Appendix B

Calculations for Hydrologic Analysis of Existing Conditions

NEW WEST LINN PRIMARY SCHOOL

Hydrologic Summary for Existing Conditions

Hydrologic Soil Group (HSG): C
Curve Number (CN) Impervious Areas: 98
Curve Number (CN) Open Space Areas: 74

Sub-Basin	Land Use	Area (ac)	Percent Impervious	Composite CN	Time of Concentration, T_c (min)
A	Open Space	2.40	0%	74	19
B	Open Space	2.70	0%	74	19
C	Open Space	0.75	0%	74	14
D	Open Space / Impervious	1.21	7%	76	19

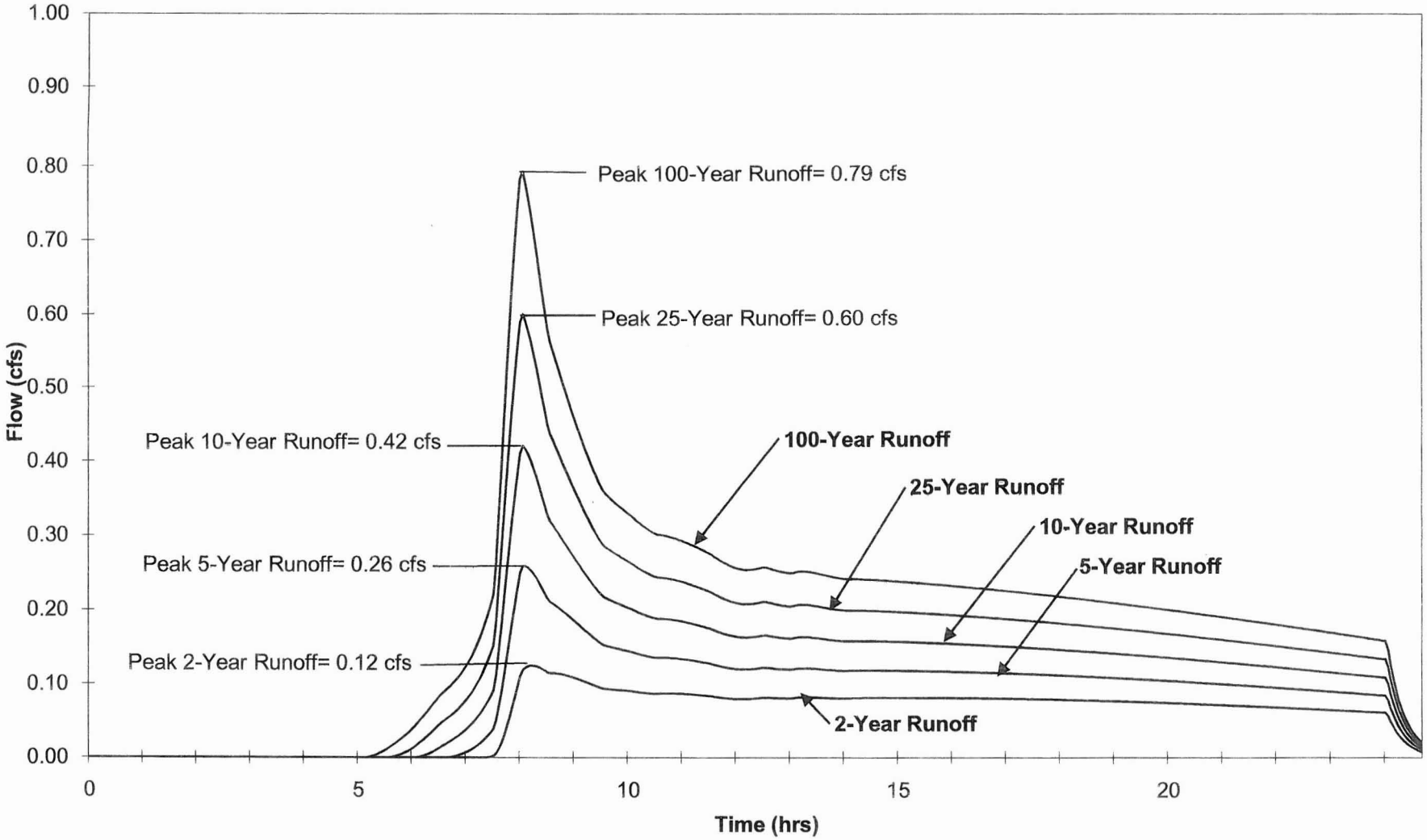
Reference: "Urban Hydrology for Small Watersheds", NRCS Technical Release 55, Second Edition, June 1986

Table 2-2c Runoff curve numbers for other agricultural lands [1]

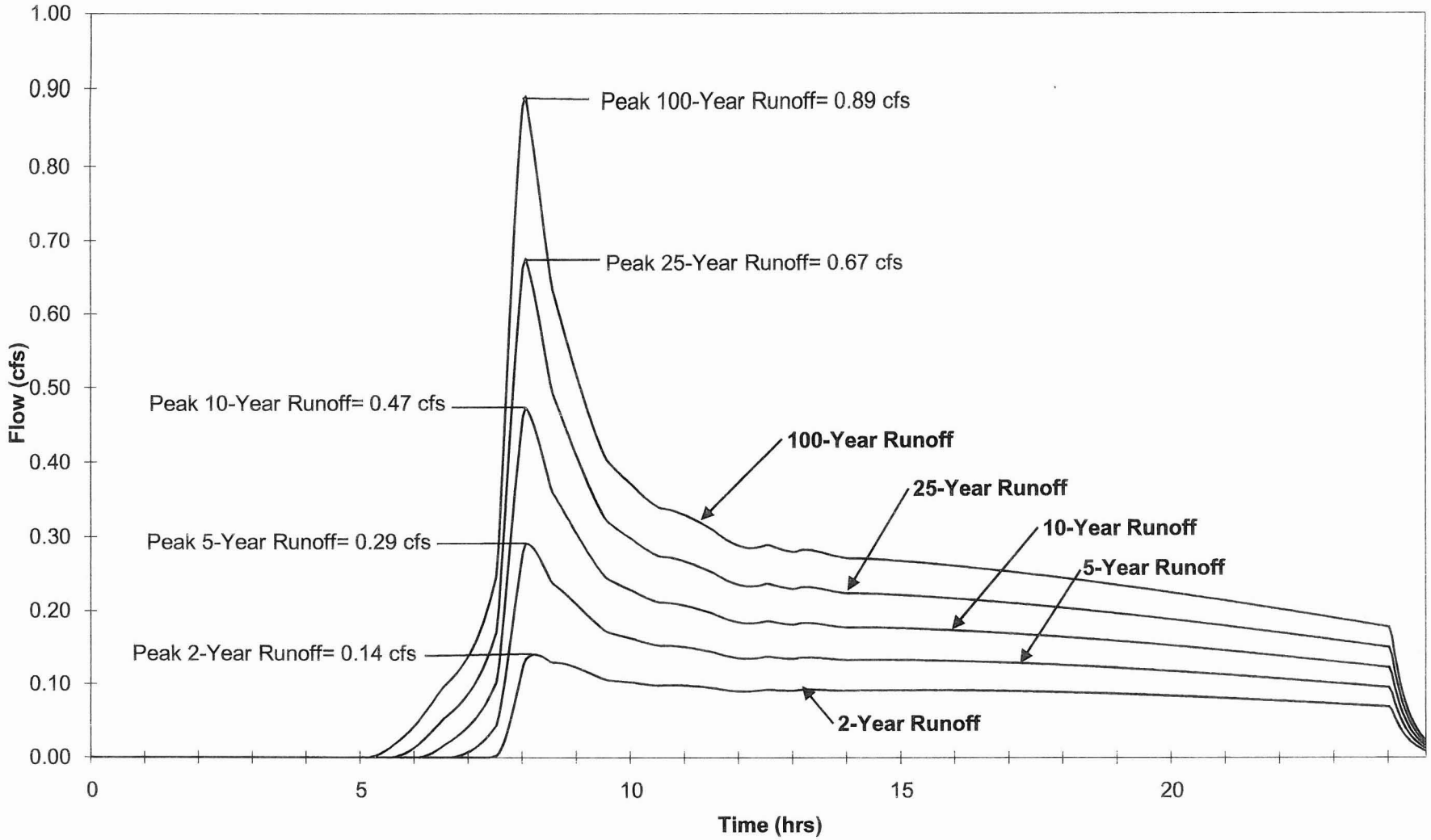
Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.
2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

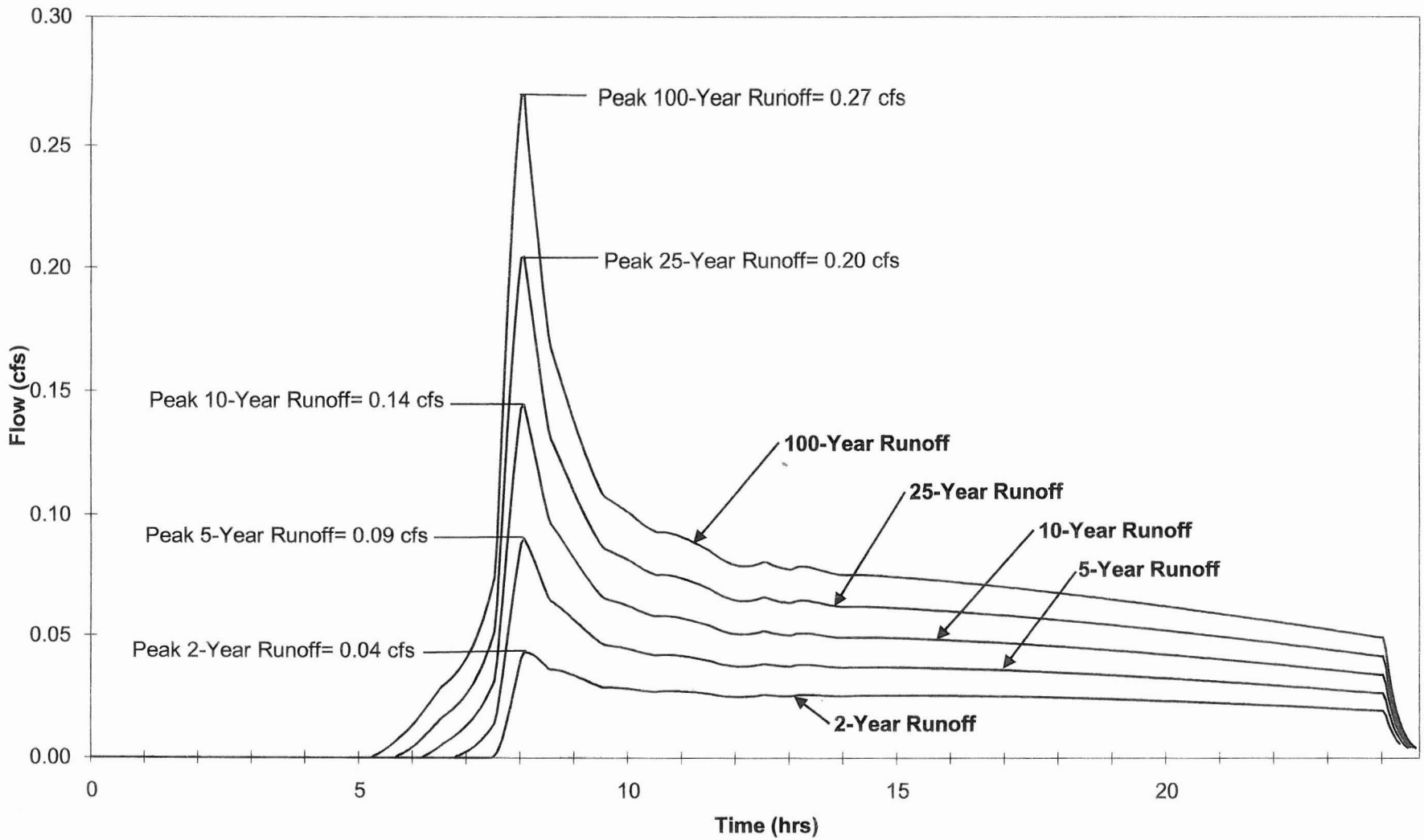
NEW WEST LINN PRIMARY SCHOOL
Runoff Hydrographs for Existing Conditions
SUB-BASIN A



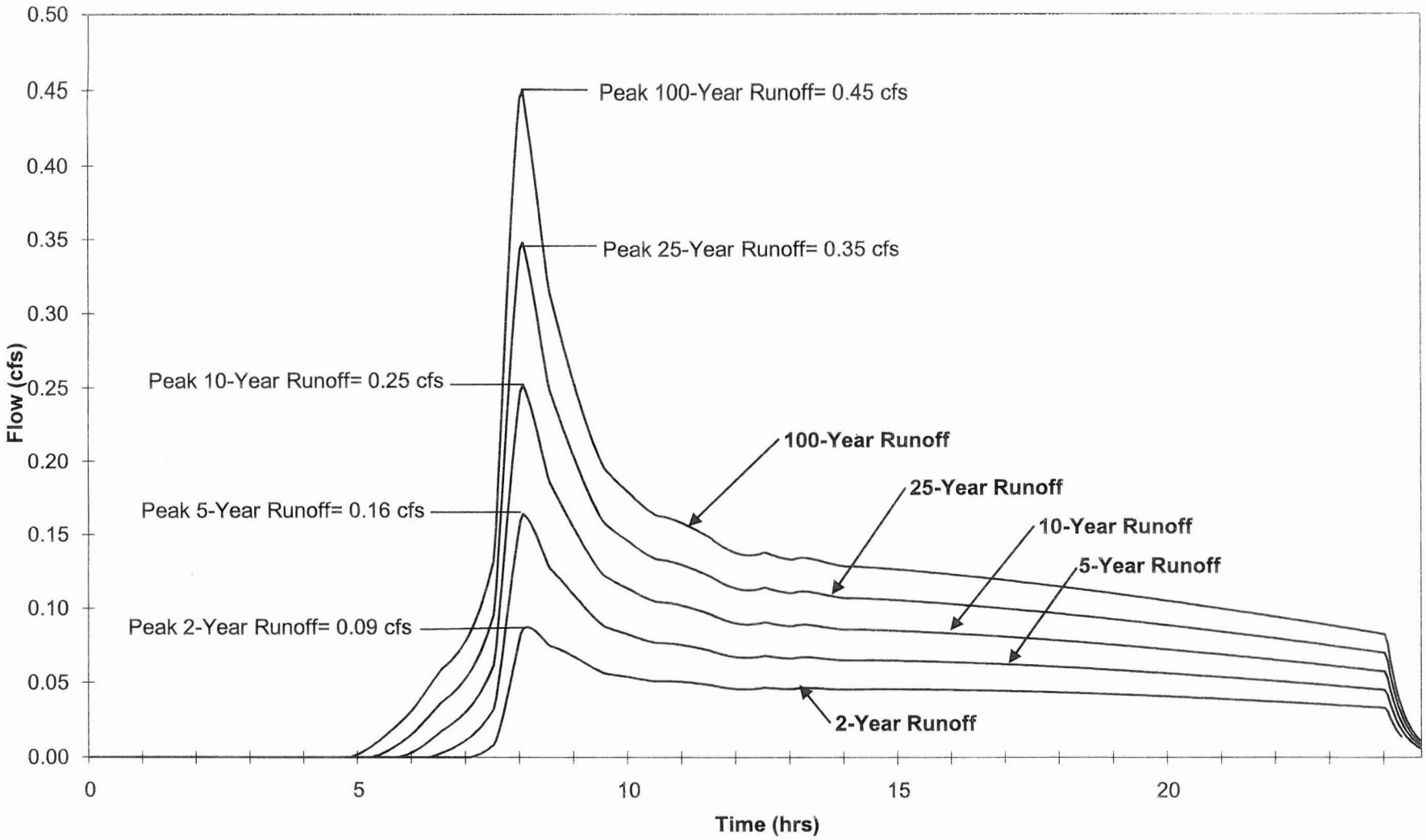
NEW WEST LINN PRIMARY SCHOOL
Runoff Hydrographs for Existing Conditions
SUB-BASIN B



NEW WEST LINN PRIMARY SCHOOL
Runoff Hydrographs for Existing Conditions
SUB-BASIN C



NEW WEST LINN PRIMARY SCHOOL
Runoff Hydrographs for Existing Conditions
SUB-BASIN D



WINZLER&KELLY

DATE: 5/28/2010
JOB No: 10884-09009
JOB NAME: New West Linn Primary School
CALC BY: STS
SUB-BASIN: A - Existing Conditions

Time of Concentration

The following calculations are based on the procedures presented in the NRCS publication TR-55: *Urban Hydrology for Small Watersheds* (June 1986 edition)

Sheet Flow

$$T_{SF} = \frac{0.007(nL)^{0.8}}{(I_2)^{0.5}s^{0.4}} \text{ (60 min/hr)}$$

T_{SF} = Travel Time for Sheet Flow (min)
n = Manning's Roughness Coefficient (From Table 3-1)
I_2 = 2-year, 24-hour rainfall (in)
L = Flow Length (ft) - 300 ft maximum
s = Land Slope (ft/ft)

Parameters
n: 0.15
I_2: 2.4 in
L: 300 ft
s: 0.05 ft/ft

T_{SF} = 19 min

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1] The n values are a composite of information compiled by Engman (1986).
[2] Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3] When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

WINZLER&KELLY

DATE: 5/28/2010
JOB No: 10884-09009
JOB NAME: New West Linn Primary School
CALC BY: STS
SUB-BASIN: B - Existing Conditions

Time of Concentration

The following calculations are based on the procedures presented in the NRCS publication TR-55: *Urban Hydrology for Small Watersheds* (June 1986 edition)

Sheet Flow

$$T_{SF} = \frac{0.007(nL)^{0.8}}{(I_2)^{0.5}s^{0.4}} \text{ (60 min/hr)}$$

T_{SF} = Travel Time for Sheet Flow (min)
n = Manning's Roughness Coefficient (From Table 3-1)
I_2 = 2-year, 24-hour rainfall (in)
L = Flow Length (ft) - 300 ft maximum
s = Land Slope (ft/ft)

Parameters
n: 0.15
I_2: 2.4 in
L: 300 ft
s: 0.05 ft/ft

T_{SF} = 19 min

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1] The n values are a composite of information compiled by Engman (1986).
[2] Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3] When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

WINZLER&KELLY

DATE: 5/28/2010
JOB No: 10884-09009
JOB NAME: New West Linn Primary School
CALC BY: STS
SUB-BASIN: C - Existing Conditions

Time of Concentration

The following calculations are based on the procedures presented in the NRCS publication TR-55: *Urban Hydrology for Small Watersheds* (June 1986 edition)

Sheet Flow

$$T_{SF} = \frac{0.007(nL)^{0.8}}{(I_2)^{0.5}s^{0.4}} \text{ (60 min/hr)}$$

T_{SF} = Travel Time for Sheet Flow (min)
n = Manning's Roughness Coefficient (From Table 3-1)
I_2 = 2-year, 24-hour rainfall (in)
L = Flow Length (ft) - 300 ft maximum
s = Land Slope (ft/ft)

Parameters
n: 0.15
I_2: 2.4 in
L: 240 ft
s: 0.07 ft/ft

T_{SF} = 14 min

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n 1/
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses 2/	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:2/	
Light underbrush	0.40
Dense underbrush	0.80

1 The n values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

WINZLER&KELLY

DATE: 5/28/2010
JOB No: 10884-09009
JOB NAME: New West Linn Primary School
CALC BY: STS
SUB-BASIN: D - Existing Conditions

Time of Concentration

The following calculations are based on the procedures presented in the NRCS publication TR-55: *Urban Hydrology for Small Watersheds* (June 1986 edition)

Sheet Flow

$$T_{SF} = \frac{0.007(nL)^{0.8}}{(I_2)^{0.5}s^{0.4}} \text{ (60 min/hr)}$$

T_{SF} = Travel Time for Sheet Flow (min)
n = Manning's Roughness Coefficient (From Table 3-1)
I_2 = 2-year, 24-hour rainfall (in)
L = Flow Length (ft) - 300 ft maximum
s = Land Slope (ft/ft)

Parameters
n: 0.15
I_2: 2.4 in
L: 300 ft
s: 0.05 ft/ft

T_{SF} = 19 min

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1] The n values are a composite of information compiled by Engman (1986).
[2] Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3] When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

Appendix C

Calculations for Hydrologic Analysis of Proposed Conditions

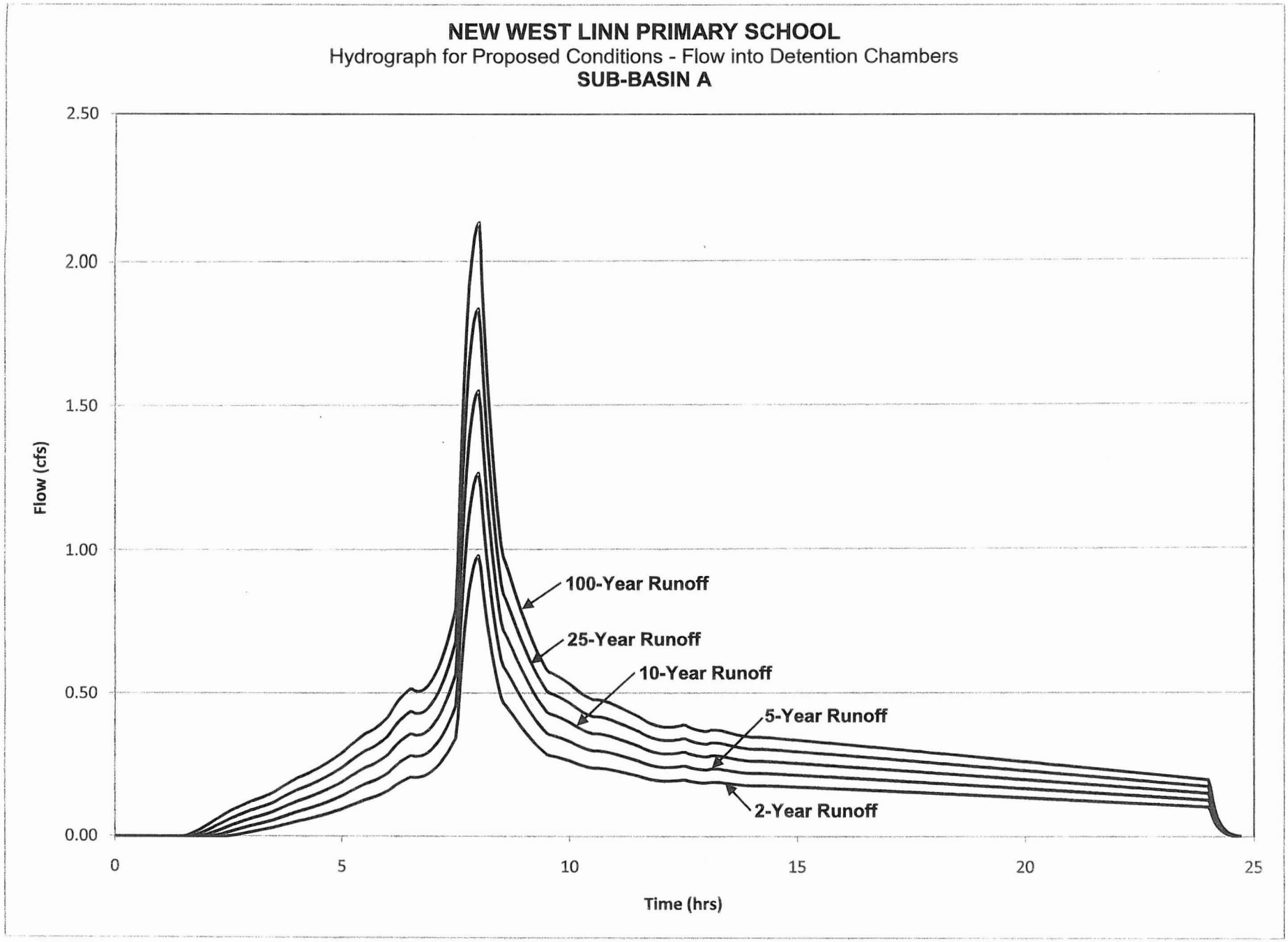
NEW WEST LINN PRIMARY SCHOOL

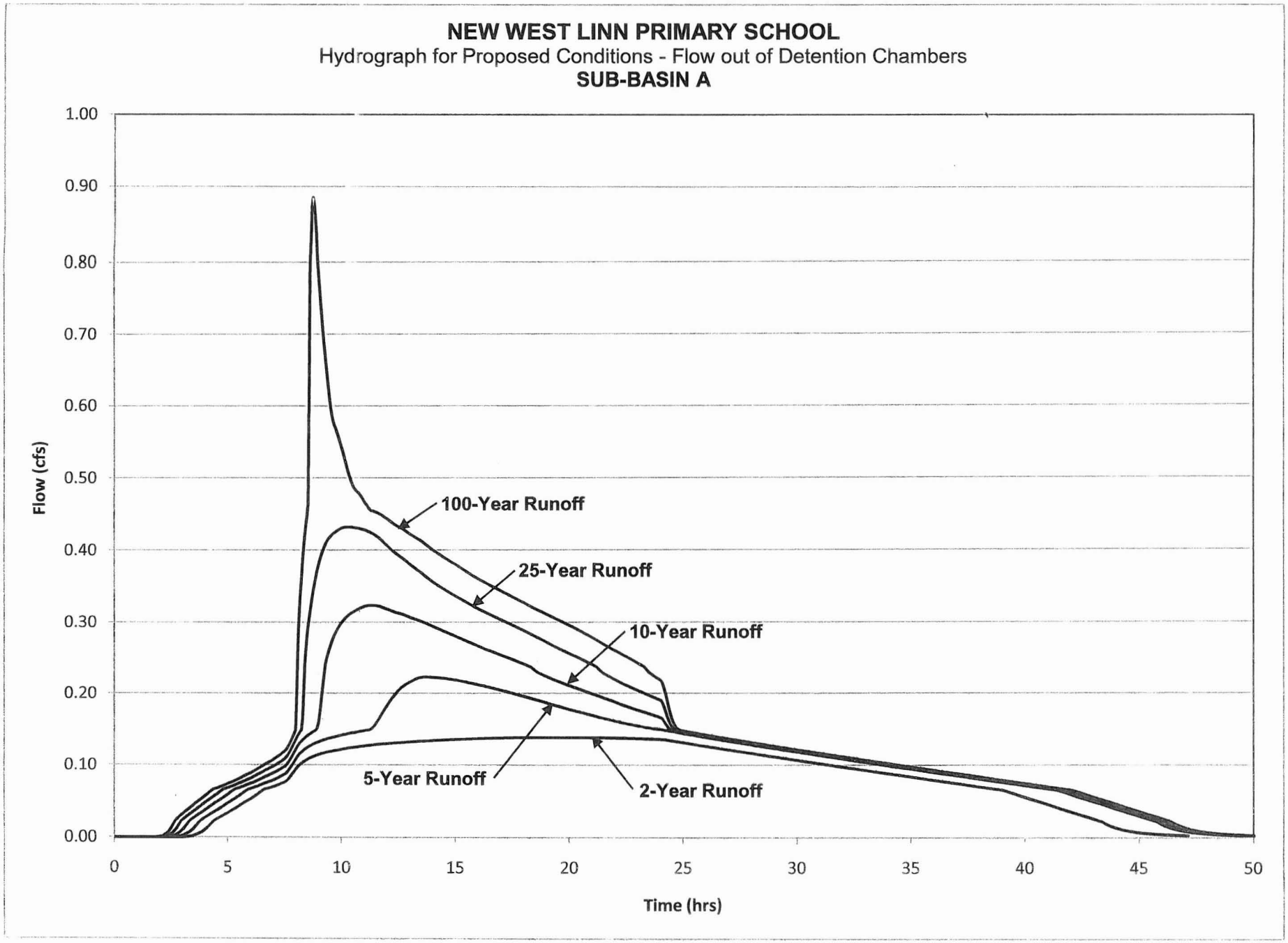
Hydrologic Summary for Proposed Conditions

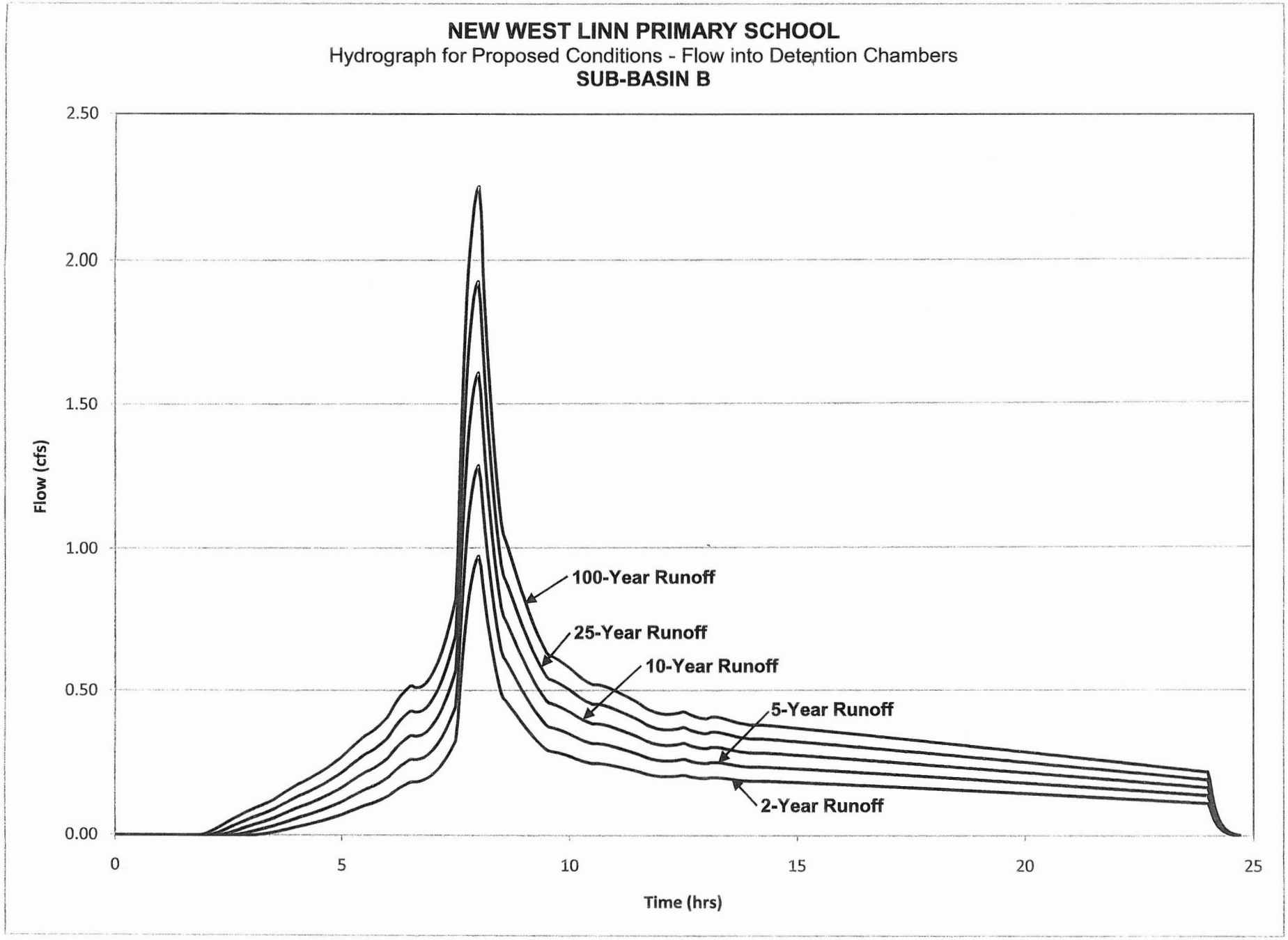
Hydrologic Soil Group (HSG):	C
Curve Number (CN) Impervious Areas:	98
Curve Number (CN) Open Space Areas:	74

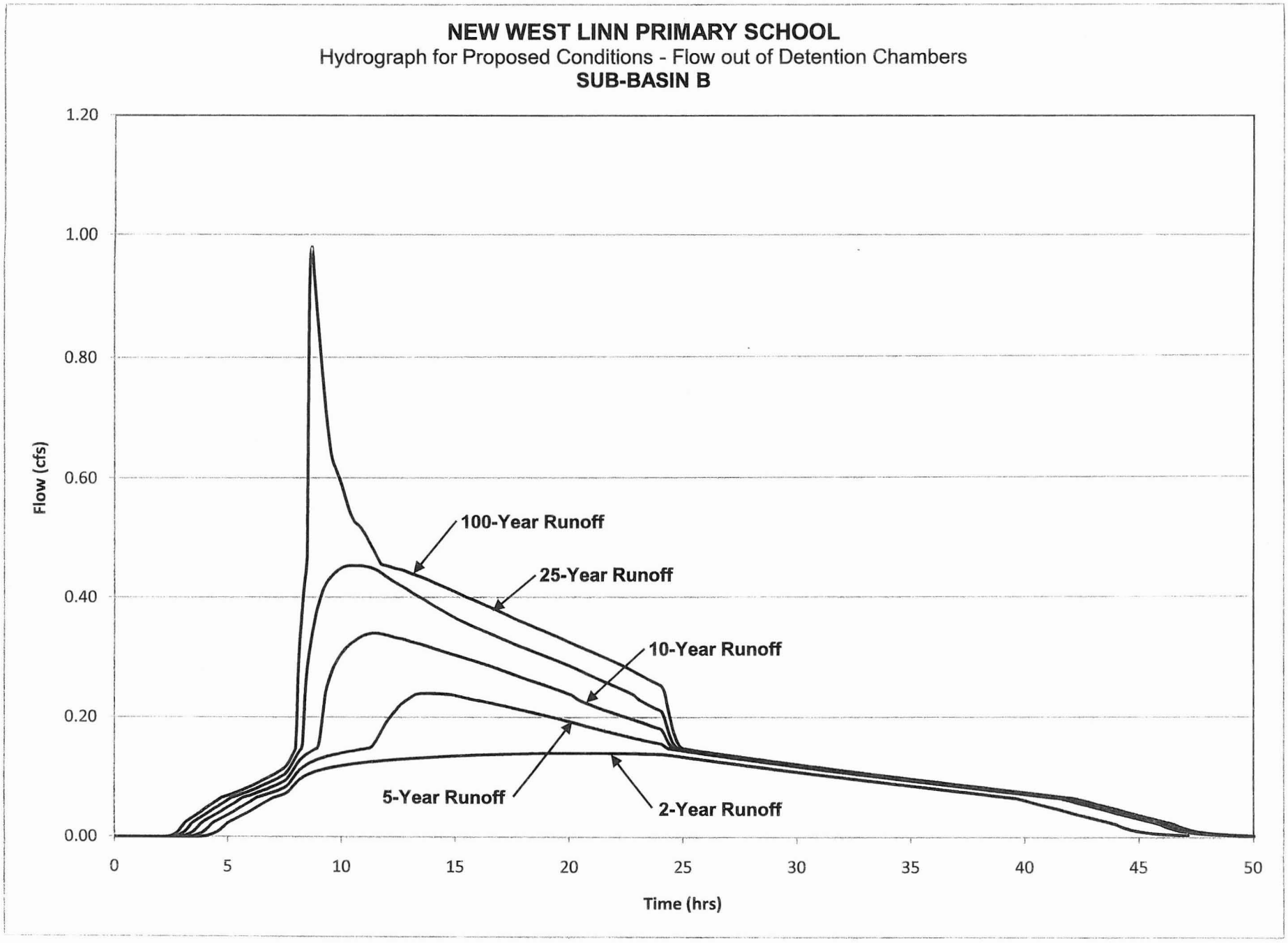
Sub-Basin	Land Use	Area (ac)	Percent Impervious	Composite CN	Time of Concentration, T_c (min)
A	Open Space / Impervious	2.40	78%	93	10
B	Open Space / Impervious	2.70	72%	91	10
C	Open Space / Impervious	0.90	51%	86	10
D	Open Space / Impervious	1.24	38%	83	10
	Total:	**7.24**			

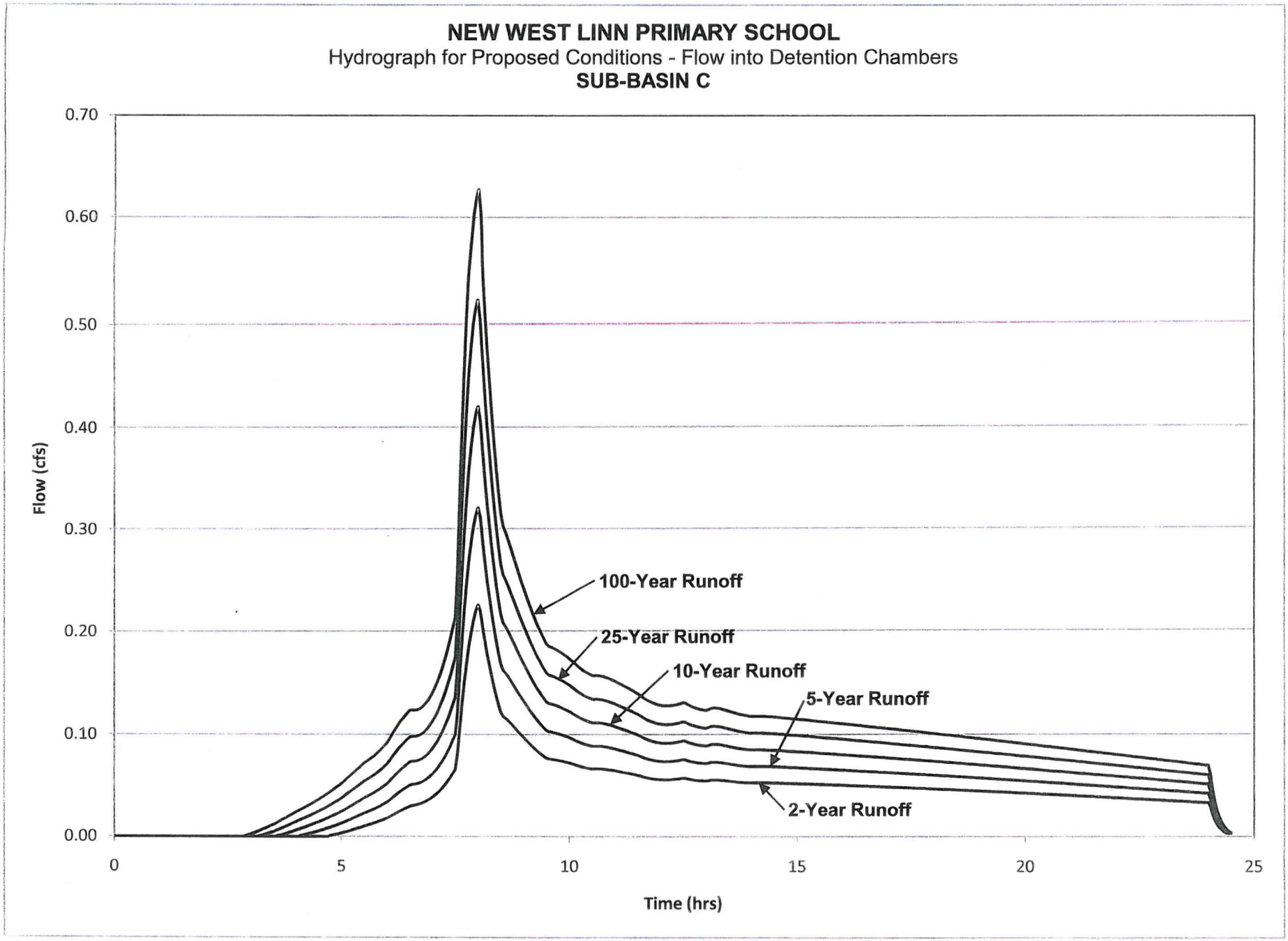
Reference: "Urban Hydrology for Small Watersheds", NRCS Technical Release 55, Second Edition, June 1986

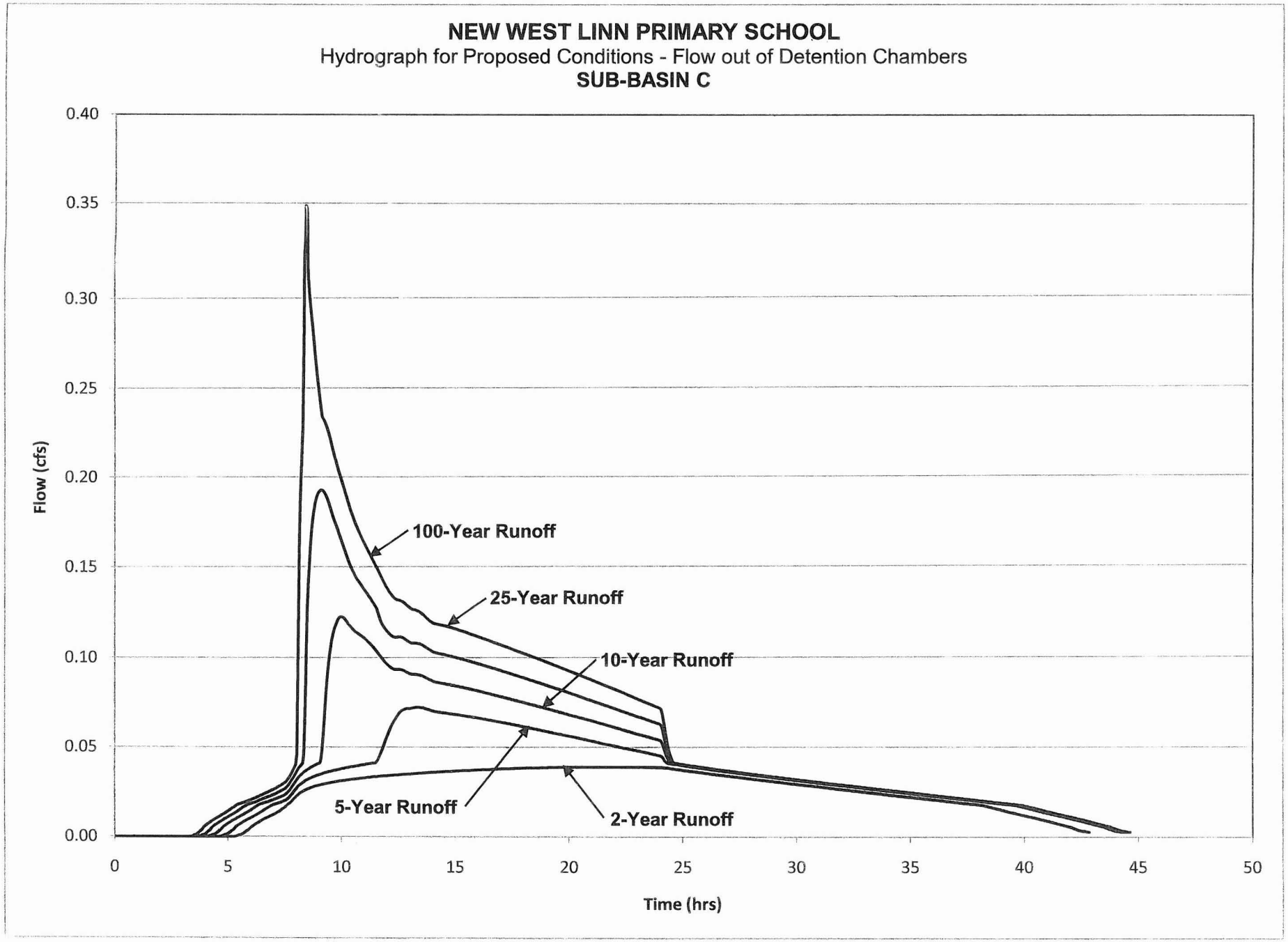

NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow into Detention Chambers
SUB-BASIN A
Flow (cfs)
2.50
2.00
1.50
1.00
0.50
0.00
0
5
10
15
20
25
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff

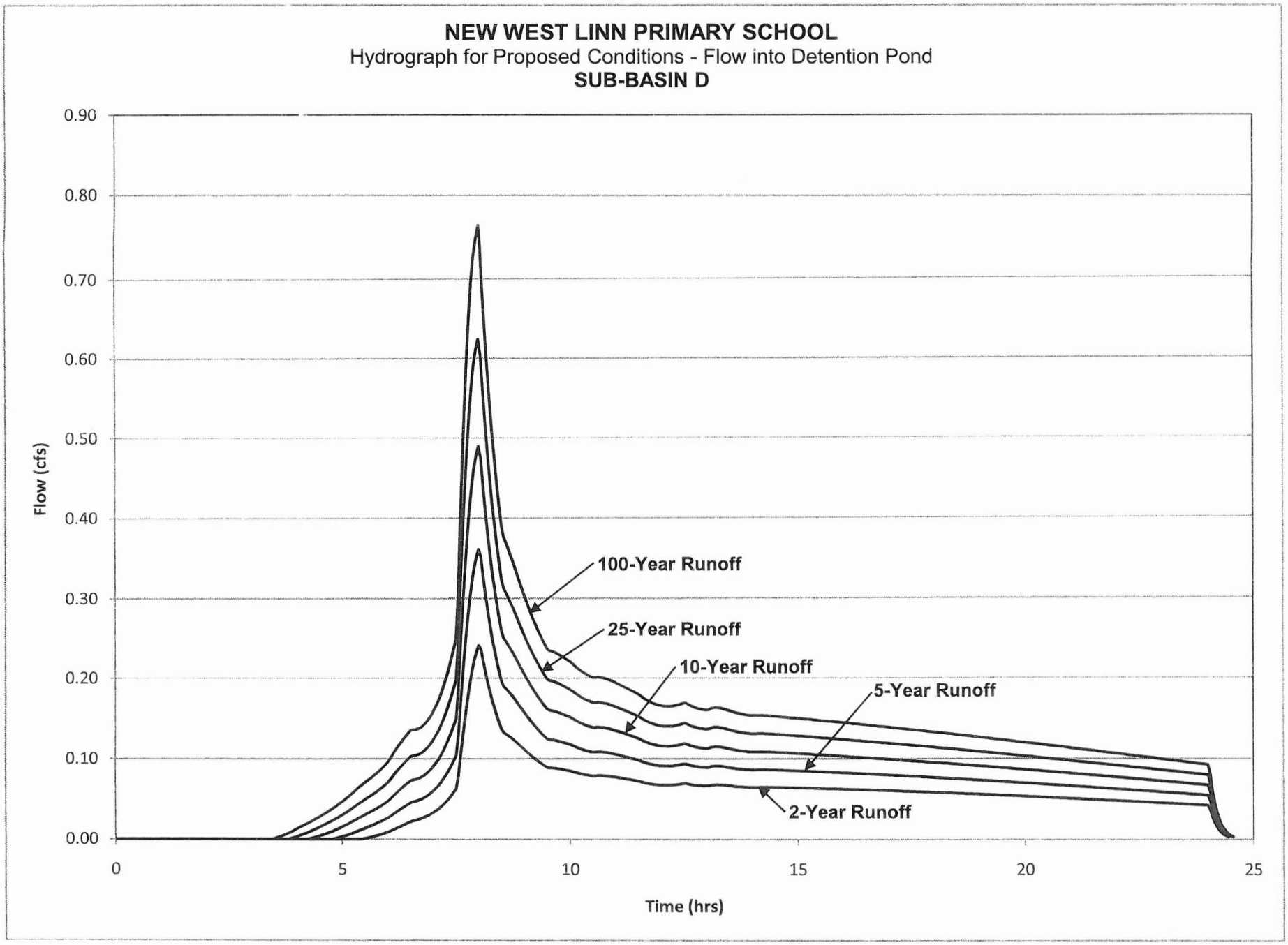

NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow out of Detention Chambers
SUB-BASIN A
Flow (cfs)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
35
40
45
50
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff

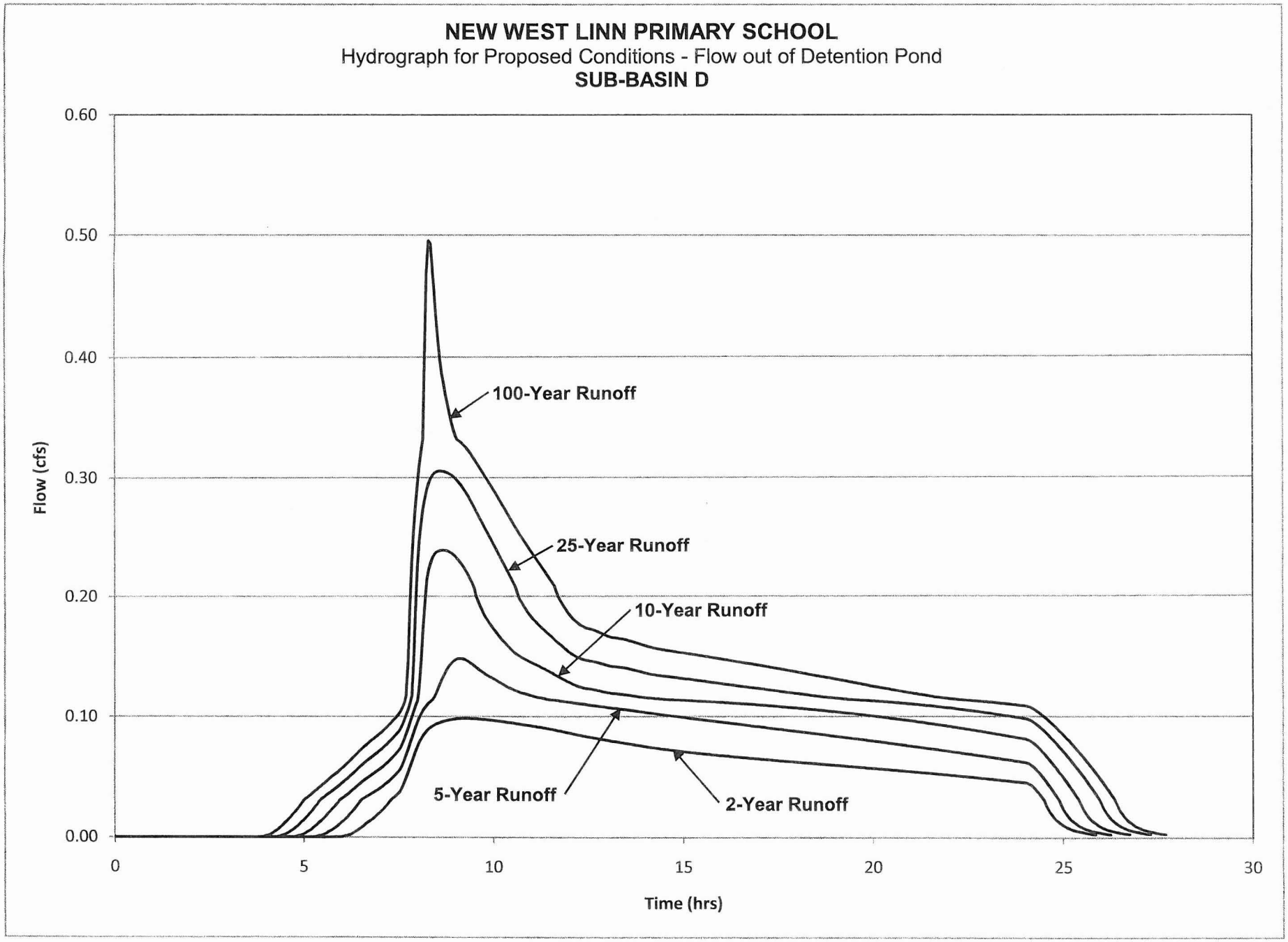

NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow into Detention Chambers
SUB-BASIN B
Flow (cfs)
2.50
2.00
1.50
1.00
0.50
0.00
0
5
10
15
20
25
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff


NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow out of Detention Chambers
SUB-BASIN B
Flow (cfs)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
5
10
15
20
25
30
35
40
45
50
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff


NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow into Detention Chambers
SUB-BASIN C
Flow (cfs)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff


NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow out of Detention Chambers
SUB-BASIN C
Flow (cfs)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
5
10
15
20
25
30
35
40
45
50
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff


NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow into Detention Pond
SUB-BASIN D
Flow (cfs)
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff


NEW WEST LINN PRIMARY SCHOOL
Hydrograph for Proposed Conditions - Flow out of Detention Pond
SUB-BASIN D
Flow (cfs)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
5
10
15
20
25
30
Time (hrs)
100-Year Runoff
25-Year Runoff
10-Year Runoff
5-Year Runoff
2-Year Runoff

Appendix D

Water Quality Calculations

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #1

Project Name:	New West Linn Primary School	**Date:**	06/02/10
Project Address:	Rosemont Road	**Permit Number:**	[Permit #]
	West Linn, OR	Run Time	6/2/2010 10:28:32 AM
Designer:	STS		
Company:	Winzler & Kelly		

Drainage Catchment Information

Catchment ID	Bioswale #1	
	Catchment Area	
Impervious Area	20,000	SF
Impervious Area	0.46	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.

Site Soils & Infiltration Testing Data

Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	

Correction Factor Component

CF_{test} (ranges from 1 to 3)	2	

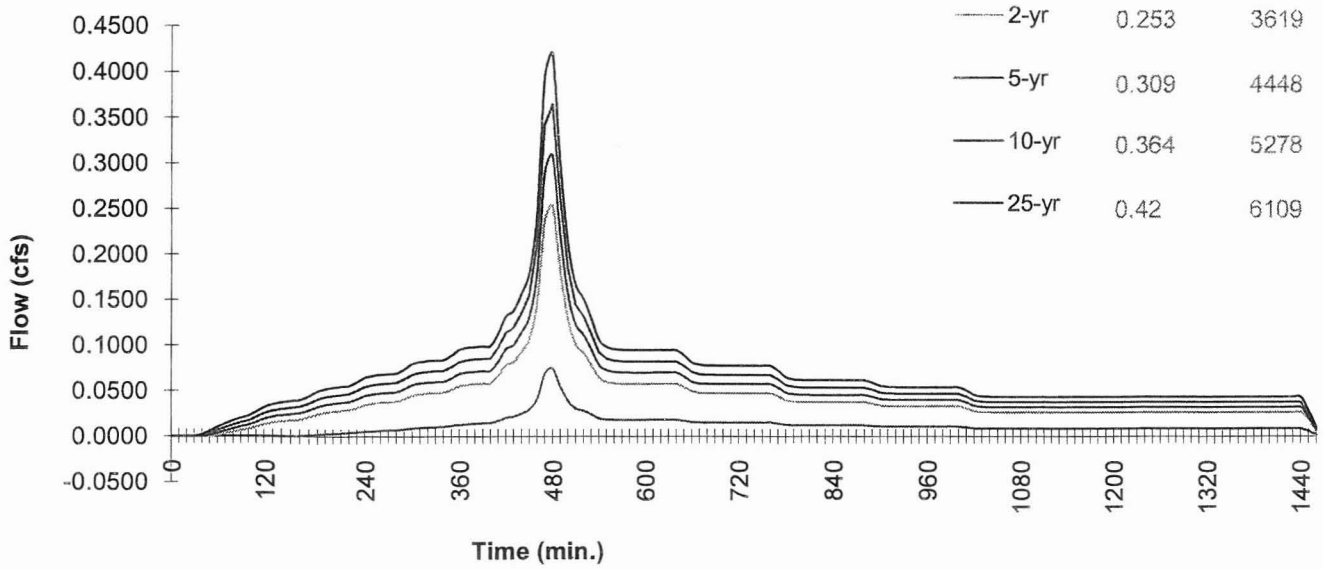
Design Infiltration Rates

I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr	**Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr	

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.075	1045
2-yr	0.253	3619
5-yr	0.309	4448
10-yr	0.364	5278
25-yr	0.42	6109



Printed: 6/2/2010 10:29 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #1

Run Time 6/2/2010 10:28:32 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #1 **Date:** 6/2/2010

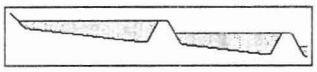
Instructions:
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

Goal Summary:

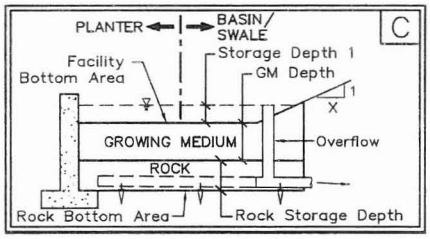
Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C

Refer to Sloped Facility Worksheet and enter Variable Parameters



Calculation Guide
Max. Rock Stor. Bottom Area
Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 464 sf
Surface Capacity Volume = 214.2 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 214 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.021 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 400 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 60 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.002 cfs

RESULTS

Pollution Reduction	Overflow Volume		
PASS	814 CF	57% Surf. Cap. Used	Run PAC
		100% Rock Cap. Used	

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.251	0.307	0.362	0.417

Current data has been exported:

Bioswale #1.xls **6/2/2010 10:28:50 AM**

FACILITY FACTS

Total Facility Area Including Freeboard = **1,098 SF**
Sizing Ratio (Total Facility Area / Catchment Area) = **0.055**

Presumptive Approach Calculator Ver 1.1

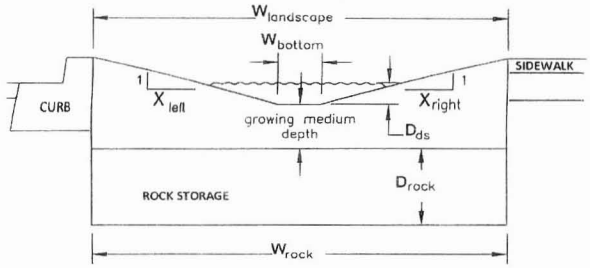
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

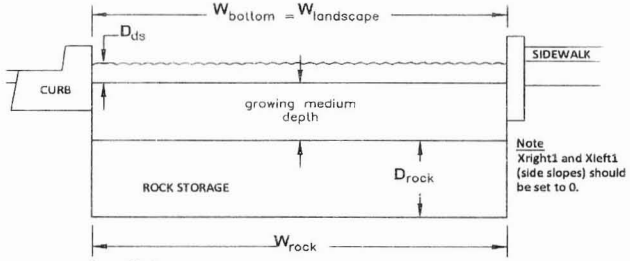
Run Time 6/2/2010 10:28:32 AM

Project Name: New West Linn Primary School **Date: 6/2/2010** **Catchment ID: Bioswale #1**

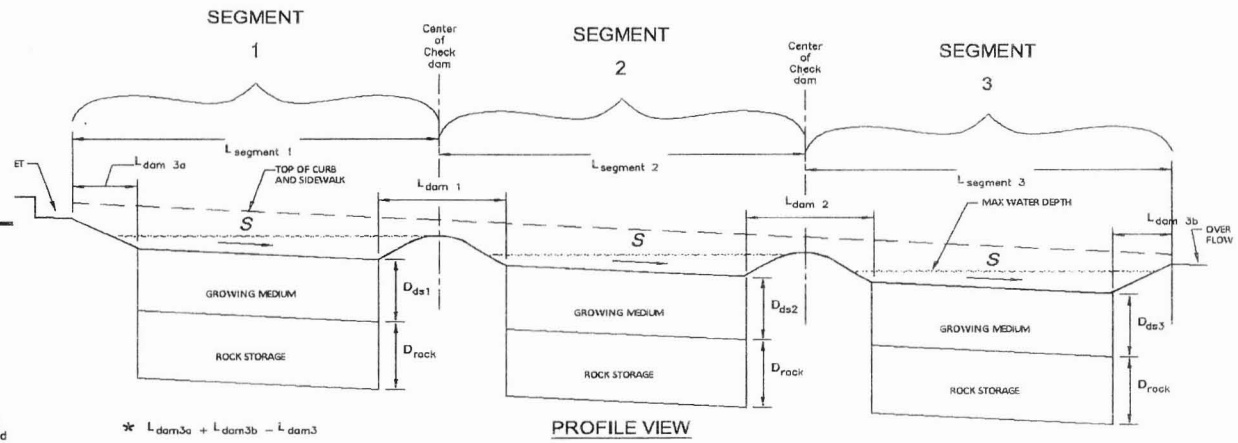
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



* $L_{dam3a} + L_{dam3b} - L_{dam3}$

PROFILE VIEW

Data Entry

Variable Description	Parameters									Rock Storage Parameters		
	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	$X_{right}:1$	$X_{left}:1$	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	18	2	0.035	5	3	3	8	11	5	12	0.3
	2	18	2	0.035	5	3	3	8	11	5		
	3	18	2	0.035	5	3	3	8	11	5		
	4	18	2	0.035	5	3	3	8	11	5		
	5	18	2	0.035	5	3	3	8	11	5		
	6											
	7											
	8											
	9											
	10											

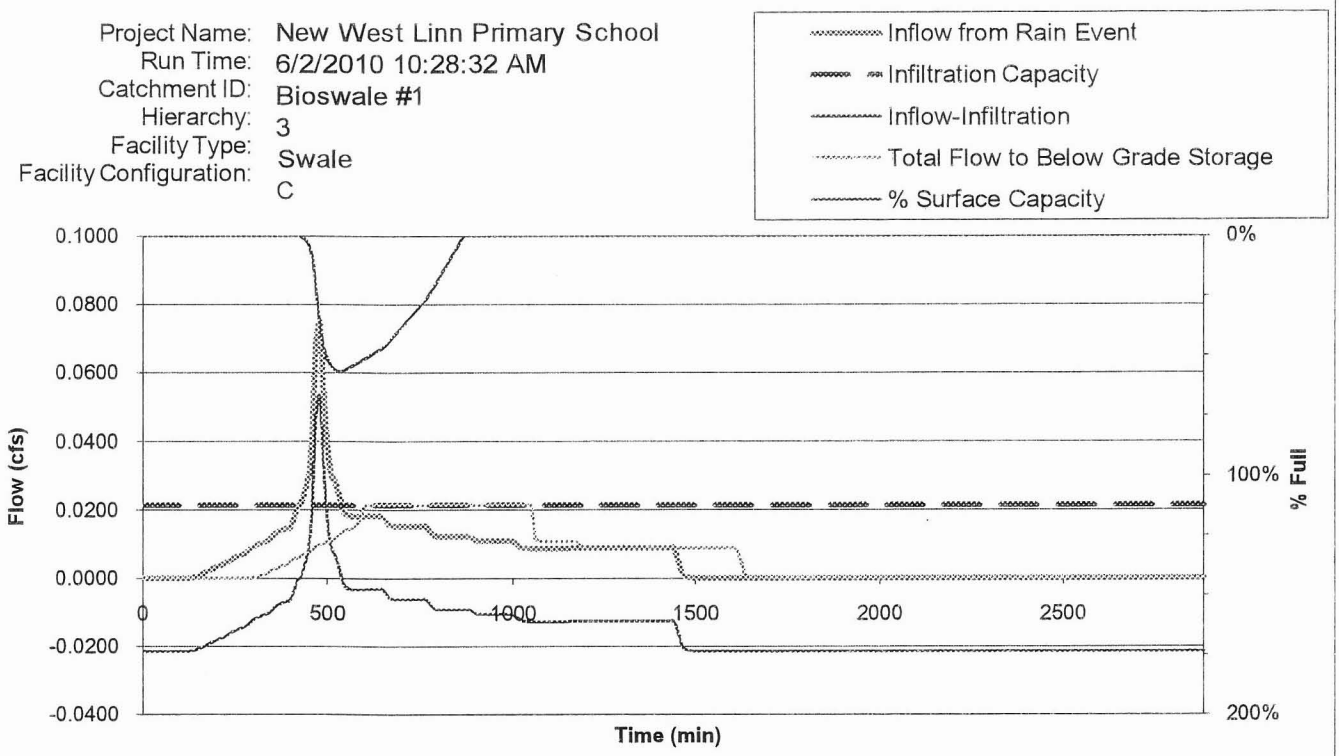
Depth 3 = 6

Error Messages

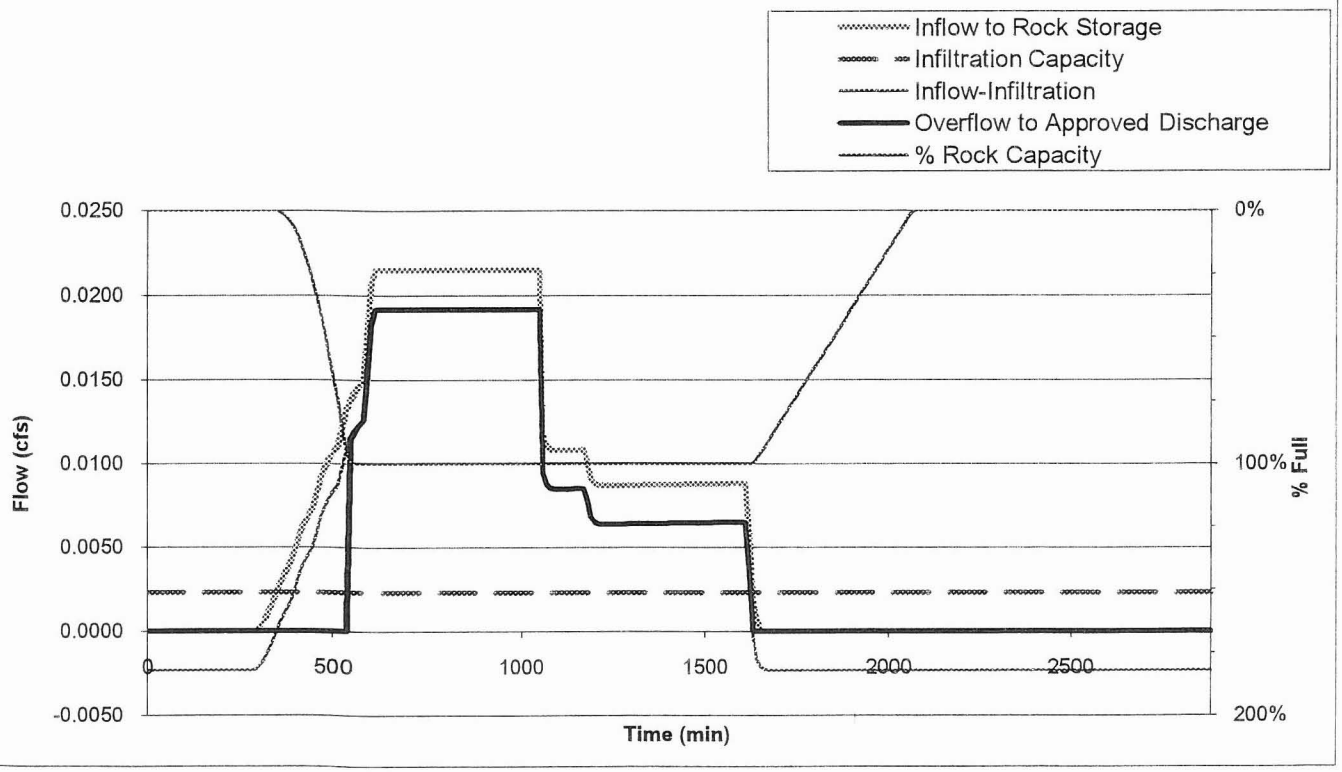
Worksheet Calculations

Pollution Reduction Event
Surface Facility Modeling

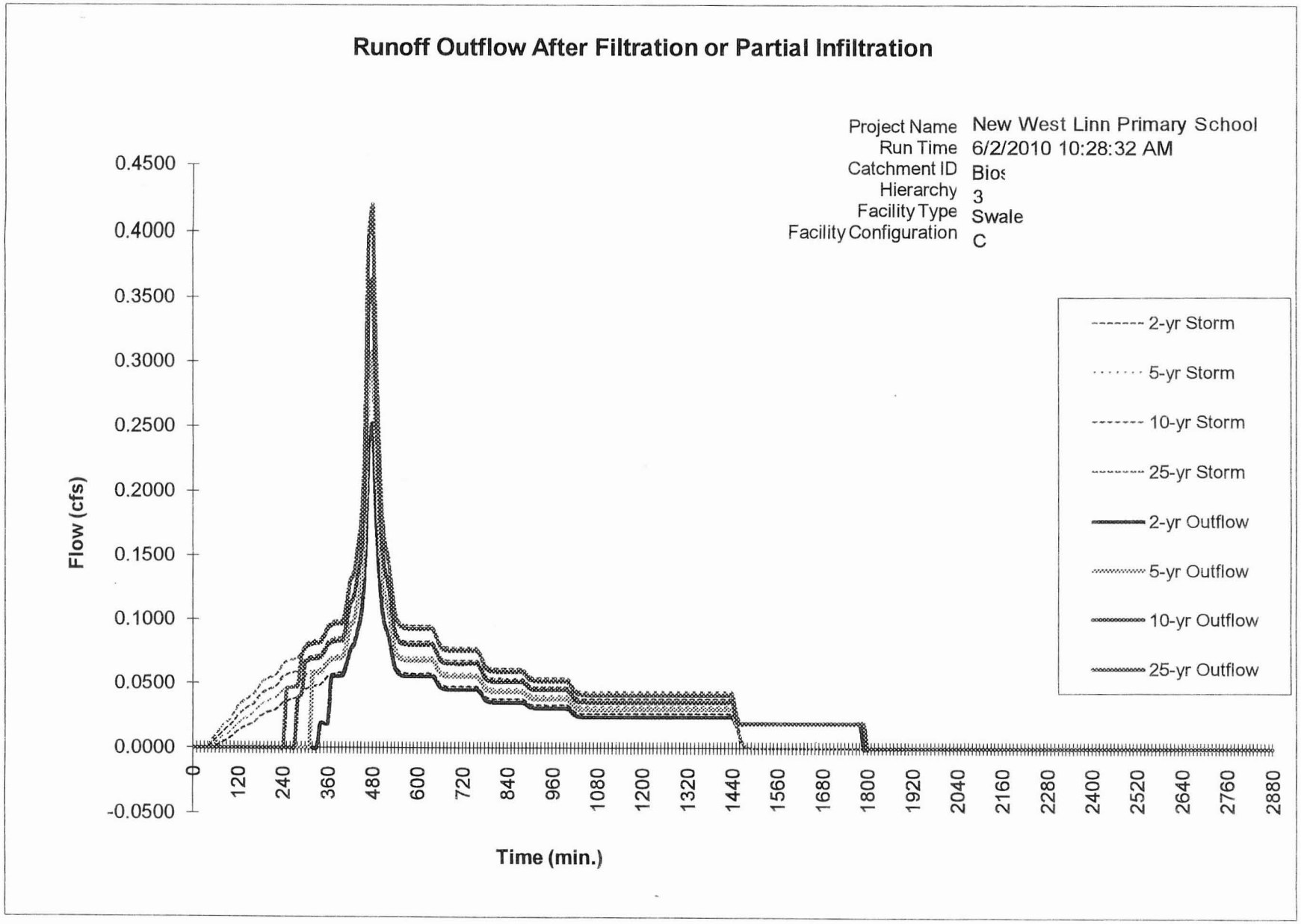
Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:28:32 AM
Catchment ID: Bioswale #1
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling



Printed: 6/2/2010 10:29 AM


Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:28:32 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.4500
0.4000
0.3500
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
-0.0500
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #2

Project Name: New West Linn Primary School

Date: 06/02/10

Project Address: Rosemont Road
West Linn, OR

Permit Number: [Permit #]

Run Time 6/2/2010 10:21:53 AM

Designer: STS

Company: Winzler & Kelly

Drainage Catchment Information

Catchment ID	Bioswale #2	
	Catchment Area	
Impervious Area	12,500	SF
Impervious Area	0.29	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.

Site Soils & Infiltration Testing Data

Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	

Correction Factor Component

CF_{test} (ranges from 1 to 3)	2	

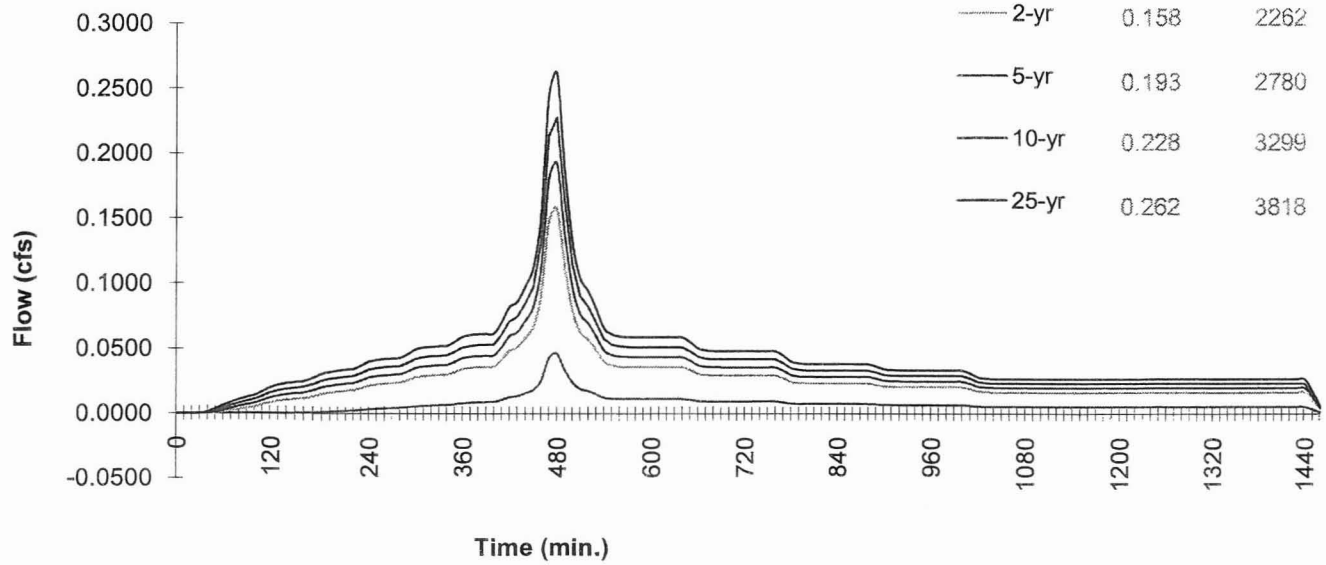
Design Infiltration Rates

I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr	**Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr	

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.047	653
2-yr	0.158	2262
5-yr	0.193	2780
10-yr	0.228	3299
25-yr	0.262	3818



Printed: 6/2/2010 10:25 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #2

Run Time 6/2/2010 10:21:53 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #2 **Date:** 6/2/2010

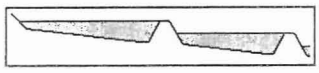
Instructions:
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

Goal Summary:

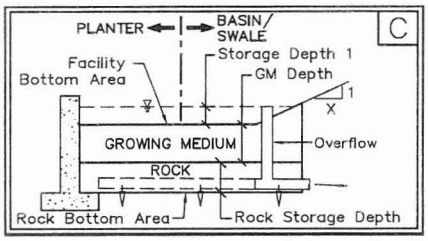
Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C

Refer to Sloped Facility Worksheet and enter Variable Parameters



Calculation Guide
Max. Rock Stor. Bottom Area Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 425 sf
Surface Capacity Volume = 144.2 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 144 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.020 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 375 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 56 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.002 cfs

RESULTS

Pollution Reduction	Overflow Volume			
PASS	432 CF	31%	Surf. Cap. Used	Run PAC
		100%	Rock Cap. Used	

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.156	0.191	0.226	0.260

FACILITY FACTS

Total Facility Area Including Freeboard = 1,043 SF
Sizing Ratio (Total Facility Area / Catchment Area) = 0.083

Presumptive Approach Calculator Ver 1.1

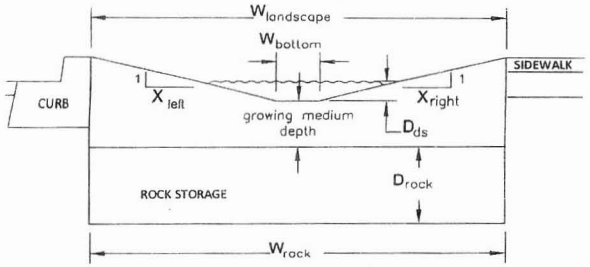
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

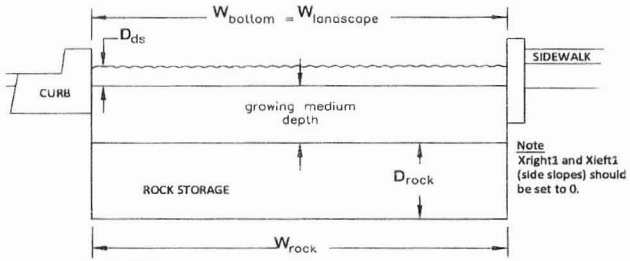
Run Time 6/2/2010 10:21:53 AM

Project Name: New West Linn Primary School **Date: 6/2/2010** **Catchment ID: Bioswale #2**

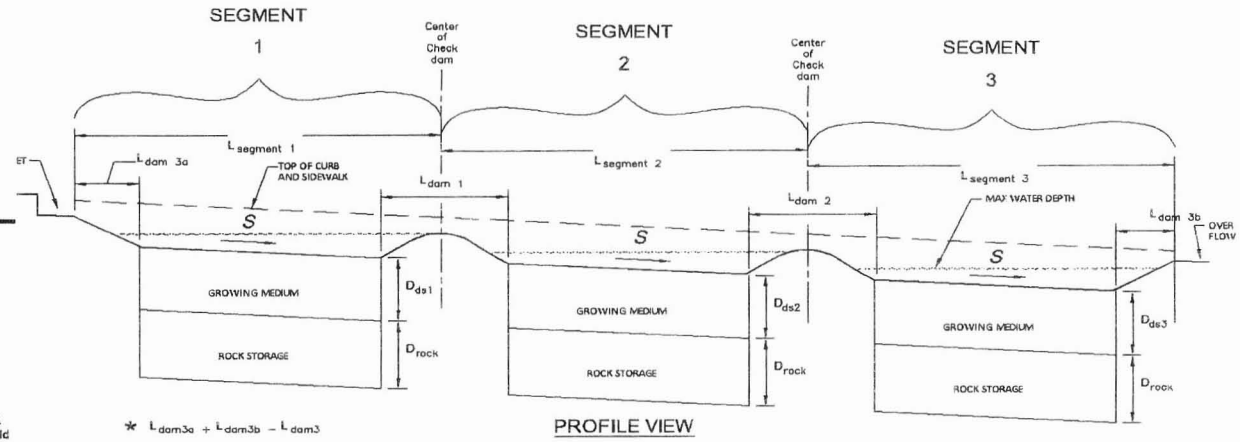
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



Data Entry

Variable Description	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	X_{right}:1	X_{left}:1	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	17	2	0.027	5	3	3	6	11	5	12	0.3
	2	17	2	0.027	5	3	3	6	11	5		
	3	17	2	0.027	5	3	3	6	11	5		
	4	17	2	0.027	5	3	3	6	11	5		
	5	17	2	0.027	5	3	3	6	11	5		
	6											
	7											
	8											
	9											
	10											

Parameters | Rock Storage Parameters

Error Messages

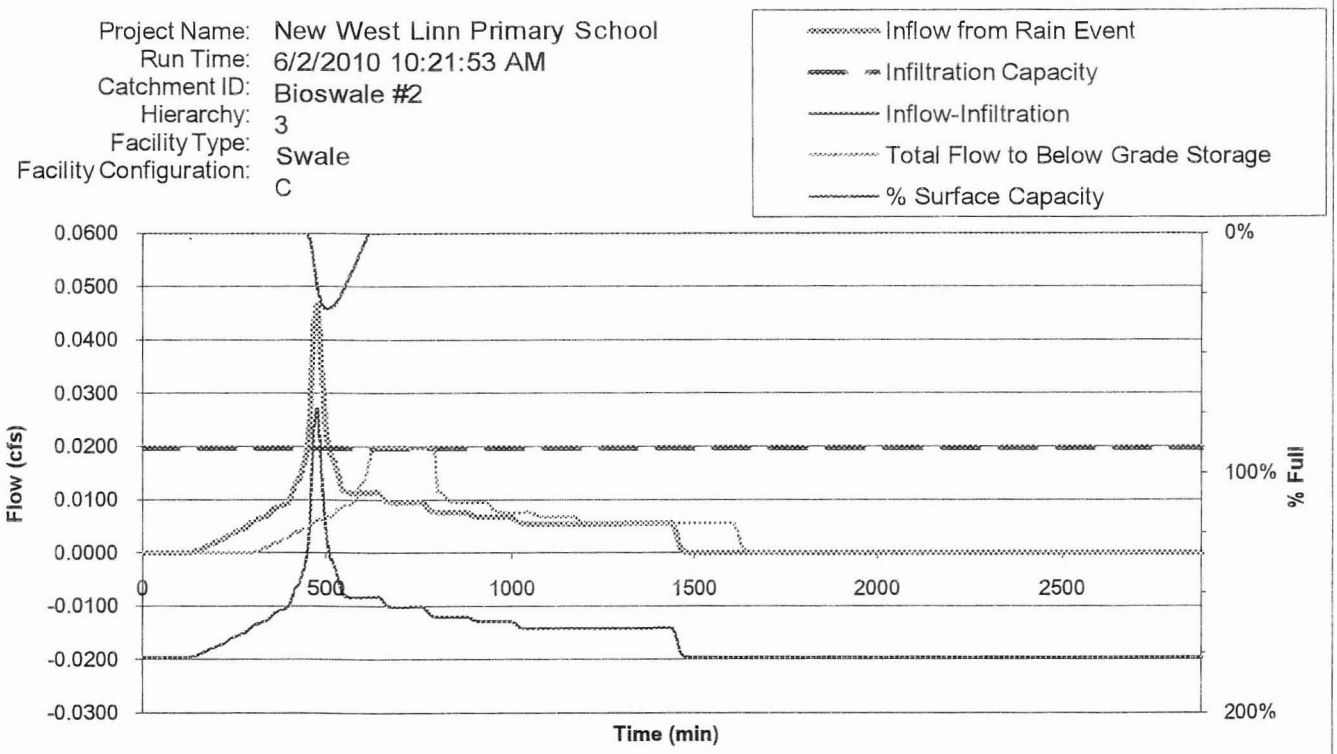
Depth 3 = 6

Worksheet Calculations

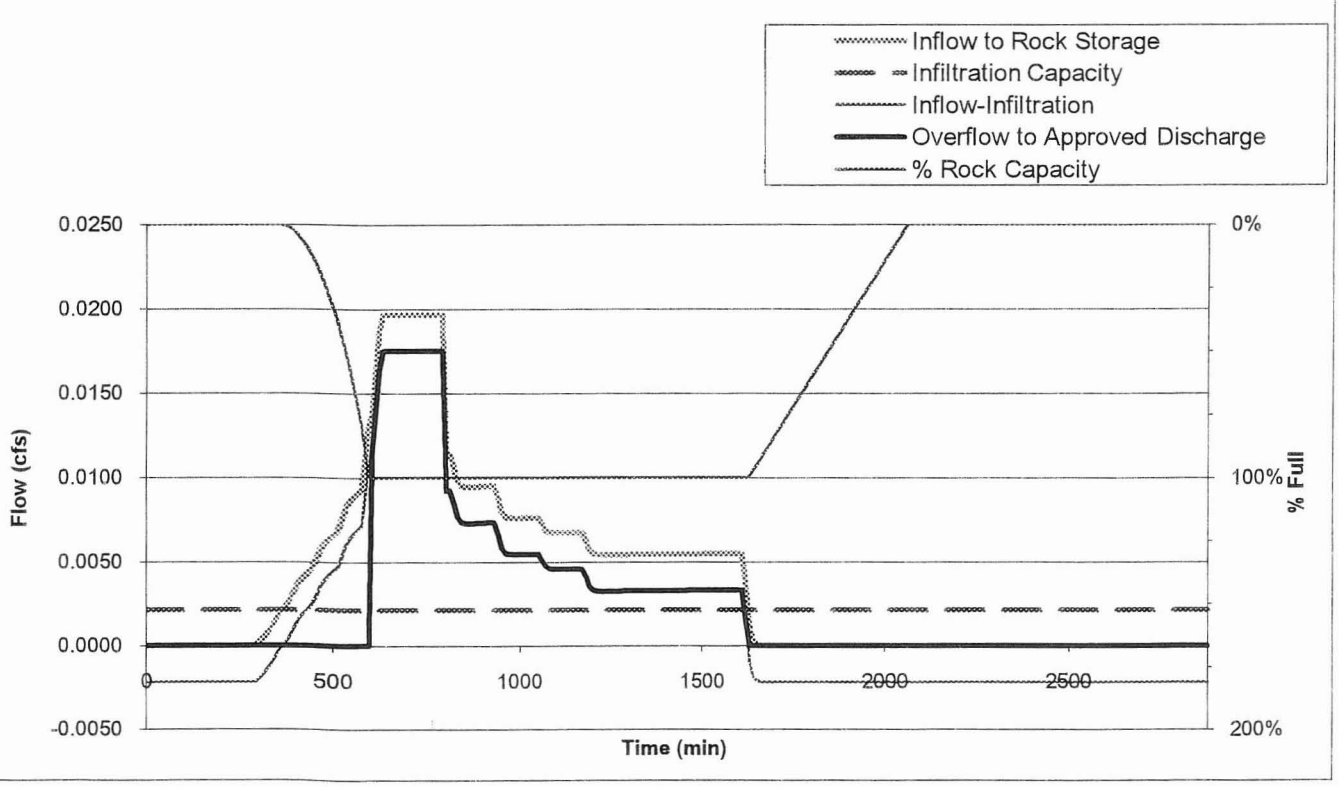
455

Pollution Reduction Event
Surface Facility Modeling

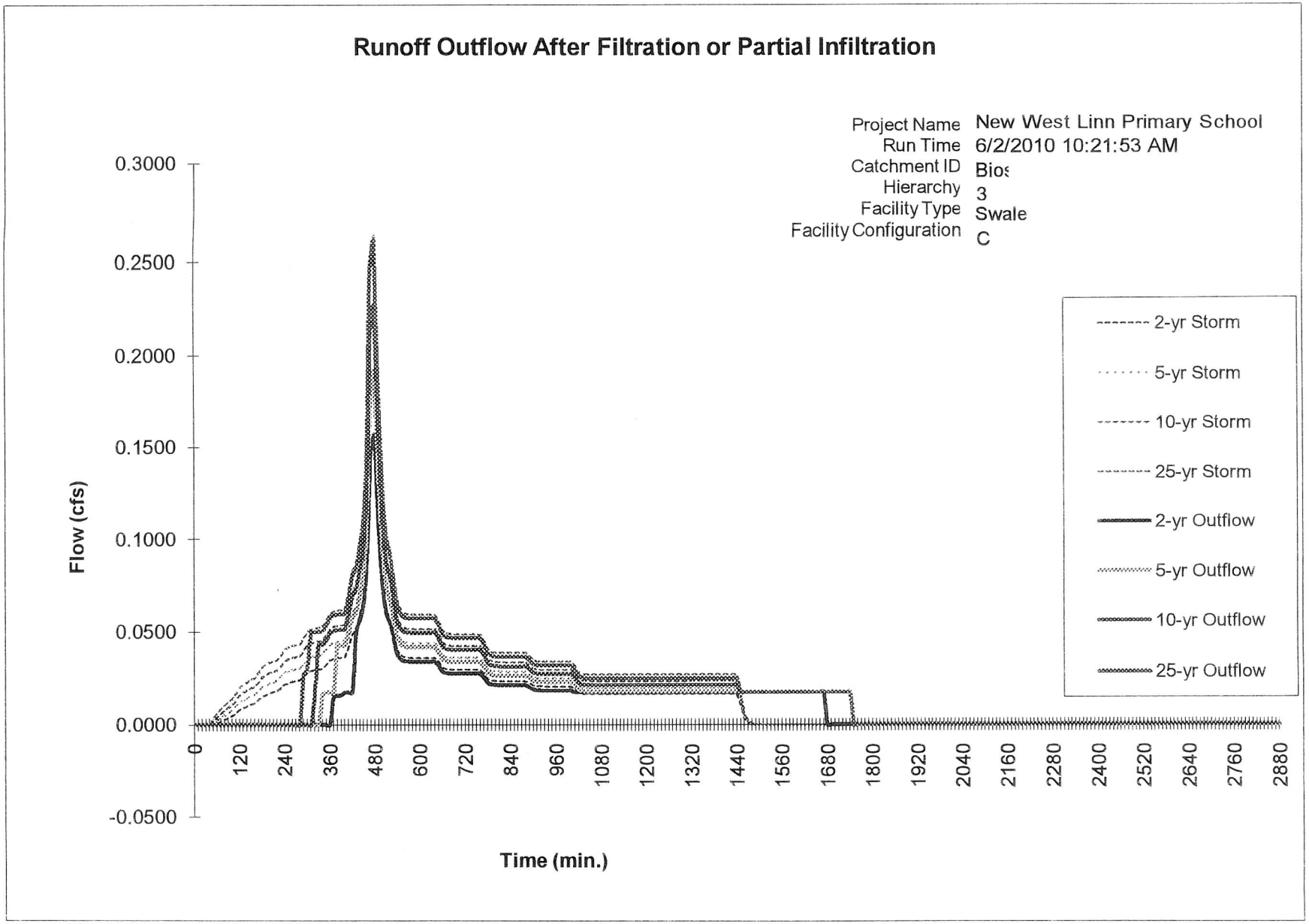
Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:21:53 AM
Catchment ID: Bioswale #2
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling



Printed: 6/2/2010 10:25 AM


Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:21:53 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
-0.0500
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #3

Project Name:	New West Linn Primary School	**Date:**	06/02/10
Project Address:	Rosemont Road	**Permit Number:**	[Permit #]
	West Linn, OR	Run Time	6/2/2010 10:39:04 AM
Designer:	STS		
Company:	Winzler & Kelly		

Drainage Catchment Information

Catchment ID	Bioswale #3	
	Catchment Area	
Impervious Area	15,400	SF
Impervious Area	0.35	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.

Site Soils & Infiltration Testing Data

Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	

Correction Factor Component

CF_{test} (ranges from 1 to 3)	2	

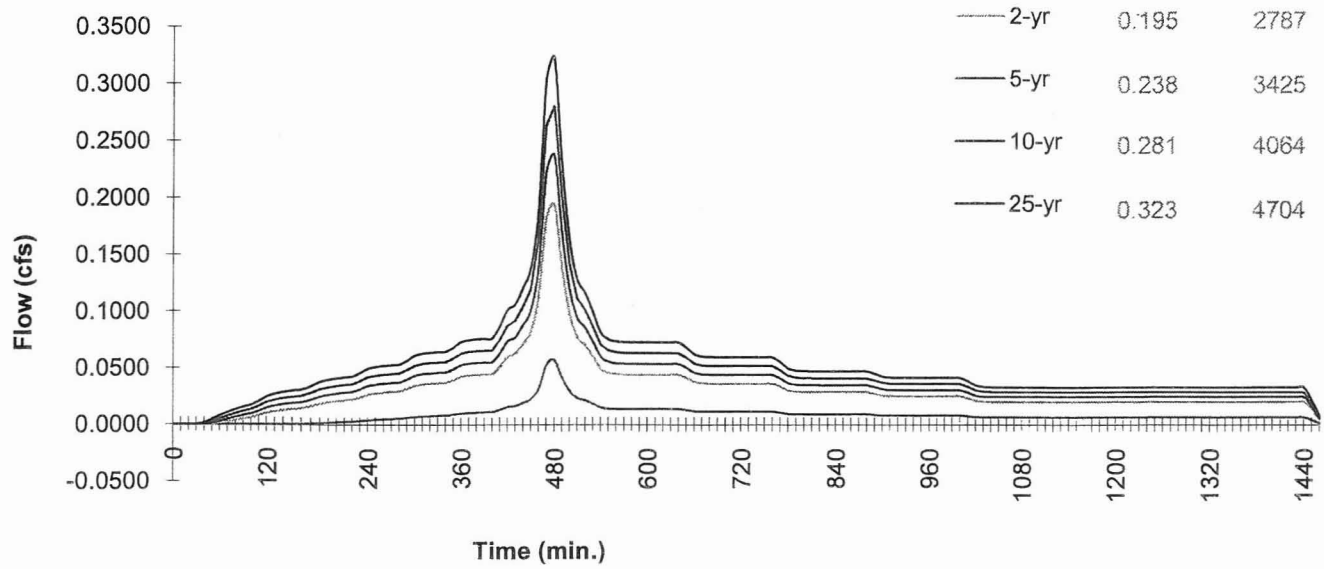
Design Infiltration Rates

I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr	**Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr	

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.058	805
2-yr	0.195	2787
5-yr	0.238	3425
10-yr	0.281	4064
25-yr	0.323	4704



Printed: 6/2/2010 10:39 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #3

Run Time 6/2/2010 10:39:04 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #3 **Date:** 6/2/2010

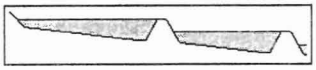
Instructions:
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

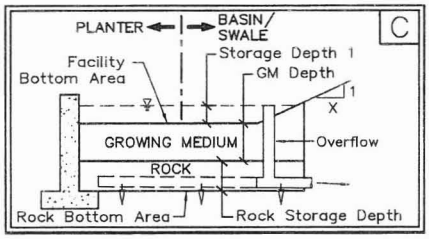
Goal Summary:

Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C



Refer to Sloped Facility Worksheet and enter Variable Parameters

Calculation Guide
Max. Rock Stor. Bottom Area
Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 418 sf
Surface Capacity Volume = 147.7 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 148 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.019 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 540 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 81 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.003 cfs

RESULTS

Pollution Reduction: **PASS**

Overflow Volume: 494 CF

52% Surf. Cap. Used

100% Rock Cap. Used

Run PAC

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.192	0.235	0.278	0.320

Current data has been exported:

Bioswale #3.xls **6/2/2010 10:39:15 AM**

FACILITY FACTS

Total Facility Area Including Freeboard = **1,428 SF**
Sizing Ratio (Total Facility Area / Catchment Area) = **0.093**

Presumptive Approach Calculator Ver 1.1

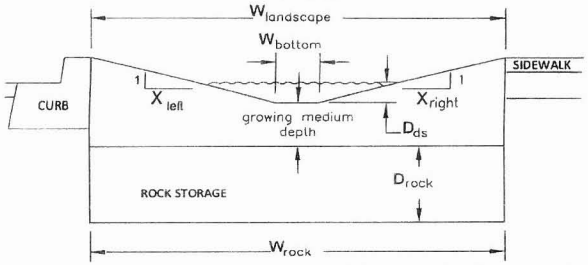
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

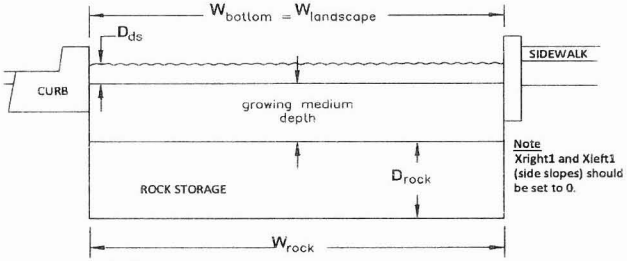
Run Time 6/2/2010 10:30:04 AM

Project Name: New West Linn Primary School **Date:** 6/2/2010 **Catchment ID:** Bioswale #3

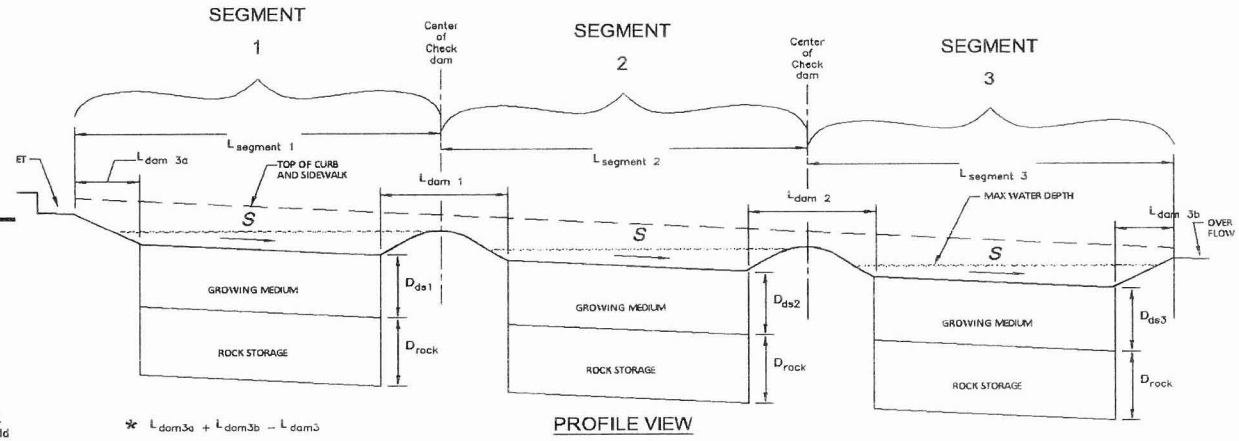
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



Data Entry

Variable Description	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	X_{right}:1	X_{left}:1	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	20	2	0.033	5	3	3	6	11	5	12	0.3
	2	20	2	0.033	5	3	3	6	11	5		
	3	20	2	0.033	5	3	3	6	11	5		
	4	20	2	0.033	5	3	3	6	11	5		
	5	20	2	0.033	5	3	3	6	11	5		
	6	20	2	0.033	5	3	3	6	11	5		
	7											
	8											
	9											
	10											

Parameters | Rock Storage Parameters

Depth 3 = 6

Error Messages

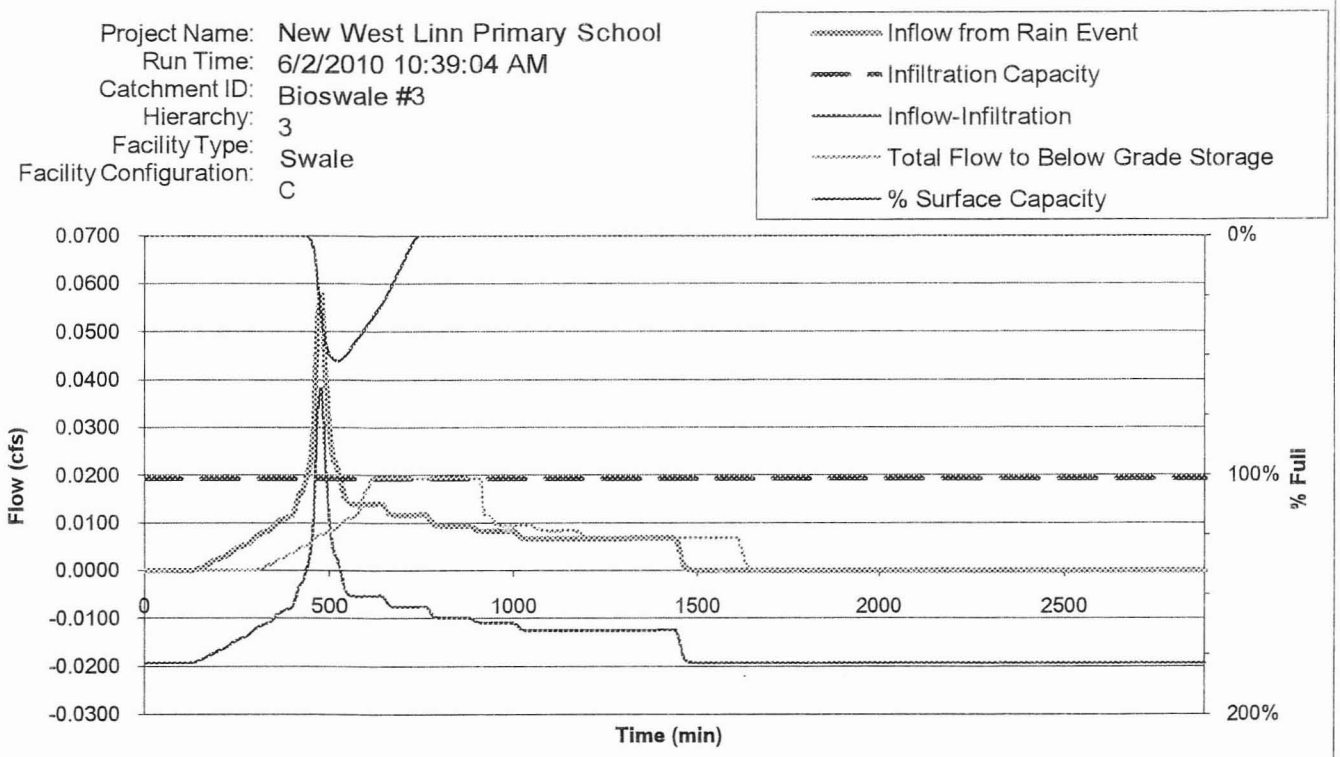
facility segment with warning message not fully utilized. Create shorter facility segments to increase surface storage capacity and infiltration area.

Warning
Warning
Warning
Warning
Warning
Warning

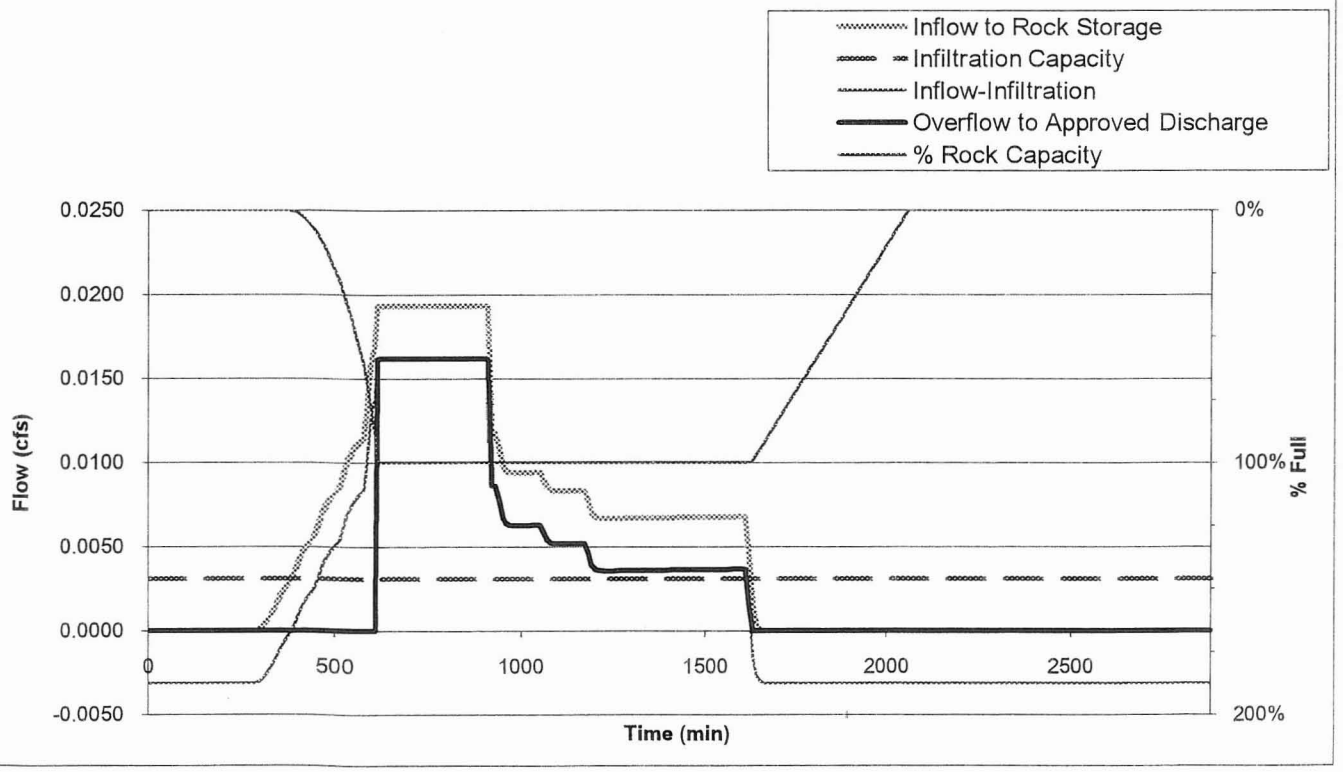
Worksheet Calculations

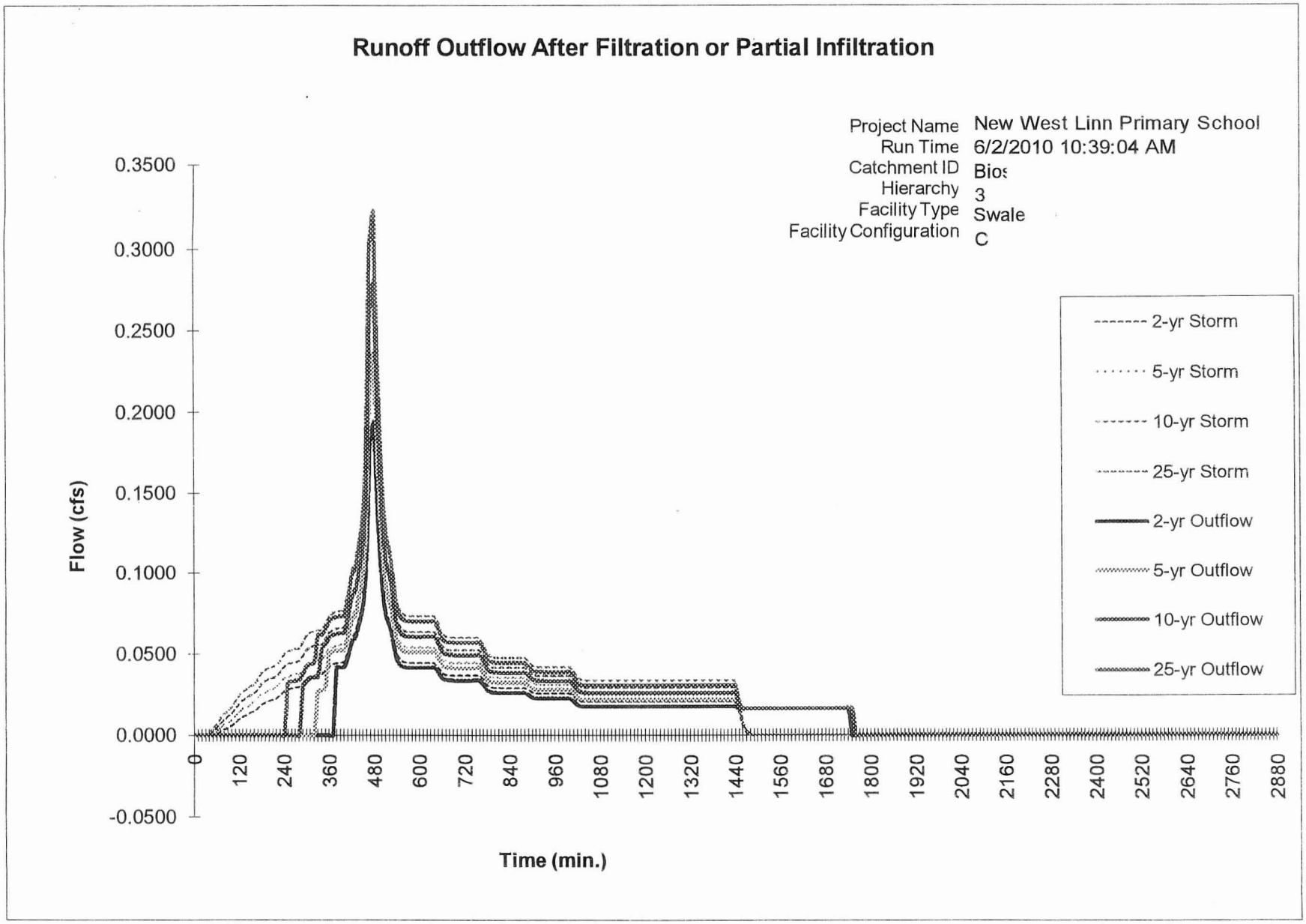
Pollution Reduction Event
Surface Facility Modeling

Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:39:04 AM
Catchment ID: Bioswale #3
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling




Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:39:04 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.3500
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
-0.0500
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #4

Project Name: New West Linn Primary School
Project Address: Rosemont Road
West Linn, OR
Designer: STS
Company: Winzler & Kelly

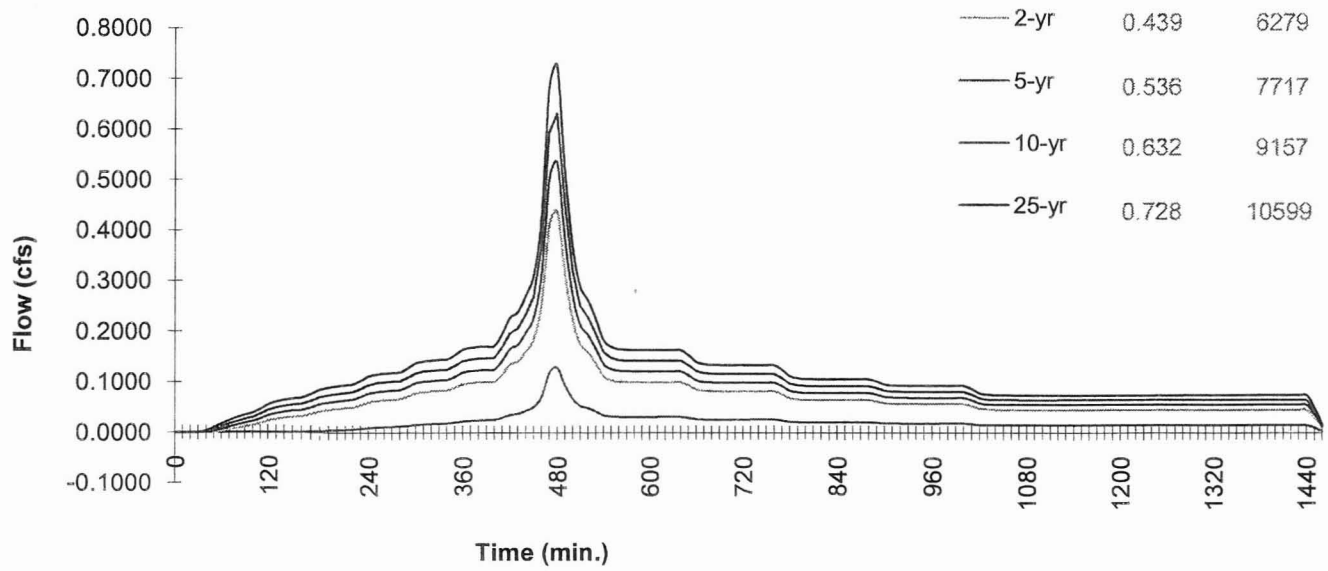
Date: 06/02/10
Permit Number: [Permit #]
Run Time 6/2/2010 10:43:38 AM

Drainage Catchment Information		
Catchment ID	Bioswale #4	
	Catchment Area	
Impervious Area	34,700	SF
Impervious Area	0.80	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.
Site Soils & Infiltration Testing Data		
Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	
Correction Factor Component		
CF_{test} (ranges from 1 to 3)	2	
Design Infiltration Rates		
I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr **Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.13	1813
2-yr	0.439	6279
5-yr	0.536	7717
10-yr	0.632	9157
25-yr	0.728	10599



Printed: 6/2/2010 10:44 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #4

Run Time 6/2/2010 10:43:38 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #4 **Date:** 6/2/2010

Instructions:

1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

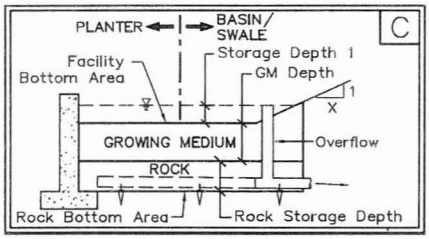
Catchment facility will meet Hierarchy Category: 3

Goal Summary:

Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale

Facility Configuration: C



Refer to Sloped Facility Worksheet and enter Variable Parameters

Calculation Guide
Max. Rock Stor. Bottom Area
Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 1,086 sf
Surface Capacity Volume = 411.5 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 412 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.050 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 840 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 126 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.005 cfs

RESULTS

Pollution Reduction: **PASS**

Overflow Volume: 1,306 CF

34% Surf. Cap. Used

100% Rock Cap. Used

Run PAC

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.434	0.531	0.627	0.723

Current data has been exported:

Bioswale #4.xls **6/2/2010 10:43:53 AM**

FACILITY FACTS

Total Facility Area Including Freeboard = **1,824 SF**

Sizing Ratio (Total Facility Area / Catchment Area) = **0.053**

Presumptive Approach Calculator Ver 1.1

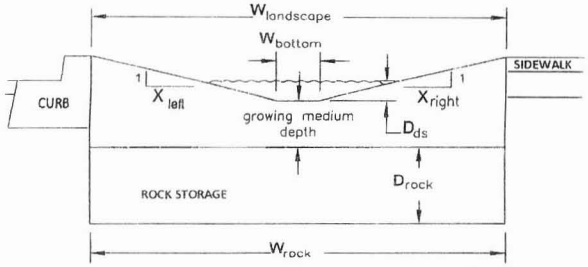
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

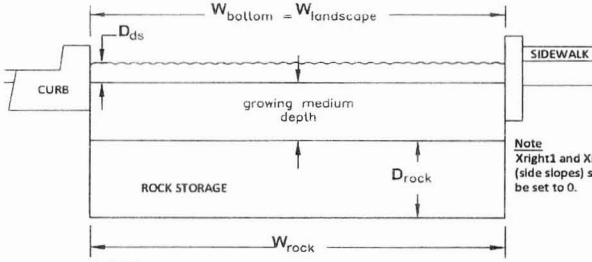
Run Time 6/2/2010 10:43:30 AM

Project Name: New West Linn Primary School **Date:** 6/2/2010 **Catchment ID:** Bioswale #4

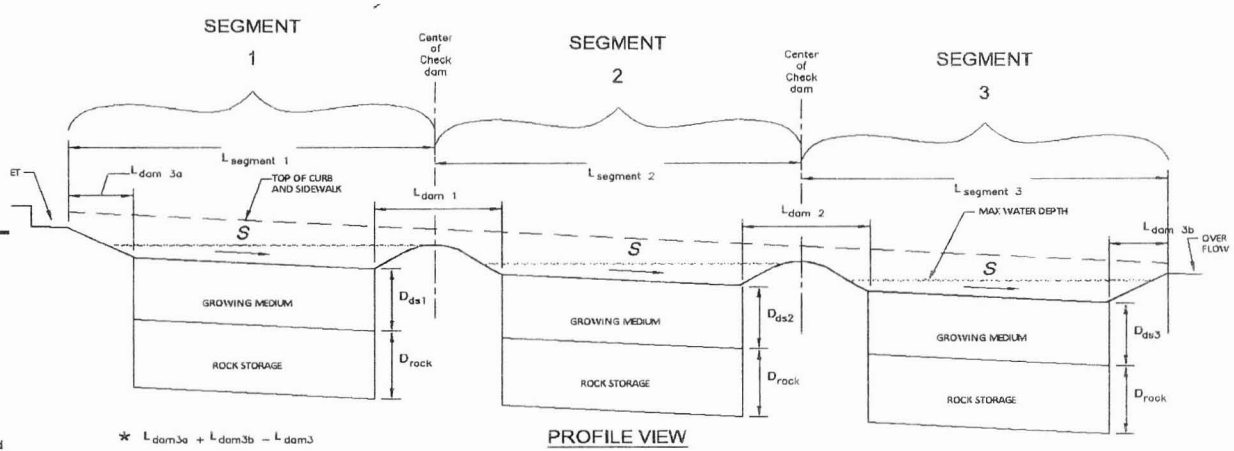
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



Data Entry

Variable Description	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	X_{right}:1	X_{left}:1	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	22	2	0.01	7	3	3	6	13	7	12	0.3
	2	22	2	0.01	7	3	3	6	13	7		
	3	22	2	0.01	7	3	3	6	13	7		
	4	22	2	0.01	7	3	3	6	13	7		
	5	22	2	0.01	7	3	3	6	13	7		
	6	22	2	0.01	7	3	3	6	13	7		
	7											
	8											
	9											
	10											

Parameters

Rock Storage Parameters

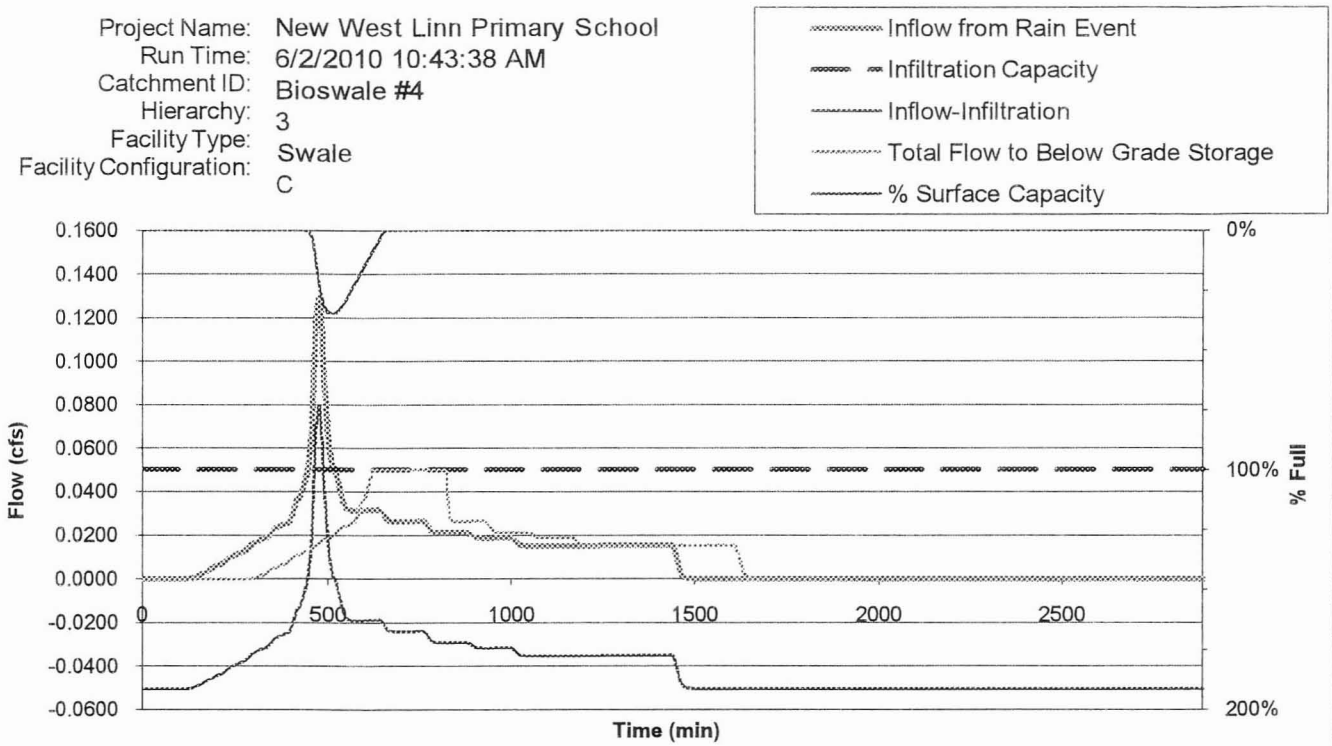
Error Messages

Depth 3 = 6

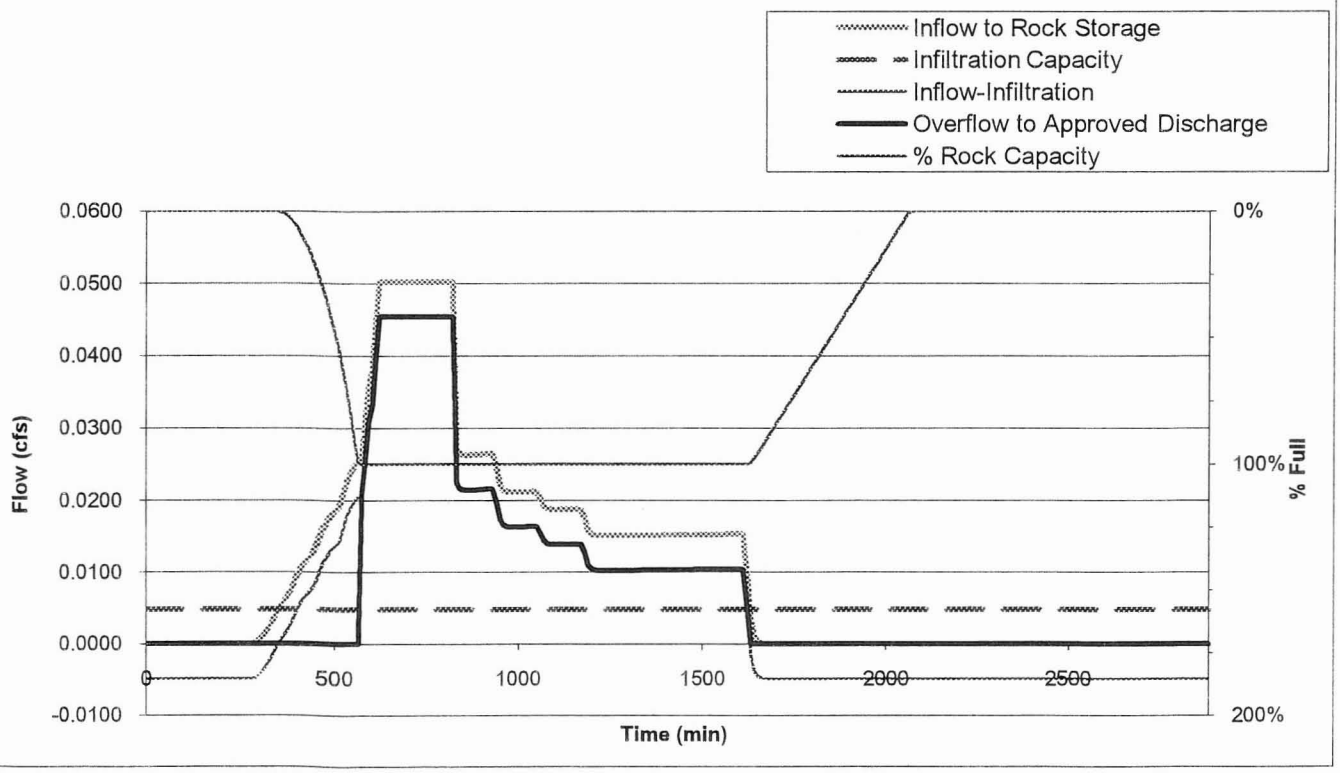
Worksheet Calculations

Pollution Reduction Event
Surface Facility Modeling

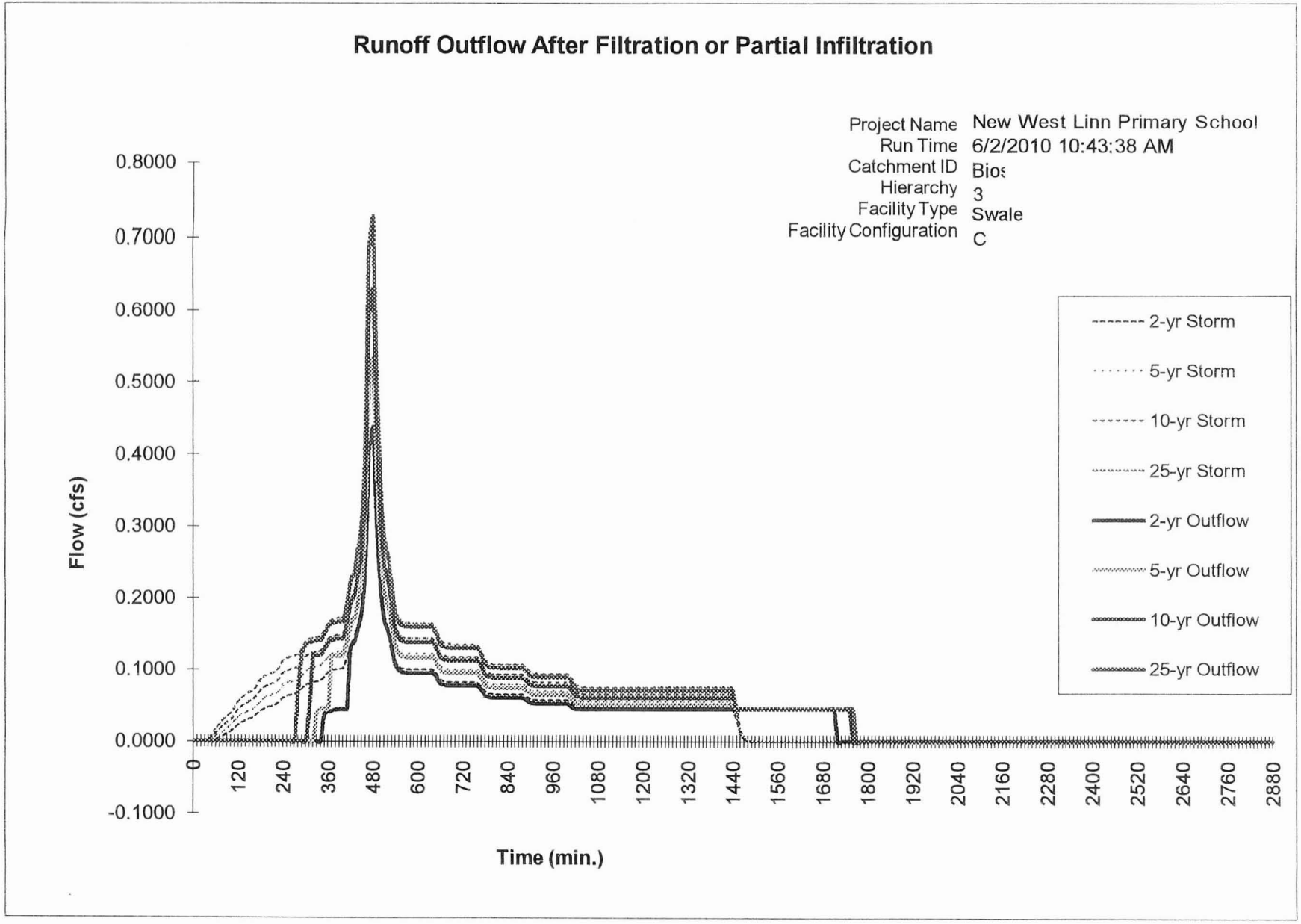
Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:43:38 AM
Catchment ID: Bioswale #4
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling



Printed: 6/2/2010 10:44 AM


Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:43:38 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.8000
0.7000
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #5

Project Name:	New West Linn Primary School	**Date:**	06/02/10
Project Address:	Rosemont Road	**Permit Number:**	[Permit #]
	West Linn, OR	Run Time	6/2/2010 10:48:10 AM
Designer:	STS		
Company:	Winzler & Kelly		

Drainage Catchment Information

Catchment ID	Bioswale #5	
	Catchment Area	
Impervious Area	22,000	SF
Impervious Area	0.51	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.

Site Soils & Infiltration Testing Data

Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	

Correction Factor Component

CF_{test} (ranges from 1 to 3)	2	

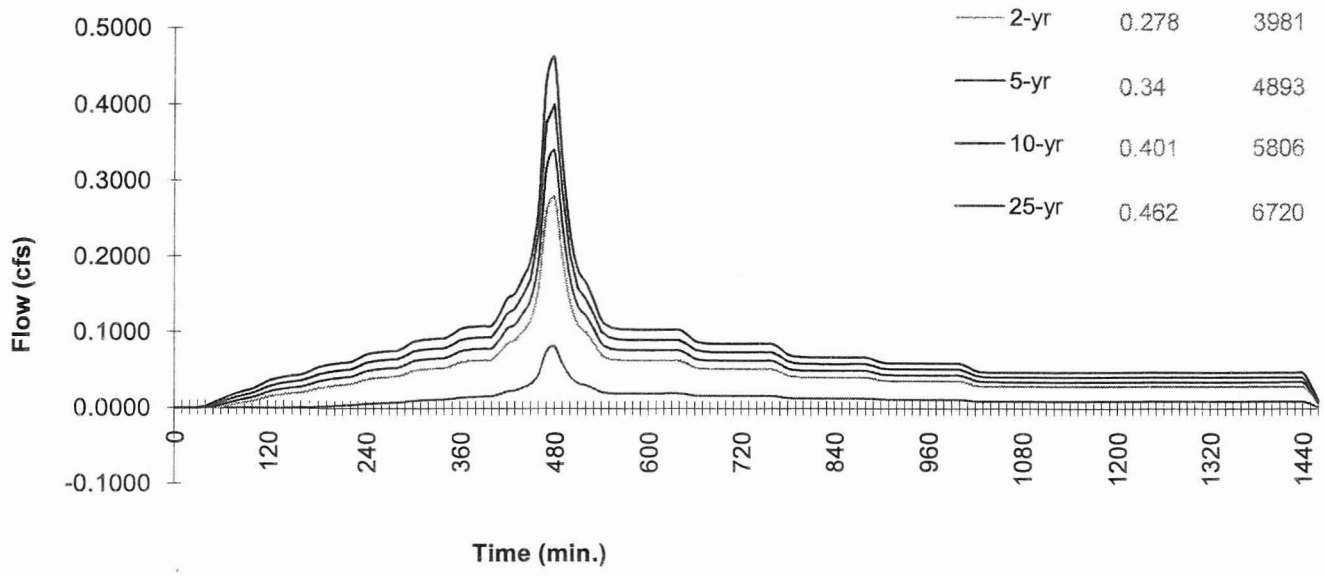
Design Infiltration Rates

I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr	**Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr	

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.082	1150
2-yr	0.278	3981
5-yr	0.34	4893
10-yr	0.401	5806
25-yr	0.462	6720



Printed: 6/2/2010 10:48 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #5

Run Time 6/2/2010 10:48:10 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #5 **Date:** 6/2/2010

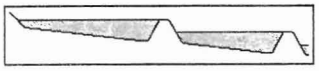
Instructions:
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

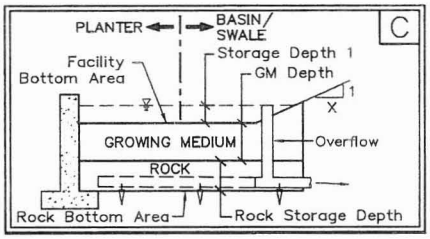
Goal Summary:

Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C



Refer to Sloped Facility Worksheet and enter Variable Parameters

Calculation Guide
Max. Rock Stor. Bottom Area
Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 919 sf
Surface Capacity Volume = 302.4 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 302 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.043 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 760 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 114 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.004 cfs

RESULTS

Pollution Reduction: **PASS**

Overflow Volume: 698 CF

19% Surf. Cap. Used

100% Rock Cap. Used

Run PAC

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.274	0.335	0.396	0.457

Current data has been exported:

Bioswale #5.xls 6/2/2010 10:48:23 AM

FACILITY FACTS

Total Facility Area Including Freeboard = 1,956 SF
Sizing Ratio (Total Facility Area / Catchment Area) = 0.089

Presumptive Approach Calculator Ver 1.1

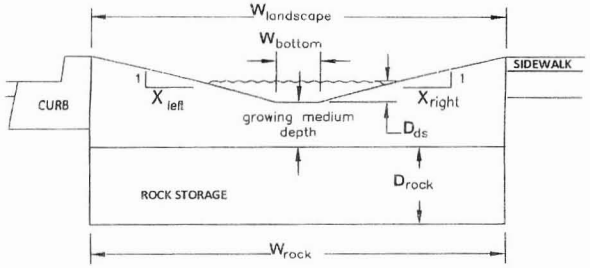
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

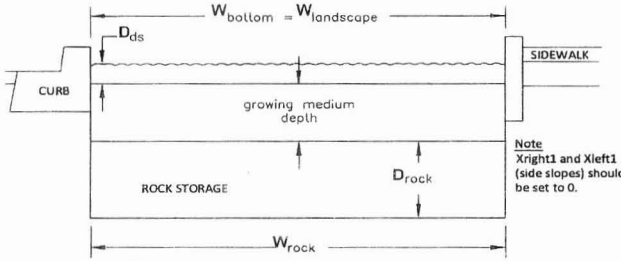
Run Time 6/2/2010 10:48:10 AM

Project Name: New West Linn Primary School **Date:** 6/2/2010 **Catchment ID:** Bioswale #5

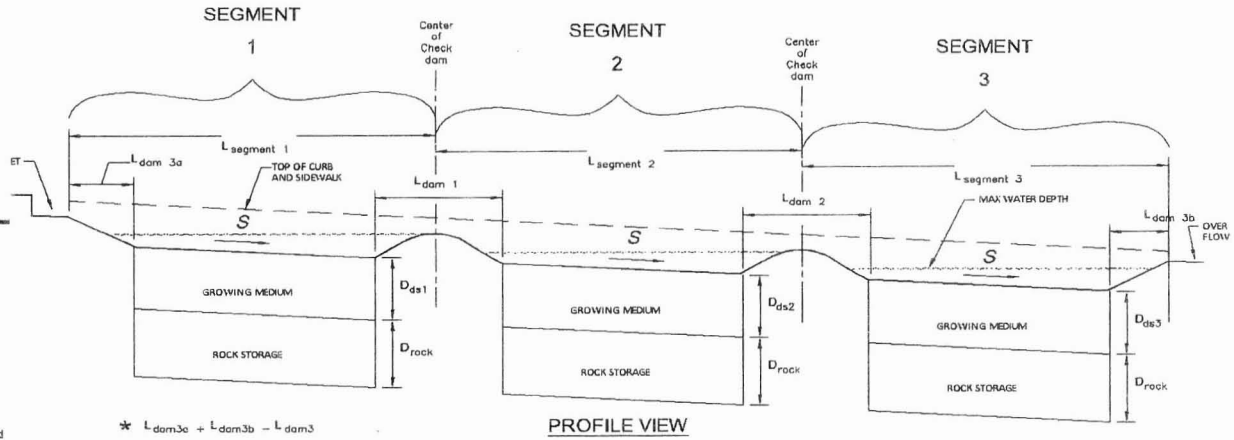
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



Data Entry

Variable Description	Parameters									Rock Storage Parameters		
	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	$X_{right}:1$	$X_{left}:1$	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	21	2	0.02	5	3	3	6	11	5	12	0.3
	2	21	2	0.02	5	3	3	6	11	5		
	3	21	2	0.02	5	3	3	6	11	5		
	4	21	2	0.02	5	3	3	6	11	5		
	5	21	2	0.02	5	3	3	6	11	5		
	6	21	2	0.02	5	3	3	6	11	5		
	7	21	2	0.02	5	3	3	6	11	5		
	8	21	2	0.02	5	3	3	6	11	5		
	9											
	10											

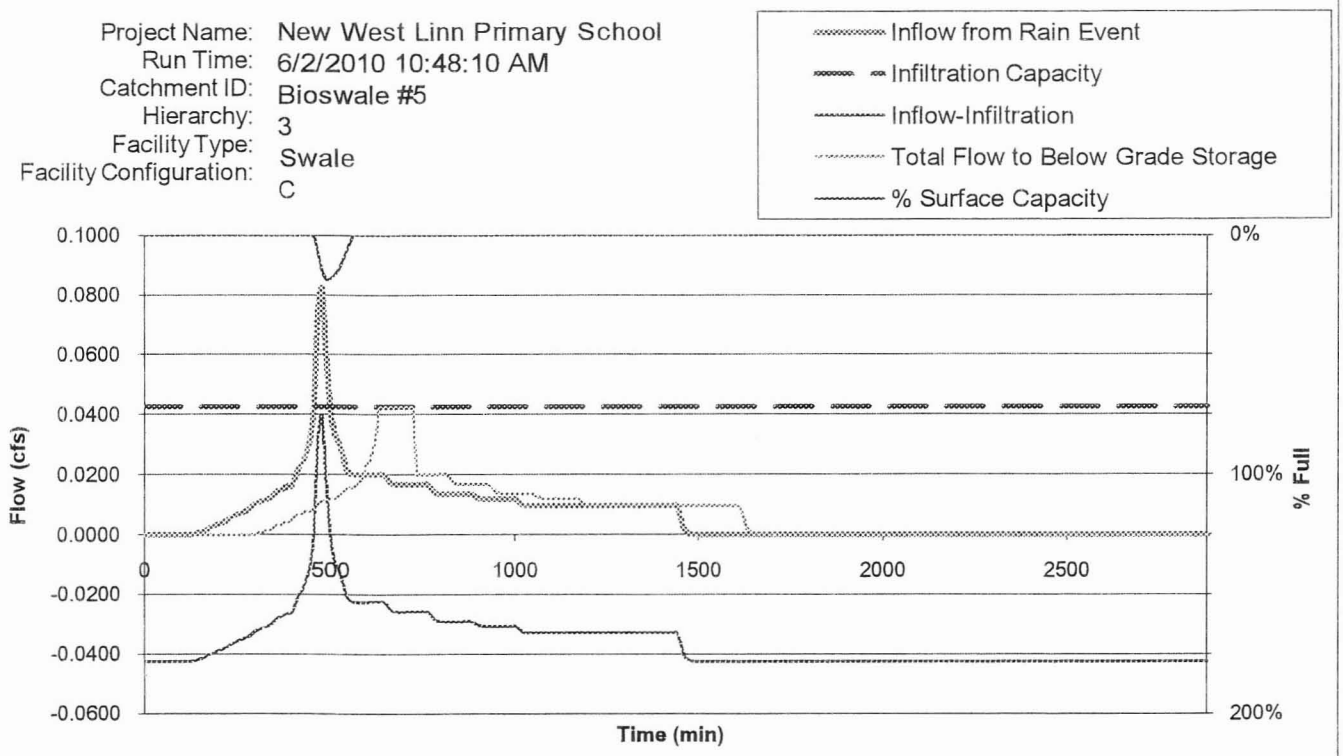
Depth 3 = 6

Error Messages

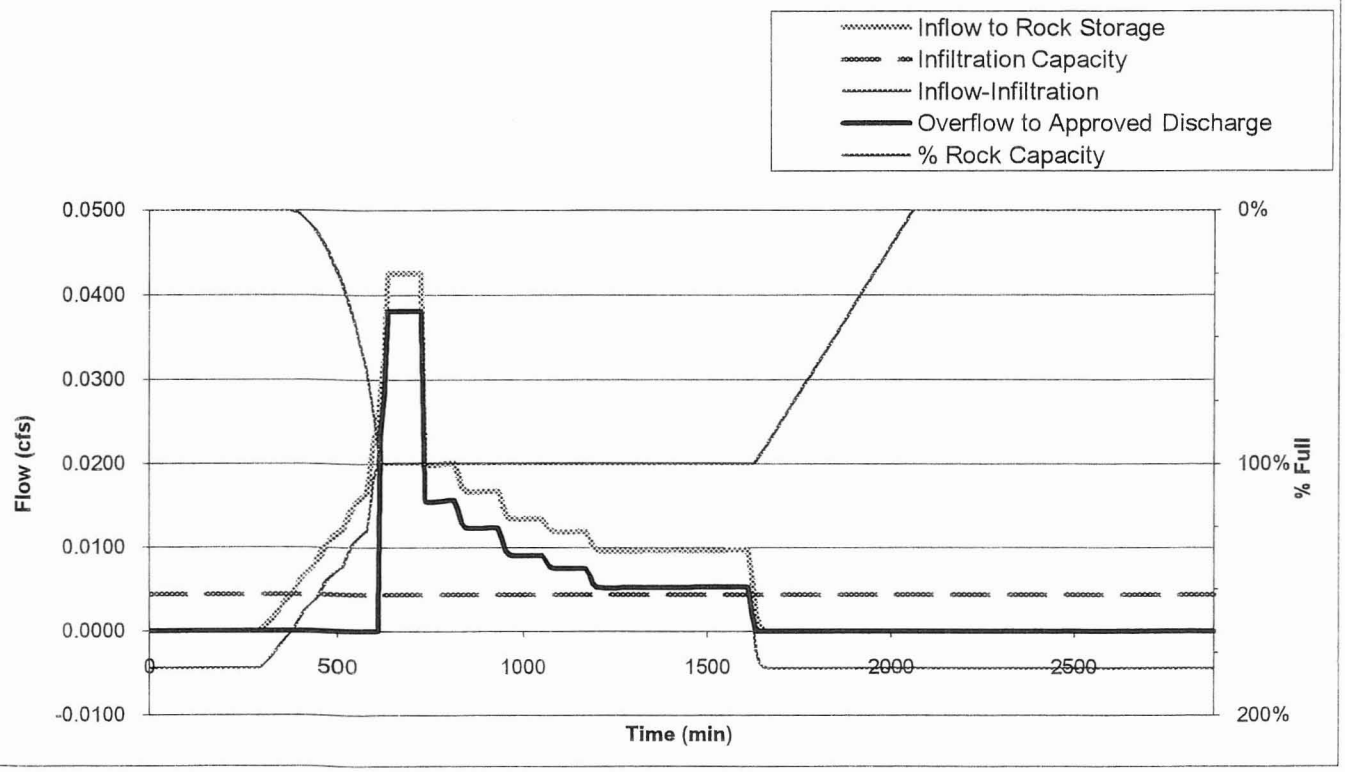
Worksheet Calculations

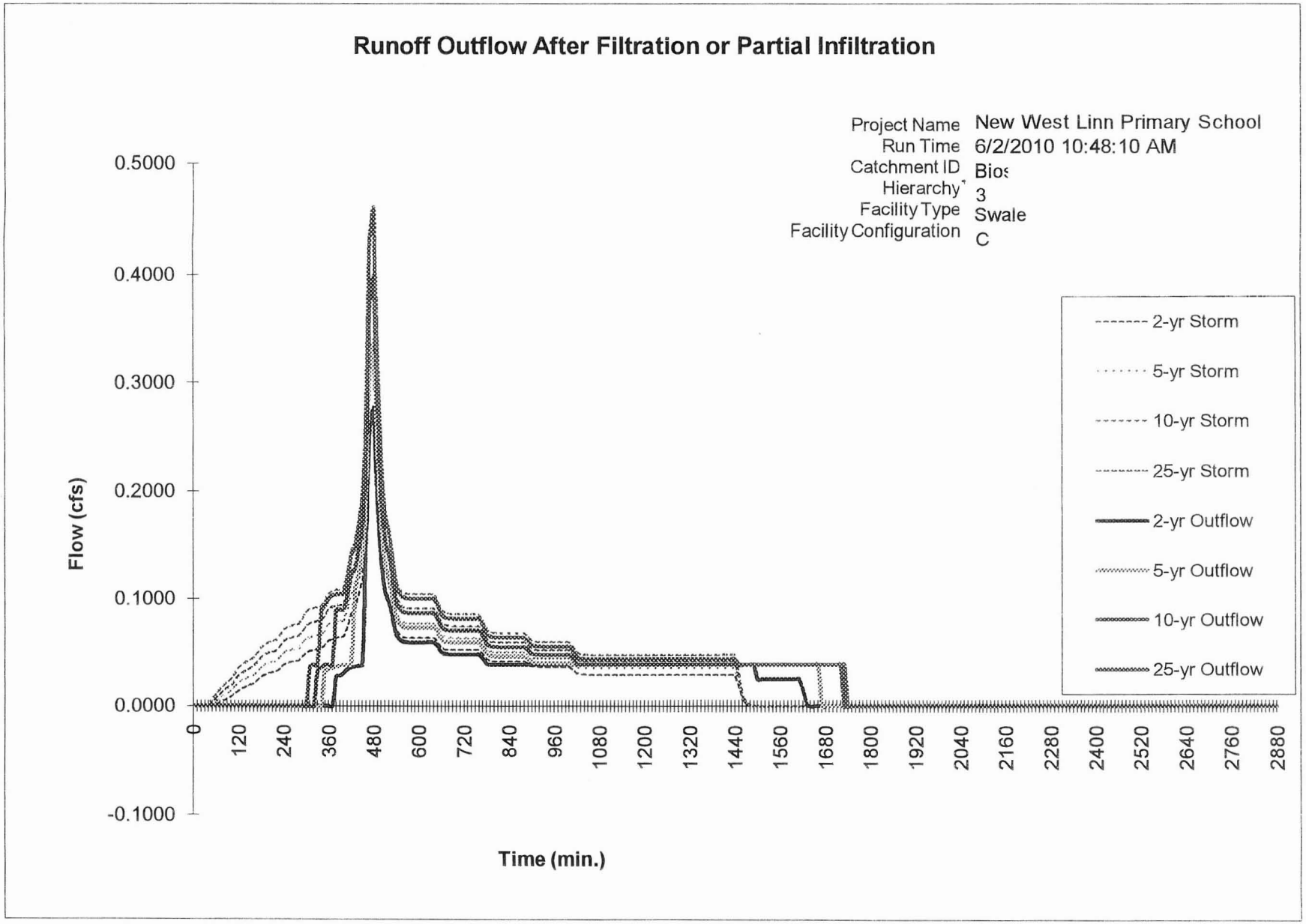
Pollution Reduction Event
Surface Facility Modeling

Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:48:10 AM
Catchment ID: Bioswale #5
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling




Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:48:10 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #6

Project Name:	New West Linn Primary School
Project Address:	Rosemont Road West Linn, OR
Designer:	STS
Company:	Winzler & Kelly

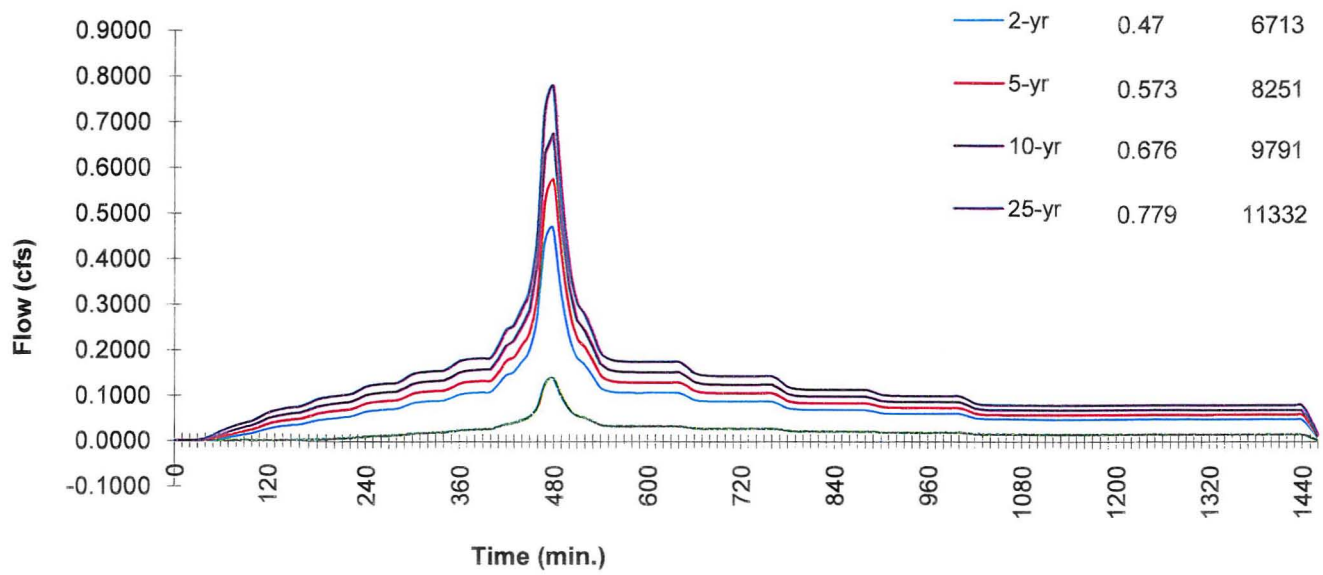
Date: 06/02/10
Permit Number: [Permit #]
Run Time 6/18/2010 3:11:51 PM

Drainage Catchment Information		
Catchment ID	Bioswale #6	
	Catchment Area	
Impervious Area	37,100	SF
Impervious Area	0.85	ac
Impervious Area Curve Number, CN_{imp}	98	
Time of Concentration, Tc, minutes	10	min.
Site Soils & Infiltration Testing Data		
Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	
Correction Factor Component		
CF_{test} (ranges from 1 to 3)	2	
Design Infiltration Rates		
I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr **Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.139	1939
2-yr	0.47	6713
5-yr	0.573	8251
10-yr	0.676	9791
25-yr	0.779	11332



Printed: 6/18/2010 3:13 PM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #6

Run Time 6/18/2010 3:11:51 PM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #6 **Date:** 6/2/2010

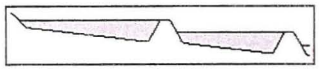
Instructions:
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

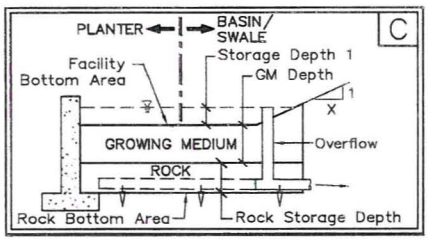
Goal Summary:

Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C



Refer to Sloped Facility Worksheet and enter Variable Parameters

Calculation Guide
Max. Rock Stor. Bottom Area Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 845 sf
Surface Capacity Volume = 324.9 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 325 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.039 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 595 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 89 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.003 cfs

RESULTS

Pollution Reduction: PASS

Overflow Volume: 1,580 CF

71% Surf. Cap. Used

100% Rock Cap. Used

Run PAC

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.466	0.570	0.673	0.775

Current data has been exported:

Bioswale #6.xls **6/18/2010 3:12:38 PM**

FACILITY FACTS

Total Facility Area Including Freeboard = 1,571 SF
Sizing Ratio (Total Facility Area / Catchment Area) = 0.042

Presumptive Approach Calculator Ver 1.1

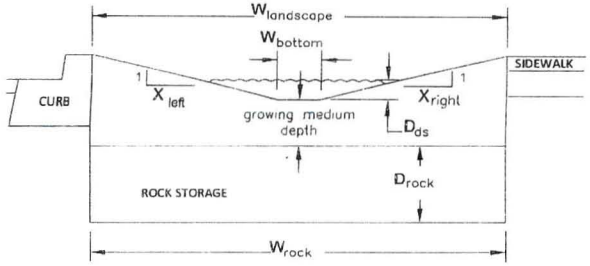
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

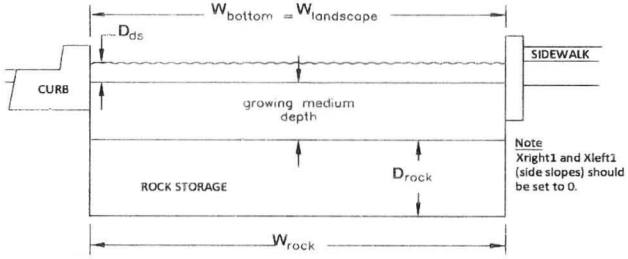
Run Time 6/18/2010 3:11:51 PM

Project Name: New West Linn Primary School **Date:** 6/2/2010 **Catchment ID:** Bioswale #6

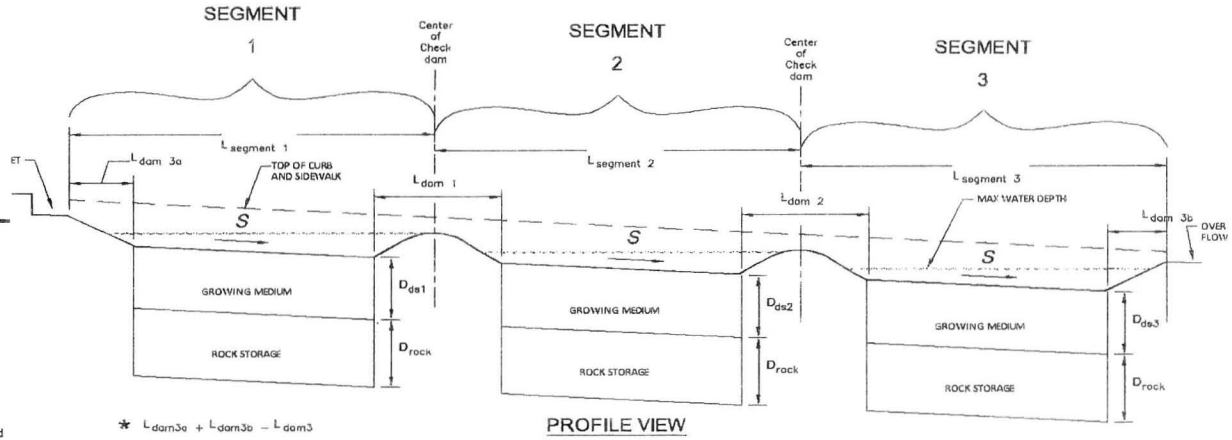
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



* $L_{dam3a} + L_{dam3b} = L_{dam3}$

PROFILE VIEW

Data Entry

Variable Description	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	$X_{right}:1$	$X_{left}:1$	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	19	2	0.01	5	3	3	6	11	5	12	0.3
	2	19	2	0.01	5	3	3	6	11	5		
	3	19	2	0.01	5	3	3	6	11	5		
	4	19	2	0.01	5	3	3	6	11	5		
	5	19	2	0.01	5	3	3	6	11	5		
	6	19	2	0.01	5	3	3	6	11	5		
	7	19	2	0.01	5	3	3	6	11	5		
	8											
	9											
	10											

Parameters | Rock Storage Parameters

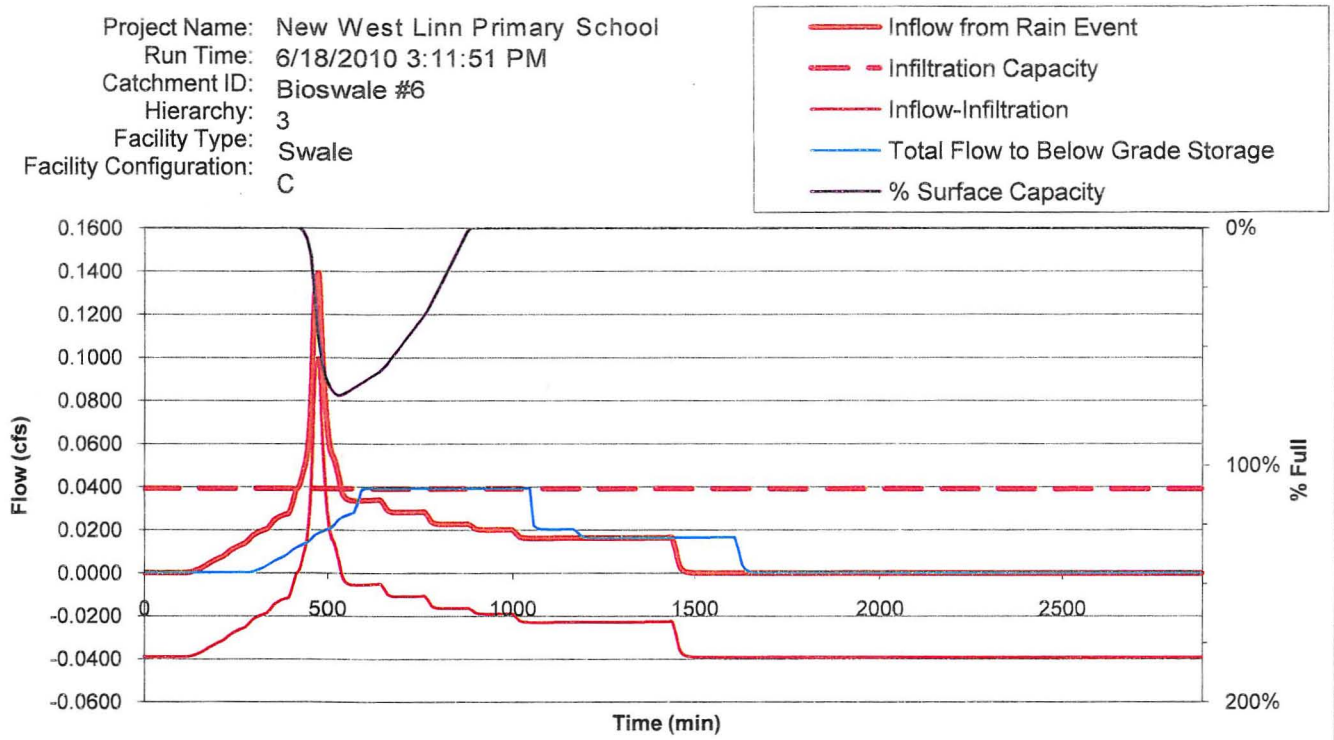
Error Messages

Depth 3 = 6

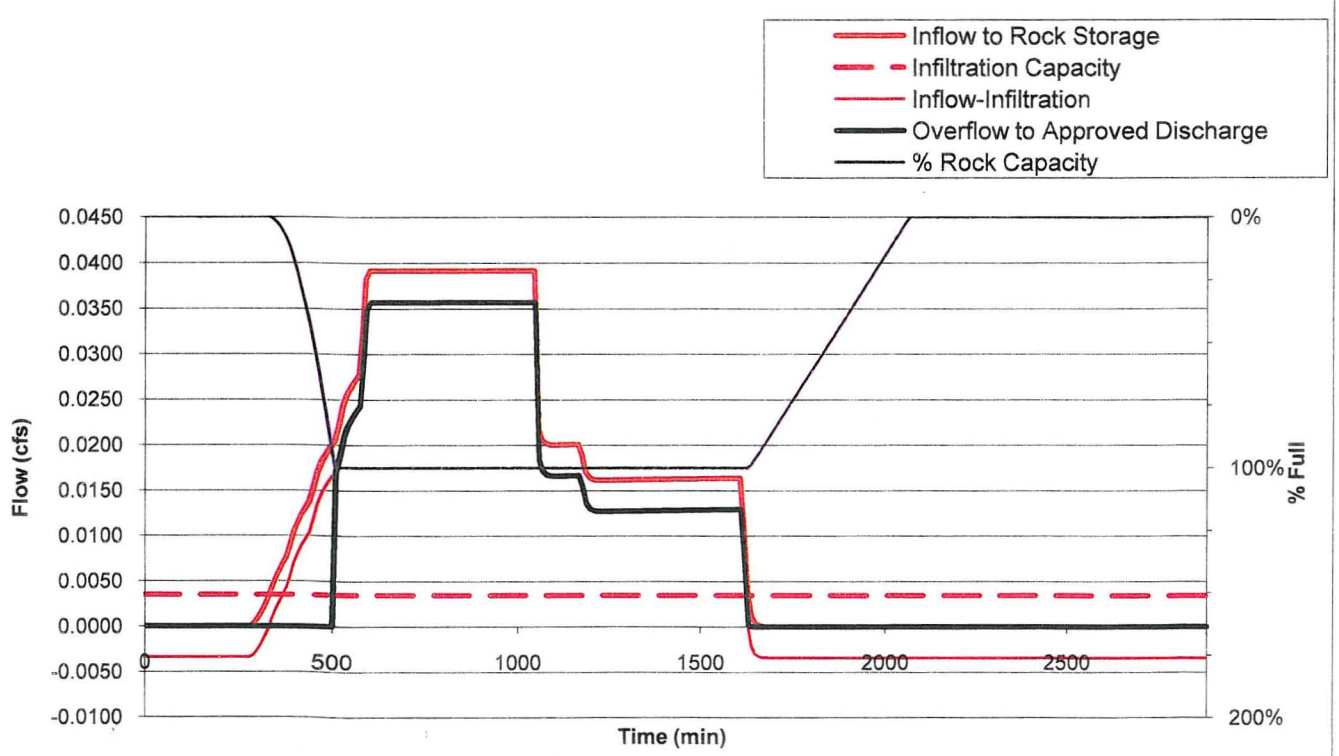
Worksheet Calculations

Pollution Reduction Event
Surface Facility Modeling

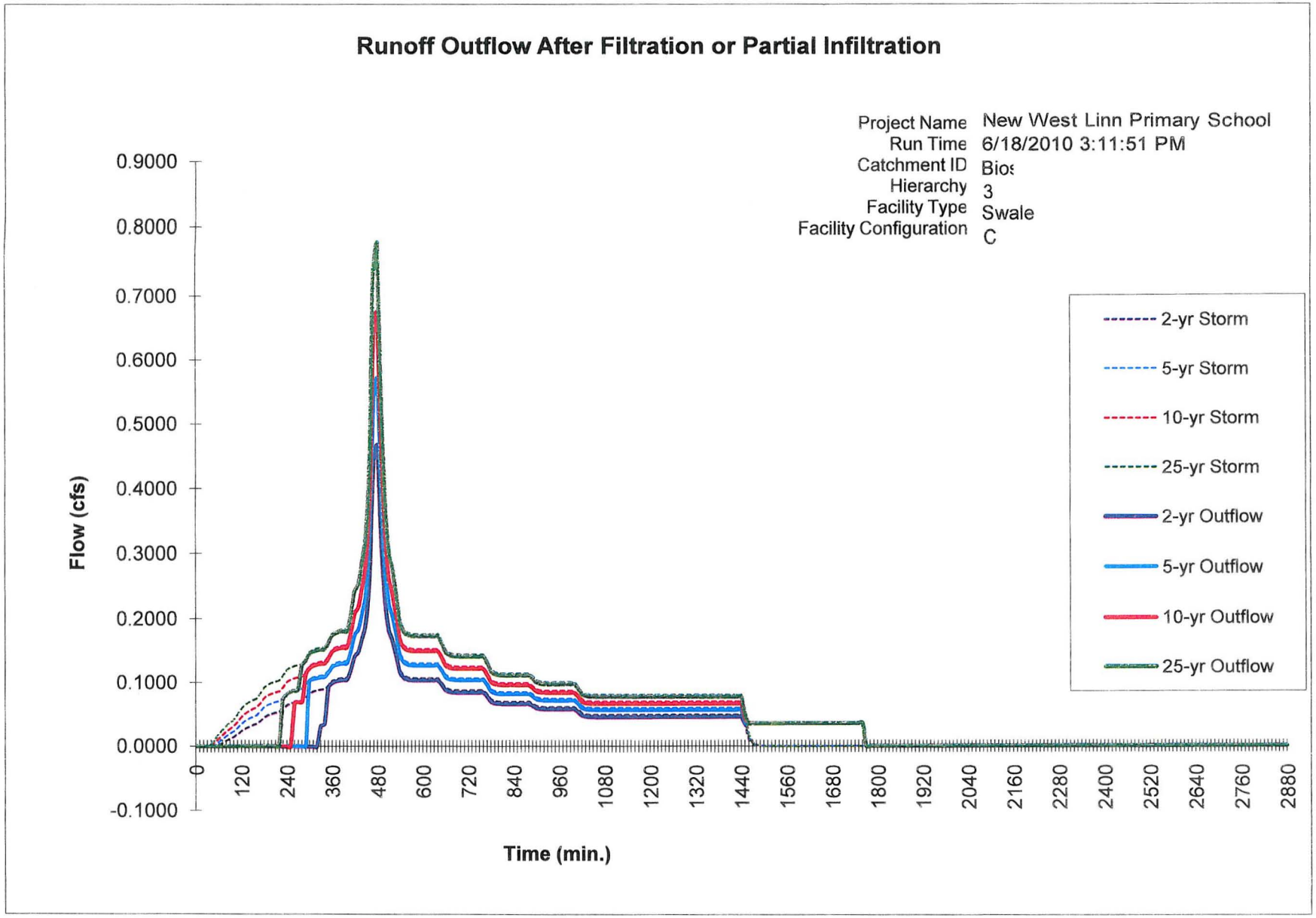
Project Name: New West Linn Primary School
Run Time: 6/18/2010 3:11:51 PM
Catchment ID: Bioswale #6
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling



Printed: 6/18/2010 3:13 PM


Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/18/2010 3:11:51 PM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
0.9000
0.8000
0.7000
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

Presumptive Approach Calculator ver. 1.1

Catchment Data

Catchment ID: Bioswale #7

Project Name:	New West Linn Primary School	**Date:**	06/02/10
Project Address:	Rosemont Road	**Permit Number:**	[Permit #]
	West Linn, OR	Run Time	6/2/2010 10:57:43 AM
Designer:	STS		
Company:	Winzler & Kelly		

Drainage Catchment Information

Catchment ID	Bioswale #7		
	Catchment Area		
Impervious Area	45,700	SF	**Catchment Area Exceeds 1 Acre**
Impervious Area	1.05	ac	
Impervious Area Curve Number, CN_{imp}	98		
Time of Concentration, Tc, minutes	10	min.	

Site Soils & Infiltration Testing Data

Infiltration Testing Procedure:	Open Pit Falling Head	
Native Soil Field Tested Infiltration Rate (I_{test}):	0.5	in/hr
Bottom of Facility Meets Required Separation From High Groundwater Per BES SWMM Section 1.4:	Yes	

Correction Factor Component

CF_{test} (ranges from 1 to 3)	2	

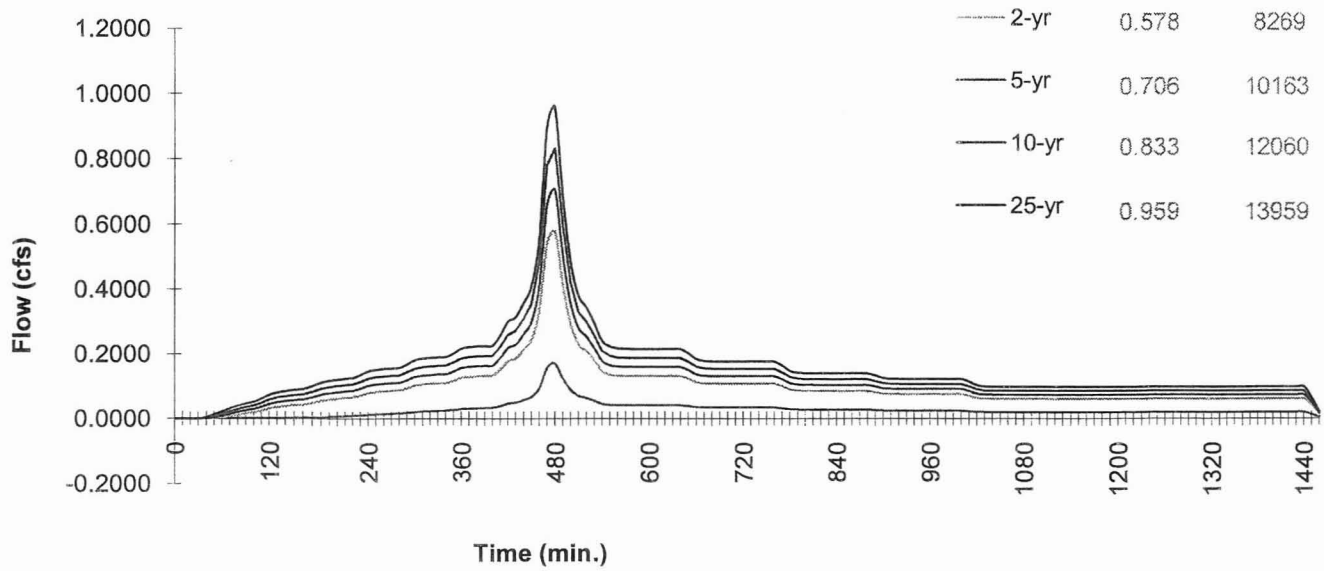
Design Infiltration Rates

I_{dsgn} for Native (I_{test} / CF_{test}):	0.25	in/hr	**Design infiltration rate < 0.5 in/hr**
I_{dsgn} for Imported Growing Medium:	2.00	in/hr	

Execute SBUH Calculations

SBUH Results

	Peak Rate (cfs)	Volume (cf)
PR	0.171	2388
2-yr	0.578	8269
5-yr	0.706	10163
10-yr	0.833	12060
25-yr	0.959	13959



Printed: 6/2/2010 10:58 AM

Presumptive Approach Calculator ver. 1.1

Catchment ID: ioswale #7

Run Time 6/2/2010 10:57:43 AM

Project Name: New West Linn Primary School **Catchment ID:** Bioswale #7 **Date:** 6/2/2010

Instructions:

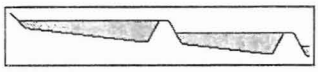
1. Identify which Stormwater Hierarchy Category the facility.
2. Select Facility Type.
3. Identify facility shape of surface facility to more accurately estimate surface volume, except for Swales and sloped planters that use the PAC Sloped Facility Worksheet to enter data.
4. Select type of facility configuration.
5. Complete data entry for all highlighted cells.

Catchment facility will meet Hierarchy Category: 3

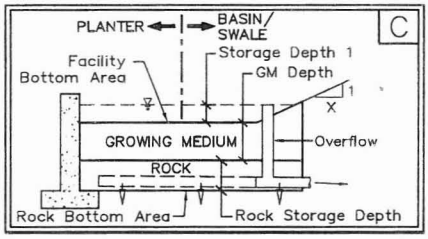
Goal Summary:

Hierarchy Category	SWMM Requirement	RESULTS box below needs to display...		Facility configurations allowed
		Pollution Reduction as a	10-yr (aka disposal) as a	
3	Off-site flow to drainageway, river, or storm-only pipe system.	PASS	N/A	ALL

Facility Type = Swale



Facility Configuration: C



Refer to Sloped Facility Worksheet and enter Variable Parameters

Calculation Guide
Max. Rock Stor. Bottom Area
Per Swale Dims

DATA FOR ABOVE GRADE STORAGE COMPONENT

Infiltration Area = 1,269 sf
Surface Capacity Volume = 483.4 cf

Growing Medium Depth = 18 in
Freeboard Depth = N/A in

Surface Capacity at Depth 1 = 483 cf
GM Design Infiltration Rate = 2.00 in/hr
Infiltration Capacity = 0.059 cfs

BELOW GRADE STORAGE

Rock Storage Bottom Area = 900 sf
Rock Storage Depth = 12 in
Rock Void Ratio = 0.3
Storage Depth 3 = 6 in

Rock Storage Capacity = 135 cf
Native Design Infiltration Rate = 0.25 in/hr
Infiltration Capacity = 0.005 cfs

RESULTS

Pollution Reduction	Overflow Volume		
PASS	1,851 CF	46% Surf. Cap. Used	Run PAC
		100% Rock Cap. Used	

Output File

	2-yr	5-yr	10-yr	25-yr
Peak cfs	0.573	0.701	0.828	0.954

Current data has been exported:

Bioswale #7.xls **6/2/2010 10:57:59 AM**

FACILITY FACTS

Total Facility Area Including Freeboard = **2,308 SF**
Sizing Ratio (Total Facility Area / Catchment Area) = **0.051**

Presumptive Approach Calculator Ver 1.1

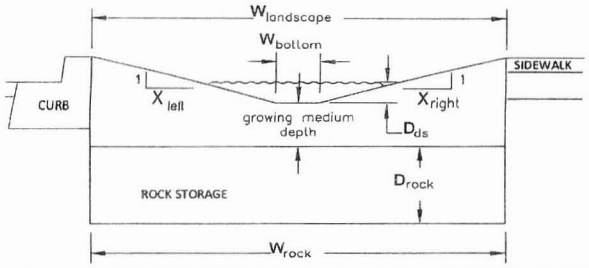
Instructions:

1. Refer to facility graphics and fill in all relevant facility parameters in the Data Entry table below. Data entry cells vary based on Facility Configuration selected on Facility Design Data tab.
2. Delete all facility parameters that may have been entered by the previous iteration that are no longer applicable.

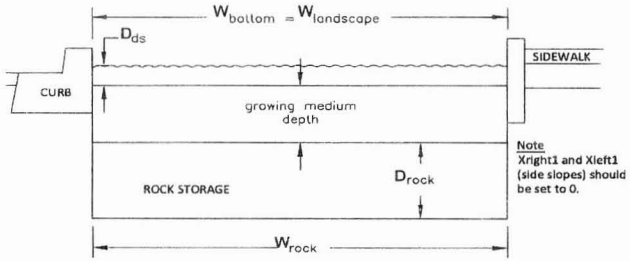
Run Time 6/2/2010 10:57:43 AM

Project Name: New West Linn Primary School **Date:** 6/2/2010 **Catchment ID:** Bioswale #7

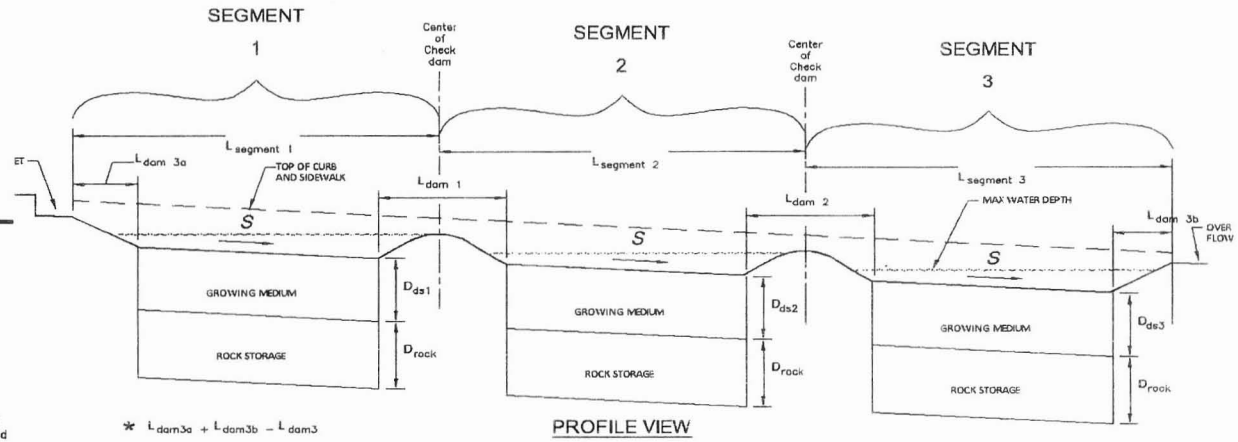
SWALE



SLOPED PLANTER



Note
Xright1 and Xleft1 (side slopes) should be set to 0.



Data Entry

Variable Description	Facility Segment	Length of facility segment	Downstream Check Dam Length	Longitudinal Facility Slope	Bottom Width	Side Slope Right	Side Slope Left	Downstream Depth	Landscape Width	Rock Storage Width	Rock Storage Depth	Rock Void Ratio
Unit		(ft)	(ft)	(ft/ft)	(ft)			(inches)	(ft)	(ft)	(inches)	
Variable Symbol		$L_{segment}$	L_{dam}	S	W_{bottom}	X_{right}:1	X_{left}:1	D_{ds}	$W_{landscape}$	W_{rock}	D_{rock}	v
	1	20	2	0.01	5	3	3	6	11	5	12	0.3
	2	20	2	0.01	5	3	3	6	11	5		
	3	20	2	0.01	5	3	3	6	11	5		
	4	20	2	0.01	5	3	3	6	11	5		
	5	20	2	0.01	5	3	3	6	11	5		
	6	20	2	0.01	5	3	3	6	11	5		
	7	20	2	0.01	5	3	3	6	11	5		
	8	20	2	0.01	5	3	3	6	11	5		
	9	20	2	0.01	5	3	3	6	11	5		
	10	20	2	0.01	5	3	3	6	11	5		

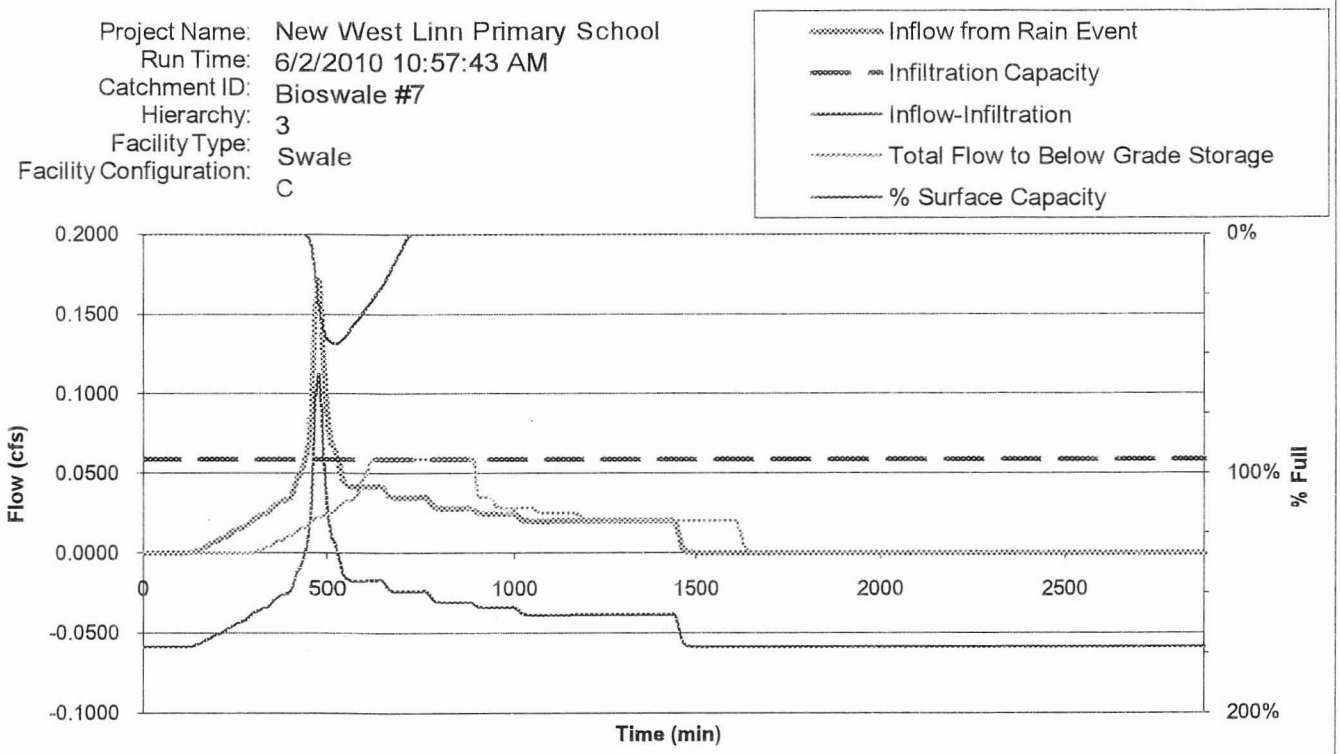
Depth 3 = 6

Error Messages

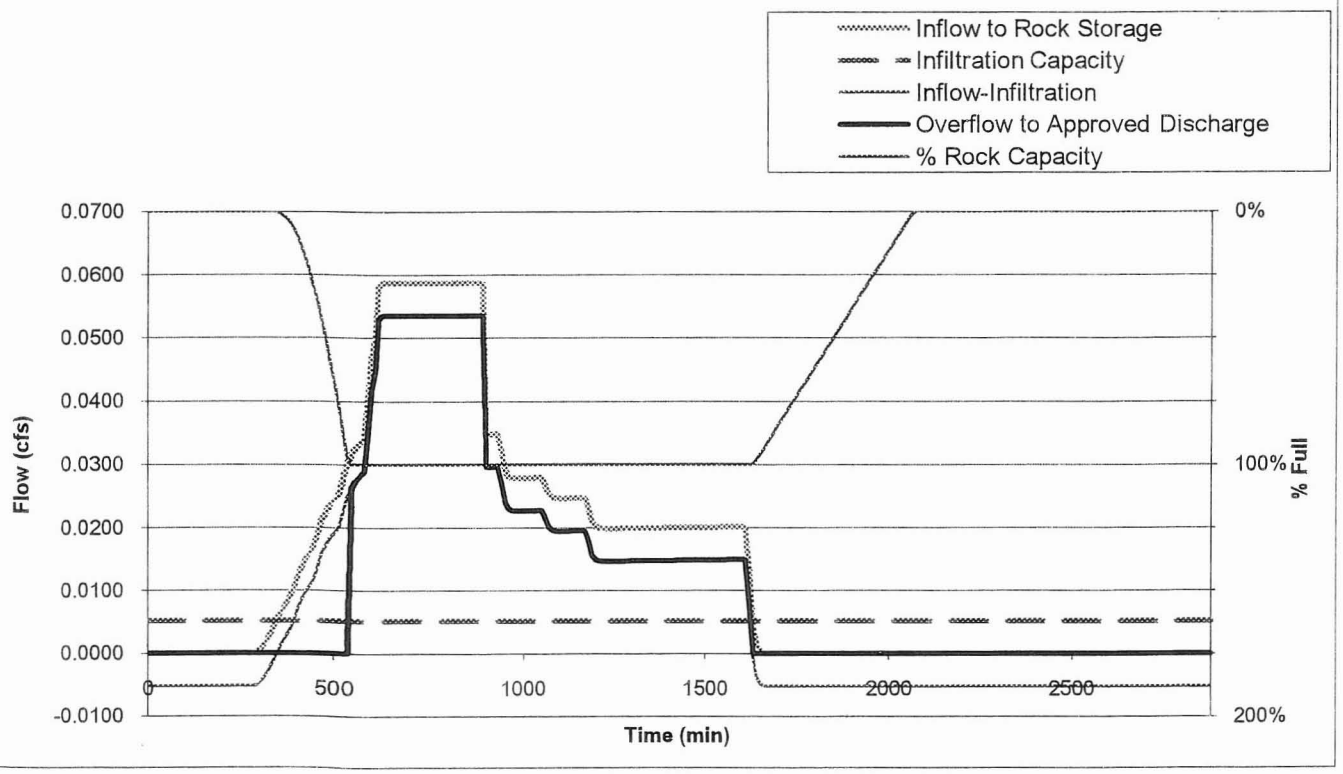
Worksheet Calculations

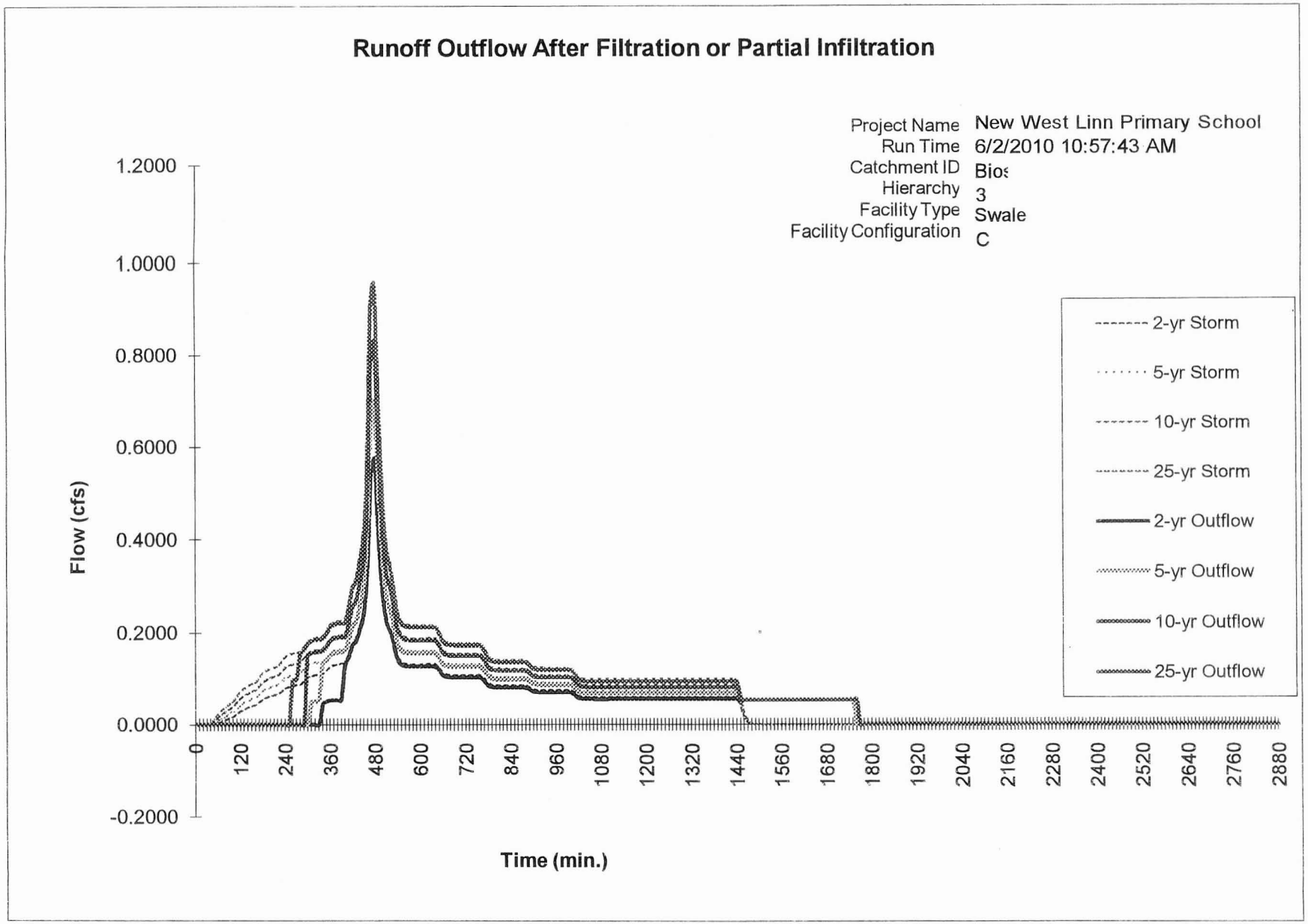
Pollution Reduction Event
Surface Facility Modeling

Project Name: New West Linn Primary School
Run Time: 6/2/2010 10:57:43 AM
Catchment ID: Bioswale #7
Hierarchy: 3
Facility Type: Swale
Facility Configuration: C



Pollution Reduction Event
Below Grade Modeling




Runoff Outflow After Filtration or Partial Infiltration
Project Name New West Linn Primary School
Run Time 6/2/2010 10:57:43 AM
Catchment ID Bios
Hierarchy 3
Facility Type Swale
Facility Configuration C
2-yr Storm
5-yr Storm
10-yr Storm
25-yr Storm
2-yr Outflow
5-yr Outflow
10-yr Outflow
25-yr Outflow
Flow (cfs)
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
-0.2000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
2160
2280
2400
2520
2640
2760
2880
Time (min.)

WINZLER & KELLY
15575 SW Sequoia Parkway, Suite 140
Portland, OR 97224-7233
(503) 226-3921

By STS Date 6/2/10 Client _____ Sheet No. ____ of ____

Subject PUBLIC POND WATER QUALITY CALCULATION Job No. _____

CRITERIA

DESIGN RAINFALL DEPTH: 0.36"
MINIMUM DETENTION TIME: 48 HOURS
IMPERVIOUS TRIBUTARY AREA: 0.47 ACRES

POND VOLUME

REQUIRED VOLUME: $V_{REQ} = (0.36")(1FT/12") (0.47 ACRES)(43,560 FT^2/AC) = 614 FT^3$

ALLOWABLE PONDING DEPTH:
INVERT OF ORIFICE #2: 661.75'
BOTTOM OF POND: 660.50'
PONDING DEPTH: 661.75 - 660.50 = 1.25'

TREATMENT VOLUME OF PROPOSED POND: 738 FT^3 (SEE ATTACHED CALCULATION)

PEAK OUTFLOW FROM POND

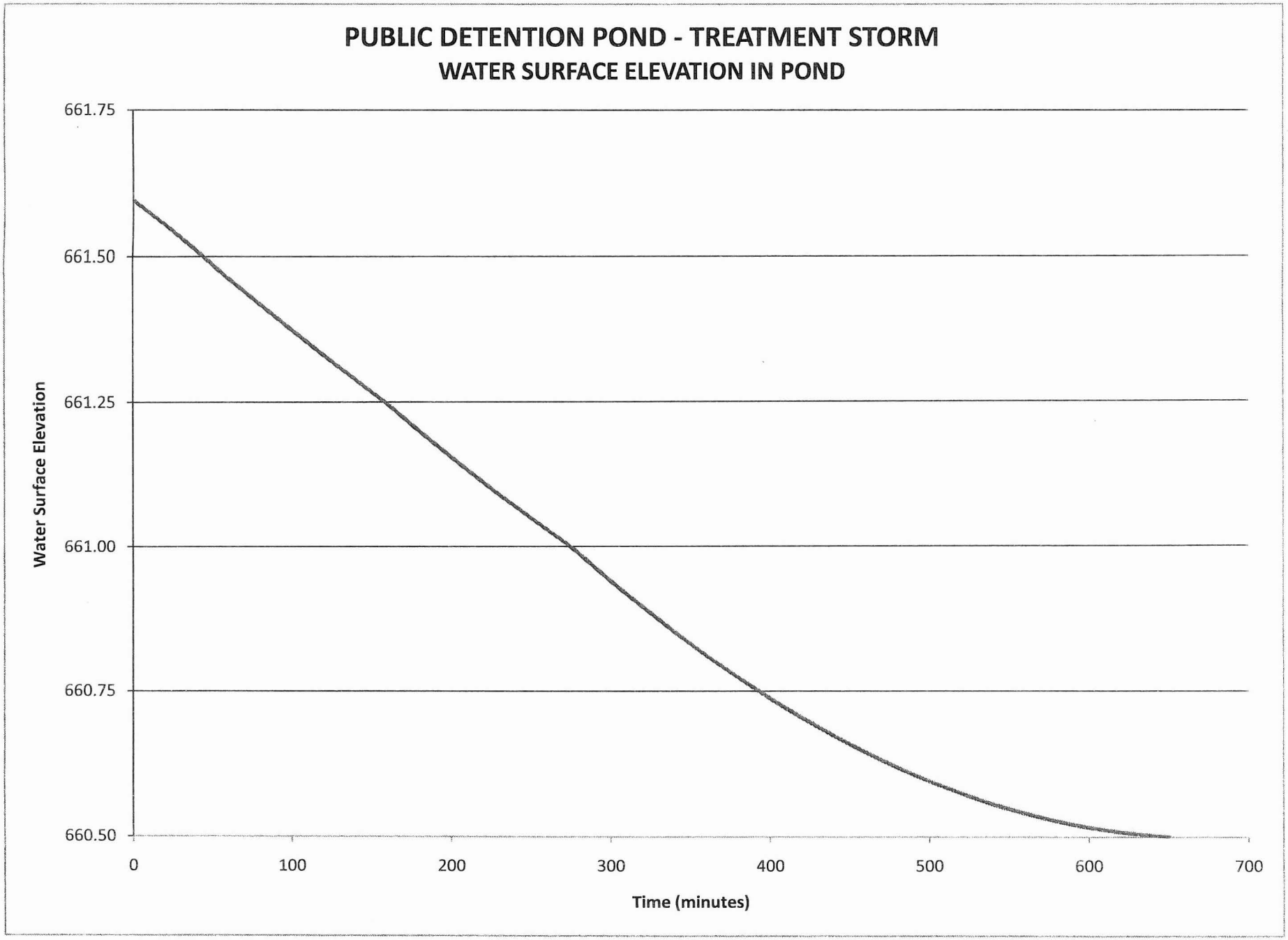
ORIFICE FLOW: $Q = CA\sqrt{2gh}$
1" ORIFICE
$A = \pi \left(\frac{0.5"}{12}\right)^2 = 5.45 \times 10^{-3} FT^2$

$Q = (0.60)(5.45 \times 10^{-3} FT^2)\sqrt{2(32.2 FT/S^2)(1.25')} = 0.029 CFS$

DETENTION TIME

650 MIN = 10.8 HRS (SEE ATTACHED CALCULATIONS)

10.8 HRS < 48 HRS ← DUE TO CITY OF WEST LINN MINIMUM ORIFICE SIZE = 1"


PUBLIC DETENTION POND - TREATMENT STORM
WATER SURFACE ELEVATION IN POND
Water Surface Elevation
661.75
661.50
661.25
661.00
660.75
660.50
0
100
200
300
400
500
600
700
Time (minutes)

Public Pond Water Quality Calculations

Elevation	Area (sf)	Volume (cf)
660.5	374	0
661	535	227
661.25	626	372
661.5	723	541
661.75	826	735

Orifice Size (in):	1.00
Orifice Area (sf):	0.00545
Orifice Coefficient:	0.60

Time (min)	Volume of Water (cf)	Water Surface Elevation	Flow out of Pond (cfs)
0	614	661.59	0.03
10	598	661.57	0.03
20	581	661.55	0.03
30	565	661.53	0.03
40	549	661.51	0.03
50	533	661.49	0.03
60	518	661.47	0.03
70	502	661.44	0.03
80	487	661.42	0.03
90	472	661.40	0.02
100	457	661.38	0.02
110	442	661.35	0.02
120	427	661.33	0.02
130	413	661.31	0.02
140	399	661.29	0.02
150	385	661.27	0.02
160	371	661.25	0.02
170	357	661.22	0.02
180	344	661.20	0.02
190	331	661.18	0.02
200	318	661.16	0.02
210	305	661.13	0.02
220	293	661.11	0.02
230	280	661.09	0.02
240	268	661.07	0.02
250	256	661.05	0.02
260	245	661.03	0.02
270	233	661.01	0.02
280	222	660.99	0.02
290	211	660.96	0.02

300	200	660.94	0.02
310	190	660.92	0.02
320	179	660.89	0.02
330	170	660.87	0.02
340	160	660.85	0.02
350	151	660.83	0.02
360	141	660.81	0.01
370	133	660.79	0.01
380	124	660.77	0.01
390	116	660.76	0.01
400	108	660.74	0.01
410	100	660.72	0.01
420	93	660.70	0.01
430	86	660.69	0.01
440	79	660.67	0.01
450	72	660.66	0.01
460	66	660.65	0.01
470	60	660.63	0.01
480	54	660.62	0.01
490	49	660.61	0.01
500	44	660.60	0.01
510	39	660.59	0.01
520	34	660.58	0.01
530	30	660.57	0.01
540	26	660.56	0.01
550	22	660.55	0.01
560	19	660.54	0.01
570	15	660.53	0.00
580	13	660.53	0.00
590	10	660.52	0.00
600	8	660.52	0.00
610	6	660.51	0.00
620	4	660.51	0.00
630	2	660.51	0.00
640	1	660.50	0.00
650	0	660.50	0.00

Appendix E

Calculations for Cheyenne Terrace Subdivision

WINZLER & KELLY
15575 SW Sequoia Parkway, Suite 140
Portland, OR 97224-7233
(503) 226-3921

By STS Date 11/18/09 Client _____ Sheet No. ____ of ____

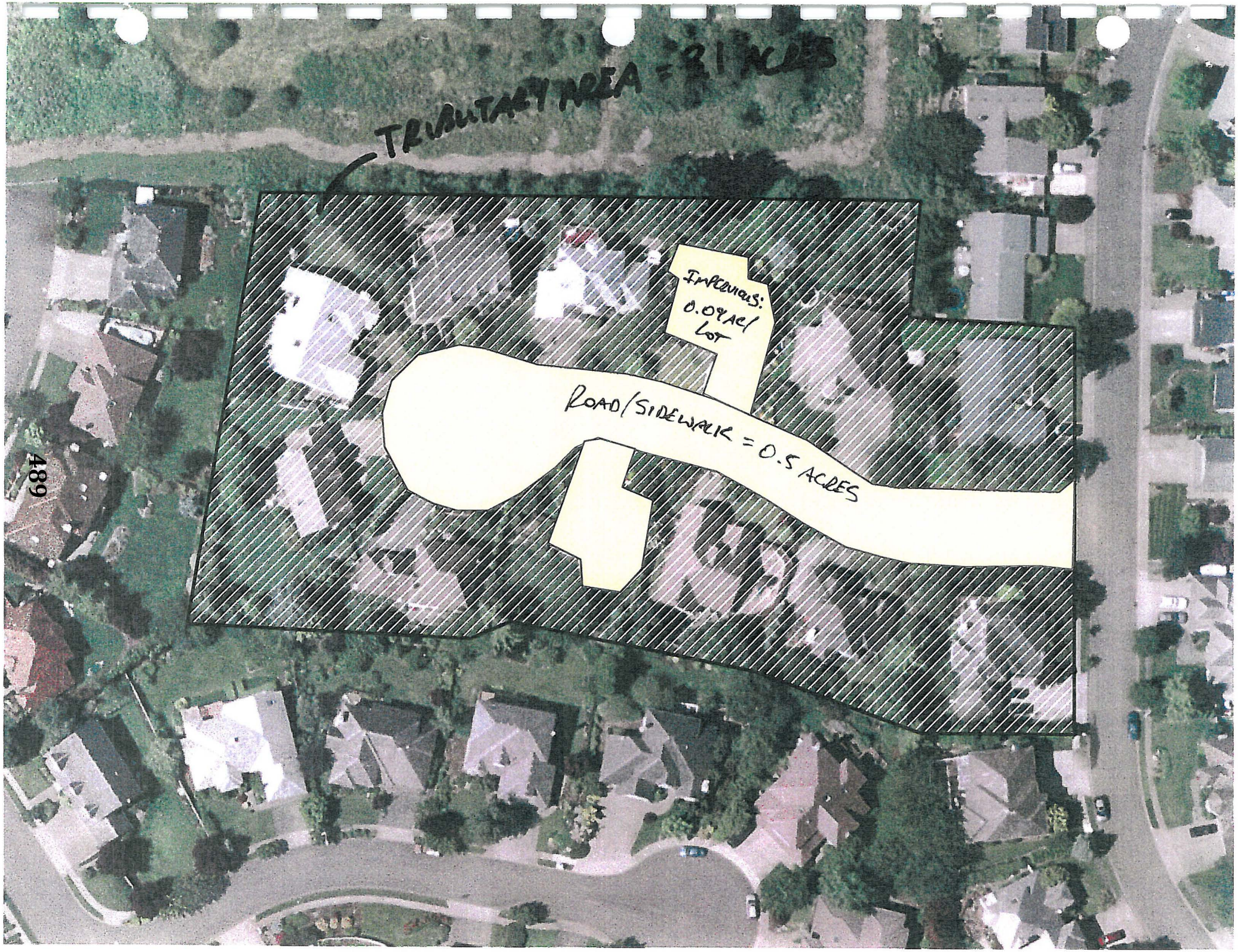
Subject CHEYENNE TERRACE HYDROLOGIC ANALYSIS Job No. _____

- TRIBUTARY AREA: 3.1 ACRES
- ROAD / SIDEWALK: 0.5 ACRES
- IMPERVIOUS AREA PER LOT: 0.09 ACRES
- # OF LOTS: 12

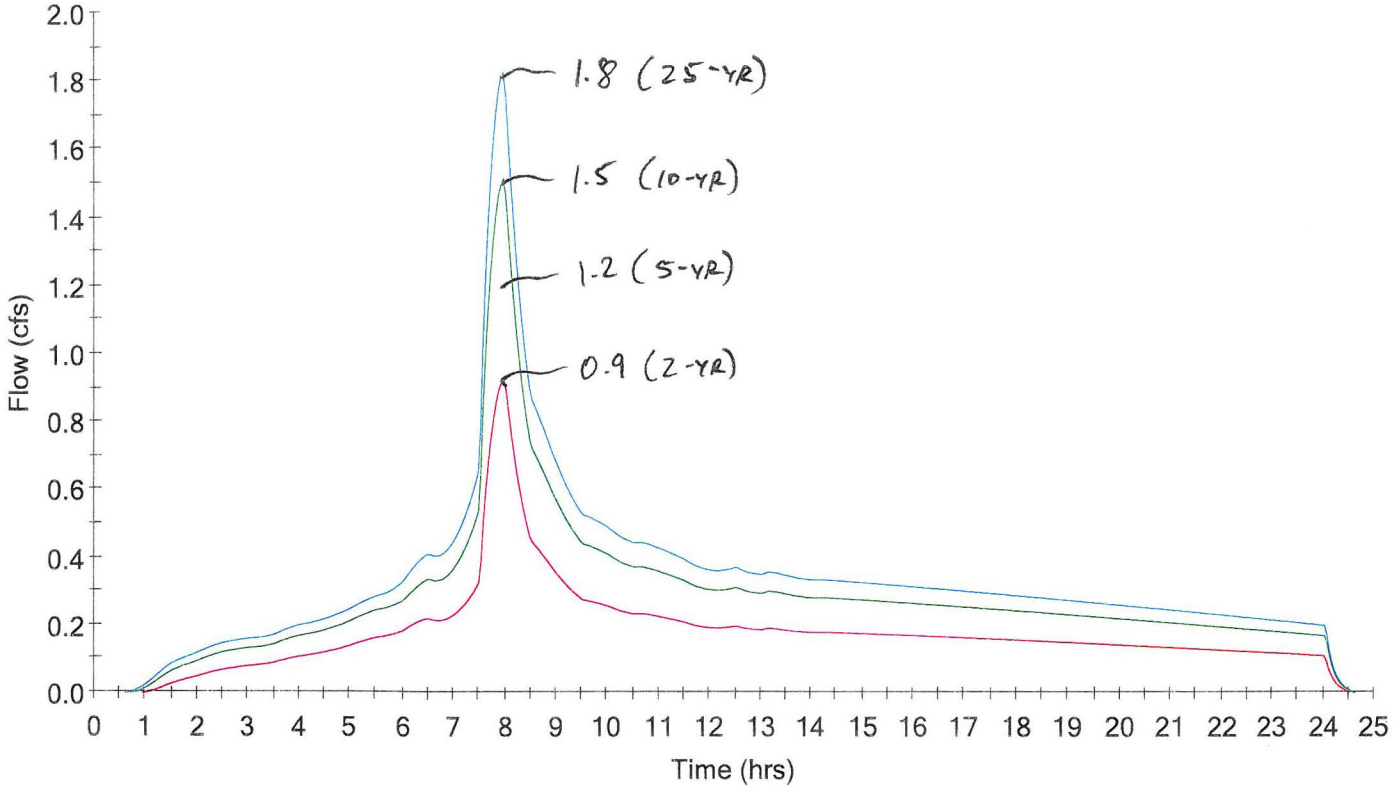
TOTAL IMPERVIOUS AREA: 0.5 ACRES + (12 LOTS)(0.09 ACRES/LOT)
≈ 1.6 ACRES

PERVIOUS AREA: 3.1 - 1.6 = 1.5 ACRES

- TIME OF CONCENTRATION: 10 MIN
- CN FOR LANDSCAPE AREAS: 74 (HSG C, LAWN, GOOD CONDITION)


TRIBUTARY AREA = 2.1 ACRES
IMPERVIOUS:
0.09 AC/
LOT
ROAD/SIDEWALK = 0.5 ACRES

Hydrograph
OUT 25



Cross Section for CheyenneTerraceChannel-25yr-Existing

Project Description

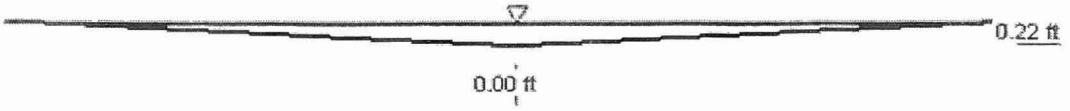
Friction Method	Manning Formula
Solve For	Normal Depth

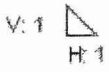
Input Data

Roughness Coefficient	0.045	
Channel Slope	0.05500	ft/ft
Normal Depth	0.22	ft
Left Side Slope	20.00	ft/ft (H:V)
Right Side Slope	20.00	ft/ft (H:V)
Bottom Width	0.00	ft
Discharge	1.80	ft^3/s ← PEAK 25-YEAR DISCHARGE

V = 1.8 FT/S

Cross Section Image





Cross Section for CheyenneTerraceChannel-25yr-Proposed

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

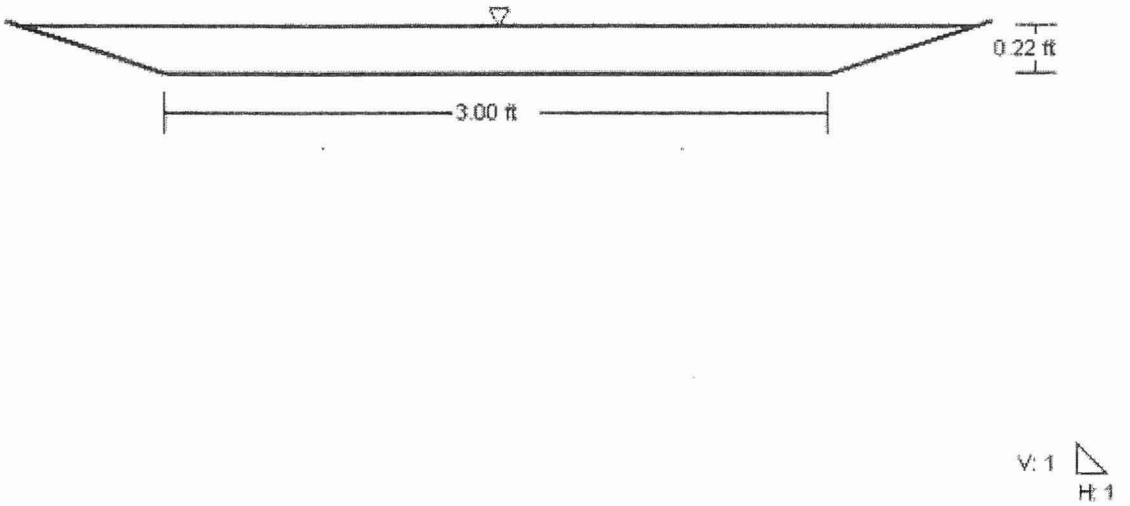
Input Data

Roughness Coefficient	0.045	
Channel Slope	0.04500	ft/ft
Normal Depth	0.22	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	1.80	ft^3/s

V= 2.3 FT/S

← PEAK 25-YEAR DISCHARGE

Cross Section Image

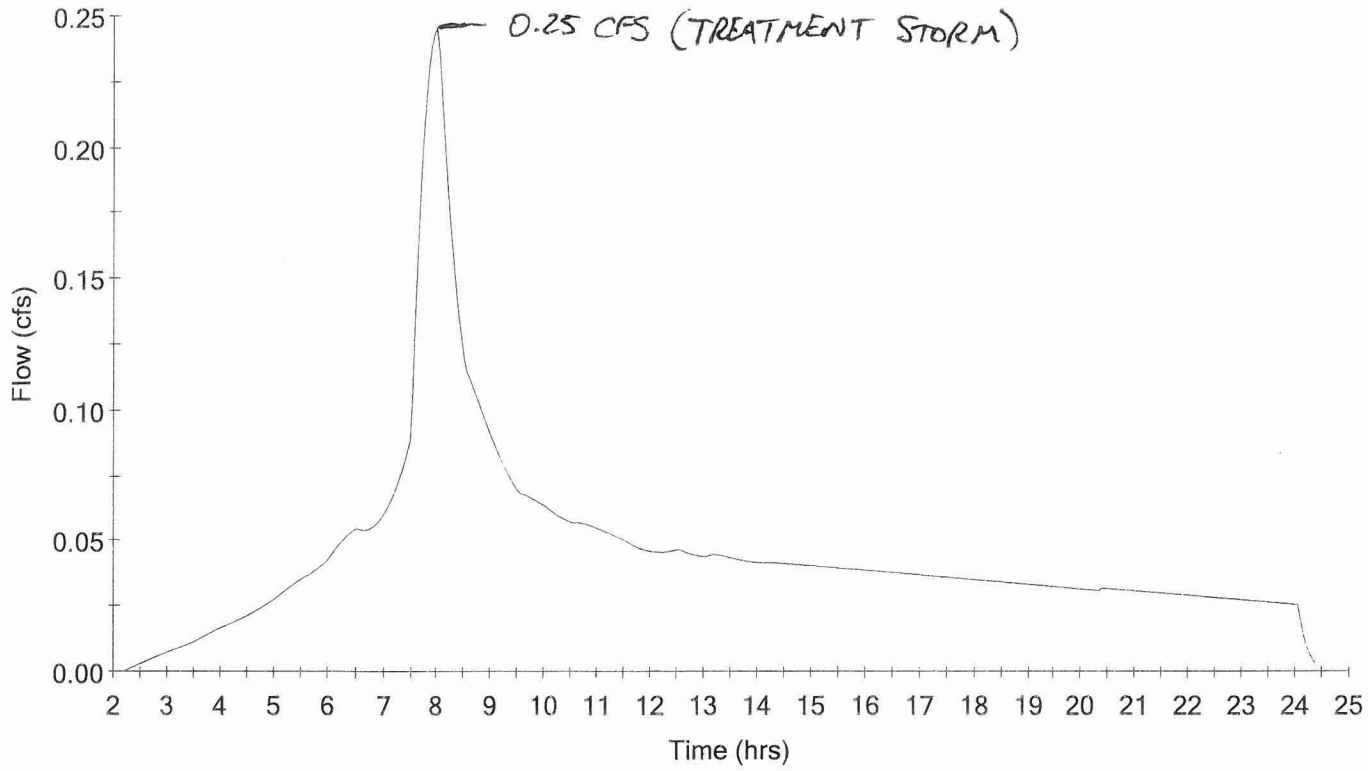


NEW WEST LINN PRIMARY SCHOOL

Travel Time Comparison for East Drainage Swale

	Length (ft)	Slope	Peak 25-yr Velocity (ft/s)	Travel Time (min)
Existing Swale	400	5.5%	1.8	3.7
Proposed Swale	485	4.5%	2.3	3.5

Hydrograph
OUT 1



Cross Section for CheyenneTerraceChannel-Treatment

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

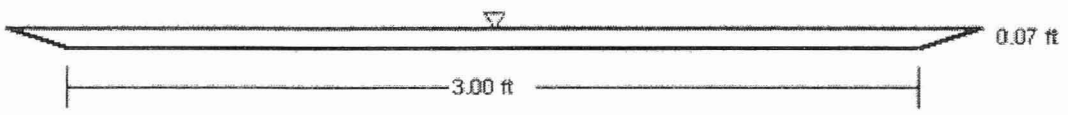
Input Data

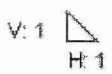
Roughness Coefficient	0.045	
Channel Slope	0.04500	ft/ft
Normal Depth	0.07	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.25	ft^3/s

V = 1.1 FT/S

← PEAK DISCHARGE FROM TREATMENT STORM

Cross Section Image



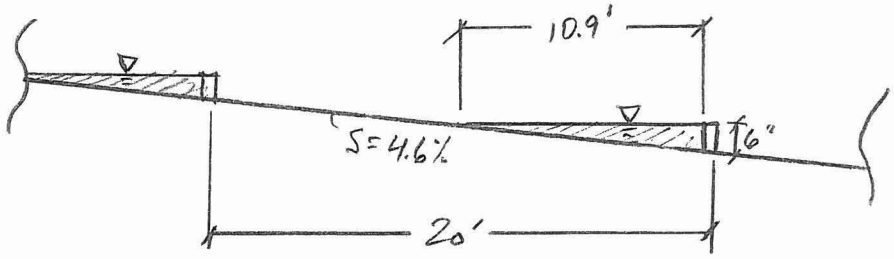


WINZLER & KELLY
15575 SW Sequoia Parkway, Suite 140
Portland, OR 97224-7233
(503) 226-3921

By STS Date 6/17/10 Client _____ Sheet No. ____ of ____

Subject EAST SWALE RESIDENCE TIME CALCULATION Job No. _____

SWALE BOTTOM WIDTH: 3'
AVERAGE SLOPE OF SWALE: 4.6%
CHECK DAM HEIGHT: 6"
CHECK DAM SPACING: 20'
SWALE LENGTH: 480'



LENGTH OF PONDED WATER: $\frac{0.5''}{0.046} = 10.9'$

PONDING VOLUME PER POOL: $(3')(10.9')(0.5')\frac{1}{2} = 8.2\ FT^3$

TOTAL # OF CHECK DAMS/POOLS: $\frac{485'}{20'} = 24$ CHECK DAMS

TOTAL PONDING VOLUME: $(24)(8.2\ FT^3) = 196\ FT^3$

PEAK TREATMENT STORM DISCHARGE: 0.25 CFS
RESIDENCE TIME IN POOLS: $\frac{196\ FT^3}{0.25\ CFS} \cdot \frac{1\ MIN}{60\ SEC} = 13.1$ MINUTES

RESIDENCE TIME IN SWALE (NOT IN POOLS): $\frac{[480' - (24)(10.9)]}{1.1\ FT/S} \cdot \frac{1\ MIN}{60\ SEC} = 3.3\ MIN$

TOTAL RESIDENCE TIME IN SWALE: 13.1 MIN + 3.3 MIN = <u>16.4 MIN</u>

Department of State Lands
775 Summer Street, Suite 100
Salem, OR 97301-1279
☎ 503-986-5200

Permit No.:	**44165-RF**
Permit Type:	**Removal/Fill**
Waterway:	**Wetland/Trillium Creek**
County:	**Clackamas**
Expiration Date:	**May 28, 2011**

WEST LINN-WILSONVILLE SCHOOL DISTRICT 3Jt

IS AUTHORIZED IN ACCORDANCE WITH ORS 196.800 TO 196.990 TO PERFORM THE OPERATIONS DESCRIBED IN THE ATTACHED COPY OF THE APPLICATION, SUBJECT TO THE SPECIAL CONDITIONS LISTED ON ATTACHMENT A AND TO THE FOLLOWING GENERAL CONDITIONS:

1. This permit does not authorize trespass on the lands of others. The permit holder shall obtain all necessary access permits or rights-of-way before entering lands owned by another.
2. This permit does not authorize any work that is not in compliance with local zoning or other local, state, or federal regulation pertaining to the operations authorized by this permit. The permit holder is responsible for obtaining the necessary approvals and permits before proceeding under this permit.
3. All work done under this permit must comply with Oregon Administrative Rules, Chapter 340; Standards of Quality for Public Waters of Oregon. Specific water quality provisions for this project are set forth on Attachment A.
4. Violations of the terms and conditions of this permit are subject to administrative and/or legal action, which may result in revocation of the permit or damages. The permit holder is responsible for the activities of all contractors or other operators involved in work done at the site or under this permit.
5. Employees of the Department of State Lands and all duly authorized representatives of the Director shall be permitted access to the project area at all reasonable times for the purpose of inspecting work performed under this permit.
6. Any permit holder who objects to the conditions of this permit may request a hearing from the Director, in writing, within twenty-one (21) calendar days of the date this permit was issued.
7. In issuing this permit, the Department of State Lands makes no representation regarding the quality or adequacy of the permitted project design, materials, construction, or maintenance, except to approve the project's design and materials, as set forth in the permit application, as satisfying the resource protection, scenic, safety, recreation, and public access requirements of ORS Chapters 196, 390, and related administrative rules.
8. Permittee shall defend and hold harmless the State of Oregon, and its officers, agents, and employees from any claim, suit, or action for property damage or personal injury or death arising out of the design, material, construction, or maintenance of the permitted improvements.
9. Authorization from the U.S. Army Corps of Engineers may also be required.

NOTICE: If removal is from state-owned submerged and submersible land, the applicant must comply with leasing and royalty provisions of ORS 274.530. If the project involves creation of new lands by filling on state-owned submerged or submersible lands, you must comply with ORS 274.905 to 274.940. This permit does not relieve the permittee of an obligation to secure appropriate leases from the Department of State Lands, to conduct activities on state-owned submerged or submersible lands. Failure to comply with these requirements may result in civil or criminal liability. For more information about these requirements, please contact the Department of State Lands, 503-986-5200.

Lori Warner-Dickason
Northern Region Manager
Wetlands & Waterways Conservation Div.
Oregon Department of State Lands

Authorized Signature

May 28, 2010
Date Issued

ATTACHMENT A

Permittee: West Linn-Wilsonville School District 3Jt

Special Conditions for Removal/Fill Permit No. 44165-RF

READ AND BECOME FAMILIAR WITH CONDITIONS OF YOUR PERMIT.

The project site may be inspected by the Department of State Lands (DSL) as part of our monitoring program. DSL has the right to stop or modify the project at any time if you are not in compliance with these conditions. A copy of this permit shall be available at the work site whenever authorized operations are being conducted.

1. **Authorization to Conduct Removal and/or Fill:** This permit authorizes the placement of up to 1480 cubic yards and removal of up to 176 cubic yards of material in T02S R01E Section 23, Tax Lot 5500, 12301, 12500, 12700, and 12800, Wetlands, Clackamas County, as described in the attached permit application, map and drawings, received February 19, 2010. In the event information in the application conflicts with these permit conditions, the permit conditions prevail.

2. **Authorization to Conduct Compensatory Mitigation:** This permit also authorizes removal and fill activities necessary to complete the required compensatory mitigation.

3. **Changes to the Project or Inconsistent Requirements from Other Permits:** It is the permittee's responsibility to ensure that all state, federal and local permits are consistent and compatible with the final approved project plans and the project as executed. Any changes made in project design, implementation and/or operating conditions to comply with conditions imposed by other permits must be approved by DSL prior to implementation.

4. **DSL May Halt or Modify:** DSL retains the authority to temporarily halt or modify the project in case of unforeseen damage to natural resources.

5. **DSL May Modify Conditions Upon Permit Renewal:** DSL retains the authority to modify conditions upon renewal, as appropriate, pursuant to the applicable rules in effect at the time of the request for renewal or to protect waters of this state.

Pre-Construction

6. **Local Government Approval Required Before Beginning Work:** Issuance of this permit is contingent upon acquisition of a conditional use permit from the City of West Linn.

7. **Stormwater Management Approval Required Before Beginning Work:** Issuance of the permit is contingent upon acquisition of a National Pollution Discharge Elimination System (NPDES) permit from the Oregon Department of Environmental Quality.

8. **Pre-construction Resource Area Flagging:** Before any site grading, the surveyed boundaries of the avoided wetlands shall be surrounded by bright orange construction fencing, which shall be

maintained during construction of the project. There shall be no heavy equipment within fenced areas, except during mitigation construction.

General Construction Conditions

9. **Water Quality Certification:** The Department of Environmental Quality (DEQ) may evaluate this project for a Clean Water Act Section 401 Water Quality Certification (WQC). If the evaluation results in issuance of a Section 401 WQC, that turbidity condition will govern any allowable turbidity exceedance and monitoring requirements.

10. **Erosion Control Methods:** The following erosion control measures (and others as appropriate) shall be installed prior to construction and maintained during and after construction as appropriate, to prevent erosion and minimize movement of soil into waters of this state.

    a. All exposed soils shall be stabilized during and after construction in order to prevent erosion and sedimentation.
    b. Filter bags, sediment fences, sediment traps or catch basins, leave strips or berms, or other measures shall be used to prevent movement of soil into waterways and wetlands.
    c. To prevent erosion, use of compost berms, impervious materials or other equally effective methods, shall be used to protect soil stockpiled during rain events or when the stockpile site is not moved or reshaped for more than 48 hours.
    d. Unless part of the authorized permanent fill, all construction access points through, and staging areas in, riparian and wetland areas shall use removable pads or mats to prevent soil compaction. However, in some wetland areas under dry summer conditions, this requirement may be waived upon approval by DSL. At project completion, disturbed areas with soil exposed by construction activities shall be stabilized by mulching and native vegetative plantings/seeding. Sterile grass may be used instead of native vegetation for temporary sediment control. If soils are to remain exposed more than seven days after completion of the permitted work, they shall be covered with erosion control pads, mats or similar erosion control devices until vegetative stabilization is installed.
    e. Where vegetation is used for erosion control on slopes steeper than 2:1, a tackified seed mulch shall be used so the seed does not wash away before germination and rooting.
    f. Dredged or other excavated material shall be placed on upland areas having stable slopes and shall be prevented from eroding back into waterways and wetlands.
    g. Erosion control measures shall be inspected and maintained as necessary to ensure their continued effectiveness until soils become stabilized.
    h. All erosion control structures shall be removed when the project is complete and soils are stabilized and vegetated.

11. **Hazardous, Toxic, and Waste Material Handling:** Petroleum products, chemicals, fresh cement, sandblasted material and chipped paint, wood treated with leachable preservatives or other deleterious waste materials shall not be allowed to enter waters of this state. Machinery refueling is to occur at least 150 feet from waters of this state and confined in a designated area to prevent spillage into waters of this state. Barges shall have containment system to effectively prevent petroleum products or other deleterious material from entering waters of this state. Project-related spills into waters of this state or onto land with a potential to enter waters of this state shall be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311.

12. **Federally Listed Endangered or Threatened Species:** When listed species are present, the authorization holder must comply with the Federal Endangered Species Act. If previously unknown listed species are encountered during construction, all construction activity shall immediately cease and the permit holder must contact DSL.

13. **Archaeological Resources**: If any archaeological resources and/or artifacts are encountered during construction, all construction activity shall immediately cease. The State Historic Preservation Office shall be contacted (phone: 503-986-0674).

14. **Hazards to Recreation, Navigation or Fishing:** The activity shall be timed so as not to interfere with or create a hazard to recreational or commercial navigation or fishing.

15. **Construction Corridor:** There shall be no removal of vegetation or heavy equipment operating or traversing outside the designated construction corridor or footprint (Figure Number/Letter).

16. **Trenching in Wetlands:** During trenching or excavation, the top layer of soil shall be separated from the rest of the excavated material and put back on top when the trench or pit is back-filled. If the native underlying soils are not used as bedding material, and a coarser, non-native soil or other material is used, preventative measures such as clay or concrete plugs shall be used so that underground hydraulic piping does not dewater the site and adjacent wetlands.

17. **Temporary Ground Disturbances:** All temporarily disturbed areas shall be returned to original ground contours at project completion, as proposed in the Site Restoration Plan in the application.

Mitigation Conditions

Compensatory Wetland Mitigation

The following conditions apply to the compensatory wetland mitigation actions proposed in the application Mitigation Plan dated February 19, 2010.

18. **Acreage and Type of Compensatory Mitigation:** Mitigation shall be conducted according to the acreages and methods described in the table below.

Acres	Cowardin/HGM Class	Method
	Authorized Impacts	
0.22 acre	palustrine forested slope/headwater	
	Required Mitigation	
0.291 acre	palustrine forested slope/headwater	creation
0.206 acre	palustrine scrub-shrub slope/headwater	creation

19. **Mitigation Site Location**: Mitigation shall be conducted on-site. The center-point of the mitigation site is 45.374150, -122.651249. The current legal description is Township 02S. Range 01E, Section 23 and 26, Tax lot 5500,12301, 12500, 12700 as shown on Figure #1 of the mitigation plan.

20. **Timing of Mitigation Site Grading:** Mitigation site grading shall be completed prior to or within the same construction season as the commencement of the wetland fill activity.

21. **Signs Required:** Signs shall be posted along the mitigation site perimeter stating that the area behind the sign is a protected wetland restoration site.

22. **Long-term Maintenance Required (see OAR 141-085-0705(1)(j)):** Long-term site maintenance will be provided by West Linn-Wilsonville School District 3Tj unless or until transferred according to OAR 141-085-0585 (8).

MONITORING AND REPORTING REQUIREMENTS

23. **Post-Construction Report Required:** A post-construction report demonstrating as-built conditions and discussing any variation from the approved plan shall be provided to the Department within 90 days of mitigation site grading. The post-construction report shall include:

    a. A scaled drawing, accurate to 1-foot elevation, showing the finished contours of the mitigation site.
    b. A narrative that describes any deviation from the approved mitigation plan.
    c. A copy of the recorded deed restriction or conservation easement.

24. **Term of Monitoring; Annual Monitoring Reports Required:** The permittee shall monitor the mitigation site to determine whether the mitigation site is meeting performance standards for a minimum period of 5 growing seasons after completion of all the initial plantings. Annual monitoring reports are required.

25. **Annual Monitoring Report Due Date:** Annual monitoring reports are due by December 1 of each year

26. **Extension of the Monitoring Period:** The monitoring period may be extended, at the discretion of the Department, for failure to provide monitoring reports, failure of the mitigation site to meet performance standards for two consecutive years or when needed to evaluate re-planting or other corrective or remedial actions.

27. **Release of Mitigation Obligation:** Mitigation monitoring is required until DSL has officially released the site from further monitoring.

28. **Failure to Submit Monitoring Reports:** Failure to submit the required monitoring report by the due date may result in an extension of the monitoring period, forfeiture of the financial security and/or enforcement action.

29. **Contents of the Annual Monitoring Report:** The annual monitoring report shall include the following information:

a. Completed Monitoring Report Cover Sheet, which includes permit number, permit holder name, monitoring date, report year, performance standards, and a determination of whether the site is meeting performance standards.
b. Impact and mitigation site location map(s).
c. A brief narrative that describes maintenance activities and recommendations to meet success criteria.
d. Mitigation site map showing permanent plot locations that correspond to the data collected and fixed photo-points.
e. Data collected to support the conclusions related to the status of the site relative to the performance standards listed in this permit (include summary/analysis in the report and raw data in the appendix).
f. Photos from fixed photo points (include in the appendix).
g. Other information necessary or required to document compliance with the performance standards listed in this permit.
h. A post-construction functional assessment by the end of the monitoring period.

30. **Corrective Action May be Required:** The Department retains the authority require corrective action in the event the performance standards are not accomplished at any time within the monitoring period.

PERFORMANCE STANDARDS

To be deemed successful, the mitigation areas including buffers shall meet the following performance standards, as determined by DSL:

31. **Establishment of Permanent Monitoring Locations Required:** Permanent plot locations must be established during the first annual monitoring in sufficient number and locations to be representative of the site. The permanent plot locations must be clearly marked on the ground.

32. **Wetland Acreage Required:** The CWM site will have a minimum of 0.291 acres of Palustrine Forested Slope/headwater; 0.206 acre of Palustrine Scrub-Shrub Slope/headwater; and 0.165 acre Riverine Flow Through wetland as determined by a wetland delineation, as specified by the Department, during spring of a year when precipitation has been near normal, vegetation has been established, and irrigation has been removed for at least two years.

Shrub-dominated and Forested Wetlands

33. **Native Species Cover:** The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.

34. **Invasive Species Cover:** The cover of invasive species is no more than 10%. A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture noxious weed list, plus known problem species including *Phalaris arundinacea, Mentha pulegium, Holcus lanatus, Anthoxanthum odoratum,* and the last crop plant if it is non-native. Non-native plants should be labeled as such if they are listed as non-native on the USDA Plants Database. Beginning in Year 2 of monitoring, DSL will consider a non-native plant species

invasive if it comprises more than 15% cover in 10% or more of the sample plots in any habitat class, and increases in cover or frequency from the previous monitoring period. Plants that meet this definition will be considered invasive for all successive years of monitoring. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%.

35. **Bare Substrate Cover:** Bare substrate represents no more than 20% cover.

36. **Woody Vegetation:** The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.

37. **Species Diversity**: By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class, **and** occur in at least 10% of the plots sampled.

38. **Moisture Prevalence Index**: Prevalence Index total for all strata is <3.0.

Monitoring and Reporting Schedule

Report	Requirements	Schedule
Post-Construction	Post-construction report Recorded Protection Instrument	90 days after completion of grading
First Annual report	Establishment of permanent monitoring locations Vegetation performance standards Demonstration that wetland hydrology has been accomplished Evidence that water rights are secured, or are not required	After one growing season of all proposed plantings
Second Annual report	Vegetation performance standards	After two growing seasons
Third and Fourth Annual reports	Vegetation performance standards Actual acreage achieved by HGM and Cowardin class[a].	After three and four growing seasons, respectively a "light delineation" during spring of a year when precipitation has been near normal and no irrigation has been in use during the previous two years
Fifth Annual report (or final report if the monitoring period has	Vegetation performance standards	After five growing seasons

been extended)	Functional assessment[χ]	

[α]These requirements may be fulfilled any time during the monitoring period, but must be received by the Department no later than the fifth annual monitoring.
[χ] Functional assessments shall meet the standards and requirements in OAR 141-085-0685. The same assessment method used for the pre-CWM site functional assessment should be used for monitoring purposes, unless otherwise approved by the Department.

Issued: May 28, 2010

WD # 09-0240

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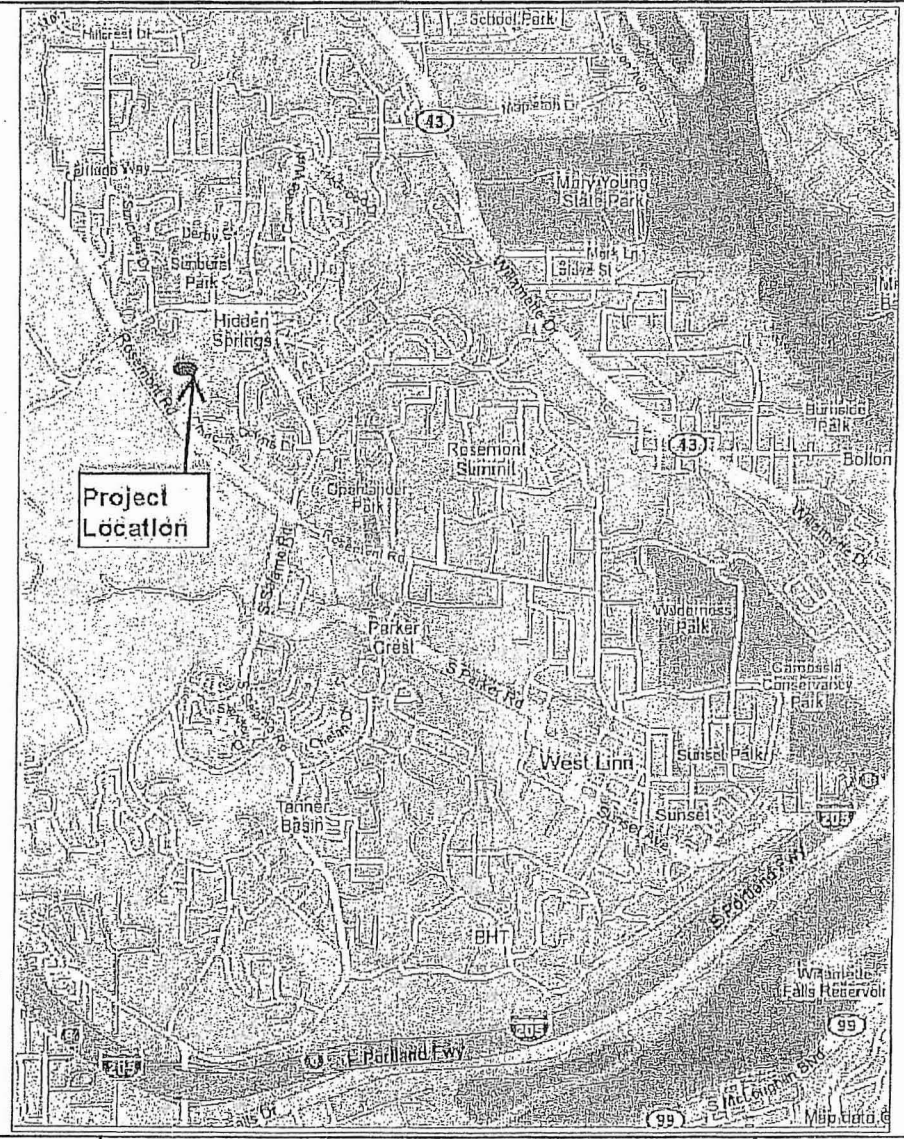

WINZLER & KELLY
15575 SW SEQUOIA PKWY, SUITE 140
PORTLAND, OR 97224
PH: 503-226-3921 FAX: 503-226-3926

PROJECT
WEST LINN-WILSONVILLE SCHOOL DISTRICT 3JT
ERICKSON SCHOOL SITE

DESIGNED	DRAWN	APPROVED	DATE	PROJECT NO.	DWG NO.
	KPT	NO	04/09/09	1145609001	

TITLE
FIGURE 1
LOCATION MAP

O:\11456 – WLWSD (WEST LINN–WILSONVILLE SCHOOL DISTRICT)\11456-09-001 WLWSD ERICKSON WETLANDS\CAD\FIG 1 LOCATION MAPS.DWG Keith Tolle 5/19/2009 1:52 PM

West Linn – Wilsonville Schools

May 18, 2010

Anita Huffman
Northern Region Resource Coordinator
Wetlands and Waterways Conservation Division
Oregon Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279

RE: Response to comments on Removal-Fill Application #APP0044165

Dear Ms. Huffman:

This letter is in response to comments made on the West Linn-Wilsonville School District's Removal-Fill Application #APP0044165 (West Linn Primary School); letter dated April 26, 2010. The primary response it to those comments made by the Oregon Department of Fish and Wildlife (ODFW) letter dated March 23, 2010 and concerned citizens during the 30-day public review period for the permit application.

Comments received from the ODFW are addressed below:

1. "ODFW does not believe that the applicant has demonstrated that the proposed road construction/culvert installation within the wetland is consistent with Goal 5 and its administrative rule for locally significant resources."

→ The City of West Linn is responsible for implementing Goal 5 of Oregon's Statewide Planning Goals and Guidelines. The City's planning department has reviewed the project and determined that it will be consistent with land use regulations when certain local approvals (e.g. Conditional Use) are obtained.

2. "ODFW encourages the applicant to consider a pedestrian bridge linking the parking lot to the school, spanning the entire wetland and buffer area to completely avoid impact to a locally significant wetland."

→ The primary concern seems to be regarding impacts to Wetlands A and B caused by the road crossing. Currently, there is a dirt road/path crossing through this location and frequent vehicle use across the wetland there and in another location crossing the Wetland B and C. Measures were taken to minimize wetland impacts early in the site planning process. The delineated wetland and buffer became the base map over which the entire site was designed, and through an extensive alternatives analysis, the present design calls for the road to cross at the narrowest possible location on the school property. The proposed road will follow the existing road/path and will span the wetland with a 4-6 foot open-bottom culvert. The wetland impacts are minimal (0.07 ac) and mitigated at a 3:1 ratio.

Department of Operations
Mail: P.O. Box 35 • West Linn, Oregon 97068 • 503-673-7995 Fax 503-638-9143 • www.wlwv.k12.or.us
Location: 2755 SW Borland Road, Tualatin, Oregon 97062

→ The total number of parking spaces was reduced during planning, and the proposed plan includes 27 out of 117 total parking spaces to use the suggested location. However, there is not enough space at that location to accommodate the full parking needs, as well as allow for safe vehicle ingress/egress and a place to safely drop-off/pick-up primary school-aged children close to the school. The first responsibility of the District is the safety of the students; thus, this space is used as secondary parking area only.

3. "At a minimum, a vehicle bridge should be built to cross the entire wetland and buffer area to be consistent with statewide planning Goal 5."

→ A bridge spanning the entire wetland and buffer would be approximately $200-$300K in additional development costs to the District, which is economically cost-prohibitive to the project. The arching, open-bottom culvert was selected to provide the largest allowable opening that still maintains structural integrity at reasonable cost.

4. "ODFW appreciates the habitat considerations that are in the application packet including reduction of invasive plant species, which is a major problem at the project site."

→ Thank you for the comment.

5. ODFW recommends "continued invasive plant removal management into the future [and] use care working in early spring when native plants are emerging through non-native plants."

→ Five years of invasive species monitoring/control is a required component of the wetland mitigation plan. Further, part of the school curricula is expected to include native habitat education, including restoration and monitoring, increasing the chances for long-term success and a net benefit for the site. However, current boards cannot create long-term service agreements that bind future boards to commit to an invasive species management program. The suggestion to use care in early spring when native plants are emerging through non-native vegetation is noted and will be taken into consideration.

6. ODFW recommends to "use permeable pavers/porous materials for parking lots, walkways, and other traditionally impervious surfaces in place of asphalt or concrete."

→ High groundwater on the site limits the suitability of permeable pavers/porous materials. The project proposes to treat stormwater runoff by diverting water from all impervious parking areas into underground perforated pipes and vegetated swales with overflow into an underground detention pipe to infiltrate stormwater runoff and recharge groundwater.

7. ODFW recommends to "install signs that warn vehicles about frog migration and turtle crossing" and to "not release turtles or frogs into the area without first talking with an ODFW non-game biologist."

→ The suggestions to raise turtle and frog awareness through signage and to not release turtles or frogs into the area without first talking to OFDW are noted and will be taken into consideration.

8. ODFW recommends to "leave any large trees or snags that exist outside of the buffer area" and "not remove any oak trees."

→ Safety of the students is the number one responsibility of the District and are willing to leave snags standing up to the point that they do not present a danger to the students. Removal of some oak trees on the site is unfortunate, but necessary to construct the road into the site at the narrow wetland location.

9. ODFW recommends to "Preserve and restore grassland/prairie upland habitat for turtles, frogs, reptiles and ground nesting birds…Mow one third of the prairie every three years…Mow outside of breeding and nesting seasons (spring/early summer)…When mowing, watch for turtles and move them out of harm's way"

→ The suggestions to preserve and restore grassland/prairie habitat by mowing one-third of this habitat type every three years in spring/early summer and to watch for turtles during mowing are noted and will be taken into consideration in the classroom curriculum.

10. ODFW recommends to "install living roofs on buildings to supply habitat for insects and birds that will be displaced."

→ The suggestion is noted. The current site plan includes two eco-roofs as well as vegetated stormwater planters to receive roof runoff.

11. "ODFW has concerns that "Development within a Goal 5 designated resource area is not consistent with the City of West Linn's comprehensive plan, the Metro's Fish and Wildlife Habitat Protection Plan, the Oregon Conservation Strategy, or ODFW's management guidelines."

→ The City of West Linn's planning department has reviewed the project and determined that it will be consistent with the comprehensive plan when certain local approvals are obtained. The priorities of Metro, the state and ODFW are important to the school district; however, they are not part of the DSL and Corps of Engineer's Joint Removal-Fill Permitting process. The Applicant's approach to protection and provision for future wildlife habitat value in the project vicinity included baseline inventory, pre-design avoidance of valuable habitats, adequate mitigation area 3 (0.165 ac) that focuses on increasing the function for greater biodiversity targeting creation of habitat for amphibians and turtles. While again, this is not required under the DSL's JPA process, the Applicant believes this is supportive of the

goals within the Metro's Fish and Wildlife Habitat Protection Plan, The Oregon Conservation Strategy, and the ODFW's management guidelines.

12. "An ESEE analysis is mandatory to amend West Linn's comprehensive plan."
→ No comprehensive plan amendment is under consideration for the school district's proposals thus an ESEE analysis would not be required.

13. "ODFW supports reconsidering alternatives [including] the properties one mile east that do not impact significant wetland and riparian resources, [and] can balance human and natural resource needs by retaining natural space."

→ Two alternative properties owned by the District were considered prior to settling on the proposed site. Both alternative sites are in conflict with the District goal of having schools serve the neighborhoods that surround them. The proposed site meets the criteria for access and the demographic served. Additionally, one alternative site is an established, highly-valued community/city youth sports field and the other site is unsuitable for a primary school.

Comments by concerned neighbors:

1. March 26, 2010 a neighbor recommended denial of the permit because of the confined nature of the project site. The comment stated further that the wetlands and open space limit development of the site and that there isn't infrastructure to support additional traffic.

→ Each of these concerns has been carefully evaluated and was taken into consideration during in the site planning and infrastructural design process.

2. March 27, 2010 Molly L. Hoeflich and Thomas A. Phipps commented that "draining this area and building a school would be a huge improvement".

→ The comment has been noted.

3. April 21, 2010 William H. Prentice and April 22, 2010 Joe Nolan were concerned about diversion of water and the risk that the project could increased flow erosion and flooding to Trillium Creek and that compensatory mitigation is insufficient.

→ The comments have been noted. Surface water runoff will be captured and managed according to City code. Any areas that may be disturbed, the surface water runoff would be detained per City of West Linn's standards (City of West Linn Design Standards Section 2). The runoff will be carefully controlled to match the pre-developed hydrology.

The design criteria are discussed within the Land Use Application, and noted herein for your reference:

STORM DRAINAGE

Description
Storm water runoff from the impervious areas of the site will be addressed in a number of ways. Storm water from roof runoff and other impervious areas will be treated with bioswales and rain garden planters. Storm water quantity will be managed by two underground detention systems with metered outlet to the existing wetland area.

Design Criteria
The design of the sanitary system will be in accordance with the City of West Linn standards.

Materials
The materials of the sanitary system will be in accordance with the City of West Linn standards for public mains and the private portions of the system.

4. April 22, 2010 Joe Nolan was concerned about artifacts from Native Americans that may exist on site.

→ An inquiry to the State Historic Preservation Office was conducted and a response was provided by them about the project site (letter from SHPO dated April 5, 2010). A surface cultural survey (pedestrian) and record search was conducted by the Applicant in 2009, but no subsurface testing has been done. However, the creek and surrounding wetlands and upland prairies will be more protected once the school is in place than they have been in the recent past. As the project site has lain fallow, the area has been used by the public and vehicles have been driven through the waterways and seep areas. In the future, however, should any artifacts be discovered during construction, work will cease until a professional archeologist can assess the discovery.

Sincerely,

Tim K. Woodley
Director, Department of Operations
West Linn-Wilsonville School District 3TJ

West Linn – Wilsonville Schools

May 18, 2010

Elizabeth Ruther
Oregon Department of Fish and Wildlife
Sauvie Island Wildlife Area
North Willamette Wildlife District
19330 NW Sauvie Island Road
Portland, OR 97231

RE: Response to comments on Removal-Fill Application #APP0044165

Dear Ms. Huffman:

This letter is in response to comments made on the West Linn-Wilsonville School District's Removal-Fill Application #APP0044165 (West Linn Primary School); letter dated April 26, 2010. The primary response it to those comments made by the Oregon Department of Fish and Wildlife (ODFW) letter dated March 23, 2010 and concerned citizens during the 30-day public review period for the permit application.

Comments received from the ODFW are addressed below:

1. "ODFW does not believe that the applicant has demonstrated that the proposed road construction/culvert installation within the wetland is consistent with Goal 5 and its administrative rule for locally significant resources."

→ The City of West Linn is responsible for implementing Goal 5 of Oregon's Statewide Planning Goals and Guidelines. The City's planning department has reviewed the project and determined that it will be consistent with land use regulations when certain local approvals (e.g. Conditional Use) are obtained.

2. "ODFW encourages the applicant to consider a pedestrian bridge linking the parking lot to the school, spanning the entire wetland and buffer area to completely avoid impact to a locally significant wetland."

→ The primary concern seems to be regarding impacts to Wetlands A and B caused by the road crossing. Currently, there is a dirt road/path crossing through this location and frequent vehicle use across the wetland there and in another location crossing the Wetland B and C. Measures were taken to minimize wetland impacts early in the site planning process. The delineated wetland and buffer became the base map over which the entire site was designed, and through an extensive alternatives analysis, the present design calls for the road to cross at the narrowest possible location on the school property. The proposed road will follow the existing road/path and will span the wetland with a 4-6 foot open-bottom culvert. The wetland impacts are minimal (0.07 ac) and mitigated at a 3:1 ratio.

Department of Operations
Mail: P.O. Box 35 • West Linn, Oregon 97068 • 503-673-7995 Fax 503-638-9143 • www.wlwv.k12.or.us
Location: 2755 SW Borland Road, Tualatin, Oregon 97062

→ The total number of parking spaces was reduced during planning, and the proposed plan includes 27 out of 117 total parking spaces to use the suggested location. However, there is not enough space at that location to accommodate the full parking needs, as well as allow for safe vehicle ingress/egress and a place to safely drop-off/pick-up primary school-aged children close to the school. The first responsibility of the District is the safety of the students; thus, this space is used as secondary parking area only.

3. "At a minimum, a vehicle bridge should be built to cross the entire wetland and buffer area to be consistent with statewide planning Goal 5."

→ A bridge spanning the entire wetland and buffer would be approximately $200-$300K in additional development costs to the District, which is economically cost-prohibitive to the project. The arching, open-bottom culvert was selected to provide the largest allowable opening that still maintains structural integrity at reasonable cost.

4. "ODFW appreciates the habitat considerations that are in the application packet including reduction of invasive plant species, which is a major problem at the project site."

→ Thank you for the comment.

5. ODFW recommends "continued invasive plant removal management into the future [and] use care working in early spring when native plants are emerging through non-native plants."

→ Five years of invasive species monitoring/control is a required component of the wetland mitigation plan. Further, part of the school curricula is expected to include native habitat education, including restoration and monitoring, increasing the chances for long-term success and a net benefit for the site. However, current boards cannot create long-term service agreements that bind future boards to commit to an invasive species management program. The suggestion to use care in early spring when native plants are emerging through non-native vegetation is noted and will be taken into consideration.

6. ODFW recommends to "use permeable pavers/porous materials for parking lots, walkways, and other traditionally impervious surfaces in place of asphalt or concrete."

→ High groundwater on the site limits the suitability of permeable pavers/porous materials. The project proposes to treat stormwater runoff by diverting water from all impervious parking areas into underground perforated pipes and vegetated swales with overflow into an underground detention pipe to infiltrate stormwater runoff and recharge groundwater.

7. ODFW recommends to "install signs that warn vehicles about frog migration and turtle crossing" and to "not release turtles or frogs into the area without first talking with an ODFW non-game biologist."

→ The suggestions to raise turtle and frog awareness through signage and to not release turtles or frogs into the area without first talking to OFDW are noted and will be taken into consideration.

8. ODFW recommends to "leave any large trees or snags that exist outside of the buffer area" and "not remove any oak trees."

→ Safety of the students is the number one responsibility of the District and are willing to leave snags standing up to the point that they do not present a danger to the students. Removal of some oak trees on the site is unfortunate, but necessary to construct the road into the site at the narrow wetland location.

9. ODFW recommends to "Preserve and restore grassland/prairie upland habitat for turtles, frogs, reptiles and ground nesting birds…Mow one third of the prairie every three years…Mow outside of breeding and nesting seasons (spring/early summer)…When mowing, watch for turtles and move them out of harm's way"

→ The suggestions to preserve and restore grassland/prairie habitat by mowing one-third of this habitat type every three years in spring/early summer and to watch for turtles during mowing are noted and will be taken into consideration in the classroom curriculum.

10. ODFW recommends to "install living roofs on buildings to supply habitat for insects and birds that will be displaced."

→ The suggestion is noted. The current site plan includes two eco-roofs as well as vegetated stormwater planters to receive roof runoff.

11. "ODFW has concerns that "Development within a Goal 5 designated resource area is not consistent with the City of West Linn's comprehensive plan, the Metro's Fish and Wildlife Habitat Protection Plan, the Oregon Conservation Strategy, or ODFW's management guidelines."

→ The City of West Linn's planning department has reviewed the project and determined that it will be consistent with the comprehensive plan when certain local approvals are obtained. The priorities of Metro, the state and ODFW are important to the school district; however, they are not part of the DSL and Corps of Engineer's Joint Removal-Fill Permitting process. The Applicant's approach to protection and provision for future wildlife habitat value in the project vicinity included baseline inventory, pre-design avoidance of valuable habitats, adequate mitigation area 3 (0.165 ac) that focuses on increasing the function for greater biodiversity targeting creation of habitat for amphibians and turtles. While again, this is not required under the DSL's JPA process, the Applicant believes this is supportive of the

goals within the Metro's Fish and Wildlife Habitat Protection Plan, The Oregon Conservation Strategy, and the ODFW's management guidelines.

12. "An ESEE analysis is mandatory to amend West Linn's comprehensive plan."
→ No comprehensive plan amendment is under consideration for the school district's proposals thus an ESEE analysis would not be required.

13. "ODFW supports reconsidering alternatives [including] the properties one mile east that do not impact significant wetland and riparian resources, [and] can balance human and natural resource needs by retaining natural space."

→ Two alternative properties owned by the District were considered prior to settling on the proposed site. Both alternative sites are in conflict with the District goal of having schools serve the neighborhoods that surround them. The proposed site meets the criteria for access and the demographic served. Additionally, one alternative site is an established, highly-valued community/city youth sports field and the other site is unsuitable for a primary school.

Comments by concerned neighbors:

1. March 26, 2010 a neighbor recommended denial of the permit because of the confined nature of the project site. The comment stated further that the wetlands and open space limit development of the site and that there isn't infrastructure to support additional traffic.

→ Each of these concerns has been carefully evaluated and was taken into consideration during in the site planning and infrastructural design process.

2. March 27, 2010 Molly L. Hoeflich and Thomas A. Phipps commented that "draining this area and building a school would be a huge improvement".

→ The comment has been noted.

3. April 21, 2010 William H. Prentice and April 22, 2010 Joe Nolan were concerned about diversion of water and the risk that the project could increased flow erosion and flooding to Trillium Creek and that compensatory mitigation is insufficient.

→ The comments have been noted. Surface water runoff will be captured and managed according to City code. Any areas that may be disturbed, the surface water runoff would be detained per City of West Linn's standards (City of West Linn Design Standards Section 2). The runoff will be carefully controlled to match the pre-developed hydrology.

The design criteria are discussed within the Land Use Application, and noted herein for your reference:

STORM DRAINAGE

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Sincerely,

Tim K. Woodley
Director, Department of Operations
West Linn-Wilsonville School District 3TJ

NEW WEST LINN PRIMARY SCHOOL
Conditional Use, Class II Design Review, Water Resource Area and Variance

May 13, 2010

APPLICATION SUMMARY

For Conditional Use, Class II Design Review, Water Resource Area, and Variance approval to construct a 67,000 square foot primary school located on a 15.98-acre site. Variances are requested to: 1) allow two, 95' wide driveways (from curb return to curb return); 2) allow parking spaces that are more than 200 feet from the building entrance; 3) reduce the transition setback for an intermittent drainage from 65 to 15 feet; and 4) allow two wall signs of approximately 38 and 84 square feet and a 32 square foot monument sign at the driveway entrance.

GENERAL INFORMATION

Location

1025 Rosemont Road (2S 1E Section 23 CD, Supplemental 2, Tax Lots 12500, 12700, and 12800). Its location is shown in Figure 1.

Comprehensive Plan and Zoning Designations

The Comprehensive Plan designation is Low Density.

Consistent with the Comprehensive Plan, the property is zoned Single Family Residential Detached (R10).

Applicant and Owner

Tim Woodley, Director of Operations
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West Linn, OR 97068
Phone: 503-673-7976
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Applicant's Representatives

Keith Liden, AICP
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Karina Ruiz, AIA
Dull Olson Weekes Architects
907 S. W. Stark Street
Portland, OR 97205
Phone: 226-6950
Fax: 273-9192
E-mail: KarinaR@dowa.com

Plan Sheets

Cover Sheet	
LU1.00	Existing Conditions Plan
LU1.01	Civil Site Plan
LU1.02	Civil Grading Plan
LU1.03	Civil Erosion Control Plan
LU1.04	Civil Utility Plan
LU2.01	Site Analysis
LU2.02	Landscape Plan – West
LU2.03	Landscape Plan – East
LU2.04	Planting/Irrigation Plan - West
LU2.05	Planting/Irrigation Plan - East
LU3.01	Main Floor Plan
LU3.02	Second Floor Plan
LU3.03	Roof Plan
LU3.04	Exterior Elevations
LU3.05	Covered Play & Signage
LU3.06	Site Sections
LU3.07	Site Sections
LU4.01	Site Plan – Lighting Calculations
LU4.02	Site Plan – Lighting Calculations

Supporting Information

- Transportation Impact Study, DKS
- Wetlands/Waters Delineation Report for West Linn-Wilsonville School District Erickson School Site, May 20, 2009
- Wetlands Memorandum, Winzler & Kelly, January 18, 2010
- Joint Permit Application
- Arborist site meeting notes, Walker Macy, April 30, 2010
- Response to CDC Chapter 32, Winzler & Kelly, May 12, 2010
- Revegetation at Water Resource Areas, Walker Macy, May 12, 2010
- Site Noise Review, Altermatt Associates, Inc.

Figure 1: Aerial Photo

Source: Google

BACKGROUND INFORMATION

Site Description

The site is an undeveloped, 15.98-acre property as shown in Figure 1 and Sheet LU1.00. Trillium Creek runs through the property generally from the southwest to the northeast corner of the site. A wetland and wooded areas are located on both sides of the creek. Open areas are located on either side of this wetland/wooded area near Rosemont Road and the southeastern portion of the site. The property slopes down toward the creek and to the northeast. An intermittent drainage originating from a storm water outfall runs from south to north near the eastern edge of the property. An analysis of the site concluded that 189,987 square feet of the property consists of Type II lands, which lie on both sides of Trillium Creek. The remainder of the site is classified as Type I land (see Sheet LU2.01).

Surrounding Area Description

The zoning designations and current land use of the surrounding area are summarized in Table 1.

Table 1
Land Use Summary

Properties in the Vicinity	*Zone Designation*	*Land Use*
Subject Property		
2S 1E Section 23 CD, Tax Lot s 12500, 12700 & 12800 (owned by school district)	R10	Vacant
Surrounding Properties		
North	R7/R10	Single family residences & undeveloped
South	R7	Single family residences
East	R10	Single family residences
West	FU10	Single family residences
	RRFF-5	Acreage homesites & limited agriculture

SCHOOL BUILDING AND RELATED IMPROVEMENTS

New Primary School

The new primary school is proposed to accommodate 500 students and 50 staff in the southeastern portion of the property. It will take advantage of the largest existing open area on the site. The main entrance for students will be on the south side of the building, and the main visitor entrance will be located on the west side. The school will generally operate between the weekday hours of 7:30am to 2:30pm. In addition, school activities and community use will occur during other times of the day and week, but the school will be closed after 10 pm.

The 67,000 square foot school, with 23 classrooms, will feature a two-story design in the northern classroom wing with the library, gym, administrative offices, and kindergarten classes on one level on the southern portion of the building. The building footprint will be slightly less than 42,000 square feet. The maximum height of the building is slightly less than the 35-foot maximum of the R-10 Zone. The district currently needs capacity for approximately 350 students with an anticipated future need to accommodate about 500 students. The plans show the complete school, which could accommodate an enrollment of 500. The district will request contractors to bid the construction of a 350- and a 500-student school. Depending upon the bids received, the district will decide whether to fully build the school now, or plan on constructing additional classrooms on the east side of the building at a later date (Sheets LU 3.01/3.02).

Access

Driveways

Access will be provided by two driveways along Rosemont Road, which will be over 400 feet apart. The northern driveway will serve as the entrance for visitors and parents to drop off and pick up students. In addition, food service deliveries will be made via this

driveway. The driveway will cross Trillium Creek and the associated wetland. It is proposed to be 28 feet wide with a 6-foot wide sidewalk on the north side.

A southern driveway will provide access for school buses, staff vehicles, and service vehicles. It is made possible with an easement acquired from the adjoining property owner. Buses will be allowed to enter the site, turn around, and drop off or pick up students along the south side of the school. This driveway will be 24 feet wide with a 10-foot wide sidewalk on the north side. The two-driveway system is designed to separate visitor and parent traffic from buses and service vehicles to allow safe and convenient access for everyone.

There will be a connection between the north and south parking lots to provide internal access for overflow parent parking in the south lot for community and school events (after hours). It will be gated the remainder of the time allowing access as described above.

To facilitate safe and efficient access and egress, both driveways are proposed to be widened to include right and left turn exit lanes. To accommodate the turning radii of buses and delivery trucks, the driveway widths, measured at Rosemont Road are 95 feet. As noted above, this driveway width requires variance approval.

Pedestrians and Bicyclists

Pedestrian and bicycle access to the site will provide several safe and convenient connections with the surrounding neighborhoods. The circulation design also minimizes

square foot standard, and the wall signs will exceed the total wall sign area of 18 square feet allowed in the CDC.

Refuse and Recycling

This area will be located on the southwestern corner of the building. There will be an enclosed area for a compactor, refuse, and recycling storage. It will be screened as shown in the landscape plan (Sheets LU 2.03 and 2.05) The separation and storage or these materials will be consistent with the solid waste hauler and DEQ. The area will be screened as shown on Sheet LU2.05.

CONDITIONAL USE REVIEW CRITERIA

The relevant review criteria in the City of West Linn Community Development Code (CDC) include the Single Family Residential Detached, R-10 requirements (Chapter 11), Water Resource Area Protection (Chapter 32), Conditional Use evaluation criteria (Chapter 60), Variance Criteria (Chapter 75), Comprehensive Plan policies, and Design Review (Chapter 55). These criteria are addressed below.

Chapter 11 Single Family Residential Detached, R-10

Section 11.060 Conditional Uses

This section lists schools as a conditional use in the R-10 zone. The school building, play area, and parking are located within this zone. Schools are allowed as a conditional use in the R-10 zone.

Section 11.080 Dimensional Requirements, Conditional Uses

This section gives the Planning Commission the authority to determine the appropriate dimensional requirements to satisfy Conditional Use criteria in Chapter 60. The primary school is proposed to cover approximately 6% of the site, which satisfies the maximum building coverage standard of 35%.

The maximum floor area ratio (FAR) allowed in the R-10 zone is 0.45. Based on the site size of 16 acres, a maximum floor area of over 313,000 square feet is allowed. The proposed building floor area of 67,000 square feet is well below this maximum limit.

Chapter 32 Water Resource Area Protection

Section 32.050 Approval Criteria

This section contains a number of requirements relating to the protection of water resources.

A. This section is satisfied because the required information and evaluation is provided as part of this application.

B. This section calls for maintaining existing natural drainageways. In this case, the district proposes to minimize encroachment into the Trillium Creek corridor and

provide appropriate mitigation for these minor encroachments. The district also plans to convert an "artificial" drainage caused improper disposal of storm drainage onto this property by creating an open and defined water channel, which is appropriately constructed and landscaped to greatly enhance its current condition. The requirements of this section are satisfied because the site plan, grading, and landscaping plans are all intended to minimize any potential detrimental impacts on Trillium Creek and the associated wetland.

C. The proposed improvement to the southeastern drainage course will enhance the quality of Trillium Creek and wetlands by establishing a defined channel that is bordered by appropriate native vegetation and lined by trees to create a superior natural environment.

D. The district is willing to have the water resource areas on the site protected into the future. It will work with the city staff during final design and permitting to accomplish this.

E. This section describes how the protected water resource area setback and transition areas are determined. In this case, it is 50 feet plus a structural setback of 15 feet. This is proposed along Trillium Creek. A variance is requested to allow a 15-foot setback from the relocated eastern drainage.

F. The site plan was developed to minimize the overall potential impact upon water resources on the site. However, as shown in the application materials, some encroachment is necessary to provide access to the school. The primary (northern) driveway design features a minimal width, a sidewalk on just one side, and retaining walls at the creek crossing to minimize grading. The route was chosen to minimize tree removal, and this approach has satisfied the city arborist.

The location of the valuable resources along Trillium Creek essentially forced the the school building, related parking, and playgrounds into the southeastern portion of the property. Part of the school access, parking, and play areas need to be in the area occupied by the eastern drainageway. Because this water resource area was artificially created and has no defined channel, wetlands or trees, its relocation and improvement as described in this application is appropriate.

G. The water resource areas shall be protected, as prescribed by the city, during construction.

H. All paved surfaces shall be located a minimum of 15 feet from the edge of the water resource areas, with the exception of the crossings shown on the plan sheets. They will be constructed as required by the city.

I. All plans have been developed by experienced engineers and environmental scientists with the goal of maintaining and enhancing the water resources on the site. While the eastern drainageway alignment will be shifted to the east, it will continue to flow to Trillium Creek as it does today.

J. All erosion control measures prescribed by the city shall be followed at all times.

K. Vegetative improvements are proposed and will be provided following construction. In particular, the eastern drainageway will be enhanced to function in a more

environmentally appropriate manner than it does presently.

L. The school building will be far beyond the minimum setback distance of 15 feet.

M. Stormwater treatment facilities are not proposed to be located within the water resource areas.

N. This criterion does not apply because there are no existing piped stormwater facilities on the site.

O. This criterion does not apply because the front yard setback can be met, and a reduction is not requested.

P. This criterion is not applicable because all relevant storm drainage channels have been identified.

Section 32.070 Mitigation Plan

This section contains a number of requirements relating to the mitigation of potential adverse impacts on water resource areas.

A. This section is satisfied because the required information and alternative evaluation is provided as part of this application. The encroachments have been held to the absolute minimum, all potential adverse impacts will be mitigated, and the southeastern drainage will be greatly enhanced compared to its current condition.

B. The mitigation plan for the site is explained in the plan sheets and the supplemental materials. The work will be accomplished in accordance with city, state, and federal requirements, and appropriate assurances will be made. A copy of the Joint Permit Application is provided as part of the supporting materials.

C. Mitigation for the relocation and enhancement of the eastern drainage course is provided, and a revegetation plan, consistent with CDC 32.080, is proposed.

D. All plans for the primary school improvement have been developed by experienced professionals. The analysis of alternatives is presented in the Joint Permit Application and the Winzler & Kelly response to CDC Chapter 32 that are included with the supporting materials.

E. The district will work with the city to provide the appropriate assurances that the water resource areas will be permanently protected.

Section 32.080 Revegetation Plan Requirements

This section contains a number of requirements relating to revegetating water resource areas. These standards were followed when the landscaping and planting plans were developed for this application. The standards are addressed in the May 12, 2010 Walker Macy memorandum regarding revegetation at water resource areas that is provided as part of the supplemental materials.

Chapter 60 Conditional Uses

Section 60.070 Approval Standards and Conditions

This code section states the applicant must provide evidence substantiating that the proposed use satisfies seven criteria, which are addressed below:

A. The following criteria shall be satisfied.

1. The site size and dimensions provide:

a. Adequate area for the needs of the proposed use.

The property has been identified as a future school site for many years, and this was recently annexed in anticipation of this application. The site is appropriate because the school is able to meet the applicable criteria for such a use. The district has found that a site size of 10 to 20 acres accommodates the facilities desired by the community for primary school programs. This has proven to be adequate for a primary school with a capacity of 500 students. As shown on the site plan information, the site can be used efficiently and there is sufficient land area to support a primary school.

b. Adequate area for aesthetic design treatment to mitigate any possible adverse effect from the use on surrounding properties and uses.

As shown on the site plan information, the setback distances for buildings, parking, fields, and related facilities from all property lines will provide ample distance and screening from adjoining residential uses. As noted above, transportation facilities, noise control, landscaping, buffering, environmental protection, controlled on-site lighting, and daytime and early evening hours of operation will avoid any adverse impacts on surrounding property owners and residents.

2. The characteristics of the site are suitable for the proposed use considering size, shape, location, topography and natural features.

The district has found that a site size of 10 to 20 acres in a basically rectangular shape accommodates the facilities desired by the community for school programs. Because of the requirements for a school building and athletic fields, a perfectly flat site would be ideal. However, in West Linn, virtually all potential sites for schools have grades over 5%. As shown in the development plans, the most sensitive areas, steepest slopes, and best stands of trees have been avoided and the portion of the site proposed for development can be appropriately graded to meet the needs of the primary school.

Trillium Creek and the associated wetland and trees on the site represent the only significant natural features on the site. Care will be taken to avoid any adverse impacts to them as described in this application.

As shown on the site plan information, the site can be used efficiently and there is sufficient land area to support a primary school.

A rationale and evaluation criteria for locating schools was developed jointly by the school district, Clackamas County, and the cities of West Linn and Wilsonville. This is documented in the *West Linn-Wilsonville School District Long Range School Facilities Plan*, which was first adopted by the district in 1996 and most recently updated in 2005. This site is identified as a potential primary school site in the plan.

3. ***The granting of the proposal will provide for a facility that is consistent with the overall needs of the community.***

The needs of the community are best expressed by the community's approval of the bond measure to finance these improvements. The relevant city policies are addressed under criterion 7 below.

4. ***All required public facilities have adequate capacity to serve the proposal.***

Transportation

The report submitted by DKS Associates shows that sufficient street capacity is available, and the school will have only a minor impact on the level of service for nearby streets and intersections. All intersections studied will continue to exceed the city's LOS standards. All necessary transportation improvements for vehicular, pedestrian, and bicycle circulation will be made as part of the school construction as described herein.

Water

As described above, water service is adequate to serve the school.

Sanitary and Storm Sewer

Sanitary and storm sewer service is available as described above. An on-site storm water system will be provided to meet water quality and volume standards as described herein.

5. ***The applicable requirements of the zone are met except as modified by the Conditional Use chapter.***

The applicable requirements of the R-10 zone will be met. The building will cover much less than 35 percent of the site, and it will be well under the 0.45 FAR maximum. The lot is over the 10,000 square feet minimum. No part of the school building will be over the 35 foot allowable height. Setbacks from the building will exceed the 20 foot minimum.

6. ***The supplementary requirements set forth in Chapters 52 to 55, if applicable, are met.***

Chapter 52 - Signs

One monument sign and two building mounted wall signs with raised-letters are proposed. As noted above, a variance is requested regarding the size of the signs.

Chapter 53 - Sidewalk Use

This CDC chapter applies to commercial activities on public sidewalks. It is not applicable to this proposal.

Chapter 54 - Installation and Maintenance of Landscaping

This is addressed in the following section relating to Design Review.

Chapter 55 - Design Review

The Design Review criteria are addressed in the following section.

7. The use will comply with the applicable policies of the Comprehensive Plan.

The relevant city of West Linn policies for schools are found in the city's Comprehensive Plan. The relevant policies are addressed below.

The "Natural Environment" section contains one policy that is relevant to the request.

Specific Policy 10 (Water Quality):

Require that new development be designed and executed so as to avoid further degradation of surface and ground water quality by runoff, paying particular attention to the mitigation of soil erosion during and after the development process.

Appropriate erosion control and water quality measures will be taken to comply with this policy and related regulations. These measures will be reviewed by the city as part of the building permit process.

Specific Policy 13 (Water Quality):

Require that new development be connected to the City's sanitary sewer system.

The school will be connected to sanitary sewer.

Specific Policy 19 (Noise Control)

Ensure that new commercial, industrial, and public facility development is landscaped and designed so that DEQ noise standards are met and neighboring noise sensitive properties are not negatively impacted by the new land use or associated activities.

As covered in the acoustical engineer's report, city noise standards will be met and no adverse impacts are expected.

Specific Policy 19 (Urban Forest):

Require that land development will maintain existing trees, which exceed six inches in diameter at breast height (DBH) except where:

A roadway is being developed
A building site is being developed
Solar access is needed for a solar heating system.

Proposed tree removal is consistent with this plan policy. A driveway access was necessary, but it will be kept to a minimal width and aligned to minimize the number of trees removed. The school building and related parking was purposely located in the southern portion of the site to avoid removal of significant trees.

The "Public Facilities and Services" section contains several relevant policies.

General Policy 3 (Public Facilities and Services):

Ensure development will coincide with the provision of adequate public facilities and services. The City recognizes the following public facilities and services as those services which shall be provided coincident with development:

A. Access
B. Storm drainage
C. Water
D. Sewer services

As discussed above, these facilities are currently provided.

General Policy 5 (Public Facilities and Services):

Monitor, coordinate with, and regulate the activities of the following, where appropriate, as they affect existing and future residents and businesses.

a. Solid Waste Collection and Recycling
b. Utilities - Electricity, Natural Gas, Telephone, and Cable TV.
c. Schools.
d. Health Services.

These services are available.

General Policy 1 (Energy Conservation):

Conserve energy through the appropriate location of land uses (through zoning).

General Policy 2 (Energy Conservation):

Ensure energy efficient provision of public facilities and services.

The new school will offer the latest in energy efficiency related to both increased insulation values and modern heating and cooling equipment.

B. Development review provisions in Chapter 55 shall be satisfied.

These criteria are addressed below.

C. The Planning Commission may impose conditions.

The District understands that the Planning Commission has the authority to impose conditions.

D. Aggregate extraction uses.

This subsection is not relevant because aggregate extraction is not proposed.

Chapter 75 Variances

Variances are being sought for the following:

- A driveway width of approximately 95 feet, where the standard in CDC 48.060 B is a maximum of 36 feet;
- Allowing parking spaces that are farther than 200 feet from the building entrance;
- Providing a 15-foot drainageway setback where the CDC requires 65 feet; and
- To allow wall signs of approximately 38 and 84 square feet where the CDC requires a maximum total of 18 square feet and a monument sign of approximately 32 square feet where the maximum allowed is 24 square feet.

These variance requests must be found to comply with the criteria in CDC Chapter 75. The variance criteria are noted below followed by the findings for each of the variance requests noted in the order above.

Chapter 75 requires that a variance will only be approved if it meets six criteria:

1. *Exceptional or extraordinary circumstances apply to the property which do not apply generally to other properties in the same zone or vicinity, and result from lot size or shape, legally existing prior to the date of this ordinance, topography, or other circumstances over which the applicant has no control.*

   Driveway Width
   A school is unique in that it has relatively significant amounts of traffic for brief periods in the morning and early afternoon. In addition, school buses and delivery trucks are part of the traffic mix. As a result, the driveways have been designed to allow efficient egress from the site with right and left turn lanes, and more gradual curb radii are included to allow for bus and delivery truck turning movements. The 36-foot maximum width standard would mean existing traffic would need to use only one lane and that buses would likely have difficulty making the turns to and from the school.

   Parking Spaces
   As demonstrated by the site analysis, the challenge for this project is how to provide the school and related facilities while protecting the natural features to the maximum extent possible. This led to the need to provide 27 spaces that are beyond the 200-foot maximum distance standard. This parking could be

provided within the 200-foot limit, but only with additional cutting/filling and tree removal. In addition, parking near the sports field in the northwest corner of the site will be beneficial, especially for the public use when the school is closed.

Drainageway Setback
Similar to the parking issue above, the placement of the school was challenged by the location of the valuable natural features on the site. The drainageway, which is the subject of the setback reduction, was artificially created after a storm water outfall was constructed on the south property boundary. Compared to the natural habitat and wetland value of the Trillium Creek area on the west and northern portions of the site, this area is obviously of lesser value. If the 65-foot setback is met, it would mean shifting the school into the Trillium Creek corridor, causing unnecessary environmental harm.

Signs
The wall sign size requirements appear to contemplate only displaying the address. The school is a somewhat unique use in residential zones that requires additional sign area to display the school name. This need does not generally apply to other properties and uses in residential zones.

Although the school would be entitled to two freestanding signs, it only needs one to identify the access driveway for the general public. Because of its location along Rosemont Road, a slightly large size is requested to allow sufficient visibility.

2. *The variance is necessary for the preservation of a property right of the applicant, which is substantially the same as a right possessed by owners of other property in the same zone or vicinity.*

Driveway Width
Commercial and public driveways with two exit lanes are relatively common and appropriate to prevent internal traffic circulation issues on site.

Parking Spaces
Under most circumstances, the 200-foot distance standard is achievable. However, for uses that have significant parking requirements, it can become difficult to satisfy. Requesting this variance is consistent with what other property owners could do when faced with the need to provide extensive parking and protect environmentally valuable resources.

Drainageway Setback
If properly designed as the outset, the storm water outfall would have included a method for conveying the storm water to Trillium Creek. The district will essentially do this now. Creating a defined channel with native plantings will actually correct an existing storm and water quality problem.

Signs
Like many public and non-residential uses, schools have a need to properly identify their location. The proposed wall signs will be very tastefully designed and will have a very understated appearance that is consistent with signs allowed for other similar uses.

The district currently has the ability to have two freestanding signs with a total area of 48 square feet. The district only requests one sign, which will have less total sign area compared to what the CDC allows.

3. *The authorization of the variance will not be materially detrimental to the purposes and standards of this Code, will not be inconsistent with all other regulatory requirements, and will not conflict with the goals and policies of the West Linn Comprehensive Plan.*

Driveway Width
The enlarged driveway width is consistent with all other aspects of the CDC and the Comprehensive Plan. The driveways are appropriately located, and the design will minimize congestion of existing vehicles as well as accommodate the buses.

Parking Spaces
The school proposal is compliant with all other parking requirements in the CDC. Although people will potentially have to walk a little farther to reach the school, the 27 spaces in question are ideally placed for use of the sports field.

Drainageway Setback
As mentioned above, all other requirements in the CDC will be met. More important, the variance will allow a higher degree of protection of the more important resource on the property – Trillium Creek.

Signs
The purpose of the sign regulations is to ensure that signs are sufficient to identify different land uses in a tasteful way that is not visually obtrusive. While the wall signs are proposed to be larger than allowed, they will be complimentary to the school's design and the surrounding neighborhood.

As noted above the proposed monument sign will feature less sign area than what would be allowed in the CDC.

4. *The variance request is the minimum variance, which would alleviate the exceptional and extraordinary circumstance.*

Driveway Width
To successfully accommodate existing traffic and bus turning, the proposed width is necessary. It is important to note that the driveway widths on the remainder of the site are consistent with CDC dimension standards.

Parking Spaces
This is the minimum deviation possible. The design does maximize the amount of parking adjacent to the building. Given the site constraints, it simply isn't practical or desirable to place the remaining 27 spaces near the building.

Drainageway Setback
As mentioned above, this setback variance is largely the result of a trade-off between two resource areas. Something had to give. The setback reduction allows the maximum protection of the more valuable Trillium Creek area, but with the proposed new channel and plantings, the eastern drainageway will function

better than it does today as a water quality amenity.

Signs
Because of the setback of the school and distance from site entrances, larger wall signs are needed to properly identify the school. The name of the school has not been determined, and the district will try to reduce the sign size from what is requested.

Having one sign, rather than two, with less total area than what is allowed by the CDC meets this criterion.

5. *The exceptional and extraordinary circumstance does not arise from the violation of this ordinance.*

None of the four variance requests are the result of a violation of the CDC.

6. *The variance will not impose physical limitations on other properties or uses in the area, and will not impose physical limitations on future use of neighboring vacant or underdeveloped properties as authorized by the underlying zoning classification.*

Driveway Width
The additional width at the driveway entrances will not adversely affect other parties along Rosemont Road. Sufficient spacing is available and appropriate traffic circulation, both on-site and off-site will be maintained.

Parking Spaces
The distance between the parking spaces and building entrance do not affect other properties. They will still be more conveniently located compared to on-street parking in adjoining neighborhoods, so people will not be inclined to park off-site to the detriment of the neighbors.

Drainageway Setback
If anything, the creation of a drainage channel and appropriately dealing with upstream storm water mitigates a physical limitation that was imposed on this property. This setback variance does not affect other properties or limit the future use of their properties.

Signs
The wall signs will simply provide proper identification, and they will not adversely affect adjoining properties due to lighting or other visual impacts.

Having one sign with less total area than allowed by the CDC will have less potential impact on surrounding properties.

Chapter 99 Procedures for Decision-Making: Quasi-Judicial

This chapter requires that the neighborhood is contacted and the proposed development discussed with any affected neighborhood for conditional use permits. In addition to the required neighborhood meeting, the district held several neighborhood meetings to inform the community about the new school and to solicit input. A packet of all the public involvement and information events is included with this application.

DESIGN REVIEW CRITERIA

The Conditional Use requirements include compliance with Chapter 55 Design Review. Section 55.100 contains the applicable approval standards for a Class II Design Review, which are addressed below.

A. The provisions of the following chapters shall be met:

1. Chapter 33 - Storm Water Quality and Detention

Section 33.040 requires storm water quality and detention facilities to be designed in accordance with City of West Linn Public Works Design Standards. These facilities will be provided as shown on the utility plans and described above.

Section 33.060 requires access for maintenance to facilities. All of the proposed facilities will be located within close proximity to driveways for vehicle access.

7. Chapter 46, Off-Street Parking and Loading

Section 46.090 B. 6. requires "one space for every employee, plus 1 space for each 1,000 square feet of floor area." With a floor area of 67,000 square feet and 50 staff members, a minimum of 117 vehicle spaces are required. This standard is satisfied as shown on the site plan.

Section 46.120 requires a 15-foot wide drive for loading and unloading passengers. This standard is satisfied as shown on the site plan.

Section 46.130 requires one loading space for the school (10,000 - 100,000 sq. ft.). Sufficient loading space is proposed on the south side of the building.

Section 46.140 contains the design standards for parking areas. The proposed parking facilities are designed in a manner that satisfies the design and dimensional standards of this section.

Section 46.150 A. contains a variety of standards pertaining to parking lot design, pavement, pedestrian access, handicapped parking, and grades. The proposed parking facilities are designed in a manner that satisfies the design and dimensional standards of this section.

Section 46.150 B. contains standards for handicapped parking, including 5 handicapped parking spaces for the 117 required parking spaces. This standard is satisfied because 5 handicapped parking spaces are proposed.

10. Chapter 54, Landscaping

Section 54.020 A. is satisfied because all trees on the site were inventoried along with the wetland areas on the site.

Section 54.020 B. is not relevant because although the district will avoid removal of significant trees, it does not want to reduce the proposed parking.

Section 54.020 C. is satisfied because the district will comply with all city tree protection requirements.

Section 54.020 D. is not relevant because there are no heritage trees on the site.

Section 54.020 E. is satisfied because well over 20% of the site will either be landscaped or left in its natural condition; sufficient landscaping is provided around the three parking lots; landscaping around parking areas meets the prescribed dimensional and buffering requirements; street trees are proposed; outdoor storage areas are proposed to be screened; safety will be provided b the open nature of the site and landscaping plan; and irrigation will be provided.

Section 54.020 F. is not relevant because this is not a subdivision.

B. Relationship to the Natural and Physical Environment

Section 55.100 B. 1. and 2. are not relevant because there are no heritage trees on the site. The city arborist visited the site and determined that no significant or heritage trees would be affected by the proposal. .

Section 55.100 B. 3. is satisfied because the school and related improvements are proposed on the southern and western portions of the site to avoid the sensitive lands, steeper slopes, and trees associated with Trillium Creek.

Section 55.100 B. 4. is satisfied because the property is geologically stable.

Section 55.100 B. 5. is satisfied because the school building will provide significant setbacks from surrounding properties. The school building is well separated and buffered from surrounding properties. It is the closest to residential properties to the south. Here, the building setback is approximately 100 feet. A landscaped buffer and fencing is provided along the southern property boundary. In addition, the parking lot and school will be significantly lower than the residences to the south, further reducing potential visual, noise, and lighting impacts.

Section 55.100 B. 6. is met based on the findings below:

a. The school is designed be a student centered place, where students connect with and learn about their built and natural environment. The building is oriented so that most of the classrooms face the woods. Primary colored student sized learning places project into the landscape from each classroom. Rainwater is celebrated in vertical runnels that lead to a cistern or storm water planters. The library is the center of research and inquiry of the school, with tall clerestory windows for daylight, view of the wetlands, and passive ventilation.

b/c. The proposed design is compatible with the natural environment because only a minimum amount of area will be used for the school and related improvements. The proposed two-story school will be complementary to the one- and two-story residences on the adjoining by incorporating a pleasing blend of contemporary architecture and exterior finish materials. Where the setback is the smallest on the south side (100± feet), the elevation of the school varies to create visual interest. The ground floor of the school is approximately 10 to 15 feet lower

than adjacent properties to the south. This, along with the proposed fencing and landscape screening, will ensure a compatible outcome.

d. The site size and the school location are sufficient to displace any contrasting architectural styles in the surrounding area.

e. The human scale of the proposed building is represented in the design approach, which features welcoming and distinctive entry and activity areas.

f. The criterion related to windows applies only to commercial and office buildings, not school structures.

g. The windows are in different planes from lower to upper windows to provide visual interest.

h. Climatic concerns are considered in the proposed building designs due to the public use associated with school buildings. The new school will meet all current energy efficiency standards. The district is striving to achieve a LEED certification for the building.

i. The proposed site plan is consistent with the city of West Linn's vision statement to provide safe and attractive pedestrian-friendly site and building environments. The design of the school and its accessible location will improve the current pedestrian-friendly character of the neighborhood by providing new walking and bicycling routes through the site.

Section 55.100 B. 7. relates to Transportation Planning Rule compliance. The provisions of this section are either satisfied or not relevant as described below:

a-c. These subsections are not relevant to this application because it is not a commercial, office, or multi-family residential project.

d/e. Subsections d and e call for safe and convenient pedestrian circulation within parking lots and throughout the site. This circulation system is proposed as shown on the site plan. It is intended to provide excellent connections to the surrounding neighborhoods and to minimize the need to drive to and from the school.

f. This encourages placing buildings as close to the main access street as possible. Because of the location of sensitive lands on the site and an intervening property along Rosemont Road, the school could not be located closer to Rosemont Road.

g. This subsection is not relevant because transit service is not provided in the vicinity, and none is planned.

h. This subsection is not relevant because it is intended to apply adjacent to a main street, such as in the Willamette neighborhood, not along Rosemont Road.

i/j. These subsections are not relevant because the school is not a fire station, etc. and trailhead parking is not proposed.

C. Compatibility Between Adjoining Uses, Buffering and Screening

The provisions of this section are satisfied as described below:

1. The school is located very significant distances from all surrounding properties. Where it is the closest on the south side, excellent buffering is proposed with the lower elevation of the school and parking lot, retaining wall and fence, and landscape buffering along the property boundary.
2. The service area on the southwest side of the building will have screening immediately surrounding it. Plus it will benefit from the perimeter screening mentioned above.
3. The rooftop HVAC systems have been evaluated for potential noise. The visual/noise screens proposed on the roof, these units will not be visible and will generate minimal noise for surrounding residents.

D. Privacy and Noise

The provisions of this section are either satisfied or not relevant as described below:

1/2. These subsections are not relevant because they apply to residential buildings.
3. The potential impacts of noise and on-site lighting were evaluated as described in the application materials. With the noise mitigation and lighting design measures described herein, the school will not create any privacy or noise impacts for the neighbors.

E. Private Outdoor Area

The provisions of this section are not relevant because they apply only to multi-family projects.

F. Shared Outdoor Recreation Area

The provisions of this section are not relevant because they apply only to multi-family projects.

G. Demarcation of Public, Semi-Public and Private Spaces

The controlled access points to the school, the design and location of the outdoor public/play areas are all designed to ensure the safety and security of the students. As shown on the site and landscaping plans, this includes clear demarcation of the outdoor areas intended for school functions.

H. Public Transit

This section is not relevant because no public transit is provided or planned in the vicinity.

I. Public Facilities

The provisions of this section are satisfied as described below:

1. Street and pedestrian/bicycle circulation system improvements, consistent with

the City Engineer and DKS *New West Linn Primary School Transportation Impact Study* recommendations will be made as noted in this application.

2. Service areas and parking will be screened according to CDC standards as described in the application.
3. As noted above the rooftop HVAC system will be screened to minimize visual and noise impacts to surrounding neighbors.

J. Crime Prevention and Safety/Defensible Space

The site and building have been designed to create visible, well lit, and open public areas. The building plan also includes windows and/or entrances to every direction, increasing natural surveillance of the entire site.

K. Provisions for Persons with Disabilities

City code criteria and ADA requirements will be satisfied during the final building and facility design for the addition and remodeling work.

L. Signs

The two proposed monument signs at each driveway entrance and the wall signs will clearly identify the school. Other traffic control and wayfinding signs will be used on the site as appropriate.

M. Utilities

As described above, utility services are available for the school and will be provided.

N. Wireless Communication Facilities

This section is not relevant because no facilities are planned.

O. Refuse and Recycling Standards

As illustrated in the application plans the recycling and refuse area will be located, designed, and screened as required by the CDC. Necessary approval from the waste hauler and other agencies will be obtained as necessary.

CONCLUSION

The proposed school satisfies all of the relevant criteria as demonstrated above.

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Specifications	Standard Unit	Extreme Winds Unit
Annual Energy Production (AEP)	2000 kWh* at 11.2 mph | 5 m/s avg wind	2000 kWh* at 12.5 mph | 5.7 m/s avg wind
Rated Power	1.2 kW at 24 mph | 10.7 m/s wind	1.2 kW at 26.8 mph | 12 m/s wind
Unit Height	30 ft | 9.1 m (pole extension options)	23 ft | 7.1 m (pole extension options)
Sound Measurement	6 dB above ambient (15 mph wind, 6 ft from base)	6 dB above ambient (15 mph wind, 6 ft from base)
Total Weight	624 lb | 283 kg	567 lb | 257 kg
Min. Wind Required for Power	8.5 mph | 3.8 m/s	8.5 mph | 3.8 m/s
Survival Wind Speed	105 mph | 47 m/s	160 mph | 71.5 m/s
Monopole/Structure Material	Recycled High-Grade Steel	Recycled High-Grade Steel
Standard Warranty	5 years	5 years

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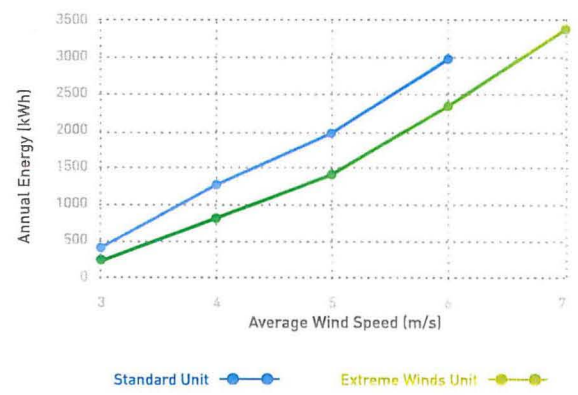

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Date: 5-12-10

MEMORANDUM

Project No.: 1080-09001 Project Name: WLWSD PRIMARY SCHOOL LU APP

To: Peter Spir, Planner, City of West Linn

From: Nancy Olmsted, Sr. Scientist, Winzler & Kelly

Copies To: K. Ruiz, DOWA

Subject: Response to CDC Chapter 32

The proposed new primary school involves building a new primary school, play areas, two access roads from Rosemont Road, parking areas, stormwater planters and bioswales and landscaping. The two new access roads from Rosemont Road will be the only public vehicular access into the site. The 20-acre site is configured such that access roads necessitated the encroachment of a water resource area, defined as Trillium Creek, Riparian zone around the creek, a small portion of the locally significant wetland as identified on the City of West Linn's Local Wetland Inventory and the drainage ditch in the eastern portion of the project site.

Alternatives Analysis

An extensive alternatives analysis examined 7 different site configurations that would provide for the bus and car access functions and would contain the school facility. There were no alternatives that completely avoided all water resource areas (WRA) because of operational and safety constraints; however the alternative that was selected had the least encroachment on the WRA. The minimal impacts of the Trillium Creek and riparian area are approximated by:

- Wetland fill due to access roads, including rock and pavement - 1,480 cy; 0.22 ac
- Wetland removal due to topsoil stripping for access roads - 176 cy; 0.22 ac

Water Resource Area (North and West)

All impacts to the WRA in the north and west portion of the site will occur during grading and construction of the access roads. Temporary disturbance during construction only affects 200 sq. ft. of wetland, and the topsoil that is initially stripped from the site will be used in final landscaping and bioswale areas (excess soil will be disposed of off-site).

Permanent impacts will be incurred along the southern access road, where 0.15 ac will be filled with 830 cy of rock. The northern access road will be filled only partially (0.07 ac) with 650 cy of rock, leaving the main wetland flow path open (0.005 ac temporary impact); a pre-cast open-bottom culvert and vertical retaining wall will be placed over the wetland, with 4-6' of the wetland left open under the culvert.

Fill materials for the two access roads will consist of base rock (up to 3/4" aggregate) and structural fill (unconsolidated crushed rock up to 3" diameter and possibly mixed with native soil). Asphalt will be the top layer of the access roads. A cement 4-6' open-bottom culvert will be placed into/over the wetland. Removal material are loam and silt loam topsoil determined from sample plots.

In addition, part of the school curriculum is expected to include environmental stewardship in the form of on-going habitat restoration—removing the blackberry and ivy and planting native vegetation, which is expected to improve habitat beyond existing conditions.

Construction Methods, Equipment and Site Access

Construction access into the site will initially be along the existing southestern grass access road, Bay Meadows drive, Suncrest Drive and the new proposed northern access road. Construction will begin with earth-moving equipment stripping the top 6" of soil off the school building site, parking lots and access roads and mounding it in one or several upland locations on-site, to be used later for bioswales and landscaping needs. Rough-grading via earth movers will down-cut the upslope (southern) portion of the school building area and push soil around to level the area as well as rough-grading the access roads. Any excess soil will be trucked out. Trenching for utilities will occur under the southern access road.

A pre-cast open-bottom culvert (4-6' opening) will be used for the northern wetland crossing and a more typical 12" culvert will be placed under the southern access road. Base rock (unconsolidated aggregate up to ¾") will then be laid along the access roads, building sites and parking lots. The school buildings will be built. Both access roads will be built-up with structural fill (3:1 slope shoulders) consisting of unconsolidated crushed rock up to 3" and possibly mixed with some native soil. The access road over the northern wetland crossing (open-bottom culvert) will be built up with a vertical retaining wall. Rock fill will come from a local quarry. Asphalting the access roads and parking lots, and final landscaping will conclude construction of the site.

The Hidden Springs Ranch Recreation Association (HSRRA), which owns the adjacent southeastern property (tax lot 5500) with tennis and basketball court, will be allowing an easement on their property for the West Linn Wilsonville School District and will allow the southern access road to cross the corner of their property. Easement agreements are pending, and a recent confirmation letter from the Association is attached.

The current source of hydrology into the wetland largely originates from a 12" cement outfall pipe and at least two 4" outfall pipes that discharge stormwater from the adjacent subdivision, as well as some runoff from Rosemont Rd. The storm outfall pipes discharge onto the site at the south-southwest corner and flows north as it begins to spread and sheet flow with seep discharges through the site for about 750' where it then turns east, narrows and ultimately channelizes as Trillium creek and continues off-site.

Hydrology is not expected to be significantly altered at either of the two access roads. The southern access road will cross the top of the wetland where the existing storm outfall pipe discharges into the wetland. Stormwater from this outfall pipe will immediately continue through a culvert to discharge into the wetland. The northern access road is an unavoidable impact that bisects the wetland, and the open-bottom culvert will constrict any surface flows to 4-6' at this location. This location was chosen to put the road, in part, because it is one of the narrowest portions of the wetland, and the arching, open-bottom culvert was selected to provide the largest allowable opening that still maintains structural integrity at reasonable cost.

The upland portions of the site will be cut, leveled and built upon creating impervious surfaces that can decrease groundwater recharge and increase flashy runoff. To minimize these impacts, several long bioswales (using City of Portland schematics) will collect runoff from the parking areas; roof downspouts will discharge into stormwater planters. Any overflow events will enter an underground detention pipe before discharging into the wetland. At the southeastern corner of the site, an existing storm outfall pipe that discharges onto the property will be conveyed through a meandering bioswale along the eastern edge of the site where it will link to an existing storm intake pipe immediately off-site.

Water Resource Area (East running North to South)

This WRA is characterized by high groundwater flowing through the lowest parts of the concave swale. A 12" outfall pipe discharges stormwater immediately above the WRA and an inlet pipe is located immediately below the area. The very slight concave topography runs through the area, essentially between the two storm pipes. The inner core of the area is dominated by a mix of Oregon crabapple (*Malus fusca*), Hawthorn (*Crataegus spp.*), Nootka rose (*Rosa nutkana*), trailing blackberry (*Rubus ursinus*) and Himalayan blackberry (*Rubus discolor*). Shallow surface water was observed in wheel ruts after a solid 24 hour of precipitation, but it drained within 10 – 12 hours. Groundwater flows through the area, likely perched on a shallow restrictive layer and the water table is deeper than 12 inches from the surface.

Although the mapped feature and buffers were shown on the planning documents, this WRA has no defined channel nor any riparian characteristics. Encroachment was necessary to have contiguous facilities for the safety of the students and for functional capacity of the proposed project. Drainage will be maintained by the creation of a more defined water feature that would be located just east of the "mapped line" on the City's water resource map. The proposed feature will maintain drainage, create a stream corridor and natural vegetated corridor, allow infiltration and natural water purification and should not contribute to sedimentation to the storm drain that it would discharge to in the northern property boundary.

WALKER·MACY

Landscape Architecture Urban Design Planning

MEMORANDUM

To: City of West Linn Planning Department

From: Mike Zilis

Cc: Karina Ruiz, DOWA

Date: May 12, 2010

RE: New West Linn Primary School – Revegetation at water resource areas

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The following is a summary of the proposed revegetation strategy at the New West Linn Primary School in relation to CDC Section 32.080.

The larger water resource area on the site is a forested portion made up of Trillium Creek and its associated wetlands. Mitigation for permanent impacts in this area has been designed to meet the requirements of the Department of State Lands, and is set forth in the Wetland Delineation and Mitigation Report. The revegetation in this area will occur in three wetland enhancement mitigation areas. Revegetation will also occur along the roadways to repair all construction related disturbance. This revegetation will be carried out in accordance with CDC Section 32.080, as follows:

- Revegetated areas will be planted with species from the Metro native plant list, and will receive temporary irrigation from June 15 through October 15 for three years following planting.
- All invasive non-native and noxious vegetation will be removed prior to planting.
- Replacement trees will be at least one-half inch caliper.
- Trees will be planted from 8 and 12 feet on-center. Shrubs will be planted between 4 and 5 feet on-center, clustered in single species groups of no more than 4 plants.
- Shrubs will consist of at least two different species, and where 10 or more trees are planted, no more than 50% of the trees will be of the same species.
- The School District will provide documentation that 80 percent survival of plants has been achieved after three years, and will provide annual reports to the Planning Director on the status of the revegetation plan during the three year period.
- The wetland mitigation areas will also be planted with a variety of native herbs, rushes and sedges to provide an understory beneath the shrubs.

The second, smaller water resource area is a grassy drainage at the southeast corner of the site. Revegetation in this drainage, as well as mitigation for the permanent impacts discussed below, is shown on the proposed planting and irrigation plan.

In the drainage area the plans for revegetation are as follows:

- Prior to planting, all invasive non-native and noxious vegetation will be removed.
- One third to one half of the water resource area will be revegetated as a native meadow. The meadow will be seeded with a mixture of native grasses and wildflowers.
- The remaining portions of the Water resource area will be planted in native shrubs and trees, following all the provisions described above for the larger Water resource area.
- The outer edges of this Water resource area will be part of the required buffer planting at the property line. The shrubs and trees in this buffer planting will meet the same standards that have been described for the rest of the revegetation areas. Plant sizes and densities will be increased as necessary to meet buffering requirements.

The setback for this drainage area has been reduced to 15 feet under the provisions of CDC 32.090. As mitigation, an equal area on the property will be revegetated to meet the standards of CDC 32.050. This revegetation will occur in the existing Douglas fir forest to the north of the proposed school building.

- The understory of this forest is currently dominated by Himalayan blackberry, English ivy, and holly. These species will be removed, and replaced with native shrubs under the tree canopy, and native meadow in the openings.
- All shrub plantings will meet the requirements of CDC 32.080, as described above.
- The difference between the extent of the water resource area with a 50 foot setback, and what will be achieved with a 15 foot setback, is 28,000 SF. The area proposed to be revegetated north of the proposed school building is approximately 60,000 SF, more than accounting for the required mitigation.

April 30, 2010

Dull Olson Weekes Architects
319 S.W. Washington St., Suite 200
Portland, OR 97204

Attention: Mr. Norm Dull

Re: West Linn-Wilsonville School District
Erickson Elementary School, Site Noise Review Project 09119

Dear Mr. Dull:

This letter is written, at your request, in review of potential noise levels that might be expected to be generated in conjunction with the referenced project. This review was undertaken in support of the Conditional Use Permit application for the proposed project.

1. Introduction

1.1 The proposed project is an Elementary School for the West Linn-Wilsonville School District. It is to be located on the East side of Rosemont Road between Hidden Springs Road and Bay Meadows Drive in West Linn, Oregon. The project site is zoned Future Urban and the general land use surrounding the project site is Residential.

2. Sound Descriptors

2.1 Human response to sound is a function of the magnitude of a sound, the frequency spectrum of the sound (the pitch of the sound), the duration of the sound and the time when it occurs. It is difficult to describe a sound with a single number because of all these parameters that influence human response.

2.2 The A-weighting function, used in most sound measuring instruments adjusts the indicated overall sound pressure level in much the same manner that the human ear responds to sound at different frequencies. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound with some indication as to the human response to that sound.

2.3 The A-weighted sound level alone is not sufficient to describe the noise environment at any given location because environmental sound levels tend to constantly change with time. Therefore, an environmental noise descriptor needs to address the length of time sound is present as well as the level of the sound. One environmental noise descriptor used widely throughout the United States is the "Statistical Sound Level". The statistical sound level is generally given in terms of "the level exceeded a percentage of time during a specified time period, and is read "L_{xx}". For example, the L_{50} would be that level exceeded 50% of the time during a specified time period. Usually, the specified time period is one hour in most regulations and standards.

2.4 Another noise descriptor which addresses time duration of sound is the L_{EQ} which is the energy-equivalent, average sound pressure level for a given time period.

2.5 Subjectively, an increase in sound level of 1 dBA would be judged insignificant, an increase of 3 dBA would be perceptible by most people, and an increase of 10 dBA would generally be judged as twice as loud.

3. West Linn Noise Regulations

3.1 The City of West Linn Noise Code in Chapter 55 of the Community Development Code is defined in terms of statistical noise levels L_{01}, L_{10} and L_{50}. The regulations state that a commercial/industrial source shall not exceed the following maximum allowable statistical noise levels in any one hour during the hours of:

7:00 AM - 10:00 PM	10:00 PM - 7:00 AM
L_{50} - 55 dBA	L_{50} - 50 dBA
L_{10} - 60 dBA	L_{10} - 55 dBA
L_{01} - 75 dBA	L_{01} - 60 dBA

Where L_{50}, L_{10}, and L_{01}, means the level equaled or exceeded 50%, 10%, and 1% of an hour respectively.

3.2 Further, the regulation requires that, on a previously unused commercial/industrial site, site related noise levels, either directly generated or indirectly caused by that site shall not increase the existing ambient statistical noise levels L_{10} or L_{50}, by more than 5 dBA in any one hour. Indirectly caused noise includes that from site-related traffic even when off site.

3.3 Based on the above, four general noise sources were reviewed relative to the Conditional Use Permit application; 1) Off-Site Traffic, 2) On-Site Traffic, 3) Playground Noise, and 4) Site Associated Equipment.