From Associated Earth Sciences Inc. Geotechnical Report.)

i = Hydraulic Gradient ~ 1 (Since groundwater table was not encountered.)

As = Surface Area of BMP (Proposed 30 Ft long x 4 Ft wide = 100 Ft²)

$$Q = (0.0000949 \text{ ft/s})(1)(120 \text{ ft}^2) = 0.011388 \text{ ft}^3/\text{s}$$

Flowrate Infiltrated by BMP = 0.011 ft³/s

Infiltration Trench Sizing Calculation

Trench Void Ratio = 0.3

Proposed Trench Depth = 3 ft

Proposed Trench Width = 4 ft

Proposed Trench Length = 30 ft

Proposed Trench Volume = (3 ft)(4 ft)(30 Ft)(0.3) = 108 ft³

Impervious Area = (60 ft)(60 ft) = 3600 ft² (0.083 acres)

Precipitation 10-Year, 24-Hour = 2.5 in (1992 Ecology "Technical Manual")

CN = 98 (Roofs)

Tc = 5 Minutes (Min)

See Water Works Calculations - Proposed Infiltration Trench O.K.

Infiltration Trench = 3 ft Deep, 4 ft Wide, and 30 ft Long

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BASIN SUMMARY
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BASIN ID: roof010 NAME:
SBUH METHODOLOGY
TOTAL AREA: 0.07 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE: TYPE1A PERV IMP
PRECIPITATION: 2.50 inches AREA: 0.00 Acres 0.07 Acres
TIME INTERVAL: 10.00 min CN: 0.00 98.00
TC: 0.00 min 5.00 min
ABSTRACTION COEFF: 0.20
PEAK RATE: 0.04 cfs VOL: 0.01 Ac-ft TIME: 480 min

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HYDROGRAPH SUMMARY

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HYD NUM	PEAK RUNOFF RATE cfs	TIME OF PEAK min.	VOLUME OF HYDRO cf\AcFt	Contrib Area Acres
1	0.012	560	569 cf	0.07

STAGE STORAGE TABLE

CUSTOM STORAGE ID No: inf
Description: Infiltration

STAGE <----STORAGE---->			STAGE <----STORAGE---->			STAGE <----STORAGE---->			STAGE <----STORAGE---->		
(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-
0.00	0.0000	0.0000	0.80	24.000	0.0006	1.60	48.000	0.0011	2.40	72.000	0.0017
0.10	3.0000	0.0001	0.90	27.000	0.0006	1.70	51.000	0.0012	2.50	75.000	0.0017
0.20	6.0000	0.0001	1.00	30.000	0.0007	1.80	54.000	0.0012	2.60	78.000	0.0018
0.30	9.0000	0.0002	1.10	33.000	0.0008	1.90	57.000	0.0013	2.70	81.000	0.0019
0.40	12.000	0.0003	1.20	36.000	0.0008	2.00	60.000	0.0014	2.80	84.000	0.0019
0.50	15.000	0.0003	1.30	39.000	0.0009	2.10	63.000	0.0014	2.90	87.000	0.0020
0.60	18.000	0.0004	1.40	42.000	0.0010	2.20	66.000	0.0015	3.00	90.000	0.0021
0.70	21.000	0.0005	1.50	45.000	0.0010	2.30	69.000	0.0016	3.00	90.000	0.0021

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STAGE DISCHARGE TABLE

DISCHARGE LIST ID No. inf
 Description: Discharge

STAGE (ft)	<--DISCHARGE--> ---cfs--	STAGE (ft)	<--DISCHARGE--> ---cfs--	STAGE (ft)	<--DISCHARGE--> ---cfs--	STAGE (ft)	<--DISCHARGE--> ---cfs--
0.00	0.0090	0.80	0.0098	1.60	0.0106	2.40	0.0114
0.10	0.0091	0.90	0.0099	1.70	0.0107	2.50	0.0115
0.20	0.0092	1.00	0.0100	1.80	0.0108	2.60	0.0116
0.30	0.0093	1.10	0.0101	1.90	0.0109	2.70	0.0117
0.40	0.0094	1.20	0.0102	2.00	0.0110	2.80	0.0118
0.50	0.0095	1.30	0.0103	2.10	0.0111	2.90	0.0119
0.60	0.0096	1.40	0.0104	2.20	0.0112	3.00	0.0120
0.70	0.0097	1.50	0.0105	2.30	0.0113	3.00	0.0120

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LEVEL POOL TABLE SUMMARY

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	MATCH	INFLOW	-STO-	-DIS-	<-PEAK->		OUTFLOW	STORAGE
<-----DESCRIPTION----->	(cfs)	(cfs)	--id--	--id-	<-STAGE>	id	(cfs)	VOL (cf)
.....	0.04	0.04	inf	inf	2.56	1	0.01	76.86 cf

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BASIN SUMMARY

BASIN ID: roof010 NAME: Infiltration Trenches for Roof
SBUH METHODOLOGY
TOTAL AREA.....: 0.08 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE.....: TYPE1A PERV IMP
PRECIPITATION.....: 2.50 inches AREA...: 0.00 Acres 0.08 Acres
TIME INTERVAL.....: 10.00 min CN.....: 0.00 98.00
TC.....: 0.00 min 5.00 min
ABSTRACTION COEFF: 0.20
PEAK RATE: 0.04 cfs VOL: 0.02 Ac-ft TIME: 480 min

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HYDROGRAPH SUMMARY

Table with 5 columns: HYD NUM, PEAK RUNOFF RATE cfs, TIME OF PEAK min., VOLUME OF HYDRO cf\AcFt, Contrib Area Acres. Row 1: 1, 0.016, 550, 684 cf, 0.08

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STORAGE STRUCTURE LIST

RECTANGULAR VAULT ID No.
Description:
Length: 0.00 ft. Width: 0.00 ft. voids: 0.300
RECTANGULAR VAULT ID No. Roof-In
Description: Roof Infiltration Trench
Length: 30.00 ft. Width: 4.00 ft. voids: 0.300

DISCHARGE STRUCTURE LIST

DISCHARGE LIST ID No. Roof-Out
Description: Roof Infiltration Trench

LEVEL POOL TABLE SUMMARY

<DESCRIPTION>	MATCH (cfs)	INFLOW (cfs)	-STO- --id-	-DIS- --id-	<-PEAK-> <-STAGE>	id	OUTFLOW (cfs)	STORAGE VOL (cf)
Roof010	0.04	0.04	Roof-In	Roof-Out	102.30	1	0.02	82.97

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BASIN RESULT SUMMARY

BASIN ID	VOLUME --cf--	Ac-ft	-RATE- --cfs-	---TIME--- min	hours	Hydrograph Methodology	Area Acres
roof010	684	0.02	0.04	480	8.00	SBUH Method	0.08

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HYDROGRAPH SUMMARY

HYD NUM	PEAK RUNOFF RATE cfs	TIME OF PEAK min.	VOLUME OF HYDRO cf\AcFt	Contrib Area Acres
1	0.016	550	684 cf	0.08

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STORAGE STRUCTURE LIST

RECTANGULAR VAULT ID No.
 Description:
 Length: 0.00 ft. Width: 0.00 ft. voids: 0.300

RECTANGULAR VAULT ID No. Roof-In
 Description: Roof Infiltration Trench
 Length: 30.00 ft. Width: 4.00 ft. voids: 0.300

DISCHARGE STRUCTURE LIST

DISCHARGE LIST ID No. Roof-Out
Description: Roof Infiltration Trench

LEVEL POOL TABLE SUMMARY

<DESCRIPTION>	MATCH (cfs)	INFLOW (cfs)	-STO- --id-	-DIS- --id-	<-PEAK-> <-STAGE>	id	OUTFLOW (cfs)	STORAGE VOL (cf)
Roof010	0.04	0.04	Roof-In	Roof-Out	102.30	1	0.02	82.97 cf