

**PRELIMINARY  
REPORT**

on

**STORMWATER  
MANAGEMENT PLAN**

at

**CROOK POINT RESORT  
CURRY COUNTY  
OREGON**

**CROOK FAMILY LLC  
Pistol River**

PRELIMINARY REPORT

on

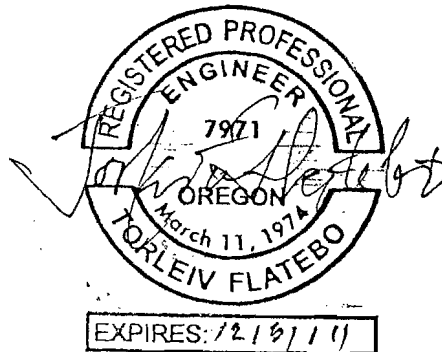
STORMWATER MANAGEMENT

- BUILDING & IMPROVEMENT AREAS
- GOLF COURSE

at

CROOK POINT RESORT  
CROOK FAMILY LLC

Curry County, Oregon



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P.O. Box 100  
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Date: June 2, 2010

**BUILDINGS and  
IMPROVEMENT AREAS**

## PROJECT DESCRIPTION

### General:

This is a preliminary report on the permanent handling and management of the added stormwater runoff resulting from the development on the Crook Point Resort building and improvement areas.

A separate study will be prepared later for the NDPES 1200C permit and the permanent Stormwater study.

### Project Area:

The total resort area is 441 Acres (247 acres West of TH 101 and 194 acres East of TH 101).

The total project area is divided into several sub areas (watershed basins). Each basin is handled separately.

The following table show the four drainage sub areas (districts) shown on Map page 26 of the Project Booklet.

<u>No:</u>	<u>Name:</u>	<u>Building Activity:</u>	<u>Acreage:</u>
1	Lodge District	2 Lodges, 2 Clubhouses, Maintenance Shop, 16 Cabins, 6 Parking Areas	13.5
2	Byrdies District	5 Buildings (Homes)	2
3	Cove District	17 Cabins, 1 Rec. Bldg. Parking Lot	5
4	Equestrian Distr. & Staff Housing	Arena, 22 Cabins, Parking Area	9
			<hr/> 29.5 Acres

### Runoff Calculation:

#### Areas involved:

Only areas disturbed or changed during construction, are being included in these calculations.

These include buildings, parking areas, roads, and other changes of the surface.

Undisturbed areas are not included. These areas will be left draining the water along the already established drainage patterns.

The golf course stormwater will be managed in separate systems and will be incorporated into the course design.

#### Study Criterias:

A 60 minute 25-years frequency storm event is used for this study. The duration intensity rainfall curves for Curry County is derived from the 25-years Curve. We get 1.4" of rainfall in 60 minutes.

The Rational Method was used to calculate the run-off. This method is normally used for smaller surface areas and shorter pipeline construction runs.

#### Calculations:

Copies of the calculations are incorporated in the back of this report. In addition there are graphs of pipe flow capacity.

## The Description of Stormwater Collection and Management:

### The Lodge District:

The stormwater is collected from building roof drains, catch basins along roads and in parking lots. It is discharged into a retention/settlement basin. The basin is designed to take twice the discharge from a 25-years storm - 28,000 gallons. The basin will reduce any turbidity and slow the discharge to a small creek.

### Byrdies District:

The roof drains from the homes will be collected in a storm sewer and discharged into the irrigation pond nearby.

### Cove District:

It is proposed to collect roof drains, run-off from parking lots and cartways into a storm sewer and discharge the water on the rocky ocean shore.

### Equestrian District:

Run-off from roofs, roads, and parking area will be collected in a storm sewer and discharged to a small creek south of the complex. A small settlement pond will be built in the creek.

## SUMMARY:

The Lodge District has most of the buildings and parking lots proposed and contribute the most run-off. A strong effort will be made in the design of roads and parking lots to slow the run-off and clean the water. Biosvales will run along the roads and discharged into storm sewer. Center area in parking lots will be constructed as a 10' wide biosvales with 10" of porous pavement on each side. A large settlement retention pond will handle all the run-off from this area.

The other areas discharges are fairly minor amounts of water and will be discharged to shoreline, creeks, or minor ponds.

It does not appear to be any danger of any pollution, erosion or any other problems caused by this development.

Pesticides, Fertilizers, Herbicides, Oil and Grease will be present only in small quantities in these areas.

## ATTACHMENTS:

Plan of Stormwater Management  
Rainfall Curves  
Flow in Pipes Graphs  
Calculations

Owner: Crook Family LLC #1  
Location: Crook Point Resort  
Purpose: Storm Water Runoff  
Date: 2-7-10

RUNOFF

25-year storm, 1 hour duration  
Curvy 1.15"  $10 \text{ ft} = 200 \text{ ft}$   $C = .90$   $1 \text{ ft} = 448 \text{ gpm}$

Main Lodge:

$280' \times 115' = 32,200 \text{ sq ft} = .74 \text{ Ac}$   
 $Q_{25} = A \cdot C \cdot i = .74 \times 1.15 \times .90 = .77 \text{ cfs}$   
 $(Q = .74 \times 1.15 \times .20 = .34 \text{ cfs} \rightarrow .22 \text{ cfs impervious})$   
 $427.22 \text{ gpm}$

Parking Lot #1:

$\frac{330 + 195}{2} \times 180 = 43,500 \text{ sq ft} = .71 \text{ Ac}$   
 $Q_{25} = .71 \times 1.15 \times .90 = .73 \text{ cfs}$   
 $400.10 \text{ gpm}$

Parking Lot #2:

$\frac{220 + 180}{2} \times 135 = 26,250 \text{ sq ft} = .46 \text{ Ac}$   
 $\frac{130 + 90}{2} \times 135 = 14,625 \text{ sq ft} = .34 \text{ Ac}$   
 $.96 \text{ Ac}$   
 $Q = .96 \times 1.15 \times .90 = 1.21 \text{ cfs}$   
 $541.90 \text{ gpm}$

Golf Lodge:

$185 \times 105 = 19,425 \text{ sq ft} = .42 \text{ Ac}$   
 $210 \times 75 = 15,750 \text{ sq ft} = .36 \text{ Ac}$   
 $.78 \text{ Ac}$   
 $Q = .78 \times 1.15 \times .90 = .98 \text{ cfs}$   
 $440.29 \text{ gpm}$   
1800.01

Owner: \_\_\_\_\_

Location: \_\_\_\_\_

#2

Purpose: Storm Water Runoff

Date: 2-7-10

Golf Shop:

$100 \times 90 = .90 \text{ Acre}$

$Q = .21 \times 6.4 \times .90 = .26 \text{ cfs}$

116.63 gpm

1st Tee Clubhouse:

$70 \times 100 =$

$80 \times 40 = .23 \text{ Acre}$

$Q = .23 \times 6.4 \times .90 = .30 \text{ cfs}$

132.18 gpm

Parking #1:

$\frac{270 + 170}{2} \times 60 = 11400$

$\frac{40 \times 60}{2} = 1200$

$\frac{70 + 35}{2} \times 60 = 3150$   
 $15750 = .36 \text{ Acre}$

$Q = .36 \times 6.4 \times .90 = .46 \text{ cfs}$

204.10 gpm

Maintenance Area:

$270 \times 120 = 28800$

$6 \times 60 = \frac{3600}{2400} = .74 \text{ Acre}$

$Q = .74 \times 6.4 \times .90 = .94 \text{ cfs}$   
 $1.46 \text{ cfs}$

419.86

872.77 gpm

Owner: \_\_\_\_\_

Location: \_\_\_\_\_

Crook Point Resort

Purpose: Storm water Runoff

Date: 2-7-10

#3

Cabins (10) @ Golf Lodge:

$$(40 \times 50 \times 10) \div 43,560 = 76$$

$$\text{Road } (600 \times 10) \div 43,560 = 14$$

$$\underline{\hspace{1.5cm}} = 90 \text{ AC.}$$

$$Q = 160 \times 1.4 \times .90 = 76 \text{ cfs}$$

338.69 gpm

Roads (Main Complex Area):

$$1800' \times 20' \div 43,560 = 83 \text{ AC}$$

$$Q = 183 \times 1.4 \times .90 = 118 \text{ cfs}$$

470.40 gpm  
 809.09 gpm

809.09  
 872.77  
 1800.01

$$3481.87 \text{ gpm} \times 1.48 = 465.49 \text{ cfs}$$

$$465.49 \text{ cfs} \times 60 \text{ min} = 27,929.4 \text{ cfs/hr} \quad (55,858.9 \text{ cfs} / 2 \text{ hours})$$

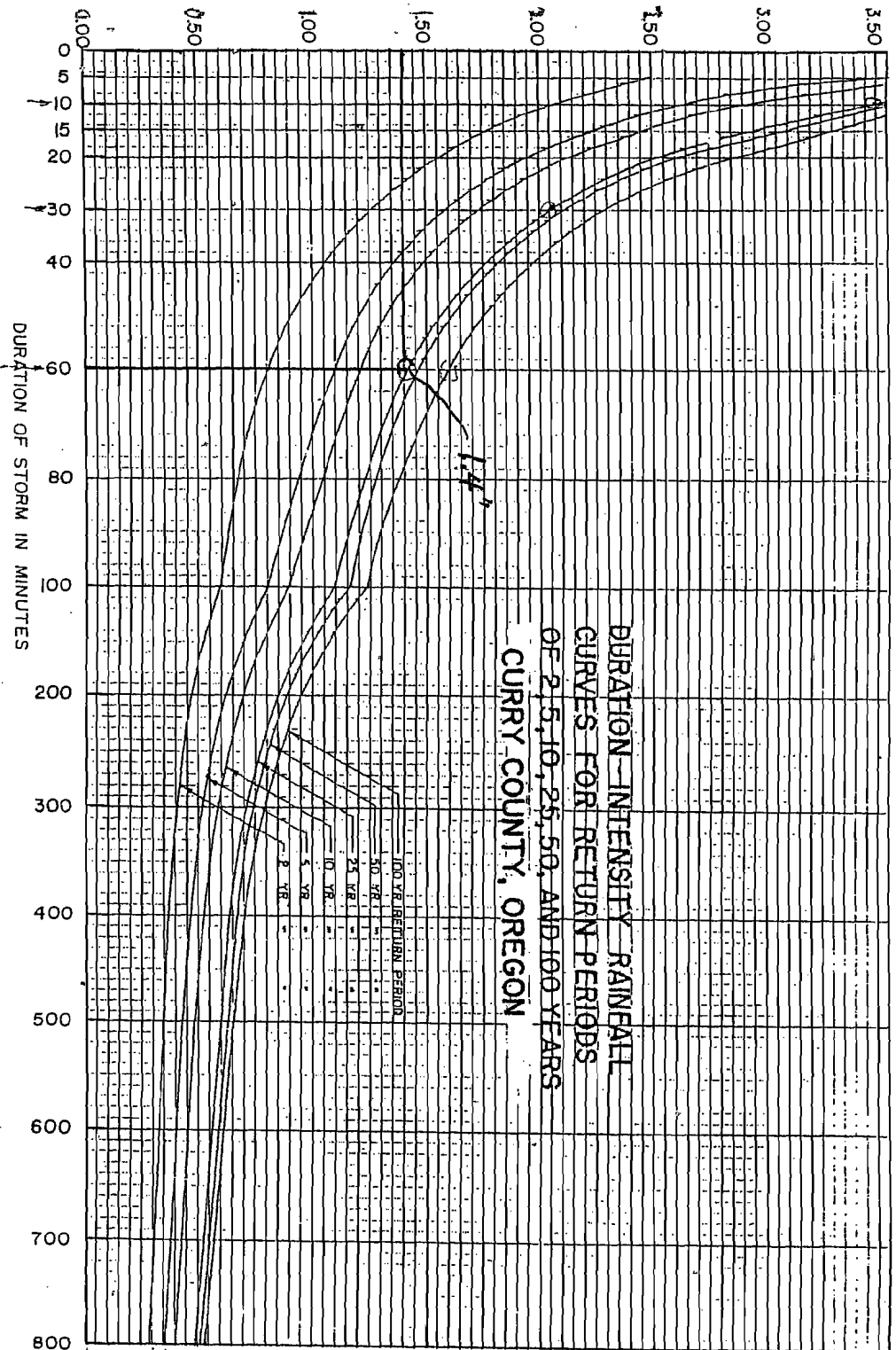


FIGURE - 1

# DRAINAGE — RUNOFF — 2

**Q = Aci RATIONAL FORMULA** (Logical approach).

**Q = RUNOFF** = Peak discharge of watershed in cubic feet per second (c.f.s.) due to maximum storm assumed. See Figs. A to F, Pg. 18-01 (Usually 10-25 years).

**A** = Area of watershed in acres.

**C** = Coefficient of runoff, Table B below (Measure of losses due to infiltration, etc.).

**i** = Intensity of rainfall in inches per hour based on concentration time, See Pg. 18-01. Concentration time = time required for rain falling at most remote point to reach discharge point. Concentration time may include overland flow time, Fig. H, Pg. 18-01, and Channel flow time, Pg. 18-05, 18-06, 18-69 and 18-71.

**TABLE A-COMPUTATION FORM FOR RATIONAL FORMULA.**

LOCATION			A		C	TIME OF FLOW - MIN.					DESIGN				PROFILE					
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	IN CHAN NEL	TIME OF CONC	L *	Q c.f.s.	CHAN- NEL OR PIPE SIZE	SLOPE ft. per ft.	n	CAPA- CITY FULL c.f.s.	V ft. per Sec.	LENGTH ft.	FALL ft.	OTHER LOSSES ft. †	INV. ELEV. UPPER END	INV. ELEV. LOWER END
FIRST ST.	A	B	1.8	1.8	.44	16.5	0.3	16.5	3.8	3.0	15"	.008	.015	4.6	3.9	60	0.48	0	82.00	81.52
MAIN RD.	B	C	1.9	3.7	.50		2.5	16.8	3.7	6.8	D-2	.011	.030	12.0	2.8	420	4.62	0	81.52	76.90
" "	C	D	2.0	5.7	.50		1.8	19.3	3.5	10.0	21"	.007	.015	11.1	4.5	480	3.36	2.20	74.70	70.34

\* Note that the sequence of design as in example, Fig. J, Pg. 18-01 involves trial assumptions in determining *i*.

† Fall in manhole.

SURFACES		C = $\frac{\text{RUNOFF}}{\text{RAINFALL}}$		VALUE PROPOSED		VALUE BY OTHER AUTHORITY	
		MIN.	MAX.	MIN.	MAX.		
ROOFS, slag to metal.		0.90	1.00	0.70	0.95	①	
PAVEMENTS	Concrete or Asphalt.	0.90	1.00	0.95	1.00	③	
	Bituminous Macadam, open and closed type.	0.70	0.90	0.70	0.90	③	
	Gravel, from clean and loose to clayey and compact.	0.25	0.70	0.15	0.30	①	
R.R. YARDS		0.10	0.30	0.10	0.30	①	
EARTH SURFACES	SAND, from uniform grain size, no fines, to well graded, some clay or silt.	Bare	0.15	0.50	0.01	0.55	④
		Light Vegetation	0.10	0.40	0.01	0.55	④
		Dense Vegetation	0.05	0.30	0.01	0.55	④
	LOAM, from sandy or gravelly to clayey.	Bare	0.20	0.60			
		Light Vegetation	0.10	0.45			
		Dense Vegetation	0.05	0.35			
	GRAVEL, from clean gravel and gravel sand mixtures, no silt or clay to high clay or silt content.	Bare	0.25	0.65			
		Light Vegetation	0.15	0.50			
		Dense Vegetation	0.10	0.40			
	CLAY, from coarse sandy or silty to pure colloidal clays.	Bare	0.30	0.75	0.10	0.70	④
		Light Vegetation	0.20	0.60	0.10	0.70	④
		Dense Vegetation	0.15	0.50	0.10	0.70	④
COMPOSITE AREAS	City, business areas.	0.60	0.75	0.60	0.95	⑤	
	City, dense residential areas, vary as to soil and vegetation.	0.50	0.65	0.30	0.60	⑤	
	Suburban residential areas.	0.35	0.55	0.25	0.40	⑤	
	Rural Districts,	0.10	0.25	0.10	0.25	②	
	Parks, Golf Courses, etc.,	0.10	0.35	0.05	0.25	①	

NOTE: Values of "C" for earth surfaces are further varied by degree of saturation, compaction, surface irregularity and slope, by character of subsoil, and by presence of frost or glazed snow or ice.

- ① Bryant & Kuichling, Report, Back Bay Sewerage District, Boston, 1909.
- ② Metcalf and Eddy, American Sewerage Practice, 1928. M<sup>c</sup> Graw-Hill.
- ③ Used by City of Boston, reported by Metcalf & Eddy.
- ④ Used by City of Detroit, reported by Metcalf & Eddy.
- ⑤ L. C. Urquhart, Civil Engineering Handbook, 1940. M<sup>c</sup> Graw-Hill.



## GOLF COURSE

--- Drainage and

--- Stormwater

## PROJECT DESCRIPTION:

### General:

This part of the preliminary report deals with the permanent collection and treatment of the stormwater run-off from the golf course.

Another temporary process called NPDES C1200 Permit will be setting the guidelines and rules for handling the stormwater run-off during construction.

### Project Area:

The total resort area consists of 443 acres of which the golf course occupies about 97 acres.

The golf course will be placed in an area which is mostly flat and wooded. About 10% will be in steep barren hillside area.

The run-off co-efficient for the wooded flat areas before construction is C=23. The steep area's co-efficient might be C=30. The complete golf course will have a C=20 value. This means the golf course will have a slightly higher run-off.

$$\begin{array}{l} \text{Before: } Q = 87.3 \times 1 \times 23 = 20.08 \\ \quad \quad Q = 9.7 \times 1 \times 30 = \underline{2.91} \\ \quad \quad \quad \quad \quad \quad \quad \quad 22.99 \text{ cfs} \end{array}$$

$$\begin{array}{l} \text{After } Q = 87.3 \times 1 \times 26 = 22.70 \\ \quad \quad Q = 9.3 \times 1 \times 33 = \underline{3.07} \\ \quad \quad \quad \quad \quad \quad \quad \quad 25.77 \text{ cfs} \end{array}$$

The increase in run-off is 2.78 cfs (1245 gpm) in 1" 10 year storm. This is a small increase in run-off.

## SEDIMENTS AND POLLUTANTS:

During the construction a certain amount of sediments will appear in the run-off. This will be curtailed by settlement ponds located in selected areas. Silt fences and strawbale dams will also be used extensively.

An NPDES C1200 permit plan will be submitted to DEQ and County prior to construction for approval. This permit will require many activities which will reduce erosion and pollution.

Permanent Bio-swales will be constructed along the low (down slope) side of all Fairways and most Tees and Greens. A couple of par-3 Tees will not have Bio-swales because of the small areas involved.

The run-off will be collected from the Fairways by catchbasins in low areas and transported to the swales. The pollutants such as the excess pesticides, herbicides, fertilizers and oil/grease will be filtered out in the bio-swales and disposed of in the surrounding soil.

A small amount of clean water will be discharged into the adjacent creeks from the bio-swale. After the project is completed, there will be very little erosion occurring. Water will flow into existing creeks which has carried water for years. It will be a less water being discharged because bio swales will allow water to seep into the soil. Erosion will be reduced.

### SUMMARY:

Three (3) plansheets are attached showing plans and details of the proposed concept. This planned drainage and removal of pollutants are widely used today in parks, golf courses, highways, subdivisions, and similar constructions.

Before construction starts, a detailed plan for the stormwater run-off will have to be prepared and submitted to DEQ for approval.

The NPDES C1200 permit has to be approved before any work on the Fairway drainage and the bio-swales are started.

### Attachments:

- Stormwater Plan for  
Golf Course
- Construction Details