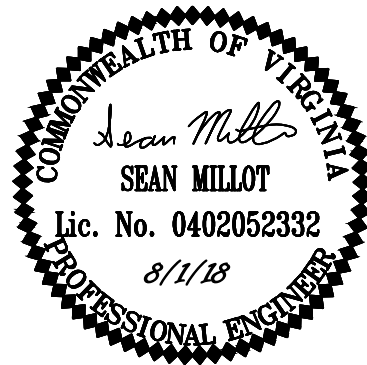


Sediment Basin and Trap Design for:

Spotsylvania Solar Energy Center
Spotsylvania County, Virginia

Prepared for:
Swinerton Renewable Energy
KHA Project #: 110554000
August 2018



Prepared by:

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VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E3
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E3

Phase 1

Drainage Area (ac) = **22.44**
 Disturbed Area (ac) = **22.44**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **14.87**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.48**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.28**
 Flow (Q₂) (cfs) = **39.0** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **59.2** (Q=c*i*drainage area)
 Required Storage (cf) = **81,188** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **40,594** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **40,594** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	360.50	20,654	0
	361.00	21,810	10,616
	361.50	22,970	21,811
	362.00	24,136	33,588
Permanent Pool Elevation	362.50	25,307	45,948
	363.00	26,483	58,896
	363.50	27,665	72,433
	364.00	28,851	86,562
Riser Crest/Dry Storage Elevation	364.50	30,042	101,285
	365.00	31,239	116,605
25-yr Estimated WSE	365.50	32,440	132,525
	366.00	33,647	149,047
	366.50	34,860	166,174
	367.00	36,078	183,908
Top of Basin Elevation	367.50	37,303	202,253

Designed Storage Elevation (ft)= **364.50**
 Designed Total Storage Volume (cf)= **101,285** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **45,948** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **55,337** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **29.6**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **50**
 Barrel Invert Elevation (Upstream) = **360.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **360.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **38.5**
 Weight of Water Displaced (lb) = **2,400**
 Min. Required Weight of Anchor Block (lb) = **3,000** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **55,337**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **2.56**
 Flow Area of Orifice = **0.53**
 Diameter of Circular orifice (in) = **10.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E4
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E4

Phase 1

Drainage Area (ac) = **6.75**
 Disturbed Area (ac) = **6.75**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **17.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **26.0** (Q=c*i*drainage area)
 Required Storage (cf) = **24,422** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **12,211** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **12,211** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	355.50	9,264	0
	356.00	9,855	4,780
	356.50	10,452	9,857
Permanent Pool Elevation	357.00	11,056	15,234
	357.50	11,665	20,914
	358.00	12,281	26,900
Riser Crest/Dry Storage Elevation	358.50	12,903	33,196
	359.00	13,531	39,805
25-yr Estimated WSE	359.50	14,166	46,729
	360.00	14,806	53,972
	360.50	15,453	61,537
	361.00	16,106	69,427
Top of Basin Elevation	361.50	16,765	77,644

Designed Storage Elevation (ft)= **358.50**
 Designed Total Storage Volume (cf)= **33,196** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **15,234** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **17,963** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **13.0**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **24** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **21** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **48**
 Barrel Invert Elevation (Upstream) = **355.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **355.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **24**
 Riser Area (sf) = **3.14**
 Volume of Water Displaced (cf) = **9.4**
 Weight of Water Displaced (lb) = **588**
 Min. Required Weight of Anchor Block (lb) = **735** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **4.0** (Sized per VESCH)
 Length (lf) = **4.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **3,504** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **17,963**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.83**
 Flow Area of Orifice = **0.20**
 Diameter of Circular orifice (in) = **7.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E5
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E5

Phase 1

Drainage Area (ac) = **38.21**
 Disturbed Area (ac) = **38.21**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **11.83**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.85**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.81**
 Flow (Q₂) (cfs) = **73.5** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **110.9** (Q=c*i*drainage area)
 Required Storage (cf) = **138,244** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **69,122** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **69,122** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	342.50	26,523	0
	343.00	27,755	13,570
	343.50	28,994	27,757
	344.00	30,240	42,565
Permanent Pool Elevation	344.50	31,491	57,998
	345.00	32,749	74,058
	345.50	34,013	90,749
	346.00	35,283	108,073
Riser Crest/Dry Storage Elevation	346.50	36,560	126,033
	347.00	37,843	144,634
	347.50	39,132	163,877
	348.00	40,427	183,767
25-yr Estimated WSE	348.50	41,729	204,306
	349.00	43,037	225,497
	349.50	44,351	247,344
	350.00	45,140	269,717
Top of Basin Elevation			

Designed Storage Elevation (ft)= **347.00**
 Designed Total Storage Volume (cf)= **144,634** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **74,058** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **70,576** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **55.5**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **72** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **36** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **48**
 Barrel Invert Elevation (Upstream) = **342.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **342.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **72**
 Riser Area (sf) = **28.26**
 Volume of Water Displaced (cf) = **127.2**
 Weight of Water Displaced (lb) = **7,935**
 Min. Required Weight of Anchor Block (lb) = **9,919** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **12.0** (Sized per VESCH)
 Length (lf) = **12.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **31,536** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **70,576**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **3.27**
 Flow Area of Orifice = **0.68**
 Diameter of Circular orifice (in) = **12.00** **Vertical Orifice Required**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E6
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E6

Phase 1

Drainage Area (ac) = 37.34
 Disturbed Area (ac) = 37.34
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 17.52
 2-yr Rainfall Intensity "i" (in/hr)* = 3.21
 25-yr Rainfall Intensity "i" (in/hr)* = 4.91
 Flow (Q₂) (cfs) = 60.0 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 91.6 (Q=c*i*drainage area)
 Required Storage (cf) = 135,096 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 67,548 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 67,548 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	295.50	16,266	0
	296.00	17,157	8,356
	296.50	18,055	17,159
	297.00	18,958	26,412
	297.50	19,868	36,119
Permanent Pool Elevation	298.00	20,785	46,282
	298.50	21,707	56,905
	299.00	22,363	67,922
	299.50	23,571	79,406
	300.00	24,513	91,427
Riser Crest/Dry Storage Elevation	300.50	25,461	103,920
	301.00	26,415	116,889
	301.50	27,375	130,337
	302.00	28,341	144,266
25-yr Estimated WSE	302.50	29,314	158,680
	303.00	30,293	173,581
	303.50	31,279	188,974
Top of Basin Elevation	304.00	32,271	204,862
	305.00	34,272	238,133

Designed Storage Elevation (ft)= 302.00
 Designed Total Storage Volume (cf)= 144,266 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 67,922 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 76,344 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 45.8
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 60 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 30 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 70
 Barrel Invert Elevation (Upstream) = 295.50 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 295.00

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 60
 Riser Area (sf) = 19.63
 Volume of Water Displaced (cf) = 127.6
 Weight of Water Displaced (lb) = 7,960
 Min. Required Weight of Anchor Block (lb) = 9,950 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 10.0 (Sized per VESCH)
 Length (lf) = 10.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 21,900 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.50
 Total "Dry" Storage (cf) = 76,344
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 3.53
 Flow Area of Orifice = 0.60
 Diameter of Circular orifice (in) = 11.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E7
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E7

Phase 1

Drainage Area (ac) = **24.23**
 Disturbed Area (ac) = **24.23**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **12.77**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.72**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.63**
 Flow (Q₂) (cfs) = **45.1** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **68.2** (Q=c*i*drainage area)
 Required Storage (cf) = **87,664** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **43,832** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **43,832** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	298.00	21,554	0
	298.50	22,806	11,090
	299.00	24,064	22,807
	299.50	25,329	35,156
Permanent Pool Elevation	300.00	26,600	48,138
	300.50	27,877	61,757
	301.00	29,160	76,016
Riser Crest/Dry Storage Elevation	301.50	30,450	90,919
	302.00	31,746	106,468
	302.50	33,048	122,666
25-yr Estimated WSE	303.00	34,357	139,517
	303.50	35,672	157,024
	304.00	36,993	175,190
	304.50	38,320	194,019
Top of Basin Elevation	305.00	39,654	213,512

Designed Storage Elevation (ft)= **302.00**
 Designed Total Storage Volume (cf)= **106,468** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **48,138** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **58,330** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **34.1**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **60**
 Barrel Invert Elevation (Upstream) = **298.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **297.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **38.5**
 Weight of Water Displaced (lb) = **2,400**
 Min. Required Weight of Anchor Block (lb) = **3,000** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **58,330**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **2.70**
 Flow Area of Orifice = **0.56**
 Diameter of Circular orifice (in) = **11.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E8
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E8

Phase 1

Drainage Area (ac) = **34.54**
 Disturbed Area (ac) = **34.54**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **21.20**
 2-yr Rainfall Intensity "i" (in/hr)* = **2.91**
 25-yr Rainfall Intensity "i" (in/hr)* = **4.49**
 Flow (Q₂) (cfs) = **50.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **77.5** (Q=c*i*drainage area)
 Required Storage (cf) = **124,966** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **62,483** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **62,483** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	316.00	18,106	0
	316.50	19,138	9,311
	317.00	20,176	19,139
	317.50	21,221	29,489
	318.00	22,272	40,362
Permanent Pool Elevation	318.50	23,330	51,762
	319.00	24,393	63,693
	319.50	25,463	76,157
	320.00	26,539	89,158
	320.50	27,622	102,698
Riser Crest/Dry Storage Elevation	321.00	28,710	116,781
	321.50	29,805	131,410
	322.00	30,907	146,588
25-yr Estimated WSE	322.50	32,014	162,318
	323.00	33,128	178,603
	323.50	34,248	195,447
	324.00	35,374	212,853
Top of Basin Elevation	324.50	36,507	230,823

Designed Storage Elevation (ft)= **321.50**
 Designed Total Storage Volume (cf)= **131,410** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **63,693** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **67,717** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **38.7**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **48** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **55**
 Barrel Invert Elevation (Upstream) = **316.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **315.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **48**
 Riser Area (sf) = **12.56**
 Volume of Water Displaced (cf) = **69.1**
 Weight of Water Displaced (lb) = **4,311**
 Min. Required Weight of Anchor Block (lb) = **5,388** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **8.0** (Sized per VESCH)
 Length (lf) = **8.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **14,016** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.25**
 Total "Dry" Storage (cf) = **67,717**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **3.14**
 Flow Area of Orifice = **0.58**
 Diameter of Circular orifice (in) = **11.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E9A
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E9A

Phase 1

Drainage Area (ac) = 27.12
 Disturbed Area (ac) = 27.12
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 69.0 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 104.5 (Q=c*i*drainage area)
 Required Storage (cf) = 98,120 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 49,060 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 49,060 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)	Cumulative Volume (CF)
Bottom of Basin Elevation	339.00	19,661
	339.50	20,395
	340.00	21,135
	340.50	21,881
	341.00	22,634
Permanent Pool Elevation	341.50	23,392
	342.00	24,157
	342.50	24,928
	343.00	25,706
Riser Crest/Dry Storage Elevation	343.50	26,489
	344.00	27,279
25-yr Estimated WSE	344.50	28,075
	345.00	28,877
	345.50	29,686
	346.00	30,501
Top of Basin Elevation	346.50	31,321

Designed Storage Elevation (ft)= 343.50
 Designed Total Storage Volume (cf)= 103,652 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 53,786 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 49,866 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 52.2
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 66 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 36 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 50
 Barrel Invert Elevation (Upstream) = 339.00 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 338.50

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 66
 Riser Area (sf) = 23.75
 Volume of Water Displaced (cf) = 106.9
 Weight of Water Displaced (lb) = 6,668
 Min. Required Weight of Anchor Block (lb) = 8,335 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 11.0 (Sized per VESCH)
 Length (lf) = 11.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 26,499 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.00
 Total "Dry" Storage (cf) = 49,866
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 2.31
 Flow Area of Orifice = 0.48
 Diameter of Circular orifice (in) = 10.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E9B
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E9B

Phase 1

Drainage Area (ac) = **22.48**
 Disturbed Area (ac) = **22.48**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **12.80**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.72**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.62**
 Flow (Q₂) (cfs) = **41.8** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **63.2** (Q=c*i*drainage area)
 Required Storage (cf) = **81,333** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **40,666** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **40,666** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	324.00	22,463	0
	324.50	23,352	11,454
	325.00	24,248	23,354
Permanent Pool Elevation	325.50	25,150	35,703
	326.00	26,058	48,505
	326.50	26,972	61,763
Riser Crest/Dry Storage Elevation	327.00	27,893	75,479
	327.50	28,819	89,657
	328.00	29,752	104,300
25-yr Estimated WSE	328.50	30,691	119,411
	329.00	31,636	134,992
	329.50	32,588	151,048
Top of Basin Elevation	330.00	33,545	167,582
	330.50	34,509	184,595
	331.00	35,479	202,092

Designed Storage Elevation (ft)= **328.00**
 Designed Total Storage Volume (cf)= **104,300** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **48,505** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **55,795** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **31.6**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **54**
 Barrel Invert Elevation (Upstream) = **324.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **323.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **38.5**
 Weight of Water Displaced (lb) = **2,400**
 Min. Required Weight of Anchor Block (lb) = **3,000** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **55,795**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **2.58**
 Flow Area of Orifice = **0.54**
 Diameter of Circular orifice (in) = **10.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E10A
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E10A

Phase 1

Drainage Area (ac) = **7.48**
 Disturbed Area (ac) = **7.48**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **19.0** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **28.8** (Q=c*i*drainage area)
 Required Storage (cf) = **27,063** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **13,531** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **13,531** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	283.50	8,294	0
	284.00	8,823	4,279
	284.50	9,358	8,824
Permanent Pool Elevation	285.00	9,899	13,638
	285.50	10,447	18,725
	286.00	11,001	24,087
Riser Crest/Dry Storage Elevation	286.50	11,561	29,727
	287.00	12,128	35,649
25-yr Estimated WSE	287.50	12,700	41,856
	288.00	13,279	48,351
	288.50	13,865	55,137
	289.00	14,456	62,217
Top of Basin Elevation	289.50	15,054	69,595

Designed Storage Elevation (ft)= **286.50**
 Designed Total Storage Volume (cf)= **29,727** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **13,638** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **16,089** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **14.4**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **24** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **21** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **40**
 Barrel Invert Elevation (Upstream) = **283.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **283.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **24**
 Riser Area (sf) = **3.14**
 Volume of Water Displaced (cf) = **9.4**
 Weight of Water Displaced (lb) = **588**
 Min. Required Weight of Anchor Block (lb) = **735** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **4.0** (Sized per VESCH)
 Length (lf) = **4.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **3,504** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **16,089**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.74**
 Flow Area of Orifice = **0.18**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E10B
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E10B

Phase 1

Drainage Area (ac) = **8.06**
 Disturbed Area (ac) = **8.06**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **20.5** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **31.1** (Q=c*i*drainage area)
 Required Storage (cf) = **29,161** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **14,581** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **14,581** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	305.50	6,638	0
	306.00	6,974	3,403
	306.50	7,317	6,976
Permanent Pool Elevation	307.00	7,666	10,721
	307.50	8,021	14,643
	308.00	8,383	18,744
Riser Crest/Dry Storage Elevation	308.50	8,751	23,028
	309.00	9,125	27,497
	309.50	9,506	32,155
25-yr Estimated WSE	310.00	9,893	37,005
	310.50	10,286	42,049
	311.00	10,685	47,292
Top of Basin Elevation	311.50	11,091	52,736
	312.00	11,503	58,384
	312.50	11,921	64,240

Designed Storage Elevation (ft)= **309.50**
 Designed Total Storage Volume (cf)= **32,155** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **14,643** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **17,512** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **31.1**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **45**
 Barrel Invert Elevation (Upstream) = **305.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **305.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **38.5**
 Weight of Water Displaced (lb) = **2,400**
 Min. Required Weight of Anchor Block (lb) = **3,000** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **17,512**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.81**
 Flow Area of Orifice = **0.17**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E10C
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E10C

Phase 1

Drainage Area (ac) = **6.85**
 Disturbed Area (ac) = **6.85**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **17.4** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **26.4** (Q=c*i*drainage area)
 Required Storage (cf) = **24,783** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **12,392** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **12,392** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	287.50	6,040	0
	288.00	6,457	3,124
	288.50	6,881	6,459
Permanent Pool Elevation	289.00	7,310	10,007
	289.50	7,746	13,771
	290.00	8,188	17,754
Riser Crest/Dry Storage Elevation	290.50	8,636	21,960
	291.00	9,091	26,392
	291.50	9,551	31,052
25-yr Estimated WSE	292.00	10,018	35,945
	292.50	10,491	41,072
	293.00	10,971	46,438
Top of Basin Elevation	293.50	11,456	52,044
	294.00	11,948	57,896

Designed Storage Elevation (ft)= **291.00**
 Designed Total Storage Volume (cf)= **26,392** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **13,771** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **12,621** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **26.4**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **36** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **24** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **42**
 Barrel Invert Elevation (Upstream) = **287.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **287.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **36**
 Riser Area (sf) = **7.07**
 Volume of Water Displaced (cf) = **24.7**
 Weight of Water Displaced (lb) = **1,543**
 Min. Required Weight of Anchor Block (lb) = **1,929** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **6.0** (Sized per VESCH)
 Length (lf) = **6.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **7,884** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **12,621**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.58**
 Flow Area of Orifice = **0.14**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E11A
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E11A

Phase 1

Drainage Area (ac) = **18.37**
 Disturbed Area (ac) = **18.37**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **46.7** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **70.8** (Q=c*i*drainage area)
 Required Storage (cf) = **66,463** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **33,231** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **33,231** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	280.50	11,190	0
	281.00	11,809	5,750
	281.50	12,434	11,810
	282.00	13,065	18,185
	282.50	13,703	24,877
Permanent Pool Elevation	283.00	14,347	31,889
	283.50	14,997	39,226
	284.00	15,654	46,888
	284.50	13,617	54,206
	285.00	16,986	61,857
Riser Crest/Dry Storage Elevation	285.50	17,661	70,519
	286.00	18,343	79,520
	286.50	19,031	88,863
25-yr Estimated WSE	287.00	19,725	98,552
	287.50	21,132	108,767
	288.00	21,132	119,333
	288.50	21,845	130,077
Top of Basin Elevation	289.00	22,565	141,180

Designed Storage Elevation (ft)= **286.00**
 Designed Total Storage Volume (cf)= **79,520** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **39,226** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **40,294** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **70.8**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **96** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **42** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **70**
 Barrel Invert Elevation (Upstream) = **280.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **280.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **96**
 Riser Area (sf) = **50.24**
 Volume of Water Displaced (cf) = **276.3**
 Weight of Water Displaced (lb) = **17,242**
 Min. Required Weight of Anchor Block (lb) = **21,553** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **16.0** (Sized per VESCH)
 Length (lf) = **16.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **56,064** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.25**
 Total "Dry" Storage (cf) = **40,294**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **1.87**
 Flow Area of Orifice = **0.35**
 Diameter of Circular orifice (in) = **8.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E11B
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E11B

Phase 1

Drainage Area (ac) = **9.56**
 Disturbed Area (ac) = **9.56**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **24.3** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **36.8** (Q=c*i*drainage area)
 Required Storage (cf) = **34,588** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **17,294** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **17,294** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	284.50	3,660	0
	285.00	4,072	1,933
	285.50	4,490	4,074
	286.00	4,915	6,425
	286.50	5,345	8,990
Permanent Pool Elevation	287.00	5,782	11,772
	287.50	6,225	14,774
	288.00	6,674	17,998
	288.50	7,129	21,449
	289.00	7,591	25,130
Riser Crest/Dry Storage Elevation	289.50	8,059	29,042
	290.00	8,533	33,190
	290.50	9,014	37,577
25-yr Estimated WSE	291.00	9,500	42,205
	291.50	9,993	47,079
	292.00	10,492	52,200
Top of Basin Elevation	292.50	10,997	57,572
	293.00	11,508	63,198
	294.00	12,550	75,227

Designed Storage Elevation (ft)= **290.50**
 Designed Total Storage Volume (cf)= **37,577** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **17,998** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **19,579** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **36.8**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **48** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **55**
 Barrel Invert Elevation (Upstream) = **284.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **284.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **48**
 Riser Area (sf) = **12.56**
 Volume of Water Displaced (cf) = **75.4**
 Weight of Water Displaced (lb) = **4,702**
 Min. Required Weight of Anchor Block (lb) = **5,878** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **8.0** (Sized per VESCH)
 Length (lf) = **8.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **14,016** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.25**
 Total "Dry" Storage (cf) = **19,579**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.91**
 Flow Area of Orifice = **0.17**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E12
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E12

Phase 1

Drainage Area (ac) = **22.45**
 Disturbed Area (ac) = **22.45**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **10.54**
 2-yr Rainfall Intensity "i" (in/hr)* = **4.03**
 25-yr Rainfall Intensity "i" (in/hr)* = **6.07**
 Flow (Q₂) (cfs) = **45.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **68.2** (Q=c*i*drainage area)
 Required Storage (cf) = **81,224** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **40,612** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **40,612** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	271.00	20,239	0
	271.50	21,124	10,341
	272.00	22,014	21,125
Permanent Pool Elevation	272.50	22,911	32,357
	273.00	23,815	44,038
	273.50	24,724	56,173
Riser Crest/Dry Storage Elevation	274.00	25,640	68,764
	274.50	26,562	81,814
	275.00	27,490	95,327
25-yr Estimated WSE	275.50	28,424	109,306
	276.00	29,365	123,753
	276.50	30,312	138,672
Top of Basin Elevation	277.00	31,266	154,067
	277.50	32,225	169,940
	278.00	33,191	186,294

Designed Storage Elevation (ft)= **275.00**
 Designed Total Storage Volume (cf)= **95,327** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **44,038** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **51,289** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **34.1**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **48** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **53**
 Barrel Invert Elevation (Upstream) = **271.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **270.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **48**
 Riser Area (sf) = **12.56**
 Volume of Water Displaced (cf) = **50.2**
 Weight of Water Displaced (lb) = **3,135**
 Min. Required Weight of Anchor Block (lb) = **3,919** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **8.0** (Sized per VESCH)
 Length (lf) = **8.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **14,016** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **51,289**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **2.37**
 Flow Area of Orifice = **0.49**
 Diameter of Circular orifice (in) = **10.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E13
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E13

Phase 1

Drainage Area (ac) = 12.55
 Disturbed Area (ac) = 12.55
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.68
 2-yr Rainfall Intensity "i" (in/hr)* = 4.93
 25-yr Rainfall Intensity "i" (in/hr)* = 7.45
 Flow (Q₂) (cfs) = 30.9 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 46.7 (Q=c*i*drainage area)
 Required Storage (cf) = 45,406 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 22,703 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 22,703 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	277.50	11,455	0
	278.00	12,016	5,868
	278.50	12,584	12,018
Permanent Pool Elevation	279.00	13,158	18,453
	279.50	13,739	25,178
	280.00	14,325	32,194
Riser Crest/Dry Storage Elevation	280.50	14,918	39,504
	281.00	15,517	47,113
	281.50	16,123	55,023
25-yr Estimated WSE	282.00	16,735	63,238
	282.50	17,353	71,760
	283.00	17,977	80,592
Top of Basin Elevation	283.50	18,608	89,738
	284.00	19,244	99,201
	284.50	19,888	108,984

Designed Storage Elevation (ft)= 281.50
 Designed Total Storage Volume (cf)= 55,023 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 25,178 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 29,846 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 23.4
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 36 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 24 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 50
 Barrel Invert Elevation (Upstream) = 277.50 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 276.50

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 36
 Riser Area (sf) = 7.07
 Volume of Water Displaced (cf) = 28.3
 Weight of Water Displaced (lb) = 1,763
 Min. Required Weight of Anchor Block (lb) = 2,204 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 6.0 (Sized per VESCH)
 Length (lf) = 6.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 7,884 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.00
 Total "Dry" Storage (cf) = 29,846
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 1.38
 Flow Area of Orifice = 0.29
 Diameter of Circular orifice (in) = 8.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E14
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E14

Phase 1

Drainage Area (ac) = 16.80
 Disturbed Area (ac) = 16.80
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 42.7 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 64.7 (Q=c*i*drainage area)
 Required Storage (cf) = 60,782 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 30,391 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 30,391 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	298.00	9,048	0
	298.50	9,791	4,710
	299.00	10,540	9,792
	299.50	11,295	15,251
	300.00	12,057	21,089
Permanent Pool Elevation	300.50	12,825	27,309
	301.00	13,599	33,915
	301.50	14,379	40,910
Riser Crest/Dry Storage Elevation	302.00	15,166	48,296
	302.50	15,959	56,077
	303.00	16,758	64,256
25-yr Estimated WSE	303.50	17,563	72,837
	304.00	18,375	81,821
	304.50	19,193	91,214
Top of Basin Elevation	305.00	20,017	101,016
	305.50	20,848	111,233
	306.00	21,685	121,866

Designed Storage Elevation (ft)= 303.00
 Designed Total Storage Volume (cf)= 64,256 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 33,915 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 30,341 **Increase Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = 64.7
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 84 (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = CMP
 Barrel Size (in) = 36 (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 72
 Barrel Invert Elevation (Upstream) = 298.00 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 292.00

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 84
 Riser Area (sf) = 38.47
 Volume of Water Displaced (cf) = 192.3
 Weight of Water Displaced (lb) = 12,001
 Min. Required Weight of Anchor Block (lb) = 15,001 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 14.0 (Sized per VESCH)
 Length (lf) = 14.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 42,924 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.00
 Total "Dry" Storage (cf) = 30,341
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 1.40
 Flow Area of Orifice = 0.29
 Diameter of Circular orifice (in) = 8.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E15
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E15

Phase 1

Drainage Area (ac) = **63.77**
 Disturbed Area (ac) = **63.77**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **11.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.96**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.97**
 Flow (Q₂) (cfs) = **126.3** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **190.5** (Q=c*i*drainage area)
 Required Storage (cf) = **230,720** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **115,360** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **115,360** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	279.50	56,727	0
	280.00	57,844	28,643
	280.50	58,968	57,846
Permanent Pool Elevation	281.00	60,098	87,612
	281.50	61,234	117,945
	282.00	62,375	148,848
	282.50	63,523	180,322
	283.00	64,676	212,372
Riser Crest/Dry Storage Elevation	283.50	65,836	245,000
	284.00	67,001	278,209
	284.50	68,173	312,003
25-yr Estimated WSE	285.00	69,350	346,384
	285.50	70,533	381,354
	286.00	71,723	416,918
Top of Basin Elevation	286.50	72,918	453,079
	287.00	74,119	489,838

Designed Storage Elevation (ft)= **284.00**
 Designed Total Storage Volume (cf)= **278,209** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **117,945** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **160,264** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **63.5** **3** **Number of Risers**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **84** **3 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **36** **3 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **55**
 Barrel Invert Elevation (Upstream) = **279.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **279.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **84**
 Riser Area (sf) = **38.47**
 Volume of Water Displaced (cf) = **173.1**
 Weight of Water Displaced (lb) = **10,801**
 Min. Required Weight of Anchor Block (lb) = **13,501** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **14.0** (Sized per VESCH)
 Length (lf) = **14.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **42,924** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.25**
 Total "Dry" Storage (cf) = **160,264**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **7.42**
 Flow Area of Orifice = **1.38**
 Diameter of Circular orifice (in) = **16.00** **Vertical Orifice Required**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E16A
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E16A

Phase 1

Drainage Area (ac) = 4.92
 Disturbed Area (ac) = 4.92
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 12.5 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 19.0 (Q=c*i*drainage area)
 Required Storage (cf) = 17,801 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 8,900 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 8,900 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	281.00	6,416	0
	281.50	7,355	3,443
	282.00	8,308	7,359
Permanent Pool Elevation	282.50	9,275	11,754
	283.00	10,256	16,637
	283.50	11,252	22,014
Riser Crest/Dry Storage Elevation	284.00	12,261	27,892
	284.50	13,285	34,279
	285.00	14,322	41,181
25-yr Estimated WSE	285.50	15,374	48,605
	286.00	16,440	56,558
	286.50	17,519	65,048
	287.00	18,613	74,081
Top of Basin Elevation	287.00	18,613	74,081

Designed Storage Elevation (ft)= 284.00
 Designed Total Storage Volume (cf)= 27,892 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 11,754 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 16,138 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = 19.0
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 27 (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = CMP
 Barrel Size (in) = 21 (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 45
 Barrel Invert Elevation (Upstream) = 281.00 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 279.50

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 27
 Riser Area (sf) = 3.97
 Volume of Water Displaced (cf) = 11.9
 Weight of Water Displaced (lb) = 744
 Min. Required Weight of Anchor Block (lb) = 930 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 4.5 (Sized per VESCH)
 Length (lf) = 4.5
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 4,435 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 0.75
 Total "Dry" Storage (cf) = 16,138
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 0.75
 Flow Area of Orifice = 0.18
 Diameter of Circular orifice (in) = 6.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E16B
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E16B

Phase 1

Drainage Area (ac) = **6.36**
 Disturbed Area (ac) = **6.36**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **16.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **24.5** (Q=c*i*drainage area)
 Required Storage (cf) = **23,010** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **11,505** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **11,505** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	284.00	2,415	0
	284.50	2,791	1,302
	285.00	3,174	2,793
	285.50	3,562	4,477
	286.00	3,957	6,357
Permanent Pool Elevation	286.50	4,360	8,436
	287.00	4,766	10,718
	287.50	5,180	13,204
	288.00	5,600	15,899
	288.50	6,027	18,806
Riser Crest/Dry Storage Elevation	289.00	6,459	21,927
	289.50	6,898	25,267
	290.00	7,344	28,827
25-yr Estimated WSE	290.50	7,795	32,612
	291.00	8,253	36,624
	291.50	8,717	40,866
Top of Basin Elevation	292.00	9,187	45,342
	292.50	9,664	50,055
	293.00	10,147	55,008

Designed Storage Elevation (ft)= **290.00**
 Designed Total Storage Volume (cf)= **28,827** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **13,204** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **15,623** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **24.5**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **36** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **24** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **57**
 Barrel Invert Elevation (Upstream) = **284.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **283.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **36**
 Riser Area (sf) = **7.07**
 Volume of Water Displaced (cf) = **42.4**
 Weight of Water Displaced (lb) = **2,645**
 Min. Required Weight of Anchor Block (lb) = **3,306** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **6.0** (Sized per VESCH)
 Length (lf) = **6.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **7,884** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.25**
 Total "Dry" Storage (cf) = **15,623**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.72**
 Flow Area of Orifice = **0.13**
 Diameter of Circular orifice (in) = **5.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E17
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E17

Phase 1

Drainage Area (ac) = 16.63
 Disturbed Area (ac) = 16.63
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 42.3 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 64.1 (Q=c*i*drainage area)
 Required Storage (cf) = 60,167 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 30,084 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 30,084 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	291.50	13,706	0
	292.00	14,456	7,041
	292.50	15,211	14,457
	293.00	15,973	22,253
Permanent Pool Elevation	293.50	16,742	30,432
	294.00	17,516	38,997
	294.50	18,267	47,942
	295.00	19,084	57,280
Riser Crest/Dry Storage Elevation	295.50	19,877	67,020
	296.00	20,677	77,159
25-yr Estimated WSE	296.50	21,482	87,699
	297.00	22,294	98,643
	297.50	23,113	109,994
	298.00	23,937	121,757
Top of Basin Elevation	298.50	24,768	133,933

Designed Storage Elevation (ft)= 295.50
 Designed Total Storage Volume (cf)= 67,020 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 30,432 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 36,588 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 32.0
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 42 **2 Risers** (Sized per VESCH, Plate 3.14-B)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 30 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 47
 Barrel Invert Elevation (Upstream) = 291.50 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 291.00

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 42
 Riser Area (sf) = 9.62
 Volume of Water Displaced (cf) = 38.5
 Weight of Water Displaced (lb) = 2,400
 Min. Required Weight of Anchor Block (lb) = 3,000 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 7.0 (Sized per VESCH)
 Length (lf) = 7.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 10,731 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.00
 Total "Dry" Storage (cf) = 36,588
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 1.69
 Flow Area of Orifice = 0.35
 Diameter of Circular orifice (in) = 9.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E18A
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E18A

Phase 1

Drainage Area (ac) = **7.54**
 Disturbed Area (ac) = **7.54**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **19.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **29.1** (Q=c*i*drainage area)
 Required Storage (cf) = **27,280** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **13,640** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **13,640** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	320.00	5,701	0
	320.50	6,162	2,966
	321.00	6,629	6,164
	321.50	7,102	9,596
Permanent Pool Elevation	322.00	7,582	13,267
	322.50	8,067	17,180
	323.00	8,559	21,336
	323.50	9,058	25,740
Riser Crest/Dry Storage Elevation	324.00	9,562	30,395
	324.50	10,073	35,304
	325.00	10,590	40,470
	325.50	11,114	45,896
25-yr Estimated WSE	326.00	11,643	51,585
	326.50	12,179	57,541
	327.00	12,722	63,766
	327.50	13,270	70,264
Top of Basin Elevation			

Designed Storage Elevation (ft)= **324.50**
 Designed Total Storage Volume (cf)= **35,304** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **17,180** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **18,125** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **29.1**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **120**
 Barrel Invert Elevation (Upstream) = **320.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **319.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **43.3**
 Weight of Water Displaced (lb) = **2,700**
 Min. Required Weight of Anchor Block (lb) = **3,375** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **18,125**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.84**
 Flow Area of Orifice = **0.17**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E18B
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E18B

Phase 1

Drainage Area (ac) = 25.62
 Disturbed Area (ac) = 25.62
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 65.2 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 98.7 (Q=c*i*drainage area)
 Required Storage (cf) = 92,693 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 46,347 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 46,347 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	337.00	11,670	0
	337.50	12,478	6,037
	338.00	13,291	12,479
	338.50	14,110	19,330
	339.00	14,936	26,591
Permanent Pool Elevation	339.50	15,768	34,267
	340.00	16,605	42,360
	340.50	17,449	50,874
	341.00	18,299	59,811
	341.50	19,155	69,174
Riser Crest/Dry Storage Elevation	342.00	20,017	78,967
	342.50	20,886	89,193
	343.00	21,760	99,855
25-yr Estimated WSE	343.50	22,641	110,955
	344.00	23,527	122,497
	344.50	24,420	134,484
Top of Basin Elevation	345.00	25,319	146,918
	345.50	26,224	159,804
	346.00	27,135	173,144

Designed Storage Elevation (ft)= 343.00
 Designed Total Storage Volume (cf)= 99,855 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 50,874 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 48,981 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 49.4
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 66 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 36 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 70
 Barrel Invert Elevation (Upstream) = 337.00 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 336.50

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 66
 Riser Area (sf) = 23.75
 Volume of Water Displaced (cf) = 142.5
 Weight of Water Displaced (lb) = 8,891
 Min. Required Weight of Anchor Block (lb) = 11,113 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 11.0 (Sized per VESCH)
 Length (lf) = 11.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 26,499 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.25
 Total "Dry" Storage (cf) = 48,981
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 2.27
 Flow Area of Orifice = 0.42
 Diameter of Circular orifice (in) = 9.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E18C
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E18C

Phase 1

Drainage Area (ac) = **5.08**
 Disturbed Area (ac) = **5.08**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **12.9** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **19.6** (Q=c*i*drainage area)
 Required Storage (cf) = **18,379** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **9,190** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **9,190** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	332.50	3,153	0
	333.00	3,521	1,669
	333.50	3,896	3,523
	334.00	4,277	5,566
Permanent Pool Elevation	334.50	4,664	7,801
	335.00	5,058	10,232
	335.50	5,457	12,861
	336.00	5,863	15,691
Riser Crest/Dry Storage Elevation	336.50	6,275	18,725
	337.00	6,694	21,967
	337.50	7,119	25,421
25-yr Estimated WSE	338.00	7,550	29,088
	338.50	7,987	32,972
	339.00	8,431	37,077
Top of Basin Elevation	339.50	8,881	41,405
	340.00	9,337	45,959

Designed Storage Elevation (ft)= **337.00**
 Designed Total Storage Volume (cf)= **21,967** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **10,232** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **11,736** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **19.6**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **30** (Sized per VESCH, Plate 3.14-B)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **21** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **47**
 Barrel Invert Elevation (Upstream) = **332.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **332.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **30**
 Riser Area (sf) = **4.91**
 Volume of Water Displaced (cf) = **22.1**
 Weight of Water Displaced (lb) = **1,378**
 Min. Required Weight of Anchor Block (lb) = **1,722** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **5.0** (Sized per VESCH)
 Length (lf) = **5.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **5,475** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **11,736**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.54**
 Flow Area of Orifice = **0.11**
 Diameter of Circular orifice (in) = **5.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E19
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E19

Phase 1

Drainage Area (ac) = **7.68**
 Disturbed Area (ac) = **7.68**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **19.5** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **29.6** (Q=c*i*drainage area)
 Required Storage (cf) = **27,786** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **13,893** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **13,893** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	316.00	4,340	0
	316.50	4,875	2,304
	317.00	5,417	4,877
	317.50	5,964	7,722
Permanent Pool Elevation	318.00	6,518	10,843
	318.50	7,078	14,242
	319.00	7,644	17,922
Riser Crest/Dry Storage Elevation	319.50	8,217	21,887
	320.00	8,796	26,141
	320.50	9,381	30,685
25-yr Estimated WSE	321.00	9,973	35,523
	321.50	10,570	40,659
	322.00	11,174	46,095
	322.50	11,784	51,835
Top of Basin Elevation	323.00	12,401	57,881
	323.50	13,024	64,237

Designed Storage Elevation (ft)= **320.50**
 Designed Total Storage Volume (cf)= **30,685** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **14,242** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **16,443** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **29.6**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **42** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **48**
 Barrel Invert Elevation (Upstream) = **316.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **315.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **42**
 Riser Area (sf) = **9.62**
 Volume of Water Displaced (cf) = **43.3**
 Weight of Water Displaced (lb) = **2,700**
 Min. Required Weight of Anchor Block (lb) = **3,375** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **7.0** (Sized per VESCH)
 Length (lf) = **7.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **10,731** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **16,443**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.76**
 Flow Area of Orifice = **0.16**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E20
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E20

Phase 1

Drainage Area (ac) = 41.46
 Disturbed Area (ac) = 41.46
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 14.68
 2-yr Rainfall Intensity "i" (in/hr)* = 3.50
 25-yr Rainfall Intensity "i" (in/hr)* = 5.31
 Flow (Q₂) (cfs) = 72.5 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 110.0 (Q=c*i*drainage area)
 Required Storage (cf) = 150,002 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 75,001 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 75,001 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	342.50	24,119	0
	343.00	24,961	12,270
	343.50	25,809	24,962
	344.00	26,663	38,080
	344.50	27,523	51,627
Permanent Pool Elevation	345.00	28,390	65,605
	345.50	29,263	80,018
	346.00	30,141	94,869
	346.50	31,026	110,161
	347.00	31,918	125,897
Riser Crest/Dry Storage Elevation	347.50	32,815	142,080
	348.00	33,719	158,714
	348.50	34,628	175,800
	349.00	35,544	193,343
	349.50	36,466	211,346
25-yr Estimated WSE	350.00	37,394	229,811
	350.50	38,329	248,742
	351.00	39,269	268,141

Designed Storage Elevation (ft)= 348.00
 Designed Total Storage Volume (cf)= 158,714 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 80,018 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 78,695 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 55.0
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 72 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 36 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 60
 Barrel Invert Elevation (Upstream) = 342.50 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 342.00

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 72
 Riser Area (sf) = 28.26
 Volume of Water Displaced (cf) = 155.4
 Weight of Water Displaced (lb) = 9,699
 Min. Required Weight of Anchor Block (lb) = 12,124 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 12.0 (Sized per VESCH)
 Length (lf) = 12.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 31,536 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 1.25
 Total "Dry" Storage (cf) = 78,695
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 3.64
 Flow Area of Orifice = 0.68
 Diameter of Circular orifice (in) = 12.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E21
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E21

Phase 1

Drainage Area (ac) = 10.19
 Disturbed Area (ac) = 10.19
 Runoff Coefficient (C) = 0.50
 Time of Concentration = 5.00
 2-yr Rainfall Intensity "i" (in/hr)* = 5.09
 25-yr Rainfall Intensity "i" (in/hr)* = 7.71
 Flow (Q₂) (cfs) = 25.9 (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = 39.3 (Q=c*i*drainage area)
 Required Storage (cf) = 36,867 (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = 18,434 (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = 18,434 (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = 2.0 (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	338.00	11,129	0
	338.50	11,914	5,761
	339.00	12,706	11,916
Permanent Pool Elevation	339.50	13,505	18,469
	340.00	14,309	25,422
	340.50	15,120	32,779
Riser Crest/Dry Storage Elevation	341.00	15,937	40,544
	341.50	16,761	48,718
	342.00	17,590	57,306
25-yr Estimated WSE	342.50	18,426	66,310
	343.00	19,268	75,734
	343.50	20,117	85,580
	344.00	20,972	95,852
Top of Basin Elevation	344.00	20,972	95,852

Designed Storage Elevation (ft)= 341.00
 Designed Total Storage Volume (cf)= 40,544 **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= 18,469 **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= 22,075 **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = 19.6
 Water Depth over Riser (ft) = 1.0
 Designed Riser Size (in) = 30 **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = 21 **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = 45
 Barrel Invert Elevation (Upstream) = 338.00 **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = 337.50

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = 30
 Riser Area (sf) = 4.91
 Volume of Water Displaced (cf) = 14.7
 Weight of Water Displaced (lb) = 918
 Min. Required Weight of Anchor Block (lb) = 1,148 (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = 5.0 (Sized per VESCH)
 Length (lf) = 5.0
 Height (lf) = 2.50 (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = 5,475 **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = 0.75
 Total "Dry" Storage (cf) = 22,075
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = 1.02
 Flow Area of Orifice = 0.25
 Diameter of Circular orifice (in) = 7.00



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E22
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E22

Phase 1

Drainage Area (ac) = **35.30**
 Disturbed Area (ac) = **35.30**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **11.18**
 2-yr Rainfall Intensity "i" (in/hr)* = **3.94**
 25-yr Rainfall Intensity "i" (in/hr)* = **5.94**
 Flow (Q₂) (cfs) = **69.5** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **104.8** (Q=c*i*drainage area)
 Required Storage (cf) = **127,715** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **63,858** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **63,858** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	338.00	29,693	0
	338.50	30,898	15,148
	339.00	32,110	30,900
Permanent Pool Elevation	339.50	33,327	47,259
	340.00	34,551	64,229
	340.50	35,781	81,812
Riser Crest/Dry Storage Elevation	341.00	37,017	100,011
	341.50	38,260	118,831
	342.00	39,509	138,273
25-yr Estimated WSE	342.50	40,764	158,341
	343.00	42,025	179,038
	343.50	43,292	200,367
Top of Basin Elevation	344.00	44,566	222,332
	344.50	45,846	244,935
	345.00	47,132	268,179

Designed Storage Elevation (ft)= **342.00**
 Designed Total Storage Volume (cf)= **138,273** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **64,229** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **74,044** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **34.9** **3** **Number of Risers**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **48** **3 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **30** **3 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **47**
 Barrel Invert Elevation (Upstream) = **338.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **337.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **48**
 Riser Area (sf) = **12.56**
 Volume of Water Displaced (cf) = **50.2**
 Weight of Water Displaced (lb) = **3,135**
 Min. Required Weight of Anchor Block (lb) = **3,919** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **8.0** (Sized per VESCH)
 Length (lf) = **8.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **14,016** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **74,044**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **3.43**
 Flow Area of Orifice = **0.71**
 Diameter of Circular orifice (in) = **12.00** **Vertical Orifice Required**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E23
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin E23

Phase 1

Drainage Area (ac) = **3.89**
 Disturbed Area (ac) = **3.89**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **9.9** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **15.0** (Q=c*i*drainage area)
 Required Storage (cf) = **14,074** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **7,037** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **7,037** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	332.00	1,537	0
	332.50	1,793	833
	333.00	2,055	1,795
	333.50	2,324	2,890
	334.00	2,599	4,120
Permanent Pool Elevation	334.50	2,880	5,490
	335.00	3,167	7,001
	335.50	3,460	8,658
Riser Crest/Dry Storage Elevation	336.00	3,760	10,463
	336.50	4,066	12,420
	337.00	4,379	14,531
25-yr Estimated WSE	337.50	4,698	16,800
	338.00	5,022	19,230
	338.50	5,354	21,824
Top of Basin Elevation	339.00	5,691	24,586
	339.50	6,035	27,517
	340.00	6,385	30,622
	340.50	6,741	33,904

Designed Storage Elevation (ft)= **337.50**
 Designed Total Storage Volume (cf)= **16,800** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **8,658** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **8,142** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **15.0**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **24** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **18** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **52**
 Barrel Invert Elevation (Upstream) = **332.00** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **331.50**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **24**
 Riser Area (sf) = **3.14**
 Volume of Water Displaced (cf) = **17.3**
 Weight of Water Displaced (lb) = **1,078**
 Min. Required Weight of Anchor Block (lb) = **1,347** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **4.0** (Sized per VESCH)
 Length (lf) = **4.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **3,504** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **1.00**
 Total "Dry" Storage (cf) = **8,142**
 Volumetric Flowrate for 6-Hour Drawdown (cfs) = **0.38**
 Flow Area of Orifice = **0.08**
 Diameter of Circular orifice (in) = **4.00**

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E

KHA Project #: 110554000

Designed by: ASW

Date: 4/12/2018

Revised by: KEM

Date: 6/12/2018

Revised by: KAM

Date: 6/14/2018

Outlet Protection Summary								
Outfall	Outlet Pipe Diameter	Discharge (25-year)	L _a	W	d ₅₀	d ₅₀	3D ₀	
	ft	cfs	ft	ft	ft	in	ft	
TSBE3	2.5	29.6	16	19	0.5	6	7.5	Per Barrel
TSBE4	1.8	13.0	8	10	0.5	6	5.25	Per Barrel
TSBE5	3.0	55.5	15	18	0.5	6	9	Per Barrel
TSBE6	2.5	45.8	19	22	0.6	7.2	7.5	Per Barrel
TSBE7	2.5	34.1	12	15	0.5	6	7.5	Per Barrel
TSBE8	2.5	38.7	18	21	0.55	6.6	7.5	Per Barrel
TSBE9A	3.0	52.2	13	16	0.5	6	9	Per Barrel
TSBE9B	2.5	31.6	12	15	0.5	6	7.5	Per Barrel
TSBE10A	1.8	14.4	8	10	0.5	6	5.25	Per Barrel
TSBE10B	2.5	31.1	11	14	0.5	6	7.5	
TSBE10C	2.0	26.4	12	14	0.5	6	6	
TSBE11A	3.5	70.8	19	23	0.8	9.6	10.5	
TSBE11B	2.5	36.8	14	17	0.5	6	7.5	
TSBE12	2.5	34.1	12	15	0.5	6	7.5	Per Barrel
TSBE13	2.0	23.4	12	14	0.5	6	6	Per Barrel
TSBE14	3.0	64.7	22	25	0.8	9.6	9	
TSBE15	3.0	63.5	26	29	0.8	9.6	9	Per Barrel
TSBE16A	1.8	19.0	10	12	0.5	6	5.25	
TSBE16B	2.0	24.5	12	14	0.5	6	6	
TSBE17	2.5	32.0	11	14	0.55	6.6	7.5	Per Barrel
TSBE18A	2.5	29.1	11	14	0.5	6	7.5	
TSBE18B	3.0	49.4	12	15	0.5	6	9	Per Barrel
TSBE18C	1.8	19.6	10	12	0.5	6	5.25	
TSBE19	2.5	29.6	11	14	0.5	6	7.5	
TSBE20	3.0	55.0	17	20	0.5	6	9	Per Barrel
TSBE21	1.8	19.6	8	10	0.5	6	5.25	Per Barrel
TSBE22	2.5	34.9	18	21	0.5	6	7.5	Per Barrel
TSBE23	1.5	15.0	11	13	0.5	6	4.5	



TEMPORARY SEDIMENT TRAP DESIGN CALCULATIONS - PHASE 1

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E9C
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on Phase 1

Trap E9C

Phase 1

Drainage Area (ac) = **2.89**
 Disturbed Area (ac) = **2.89**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **7.4** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **11.1** (Q=c*i*drainage area)
 Required Storage (cf) = **10,456** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **5,228** (67 cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **5,228** (67 cy per acre of acre of drainage)

Storage Dimensions:

Trap Side Slopes (X : 1) = **2.0** (2:1 max side slopes)

	Elev (ft)	Area (SF)	Cumulative Volume (CF)
Bottom of Trap Elevation	322.00	3,501	0
	322.50	3,774	1,819
	323.00	4,053	3,775
Base of Outlet	323.50	4,339	5,873
	324.00	4,631	8,116
	324.50	4,929	10,506
Top of Outlet	325.00	5,234	13,046
	325.50	5,544	15,741
Top of Trap	326.00	5,862	18,592

Designed Storage Elevation (ft)= **325.00**
 Designed Total Storage Volume (cf)= **13,046** **O.K. > Minimum Required Storage**
 Designed 'Wet' Storage Volume (cf)= **5,873** **O.K. > Minimum Required Storage**
 Designed 'Dry' Storage Volume (cf)= **7,173** **O.K. > Minimum Required Storage**

Trap Dimensions:

Width (ft) = **35**
 Length (ft) = **100**
 Embankment Width (ft) = **4.0** (VESCH Plate 3.13-1)
 Side Slopes = **2:1**
 Outlet Length = **17** ft (6*Drainage Area (AC))



TEMPORARY SEDIMENT TRAP DESIGN CALCULATIONS - PHASE 1

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone E Drainage Area: E27
 KHA Project #: 110554000
 Designed by: ASW Date: 4/12/2018
 Revised by: KEM Date: 6/12/2018
 Revised by: KAM Date: 6/14/2018

Sediment Trap or Basin designs are based on Phase 1

Trap E27

Phase 1

Drainage Area (ac) = **1.27**
 Disturbed Area (ac) = **1.27**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **3.2** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **4.9** (Q=c*i*drainage area)
 Required Storage (cf) = **4,595** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **2,297** (67 cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **2,297** (67 cy per acre of acre of drainage)

Storage Dimensions:

Trap Side Slopes (X : 1) = **2.0** (2:1 max side slopes)

	Elev (ft)	Area (SF)	Cumulative Volume (CF)
Bottom of Trap Elevation	321.00	1,000	0
	321.50	1,143	536
	322.00	1,293	1,145
Base of Outlet	322.50	1,449	1,830
	323.00	1,611	2,595
	323.50	1,779	3,443
Top of Outlet	324.00	1,953	4,376
	324.50	2,134	5,397
	325.00	2,321	6,511
Top of Trap	325.50	2,515	7,720

Designed Storage Elevation (ft)= **324.50**
 Designed Total Storage Volume (cf)= **5,397** **O.K. > Minimum Required Storage**
 Designed 'Wet' Storage Volume (cf)= **2,595** **O.K. > Minimum Required Storage**
 Designed 'Dry' Storage Volume (cf)= **2,802** **O.K. > Minimum Required Storage**

Trap Dimensions:

Width (ft) = **20**
 Length (ft) = **50**
 Embankment Width (ft) = **2.5** (VESCH Plate 3.13-1)
 Side Slopes = **2:1**
 Outlet Length = **8** ft (6*Drainage Area (AC))



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 31
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin H31

Phase 1

Drainage Area (ac) = **6.46**
 Disturbed Area (ac) = **6.46**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **7.35**
 2-yr Rainfall Intensity "i" (in/hr)* = **4.57**
 25-yr Rainfall Intensity "i" (in/hr)* = **6.89**
 Flow (Q₂) (cfs) = **14.8** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **22.3** (Q=c*i*drainage area)
 Required Storage (cf) = **23,372** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **11,686** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **11,686** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	360.50	7,197	0
	361.00	7,622	3,705
	361.50	8,054	7,624
Permenant Pool Elevation	362.00	8,491	11,760
	362.50	8,935	16,117
	363.00	9,385	20,697
Riser Crest/Dry Storage Elevation	363.50	9,841	25,503
	364.00	10,304	30,539
25-yr Estimated WSE	364.50	10,772	35,808
	365.00	11,247	41,313
	365.50	11,729	47,057
	366.00	12,216	53,043
Top of Basin Elevation	366.50	12,710	59,275

Designed Storage Elevation (ft)= **363.50**
 Designed Total Storage Volume (cf)= **25,503** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **11,760** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **13,743** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) Per Riser = **11.1**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **21** **2 Risers** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **18** **2 Barrels** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **38**
 Barrel Invert Elevation (Upstream) = **360.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **360.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **21**
 Riser Area (sf) = **2.40**
 Volume of Water Displaced (cf) = **7.2**
 Weight of Water Displaced (lb) = **450**
 Min. Required Weight of Anchor Block (lb) = **563** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **3.5** (Sized per VESCH)
 Length (lf) = **3.5**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **2,683** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **13,743**
 Voumetric Flowrate for 6-Hour Drawdown (cfs) = **0.64**
 Flow Area of Orifice = **0.15**
 Diameter of Circular orifice (in) = **6.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 32
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin H32

Phase 1

Drainage Area (ac) = **3.29**
 Disturbed Area (ac) = **3.29**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **8.4** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **12.7** (Q=c*i*drainage area)
 Required Storage (cf) = **11,903** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **5,952** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **5,952** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	372.50	3,697	0
	373.00	4,009	1,927
	373.50	4,327	4,011
Permenant Pool Elevation	374.00	4,651	6,255
	374.50	4,982	8,663
	375.00	5,318	11,238
Riser Crest/Dry Storage Elevation	375.50	5,661	13,983
	376.00	6,011	16,901
25-yr Estimated WSE	376.50	6,366	19,995
	377.00	6,728	23,269
	377.50	7,096	26,725
	378.00	7,471	30,367
Top of Basin Elevation	378.50	7,851	34,197

Designed Storage Elevation (ft)= **375.50**
 Designed Total Storage Volume (cf)= **13,983** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **6,255** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **7,728** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **12.7**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **24** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **18** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **38**
 Barrel Invert Elevation (Upstream) = **372.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **372.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **24**
 Riser Area (sf) = **3.14**
 Volume of Water Displaced (cf) = **9.4**
 Weight of Water Displaced (lb) = **588**
 Min. Required Weight of Anchor Block (lb) = **735** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **4.0** (Sized per VESCH)
 Length (lf) = **4.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **3,504** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **7,728**
 Voumetric Flowrate for 6-Hour Drawdown (cfs) = **0.36**
 Flow Area of Orifice = **0.09**
 Diameter of Circular orifice (in) = **4.00**



VIRGINIA TEMPORARY SEDIMENT BASIN DESIGN CALCULATIONS

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 34
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on the worst case scenario between Phase 1 or Phase 2.

Basin H34

Phase 1

Drainage Area (ac) = **3.68**
 Disturbed Area (ac) = **3.68**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **9.4** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **14.2** (Q=c*i*drainage area)
 Required Storage (cf) = **13,314** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **6,657** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **6,657** (67cy per acre of acre of drainage)

Storage Dimensions:

Basin Side Slopes (X : 1) = **2.0** (2:1 Max side slopes)

	Elev (ft)		Cumulative Volume (CF)
Bottom of Basin Elevation	382.50	5,128	0
	383.00	5,547	2,669
	383.50	5,972	5,549
Permenant Pool Elevation	384.00	6,404	8,643
	384.50	6,841	11,954
	385.00	7,285	15,485
Riser Crest/Dry Storage Elevation	385.50	7,735	19,240
	386.00	8,191	23,222
	386.50	8,654	27,433
25-yr Estimated WSE	387.00	9,123	31,877
	387.50	9,598	36,558
	388.00	10,079	41,477
	388.50	10,566	46,638
Top of Basin Elevation	388.50	10,566	46,638

Designed Storage Elevation (ft)= **385.50**
 Designed Total Storage Volume (cf)= **19,240** **O.K. > Minimum Required Storage**
 Designed "Wet" Storage Volume (cf)= **8,643** **O.K. > Minimum Required Storage**
 Designed "Dry" Storage Volume (cf)= **10,598** **O.K. > Minimum Required Storage**

Sizing of Barrel & Riser:

Flow (Q₂₅) (cfs) = **14.2**
 Water Depth over Riser (ft) = **1.0**
 Designed Riser Size (in) = **24** (Sized per VESCH, Plate 3.14-8)
 Barrel Pipe Material (CMP or RCP) = **CMP**
 Barrel Size (in) = **21** (Sized per VESCH, Table 3.14-A)
 Barrel Length (lf) = **40**
 Barrel Invert Elevation (Upstream) = **382.50** **Invert at Bottom of Basin Elevation**
 Barrel Invert Elevation (Downstream) = **382.00**

Sizing of Steel Plate Antiflotation Block:

Riser Size (in) = **24**
 Riser Area (sf) = **3.14**
 Volume of Water Displaced (cf) = **9.4**
 Weight of Water Displaced (lb) = **588**
 Min. Required Weight of Anchor Block (lb) = **735** (1.25 factor of safety)
 Steel Plate Anchor Size:
 Width (lf) = **4.0** (Sized per VESCH)
 Length (lf) = **4.0**
 Height (lf) = **2.50** (VESCH min. 1.50 feet for concrete, 2.50 feet for steel plate)
 Weight of Anchor (lb) = **3,504** **O.K. > Minimum Required Weight**

Dewatering

Average Driving Head (ft) = **0.75**
 Total "Dry" Storage (cf) = **10,598**
 Voumetric Flowrate for 6-Hour Drawdown (cfs) = **0.49**
 Flow Area of Orifice = **0.12**
 Diameter of Circular orifice (in) = **5.00**



TEMPORARY SEDIMENT TRAP DESIGN CALCULATIONS - PHASE 1

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 29
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on Phase 1

Trap H29

Phase 1

Drainage Area (ac) = **2.63**
 Disturbed Area (ac) = **2.63**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **6.7** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **10.1** (Q=c*i*drainage area)
 Required Storage (cf) = **9,515** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **4,758** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **4,758** (67cy per acre of acre of drainage)

Storage Dimensions:

Trap Side Slopes (X : 1) = **2.0** (2:1 max side slopes)

	Elev (ft)	Area (SF)	Cumulative Volume (CF)
Bottom of Trap Elevation	363.00	4,318	0
	364.00	4,911	4,615
Base of Outlet	365.00	5,529	9,835
	366.00	6,173	15,686
Top of Outlet	367.00	6,841	22,193
Top of Trap	368.00	7,535	29,381

Designed Storage Elevation (ft)= **367.00**
 Designed Total Storage Volume (cf)= **22,193** **O.K. > Minimum Required Storage**
 Designed 'Wet' Storage Volume (cf)= **9,835** **O.K. > Minimum Required Storage**
 Designed 'Dry' Storage Volume (cf)= **12,358** **O.K. > Minimum Required Storage**

Trap Dimensions:

Width (ft) = **43**
 Length (ft) = **103**
 Embankment Width (ft) = **2.5** (VESCH Plate 3.13-1)
 Side Slopes = **2:1**
 Outlet Length = **16** ft (6*Drainage Area (AC))



TEMPORARY SEDIMENT TRAP DESIGN CALCULATIONS - PHASE 1

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 30
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on Phase 1

Trap H30

Phase 1

Drainage Area (ac) = **2.58**
 Disturbed Area (ac) = **2.58**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **6.6** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **9.9** (Q=c*i*drainage area)
 Required Storage (cf) = **9,334** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **4,667** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **4,667** (67cy per acre of acre of drainage)

Storage Dimensions:

Trap Side Slopes (X : 1) = **2.0** (2:1 max side slopes)

	Elev (ft)	Area (SF)	Cumulative Volume (CF)
Bottom of Trap Elevation	364.00	4,514	0
	365.00	5,111	4,813
Base of Outlet	366.00	5,732	10,234
	367.00	6,379	16,290
Top of Outlet	368.00	7,051	23,005
Top of Trap	369.00	7,748	30,404

Designed Storage Elevation (ft)= **368.00**
 Designed Total Storage Volume (cf)= **23,005** **O.K. > Minimum Required Storage**
 Designed 'Wet' Storage Volume (cf)= **10,234** **O.K. > Minimum Required Storage**
 Designed 'Dry' Storage Volume (cf)= **12,771** **O.K. > Minimum Required Storage**

Trap Dimensions:

Width (ft) = **41**
 Length (ft) = **108**
 Embankment Width (ft) = **3.0** (VESCH Plate 3.13-1)
 Side Slopes = **2:1**
 Outlet Length = **15** ft (6*Drainage Area (AC))



TEMPORARY SEDIMENT TRAP DESIGN CALCULATIONS - PHASE 1

Project Information

Project Name: Spotsylvania Solar Energy Center - Zone H Drainage Area: 30
 KHA Project #: 110554000
 Designed by: KAM Date: 5/3/2018
 Revised by: _____ Date: _____
 Revised by: _____ Date: _____

Sediment Trap or Basin designs are based on Phase 1

Trap H30

Phase 1

Drainage Area (ac) = **2.77**
 Disturbed Area (ac) = **2.77**
 Runoff Coefficient (C) = **0.50**
 Time of Concentration = **5.00**
 2-yr Rainfall Intensity "i" (in/hr)* = **5.09**
 25-yr Rainfall Intensity "i" (in/hr)* = **7.71**
 Flow (Q₂) (cfs) = **7.0** (Q=c*i*drainage area)
 Flow (Q₂₅) (cfs) = **10.7** (Q=c*i*drainage area)
 Required Storage (cf) = **10,022** (134 cy per acre of acre of drainage)
 Required "Wet" Storage (cf) = **5,011** (67cy per acre of acre of drainage)
 Required "Dry" Storage (cf) = **5,011** (67cy per acre of acre of drainage)

Storage Dimensions:

Trap Side Slopes (X : 1) = **2.0** (2:1 max side slopes)

	Elev (ft)	Area (SF)	Cumulative Volume (CF)
Bottom of Trap Elevation	377.00	4,973	0
	378.00	5,570	5,272
Base of Outlet	379.00	6,191	11,152
	380.00	6,838	17,667
Top of Outlet	381.00	7,510	24,841
Top of Trap	382.00	8,207	32,699

Designed Storage Elevation (ft)= **381.00**
 Designed Total Storage Volume (cf)= **24,841** **O.K. > Minimum Required Storage**
 Designed 'Wet' Storage Volume (cf)= **11,152** **O.K. > Minimum Required Storage**
 Designed 'Dry' Storage Volume (cf)= **13,689** **O.K. > Minimum Required Storage**

Trap Dimensions:

Width (ft) = **41**
 Length (ft) = **108**
 Embankment Width (ft) = **2.5** (VESCH Plate 3.13-1)
 Side Slopes = **2:1**
 Outlet Length = **17** ft (6*Drainage Area (AC))