Appendix 5 Hydrology

5A

Hydrology and Hydraulics Drainage Report for Sunbelt Center II. Holms Enterprises, Inc. October 3, 2005.

HYDROLOGY AND HYDRAULICS DRAINAGE REPORT

FOR

SUNBELT CORPORATE CENTER II

05-CUP-006

APN: 2053-01-8

10-25-05

LOCATED AT
CANWOOD STREET
AGOURA HILLS CALIFORNIA

PREPARED FOR

SUNBELT ENTERPRISES

1801 SOLAR DRIVE
OXNARD CALIFORNIA

OCT. 03, 2005

PREPARED BY:

HOLMES ENTERPRISES, INC

STRUCTURAL and CIVIL ENGINEERING
200 Wicks Road Moorpark, CA 93021

REGISTERED PROFESSIONAL ENGINEER
DANNY P. HOLMES
No. 24769
Exp: 12/31/05
CIVIL
STATE OF CALIFORNIA

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 Wicks Road Moorpark CA 93021 (805) 532-1571

Project CANWOOD Location CANWOOD ST, AGOURA HILLS CA Date OCT 3, 2005

RUN-OFF FROM OFF-SITE

DATA:

Watershed Area, A	=	3.40 ac	see Attachment "A"
Soil Type	=	028	
Runoff Coefficient Group	=	B	
Rainfall Zone	=	K	
Capital Flood Q	=	4.5 cfs/Ac	see Attachment "M-2"
Design Q	=	15.3 cfs	

Runoff from offsite north east of the property will be directed to the CMP culvert.

CALCULATION:

Using Land Development Desktop Channel Calculator - CMP Pipe

Manning Pipe Calculator

Given Input Data:
Shape ..... Circular
Solving for ..... Flowrate
Diameter ..... 30.0000 in
Depth ..... 24.0000 in
Slope ..... 0.0100 ft/ft
Manning's n ..... 0.0200 **CMP Pipe**

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 Wicks Road Moorpark CA 93021 (805) 532-1571

Project *CANWOOD* Location *CANWOOD ST, AGOURA HILLS CA* Date *OCT 3, 2005*

Computed Results:

Flowrate	**26.0604 cfs**	> Design Q =	15.30 cfs ...ok
Area	4.9087 ft2		
Wetted Area	4.2098 ft2		
Wetted Perimeter	66.4289 in		
Perimeter	94.2478 in		
Velocity	6.1904 fps		
Hydraulic Radius	9.1258 in		
Percent Full	80.0000 %		
Full flow Flowrate	26.6611 cfs		
Full flow velocity	5.4314 fps		

Critical Information

Critical depth	21.9566 in
Critical slope	0.0130 ft/ft
Critical velocity	7.0879 fps
Critical area	3.9037 ft2
Critical perimeter	61.0371 in
Critical hydraulic radius	9.2096 in
Critical top width	30.0000 in
Specific energy	2.6347 ft
Minimum energy	2.7446 ft
Froude number	0.8562
Flow condition	Subcritical

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 Wicks Road Moorpark CA 93021 (805) 532-1571

Project *CANWOOD* Location *CANWOOD ST, AGOURA HILLS CA* Date *OCT 3, 2005*

RUN-OFF CALCULATION FROM OFF-SITE

DATA:

Catchment Area.	=	3.40 acres	**see Attachment "A"**
Soil Type	=	028	
Runoff Coefficient Group	=	B	
Rainfall Zone	=	K	

CALCULATION:

Runoff:

Peak Runoff per Acre	=	4.00 cfs/Ac	**see Attachment "B"**
Peak Runoff	=	13.60 cfs	

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 Wicks Road Moorpark CA 93021 (805) 532-1571

Project CANWOOD Location CANWOOD ST, AGOURA HILLS CA Date OCT 3, 2005

85th Percentile Design Goal Implementation Considerations

DATA:

Total Area for Development, A_{total}	=	3.40 acres	=	148104 ft²
Total Impervious Area after Development, A_I	=	1.73 acres	=	75533 ft²
Impervious Area Runoff Coefficient, C_I	=	0.53		
Precip. from the 85th percentile, 24-hr storm event, P	=	0.75 in/24 hr		
Precip. from the 85th percentile, 1-hr storm event, P	=	0.10 in/hr		
Safety Factor, Flow Based BMP, SF	=	2		

CALCULATION:

Stormwater Runoff generated from the 85th percentile storm-event, R

Volume Based BMP

$R = P * A_I * C_I$ = 2502.03 ft³/24 hrs
= 0.03 cfs

Flow Based BMP

$R = P * A_I * C_I * SF$ = 667.21 ft³/hr
= 0.19 cfs

Area (Acres)	Capital Flood Q's by Rainfall Zone:				
	I	J	K	L	M
0.5	2.0	1.5	2.3	2.8	3.3
1.0	4.0	2.9	4.5	5.6	6.5
1.5	5.9	4.4	6.8	8.4	9.8
2.0	7.9	5.9	9.1	11.0	13.0
2.5	9.9	7.4	11.0	14.0	16.0
3.0	12.0	8.8	14.0	17.0	20.0
3.5	14.0	10.0	16.0	19.0	23.0
4.0	16.0	12.0	18.0	22.0	26.0
4.5	18.0	13.0	20.0	25.0	29.0
5.0	20.0	15.0	23.0	28.0	33.0
5.5	22.0	16.0	25.0	31.0	36.0
6.0	24.0	18.0	27.0	33.0	39.0
6.5	26.0	19.0	29.0	36.0	42.0
7.0	28.0	21.0	32.0	39.0	46.0
7.5	30.0	22.0	34.0	42.0	49.0
8.0	32.0	24.0	36.0	45.0	52.0
8.5	34.0	25.0	39.0	47.0	56.0
9.0	36.0	26.0	41.0	50.0	59.0
9.5	38.0	28.0	43.0	53.0	62.0
10.0	40.0	29.0	45.0	55.0	65.0

NOT for use for Areas Greater Than 10 Acres.

QAREA2.TAB

Flood Level Adjustment	
Flood Level	Factor
10 Yrs. Urban	0.696 0.855

To Adjust from a Capital Flood to a 10-Year or Urban Flood, Multiply the Table Q by the Factor.

Los Angeles County Department of Public Works

CAPITAL FLOOD Q'S FOR SMALL DEVELOPED DRAINAGE AREAS - RUNOFF COEFFICIENT GROUP A

December 1990

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 Wicks Road Moorpark CA 93021 (805) 532-1571

Project *CANWOOD* Location *CANWOOD ST, AGOURA HILLS CA* Date *OCT 3, 2005*

GRASS SWALE FILTER CALCULATION

CALCULATION:

Banks		=	6 : 1
Bottom Width, W_{bot}		=	10.0 ft
Top Width, W_{top}		=	14.0 ft
Depth Of Flow, D		=	0.3 ft
Design Area, A		=	4.0 ft^2
Wetted Perimeter, P		=	14.0 ft
Hydraulic Radius, R = A/P		=	0.3 ft
Slope, S		=	0.50 %
Roughness Coeff., n	Grass	=	0.200
$Q_{ditch} = A*(1.49/n)*R^{2/3}*S^{1/2}$		=	0.9 cfs
Velocity, V = QA		=	0.23 ft/s
Design Length, L = (7min)*V*60		=	95 ft

THEREFORE PROVIDE 95 L.F. OF GRASSY SWALE 10 FT WIDE @ SOUTH END OF PROPERTY PARALLEL TO CANWOOD.

5B
Hydrology and SUSMP Calculations for Sunbelt Corporate Center II. Holms Enterprises, Inc. October 2008.

HYDROLOGY AND SUSMP CALCULATIONS

FOR

SUNBELT CORPORATE CENTER II

05-CUP-006

LOCATED AT
CANWOOD STREET
AGOURA HILLS, CALIFORNIA

PREPARED FOR

SUNBELT ENTERPRISES
1801 SOLAR DRIVE
OXNARD CALIFORNIA

OCTOBER 17 2008

PREPARED BY:

HOLMES ENTERPRISES, INC
STRUCTURAL and CIVIL ENGINEERING
200 Wicks Road Moorpark, CA 93021

10/23/08
memo

TABLE OF CONTENTS

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

A. SUMMARY OF RESULTS

PRE-DEVELOPED SUMMARY

The existing site is 3.23 acres in area and presently vacant with groundcover of natural seasonal grasses. Currently, the storm water from the site and off-site drains onto the existing 36" cmp crossing the Canwood St.

DEVELOPED SUMMARY

The proposed development consists of two 12,600 square foot 2-story office building, parking lots, driveway and accessories. The development will result in additional stormwater runoff due to the proposed 51% impervious area. This runoff will be directed into the existing 36" cmp via series of catch basin and storm drain pipe.

SUSMP SUMMARY

To mitigate the increased in stormwater pollutants, Flo-gard inserts will be added onto the catch basin.

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Sunbelt-6 ***Canwood Street*** ***01/18/06***

SUMMARY

Q_{50}	Pre-developed	=	**9.48** cfs
Q_{50}	Post-developed	=	**12.17** cfs
Q_{SUSMP}		=	**0.74** cfs

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Sunbelt-6 ***Canwood Street*** ***01/18/06***

B. PRE-DEVELOPED ANALYSIS

DATA

Type Of Development	**Undeveloped**			
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Total Undeveloped Upstream Area	Au	=	**3.40**	Ac
Length of Overland Flow	L	=	**748**	ft
Ave. Slope of Overland Flow	S = V/H V= 115'	=	**0.16**	

CALCULATION

Undeveloped Runoff Coefficient — Cu — *App. D-47*

Rainfall Intensity (in/hr) — Ix — *App. C-28*

Time of Concentration (min) — $Tc = 10^{-0.507} * (C*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

50 YEAR FREQUENCY

Iteration No.	Initial Tc	Ix	Cu	C*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.67**	**2.55**	**6.0**	**0.99**
2	**6**	**4.10**	**0.68**	**2.79**	**5.7**	**-0.28**

Acceptable Tc Value = **6** min

Q_{50_PRE} flow rate — $Q_{50\_PRE} = Cd*Ix*A_{TOTAL}$ = **9.48** (cfs)

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page _____ Date ***10/16/08***

C. POST-DEVELOPED ANALYSIS

C.1 AREA 1

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.540**	Ac
Pervious Area	Ap	=	**0.090**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.27**	Ac
Length of Overland Flow	L	=	**540**	ft
Ave. Slope of Overland Flow	S = V/H	= V= 86	**0.16** 540	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.900**	Ac
% of Project Impervious	A_I	=	**0.60**	%
% of Project Pervious	A_P	=	**0.10**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.30**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page _____ Date ***10/16/08***

Undeveloped Runoff Coefficient — Cu — *App. D-47*

Developed Runoff Coefficient — Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) — Ix — *App. C-28*

Time of Concentration (min) — $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.10**	**0.83**	**3.18**	**4.57**	**-0.43**

Acceptable Tc Value = **5** min

Q_{50} flow rate — $Q_{50} = Cd*Ix*A_{TOTAL}$ = **2.86** (cfs)

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

C. POST-DEVELOPED ANALYSIS ...cont"d

C.2 AREA 2

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.910**	Ac
Pervious Area	Ap	=	**0.450**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.64**	Ac
Length of Overland Flow	L	=	**622**	ft
Ave. Slope of Overland Flow	S = V/H V=103 '	= H=622'	**0.16**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**2.000**	Ac
% of Project Impervious	A_I	=	**0.46**	%
% of Project Pervious	A_P	=	**0.23**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.32**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page _____ Date ***01/18/06***

Undeveloped Runoff Coefficient Cu *App. D-47*

Developed Runoff Coefficient $Cd = (0.9*Imp)+[(1-Imp)*Cu]$

Rainfall Intensity (in/hr) Ix *App. C-28*

Time of Concentration (min) $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.10**	**0.83**	**3.18**	**4.89**	**-0.11**

Acceptable Tc Value = **5** min

Q_{50} flow rate $Q_{50} = Cd*Ix*A_{TOTAL}$ = **6.35** (cfs)

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

C. POST-DEVELOPED ANALYSIS ...cont"d

C.3 AREA 3

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.100**	Ac
Pervious Area	Ap	=	**0.100**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**114**	ft
Ave. Slope of Overland Flow	S = V/H V=8'	=	**0.07**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.200**	Ac
% of Project Impervious	A_I	=	**0.50**	%
% of Project Pervious	A_P	=	**0.50**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page _____ Date ***01/18/06***

Undeveloped Runoff Coefficient — Cu — *App. D-47*

Developed Runoff Coefficient — Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) — Ix — *App. C-28*

Time of Concentration (min) — $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.10**	**0.83**	**3.18**	**2**	**-2.59**

Acceptable Tc Value = **5** min

Q_{50} flow rate — $Q_{50} = Cd*Ix*A_{TOTAL}$ = **0.64** (cfs)

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

C. POST-DEVELOPED ANALYSIS ...cont"d

C.4 AREA 4

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.046**	Ac
Pervious Area	Ap	=	**0.414**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**192**	ft
Ave. Slope of Overland Flow	S = V/H	=	**0.03**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.460**	Ac
% of Project Impervious	A_I	=	**0.10**	%
% of Project Pervious	A_P	=	**0.90**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***10/16/08***

Undeveloped Runoff Coefficient — Cu — *App. D-47*

Developed Runoff Coefficient — $Cd = (0.9*Imp)+[(1-Imp)*Cu]$

Rainfall Intensity (in/hr) — Ix — *App. C-28*

Time of Concentration (min) — $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.10**	**0.83**	**3.18**	**3**	**-1.53**

Acceptable Tc Value = **5** min

Q_{50} flow rate — $Q_{50} = Cd*Ix*A_{TOTAL}$ = **1.46** (cfs)

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

C. POST-DEVELOPED ANALYSIS ...cont"d

C.5 AREA 5

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.216**	Ac
Pervious Area	Ap	=	**0.054**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**210**	ft
Ave. Slope of Overland Flow	S = V/H	=	**0.03**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.270**	Ac
% of Project Impervious	A_I	=	**0.80**	%
% of Project Pervious	A_P	=	**0.20**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Page

Project ***Sunbelt-6*** Location ***Canwood Street*** Date ***01/18/06***

Undeveloped Runoff Coefficient Cu *App. D-47*

Developed Runoff Coefficient Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) Ix *App. C-28*

Time of Concentration (min) $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**3.84**	**0.10**	**0.83**	**3.18**	**4**	**-1.37**

Acceptable Tc Value = **5** min

Q_{50} flow rate $Q_{50} = Cd*Ix*A_{TOTAL}$ = **0.86** (cfs)

USE FLO-GARD FF-18D

INLET I.D. = **18"x18"**
FILTERED FLOW = **0.5 cfs**

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

D. SUSMP ANALYSIS

D.1 AREA 1

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.540**	Ac
Pervious Area	Ap	=	**0.090**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.27**	Ac
Length of Overland Flow	L	=	**540**	ft
Ave. Slope of Overland Flow	S = V/H V+86	=	**0.16**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.900**	Ac
% of Project Impervious	A_I	=	**0.60**	%
% of Project Pervious	A_P	=	**0.10**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.30**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

Undeveloped Runoff Coefficient Cu *App. D-47*

Developed Runoff Coefficient Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) Ix *Table 1*

Time of Concentration (min) $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**0.447**	**0.10**	**0.83**	**0.37**	**14**	**8.95**
2	**15**	**0.267**	**0.10**	**0.83**	**0.22**	**18**	**3.22**
3	**21**	**0.228**	**0.10**	**0.83**	**0.19**	**20**	**-1.22**

Acceptable Tc Value = **21** min

Peak Mitigated Flow Rate $Qpm = Cd*Ix*A_{TOTAL}$ = **0.17** (cfs)

USE FLO-GARD FF-18D

INLET I.D. = 18"x18"
FILTERED FLOW = 0.5 cfs

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

D. SUSMP ANALYSIS ...cont'd

D.2 AREA 2

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.910**	Ac
Pervious Area	Ap	=	**0.450**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.64**	Ac
Length of Overland Flow	L	=	**622**	ft
Ave. Slope of Overland Flow	S = V/H V=103'	=	**0.16**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**2.000**	Ac
% of Project Impervious	A_I	=	**0.46**	%
% of Project Pervious	A_P	=	**0.23**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.32**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

Undeveloped Runoff Coefficient — Cu — *App. D-47*

Developed Runoff Coefficient — Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) — Ix — *Table 1*

Time of Concentration (min) — $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**0.447**	**0.10**	**0.83**	**0.37**	**15**	**9.93**
2	**15**	**0.267**	**0.10**	**0.83**	**0.22**	**20**	**4.51**
3	**21**	**0.228**	**0.10**	**0.83**	**0.19**	**21**	**0.18**
4	**25**	**0.210**	**0.10**	**0.83**	**0.17**	**22**	**-2.90**

Acceptable Tc Value = **25** min

Peak Mitigated Flow Rate — $Qpm = Cd*Ix*A_{TOTAL}$ = **0.35** (cfs)

USE FLO-GARD FF-18D

INLET I.D. = 18"x18"
FILTERED FLOW = 0.5 cfs

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

D. SUSMP ANALYSIS ...cont'd

D.3 AREA 3

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.100**	Ac
Pervious Area	Ap	=	**0.100**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**114**	ft
Ave. Slope of Overland Flow	S = V/H V=8'	=	**0.07**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.200**	Ac
% of Project Impervious	A_I	=	**0.50**	%
% of Project Pervious	A_P	=	**0.50**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%

HOLMES ENTERPRISES, INC.

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200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page _____ Date ***01/18/06***

Undeveloped Runoff Coefficient Cu *App. D-47*

Developed Runoff Coefficient Cd = (0.9*Imp)+[(1-Imp)*Cu]

Rainfall Intensity (in/hr) Ix *Table 1*

Time of Concentration (min) $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**0.447**	**0.10**	**0.83**	**0.37**	**7**	**2.36**
2	**15**	**0.267**	**0.10**	**0.83**	**0.22**	**10**	**-5.39**

Acceptable Tc Value = **14** min

Peak Mitigated Flow Rate $Qpm = Cd*Ix*A_{TOTAL}$ = **0.04** (cfs)

USE FLO-GARD FF-18D

INLET I.D. = **18"x18"**
FILTERED FLOW = **0.5 cfs**

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

D. SUSMP ANALYSIS ...cont'd

D.4 AREA 4

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.046**	Ac
Pervious Area	Ap	=	**0.414**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**192**	ft
Ave. Slope of Overland Flow	S = V/H	=	**0.03**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.460**	Ac
% of Project Impervious	A_I	=	**0.10**	%
% of Project Pervious	A_P	=	**0.90**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

Undeveloped Runoff Coefficient Cu *App. D-47*

Developed Runoff Coefficient $Cd = (0.9*Imp)+[(1-Imp)*Cu]$

Rainfall Intensity (in/hr) Ix *Table 1*

Time of Concentration (min) $Tc = 10^{-0.507} * (Cd*Ix)^{-0.519} * L^{0.483} * S^{-0.135}$

Iteration No.	Initial Tc	Ix	Cu	Cd	Cd*Ix	Calc. Tc	Diff. (min)
1	**5**	**0.447**	**0.10**	**0.83**	**0.37**	**11**	**5.61**
2	**15**	**0.267**	**0.10**	**0.83**	**0.22**	**14**	**-1.14**

Acceptable Tc Value = **14** min

Peak Mitigated Flow Rate $Qpm = Cd*Ix*A_{TOTAL}$ = **0.10** (cfs)

USE FLO-GARD FF-18D

INLET I.D. = 18"x18"
FILTERED FLOW = 0.5 cfs

HOLMES ENTERPRISES, INC.

Structural and Civil Engineering

200 WICKS ROAD MOORPARK CA 93021 (805) 532-1571

Project ***Sunbelt-6*** Location ***Canwood Street*** Page ____ Date ***01/18/06***

D. SUSMP ANALYSIS ...cont'd

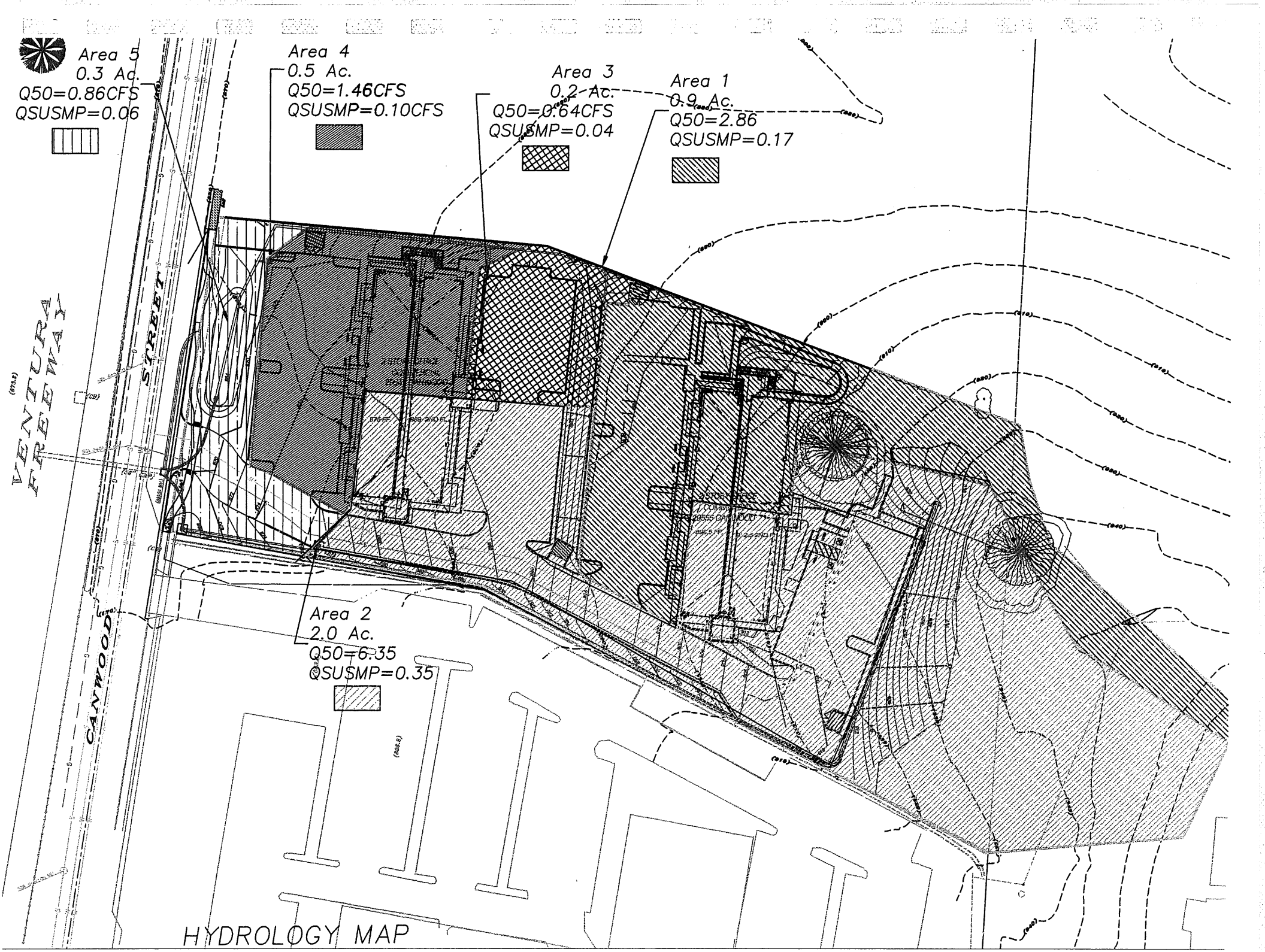
D.5 AREA 5

DATA

Type Of Development	**Commercial Office Buildings**			
Proportion Impervious	Imp	=	**0.909**	
Soil Type			**028**	
Runoff Coefficient Group			**B**	
Rainfall Zone			**K**	
Impervious Area	Ai	=	**0.216**	Ac
Pervious Area	Ap	=	**0.054**	Ac
Total Contributing Undeveloped Upstream Area	Au	=	**0.00**	Ac
Length of Overland Flow	L	=	**210**	ft
Ave. Slope of Overland Flow	S = V/H	=	**0.03**	

CALCULATION

Total Drainage Area	A_{TOTAL} = Ai +Ap +Au	=	**0.270**	Ac
% of Project Impervious	A_I	=	**0.80**	%
% of Project Pervious	A_P	=	**0.20**	%
% of Project Contributing Undeveloped Area	A_U	=	**0.00**	%


Area 5
0.3 Ac.
Q50=0.86CFS
QSUSMP=0.06
Area 4
0.5 Ac.
Q50=1.46CFS
QSUSMP=0.10CFS
Area 3
0.2 Ac.
Q50=0.64CFS
QSUSMP=0.04
Area 1
0.9 Ac.
Q50=2.86
QSUSMP=0.17
Area 2
2.0 Ac.
Q50=6.35
QSUSMP=0.35
VENTURA FREEWAY
CANWOOD STREET
HYDROLOGY MAP

5C
Stormwater Pollution Prevention Plan for Sunbelt Properties 29541, 29555 Canwood Street, Agoura Hills, California. July 2008.

Ventura Countywide Stormwater Quality Management Program

COUNTY OF VENTURA
CITY OF OXNARD

STORM WATER

POLLUTION

PREVENTION PLAN

FOR

SUNBELT PROPERTIES
29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

STORM WATER POLLUTION PREVENTION PLAN

for

SUNBELT PROPERTIES
29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

Owner/Developer/Contractor:

Sunbelt Properties
1801 Solar Dr.
Oxnard, CA 93030
(805) 604-0700
John Brock

Project Site Location/Address

29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

SWPPP Prepared by:

HOLMES ENTERPRISES
200 WICKS ROAD
MOORPARK, CA 93021
(805) 532-1571

SWPPP Preparation Date

July. 2008

Estimated Start Date of Project

December 15, 2008

Estimated Finish Date of Project

December 15, 2009

WDID No.

Contents

00-1
Section 500 Body of SWPPP

5

00-1

Section 100
Section 101SWPPP Certifications and Approval

100.1 Initial SWPPP Certification by Architect/Engineer or Authorized Qualified Designee

Project:, **29541,29555 CANWOOD STREET**
AGOURA HILLS CALIFORNIA

AP# **2053-001-008**

"As the Architect/Engineer of record, I have selected appropriate BMPs to effectively minimize the negative impacts of this project's construction activities on storm water quality. The project owner/developer/ contractor is aware that the selected BMPs must be installed, monitored, and maintained to ensure their effectiveness. The BMPs not selected for implementation are redundant or deemed not applicable to the proposed construction activity."

HOLMES ENTERPRISES
200 WICKS ROAD
MOORPARK, CA 93021
(805) 532-1571

DANNY P. HOLMES

100.2 SWPPP Owner/Developer/Contractor Approval and Certification

Owner/Developer/Contractor's Approval and Certification of the Storm Water Pollution Prevention Plan

Project name: 29541,29555 CANWOOD STREET AGOURA HILLS CALIFORNIA

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is true, accurate and complete. I am aware that submitting false and/or inaccurate information, failing to update the SWPPP to reflect current conditions, or failing to properly and/or adequately implement the SWPPP may result in revocation of grading and/or other permits or other sanctions provided by law."

John Brock

Sunbelt Properties

1801 Solar Dr.

Oxnard, CA 93030

Acceptance or approval of this Storm Water Pollution Prevention Plan in no way precludes the authority of the agency to require modification to the plan as conditions warrant, nor does agency take responsibility for performance of BMPs provided for in the Plan.

100.3 Annual Compliance Certification

By July 1 of each year, the Owner/Developer/Contractor shall submit an Annual Certification of Compliance to the appropriate Regional Water Quality Control Board (RWQCB), stating compliance with the terms and conditions of the Permit and the SWPPP. The Annual Certification of Compliance Form and Owner/Developer/Contractor's Approval Form are included in Attachment M. Completed Annual Certifications of Compliance and Approvals can be found in the following pages.

Section 200SWPPP Amendments

200.1SWPPP Amendment Certification and Approval

This SWPPP shall be amended:

- Whenever there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4); or
- If any condition of the Permit is violated or the general objective of reducing or eliminating pollutants in storm water discharges has not been achieved. If the RWQCB or a local agency determines that a Permit violation has occurred, the SWPPP shall be amended and implemented within 14-calendar days after notification by the RWQCB; and/or
- When deemed necessary by the Owner/Developer/Contractor.

The amendments for this SWPPP, along with the Owner/Developer/Contractor's Certification and the Owner/Developer/Contractor's approval, can be found in the following pages. Amendments are listed in the Amendment Log in section 200.2

SWPPP Amendment No.

Project Name: 29541,29555 CANWOOD STREET AGOURA HILLS CALIFORNIA

Owner/Developer/Contractor's Approval and Certification of the Storm Water Pollution Prevention Plan Amendment

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

_____

John Brock
Sunbelt Properties
1801 Solar Dr.
Oxnard, CA 93030

200.2Amendment Log

Amendment No.	Date	Brief Description of Amendment	Prepared By

Section 301 Introduction and Project Description

300.1 Introduction and Project Description

The project consists of the improvement of 3.3 acre vacant lot as an medical office building with parking.

300.2 Unique Site Features

The site is situated at the north side of Canwood Ave. and the Ventura Freeway in the City of Agoura. The site slopes from North to South at an average slope of 12%.

300.3 Construction Site Estimates

The following are estimates of the construction site:

Construction site area: 3.3 acres

Percentage impervious area before construction: 100%

Runoff coefficient before construction (1):

Percentage impervious area after construction: 65.0%

Runoff coefficient after construction (1): 0.86

Anticipated storm water flow onto the construction site: 0

(1) Calculations are shown in Attachment D
(2) Calculations are shown in Attachment E

300.4 Construction Activities Schedule

Written Schedule

Estimate Construction Start: 12/15/08
Estimate Construction Finish: 12/15/09
Mobilization of equipment and materials to begin on 12/10/08
Install stabilized construction entrance on 12/10/08
Site preparation: Removal ,Recompaction
Excavation operations 12/15/2008-04/01/2008
Operations complete 12/15/2009

300.5 Contact Information/List of Responsible Parties

The Storm Water Pollution Prevention Manager (SWPPM) that shall have primary responsibility and significant authority for the management, implementation, maintenance, inspection and amendments to the approved SWPPP for this project

John Brock
Sunbelt Properties
1801 Solar Dr.
Oxnard, CA 93030

Duties of this person include but are not limited to:

- Ensuring full compliance with the SWPPP and the Permits
- Implementing all elements of the SWPPP, including but not limited to:
  - Implementation of prompt and effective erosion and sediment control measures
  - Implementing all non-storm water management, and materials and waste management activities such as: monitoring discharges (dewatering, diversion devices); general site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.
- Pre-storm inspections
- Storm event inspections
- Post-storm inspections
- Monthly inspections
- Updates/Amendments to the SWPPP, as needed
- Preparing annual compliance certification
- Ensuring elimination of all unauthorized discharges
- The responsible person shall be assigned authority by the Owner/Developer/Contractor to mobilize crews to make immediate repairs to the control measures
- Coordinate with the Owner/Developer/Contractor to assure all the necessary corrections/repairs are made immediately, and that the project complies with the SWPPP, the Permit and approved plans at all times.

Section 400
References

The following documents are made a part of this SWPPP by reference:

- Project plans, City of Oxnard DWG
- State Water Resources Control Board (SWRCB) Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity, August 1999.
- Caltrans Storm Water Quality Handbooks, Construction Site Best Management Practices Manual, dated November 2000.
- Caltrans Storm Water Quality Handbooks, SWPPP/WPCP Preparation Manual, dated November 2000
- California Storm Water Best Management Practices Handbook, January2003
- Ventura Countywide Stormwater Program AutoCAD Cover Sheet

Section 500
500.1 Objectives

This Storm Water Pollution Prevention Plan (SWPPP) has six main objectives:

- Identify all pollutant sources, including sources of sediment that may affect the quality of storm water discharges associated with construction activity (storm water discharges) from the construction site, and
- Identify non-storm water discharges that will be prevented or eliminated, and
- Identify, construct, implement in accordance with a time schedule, and maintain Best Management Practices (BMPs) to reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from the construction site during construction, and
- Develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs).

- Identify a sampling and analysis strategy and sampling schedule for discharges from construction activity which discharge directly into water bodies listed on Attachment 3 of the Permit (Clean Water Act Section 303(d) [303(d)] Water Bodies listed for Sedimentation).

- For all construction activity, identify a sampling and analysis strategy and sampling schedule for discharges that have been discovered through visual monitoring to be potentially contaminated by pollutants not visually detectable in the runoff.

This SWPPP conforms with the required elements of the General Permit No. CAS000002 issued by the State of California, State Water Resources Control Board (SWRCB). This SWPPP will be modified and amended to reflect any changes in the site conditions or construction activities that may affect the discharge of pollutants from the construction site to surface waters, groundwaters, or the municipal separate storm sewer system (MS4). The SWPPP will also be amended if it is in violation of any condition of the Permit or has not achieved the general objective of reducing pollutants in storm water discharges. The SWPPP shall be readily available on-site for the duration of the project.

500.2 VICINITY MAP

The construction project vicinity map showing the project location, surface water boundary geographic features, construction site perimeter and general topography is located in Attachment A.

500.3 Pollutant Source Identification and BMP Selection

500.3.1 Inventory of Materials and Activities that May Pollute Storm Water

The following is a list of construction materials that will be used and activities that will be performed that have the potential to contribute pollutants, other than sediment, to storm water runoff (control practices for each activity are identified in the Site Plans (Site Plans) and/or in Sections 500.3.4 through 500.3.9:

- Vehicle fluids, including oil, grease, petroleum, and coolants
- Asphaltic emulsions associated with asphalt-concrete paving operations

Construction activities that have the potential to contribute sediment to storm water discharges include:

- Clear and grub operations
- Grading operations
- Vehicle operation and maintenance
- Utility excavation operations

Attachment C lists all Best Management Practices (BMPs) that are minimum requirements, and all BMPs selected by the Owner/Developer/Contractor and/or Architect/Engineer of record for the appropriate construction activities for this project. Implementation and location of BMPs are shown on the Site Plans in Attachment B. Narrative descriptions of BMPs to be used during the project are listed by category in each of the following SWPPP sections.

500.3.2 Existing (pre-construction) Control Measures

- None.

500.3.3 Fill Material and Existing Data Describing the Soil

- Native Soil is composed of brown to deep grayish brown sandy silt that was found to be firm to stiff and containing rootlets in the upper foot.
- The underlying bedrock is composed of dense (Saugus formation) silty sand.
- There are no existing site condition presently known to contribute pollutants to storm water.

500.3.4 Soil Stabilization (Erosion Control)

Soil stabilization, also referred to as erosion control, consists of source control measures that are designed to prevent soil particles from detaching and becoming suspended in storm water runoff. Soil stabilization BMPs protect the soil surface by covering and/or binding soil particles. This project will incorporate effective temporary soil stabilization measures selected by the Owner/Developer/Contractor. This project will utilize and implement the following principles for effective temporary and final soil stabilization during construction:

Preserve existing vegetation where required and when feasible.
Apply temporary soil stabilization (erosion control) to remaining active and non-active areas. Reapply as necessary to maintain effectiveness.
Stabilize non-active areas within 14 days of cessation of construction activities.
Control erosion in concentrated flow paths by applying erosion control blankets, erosion control seeding, and lining swales.
Seeding/vegetation will be applied either during the defined seeding window, and/or to areas deemed substantially complete by the Owner/Developer/Contractor during the defined rainy season.
At completion of construction, apply permanent erosion control to all remaining disturbed soil areas.

Sufficient quantities of temporary soil stabilization materials will be maintained on-site to allow implementation as described in this SWPPP. This includes implementation requirements for active areas, non-active areas, and areas that require deployment before the onset of rain.

Implementation and locations of temporary soil stabilization BMPs are shown on the Site Plans in Attachment B and/or described in this section. The BMP Consideration Checklist in Attachment C indicates the BMPs that will be implemented to control erosion on the construction site; these are:

500.3.5 Sediment Control

Sediment controls are structural measures that are intended to complement and enhance the selected soil stabilization (erosion control) measures. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. This project will incorporate temporary sediment control measures selected by the Owner/Developer/Contractor. The temporary sediment control BMPs selected are adequate to prevent a net increase of sediment in storm water discharge relative to pre-construction levels.

Sufficient quantities of temporary sediment control materials will be maintained on-site throughout the duration of the project, to allow implementation of temporary sediment controls in the event of predicted rain, and for rapid response to failures or emergencies, as described in this SWPPP. This includes implementation requirements for active areas and non-active areas before the onset of rain.

Implementation and locations of temporary sediment control BMPs are shown on the Site Plans in Attachment B. The BMP Consideration Checklist in Attachment C indicates all the BMPs that will be implemented to control sediment on the construction site; these are:

- SC-10, Storm drain inlet protection

500.3.6 Tracking Control

The following BMPs have been selected to reduce sediment tracking from the construction site onto paved private or public roads:

- TC-1, Stabilized Construction Entrance/Exit
  - A stabilized construction entrance/exit will be constructed and maintained at construction site entrances and exits as shown on the site map/site plans.

500.3.7 Wind Erosion Control

The following BMPs have been selected to control dust from the construction site:

- Potable water will be applied to disturbed soil areas of the project site to control dust. The water will be applied using water trucks.
- BMP WE-1, Wind Erosion Control, and BMP NS-1, Water Conservation Practices, will be implemented to provide dust control and prevent discharges from dust control activities and water supply equipment. Water application rates will be minimized as necessary to prevent runoff and ponding and water equipment leaks will be repaired immediately.
- During windy conditions (forecast or actual wind conditions of approximately 25 mph or greater), dust control will be applied to DSAs to adequately control wind erosion.

500.3.8 Non-Storm Water Control

An inventory of construction activities and potential non-storm water discharges is provided in Section 5.3.1. The BMP Consideration Checklist in Attachment C and the list below indicates the BMPs that have been selected to control non-storm water pollution on the construction site. Implementation and locations of some non-storm water control BMPs are shown on the Site Plans in Attachment B. Subcontractors and employees whose activities may generate non-storm water discharges will be trained to minimize the potential for such discharges. A narrative description of each BMP follows.

- NS-1, Water Conservation Practices
- NS-3, Paving and Grinding Operations
- NS-8, Vehicle and Equipment Cleaning
- NS-9, Vehicle and Equipment Fueling
- NS-10, Vehicle and Equipment Maintenance
- Several types of vehicles and equipment will be used on-site throughout the project, including, graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, generators and compressors. BMPs NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance will be utilized to prevent discharges of fuel and other vehicle fluids. Except for concrete washout, which is addressed in Section 500.3.9, vehicle cleaning will not be performed on-site.
- Drip pans or plastic sheeting will be used for all vehicle and equipment maintenance activities that involve grease, oil, solvents, or other vehicle fluids.
- All vehicle maintenance and mobile fueling operations will be conducted at least 50 ft away from operational inlets and drainage facilities and on a level graded area.

500.3.9 Waste Management and Materials Pollution Control

An inventory of construction activities, materials, and wastes is provided in Section 5.3.1. The BMP Consideration Checklist in Attachment C and the following list indicates the BMPs that have been selected to control construction site wastes and materials. Implementation and locations of some materials handling and waste management BMPs are shown on the Site Plans in Attachment B. A narrative description of each BMP follows.

- WM-1, Material Delivery and Storage
- WM-2, Material Use
  WM-4, Spill Prevention and Control
- WM-5, Solid Waste Management
- WM-6, Hazardous Waste Management
- WM-8, Concrete Waste Management
- WM-9, Solid Waste Management

Material Delivery, Storage, and Use

In general, BMPs WM-1 and WM-2 will be implemented to help prevent discharges of construction materials during delivery, storage, and use. The general material storage area will be located in the contractor's yard as shown on sheet 4 of the Site Plans. A sandbag barrier (BMP SC-8) will be provided around the storage area to prevent run-on from adjacent areas. Two types of storage/containment facilities will be provided within the storage area to minimize storm water contact with construction materials:

- A watertight shipping container will be used to store hand tools, small parts, and most construction materials that can be carried by hand, such as paint cans, solvents and grease.

- Very large items, such as light standards, framing materials, and stockpiled lumber, will be stored in the open in the general storage area. Such materials will be elevated with wood blocks to minimize contact with run-on.

- Landscaping and building materials will also be stockpiled in the general storage area and will be surrounded with additional sediment controls (i.e., SC-8, Sandbag Barrier). Plastic covers (SS-7, Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats) will be provided if necessary for wind/dust control.

Spill clean-up materials, material safety data sheets, a material inventory, and emergency contact numbers will be maintained and stored in the shipping containers.

Spill Prevention and Control

BMP WM-4, Spill Prevention and Control, will be implemented to contain and clean-up spills and prevent material discharges to the storm drain system. Spill prevention is also discussed above in Material Delivery, Storage, and below in the following waste management and equipment maintenance sections.

Waste Management

BMP WM-5, Solid Waste Management, and BMP WM-6, Hazardous Waste Management will be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes will be loaded directly into trucks for off-site disposal. When on-site storage is necessary, solid wastes will be stored in watertight dumpsters in the general storage area of the contractors yard. Dumpster locations are shown on sheet 4 of the Site Plans. AC and PCC rubble will be stockpiled in the general storage area and will be surrounded with sediment controls (SC-8, Sandbag Barrier). Solid waste, including rubble stockpiles, will be removed and disposed off-site at least weekly. ABC Waste Disposal (License CA9999999) will provide solid waste disposal services. Hazardous wastes will be stored in the shipping containers or covered containment area discussed above for materials storage. Hazardous wastes will be appropriate and clearly marked containers and segregated from other non-waste materials.

Contaminated Soil Management

Contaminated soil management BMPs address the possibility of construction activity near contaminated soils. The construction site has no known history of contaminated soil or other impairments. However, employees will be instructed to recognize evidence of contaminated soil, such as buried debris, discolored soil, and unusual odors.

Concrete Residuals and Washout Wastes

- This project includes placement of about 3-cy of concrete. The estimated maximum washout volume is 3.5 cubic feet. Discharges will consist of rinse water and residual concrete (Portland cement, aggregates, admixture, and water). Concrete pours will not be conducted during or immediately prior to rainfall events.

- BMP WM-8, Concrete Waste Management, will be implemented and a below grade concrete washout facility will be constructed and maintained at the contractor's yard as shown on sheet 4 of the Site Plans. All excess concrete and concrete washout slurries will be discharged to the washout facility for drying. The minimum-sized washout, at 10-ft x 10-ft x 3.3-ft deep, will provide more than sufficient volume to contain concrete washout wastes and waste collected from concrete saw-cutting operations, discussed below. BMP maintenance, waste disposal, and BMP removal will be conducted as described in WM-8. Dried-off concrete may be used as fill material.

Sanitary and Septic Wastes

The contractor will implement BMP WM-9, Sanitary and Septic Waste Management, and portable toilets will be located and maintained at the contractors yard for the duration of the project. Weekly maintenance will be provided each Wednesday by ABC Sanitation (license CA0Q45W) and wastes will be disposed off-site. The toilets will be located away from concentrated flow paths and drainage inlets.

500.4 Site plan: The site plan can be found in attachment B of the SWPPP.

500.5 Construction BMP Maintenance, Inspection and Repair

A program for Maintenance, Inspection and Repair of BMPs is shown in Attachment G.

500.6 Post-Construction Storm Water Management

The following are the post-construction BMPs that are to be used at this construction site after all construction is complete:

Kristar trench drain flogard filter and catch basin filter insert

500.6.2 Operation/Maintenance after Project Completion

The post-construction BMPs that are described above will be funded and maintained by the property owner

500.7 Training

Informal training will include tailgate site briefings to be conducted bi-weekly and address the following topics:

- Erosion Control BMPs
- Sediment Control BMPs
- Non-Storm Water BMPs
- Waste Management and Materials Pollution Control BMPs
- Emergency Procedures specific to the construction site storm water management

The SWPPM attended a three (3) day construction storm water management course given by the County of Los Angeles Storm Water Program in October of 1999. Other personnel attending tailgate training will document attendance using the form in Attachment I.

If needed, formal training sessions will be selected from one of the following organizations:

- Ventura County Stormwater Management Program
- County of Los Angeles Storm Water Program
- State of California Regional Water Quality Control Board
- USEPA sponsored training
- Recognized municipal stakeholder organizations throughout California
- Professional organizations and societies in the building and construction field

This SWPPP was prepared by Holmes Enterprises, Inc., under the direction of Mr. Dan Holmes, a registered Professional Engineer in the State of California.

Section 300.5 shows the name of the Owner/Developer/Contractor's Storm Water Pollution Prevention Manager (SWPPM). This person has received the following training:

- Design and monitoring of numerous SWPP plans.

The training log showing formal and informal training of various personnel is shown in Attachment I.

This SWPPP was prepared by Holmes Enterprises, Inc., Danny Holmes, RCE 24769.

500.8 List of Subcontractors

All contractors and subcontractors will be notified of the requirement for storm water management measures during the project. A list of contractors will be maintained and included in the SWPPP. If subcontractors change during the project, the list will be updated accordingly. The sub-contractor notification letter and log is included in the SWPPP as Attachment J.

500.9 Other Plans/Permits

Following is a list of the plans and permits included in Attachment N of this SWPPP.

- State Water Resources Control Board (SWRCB) Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity, August 1999.

- California Department of Fish and Game Code section 1601 Streambed Alteration Agreement

- Clean Water Act section 401 Water Quality Certification issued by the State of California as processed through the RWQCB

- U.S. Army Corps of Engineers Clean Water Act section 404 Nationwide Permit

Attachment N includes copies of other local, state, and federal plans and permits. Following is a list of the plans and permits included in Attachment N:

- State Water Resources Control Board (SWRCB) Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity, August 1999.

Section 304 Section 600Monitoring Program and Reports

600.1 Site Inspections

The Owner/Developer/Contractor will inspect the site prior to a forecast storm, after a rain event that causes runoff from the construction site, at 24-hour intervals during extended rain events, monthly, and as specified elsewhere in this SWPPP. The results of all inspections and assessments will be documented and copies of the completed inspection checklists will be maintained with the SWPPP. Site inspections conducted for monitoring purposes will be performed using the inspection checklist shown in Attachment H.

The name(s) and contact number(s) of the assigned inspection personnel are listed below:

Assigned inspector: Dan Holmes Contact phone: 805-532-1571

600.2 Monitoring Program for Sedimentation/Siltation

This project does not have the potential to discharge storm water associated with construction activity into a 303(d) listed water body. Therefore, no sampling and analysis program has been developed for monitoring sedimentation/siltation or turbidity.

600.3 Monitoring Program for Pollutants Not Visually Detectable in Storm Water

600.4 Non-Compliance Reporting

If the project is in non-compliance at any time, the Owner/Developer/Contractor will submit a written report to the State Water Resources Control Board (SWRCB) or applicable regional Water Quality Control Board (RWQCB) within 30 days of identification of non-compliance. Corrective measures will be implemented immediately following non-compliance. A sample discharge form is provided in Attachment K.

The report to the Owner/Developer/Contractor will contain the following items:

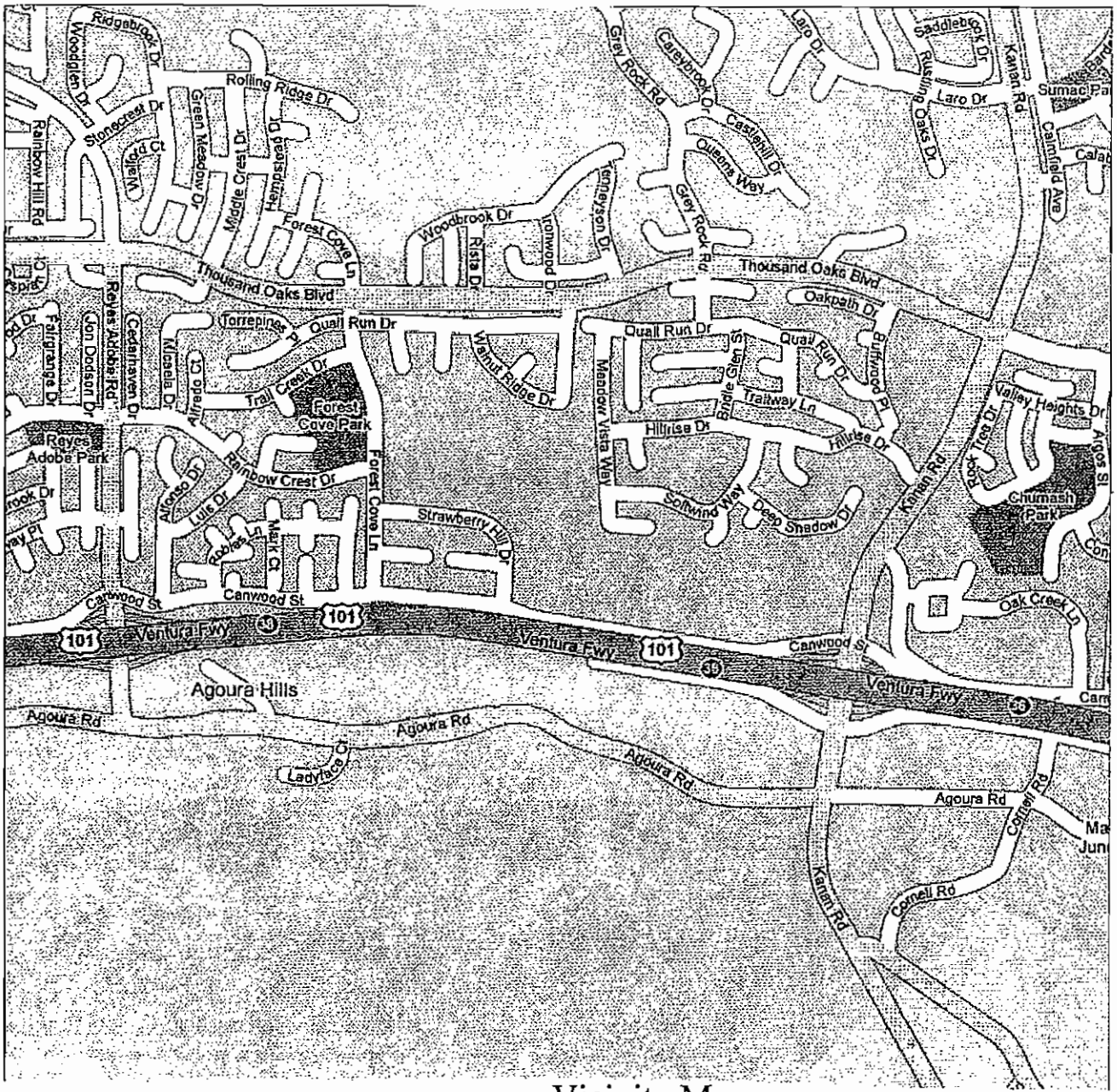
- The date, time, location, nature of operation, and type of unauthorized discharge, including the cause or nature of the notice or order,
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order,
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence, and
- An implementation and maintenance schedule for any affected BMPs

600.5 Record Keeping and Reports

Records shall be retained for a minimum of three years for the following items:

- Site inspections
- Compliance certifications
- Non-compliance reports
- Approved SWPPP document and amendments

Attachment A



Vicinity Map

Attachment C

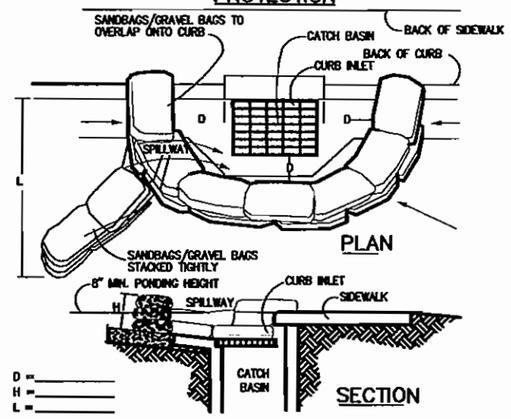
BMP Consideration Checklist

CONSTRUCTION SITE BMPs CONSIDERATION CHECKLIST					
The BMPs listed here should be considered for every project. Those BMPs that are not included in the SWPPP must be checked as "Not Used" with a brief statement describing why it is not being used.					
EROSION CONTROL BMPs					
BMP No.	**BMP**	**CONSIDERED FOR PROJECT**	**CHECK IF USED**	**CHECK IF NOT USED**	**IF NOT USED, STATE REASON**
ES-1	Scheduling	X	X		
ES-2	Preservation of Existing Vegetation		X		
ES-3	Hydraulic Mulch		X		
ES-4	Hydroseeding			X	NOT APPLICABLE TO THIS SITE
ES-5	Soil Binders			X	NOT APPLICABLE TO THIS SITE
ES-6	Straw Mulch		X		
ES-7	Geotextiles & Mats		X		
ES-8	Wood Mulching		X		
ES-9	Earth Dikes & Drainage Swales		X		
ES-10	Velocity Dissipation Devices		X		
ES-11	Slope Drains		X		

GENERAL NOTES

1. BEST MANAGEMENT PRACTICES (BMP'S) CONTAINED HEREIN REFLECT MINIMUM REQUIREMENTS. FOR ADDITIONAL BMP'S REFER TO CALIFORNIA STORMWATER BMP HANDBOOKS.
2. ALL CONSTRUCTION ACTIVITY SHALL BE PERFORMED IN ACCORDANCE WITH A STORMWATER POLLUTION CONTROL PLAN (SWPCP) DEVELOPED AND IMPLEMENTED IN COMPLIANCE WITH REQUIREMENTS OF THE VENTURA COUNTYWIDE STORMWATER QUALITY MANAGEMENT PROGRAM, NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT NO. CAS063339.
3. THE SWPCP SHALL:
   A. IDENTIFY POTENTIAL POLLUTANT SOURCES AND INCLUDE THE DESIGN AND PLACEMENT OF BMP'S TO EFFECTIVELY PROHIBIT THE ENTRY OF POLLUTANTS FROM THE CONSTRUCTION SITE INTO AND ONTO THE STREET AND STORM DRAIN SYSTEM DURING CONSTRUCTION.
   B. BE KEPT ON SITE AND AMENDED TO REFLECT CHANGING CONDITIONS THROUGHOUT THE COARSE OF CONSTRUCTION.
   C. BE KEPT UP TO DATE. ANY ADDITIONAL UPDATES REQUESTED BY AGENCY REPRESENTATIVES ARE TO BE MADE IMMEDIATELY.
4. NON-STORMWATER DISCHARGES ARE PROHIBITED FROM ENTERING ANY STORM DRAIN SYSTEM AND/OR STREET.
5. DISCHARGES OF PUMPED GROUND WATER REQUIRE A DISCHARGE PERMIT FROM THE STATE OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD (RWQCB).
6. POLLUTANTS SHALL BE REMOVED FROM STORMWATER DISCHARGES TO THE MAXIMUM EXTENT PRACTICABLE (MEP) THROUGH DESIGN & IMPLEMENTATION OF THE SWPCP.
7. A STANDBY CREW FOR EMERGENCY WORK SHALL BE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON (NOV. 1 TO APR. 15). NECESSARY MATERIALS SHALL BE AVAILABLE ON SITE AND STOCKPILED AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF EMERGENCY DEVICES WHEN RAIN IS IMMINENT.
8. PORTABLE SANITARY FACILITIES SHALL BE LOCATED ON RELATIVELY LEVEL GROUND AWAY FROM TRAFFIC AREAS, DRAINAGE COURSES, AND STORM DRAIN INLETS.
9. EMPLOYEES, SUBCONTRACTORS AND SUPPLIERS SHALL BE EDUCATED ON ALL BMP'S INCLUDING CONCRETE WASTE STORAGE AND DISPOSAL PROCEDURES.
10. SEDIMENT CONTROL PRACTICES SHALL EFFECTIVELY PREVENT A NET INCREASE OF SEDIMENT LOAD IN STORMWATER DISCHARGE.

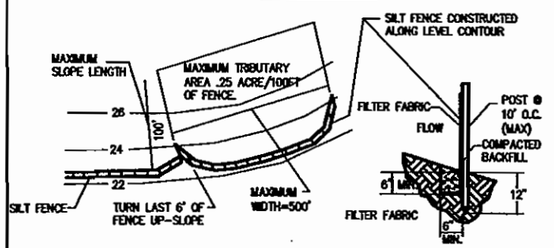
A
CATCH BASIN/INLET PROTECTION



NOTES:

1. CATCH BASIN/INLET PROTECTION SHALL BE INSTALLED WHEREVER THERE IS A POTENTIAL OF STORMWATER OR NON-STORMWATER BEING DISCHARGED INTO IT.
2. INLET PROTECTION IS REQUIRED ALONG WITH OTHER POLLUTION PREVENTION MEASURES SUCH AS; EROSION CONTROL, SOIL STABILIZATION, AND MEASURES TO PREVENT TRACKING ONTO PAVED SURFACES.
3. MODIFY INLET PROTECTION AS NEEDED TO AVOID CREATING TRAFFIC HAZARDS.
4. INCLUDE INLET PROTECTION MEASURES AT HILLSIDE V-DITCHES AND MISC. DRAINAGE SWALES.
5. INLET PROTECTION SHALL BE INSPECTED AND ACCUMULATED SEDIMENTS REMOVED. SEDIMENT SHALL BE DISPOSED OF PROPERLY AND IN A MANNER THAT ASSURES THAT THE SEDIMENT DOES NOT ENTER THE STORM DRAIN SYSTEM
6. DAMAGED BAGS SHALL BE REPLACED IMMEDIATELY.
7. ADDITIONAL SANDBAG SEDIMENT TRAPS SHALL BE PLACED AT INTERVALS AS INDICATED ON SITE PLAN.

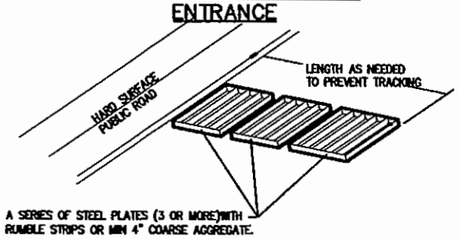
B
SILT FENCE



NOTES:

1. CONSTRUCT THE SILT FENCE ALONG A LEVEL CONTOUR.
2. SILT FENCES SHALL REMAIN IN PLACE UNTIL THE DISTURBED AREA IS PERMANENTLY STABILIZED.
3. PROVIDE SUFFICIENT ROOM FOR RUNOFF TO POND BEHIND THE FENCE AND ALLOW SEDIMENT REMOVAL EQUIPMENT TO PASS BETWEEN THE SILT FENCE AND TOE OF SLOPE OR OTHER OBSTRUCTIONS. ABOUT 1200 SQ. FT. OF PONDING AREA SHALL BE PROVIDED FOR EVERY ACRE DRAINING TO THE FENCE.
4. TURN THE ENDS OF THE FILTER FENCE UPHILL TO PREVENT STORMWATER FROM FLOWING AROUND THE FENCE.
5. LEAVE AN UNDISTURBED OR STABILIZED AREA IMMEDIATELY DOWNSLOPE FROM THE FENCE.
6. DO NOT PLACE IN LIVE STREAM OR INTERMITTENTLY FLOWING CHANNELS.
7. WHEN STANDARD FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS.

C
STABILIZED CONSTRUCTION ENTRANCE



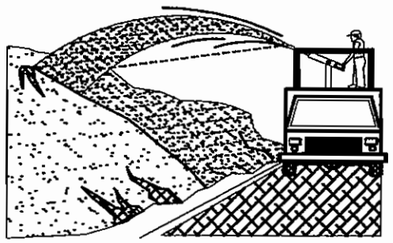
NOTES:

1. SEDIMENTS AND OTHER MATERIALS SHALL NOT BE TRACKED FROM THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAYS SHALL BE STABILIZED SO AS TO PREVENT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC ROADS. DEPOSITIONS MUST BE SWEPT UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR OTHER MEANS INTO THE STORM DRAIN SYSTEM.
2. STABILIZED CONSTRUCTION ENTRANCE SHALL BE:
   A. LOCATED AT ANY POINT WHERE TRAFFIC WILL BE ENTERING OR LEAVING A CONSTRUCTION S TO OR FROM A PUBLIC RIGHT OF WAY, STREET, ALLEY, AND SIDEWALK OR PARKING AREA.
   B. A SERIES OF STEEL PLATES WITH "RUMBLE STRIPS", AND/OR MIN 4" COARSE AGGREGATE WITH LENGTH, WIDTH & THICKNESS AS NEEDED TO ADEQUATLY PREVENT ANY TRACKING ONT PAVED SURFACES.
3. ADDING A WASH RACK WITH A SEDIMENT TRAP LARGE ENOUGH TO COLLECT ALL WASH WATER CAN GREATLY IMPROVE EFFICIENCY.
4. ALL VEHICLES ACCESSING THE CONSTRUCTION SITE SHALL UTILIZE THE STABILIZED CONSTRUCTI ENTRANCE SITES.

STREET MAINTENANCE

1. REMOVE ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS IMMEDIATELY.
2. SWEEP PAVED AREAS THAT RECEIVE CONSTRUCTION TRAFFIC WHENEVER SEDIMENT BECOMES VISIBLE.
3. PAVEMENT WASHING WITH WATER IS PROHIBITED IF IT RESULTS IN A DISCHARGE TO THE STORM DRAIN SYSTEM.

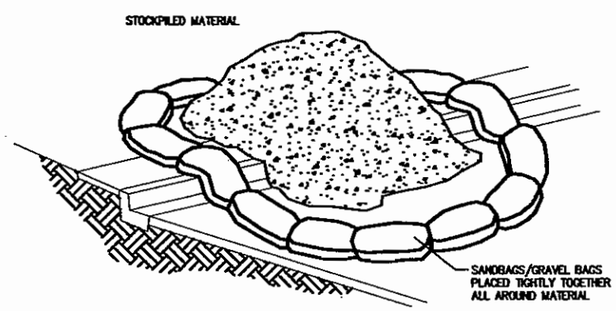
D
EROSION CONTROL



NOTES:

1. SOIL/SLOPE STABILIZATION PRACTICES SHALL BE DESIGNED TO PRESERVE EXISTING VEGETATION WHERE FEASIBLE AND TO REVEGETATE OPEN AREAS AS SOON AS FEASIBLE AFTER GRADING. THESE CONTROL PRACTICES SHALL INCLUDE TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING, SOD STABILIZATION, VEGETATIVE BUFFER STRIPS, PROTECTION OF TREES, OR OTHER SOIL STABILIZATION PRACTICES.
2. SOIL STABILIZATION SHALL BE IMPLEMENTED ON ALL INACTIVE DISTURBED AREAS FROM NOVEMBER 1 THRU APRIL 15 AND ON ALL DISTURBED AREAS DURING A RAIN EVENT OR POTENTIAL RAIN.
3. STABILIZATION PRACTICES SHALL CONTROL/PREVENT EROSION FROM THE FORCES OF WIND AND WATER.
4. STABILIZATION PRACTICES SHALL BE IMPLEMENTED IN CONJUNCTION WITH SEDIMENT TRAPPING/FILTERING PRACTICES AND PRACTICES TO REDUCE THE TRACKING OF SEDIMENT ONTO PAVED ROADS.
5. WHEN USING STRAW MULCHING, THE MINIMUM APPLICATION SHALL BE 2 TONS/ACRE. MULCH MUST BE ANCHORED IMMEDIATELY TO MINIMIZE LOSS BY WIND OR WATER.
6. WHEN USING HYDROSEEDING/MULCHING, THE MINIMUM APPLICATION OF WOOD FIBER SHALL BE 1,500 LBS/ACRE, THAT DOES NOT CONTAIN MORE THAN 50 PERCENT NEWSPRINT.
7. FOR SEEDING RECOMMENDATIONS, CONTACT: USDA, NATURAL RESOURCES CONSERVATION SERVICE OR VENTURA COUNTY RCD.

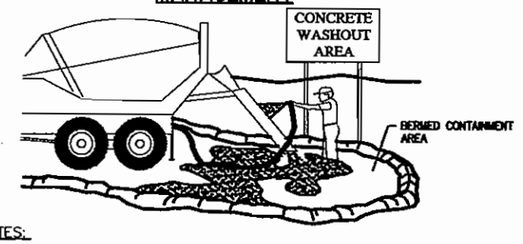
E
MATERIAL STORAGE



NOTES:

1. DIRT AND OTHER CONSTRUCTION RELATED MATERIALS PLACED IN THE STREET OR ON OTHER IMPERVIOUS SURFACES MUST BE CONTAINED WITH SANDBAGS OR OTHER MEASURES TO PREVENT TRANSPORT TO THE STORMDRAIN SYSTEM.
2. ANY CONSTRUCTION MATERIAL STORED OR STOCKPILED ON-SITE SHALL BE PROTECTED FROM BEING TRANSPORTED BY THE FORCE OF WIND OR WATER.

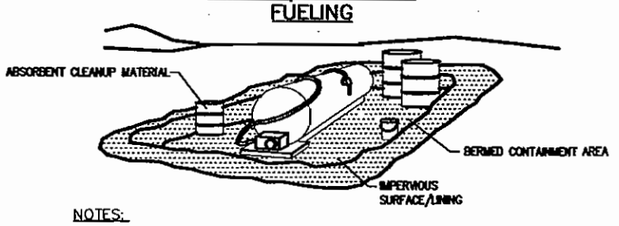
F
CONCRETE WASTE MANAGEMENT



NOTES:

1. EXCESS AND WASTE CONCRETE SHALL NOT BE WASHED INTO THE STREET OR INTO A DRAINAGE SYSTEM.
2. FOR WASHOUT OF CONCRETE AND MORTAR PRODUCTS, A DESIGNATED CONTAINMENT FACILITY OF SUFFICIENT CAPACITY TO RETAIN LIQUID AND SOLID WASTE SHALL BE PROVIDED ON SITE.
3. SLURRY FROM CONCRETE AND ASPHALT SAW CUTTING SHALL BE VACUUMED OR CONTAINED, DRIED, PICKED UP AND DISPOSED OF PROPERLY.

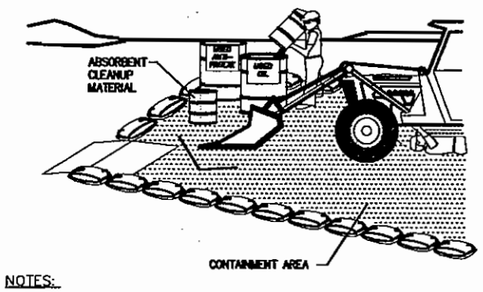
G
VEHICLE/EQUIPMENT FUELING



NOTES:

1. FUELING SHALL BE PERFORMED IN A DESIGNATED AREA, AWAY FROM DRAINAGE COURSES.
2. ABSORBENT CLEANUP MATERIAL SHALL BE ON SITE AND USED IMMEDIATELY IN THE EVENT OF A SPILL.

H
EQUIPMENT REPAIR/MAINTENANCE



NOTES:

1. LEAKING VEHICLES AND EQUIPMENT SHALL NOT BE ALLOWED ON-SITE. EQUIPMENT AND VEHICLES SHALL BE INSPECTED FREQUENTLY FOR LEAKS AND SHALL BE REPAIRED IMMEDIATEL CLEAN UP SPILLS AND LEAKS PROMPTLY WITH ABSORBENT MATERIALS; DO NOT FLUSH WITH WATER.
2. VEHICLES AND EQUIPMENT SHALL BE MAINTAINED, AND REPAIRED ON-SITE ONLY IN DESIGNATED AREAS. PREVENT RUN-ON AND RUN-OFF FROM DESIGNATED AREAS. CONTAINMENT DEVICES SHALL BE PROVIDED AND AREAS SHALL BE COVERED IF NECESSARY.
3. DESIGNATE ON-SITE VEHICLE AND EQUIPMENT MAINTENANCE AREAS, AWAY FROM STORM DRAIN INLETS AND WATERCOURSES.
4. ALWAYS USE SECONDARY CONTAINMENT, SUCH AS A DRAIN PAN OR DROP CLOTH, TO CATCH SPILLS AND LEAKS WHEN REMOVING OR CHANGING FLUIDS.
5. LEGALLY DISPOSE OF USED OILS, FLUIDS, AND LUBRICANTS.
6. PROVIDE SPILL CONTAINMENT DIKES OR SECONDARY CONTAINMENT AROUND STORED OIL, FUEL, AND CHEMICAL DRUMS.
7. MAINTAIN AN ADEQUATE SUPPLY OF ABSORBENT SPILL CLEANUP MATERIALS IN DESIGNATED AREA.

04/18/08

CITY OF AGOURA HILLS

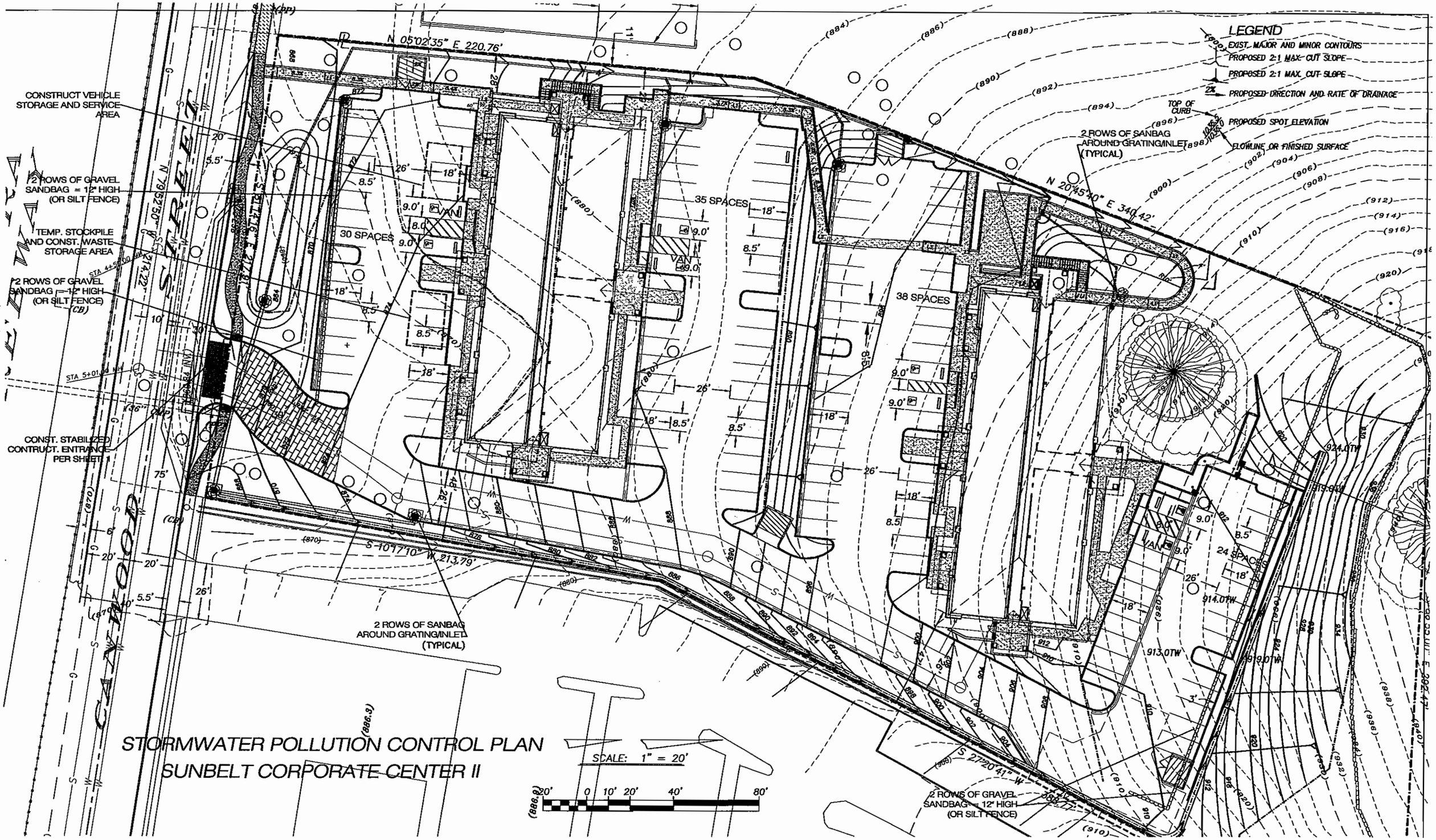
CANWOOD STREET OFFICES
29541 AND 29555 CANWOOD STRE
AGOURA HILLS CALIFORNIA

STORMWATER POLLUTION CONTROL PLAN
SUNBELT CORPORATE CENTER II

PREPARED FOR:
SUNBELT PROPERTIES
1801 SOLAR DRIVE, SUITE 250
OXNARD, CA 93031-9031

PREPARED BY:

Holmes Enterprises inc.
Structural and Civil Engineering
200 Wicks Rd. Moorpark, CA. 93021
(805) 532-1571 fax(805) 532-1596



STORMWATER POLLUTION CONTROL PLAN
SUNBELT CORPORATE CENTER II

Attachment D

Computation Sheet for Determining Runoff Coefficients

Total Site Area = _____ Acres (A)

Existing Site Conditions

Impervious Site Area [1] = 2.2 Acres (B)

Impervious Site Area Runoff Coefficient [2, 4] = 0.95 (C)

Pervious Site Area [3] = 0.03 Acres (D)

Pervious Site Area Runoff Coefficient [4] = _____ (E)

Existing Site Area Runoff Coefficient $\frac{(B \times C)+(D \times E)}{(A)}$ = _____ (F)

Proposed Site Conditions (after construction)

Impervious Site Area [1] = 2.2 Acres (G)

Impervious Site Area Runoff Coefficient [2, 4] = 0.95 (H)

Pervious Site Area [3] = 0.06 Acres (I)

Pervious Site Area Runoff Coefficient [4] = _____ (J)

Proposed Site Area Runoff Coefficient $\frac{(G \times H)+(I \times J)}{(A)}$ = _____ (K)

1. Includes paved areas, areas covered by buildings, and other impervious surfaces.
2. Use 0.95 unless lower or higher runoff coefficient can be verified.
3. Includes areas of vegetation, most unpaved or uncovered soil surfaces, and other pervious areas.
4. Refer to local Hydrology Manual for typical C values.

Attachment E

Computational Sheet for Determining Run-on Discharges

Existing Site Conditions

	Area Runoff Coefficient	=	_____	(A)
	Area Rainfall Intensity	=	_____ in/hr	(B)
	Drainage Area	=	_____ Acres	(C)
Site Area Run-on Discharge	(A) x (B) x (C)	=	_____ ft^3/sec	(D)

Attachment G

Program for Maintenance, Inspection, and Repair of Construction Site BMPs

The contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP		
BEST MANAGEMENT PRACTICES (BMPs)	**INSPECTION FREQUENCY (all controls)**	**MAINTENANCE/REPAIR PROGRAM**
TEMPORARY EROSION CONTROL BMPs		
		■ ■ ■
		■ ■ ■

The contractor shall use the following guidelines for maintenance, inspection, and repair of BMPs identified in the SWPPP		
BEST MANAGEMENT PRACTICES (BMPs)	**INSPECTION FREQUENCY (all controls)**	**MAINTENANCE/REPAIR PROGRAM**
TEMPORARY SEDIMENT CONTROL BMPs		
		■ ■ ■ ■ ■ ■
		■ ■
		■ ■ ■ ■ ■ ■
WIND EROSION CONTROL BMPs		
		■
TRACKING CONTROL BMPs		
		■ ■ ■

Attachment H

Storm Water Quality Construction Site Inspection Checklist

GENERAL INFORMATION	
Project Name	**29541,29555 CANWOOD STREET AGOURA HILLS CALIFORNIA**
Project N°	
Contractor	
Inspector's Name	

GENERAL INFORMATION				
Inspector's Title				
Signature				
Date of Inspection				
Inspection Type (Check Applicable)	☐ Prior to forecast rain ☐ 24-hr intervals during extended rain		☐ After a rain event ☐ Other _____	
Season (Check Applicable)	☐ Rainy		☐ Non-Rainy	
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle Applicable Units)	Min. Hr. Days	Approximate Rainfall Amount (inches)	

PROJECT AREA SUMMARY AND DISTURBED SOIL AREA (DSA) SIZE		
Total Projeet Area	_____	Acres
Field Estimate of Active DSAs	_____	Aeres
Field Estimate of Non-Active DSAs	_____	Acres

Attachment I

Trained Contractor Personnel Log

Storm Water Management Training Log

29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

Project Name: _____

Project Number/Location: _____

Storm Water Management Topic: (check as appropriate)

- ☐ Erosion Control
- ☐ Sediment Control
- ☐ Wind Erosion Control
- ☐ Tracking Control
- ☐ Non-storm water management
- ☐ Waste Management and Materials Pollution Control
- ☐ Storm Water Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hours): _____

Attendee Roster (attach additional forms if necessary)

Name	Company	Phone

Attachment J

Subcontractor Notification Letter and Notification Log

SWPPP Notification

Company
Address

City, State, ZIP

Dear Sir/Madam,

Please be advised that the California State Water Resources Control Board has adopted the General Permit (General Permit) for Storm Water Discharges Associated with Construction Activity (CAS000002). The goal of these permits is prevent the discharge of pollutants associated with construction activity from entering the storm drain system, ground and surface waters.

[Owner/Developer/Contractor] has developed a Storm Water Pollution Prevention Plan (SWPPP) in order to implement the requirements of the Permits.

As a subcontractor, you are required to comply with the SWPPP and the Permits for any work that you perform on site. Any person or group who violates any condition of the Permits may be subject to substantial penalties in accordance with state and federal law. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP and the Permits. A copy of the Permits and the SWPPP are available for your review at the construction office. Please contact me if you have further questions.

Sincerely,

Name
Title

Attachment K

Notice of Non-Compliance

To: Name of [City] Engineer/Regional Board Staff Date: Insert Date

Subject: Notice of Non-Compliance

29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

Project Name:

Project Number/Location: Project number

In accordance with the NPDES Statewide Permit for Storm Water Discharges Associated with Construction Activity, the following instance of discharge is noted:

Date, time, and location of discharge

Insert description and date of event

Nature of the operation that caused the discharge

insert description of operation

Initial assessment of any impact cause by the discharge

insert assessment

Existing BMP(s) in place prior to discharge event

list BMPs in place

Date of deployment and type of BMPs deployed after the discharge.

BMPs deployed after the discharge (with dates)

Steps taken or planned to reduce, eliminate and/or prevent recurrence of the discharge

insert steps taken to prevent recurrence

Implementation and maintenance schedule for any affected BMPs

insert implementation and maintenance schedule

If further information or a modification to the above schedule is required, notify the contact person below.

Name of Contact Person	***Title***
Company	***Telephone Number***
Signature	***Date***

Attachment L

Storm Water Pollution Prevention Plan (SWPPP) and Monitoring Program Checklist

29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

CONSTRUCTION PROJECT: _____

CONTRACTOR: _____

CONTRACT NO: _____

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	100	***SWPPP Certification and Approval***	***C.10***	
	100.1	SWPPP Certification	***C.10***	
	100.2	SWPPP Approval	***C.10***	
	200	***SWPPP Amendments***	***A.4.a, A.16***	
	200.1	Amendment number and date entered into SWPPP – Amendment Log	***A.4.a, A.16***	
	200.2	Amendment Certification and Approval	***A.4.a, A.16***	
	300	***Introduction/Project Description***		
	300.1	Project Description and Location (narrative)	***A.5.a.1***	
	300.2	Unique Site Features (narrative)	***A.5.a.1***	
	300.4	***Project Schedule (narrative and graphical)***	***A.5.c.5***	

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	400	***References***	***A.14***	
	500.2	***Vicinity Map (narrative or graphic)***	***A.5.a.1***	
	500.2	Site perimeter	A.5.a.1	
	500.2	Geographic Features	A.5.a.1	
	500.2	General topography	A.5.a.1	
	500.4	***Water Pollution Control Drawings (WPCDs) (graphic or narrative)***	A.5.a.2	
	500.4	***Site perimeter***	***A.5.a.2***	
	500.4	Existing and proposed buildings, lots, and roadways	***A.5.a.2***	
	500.4	Storm water collection and discharge points	***A.5.a.2***	
	500.4	General topography before and after construction	***A.5.a.2***	
	500.4	Anticipated discharge location(s)	***A.5.a.2***	
	500.4	Drainage patterns including the entire relevant drainage areas	***A.5.a.2***	
	500.4	Temporary on-site drainage(s)	***A.5.a.2***	
	500.3	***Pollutant Source and BMP Identification (narrate/ or indicate on site map)***	A.5.b	
		Drainage	A.5.b.1	
	500.4	Drainage patterns after major grading	A.5.b.1	
	500.4	Slopes after major grading	A.5.b.1	
	Attach. E	Calculations for storm water run-on	A.5.b.1	
	500.4	BMPs that divert off-site drainage from passing through site	A.5.b.1	
	500.4	***Storm Water Inlets***	A.5.b.2	
	500.4	Drainage patterns to storm water inlets or receiving water	A.5.b.2	
	500.4	BMPs that protect storm water inlets or receiving water	A.5.b.2	

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
		Site History (narrative; if possible, indicate location(s) on the Water Pollution Control Drawings)	A.5.b	
	500.3.3	Nature of fill material and data describing the soil. Description of toxic materials treated, stored, disposed, spilled or leaked on site	A.5.b.3	
	500.3.8 & 500.3.9	BMPs that minimize contact of contaminants with storm water	A.5.b.3	
		Location of Areas Designated for:	A.5.b.4	
	500.3.8 & 500.4	Vehicle storage & service	A.5.b.4	
	500.3.8 & 500.4	Equipment storage, cleaning, maintenance	A.5.b.4	
	500.3.9 & 500.4	Soil or waste storage	A.5.b.4	
	500.3.9 & 500.4	Construction material loading, unloading, storage and access	A.5.b.4	
	500.3.8 & 500.3.9	Areas outside of physical site (yards, borrow areas, etc.)		
		BMP Locations or Descriptions for:	A.5.b.5	
	500.3.9 & 500.4	Waste handling and disposal areas	A.5.b.5	
	500.3.9 & 500.4	On-site storage and disposal of construction materials and waste	A.5.b.5	
	500.3.8, 500.3.9 & 500.4	Minimum exposure of storm water to construction materials, equipment, vehicles, waste	A.5.b.5	
	500.6	***Post Construction BMPs***	A.5.b.6	
	500.6.1	Listing or Description of Post-construction BMPs	A.5.b.6	
	500.4	Location of post-construction BMPs	A.5.b.6	
	500.6.2	Parties responsible for long-term maintenance	A.5.b.6	
		Additional Information	A.5.c	
	500.3.1	Description of other pollutant sources and BMPs	A.5.c.1	
	500.3.2	Pre-construction control practices	A.5.c.1	
	500.3.1	Inventory of materials and activities that may pollute storm water	A.5.c.2	
	500.3.8 & 500.3.9	BMPs to reduce/eliminate potential pollutants listed in the inventory	A.5.c.2	
	300.4	Runoff coefficient (before & after)	A.5.c.3	

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	300.4	Percent impervious (before & after)	A.5.c.3	
	Attach. F	Copy of the NOT	A.5.c.4	
	300.3	Construction activity schedule	A.5.c.5	
	300.5	Contact information	A.5.c.6	
	500.4.1	**SOIL STABILIZATION (EROSION CONTROL)**	A.6	
		The SWPPP shall include:	A.6.a-c	
	500.4	Areas of vegetation on site	A.6.a.1	
	500.4	Areas of soil disturbance that will be stabilized during rainy season	A.6.a.2	
	500.4	Areas of soil disturbance which will be exposed during any part of the rainy season	A.6.a.3	
	300.4	Implementation schedule for erosion control measures	A.6.a.4	
	500.3.4	BMPs for erosion control	A.6.b	
	500.3.7	BMPs to control wind erosion	A.6.c	
	500.3.5	**SEDIMENT CONTROL**	A.8	
	500.3.5 & 500.4	Description/Illustration of BMPs to prevent increase of sediment load in discharge	A.8	
	300.4, 500.3.5	Implementation schedule for sediment control measures	A.8	
	500.3.6	BMPs to control sediment tracking	A.8	
	500.3.8 & 500.3.9	**NON-STORM WATER MANAGEMENT**	A.9	
	500.3.8 & 500.3.9	Description of non-storm water discharges to receiving waters	A.9	
	500.3.8 & 500.3.9	Locations of discharges	A.9	
	500.3.8 & 500.3.9	Description of BMPs	A.9	
	300.5	Name and phone number of person responsible for non-storm water management	A.9	
	500.6	**POST-CONSTRUCTION**	A.10	
	500.6.1	Description of post-construction BMPs	A.10	
	500.6.2	Operation/Maintenance of BMPs after project completion (including short-term funding, long-term funding and responsible party)	A.10	

SECTION A: STORM WATER POLLUTION PREVENTION PLAN (SWPPP)				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	500.5	**MAINTENANCE, INSPECTIONS, AND REPAIR**	A.11	
	300.5, 600.1	Name and phone number of person(s) responsible for inspections	A.11	
	600.1, Attach. H	Complete inspection checklist: date, weather, inadequate BMPs, visual observations of BMPs, corrective action, inspector's name, title, signature	A.11.a-f	
		OTHER REQUIREMENTS	A.12-16	
	500.7	Documentation of all training	A.12	
	500.8	List of Contractors/Subcontractors	A.13	

SECTION B: MONITORING AND REPORTING REQUIREMENTS				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	600.1	Description of Site Inspection Plans	B.3	
	100.3	Compliance certification (annually 7/1)	B.4	
	600.2	Discharge reporting	B.5	
	600.3	Keep records of all inspections, compliance certifications, and noncompliance reports on site for a period of at least three years	B.6	
	600.4	Sampling and Analysis Plan for Sediment	B.7	
	600.5	Sampling and Analysis Plan for Non-Visible Pollutants	B.8	

SECTION C: STANDARD PROVISIONS FOR CONSTRUCTION ACTIVITIES				
CHECK IF ADDRESSED N/A IF NOT APPLICABLE	*SWPPP Section*	*ITEM*	*GENERAL PERMIT REF.*	*COMMENTS*
	100.1	Signed SWPPP Certification	C.9,10	

Attachment M

Annual Certification of Compliance Form

29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

Project Name: _____

Project Number: _____

Contractor Company Name: _____

Contractor Address: _____

Construction Start Date: _____ **Completion Date:** _____

Description of Work:	description of work
Work Now in Progress:	work in progress
Work Planned for Next 12 Months:	work planned

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the

information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Owner/Developer/Contractor Signature

Date

Attachment O

Water Pollution Control Cost Breakdown

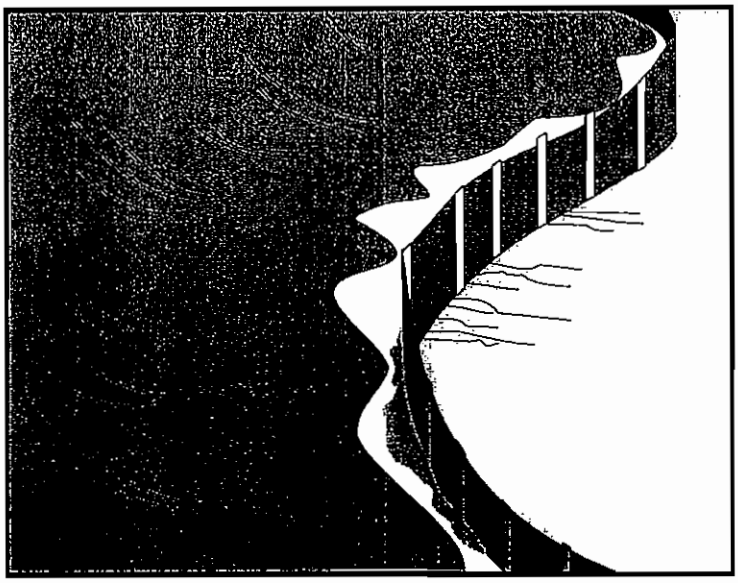
29541,29555 CANWOOD STREET
AGOURA HILLS CALIFORNIA

Project Name: _____

Project Number: _____

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
EC-3	Hydraulic Mulch	FT^2			
EC-4	Hydroseeding	FT^2			
EC-5	Soil Binders	FT^2			
EC-6	Straw Mulch	FT^2			
EC-7	Geotextiles & Mats	FT^2			
EC-8	Wood Mulching	FT^2			
EC-9	Earth Dikes & Drainage Swales	FT			
EC-10	Velocity Dissipation Devices	EA			
EC-11	Slope Drains	EA			
EC-12	Streambank Protection	LS			
EC-13	Polyacrylamide	LS			
SE-1	Silt Fence	FT			
SE-2	Sediment Basin	EA			
SE-3	Sediment Trap	EA			
SE-4	Check Dam	EA			
SE-5	Fiber Rolls	FT			
SE-6	Gravel Bag Berm	FT			
SE-7	Street Sweeping and Vacuuming	LS			

Silt Fence SE-1



Objectives

EC	Erosion Control	✓
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
✓ **Primary Objective**
✓ **Secondary Objective**

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

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- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

Implementation

General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy-duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with compacted native material.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

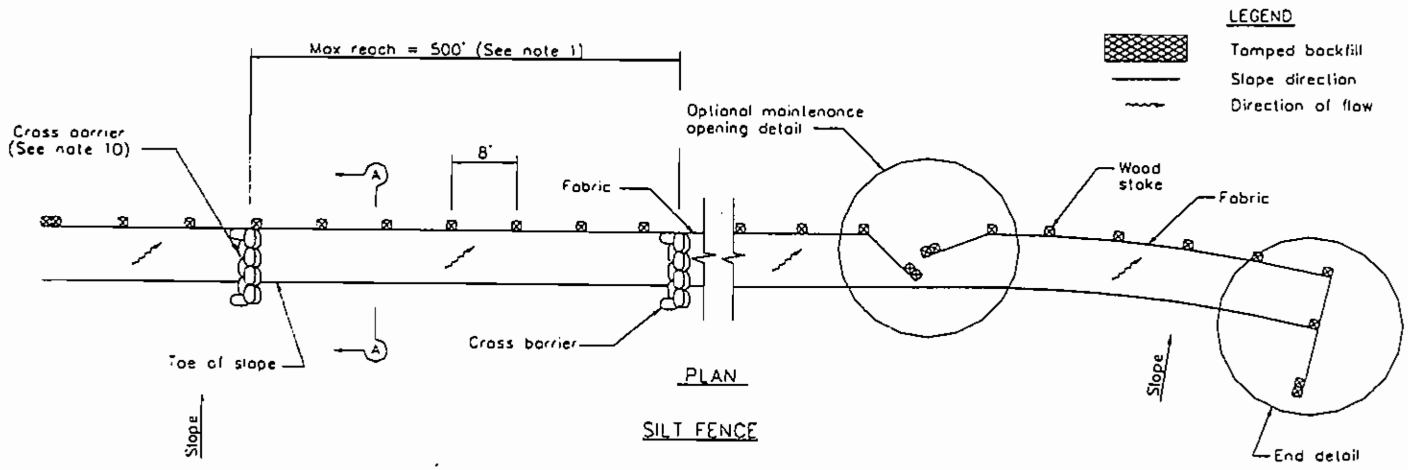
Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

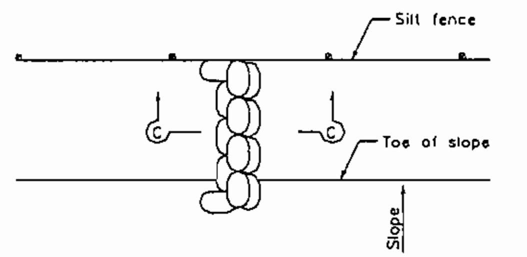


PLAN

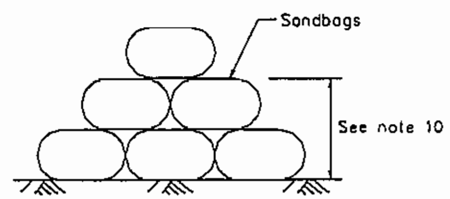
SILT FENCE

NOTES

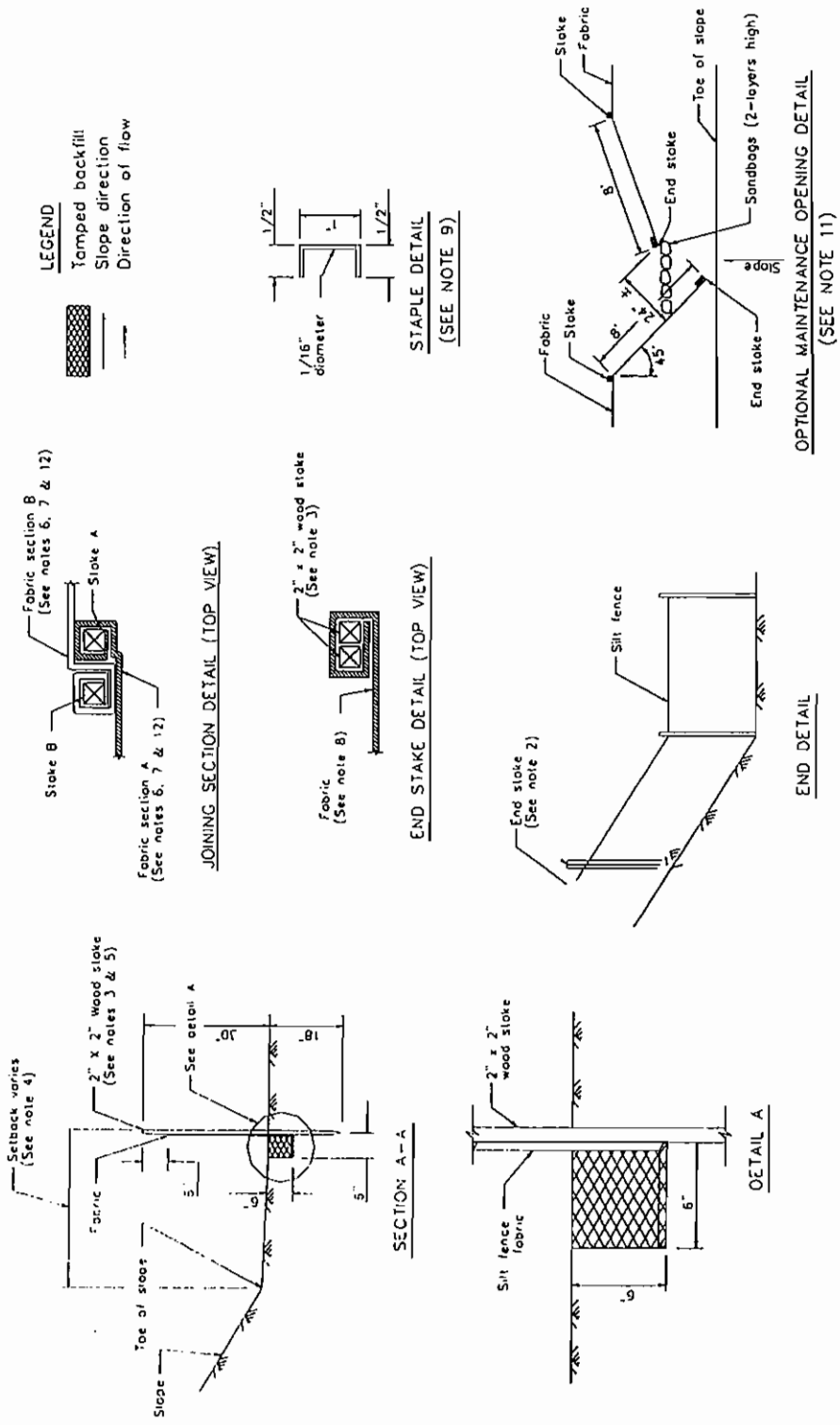
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.



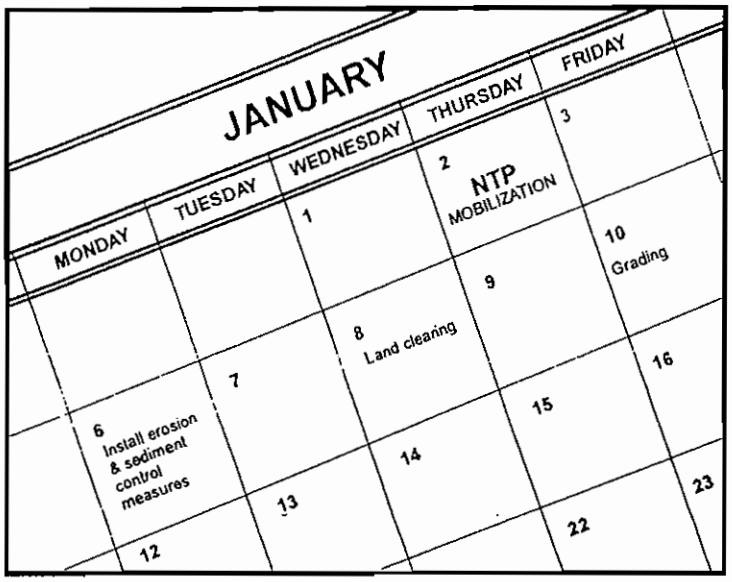
CROSS BARRIER DETAIL



SECTION C-C


LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
Toe of slope
8'
End stake
Sandbags (2-layers high)
Slope
Fabric
Stake
8'
4'
2'
4'
45°
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
Silt fence
End stake
(See note 2)
1'
END DETAIL
Setback varies
(See note 4)
2" X 2" Wood stake
(See notes 3 & 5)
See detail A
10"
18"
Fabric
5'
10'
5'
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
6"
6"
DETAIL A

Scheduling EC-1



Objectives

EC	Erosion Control	✓
SE	Sediment Control	✓
TC	Tracking Control	✓
WE	Wind Erosion Control	✓
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

✓ **Primary Objective**

✓ **Secondary Objective**

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil

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disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

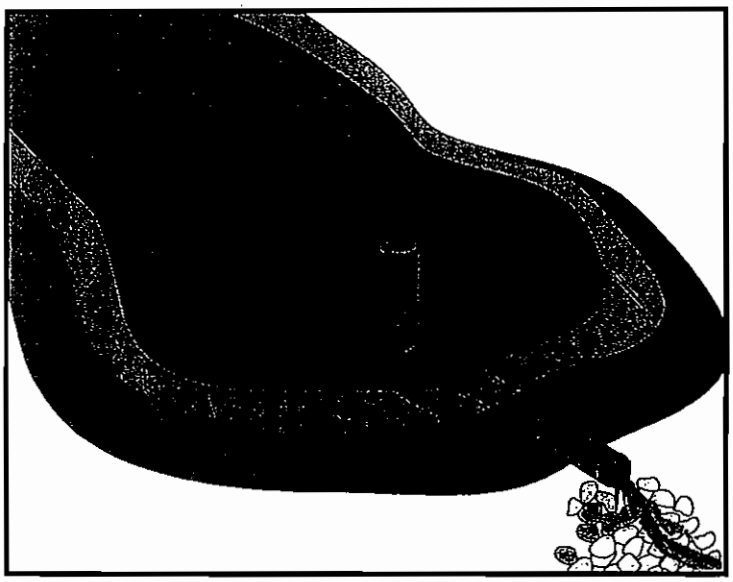
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Sediment Basin SE-2



Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres
- At the outlet of large disturbed watersheds, as necessary
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of

Objectives

EC	Erosion Control	
SE	Sediment Control	✓
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

✓ **Primary Objective**

✓ **Secondary Objective**

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

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public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- Generally, sediment basins are limited to drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical treatment is used in addition to the sediment basin.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitoes or other pests to breed.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure with a design life of 12 to 28 months in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 % of the sediment that flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as

temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas. Drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin must not be located in a stream but it should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

- Construct before clearing and grading work begins when feasible.
- Do not locate in a stream.
- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Large basins are subject to state and local dam safety requirements.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

Sediment basins must be designed in accordance with Section A of the State of California NPDES General Permit for Stormwater Discharges Associated with Construction Activities (General Permit) where sediment basins are the only control measure proposed for the site. If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate design standards specified herein may be used.

Sediment basins designed per the General Permit shall be designed as follows:

Option 1:

Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

OR

Option 2:

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet (133 yd^3) of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The

length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency.

OR

Option 3:
Sediment basin(s) shall be designed using the standard equation:

$$As=1.2Q/Vs \quad \text{(Eq. 1)}$$

Where:

As = Minimum surface area for trapping soil particles of a certain size

Vs = Settling velocity of the design particle size chosen

Q = C I A

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient

I = Precipitation intensity for the 10-year, 6-hour rain event

A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 2 ft of capacity.

OR

Option 4:
The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Other design considerations are:

- The volume of the settling zone should be sized to capture runoff from a 2-year storm or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 % of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- Sediment basins are best used in conjunction with erosion controls. Sediment basins that will be used as the only means of treatment, without upstream erosion and sediment controls, must be designed according to the four options required by the General Permit (see Options 1-4 above). Sediment basins that are used in conjunction with upstream erosion and sediment controls should be designed to have a capacity equivalent to 67 yd^3 of sediment storage per acre of contributory area.
- The length of the basin should be more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet.
- The depth must be no less than 3 ft.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- Basins should be designed to drain within 72 hours following storm events. If a basin fails to drain within 72 hours, it must be pumped dry.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- Basin inlets should be located to maximize travel distance to the basin outlet.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 72 hours (also referred to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 72-hour limit is specified to mitigate vector control concerns.
- The two most common outlet problems that occur are: (1) the capacity of the outlet is too great resulting in only partial filling of the basin and drawdown time less than designed for; and (2) the outlet clogs because it is not adequately protected against trash and debris. To avoid these problems, the following outlet types are recommended for use: (1) a single orifice outlet with or without the protection of a riser pipe, and (2) perforated riser. Design guidance for single orifice and perforated riser outlets follow:
  - *Flow Control Using a Single Orifice At The Bottom Of The Basin (Figure 1)*: The outlet control orifice should be sized using the following equation:

$$a = \frac{2A(H-Ho)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7x10^{-5})A(H-Ho)^{0.5}}{CT} \qquad \text{(Eq. 2)}$$

where:

a = area of orifice (ft^2)

A = surface area of the basin at mid elevation (ft^2)

C = orifice coefficient

T = drawdown time of full basin (hrs)

g = gravity (32.2 ft/s²)

H = elevation when the basin is full (ft)

Ho = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75x10^{-6})A(H - Ho)^{0.5}}{C} \quad \text{(Eq. 3)}$$

- *Flow Control Using Multiple Orifices (see Figure2):*

$$a_t = \frac{2A(h_{max})}{CT(2g[h_{max} - h_{centroid\ of\ orifices}])^{0.5}} \quad \text{(Eq. 4)}$$

With terms as described above except:

a_t = total area of orifices

h_{max} = maximum height from lowest orifice to the maximum water surface (ft)

$h_{centroid\ of\ orifices}$ = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 2).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

C = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

C = 0.80 when the material is thicker than the orifice diameter

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

Average annual costs for installation and maintenance (2 year useful life) are:

- Basin less than 50,000 ft³: Range, $0.24 - $1.58/ft³. Average, $0.73 per ft³. $400 - $2,400, $1,200 average per drainage acre.
- Basin size greater than 50,000 ft³: Range, $0.12 – $0.48/ft³. Average, $0.36 per ft³. $200 - $800, $600 average per drainage acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at appropriate locations.
- Remove standing water from basin within 72 hours after accumulation.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

References

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March 1992.

Draft-Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA. April 1990.

Guidelines for the Design and Construction of Small Embankment Dams, Division of Safety of Dams, California Department of Water Resources, March 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

McLean, J., 2000. Mosquitoes in Constructed Wetlands: A Management Bugaboo? In T.R. Schueler and H.K. Holland [eds.], The Practice of Watershed Protection. pp. 29-33. Center for Watershed Protection, Ellicott City, MD, 2000.

Metzger, M.E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. The dark site of stormwater runoff management: disease vectors associated with structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

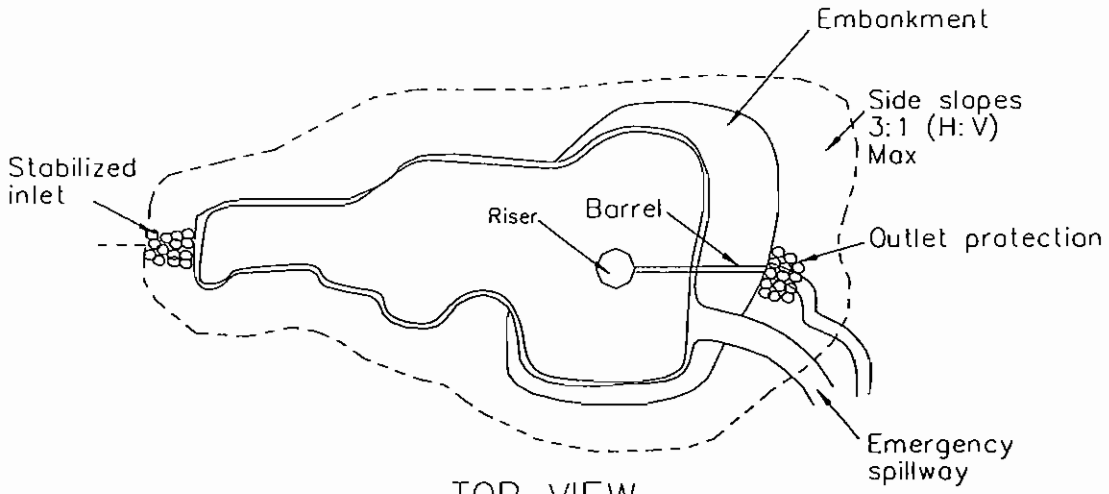
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Water, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

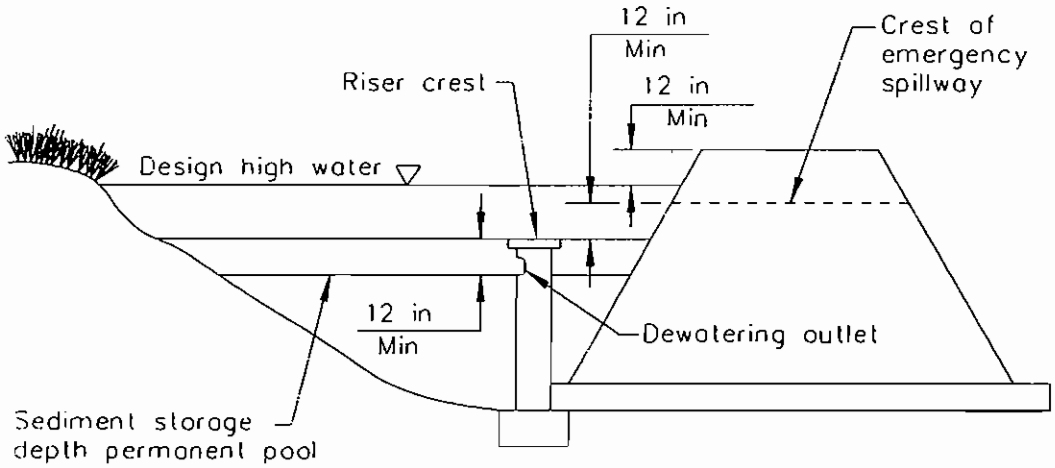
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993

Water Quality Management Plan for the Lake Tahoe Region, Volume II Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



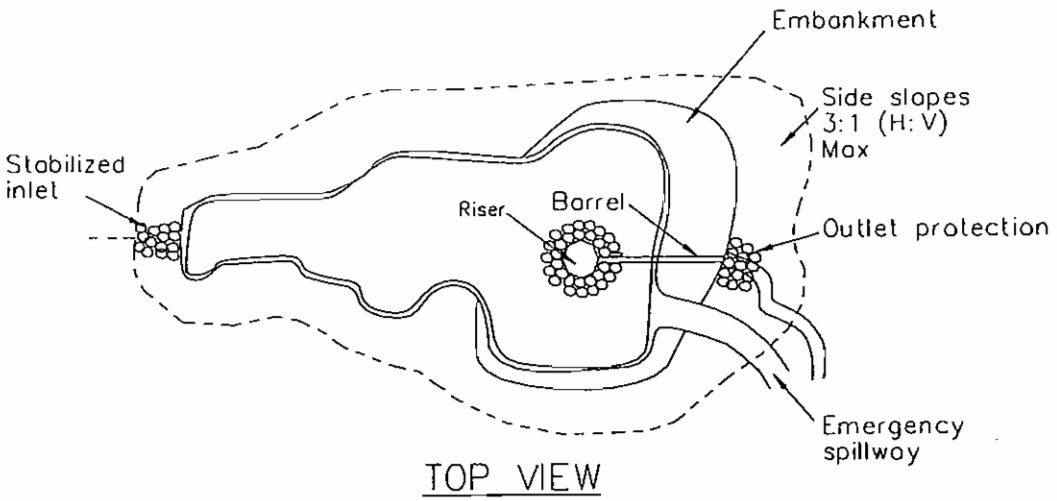
TOP VIEW



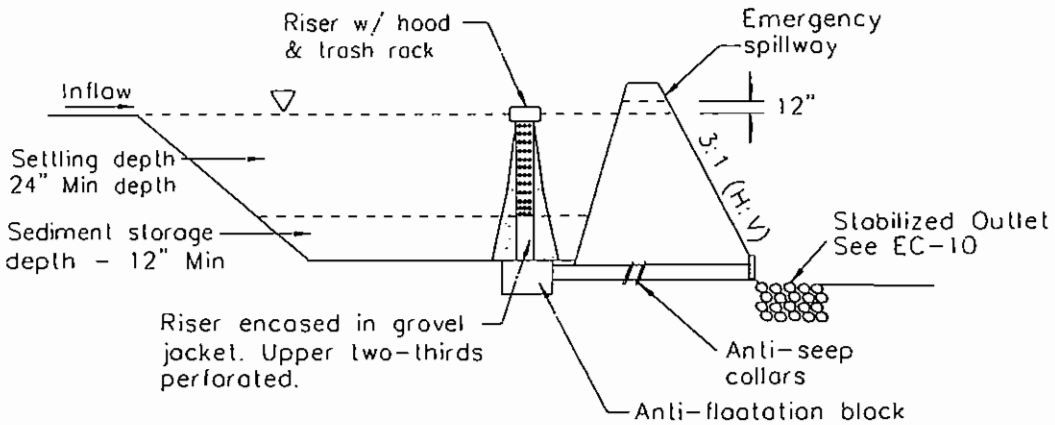
SIDE VIEW

NOTE:
This outlet provides no drainage for permanent pool

FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
SINGLE ORIFICE DESIGN
NOT TO SCALE



TOP VIEW



SIDE VIEW

FIGURE 2: TYPICAL TEMPORARY SEDIMENT BASIN

MULTIPLE ORIFICE DESIGN

NOT TO SCALE

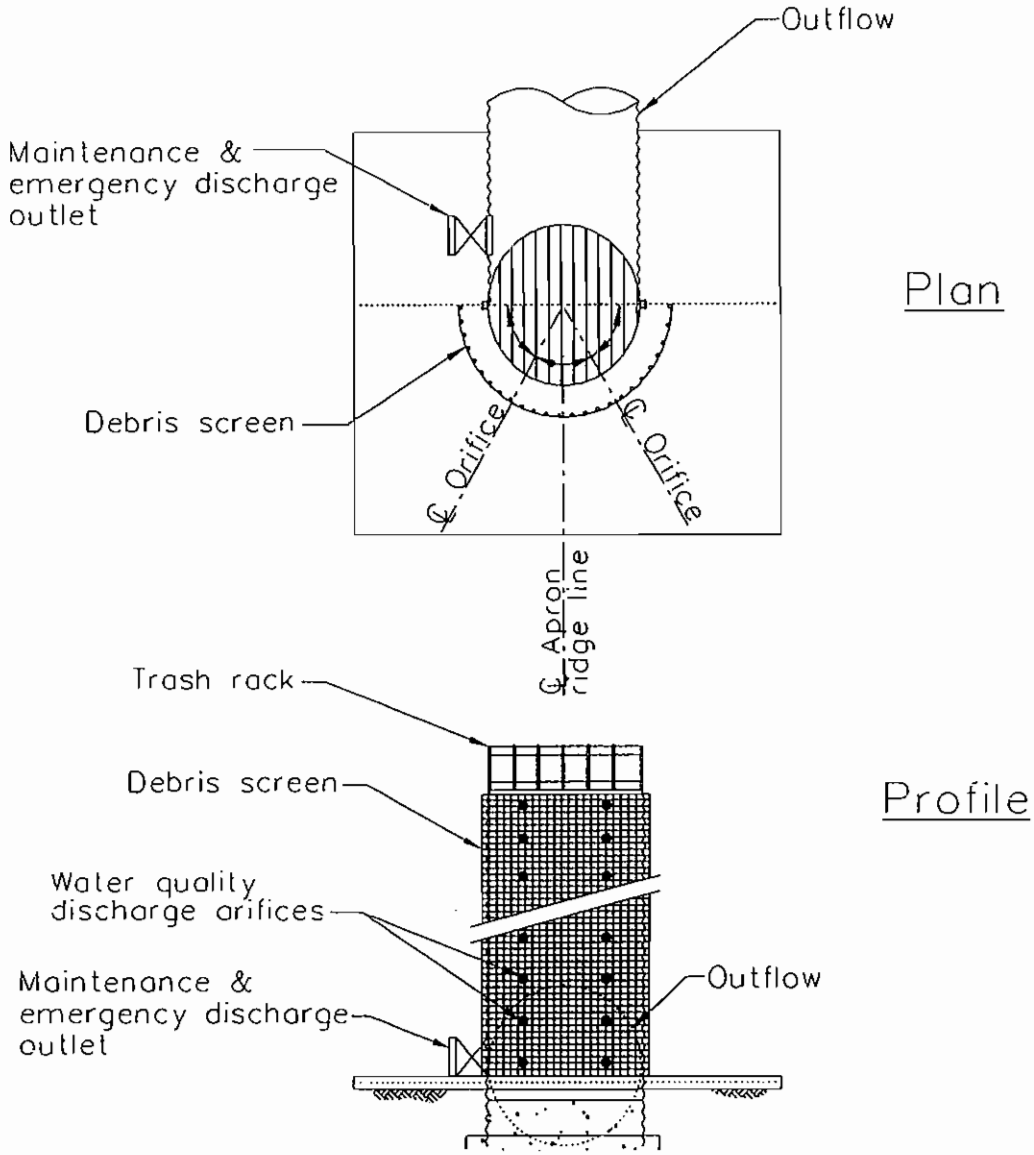
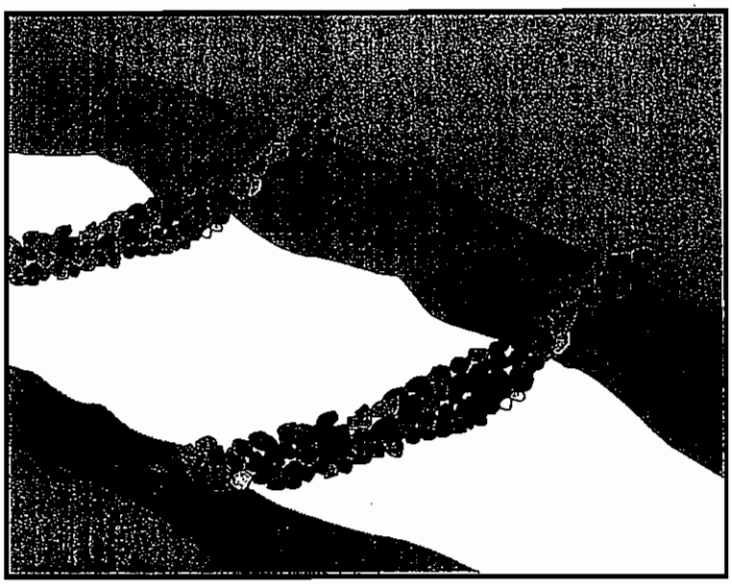


FIGURE 5: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

Check Dams

SE-4



Objectives

EC	Erosion Control	✓
SE	Sediment Control	✓
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

✓ **Primary Objective**

✓ **Secondary Objective**

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

Limitations

- Not to be used in live streams or in channels with extended base flows.

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- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Reduced slopes reduce the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Use of check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity must be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, there are several options:

- Don't use check dams. Consider alternative BMPs.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam. The center section of the dam should be lower than the edge sections so that the check dam will direct flows to the center of the ditch or swale.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products manufactured specifically for use as check dams are also being used, and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Straw bales can also be used for check dams and can work if correctly installed; but in practice, straw bale check dams have a high failure rate. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam must completely span the ditch

or swale to prevent washout. The rock used must be large enough to stay in place given the expected design flow through the channel.

Log check dams are usually constructed of 4 to 6 in. diameter logs. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

Gravel bag and sandbag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet.

Manufactured products should be installed in accordance with the manufacturer's instructions.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- Backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap must be cleaned following each storm event.
- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.
- Gravel bags may be used as check dams with the following specifications:

Materials

Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms. Sandbags used for check dams should conform to SE-8, Sandbag Barrier. Fiber rolls used for check dams should conform to SE-5, Fiber Rolls. Straw bales used for check dams should conform to SE-9, Straw Bale Barrier.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section. Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Fiber rolls and straw bales must be trenched in and firmly staked in place.

Costs

Cost consists of only installation costs if materials are readily available. If material must be imported, costs may increase. For material costs, see SE-5, SE-6, SE-8 and SE-9.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Replace missing rock, bags, bales, etc. Replace bags or bales that have degraded or have become damaged.
- If the check dam is used as a sediment capture device, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

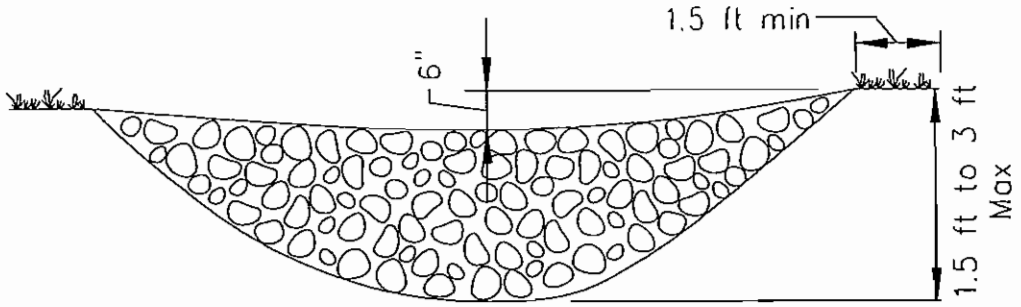
References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

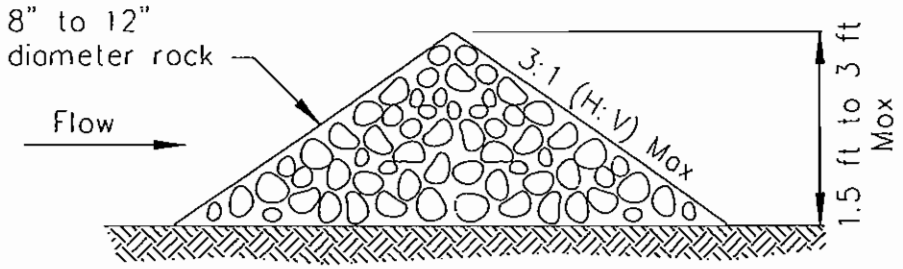
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

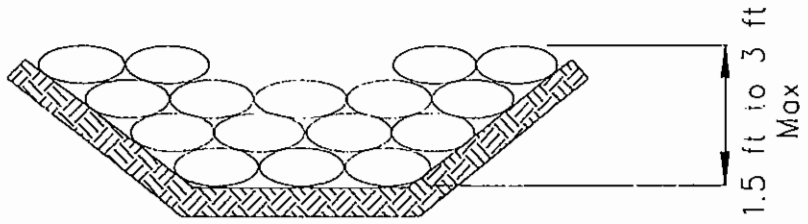


ELEVATION



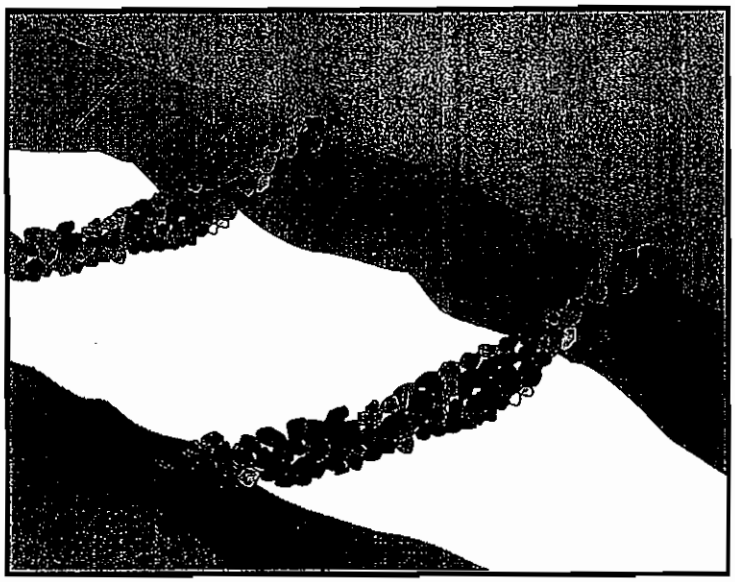
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE

Check Dams SE-4



Objectives		
EC	Erosion Control	✓
SE	Sediment Control	✓
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
✓ **Primary Objective**
✓ **Secondary Objective**

Targeted Constituents	
Sediment	✓
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

Limitations

- Not to be used in live streams or in channels with extended base flows.

CASQA
California Stormwater Quality Association