Organization of Data in this Appendix	
Table	**Description**
E-1	WQv Calculation for terraced parking DSW Sizing Calculations; pretreatment, treatment QP for offline treatment diversion
E-2	Forebay FB1 CN and WQv Calculation
E-3	Surface Sand Filter Calculations (FB1 Contribution)
E-4	Forebay FB2 CN and WQv Calculation
E-5	Surface Sand Filter Calculations (FB2 Contribution)
E-6	WQv Calculations for BIORET1
E-7	Bioretention Filter Calculations (BIORET1)
E-8	WQv Calculations for BIORET2
E-9	Bioretention Filter Calculations (BIORET2)

EAST PARKING AREA

Table E-1 Belleayre UMP/DEIS Stormwater Management System Calculations

Location: Proposed East Parking Lot
Post-Development Conditions

Composite Curve Number and WQv Calcs

rev: 2/26/2010
Location: East Parking Tiers

Subcatchments to Tiered DSWs and DDPs

					Percent Cover			Area Cover					
	Sub-Basin	Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Grassed Area CN=74	Pavement/Gravel Parking/Roofs CN=98	Wooded CN=70	Grassed Area CN=74 (sf)	Parking/Roofs CN=98 (sf)	Wooded CN=70 (sf)	Weighted CN	WQv acre ft	WQv cf
PND1													
	P1	48363	0.001735	1.1	68	28	4	32952	13497	1914	81	0.036324062	1582
	P2	59013	0.002117	1.4	61	33	6	36033	19663	3317	82	0.050927388	2218
	Total to Pond PND1:	**107,376**							**33,160**				**3,800**
PND2													
	2P1	39174	0.001405	0.9	47	47	6	18585	18355	2234	85	0.04608221	2007
	2P2	46546	0.001670	1.1	51	31	19	23522	14269	8755	81	0.038084872	1659
	Total to Pond PND2:	**85,720**							**32,624**				**3,666**
PND3													
	3P1	17942	0.000644	0.4	62	33	5	11171	5837	934	82	0.015483693	674
	3P2	26981	0.000968	0.6	52	35	12	14118	9552	3311	81	0.02449205	1067
	Total to Pond PND3:	**44,923**							**15,389**				**1,741**
Other East Parking Subcats													
	SCV2.7	66502	0.002385	1.5	32	13	55	21285	8511	36706	75	0.033077977	1441
	SRSWL1	35958	0.001290	0.8	62	9	30	22121	3063	10774	76	0.017885445	779
	SCBB1	39299	0.001410	0.9	57	16	27	22499	6215	10585	77	0.019547253	851
	SCV2.8	136527	0.004897	3.1	24	15	61	32219	20865	83443	75	0.067908287	2958

PND1 % Impervious: 31
PND2 % Impervious: 38
PND3 % Impervious: 34

using P= 1.3 in

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Table E-1 Belleayre UMP/DEIS Stormwater Management System Calculations

Location: Proposed East Parking Lot
Post-Development Conditions

DSW Sizing

rev: 2/26/10
Location: East Parking Tiers

		Parking Area Filter Strip Pretreatment (FSP)					DSW Pretreatment @10% volume			DSW Treatment (Selections are in Bold)			
Practice	Sub-Basin	Gross L, Parking (ft)	L, DSW along lot (ft)	Minimum L, DSW extension (ft)	A, Parking to FSP (sf)	WQv from parking (cf)	WQv from all but parking (cf)	V, DSW pretreat 10% WQv (cf)	L, reqd pretreat @7.5 cf/lf (ft)	L, avail for 100% WQv (ft)	L,reqd 5' floor treatment @7.5 cf/lf (ft)	L,reqd 6.5' floor treatment @8.83 cf/lf (ft)	L,reqd 8' floor treatment @10.125 cf/lf (ft)
PND1													
1P	P1	190	155	33	**9370**	964	618	61.8	8	180	n/a	**179.2**	156.2
2P	P2	255	220	12	**12750**	1312	906	90.6	12	220	n/a	n/a	**219.1**
PND2													
3P	2P1	295	260	14	**14830**	1526	481	48.1	6	268	**267.6**	227.3	198.2
4P	2P2	175	140	34	**8590**	884	775	77.5	10	164	n/a	n/a	**163.9**
PND3													
5P	3P1	105	70	22	**4950**	509	165	16.5	2	90	**89.9**	76.3	66.6
6P	3P2	140	105	6	**6770**	697	370	37	5	106	n/a	n/a	**105.4**

Table E-2 Belleayre UMP/DEIS Stormwater Management System Calculations Table

Location: **Proposed East Parking**
Post-Development Conditions
Composite Curve Number and WQv Calculations for Surface Sand Filter

Location: FB1 Pretreatment to sand filter
print: 2/26/2010
rev: 02/26/2010

Subcatchments to Pond DDP4 - Forebay FB1 to Surface Sand Filter

Sub-Basin	Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Percent Cover: Grassed Area CN=74	Percent Cover: Pavement/Gravel Parking/Roofs CN=98	Percent Cover: Wooded CN=70	Weighted CN	WQv acre ft	WQv cf	Area Cover: Grassed Area CN=74 (sf)	Area Cover: Parking/Roofs CN=98 (sf)	Area Cover: Wooded CN=70 (sf)
SCVS1	24269	0.000871	0.6	53	11	36	75	0.012071358	526	12800	2617	8852
SCVS2	6515	0.000234	0.1	60	40	0	84	0.006643126	289	3878	2637	0
SDV1	31277	0.001122	0.7	66	24	10	79	0.020690975	901	20651	7430	3196
Total to Forebay FB1 :	**62,061**								**1,716**		**12,684**	

FB1% Impervious: **20**

using P= 1.3

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Table E-3 Surface Sand Filter - Design Calculations Summary

Proposed East Parking **Location: FB1 Pretreatment to sand filter**

print: 2/26/2010

rev: 02/26/2010

Forebay/Pretreatment Area Sizing and Volume

Value	Units	Variable, Description…
1716	cf	WQv treated in this pretreatment area (from Table E-2)
Y	Y or N	Is imperviousness less or equal to 75%
113.256	sf	Apt, Surface area of pretreatment basin needed (considered at sideslope mid-height MD Appendix C.2)
3	1:X, rise to run	Proposed Sideslope in Forebay area
2	ft	Df, Proposed Forebay Depth
6		Wf, Proposed Forebay Floor Width
9		Lfb, Calculated Forebay Floor Length
180	sf	Apt, Surface area of pretreatment basin provided at midheight
OK	check if > needed	
432	cf	V Forebay provided
429	cf	Min Pretreatment Volume, at 25% WQv treated in this area
686	cf	Min Pretreatment Volume, at 40% WQv treated in this area

From ACAD, V= 451 CF
From ACAD, use A= 190 SF at midheight EL=1905

Sand Filter Surface Area Calculation - Partial, for flow entering through FB1

1716	cf	WQv from above
4	ft	D, Max Height of Water above filter bed, used for average height calc
1.5	ft	df, Filter Bed Depth
3.5	ft/day	k, Coefficient of Permeability for Filter Media (Sand=3.5 ft/day)
2	ft	hf, Average Height of Water above filter bed
1.67	days	tf, Design Filter bed drain time
126	sf	Asf, Filter Bed Area needed, per NYSSMDM 6.4.4 (This will be added to FB2 area calculated)

From ACAD, use A= 178 SF at EL=1902

Sand Filter Storage Volume Calculation - Partial, for flow entering through FB1

3	1:X, rise to run	Proposed Sideslope in treatment area
27	ft	Proposed Length Lf
6	ft	Proposed Width Wf
3384	cf	Vf, Volume in filter area provided in a rectangular bed as described above

From ACAD, V= 3232 CF Available in filter bed that is uniquely shaped, not rectangular

1287	cf	Minimum Vol that must be held in combined pretreat and filter areas,75% WQv
432	cf	Forebay Volume From Above
855	cf	V sandfilter needed

WQv Calculation using Unified Stormwater Sizing (follows table E-2)

Given:	62061	sf	A, site area
	1.425	acres	A
	0.002226563	sm	A
	20.4379562	%	I, Impervious Cover
	1.3	in	P, 90% Rainfall Event Number (see figure 4.1 NYSSMDM)
Find:	0.039000	acre-ft	WQv, Water Quality Volume
	1,716	cubic ft	WQv
	29	ft	X*Y Dimensions of a hypothetical 2-ft deep containment area
As Follows:	0.233941606		Rv, = 0.05+0.009(I), minimum equals 0.2

Qp=WQv, Peak Flow Calculation from NYSSMDM Appendix B

Find:	**0.609**	cfs	Qp, Peak Discharge associated with Water Quality Volume (Per NYSSMDM App B, pg B-3) obtain during Q10 event Hydrocad
As Follows:	0.304124088	watershed in.	Qa=P x Rv= WQv in watershed inches
	84		CN
	0.381	in	Ia= (200/CN) -2
	0.293		Ia/P
	6	min	Tc, from TR55 Methods
	900	csm/in	qu (from scanned table TR55 Exhibit 4-II (Type II))

D, Vertical Low Flow Orifice Diameter Needed for WQv flow diversion to practice, starting size

			Use Q10 in stormwater to calc actual size needed.
Find:	**4.1**	in	D, Orifice Diameter needed with driving head below (vertical orifice equation)
	0.09	sf	A, Orifice Area needed
As Follows:			Using the Equation: Qp=cA*(2gh)^0.5
			Where:
	0.6		c is the orifice coefficient, typically 0.6
	2	ft	h is the driving head acting on the orifice, assume a value

Table E-4 Belleayre UMP/DEIS Stormwater Management System Calculations Table

Location: **Proposed East Parking Lot**
Post-Development Conditions
Composite Curve Number and WQv Calcs

Location: FB2 Pretreatment to sand filter
printed: 2/26/2010
rev: 02/26/2010

Subcatchments to Pond DDP4 - Forebay FB2 to Surface Sand Filter

				Percent Cover						Area Cover		
Sub-Basin	Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Grassed Area CN=74	Pavement/Gravel Parking/Roofs CN=98	Wooded CN=70	Weighted CN	WQv acre ft	WQv cf	Grassed Area CN=74 (sf)	Parking/Roofs CN=98 (sf)	Wooded CN=70 (sf)
SDV2	19957	0.000716	0.5	82	18	0	78	0.010522171	458	16447	3510	0
Total to Forebay FB2 :	**19,957**								**458**	<<498 ok	**3,510**	
FB2% Impervious:	18											

using P= 1.3

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Table E-5 Surface Sand Filter - Design Calculation Summary

Proposed East Parking

Location: FB2 Pretreatment to sand filter
printed: 2/26/2010
rev: 02/26/2010

Forebay/Pretreatment Area Sizing and Volume

Value	Units	Variable, Description…
458	cf	WQv treated in this pretreatment area (from Table E-4)
Y	Y or N	Is imperviousness less or equal to 75%
30.228	sf	Apt, Surface area of pretreatment basin needed (considered at sideslope mid-height MD Appendix C.2)
3	1:X, rise to run	Proposed Sideslope in Forebay area
2	ft	Df, Proposed Forebay Depth
2		Wf, Proposed Forebay Floor Width
3		Lfb, Calculated Forebay Floor Length
72	sf	Apt, Surface area of pretreatment basin provided at midheight
OK	check if > needed	

From ACAD, use A= 91 SF at midheight EL=1905

216	cf	V Forebay provided by geometry above
115	cf	Min Pretreatment Volume, at 25% WQv treated in this area
183	cf	Min Pretreatment Volume, at 40% WQv treated in this area
269	cf	*Manual input for odd shape from ACAD, V= 269 CF 1904 to 1906*

Sand Filter Surface Area Calculation - Partial, for flow entering through FB2

458	cf	WQv from above
4	ft	D, Max Height of Water above filter bed, used for average height calc
1.5	ft	df, Filter Bed Depth
3.5	ft/day	k, Coefficient of Permeability for Filter Media (Sand=3.5 ft/day)
2	ft	hf, Average Height of Water above filter bed
1.67	days	tf, Design Filter bed drain time
34	sf	Asf, Filter Bed Area needed, per NYSSMDM 6.4.4

From ACAD, use A= 165 SF at EL=1902 (126+34=160sf < 165sf OK)

Sand Filter Storage Volume Calculation - Partial, for flow entering through FB2

3	1:X, rise to run	Proposed Sideslope in treatment area
10	ft	Proposed Length Lf
6	ft	Proposed Width Wf
2160	cf	Vf, Volume in filter area provided

From ACAD, V= 3232 CF Avaliable in filter bed that is uniquely shaped, non rectangular

343.5	cf	Minimum Vol that must be held in combined pretreatment and filter areas,75% WQv
74.5	cf	Filter Area Vol obtained by Subtracting Pretreatment Volume from Above
929.5	cf	Min Vol 75% WQv for FB1 +FB2 <<3232 cf OK

WQv Calculation using Unified Stormwater Sizing

Given:	19957	sf	A, site area
	0.458	acres	A
	0.000715625	sm	A
	18	%	I, Impervious Cover
	1.3	in	P, 90% Rainfall Event Number (see figure 4.1 NYSSMDM)
Find:	0.010518733	acre-ft	WQv, Water Quality Volume
	458	cubic ft	WQv
	15	ft	For info only, X*Y Dimensions of a 2-ft deep containment area
As Follows:	0.212		Rv, = 0.05+0.009(I), minimum equals 0.2

Qp=WQv, Peak Flow Calculation from NYSSMDM Appendix B

Find:	**0.178**	cfs	Qp, Peak Discharge associated with Water Quality Volume (Per NYSSMDM App B, pg B-3)
As Follows:	0.2756	watershed in.	Qa=P x Rv= WQv in watershed inches
	83		CN
	0.41	in	Ia= (200/CN) -2
	0.315		Ia/P
	6	min	Tc, from TR55 Methods
	900	csm/in	qu (from scanned table TR55 Exhibit 4-II (Type II)) using Tc and Ia/P above

D, Vertical Low Flow Orifice Diameter Needed for WQv flow diversion to practice, initial range

Find:	**2.3**	in	D, Orifice Diameter needed with driving head below (vertical orifice equation)
	0.03	sf	A, Orifice Area needed
As Follows:			Using the Equation: Qp=cA*(2gh)^0.5
			Where:
	0.6		c is the orifice coefficient, typically 0.6
	2	ft	h is the driving head acting on the orifice, assume a value

Surface sand filter base flow calculation

2174	cf	WQv, combined from DV1 and DV2
1.67	days	tf, Design Filter bed drain time (40 hrs recommended max)
0.015067088	cfs	QSSF treated, Averaged Flowrate, consider minimum

Table E-6 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Post-Development Conditions

Composite Curve Number and WQv Calcs

using P= 1.3 in

Treatment Component: BIORET1
Print: 2/26/2010
rev: 2/26/2010

Subcatchments to Lower Treatment Area - offline flow to BIORET1

Treatment Area	Sub-Basin	Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Percent Cover			Area Cover			Weighted CN	WQv acre ft	WQv cf
					Grassed Area CN=74	Pavement/Gravel Parking/Roofs CN=98	Wooded CN=70	Grassed Area CN=74 (sf)	Parking/Roofs CN=98 (sf)	Wooded CN=70 (sf)			
BIORET1	SCBB1	39299	0.001410	0.9	44	16	40	17193	6215	15891	76	0.01954725	851
	SCBB4	4064	0.000146	0.1	100	0	0	4064	0	0	74	0.00202143	88
		43363							**6215**				**939**

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Table E-6 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Post-Development Conditions

Composite Curve Number and WQv Calcs

Treatment Component: BIORET1

Print: 2/26/2010

rev: 2/26/2010

			Grass Channel Pretreatment Volume		Pretreatment Channel Length needed				Ponding with 25% of WQv in Channel		Ponding w/o Storage of 25% WQv in Chanl	
Practice	Sub-Basin	WQv (cf)	V, PT pretreat 25% WQv (cf)		L,reqd 2' floor treatment @1 cf/lf (ft)	L,reqd 4' floor treatment @1.66 cf/lf (ft)	L,reqd 6' floor treatment @2.33 cf/lf (ft)	L,reqd 8' floor treatment @2.99 cf/lf (ft)	w/ Channel 50% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)	w/o Channe 75% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)
	SCBB1	851	212.75		213	128	91	71	426	852	638	1276
	SCBB4	88	22		22	13	9	7	44	88	66	132
												1408

Table E-6 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Post-Development Conditions

Composite Curve Number and WQv Calcs

Treatment Component: BIORET1

Print: 2/26/2010

rev: 2/26/2010

SSF Flow Calculations

								Ballpk orifice to send WQv to offline practice, Use HCAD w/ Q10					
Practice	Sub-Basin	Qa=PxRv=WQv watershed in (in)	CN	Ia =(200/CN) -2 (in)	Ia/P	Tc (hours)	qu (csm/in)	WQV assoc flow, Qp (cfs)	Prelim Design H over orifice (ft)	c, orifice coefficient	A, orifice min needed (sf)	Diam, round vert orifice min needed (in)	Notes:
	SCBB1	0.26	83	0.41	0.315	0.43	470	**0.172**	2	0.6	0.025	**2.2**	

Table E-7 Bioretention System - Design Calculation Summary

Location: East Parking Lot EP-D

Treatment Component: BIORET1
Print: 2/26/2010
rev: 2/26/2010

Forebay/Pretreatment Area Sizing and Volume

Value	Units	Variable, Description…
939	cf	WQv from above, 100%
Y	Y/N	Is Treatment practice offline?
235	cf	25% WQv temporarily held in grassed channel
470	cf	50% WQv temporarily held in Ponding Area
N/A		75% WQv temporarily held in Ponding Area

Treatment Surface Area Calculation

0.5	ft	D, Max Height of Water above filter bed, used for average height calc
4	ft	df, Filter Bed Depth
0.5	ft/day	k, Coeff of Permeability for Bioretention Soil (NYSSMDM 6.4.4=0.5 ft/day)
0.5	ft	hf, Average Height of Water above filter bed
2	days	tf, Design Filter bed drain time for 100% of WQv
835	sf	Af, Surface area of Filter Bed needed, per NYSSMDM 6.4.4

From ACAD, use A= ### SF at EL=####

Filter Storage Volume Calculation

470	cf	WQv temporarily held in Ponding Area

From ACAD, V= #### CF

WQv Calculation using Unified Stormwater Sizing

Given:	43363	sf	A, site area
	0.995	acres	A
	0.001554688	sm	A
	14	%	I, Impervious Cover
	1.3	in	P, 90% Rainfall Event Number (see figure 4.1 NYSSMDM)
Find:	**939**	cubic ft	WQv
	0.021558333	acre-ft	WQv, Water Quality Volume
	43	ft	For info only, X*Y Dimensions of a 0.5 ft deep containment area
As Follows:	0.2		Rv, = 0.05+0.009(I), minimum equals 0.2

Qp=WQv, Peak Flow Calculation from NYSSMDM Appendix B
Use Q10 flow & head conditions in Hydrocad model to send Qp to offline practice.

Find:	**0.192**	cfs	Qp, Peak Discharge associated with Water Quality Volume (Per NYSSMDM App B, pg B-3)
As Follows:	0.26	watershed in.	Qa=P x Rv= WQv in watershed inches
	83		CN, computed value - not weighted average
	0.41	in	Ia= (200/CN) -2
	0.315		Ia/P
	26	min	Tc, from TR55 Methods (see Hydrocad model)
	0.43		Tc, hours
	475	csm/in	qu (from scanned table TR55 Exhibit 4-II (Type II)) using Tc and Ia/P above

D, Approx Low Flow Orifice Diameter to div
Use Q10 flow & head conditions in Hydrocad model to send Qp to offline practice.

Find:	**2.3**	in	D, Orifice Diameter needed with driving head below (vertical orifice equation)
	0.03	sf	A, Orifice Area needed
As Follows:			Using the Equation: Qp=cA*(2gh)^0.5
			Where:
	0.6		c is the orifice coefficient, typically 0.6
	2	ft	h is the driving head acting on the orifice, assume a value

Average treated flow calculation

939	cf	WQv, total send into treatment filter
2	days	tf, Design Filter bed drain time 1.67 days for max for SF, 2.0 max for biotreatment
0.005434028	cfs	Q biofilter, averaged flowrate, consider minimum
0.326041667	cfm	
2.438791667	gpm	

Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

using P= 1.3 in

Subcatchments to Lower Treatment Area - Parking lot flow to BIORET2

Sub-Basin		Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Percent Cover: Grassed Area CN=74	Percent Cover: Pavement/Gravel Parking/Roofs CN=98	Percent Cover: Wooded CN=70	Area Cover: Grassed Area CN=74 (sf)	Area Cover: Parking/Roofs CN=98 (sf)	Area Cover: Wooded CN=70 (sf)	Weighted CN	WQv acre ft	WQv cf
BIORET2	SCBB2	18500	0.000664	0.4	42	58	0	7842	10658	0	88	0.0263173	1146

Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

			Grass Channel Pretreatment Volume		Pretreatment Channel Length needed				Ponding with 25% of WQv in Channel		Ponding w/o Storage of 25% WQv in Chanl	
Practice	Sub-Basin	WQv (cf)	V, PT pretreat 25% WQv (cf)		L,reqd 2' floor treatment @1 cf/lf (ft)	L,reqd 4' floor treatment @1.66 cf/lf (ft)	L,reqd 6' floor treatment @2.33 cf/lf (ft)	L,reqd 8' floor treatment @2.99 cf/lf (ft)	w/ Channel 50% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)	w/o Channe 75% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)
	SCBB2	1146	286.5		287	173	123	96	573	1146	860	1720

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Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

BRF Flow Calculations

								Ballpk orifice to send WQv to offline practice, Use HCAD w/ Q10					
Practice	Sub-Basin	Qa=PxRv=WQv watershed in (in)	CN	Ia =(200/CN) -2 (in)	Ia/P	Tc (hours)	qu (csm/in)	WQV assoc flow, Qp (cfs)	Prelim Design H over orifice (ft)	c, orifice coefficient	A, orifice min needed (sf)	Diam, round vert orifice min needed (in)	Notes:
NA													

Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

using P= 1.3 in

Subcatchments to Lower Treatment Area - Parking lot flow to BIORET2

Sub-Basin		Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Percent Cover: Grassed Area CN=74	Percent Cover: Pavement/Gravel Parking/Roofs CN=98	Percent Cover: Wooded CN=70	Area Cover: Grassed Area CN=74 (sf)	Area Cover: Parking/Roofs CN=98 (sf)	Area Cover: Wooded CN=70 (sf)	Weighted CN	WQv acre ft	WQv cf
BIORET2	SCBB2	18500	0.000664	0.4	42	58	0	7842	10658	0	88	0.0263173	1146

Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

			Grass Channel Pretreatment Volume		Pretreatment Channel Length needed				Ponding with 25% of WQv in Channel		Ponding w/o Storage of 25% WQv in Chanl	
Practice	Sub-Basin	WQv (cf)	V, PT pretreat 25% WQv (cf)		L,reqd 2' floor treatment @1 cf/lf (ft)	L,reqd 4' floor treatment @1.66 cf/lf (ft)	L,reqd 6' floor treatment @2.33 cf/lf (ft)	L,reqd 8' floor treatment @2.99 cf/lf (ft)	w/ Channel 50% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)	w/o Channe 75% WQv in Ponding Area (cf)	A,avg of 6" deep Pond Area sf (sf)
	SCBB2	1146	286.5		287	173	123	96	573	1146	860	1720

P:\Projects\03-2120\UMP SWPPP\2008 SWPPP Draft Documents\Tables and Figures\[2009 SWPPP WQv and Cn Weighting.xls]PR East Bioret2

Table E-8 Belleayre UMP/DEIS Stormwater Management System Calculations - Water Quality Volume and Qp

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

BRF Flow Calculations

								Ballpk orifice to send WQv to offline practice, Use HCAD w/ Q10					
Practice	Sub-Basin	Qa=PxRv=WQv watershed in (in)	CN	Ia =(200/CN) -2 (in)	Ia/P	Tc (hours)	qu (csm/in)	WQV assoc flow, Qp (cfs)	Prelim Design H over orifice (ft)	c, orifice coefficient	A, orifice min needed (sf)	Diam, round vert orifice min needed (in)	Notes:
NA													

Table E-9 Bioretention System - Design Calculation Summary

Location: East Parking Lot EP-D

Treatment Component: BIORET2
Print: 2/26/2010
rev: 02/26/2010

Forebay/Pretreatment Area Sizing and Volume

Value	Units	Variable, Description…
1146	cf	WQv from above, 100%
N	Y/N	Is Treatment practice offline?
N/A	cf	25% WQv temporarily held in grassed channel
N/A	cf	50% WQv temporarily held in Ponding Area
860		75% WQv temporarily held in Ponding Area

Treatment Surface Area Calculation

0.5	ft	D, Max Height of Water above filter bed, used for average height calc
4	ft	df, Filter Bed Depth
0.5	ft/day	k, Coeff of Permeability for Bioretention Soil (NYSSMDM 6.4.4=0.5 ft/day)
0.25	ft	hf, Average Height of Water above filter bed
2	days	tf, Design Filter bed drain time for 100% of WQv 1.67 days max for SF, 2.0 max for biotreatment
1079	sf	Af, Surface area of Filter Bed needed, per NYSSMDM 6.4.4

From ACAD, use A= ### SF at EL=####

Filter Storage Volume Calculation

From ACAD, V= #### CF

WQv Calculation using Unified Stormwater Sizing

Given:	18500	sf	A, site area
	0.425	acres	A
	0.000664063	sm	A
	58	%	I, Impervious Cover
	1.3	in	P, 90% Rainfall Event Number (see figure 4.1 NYSSMDM)
Find:	**1147**	cubic ft	WQv
	0.026335833	acre-ft	WQv, Water Quality Volume
	48	ft	For info only, X*Y Dimensions of a 0.5 ft deep containment area
As Follows:	0.572		Rv, = 0.05+0.009(I), minimum equals 0.2

Qp=WQv, Peak Flow Calculation from NYSSMDM Appendix B
Use Q10 flow & head conditions in Hydrocad model to send Qp to offline practice.

Find:	**0.284**	cfs	Qp, Peak Discharge associated with Water Quality Volume (Per NYSSMDM App B, pg B-3)
As Follows:	0.7436	watershed in.	Qa=P x Rv= WQv in watershed inches
	94		CN, computed value - not weighted average
	0.128	in	Ia= (200/CN) -2
	0.098		Ia/P
	26	min	Tc, from TR55 Methods (see Hydrocad model)
	0.43		Tc, hours
	575	csm/in	qu (from scanned table TR55 Exhibit 4-II (Type II)) using Tc and Ia/P above

D, Approx Low Flow Orifice Diameter to divert WQv flow practice, initial range
Use Q10 flow & head conditions in Hydrocad model to send Qp to offline practice.

Find:	**2.7**	in	D, Orifice Diameter needed with driving head below (vertical orifice equation)
	0.04	sf	A, Orifice Area needed
As Follows:			Using the Equation: Qp=cA*(2gh)^0.5
			Where:
	0.6		c is the orifice coefficient, typically 0.6
	2	ft	h is the driving head acting on the orifice, assume a value

Average treated flow calculation

1146	cf	WQv, total send into treatment filter
2	days	tf, Design Filter bed drain time 1.67 days max for SF, 2.0 max for biotreatment
0.006631944	cfs	Q biofilter, averaged flowrate, consider minimum
0.397916667	cfm	
2.976416667	gpm	

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Rev: 3/16/10

Table TH-1 Belleayre UMP/DEIS Stormwater Management System Calculations

Location: Tomahawk and Skier Bridge Area

Location: Tomahawk and Skier Bridge Area

Post-Development Conditions

Composite Curve Number and WQv Calcs

using P= 1.3 in

Subcatchments to Tiered DDPs

					Percent Cover			Area Cover					
DDP/ Practice	Sub-Basin	Drainage Area (sf)	Drainage Area (sq. mi.)	Drainage Area (Acres)	Grassed Area CN=74	Pavement/Gravel Parking/Roofs"I" CN=98	Wooded CN=70	Grassed Area CN=74 (sf)	Parking/Roofs CN=98 (sf)	Wooded CN=70 (sf)	Weighted CN	WQv acre ft	WQv cf
1.111		419,683	0.015054	9.6	36	0	64	150,807	0	268,876	71	0.208749579	9,093
1.112		45,318	0.001626	1.0	42	8	49	19,212	3,745	22,361	73	0.022541093	982
2.101		72,852	0.002613	1.7	27	0	73	19,817	0	53,035	71	0.036236455	1,578
2.102		25,919	0.000930	0.6	3	0	97	865	0	25,054	70	0.012892065	562
2.103		214,580	0.007697	4.9	74	0	26	159,585	0	54,995	73	0.106731711	4,649
2.104		36,440	0.001307	0.8	90	10	0	32,931	3,509	0	76	0.018125191	790
2.111		93,560	0.003356	2.1	94	3	3	87,704	3,184	2,672	75	0.046536578	2,027
2.112		35,442	0.001271	0.8	62	38	0	22,133	13,309	0	83	0.034196625	1,490
2.113		16,750	0.000601	0.4	54	11	35	9,042	1,834	5,874	75	0.00833142	363
2.114		168,144	0.006031	3.9	35	65	0	59,285	108,859	0	90	0.264566862	11,525
2.115		3,999	0.000143	0.1	100	0	0	3,999	0	0	74	0.001988847	87
2.141		75,948	0.002724	1.7	67	11	23	50,564	8,113	17,271	76	0.0377764	1,646
			0.043354	**27.75**				**615,944**	**142,553**	**450,138**			**34,792**

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