# Stormwater Drainage Report

## For Devon Court

## A Division of Sherwood Village

Owner: Bill Littlejohn
550 W. Hendrickson Road
Sequim, WA 98382

Date: December 1, 2017

Property Location: Section 18, Twp 30N, R 3W, W.M.
Southwest corner of Old Olympic Highway and 5th Avenue,
Sequim WA 98382

Prepared by: 4 Seasons Engineering, Inc
619 South Chase Street,
Port Angeles, WA 98362

**Narrative:**

Devon Court is a new phase of the Sherwood Village residential community in Sequim WA. The Devon Court project includes 3.86 acres of land. 16 new condominium units will be constructed in this project. . Infrastructure improvements will include a new 20 foot wide driveway, extension of water, sanitary sewer, power, telephone, telecable, irrigation, and providing for on-site stormwater management. Sherwood Village has an existing stormwater system which includes collection of roadway runoff and routing it to underground infiltration facilities. Individual buildings may directly infiltrate roof runoff using drywells at the owners discretion. The existing system was developed in accordance with the Department of Ecology Stormwater Manual. The proposed stormwater collection and infiltration facilities for Devon Court are modeled after the previous stormwater facilities in Sherwood Village.

The site is very gently sloping to the north east and is currently pasture ground. The new development will be include 8 residential condominium buildings and landscaped open areas along with the roadway and walking paths. Access will be from Evergreen Farm Way, an existing entrance to the Sherwood Village community. The underlying soils are very conducive to infiltration. The site is approximately 150 feet above sea level. The average rainfall at this site is in the 15 to 20 inch per year range. Construction of the road an infrastructure is scheduled for the year of 2018. Condominium units will be constructed over time, as the demand for housing warrants.

Sediment and Erosion Control will be provided by using Best Management practices, such as using a stabilized construction entrance, controlling concrete truck washout, installing filters in the catchbasins, and containing all stormwater runoff on-site. Erosion and sediment control will be the responsibility of the owner and property developer.

## STORM DRAINAGE CALCULATIONS

Hydrologic modeling was done using the WaterWorks Program produced by Engenious Systems. The infiltration trench was calculated to store and infiltrate a 24 hour 100 year storm. To determine the length of individual infiltration trenches, the project site was divided into drainage basins. Basin information was fed into the program and the hydrographs were generated for two basic scenarios. For the bulk of the project, the residential density is 4.2 units per acre. The hydrograph for the 100 year storm was routed into a 4 foot wide by 4 feet deep infiltration trench. This length was found to be adequate. In accordance with the Manual, the length was increased 20 % . Individual basins were then directly correlated with the 120 feet of infiltration trench per acre of residential development.

In a similar method, the trench size was computed at 100 feet per ¼ acre for paving and streets. Some slight adjustments were made to account for the variation in the percentage of impervious. In accordance with the Manual the trench size was increased an additional 20%.
A calculation sheet is included detailing the catch basin location, drainage contributory area, length of infiltration trench, and relevant notes.

**Design Assumptions:**

Soils #63 Sequim Very Gravelly Loam
Hydrological Group A (Rapid Permeable Soil)
Infiltration Rate = 20in/hr (Ref. 2)/Past infiltration tests for similar soils indicate 20-40in/hr.
(See Table III - 3.1 of the DOE manual)
Predevelopment Curve Number = 65
Design Storms: 6-month/24hr = 0.96in/hr
2-yr/24-hr = 1.50in/hr
25-yr/24-hr = 2.50in/hr
100-yr/24-hr = 3.50in/hr

**Calculations:**

- f = rate of infiltration (in/hr)
- $f_d$ = design rate of infiltration, 50% safety factor (in/hr)
- Q = flowrate at which runoff is infiltrated (cfs)
- $A_s$ = surface area of the infiltration trench ($ft^2$)
- w = width of infiltration trench (ft)
- $L_t$ = length of infiltration trench (ft)
- i = hydraulic gradient (ft/ft)
- L = depth to water table (ft)
- h = height of the water column over the infiltration media (ft)
- S = amount of storage available in the infiltration trench($ft^3$)
- e = void ratio for drain rock filled infiltration trench

f = 20in/hr
$f_d$ = 0.5(f) = 10in/hr = 0.833ft/hr
e = 0.35
i = (h+L)/L = (h+4ft)/4ft
$A_s = L_t(w) = L_t(4ft)$
$Q = (f_d)(i)(A_s) = ((0.833ft/hr)/3600sec)((h+4ft)/4ft)(L_t)(4ft)$
$S = A_s(e)(h) = L_t(4ft)(0.35)(h)$

**Residential Infiltration Trench**

Total Area = 1 acre
Percent pervious 70% CN =68
Percent impervious 30% CN =98

100-yr/24-hr Storm

100 ft of trench

Stage-discharge Relationship

$f_d$ = 0.833ft/hr
h = variable = maximum of 2.5 ft
L = 4 ft
$A_s = L_p(w)$ = 70ft(4ft) = 280 $ft^2$
$Q = f_d(i)(A_s)$ = ((0.833ft/hr)/3600 sec)((h+4ft)/4ft)(280$ft^2$)
= 0.0162(h) + 0.0648

Stage-storage Relationship
$S = A_s(e)(h) = 280ft^2(0.35)(h) = 98(h)$

Stage-storage Stage-discharge Relationship

| h (ft) | I (ft/ft) | Q (cfs) | S (cu ft) |
|---|---|---|---|
| 100.00 | 1.000 | 0.09 | 0.00 |
| 100.50 | 1.125 | 0.10 | 70 |
| 101.00 | 1.250 | 0.11 | 140.00 |
| 101.50 | 1.375 | 0.13 | 210.00 |
| 102.00 | 1.500 | 0.14 | 280.00 |
| 102.50 | 1.625 | 0.15 | 350.00 |
| 103.00 | 1.75 | 0.16 | 420.00 |
| 103.50 | 1.875 | 0.17 | 490.00 |
| 104.00 | 2.000 | 0.18 | 560.00 |
| 104.50 | 2.000 | 0.18 | 630.00 |

⇒ Use 20% volume correction factor.

100 ft(1.2) = 120 ft
4 ft x 4ft wide x 4ft deep trench (with an effective depth of drain rock of 4 feet).

**Roadway Infiltration Trench**

Total Area = ¼ acre = 0.25 acres
Total Impervious Area = 0.25 acres, CN = 98

100-yr/24-hr Storm

100 ft of trench required.
⇒ Use 20% volume correction factor.

100 ft(1.2) = 120 ft (20% increase per Manual)
⇒ 120 ft x 4ft wide x 4ft deep trench (with an effective depth of drain rock of 4 feet).
⇒ For ¼ acre contributory area of street and pathway use 120 feet of trench.

⇒ **Individual Infiltration Trench Sizing**

DEVON Court

INFILTRATION Trench Sizing -

- 120 LF Trench Per 1/4 Acre Road/Impervious
- 120 LF Trench per 1 Acre Housing

| DRAINAGE AREA | Contributary Area ROAD | Contributary Area Housing | DRAINS TO | Trench Length per PLAN |
|---|---|---|---|---|
| A-1 | 4000 SF | 4000 Ft² | SD # 1 | 90 Ft |
| A-2 | 4200 | 14,000 | SD #2 | 90 Ft |
| A-3 | 3600 | 1,500 | SD #3 | 200 Ft Combined Trench |
| A-4 | 2700 | 11,050 | SD #4 | |
| A-5 | 3300 | — | SD #4 | |
| A-6 | 4800 | 18,000 | SD #5 | 120 Ft |
| OFFSite Parking | 18,750 | — | SD #6 | 210 Ft |

Y INDIVIDUAL DRYWELLS MAY BE USED FOR BUILDINGS IN LIEU OF SPLASHBLOCKS

K TRENCH SIZES ARE EQUAL OR LARGER THAN CALCULATED. SEE PLAN

**Soils Information:**

The site soils are classified as Sequim Gravelly Sandy Loam by the Soil Survey of Clallam County. This soil type is comprised of stratified sands and gravels. The material is very free draining and is classified as Hydrologic group A. Site specific soils exploration was not done at this location. Previous underground work in and along the Old Olympic Highway confirms the presence of the Sequim soils at this location. Excavations within the Sherwood Village community and the Lodge to the west have also been consistent with this type of soil. If during the course of the work other types of soils are encountered the engineer should be contacted and the infiltration system should be redesigned.

**References:**

1. Stormwater Management Manual for the Puget Sound Basin (DOE)
2. Drainage Plans by Clallam County.
3. Soil Survey of Clallam County Area, Washington, United States Department of Agriculture.