

Data entry date **7/23/2007**

ENVIRONMENT 21 Sketch Plan, Hydrology Analysis, and Hydraulic Analysis

Site/Project **BRUNSWICK SCHOOL**
 Municipality **GREENWICH, CT**
 Engineer **REDINISS & MEAD**
 Owner **NS**
 Contractor **NS**
 ENV 21 Affiliate **CONNECTICUT PRECAST**

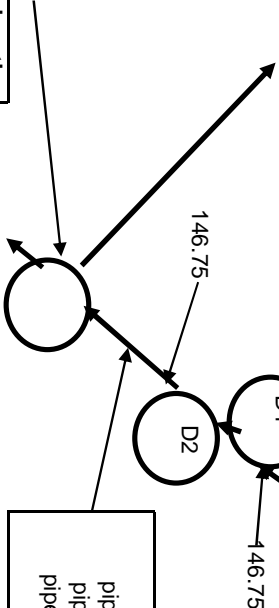
Trunk Sewer Travel Time	
Longest travel distance, ft	100
Average pipe velocity, ft/sec	4.0
Travel time, minutes	0.4
IDF duration at last inlet, min.	5.0
IDF duration at first inlet, min.	5.0

Drainage Area Hydrology / Design Storm IDF Values	
Specified return interval	10 yrs
Specified duration	5.0 minutes
Average intensity	6.0 in/hr
Rainfall depth	0.50 inches

VZB1 Dimensioning			
Structure #	OS#3		
Model #	4		
MH#	D1	MH#	D2
diam, ft	5	diam, ft	5
Rim	150.50	Rim	150.50
inlet inv.	146.75	outlet inv.	146.75
floor	142.25	floor	142.25

Drainage Area Hydrology for Specified IDF Duration			
Rainfall rate	3.6 cfs	Area, acres	0.60
Ponding/bypassing at inlets	0.6 cfs	% paved	90
Flow entering inlets	3.0 cfs	% roof	0
Inflow from offsite	0 cfs	% vegetation	10
Total flow entering inlets	3.0 cfs	CA	0.50
C = fraction of rainfall depth entering inlets during specified duration			
Storm Sewer Flow to Initiate Ponding at Drain Inlets			
(Based on ENV 21 Backwater Analysis)		Outlet pipe flow to initiate ponding at inlets(est.)	6.2 cfs
		Outlet pipe velocity to initiate ponding at inlets (est.)	8.0 fps

VZB1 inlet pipe	
pipe material	HDDPE
pipe diam., in	12
pipe length, ft	13
pipe slope, %	0.67



VZB1 outlet pipe	
pipe material	HDDPE
pipe diam., in	12
pipe length, ft	15
Slope, %	0.67

Upstream junction	
Rim	150.50
outlet inv.	146.84

Downstream junction	
MH	NS
rim	146.65
Inlet invert	146.65
Outlet invert	146.65
Outlet type	12"
Return interval, yrs	10
WSE at invert from VZB1	148.50

Water Quality Volume (WQV)	
Drainage area	0.60 acres
Impervious area	0.54 acres
Impervious area	90 %
Water Quality Rv	0.86
Rainfall	1.00 inches
Runoff	0.86 inches
WQV	0.04 ac-ft
WQV	1873 cf
Water Quality Flow Rate (WQFR)	
Average intensity	1.00 in/hr
Rainfall duration	NS minutes
Annual frequency	NS events/yr
Runoff coeff.	0.90
Imp. area	0.54 acres
WQFR	0.49 cfs

SKETCH PLAN

Environment 21, LLC

8713 Read Road, P.O. Box 55
 East Pembroke, NY 14056-0055
 Fax: (585) 762-8315
 Web: www.env21.com

Phone: (800) 809-2801

Site/Project: BRUNSWICK SCHOOL

Location: GREENWICH, CT

Owner: NS

Engineer: REDNISS & MEAD

Contractor: NS

ENV 21 Affiliate: CONNECTICUT PRECAST

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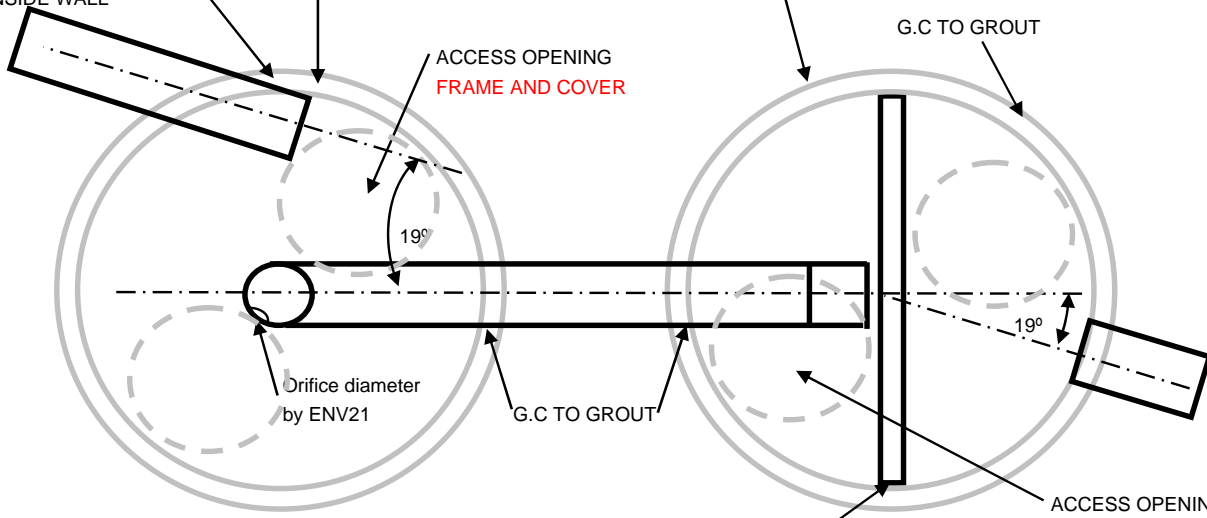
environment
 Global Stormwater Solutions

Product Name: V2B1™

STRUCTURE NO.	OS#3	
V2B1 MODEL NO.	4	
	D1	D2
MANHOLE DIAM., FT.	5	5
ACCESS OPENING DIAM., IN.	24	24

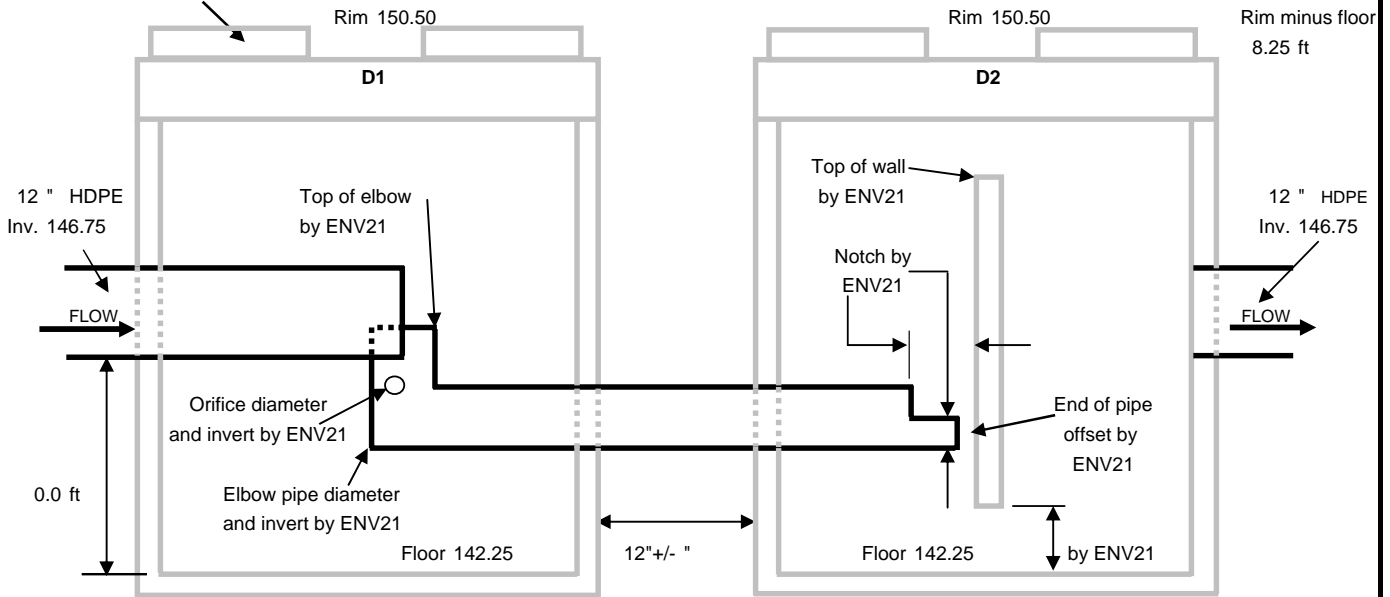
DESIGN STORM HYDROLOGY			
Return Interval, yrs	10	Area, acres	0.60
Average Intensity, in/hr	6.0	% paved	90
Average Runoff, cfs	3.6	%roof	0
Flow to V2B1, cfs	3.0	%vegetation	10

0.5" MAX. FROM PIPE O.D.
 TO INSIDE WALL



PLAN

G.C. TO SEAL/GROUT
 RISER RINGS AS REQUIRED



SECTION

NOTES: THE INFORMATION IN THIS DRAWING IS PROPRIETARY AND IS BASED ON ENVIRONMENT 21
 TECHNICAL ANALYSIS OF SITE HYDROLOGY AND STORM SEWER SYSTEM HYDRAULICS
 PROPRIETARY INFORMATION: PATENTS PENDING - ALL RIGHTS TO ENVIRONMENT 21, LLC.

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Technical Report

Date: 07/23/07
 Project: BRUNSWICK SCHOOL
 Municipality: GREENWICH, CT
 Engineer: REDNISS & MEAD
 Owner: NS
 Contractor: NS
 Environment 21 Affiliate: CONNECTICUT PRECAST

ENV 21 Product: V2B1™
 Model #: 4
 Structure #: OS#3

Swirl chamber diameter 5 ft
 Floatable trap diameter 5 ft
 Swirl chamber surface area 20 sf

Design Storm Hydrology

Specified return interval 10 yrs
 Specified duration 5.0 minutes
 Average intensity 6.0 in/hr
 Peak inflow to V2B1 3.0 +/- cfs
 Peak V2B1 inlet pipe velocity 3.88 +/- fps

Water Quality Volume

Rainfall 1.00 inches
 Site volumetric runoff coefficient 0.86
 Runoff depth 0.86 inches
 Drainage area 0.60 acres
 Water Quality Volume 0.04 ac-ft

Drainage Area

Drainage area 0.60 acres
 Paved area 90 %
 Roof area 0 %
 Vegetated area 10 %

Water Quality Flow Rate

Runoff coefficient 0.90
 Average Intensity 1.00 in/hr
 Impervious area 0.54 acres
 Water Quality Flow Rate 0.49 cfs

Design Storm Rainfall IDF Values

Specified return interval 10 yrs
 Specified duration 5.0 minutes
 Average intensity 6.0 in/hr

Drainage Area Hydrology for Specified IDF Duration

Rainfall depth 0.50 inches
 Rainfall rate 3.6 cfs
 Ponding/bypassing at inlets 0.6 cfs
 Flow entering inlets 3.0 cfs
 Inflow from offsite 0 cfs
 Total flow entering inlets 3.0 cfs

Estimated Storm Sewer Flow for Surge at Drain Inlets

Outfall pipe flow with inlets surcharged (est.) 6.2 cfs
 Outfall pipe velocity with inlets surcharged(est.) 8.0 fps



Sediment Pumpout Interval

Hydraulic model: Online treatment without internal bypass

Estimated Composition for Pollutant Washoff Entering V2B1

Annual unit pavement pollutant washoff	500	#/ac/yr
Annual unit roof pollutant washoff	100	#/ac/yr
TSS as silt + bouyant organics	30	wt%
TSS as fine sand	40	wt%
TSS as medium sand	30	wt%
Pavement pollutant washoff	270	#/yr
Roof pollutant washoff	0	#/yr
Site pollutant washoff load	270	#/yr

Storage Capacity for Washoff of Oil-Floatables

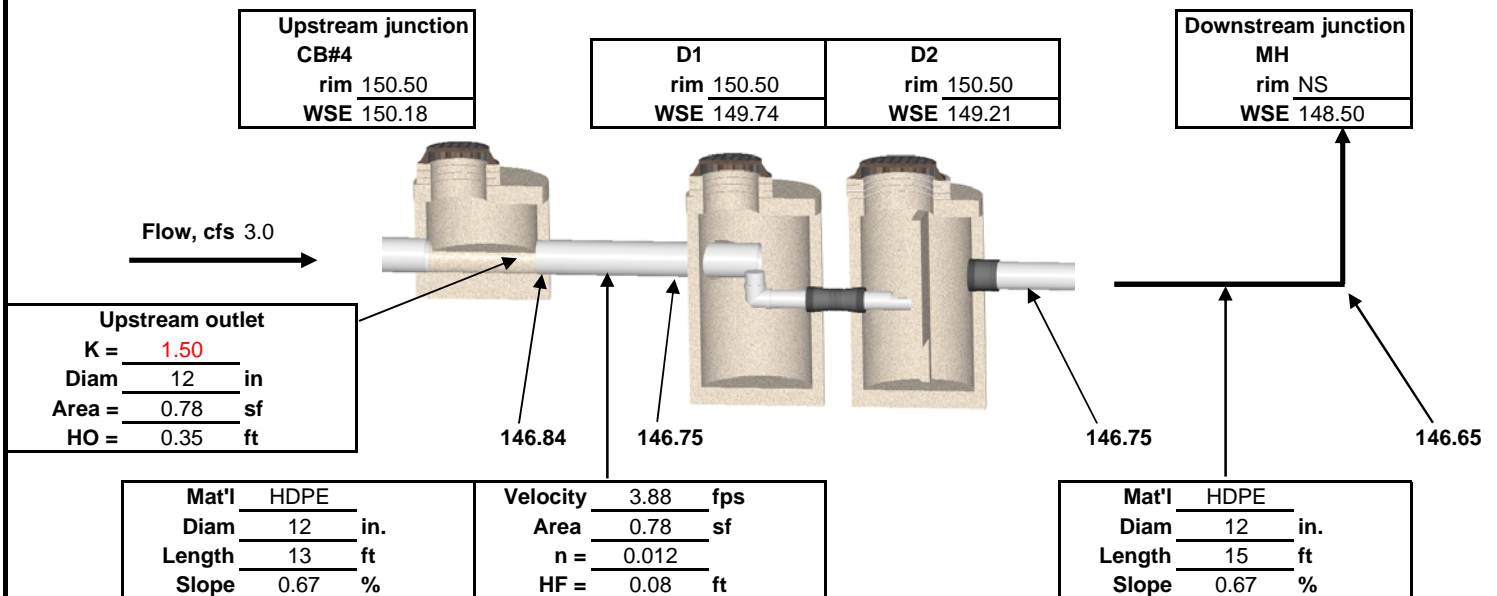
Swirl chamber capacity	14.7	+/- gal	floatables depth	0.10	ft
floatables chamber capacity	10.9	+/- gal	floatables depth	0.15	ft

Estimated V2B1 Pumpout Interval

Washoff trapped at curbs and inlets	62	#/yr	V2B1 sump depth	4.5	ft
Washoff trapped in V2B1	154	#/yr	Design sediment storage capacity	780	#
Estimated per cent washoff trapped	80	%	Design sediment storage capacity	9.75	cf
			Design sediment storage depth	0.5	ft
			Maximum pumpout interval	5.0	yrs±
			Recommended pumpout interval	1.0	yrs±

Design Storm Backwater Analysis

- (1) Downstream Water Elevation Estimated by ENV 21 or Provided by Site Engineer
- (2) Outlet pipe hydraulics based on circular culvert hydraulics



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environment
 Global Stormwater Solutions
Product Name: V2B1™**V2B1 CHAMBER DIMENSIONING****Structure #** OS#3**Model #** 4

MH#	D1	MH#	D2
Diam, ft	5	Diam, ft	5
Rim	150.50	Rim	150.50
Inlet inv.	146.75	Outlet inv.	146.75
floor	142.25	floor	142.25

Area treated by V2B1

Area, acres	0.60	C
% paved	90	0.90
% roof	0	0.90
% vegetation	10	0.30
CA	0.50	

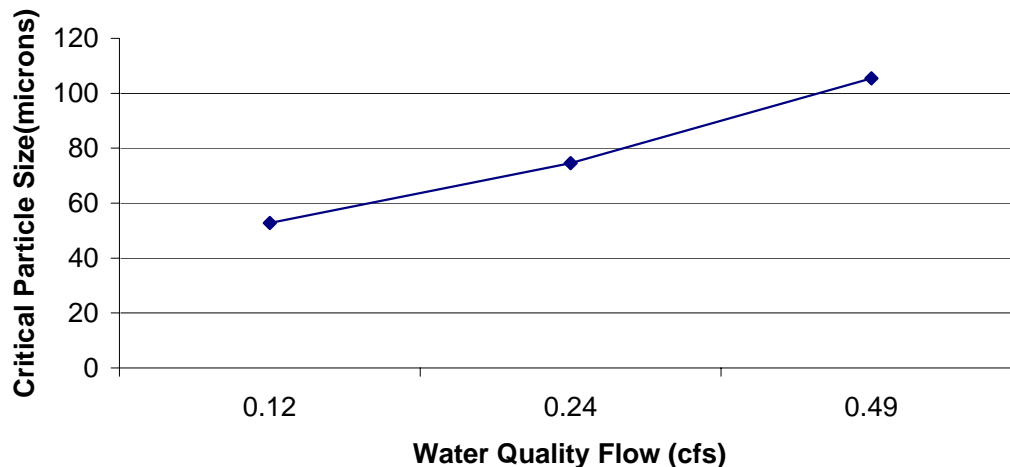
Hydraulic model: online treatment without bypassing
Critical particle size analysis for removal of sediment TSS in V2B1**DETPOND parameters for gravity separation**


Per cent removal of critical particle size	80	80	80
Particle specific gravity	2.6	2.6	2.6
V2B1 water surface area, sf	20	20	20
Water Quality Flow Rate	0.5	0.5	0.5
Percent of water quality flow rate	25	50	100
Flow entering V2B1, cfs	0.12	0.24	0.49
Critical settling velocity, ft/sec	0.008	0.016	0.031

Results of DETPOND Analysis

Critical particle size, microns	53	75	105
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Note: Critical particle size refers to smallest particle for which the specified per cent removal can be achieved.
 Based on DETPOND Detention Pond Treatment Model by Robert Pitt.
 For DETPOND summary refer to ENV 21 TN-097.



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V2B1 CHAMBER DIMENSIONING			
Structure # OS#3			
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Diam, ft	5	Diam, ft	5
Rim	150.50	Rim	150.50
Inlet inv.	146.75	Outlet inv.	146.75
floor	142.25	floor	142.25

Area treated by V2B1		
Area, acres	0.60	C
% paved	90	0.90
% roof	0	0.90
% vegetation	10	0.30
CA	0.50	

Based on removal of a particle gradation of **120** microns

Calculated 70 % removal Critical particle size (micron)
39
55
68
78
88
96
104
111
124
175
215
248
277
304
328
351
372

Rainfall intensity (in/hr)	Flow rate (cfs)	SOR (cfs/ft²)	Calculated critical settling velocity (ft/sec)	Calculated removal efficiency for 120 micron particle
0.1	0.050	1.1605	0.004	100 %
0.2	0.101	2.3210	0.009	100 %
0.3	0.151	3.4815	0.013	100 %
0.4	0.202	4.6420	0.017	153 %
0.5	0.252	5.8025	0.022	136.8 %
0.6	0.302	6.9630	0.026	124.9 %
0.7	0.353	8.1234	0.030	115.6 %
0.8	0.403	9.2839	0.034	108.2 %
1	0.504	11.6049	0.043	96.75 %
2	1.008	23.2098	0.086	68.41 %
3	1.512	34.8148	0.129	55.86 %
4	2.016	46.4197	0.172	48.37 %
5	2.520	58.0246	0.215	43.27 %
6	3.024	69.6295	0.258	39.5 %
7	3.528	81.2345	0.302	36.57 %
8	4.032	92.8394	0.345	34.21 %
9	4.536	104.4443	0.388	32.25 %

Average annual estimated removal efficiency **81.98 %**

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