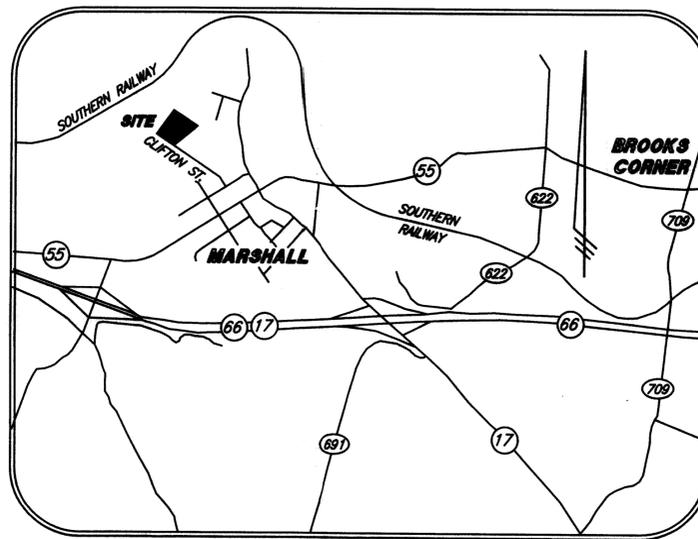


AS-BUILT PLAN FOR STORMWATER MANAGEMENT POND MOUNTAIN SHADE SUBDIVISION

SITE PLAN AMENDMENT
MARSHALL MAGISTERIAL DISTRICT
FAUQUIER COUNTY, VIRGINIA
OCTOBER 13, 2014



VICINITY MAP
(1" = 2000')

SHEET INDEX

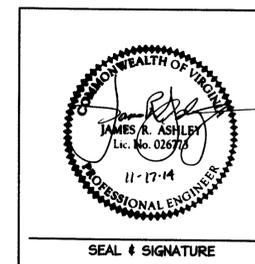
SHEET	DESCRIPTION
1	COVER SHEET
2	AS-BUILT SWM POND
3	SWM CALCULATIONS AND DETAILS

AS A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF VIRGINIA, I HEREBY CERTIFY THAT I HAVE REVIEWED THIS "AS-BUILT" SURVEY AND IT ACCURATELY REFLECTS THE INFIELD CONSTRUCTION OF THE STORMWATER MANAGEMENT/BMP FACILITIES. THE FACILITIES HAVE BEEN FOUND TO BE BUILT IN CONFORMANCE WITH THE APPROVED CONSTRUCTION PLAN. FIELD INSPECTION FURTHER ATTESTS THAT THE FACILITY IS FUNCTIONING WELL FOR THE PURPOSE FOR WHICH IT IS DESIGNED BY PROVIDING QUANTITY AND QUALITY STORMWATER TREATMENT AT THE SITE.

James R. Ashley
JAMES R. ASHLEY, P.E., VA LICENSE NUMBER 026773 11-27-14
DATE

*Approved
3-12-14
[Signature]*

REVISIONS		
NO.	DESCRIPTION	DATE
1	ADDRESS COUNTY COMMENTS	11-17-14



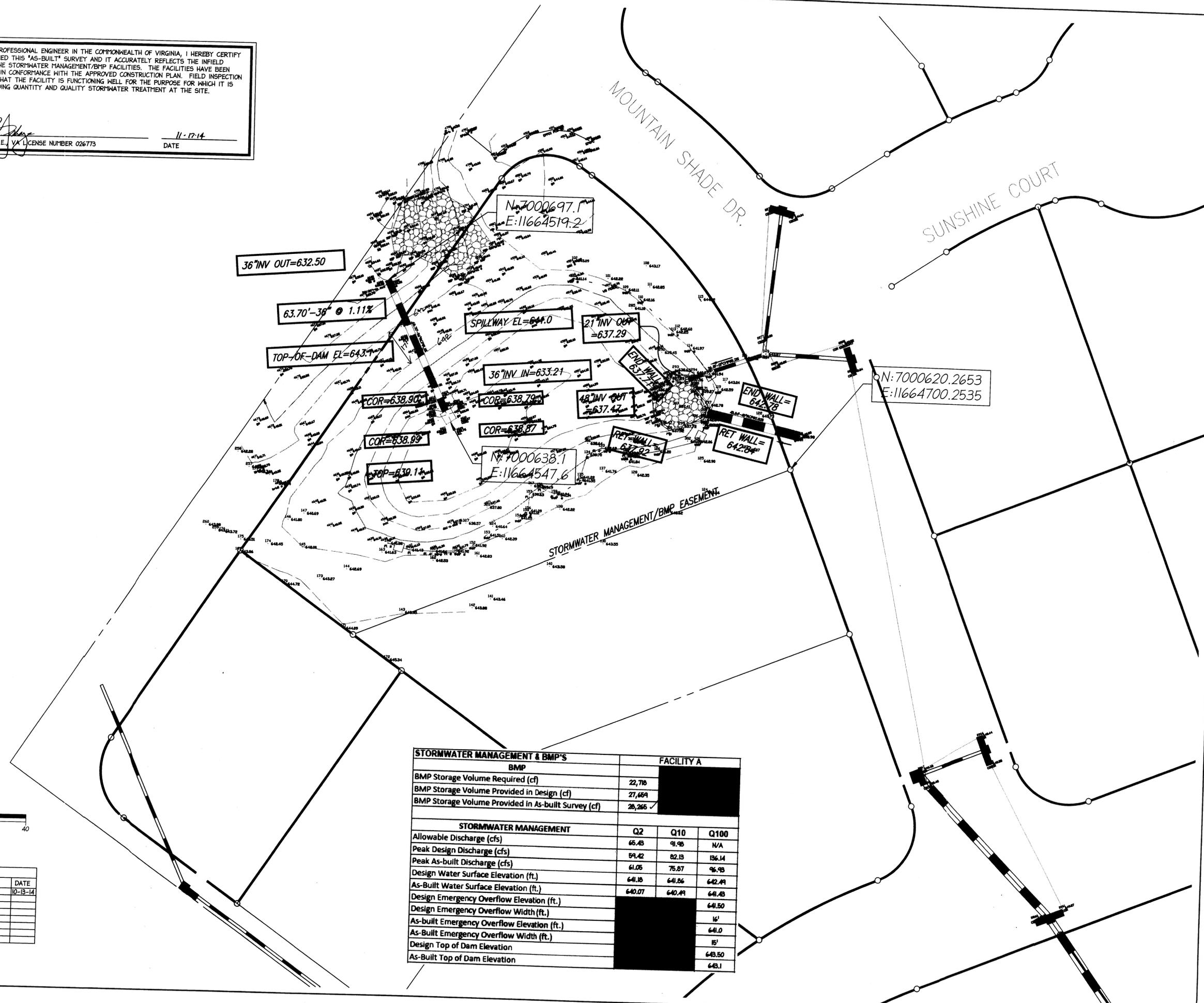
CARSON ASHLEY
ENGINEERS . SURVEYORS . PLANNERS

410 Rosedale Court . Suite 200 . Warrenton, Virginia 20186
Phone: (540) 347-9191 . Fax: (540) 349-1905
www.carson-ashley.com

AS-BUILT MOUNTAIN SHADE FOR SWM POND

AS A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF VIRGINIA, I HEREBY CERTIFY THAT I HAVE REVIEWED THIS "AS-BUILT" SURVEY AND IT ACCURATELY REFLECTS THE INFIELD CONSTRUCTION OF THE STORMWATER MANAGEMENT/BMP FACILITIES. THE FACILITIES HAVE BEEN FOUND TO BE BUILT IN CONFORMANCE WITH THE APPROVED CONSTRUCTION PLAN. FIELD INSPECTION FURTHER ATTESTS THAT THE FACILITY IS FUNCTIONING WELL FOR THE PURPOSE FOR WHICH IT IS DESIGNED BY PROVIDING QUANTITY AND QUALITY STORMWATER TREATMENT AT THE SITE.

James R. Ashley
 JAMES R. ASHLEY, P.E., VA LICENSE NUMBER 026773 DATE 11-17-14

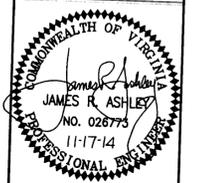


REVISIONS		
NO.	DESCRIPTION	DATE
1	ADDRESS COUNTY COMMENTS	10-13-14

STORMWATER MANAGEMENT & BMP'S		FACILITY A		
BMP				
BMP Storage Volume Required (cf)	22,716			
BMP Storage Volume Provided in Design (cf)	27,659			
BMP Storage Volume Provided in As-built Survey (cf)	28,265 ✓			
STORMWATER MANAGEMENT				
Allowable Discharge (cfs)	Q2	Q10	Q100	
Peak Design Discharge (cfs)	65.43	91.93	N/A	
Peak As-built Discharge (cfs)	59.42	82.13	136.14	
Design Water Surface Elevation (ft.)	61.05	75.87	96.93	
As-Built Water Surface Elevation (ft.)	64.18	64.86	642.44	
Design Emergency Overflow Elevation (ft.)	640.07	640.44	641.43	
Design Emergency Overflow Width (ft.)				641.50
As-built Emergency Overflow Elevation (ft.)				16'
As-Built Emergency Overflow Width (ft.)				641.0
Design Top of Dam Elevation				15'
As-Built Top of Dam Elevation				643.50
As-Built Top of Dam Elevation				643.1

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AS-BUILT SURVEY
MOUNTAIN SHADE
 MARSHALL MAGISTERIAL DISTRICT
 FAUQUIER COUNTY, VIRGINIA



DESIGNED BY:
 JRA
 DATE:
 9/26/2012
 SCALE:
 1"=20'
 SHEET 2
 OF 3

MOUNTAIN SHADE SUBDIVISION STORMWATER MANAGEMENT AND BEST MANAGEMENT PRACTICE CALCULATIONS AND INFORMATION

MOUNTAIN SHADE SUBDIVISION CONSISTS OF 10.75 ACRES OF MODERATELY SLOPED LAND BOUNDED BY EXISTING SUBDIVISIONS ON TWO SIDES, AND BY FARMLAND AND A ROAD ON THE OTHER TWO SIDES. THE ENTIRE PROPERTY DRAINS TO THE GOOSE CREEK WATERSHED BY MEANS OF A SMALL STREAM WHICH CROSSES THE PARCEL. A TOTAL OF 36.80 ACRES OF OFF-SITE DEVELOPED PROPERTY (SINGLE FAMILY SUBDIVISIONS) ALSO DRAINS ACROSS THE SITE. THIS OFF-SITE PROPERTY WAS INCLUDED IN ALL SWM CALCULATIONS, WHILE BMP COMPUTATIONS SHOW THAT BMP REQUIREMENTS CAN BE MET WITHOUT TAKING OFF-SITE CREDIT. STORMWATER MANAGEMENT AND BMP REQUIREMENTS WERE MET USING A SMALL WET POND WITH BOTTOM ELEVATION 632.0 FEET AND TOP OF BERM AT ELEVATION 643.5 FEET.

THE REQUIRED BMP VOLUME, (3)(9272) = 27,816 CF (0.6386 AC-FT), IS CONTAINED BETWEEN ELEVATIONS 632.30 FEET AND 639.30 FEET, WHICH IS THE DESIGN WATER SURFACE ELEVATION FOR THE WET POND.

THE SWM POND PRINCIPAL OUTLET STRUCTURE CONSISTS OF A STANDARD DI-7 GRATE INLET ON A STANDARD PRECAST MANHOLE STANDPIPE. ELEVATION OF THE DI-7 INLET SHALL BE SET AT ELEVATION 639.30 FEET. A GRASS-LINED, TRAPEZOIDAL SPILLWAY WITH 16 FOOT BOTTOM WIDTH AT ELEVATION 641.5 FEET, ALLOWS DISCHARGE OF THE 100-YEAR STORM RUNOFF WHILE MAINTAINING AT LEAST ONE FOOT OF FREEBOARD IN THE POND. THE POND IS DESIGNED SO THAT THE SUM OF THE 2-YEAR POST-DEVELOPMENT DISCHARGE FROM THE SWM POND AND THE DISCHARGE FROM THE 2-YEAR POST-DEVELOPMENT BYPASS AREAS, DOES NOT EXCEED THE TOTAL PRE-DEVELOPMENT FLOWS. OFFSITE AREAS ARE INCLUDED AS PART OF THE TOTAL DRAINAGE AREA. DETAILED INFORMATION ON TIMES OF CONCENTRATION, RUNOFF, AND POND ROUTING ARE PROVIDED IN A BINDER SUBMITTED WITH THESE PLANS. ALL RUN-OFF CALCULATIONS AND POND ROUTINGS WERE PERFORMED USING HAESTAD METHODS' POND PACK 6.0 SOFTWARE AND THE MODIFIED RATIONAL METHOD. THE AVAILABLE I-D-F CURVES FOR FAUQUIER COUNTY WERE USED THROUGHOUT. SWM ROUTING INFORMATION IS SUMMARIZED BELOW:

PRE-DEVELOPMENT STORMWATER RUNOFF SUMMARY

ON-SITE + OFF-SITE AREAS | 47.55 AC | C=0.42 | TC = 15 MIN | Q_p = 69.83 CFS

POST-DEVELOPMENT STORMWATER RUNOFF SUMMARY

DRAINAGE AREA	AREA	C	Tc	2-YEAR FLOW
BYPASS AREA	1.97 ACRES	0.42	5 MIN	4.40 CFS
POST-DEV AREA TO SWM	45.58 ACRES	0.41	11 MIN	89.81 CFS
POND DISCHARGE				39.42 CFS
TOTALS	47.55 ACRES			63.82 CFS

* POST-DEV AREAS FLOW TO THE POND AND ARE ROUTED THROUGH IT. PEAK FLOWS TO THE POND ARE NOT INCLUDED IN THE TOTAL SITE FLOW.

CONCLUSION

THE TOTAL 2-YEAR POST-DEVELOPMENT PEAK FLOW (63.82 CFS) IS LESS THAN THE TOTAL 2-YEAR PRE-DEVELOPMENT PEAK FLOW (69.83 CFS). THE 10-YEAR AND 100-YEAR RETURN PERIOD FLOWS ARE ALSO TOTALLY CONTAINED WITHIN THE POND, WHILE MAINTAINING 1 FOOT OF FREE-BOARD DURING A 100-YEAR EVENT. STORMWATER MANAGEMENT AND BMP DETENTION REQUIREMENTS ARE MET FOR MOUNTAIN SHADE SUBDIVISION.

REVISIONS		
NO.	DESCRIPTION	DATE
1	ADDRESS COUNTY COMMENTS	10-18-14

BYPASS FLOW

PRE & POST DEVELOPMENT FLOW PASSING THROUGH MOUNTAIN SHADE AND DISCHARGING TO GOLDEN ACRES SUBDIVISION.

PRE-DEVELOPMENT

2.82 ACRES
C = 0.35
Q_p = 7.27 * 2.82 * .35 = 7.81 CFS

POST DEVELOPMENT

.23 ACRES @ .90
1.74 ACRES @ .35
C = .41
Q_p = 7.27 * 1.97 * .41 = 5.93 CFS

POST DEVELOPMENT FLOW < PRE DEVELOPMENT FLOW.

BMP FACILITY DESIGN WORKSHEET

STEP 1. DETERMINE THE REQUIRED BMP STORAGE VOLUME FOR THE SITE.

- A) SITE ARE DRAINING INTO THE OCCOQUAN WATERSHED 10.75 ACRES
- B) IMPERVIOUS OF AREA IN STEP 1A: 27.6%
- IMPERVIOUS = 27.6%
OF C VALUE =
- C) CHART A VALUE = 862.5 cf/AC
- D) TOTAL REQUIRED BMP STORAGE FOR THE SITE (AxC) = 9272 cf
(x3)=27816 cf

STEP 2. DETERMINE THE REQUIRED BMP STORAGE FOR THE PROPOSED FACILITY.

- A) ON-SITE AREA (AND OFF-SITE AREA IF CREDIT IS TO BE TAKEN) DRAINING TO THE PROPOSED FACILITY 8.78 ACRES
- B) IMPERVIOUS OF AREA IN STEP 2A: 27.6%
- IMPERVIOUS = 27.6%
OF C VALUE =
- C) CHART A VALUE = 862.5 cf/AC
- D) TOTAL REQUIRED BMP STORAGE FOR THE SITE (AxC) = 7573 cf
(x3)=22,718 cf **28,285 CF**

NOTE: REPEAT STEP 2 FOR EACH PROPOSED BMP FACILITY.

27,659 cf PROVIDED

STEP 3 CHECK UNCONTROLLED AREAS.

- A) IN THE UNCONTROLLED PORTIONS OF THE SITE, MEASURES THE OPEN AREAS AND ANY IMPERVIOUS AREAS THAT DRAIN BY SHEET FLOW OVER AN OPEN AREA. 1.97 ACRES
- B) DIVIDE (A) BY 2 0.98 ACRES
- C) MULTIPLY (B) BY THE ANSWER FROM 1 (C) 0.98 cf

STEP 4 CHECK SITE COVERAGE

- A) TOTAL BMP VOLUMES PROVIDED: 8418 cf
- SUM ALL OF STEPS 2(D) AND ADD TO 3 (C)
- B) PERCENTAGE OF STORAGE VOLUME PROVIDED: 90.8%
- DIVIDED 4 (A) BY 1 (D)
- C) COMPARE 4 (B) TO 70% 90.8% > 70%
- DESIGN IS ACCEPTABLE IF 4 (B) 90.8% > 70%
- DESIGN IS UNACCEPTABLE IF 4 (B) < 70%

IF OFF-SITE CREDIT IS NOT TO BE TAKEN:

- D) TOTAL EQUIVALENT CONTROLLED AREA: 9.76 ACRES
- ADD SUM STEPS 2(A) TO 3 (B)
- E) PERCENTAGES OF THE SITE IS CONTROLLED: 90.8%
- DIVIDE 4 (D) BY 1 (A)
- F) COMPARE 4 (E) TO 70% 90.8% > 70%
- DESIGN IS ACCEPTABLE IF 4 (E) 90.8% > 70%
- DESIGN IS UNACCEPTABLE IF 4 (E) < 70%

STEP 5. IMPERVIOUS ACRES SERVED

- A) MEASURE TOTAL IMPERVIOUS AREA (INCLUDING OFF-SITE AREA IF CREDIT IS TO BE TAKEN) 2.96 ACRES
- 1. IMPERVIOUS AREA FROM HOUSES: 27*900 SF = 24,300 SF
- 2. DOUBLE GARAGES: 27*400 SF = 10,800 SF
- 3. PORCHES, STOODS, & DRIVEWAYS = 31,455 SF
- 4. ELDRADO DRIVE (W/WALK) = 31,850 SF
- 5. MOUNTAIN SHADE DRIVE (W/WALK) = 16,763 SF
- 6. SUNSHINE COURT (W/WALK) = 13,850 SF
- TOTAL = 129,018 SF

129,018 SF = 2.96 ACRES
2.96/10.75 = 27.6% IMP

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James R. Ashley
JAMES R. ASHLEY, P.E., VA LICENSE NUMBER 026773 DATE 11-17-14

SEDIMENT BASIN CALCULATIONS

5.57 ACRES DRAINED TO POND
STORAGE REQUIRED - TOTAL VOLUME DRY & WET 639.30
134 cu/AC x 5.57 AC = 746 cu yd
746 cu yd x 27 $\frac{cu\ ft}{cu\ yd}$ = 20,152 cu ft
WET VOLUME = 10,076 cu ft
DRY VOLUME = 10,076 cu ft
CLEAN OUT VOLUME = 5171 cu ft

SEDIMENT BASIN ELEVATIONS

ELEVATIONS DETERMINED FROM VOLUME STORAGE TABLE CALCULATED FOR SWM/BMP POND
TOP OF DAM = 643.50
RISER CREST = 639.30
DRY POND ELEVATION = 638.40
DEWATERING DEVICE = 636.60
WET POND ELEVATION = 636.60
CLEAN OUT ELEVATION = 635.30
BOTTOM OF POND = 632.00

ORIFICE CALCULATIONS

Q = 10,076 cu ft / 21,600
= 0.4665 CFS

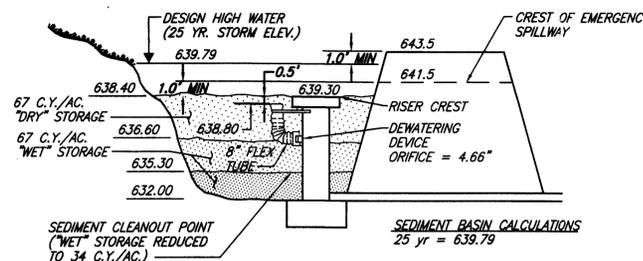
h = (639.30 - 636.60) / 2
= 1.35

A = $\frac{0.4665}{(64.32 \times ((1.35/2))^{0.6})}$
= 0.1180

d = $2 \times (0.1180/3.14)^{0.5}$
= .39 ft = 4.66"

NOTE

THE POND IS TO BE BUILT AS DESIGNED AND USED AS A TEMPORARY SEDIMENT BASIN. THE OUTFALL FOR THE POND WILL BE THE SAME OUTFALL AS FOR THE SEDIMENT BASIN, WITH THE ONLY MODIFICATION BEING THAT THE DEWATERING DEVICE IS TO BE BLOCKED & PLUGGED WHILE TRANSITION FROM BASIN TO SWM/BMP POND. A TEMPORARY BYPASS PIPING SYSTEM TO DIVERT OFF-SITE WATER FROM THE SEDIMENT BASIN SHALL BE CONSTRUCTED ALONG WITH THE BASIN. WHEN THE SITE IS COMPLETED AND STABILIZED THE SEDIMENT IS TO BE REMOVED AND THE TEMPORARY BYPASS PIPING SHALL BE CUT IN ORDER TO TRANSITION TO THE SWM/BMP POND.



SEDIMENT BASIN SCHEMATIC ELEVATIONS

SCALE: NTS

ANTI-SEEP COLLARS

Ls = Y(Z+4) (1 + (S/25-S))
Ls = 7.3(2+4) (1+(.011/25-.011))
Ls = 45.8

2 COLLARS - 5.95' x 5.25'

Name... SEDIMENT BASIN Trq: 25YR
File... C:\HAESTAD\PPK\PROJECTS\MTHSHADE.PPK
Title... SWM POND VOLUMES

Elevation (ft.)	Planimeter (sq. ft.)	Area (sq. ft.)	A1+A2+age(A1+A2) (cu. ft.)	Volume (cu. ft.)	Volume Sum (cu. ft.)
632.00	14368	14368	2180	2180	2180
634.00	14368	14368	4360	6540	7720
636.00	14368	14368	6560	13100	17820
638.00	14368	14368	8760	21860	24500
640.00	14368	14368	10960	32820	35480
642.00	14368	14368	13160	45980	48660
644.00	14368	14368	15360	61340	64040

Elevations With Areas Interpolated From The Closest Two Planimeter Readings

Elevation (ft.)	Planimeter (sq. ft.)	Area (sq. ft.)	A1+A2+age(A1+A2) (cu. ft.)	Volume (cu. ft.)	Volume Sum (cu. ft.)
632.00	14368	14368	2180	2180	2180
632.50	14368	14368	2590	4770	6950
633.00	14368	14368	3000	7970	14920
633.50	14368	14368	3410	11170	26090
634.00	14368	14368	3820	14370	40460
634.50	14368	14368	4230	17570	55830
635.00	14368	14368	4640	20770	72200
635.50	14368	14368	5050	23970	89570
636.00	14368	14368	5460	27170	107540
636.50	14368	14368	5870	30370	126110
637.00	14368	14368	6280	33570	145280
637.50	14368	14368	6690	36770	165050
638.00	14368	14368	7100	39970	185420
638.50	14368	14368	7510	43170	206390
639.00	14368	14368	7920	46370	227960
639.50	14368	14368	8330	49570	250130
640.00	14368	14368	8740	52770	272900
640.50	14368	14368	9150	55970	296270
641.00	14368	14368	9560	59170	320240
641.50	14368	14368	9970	62370	344810
642.00	14368	14368	10380	65570	370080
642.50	14368	14368	10790	68770	396050
643.00	14368	14368	11200	71970	422720
643.50	14368	14368	11610	75170	450090
644.00	14368	14368	12020	78370	478160
644.50	14368	14368	12430	81570	506930
645.00	14368	14368	12840	84770	536400
645.50	14368	14368	13250	87970	566570
646.00	14368	14368	13660	91170	597440
646.50	14368	14368	14070	94370	629010
647.00	14368	14368	14480	97570	661280
647.50	14368	14368	14890	100770	694350
648.00	14368	14368	15300	103970	728120
648.50	14368	14368	15710	107170	762590
649.00	14368	14368	16120	110370	797760
649.50	14368	14368	16530	113570	833630
650.00	14368	14368	16940	116770	870200
650.50	14368	14368	17350	119970	907470
651.00	14368	14368	17760	123170	945440
651.50	14368	14368	18170	126370	984110
652.00	14368	14368	18580	129570	1023480
652.50	14368	14368	18990	132770	1063650
653.00	14368	14368	19400	135970	1104520
653.50	14368	14368	19810	139170	1146090
654.00	14368	14368	20220	142370	1188360
654.50	14368	14368	20630	145570	1231330
655.00	14368	14368	21040	148770	1275000
655.50	14368	14368	21450	151970	1319370
656.00	14368	14368	21860	155170	1364440
656.50	14368	14368	22270	158370	1410210
657.00	14368	14368	22680	161570	1456680
657.50	14368	14368	23090	164770	1503850
658.00	14368	14368	23500	167970	1551720
658.50	14368	14368	23910	171170	1600290
659.00	14368	14368	24320	174370	1649560
659.50	14368	14368	24730	177570	1700530
660.00	14368	14368	25140	180770	1753200
660.50	14368	14368	25550	183970	1807570
661.00	14368	14368	25960	187170	1863640
661.50	14368	14368	26370	190370	1921410
662.00	14368	14368	26780	193570	1980880
662.50	14368	14368	27190	196770	2042050
663.00	14368	14368	27600	199970	2104920
663.50	14368	14368	28010	203170	2169490
664.00	14368	14368	28420	206370	2235760
664.50	14368	14368	28830	209570	2303730
665.00	14368	14368	29240	212770	2373400
665.50	14368	14368	29650	215970	2444770
666.00	14368	14368	30060	219170	2517840
666.50	14368	14368	30470	222370	2592610
667.00	14368	14368	30880	225570	2669080
667.50	14368	14368	31290	228770	2747250
668.00	14368	14368	31700	231970	2827120
668.50	14368	14368	32110	235170	2908690
669.00	14368	14368	32520	238370	2991960
669.50	14368	14368	32930	241570	3076930
670.00	14368	14368	33340	244770	3163600
670.50	14368	14368	33750	247970	3251970
671.00	14368	14368	34160	251170	3342040
671.50	14368	14368	34570	254370	3433810
672.00	14368	14368	34980	257570	3527280
672.50	14368	14368	35390	260770	3622450
673.00	14368	14368	35800	263970	3719320
673.50	14368	14368	36210	267170	3817890
674.00	14368	14368	36620	270370	3918160
674.50	14368	14368			