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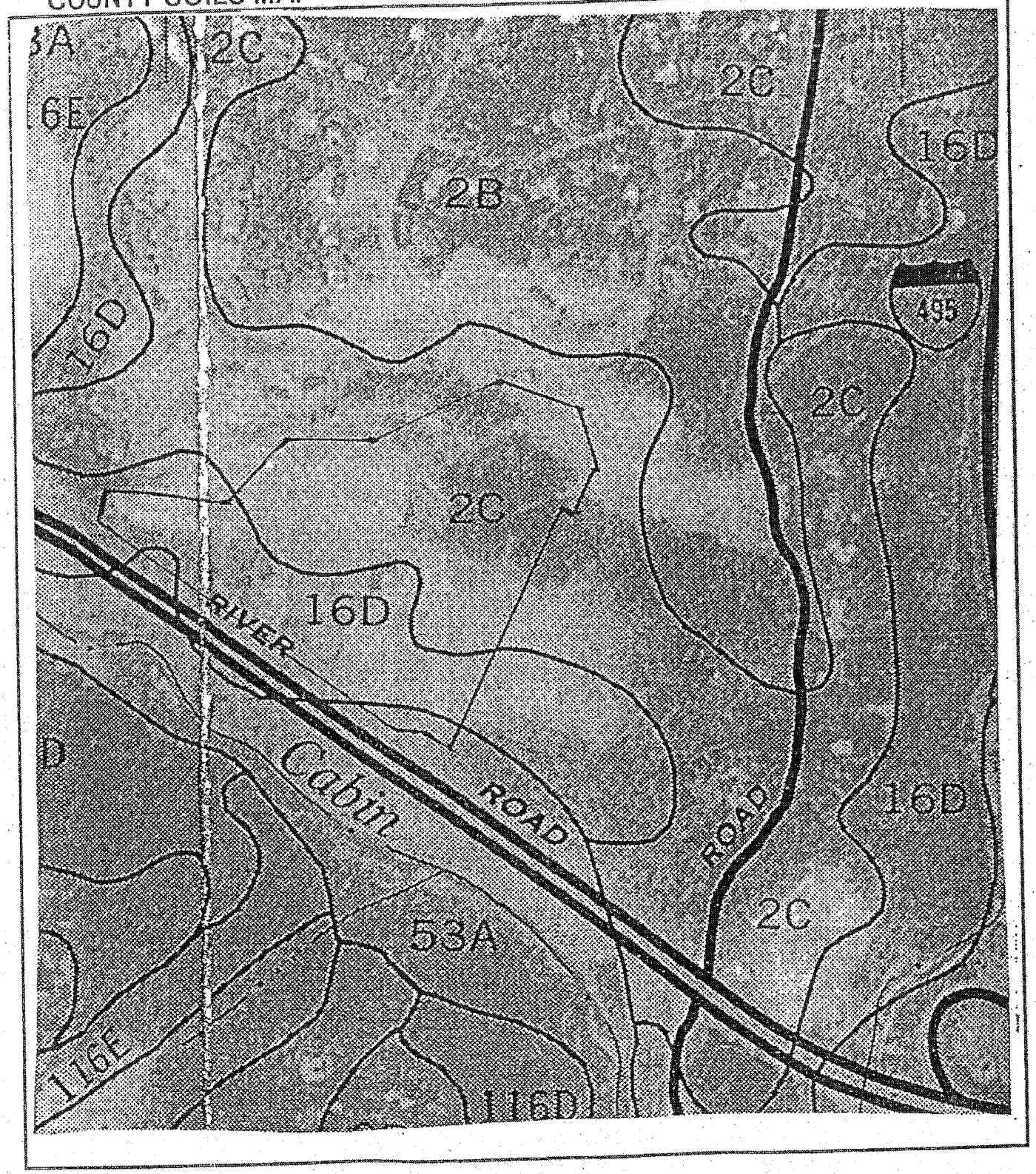
Project Stoneyhurst Quarry
Project No. 01-205-11 Date 11/17/01
Prepared By JDS
Scale 1" = 400'

COUNTY SOILS MAP Sheet 26

ISSUED JULY 1995 (AERIAL PHOTO BASE 1980)



WATERBODY: CABIN JOHN CREEK CLASS I-P WATERS
STATE: MARYLAND COUNTY: MONTGOMERY

SOIL KEY

2C - Glenelg silt loam, (Hydrologic Soil Group B), 8 to 15% slopes

16D - Brinklow-Blocktown channery silt loam, Hydrologic Soil Group B/D), 15 to 25% slopes, severely erodible soils

53A - Codorus silt loam Hydrologic Soil Group C), 0 to 3% slopes, occasionally flooded

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DATE: 11/13/03
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PROJECT No.: **2001.205**
FILE: **SWMVOL_01**

The Quarry - SWM Concept

UNIFIED STORMWATER SIZING CRITERIA TREATMENT VOLUME DETERMINATION

SITE INFORMATION

TOTAL AREA = **11.90 AC**

IMPERVIOUS AREA = **4.70 AC** OR 39.5 %
RAINFALL ZONE: **EASTERN**

WATER QUALITY VOLUME/DISCHARGE

Adjusted Area For WQv = 11.90 AC
WQv = (P)(Rv)(A)/12 = 0.402 AC-FT OR 0.41 IN OR 17515 FT3
P = 1.0 in
Rv = 0.05 + 0.009(I) = 0.405
I = PERCENT IMPERVIOUS AREA

Water Quality Discharge = (WQv)(qu*)(Area) =
* qu From TR-55 (See Cpv Worksheet)
Water Quality Discharge = (0.41 IN)(1.282 CFS/AC/IN)(11.9 Ac.) = 6.18 CFS

RECHARGE VOLUME

SOIL SPECIFIC RECHARGE FACTOR (S)

HSG	(S)	% AREA	(S)(%A)
A	0.38	**0**	0
B	0.26	**100**	26
C	0.13	**0**	0
D	0.06	**0**	0
		COMPOSITE S =	26

Re_v = [(S)(Rv)(A)]/12 (Percent Volume Method) = 0.10 AC-FT

Re_v = [(S) (Aimp) (Percent Area Method) = 1.22 AC

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The Quarry - SWM Concept

UNIFIED STORMWATER SIZING CRITERIA TREATMENT VOLUME DETERMINATION

CHANNEL PROTECTION VOLUME (Cpv)

EXTENDED DETENTION TIME (T) = **24 HOURS**
DESIGN RAINFALL = **2.6 in**
PROPOSED CONDITION RCN = **75.6**
RUNOFF = **0.74 in**
PROPOSED CONDITION Tc = **0.15 HOURS**

USE THE MDE METHOD TO COMPUTE STORAGE VOLUME

INITIAL ABSTRACTION = Ia = (200/75.6) -2 = 0.646
Ia/P = (0.646)/2.6 IN = 0.248
tc = 0.15 HOURS OR 0.10 HOURS MINIMUM

FROM TR55: qu = 820 CSM/IN OR 1.282 CFS/AC/IN

From Fig. D.11.2 "Detention Time Vs. Discharge Ratios" qo/qi = 0.022

With qo/qi, compute Vs/Vr for Type II rainfall Distribution

$Vs/Vr = .682 - 1.43(qo/qi) + 1.64(qo/qi)^2 - 0.804(qo/qi)^3$
Vs/Vr = 0.65

Therefore Vs = 0.65(0.74IN)(1/12)(11.9Ac) = 0.48 Ac-Ft

Define the Cpv Release Rate

qi = (0.74 IN)(1.282 CFS/AC/IN)(11.9Ac.) = 11.2 CFS

qo = (qo/qi)qi = (0.022)(11 CFS) = 0.25 CFS

Summary Table	
Recharge Volume (Rev) =	**4554 Cu Ft. or 0.105 Ac Ft.**
Recharge Area =	**1.22 ac**
Water Quality Volume (WQv) =	**17515 Cu Ft or 0.402 Ac Ft.**
Water Quality Peak Discharge =	**6.18 CFS**
Channel Protection Volume =	**20742 Cu. Ft. or 0.476 Ac Ft.**
Channel Protection Peak Release Rate =	**0.25 CFS**

SUMMARY TABLE OF STORMWATER MANAGEMENT VAULT STORAGE VALUES

STORAGE INVERT IN OTHER CHAMBERS = 148.00 FT
SAND FILTER SURFACE ELEVATION = 148.00 FT
CONTROL CHAMBER INVERT= 145.50 FT

ELEVATION	STORAGE IN OTHER CHAMBERS 50 FT2	STORAGE IN S.F. CHAMBER 400 FT2	STORAGE IN CONTROL CHAMBER 30 FT2	STORAGE IN 54 IN CMP	TOTAL STORAGE VOLUME (AC-FT)
145.5	0.0000	0.0000	0.0000	0.0000	0.0000
148	0.0000	0.0000	0.0017	0.0000	0.0017
148.5	0.0006	0.0046	0.0021	0.0142	0.0214
149	0.0011	0.0092	0.0024	0.0529	0.0657
150	0.0023	0.0184	0.0031	0.1689	0.1926
151	0.0034	0.0275	0.0038	0.3058	0.3406
151.3	0.0038	0.0303	0.0040	0.3402	0.3783
152	0.0046	0.0367	0.0045	0.4216	0.4674
152.5	0.0052	0.0413	0.0048	0.4603	0.5116

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FILE: CMP_VOL

STAGE-STORAGE COMPUTATIONS FOR CMP STORAGE SYSTEM

PIPE SYSTEM DIAMETER =	**4.50 FT**	**CMP PIPE SYSTEM**
CROSS SECTIONAL AREA OF PIPE =	**15.90 FT**	
EFFECTIVE LENGTH OF PIPE =	**1300 FT**	
LOWER INVERT IN PIPE SYSTEM =	**148.00 FT**	
UPPER INVERT IN PIPE SYSTEM =	**148.50 FT**	

ELEVATION	H1[1] FT	AREA A1[2] (D/S)	H2[3] FT	AREA A2[4] (U/S)	(A1+A2)/2	LENGTH FT	VOLUME[5] FT^3	VOLUME AC-FT
145.50 FT	0.00	0.00	0.00 FT	0.00	0.00	1300	0	**0.0000**
148.00 FT	0.00	0.00	0.00 FT	0.00	0.00	1300	0	**0.0000**
148.50 FT	0.50	0.95	0.00 FT	0.00	0.48	1300	619	**0.0142**
149.00 FT	1.00	2.59	0.50 FT	0.95	1.77	1300	2305	**0.0529**
150.00 FT	2.00	6.74	1.50 FT	4.58	5.66	1300	7355	**0.1689**
151.00 FT	3.00	11.33	2.50 FT	9.17	10.25	1300	13320	**0.3058**
151.30 FT	3.30	12.44	2.80 FT	10.36	11.40	1300	14818	**0.3402**
152.00 FT	4.00	14.94	3.50 FT	13.31	14.13	1300	18366	**0.4216**
152.50 FT	4.50	15.90	4.00 FT	14.94	15.42	1300	20052	**0.4603**

1.. H1 = ELEVATION - LOWER INVERT IN PIPE SYSTEM

2.. AREA A1 = AREA OF PONDED WATER AT LOWER END OF PIPE = Dia^2 x A/Dia^2 (FOR H1/Dia FROM ATTACHED TABLE)

3.. H2 = ELEVATION - UPPER INVERT IN PIPE SYSTEM

4.. AREA A2 = AREA OF PONDED WATER AT UPPER END OF PIPE = Dia^2 x A/Dia^2 (FOR H2/Dia FROM ATTACHED TABLE)

5.. VOLUME = AVERAGE AREA x EFFECTIVE LENGTH

COME RAIN, WE SHINE!® STORMWATER MANAGEMENT INC.

StormFilter Sizing Based on the MDE Design Methodology

Project Name: The Quarry Apartments
11/13/2003

Input	XXX
Result	XXX

SITE CHARACTERISTIC INPUT

Design Storm, P (inches) *	1.00	*(1.0 if in Eastern rainfall zone, 0.9 if in Western rainfall zone)
Total Area, A_T (acres)	11.90	
Impervious Area, A_I (acres)	4.70	
Percent of WQv to be temporarily stored in system	100%	

WQv CALCULATIONS

Percent Impervious Cover, I	39%	
Volumetric Runoff Coefficient, Rv	0.41	
Water Quality Volume, WQv (ac-ft)	0.402	
Water Quality Volume, WQv (cu ft)	17,515	* Provided by Macris, Hendricks, & Glascock, P.A.
Required Storage Volume (% of WQv) (cu ft) *	17,515	*(This is the volume that the entire system is required to temporarily hold prior to filtration, including both pretreatment and treatment)

STORMFILTER DESIGN CONSTANTS (PER MDE MANUAL)

Filter Bed Depth, D_f (ft)*	0.58	*(0.58 for StormFilter)
Coeff. of Perm. of Filter Media, k (ft/day)*	8.7	*(8.7 ft/day for Leaf Compost)
Avg. Height of Water above Filter Bed, H_f (ft)*	0.75	*(0.75 for StormFilter)
Design Filter Bed Drain Time, T_f (days)*	1.67	*(1.67 days recommended)
Surface Area of StormFilter Cartridge (sq ft)*	7.1	*(7.1 sq ft for standard cartridge)

SIZING CALCULATIONS

Surface Area of Equivalent Filter Bed (sq ft)	525.7
Number of Cartridges Required	75
Maximum Release Rate from Storage (cfs)	1.25

SYSTEM DESIGN

OPTION A
Combined Storage/Treatment Structure

Minimum Storage Provided (ft^3)	2,042
Additional Storage Required (ft^3)	15,473
Length for Additional Storage (ft)	221.0
Number of 10x8 Sections Required	32
Total 10x8 Structure Length (ft)	EXCEEDS MAXIMUM

NOTE : 40 CARTRIDGE MAXIMUM/UNIT

OPTION B
Separate Storage/Treatment Structures - OMEGA Culvert

Size of Precast StormFilter Vault System	BCSF 80
Storage Volume within StormFilter Vault (ft^3)	731
Pretreatment Storage Required (ft)	16,784
Internal Rise of OMEGA Storage Culvert (ft)	6
Length of OMEGA Culvert Required (ft)	168

OPTION C
Separate Storage/Treatment Structures - Storage Pipe

Size of Precast StormFilter Vault System	BCSF 80
Storage Volume within StormFilter Vault (ft^3)	731
Pretreatment Storage Required (ft)	16,784
Diameter of Storage Pipe (in)	48
Length of Storage Pipe Required (ft)	1,336

OPTION A SUMMARY

(1) PRECAST VOLUME BOX CULVERT STORMFILTER SYSTEM

NUMBER OF CARTRIDGES : 31

SYSTEM DIMENSIONS (ft) : 10 W x 9.5 D x EXCEEDS MAXIMUM L

TOTAL STORAGE VOLUME PROVIDED : 17,722 FT^3

OPTION B SUMMARY

168 LINEAR FEET

OF 6 FT TALL x 18 FT WIDE OMEGA CULVERT

FOLLOWED BY A PRECAST BCSF 80 STORMFILTER

WITH 75 CARTRIDGES

OPTION C SUMMARY

1,336 LINEAR FEET

OF 48 INCH ø STORAGE PIPE

FOLLOWED BY A PRECAST BCSF 80 STORMFILTER

WITH 75 CARTRIDGES

COME RAIN, WE SHINE™

STORMWATER MANAGEMENT INC.

The Quarry Apartments – Stormwater Treatment System Size and Cost Estimate

Bethesda, MD

Information provided:

- Total contributing area = 11.9 acres
- Impervious area = 4.70 acres
- WQv = 17,515 ft^3
- Presiding agency = MCDPS

Assumptions:

- Media = Compost cartridges
- Drop required from inlet to outlet = 2.3' minimum

Size and cost estimates:

The Maryland Department of the Environment Water Management Administration requires the StormFilter to be sized according to the Department of the Environment's "capture and treat" methodology.

According to the attached calculations, Stormwater Management recommends a two-part system: a capture system providing the water quality storage volume followed by a StormFilter sized based on the required filter surface area. Refer to "Option C" on the attached spreadsheet flow control structure will need to be provided to limit the outflow rate from the WQv storage facility to the StormFilter to that rate shown on the attached spreadsheet. Pretreatment will also need to be provided. A high flow bypass structure should be placed upstream of the WQv storage facility to divert higher flows around the treatment system.

For the filtration system, Stormwater Management recommends using a cast in place StormFilter with 75 cartridges. For cast in place systems, Stormwater Management, Inc. will provide design assistance and engineering detail drawings to the engineer and provide the internal components to the site contractor. The vault itself will be constructed in the field. Structural shop drawings and calculations will need to be provided by other. The estimated cost of the components for this system is $59,700, complete and delivered to the site.

The information above assumes that a WQv storage facility and flow control structure will be provided upstream of the StormFilter system. Stormwater Management also offers an alternative design, the Volume StormFilter, in which the WQv storage, pretreatment, flow control, and filter cartridges are provided in a single cast-in-place concrete structure. This system does require 7' of drop from to operate. Please contact Stormwater Management for further information in this regard.

Typically, we recommend maintenance every 18-24 months for the StormFilter treatment system, but the maintenance cycle will ultimately depend on the rainfall conditions and actual pollutant loading. If contracted with Stormwater Management Inc., the estimate maintenance cost for the system is $9,540 per cycle.

Thank you for the opportunity to present this information to you and your client.

SMI ENGR: M. GRIFFIN 11/13/03

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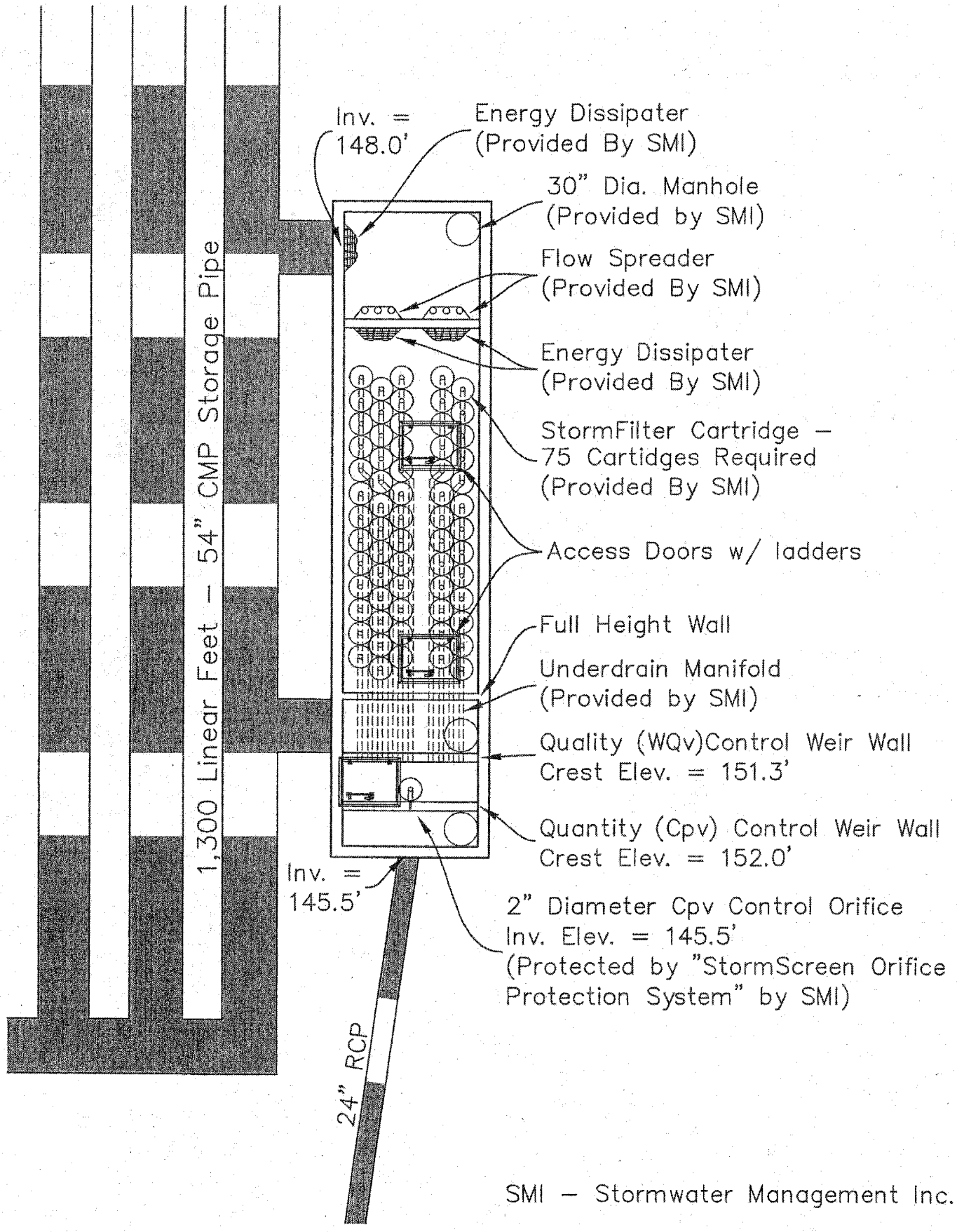
Project: The Quarry
Project No.: 2001.205
Prepared By: S Wilde
Scale: 1" = 10'

StormFilter Detail – Plan View



SMI – Stormwater Management Inc.

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StormFilter Detail – Typical Section