PRELIMINARY DRAINAGE STUDY

For

Woodspring Suites
Sacramento, CA 95834
APN: 225-0070-127

July 2024

Prepared by,
CWE
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CWE Project No. R23138

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APPENDIX

A. PROJECT LOCATION

The project property is located on Truxel Rd in Sacramento, CA 95834. The property is 2.24 acres. It is part of the Centerpointe Business Park located at the southeast corner of Truxel Road and Del Paso Road. Much of the storm drain infrastructure was installed 15-20 years ago with the initial project phases. The assessor's parcel number is 225-0070-127. The site is located at latitude 38°39'16" N and longitude 121°30'39" W. The vicinity map of this project can be found in Appendix A.

B. PROJECT DESCRIPTION

This proposed project will include the construction of a 4-story hotel that will have a building footprint of approximately 13,120 square feet, 50,922 total square feet, and 122 guest rooms. The project will also include construction of new associated parking, flatwork, landscaping, and underground utilities. The site plan can be found in Appendix A.

C. EXISTING CONDITIONS

The project site is largely undeveloped with seasonal grasses, however there are a number of existing utility lines located onsite such as electrical, gas, water, sewer, and storm drain. In summary, bordering properties include the following:

- North: Developed employment center property (2260 & 2280 Del Paso Road) and undeveloped employment center property (2290 Del Paso Road)
- East: Undeveloped employment center property (2240 Del Paso Road)
- South: Developed employment center property (4752 Truxel Road)
- West: Truxel Road and undeveloped employment center property beyond (2380 Del Paso Road)

The existing site has mild slopes with elevations ranging between 10-14 feet. The existing site can be divided into three drainage sheds, A-X1 to A-X3. It should be noted that the overall drainage shed does not match the existing property boundary as the property owner is currently in the process of a boundary line adjustment, so the overall drainage shed perimeter matches the proposed property boundary. This project is part of a larger overall master plan that has been developed in phases, dating back to 2006. The existing conditions and delineated existing drainage sheds can be found on the Pre-Construction Shed Map in Appendix B.

D. PROPOSED CONDITIONS

The storm drainage design of the site has been done in accordance with the City of Sacramento Onsite Design Manual. The proposed project has been split into four drainage management areas (DMA's), DMA-01 to DMA-04, that represent areas tributary to the proposed onsite system that ties into the larger existing system within the employment center complex. DMA-01 represents the western portion of the site, DMA-02 represents the southern portion of the site, DMA-03 represents the eastern portion of the site, and DMA-04 represents the northern portion of the site. DMA-01, DMA-02, and DMA-03 are each tributary to their own bioretention planters where runoff will be treated and eventually tie into the larger existing system. Runoff in DMA-04 will sheet flow into a combination of existing and proposed drainage inlets that tie into the larger existing system. The proposed conditions and delineated proposed drainage sheds can be found on the Post-Construction Shed Map in Appendix B.

Design Criteria

Per Section 3.1.2 of the City of Sacramento Onsite Design Manual, the Rational Method (Static Analysis) was used to determine peak flows based on a 10-year event. A spreadsheet including all the information used to determine the peak flows using the rational method can be found in Appendix C. All proposed storm drain pipes will be 12" PVC SDR-35 pipe. CWE analyzed the capacity of several pipes that are deemed critical to the overall system using AutoCAD's Hydraflow Express Extension to ensure that 12" pipes would be sufficient to convey the peak flows calculated using the rational method. The critical pipes are labeled as SD1 through SD4 on the Post-Construction Shed Map in Appendix B. SD1 is the existing pipe that will convey the runoff from DMA-01 and DMA-04 into the existing larger system. The peak flow for DMA-01 and DMA-04 is substantially less than the full flow capacity a 12" pipe can convey, and since all onsite pipes have a 12" diameter, it can be assumed that all pipes that within the DMA-01 and DMA-04 system are sufficient. The peak flow for DMA-02 and DMA-03 combined is much larger as these shed areas are larger, so it was important that CWE analyzed the capacity of the onsite pipes in these sheds as well as the existing tie-in pipe. SD2 is the existing pipe that will convey the runoff from DMA-02 and DMA-03 into the existing larger system. SD3 is the proposed pipe that will convey the runoff from DMA-02 and DMA-03 from the DMA-03 bioretention planter to SD2. SD4 is the proposed pipe that will convey the DMA-02 runoff to SD3. The Hydraflow Express reports can be found in Appendix C.

Detention

This project will be collected and conveyed to Basin 15, an existing regional detention facility for site drainage. This project conforms to the Basin 15 model and will not be required to provide onsite detention, as Basin 15 is sized adequately to accommodate the project site and the increased peak flows that come with this development. See Email Correspondence with Wint Tun in Appendix D that confirms onsite detention will not be required for this project.

Low-Impact Development

Basin 15 provides treatment, however the project is still required to provide low-impact development control and accumulate 100 LID credits across the project site. DMA-01, DMA-02, and DMA-03 each propose bioretention planters of 458, 922, and 690 square feet respectively all with a 6" ponding depth. All four DMA's incorporate runoff reduction in the form of proposed deciduous and evergreen trees, disconnected roof drains, and landscape used to disconnect pavement. The overall weighted LID points for the project site totals over 100 points. The LID worksheet can be found in Appendix C.

Trash Capture Control

To satisfy full trash capture control requirements, the proposed bioretention planters will be designed and regularly maintained per the California State Water Board's Bioretention BMP Minimum Specifications found in Appendix D. All proposed drainage inlets will also be installed with ADS Flexstorm Pure Inlet Filters that satisfy full trash capture requirements. Details and specifications for ADS Flexstorm Pure Inlet Filters can be found in Appendix D.

Finish Floor Elevation

Per the City of Sacramento Onsite Design Manual, for an infill development, the finish floor elevation of new structures must be at least 6" above the nearest 100-year event HGL of the City's drainage system and 12" above the controlling overland release point in the public right of way. The nearest drainage node within the City's drainage system is Node 5319, about 140' west of the project site. Node 5319 has 10-year and 100-year HGL's of 9.987' and 10.474' respectively. The finish floor elevation of the proposed hotel is 14.50', which is 4.026' above the nearest City 100-year HGL, well above the 6" minimum. The controlling overland release point in the public right of way is the overland release point for the western bioretention planter tributary to DMA-01. The elevation at the back of walk along Truxel where runoff would flow into the public right of way is about 9.54, which is well under the 12" minimum.

This project is also located in a Special Flood Hazard Area (Zone A99), so this requires the lowest proposed finish floor to be at least 12" above the highest adjacent 100-year event HGL (Node 5319: 10.474') and 18" above the controlling overland release point in the public right of way (9.54'). The proposed hotel finish floor elevation of 14.50' is still well above these minimum requirements.

E. CONCLUSIONS

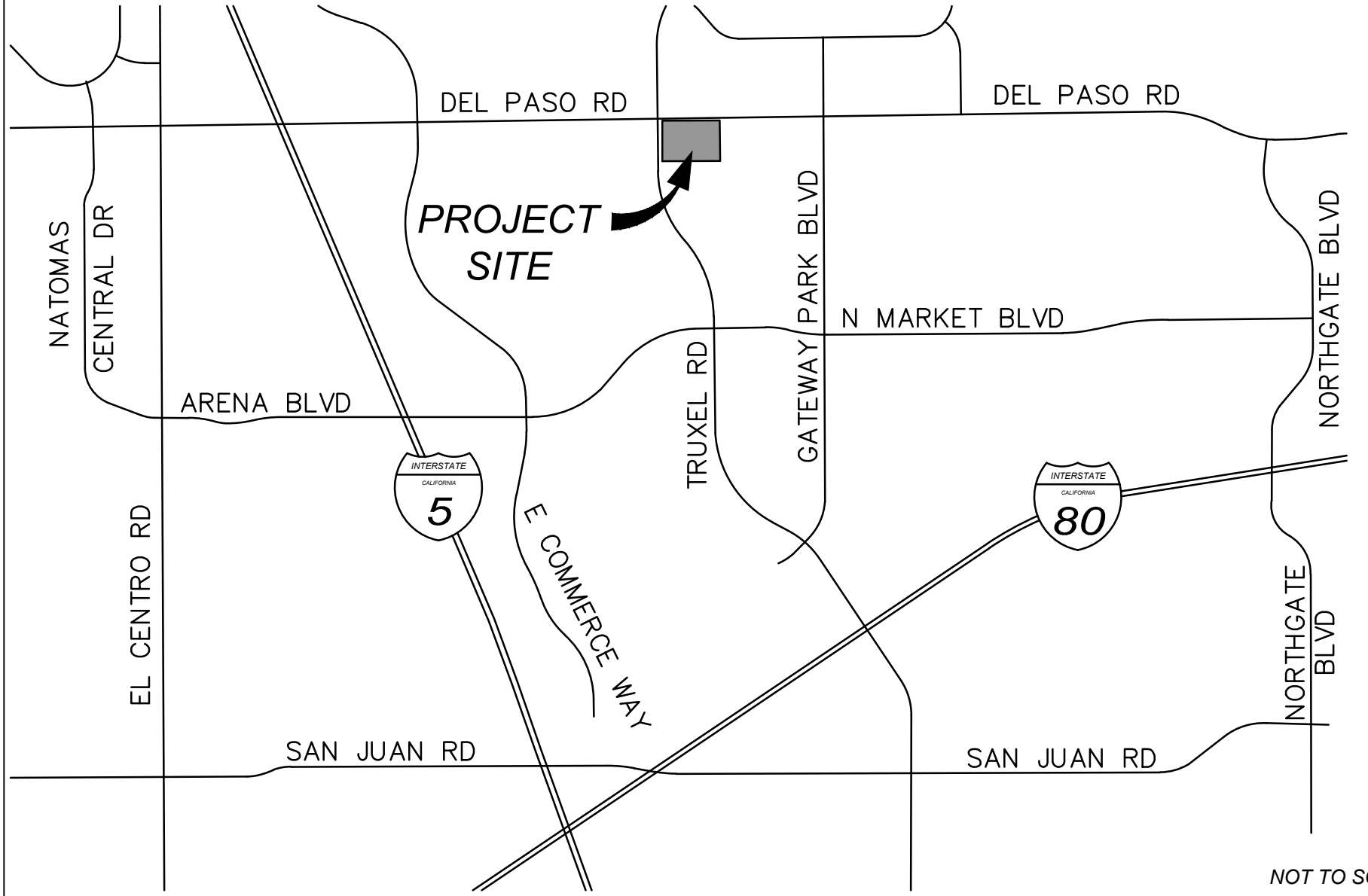
The storm drainage improvements were designed to meet the minimum design standards of the City of Sacramento Onsite Design Manual. The proposed on-site storm drainage pipe system is adequate to convey the peak design flows. Overland flows would be routed off-site with sufficient freeboard from the building finish floor elevation.

F. REFERENCES

- *City of Sacramento Onsite Design Manual for Onsite Drainage, Sewer, Water, Stormwater Quality and Erosion and Sediment Control. May 2020*

APPENDIX A

VICINITY MAP AND SITE PLAN



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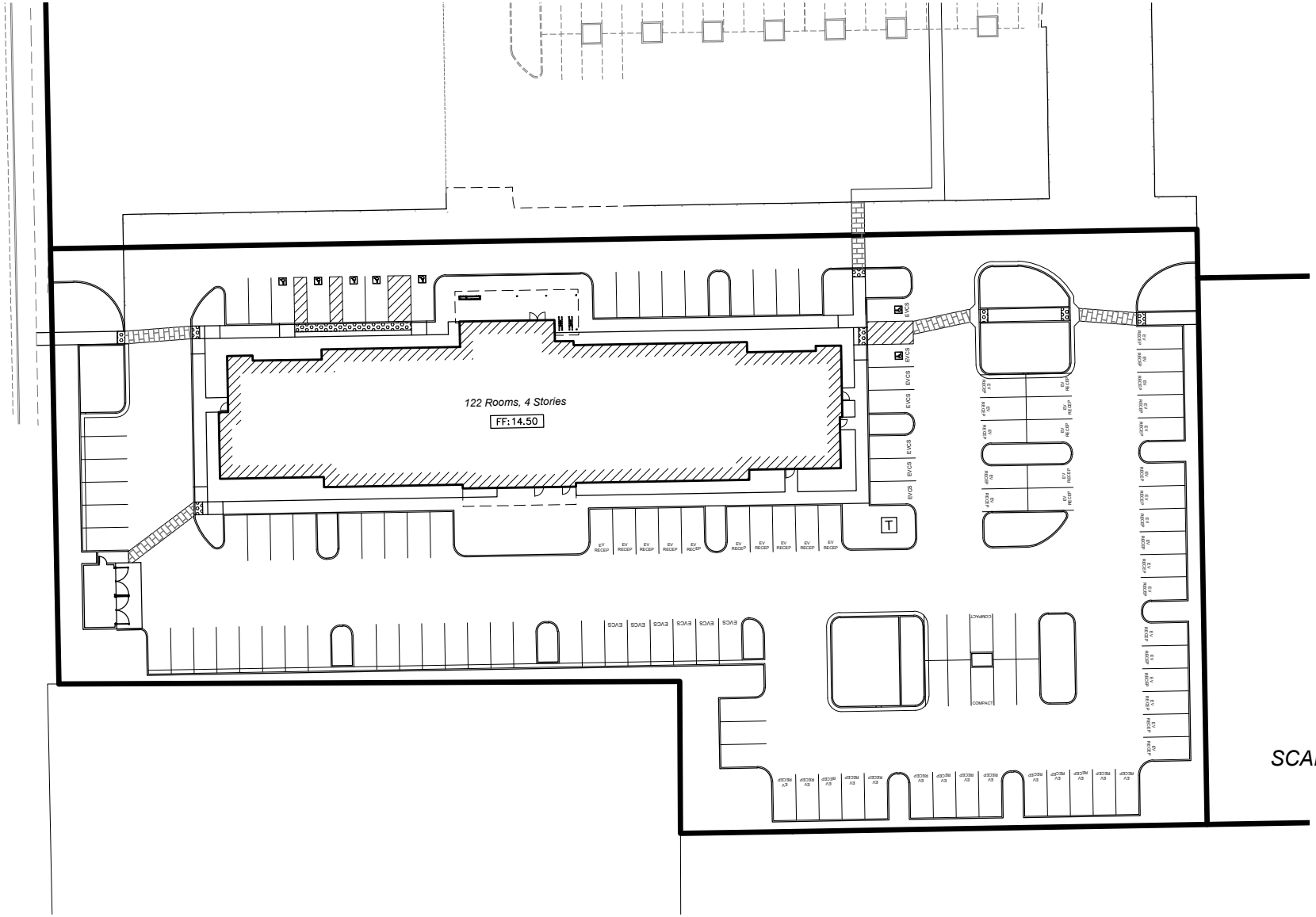
VICINITY MAP

WOODSPRING SUITES

DEL PASO ROAD
SACRAMENTO, CA 95834

TRUXEL ROAD



SCALE: 1"=60'

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SITE PLAN

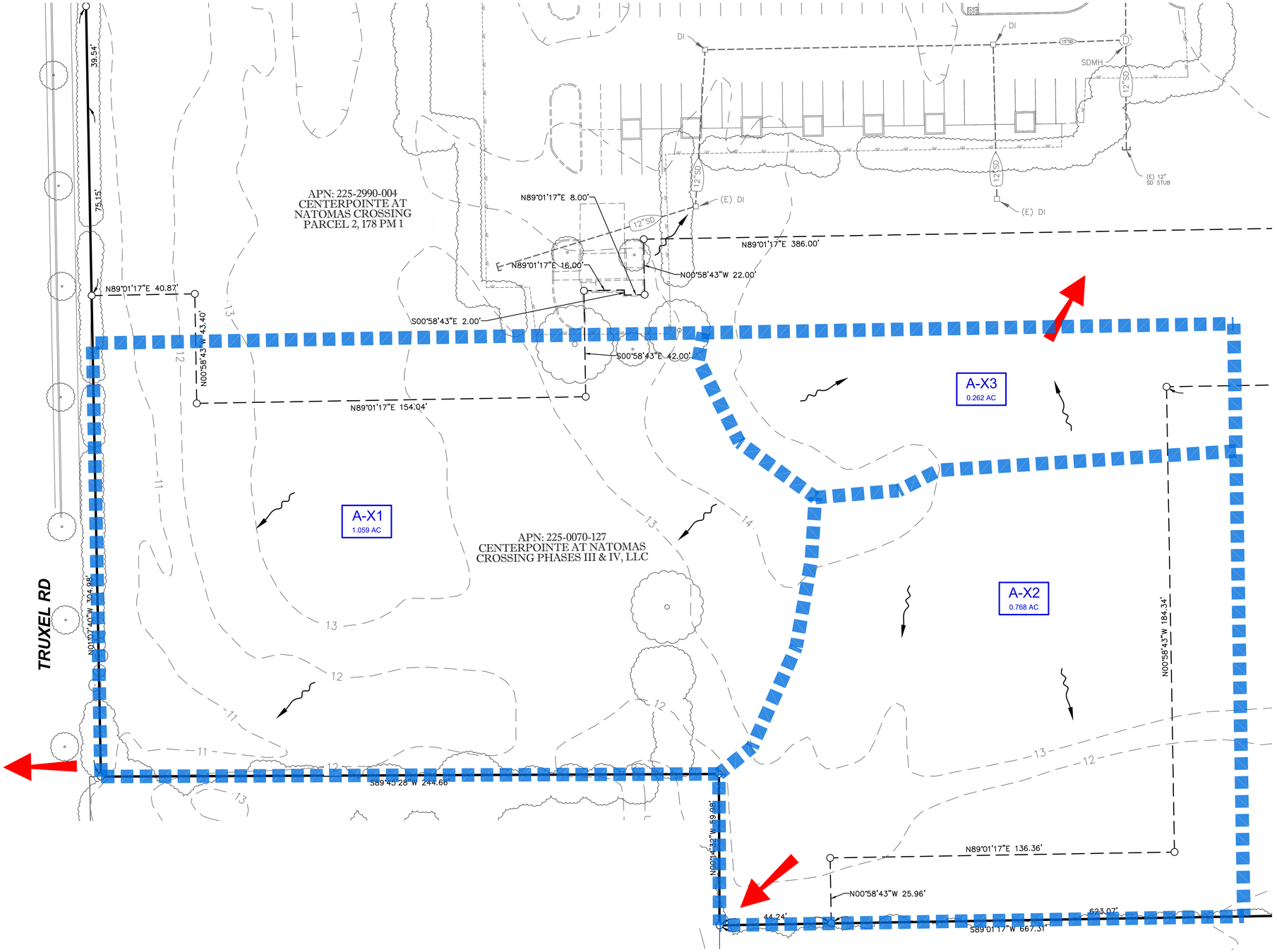
WOODSPRING SUITES
DEL PASO ROAD
SACRAMENTO, CA 95834

APPENDIX B

PROJECT SHED MAPS

PRE-CONSTRUCTION SHED AREAS (ACRES)

SHED	IMPERVIOUS	PERVIOUS	TOTAL	% IMPERVIOUS
A-X1	0.000	1.059	1.059	0.0%
A-X2	0.000	0.768	0.768	0.0%
A-X3	0.000	0.262	0.262	0.0%
TOTAL	0.000	2.089	2.09	0.0%



LEGEND

- A-X1 / X.XXX AC — DRAINAGE AREA DESIGNATIONS & AREA
- DRAINAGE AREA BOUNDARY
- OVERLAND RELEASE
- SURFACE FLOW

811 Know what's **below.** **Call** before you dig. or (800) 642-2444

NOT FOR CONSTRUCTION

NO.	REVISION	DATE	BY	APPR'VD

BY	CHECK
DESIGN RFE	RFE
DRAWN YN	RFE
QUANT.	

ORIGINAL SCALE IS IN INCHES 0 1 2

REGISTERED PROFESSIONAL ENGINEER ROBERT F. EYNON No. C040666 *PRELIMINARY* NOT FOR CONSTRUCTION OF CALIF

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PRELIMINARY
PRE-CONSTRUCTION SHED MAP

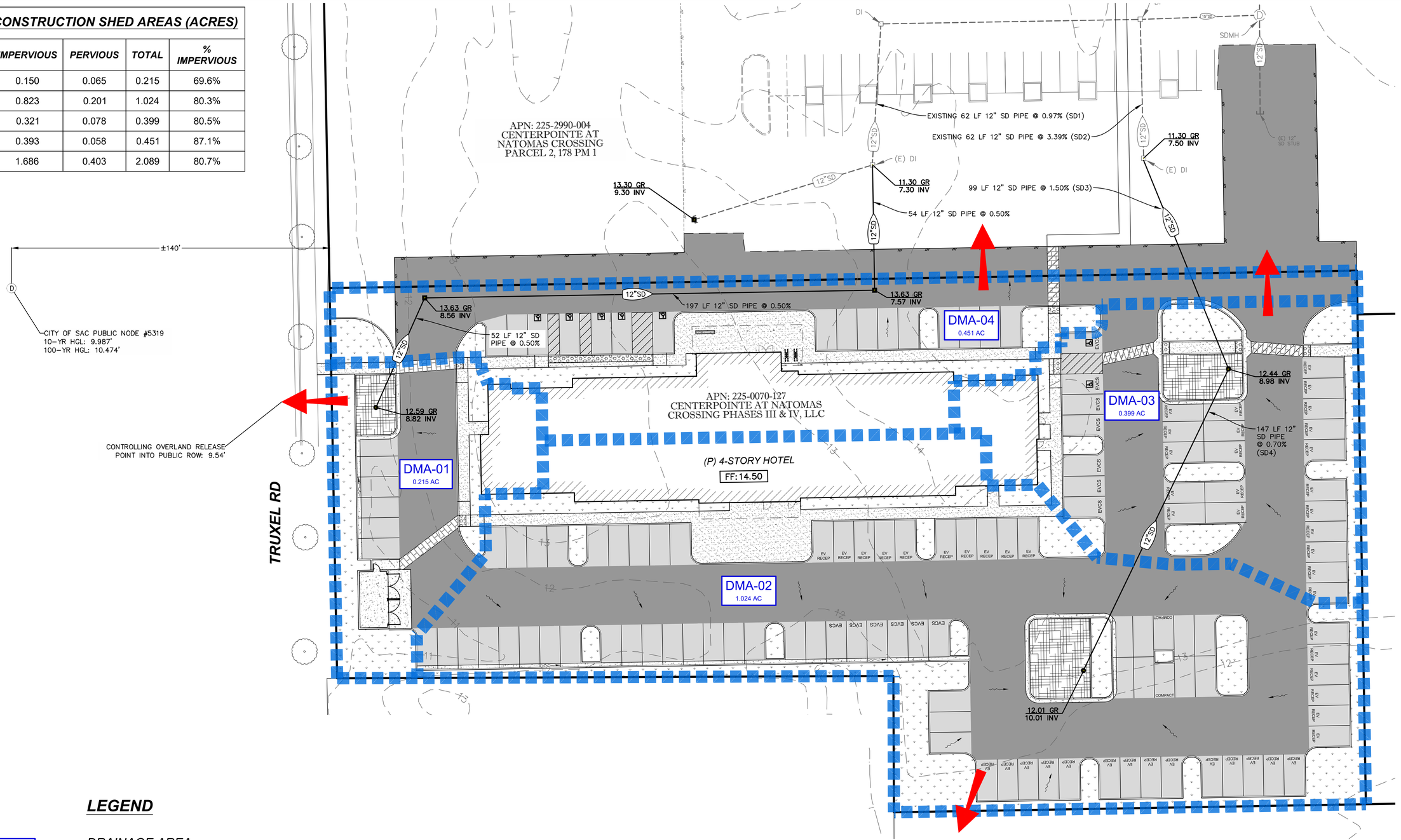
Sheet
SM1
1 of 2
6/21/2024

CWE PROJECT R23138 – WOODSPRING SUITES, SACRAMENTO, CA

W:\2023 Projects\R23138 Woodspring Suites\WORKING CAD\Exhibits\SM1-PRELIM PRE SHED MAP-23138.dwg Jun 14, 2024-03:51 pm

POST-CONSTRUCTION SHED AREAS (ACRES)

SHED	IMPERVIOUS	PERVIOUS	TOTAL	% IMPERVIOUS
DMA-01	0.150	0.065	0.215	69.6%
DMA-02	0.823	0.201	1.024	80.3%
DMA-03	0.321	0.078	0.399	80.5%
DMA-04	0.393	0.058	0.451	87.1%
TOTAL	1.686	0.403	2.089	80.7%



LEGEND

DMA-X
XX.XX AC — *DRAINAGE AREA DESIGNATIONS & AREA*

DRAINAGE AREA BOUNDARY

OVERLAND RELEASE

SURFACE FLOW

1 INCH = 20 FEET

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NOT FOR CONSTRUCTION

NO.	REVISION	DATE	BY	APPRVD

BY	CHECK
DESIGN RFE	RFE
DRAWN YN	RFE
QUANT.	

ORIGINAL SCALE IS IN INCHES 0 1 2

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PRELIMINARY
POST-CONSTRUCTION SHED MAP

Sheet
SM2
2 of 2
7/19/2024

CWE PROJECT R23138 – WOODSPRING SUITES, SACRAMENTO, CA

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APPENDIX C

DRAINAGE CALCULATIONS

Peak Flow Calculations

Date: 7/15/2024
Project: Woodspring Suites
Location: Sacramento, CA
Designer: AEB

References: City of Sacramento Onsite Design Manual

Land Coverage

Shed	Impervious Area		Pervious Area		Total Area		% Imp.	Runoff Coeff.	Time of Conc. (min.)	Rainfall Intensity (in./hr.)	Peak Flow (cfs)
	SF	AC	SF	AC	SF	AC		C	t	i	Q
DMA-01	6521	0.150	2845	0.065	9366	0.215	69.62%	0.78	6.09	2.88	0.484
DMA-02	35818	0.822	8767	0.201	44585	1.024	80.34%	0.84	5.79	2.96	2.551
DMA-03	14004	0.321	3397	0.078	17401	0.399	80.48%	0.84	5.79	2.96	0.997
DMA-04	17121	0.393	2539	0.058	19660	0.451	87.09%	0.88	5.61	3.02	1.197

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 15 2024

Existing 12-inch SD Pipe (Serving DMA-01 and DMA-04)

Circular

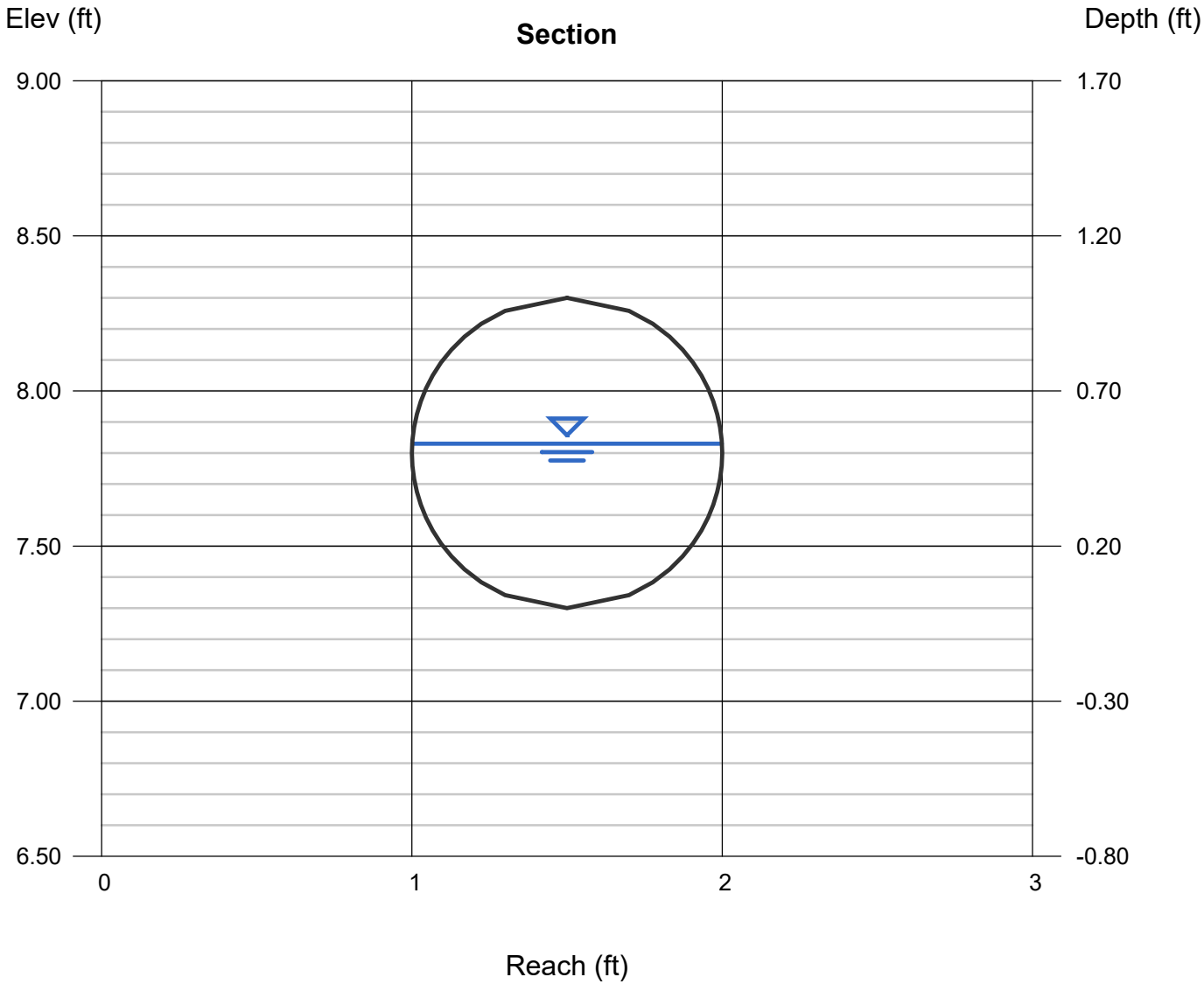
Diameter (ft)	= 1.00
Invert Elev (ft)	= 7.30
Slope (%)	= 0.97
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.68

Highlighted

Depth (ft)	= 0.53
Q (cfs)	= 1.681
Area (sqft)	= 0.42
Velocity (ft/s)	= 3.96
Wetted Perim (ft)	= 1.63
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 1.00
EGL (ft)	= 0.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 15 2024

Existing 12-inch SD Pipe (Serving DMA-02 and DMA-03)

Circular

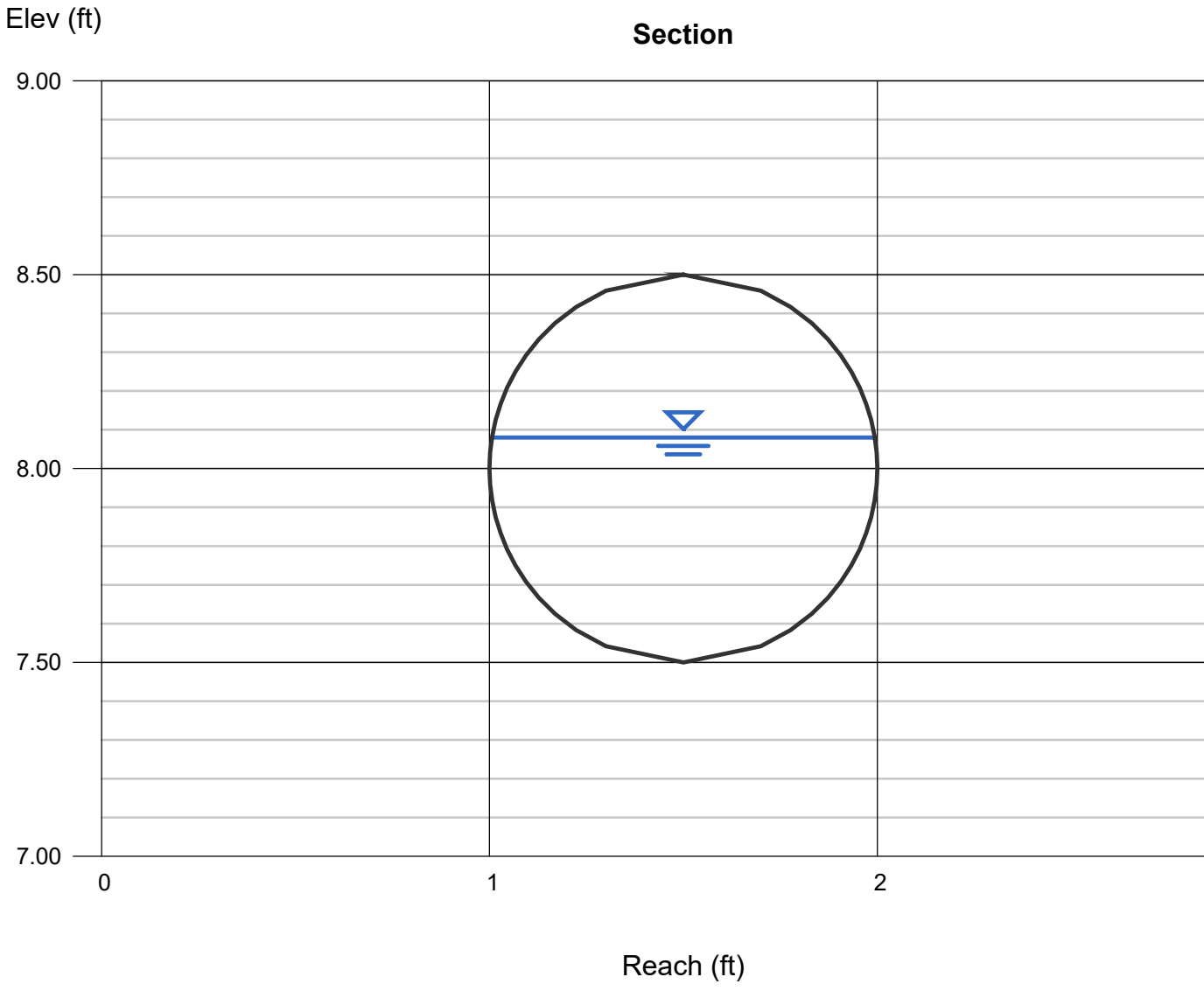
Diameter (ft)	= 1.00
Invert Elev (ft)	= 7.50
Slope (%)	= 3.39
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.55

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 3.550
Area (sqft)	= 0.47
Velocity (ft/s)	= 7.49
Wetted Perim (ft)	= 1.73
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 0.99
EGL (ft)	= 1.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 15 2024

Proposed 12-inch SD Pipe (Serving DMA-02 and DMA-03)

Circular

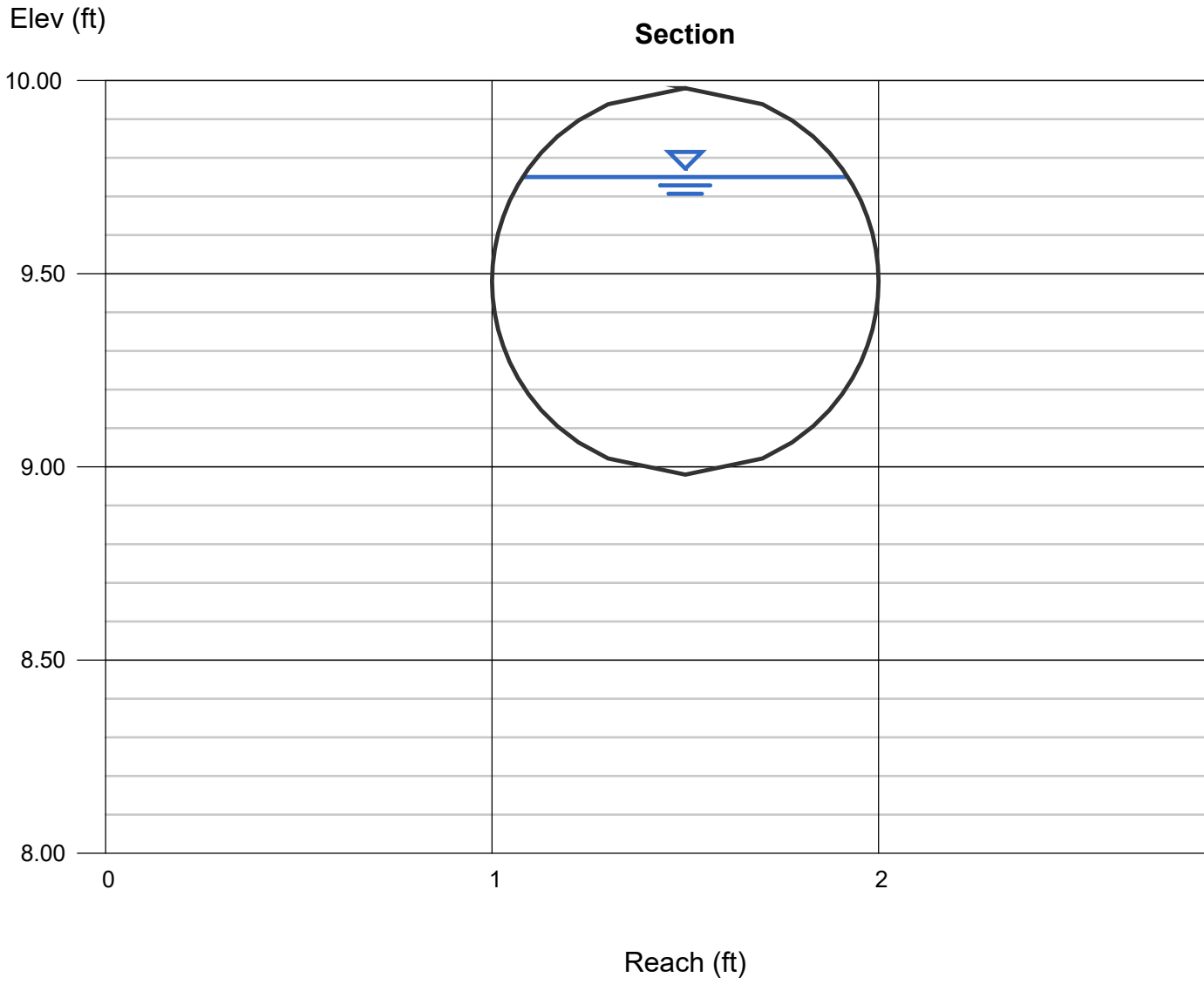
Diameter (ft)	= 1.00
Invert Elev (ft)	= 8.98
Slope (%)	= 1.50
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.55

Highlighted

Depth (ft)	= 0.77
Q (cfs)	= 3.550
Area (sqft)	= 0.65
Velocity (ft/s)	= 5.46
Wetted Perim (ft)	= 2.15
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 0.84
EGL (ft)	= 1.23



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 15 2024

Proposed 12-inch SD Pipe (Serving DMA-02)

Circular

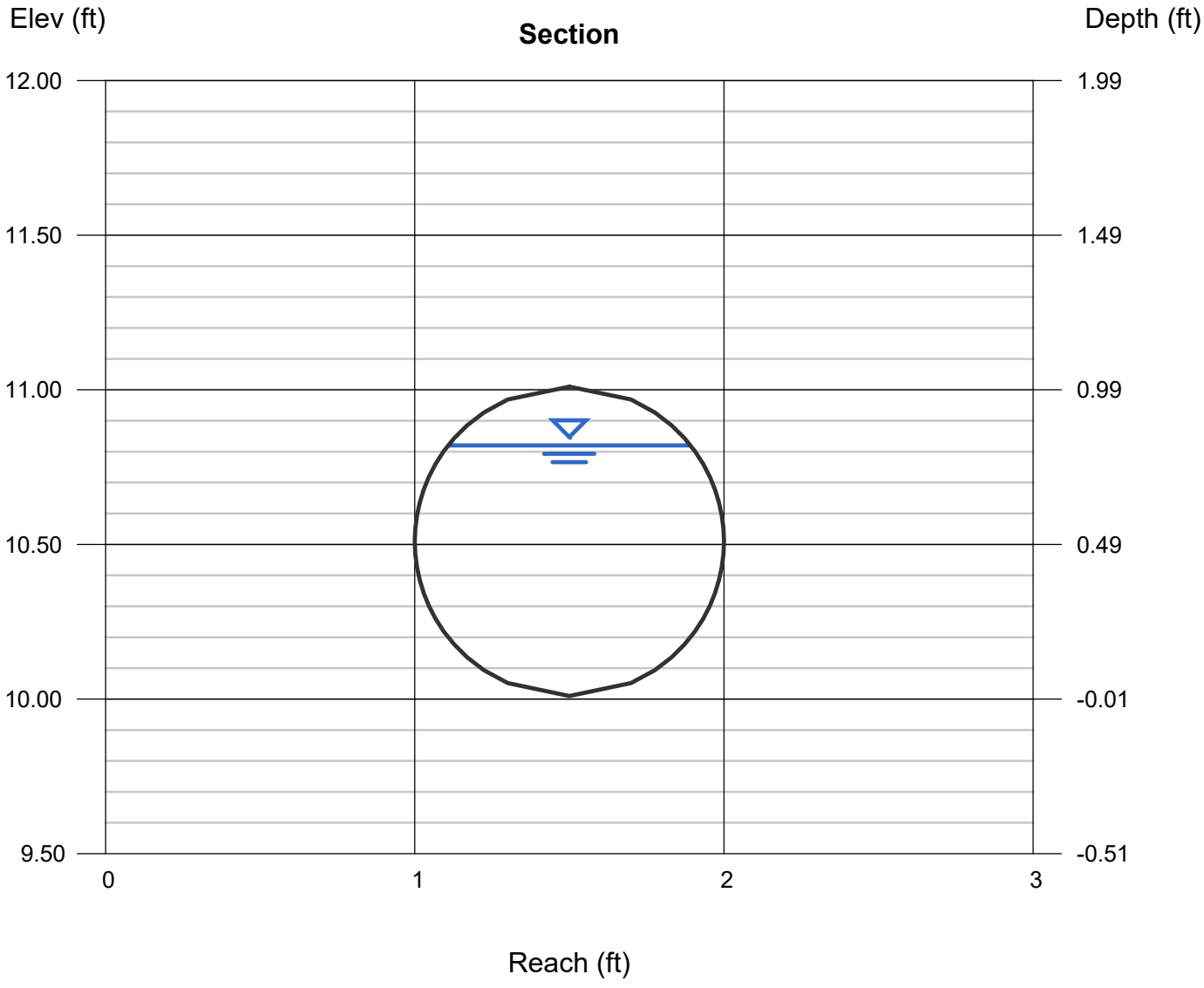
Diameter (ft)	= 1.00
Invert Elev (ft)	= 10.01
Slope (%)	= 0.70
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.55

Highlighted

Depth (ft)	= 0.81
Q (cfs)	= 2.550
Area (sqft)	= 0.68
Velocity (ft/s)	= 3.74
Wetted Perim (ft)	= 2.24
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 0.78
EGL (ft)	= 1.03



WEIGHTED LID TABLE

			Contributions to Runoff					
Drainage Shed	**Shed Area (AC)**	**Pervious (AC)**	**Impervious (AC)**	**Area of LID Feature[1] (SF)**	**LID Points from Worksheet (max 200)[2]**	**% of Site**	**Weighted LID Points**	**Description**
DMA-01	0.215	0.065	0.150	458	173	10%	11.01	6-in pond depth, 4-in subdrain, 0 new trees
DMA-02	1.024	0.201	0.822	922	99	49%	52.42	6-in pond depth, 4-in subdrain, 0 new trees
DMA-03	0.399	0.078	0.321	690	123	19%	20.46	6-in pond depth, 4-in subdrain, 0 new trees
DMA-04	0.451	0.058	0.393	0	80	22%	23.11	6-in pond depth, 4-in subdrain, 0 new trees
DMA-05				-	-			
DMA-06				-	-			
Sub-Total	2.089	0.403	1.687	-	-	-	-	
Totals	2.089					100%	107.0	[4] This is the weighted LID Credit for the whole site.
		Verify Sub-Total	2.089					

Notes:

[1] *Area of LID features should not be included in Step 1 of the LID worksheet.*

[2] *Maximum of 200 LID credits per drainage shed can be applied to the weighting of the overall site LID.*

[3] *These DMAs are at the exterior of the site and flow offsite. SWQ has been met with inteceptor trees where needed.*

[4] *The weighted LID points only applies to obtaining LID compliance. 100% SWQ treatment is still required for any shed with new or reconstructed impervious area.*

[5] *Proprietary Sacramento Stormwater Quality Partnership (SSQP) approved SWQ Treatment structure with 50in/hr Hydraulic Load Rate (HLR).*

[6] *DMA-5 AND DMA-6 Do Not Require LID OR SWQ treatment as no additional impervious area is created or replaced.*

Appendix D-2: Commercial Sites: Low Impact Development (LID) Credits and Treatment BMP Sizing Calculations

Name of Drainage Shed: DMA-01
Location of project: Sacramento

Fill in Blue Highlighted boxes

Step 1 - Open Space and Pervious Area Credits

Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

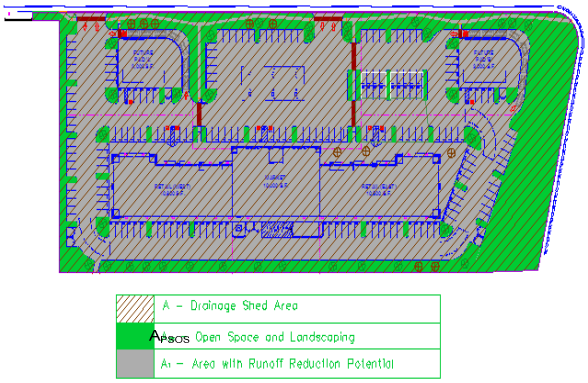
1 a. Common Drainage Plan Area	488	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	121	acres	A_{OS}	**see area example below**
a. Natural storage reservoirs and drainage corridors	0	acres		
b. Buffer zones for natural water bodies	0	acres		
c. Natural areas including existing trees, other vegetation, and soil	0	acres		
d. Common landscape area/park	107	acres		
e. Regional Flood Control/Drainage basins	14	acres		
1 b. Project Drainage Shed Area (Total)	0.215	acres	A	
Project-Specific Open Space (In-project, communal)**	0.0548	acres	A_{PSOS}	
a. Natural storage reservoirs and drainage corridors	0.00	acres		
b. Buffer zones for natural water bodies	0.00	acres		
c. Natural areas including existing trees, other vegetation, and soil	0.00	acres		**see area example below**
d. Landscape area/park	0.0548	acres		
e. Flood Control/Drainage basins	0.00	acres		

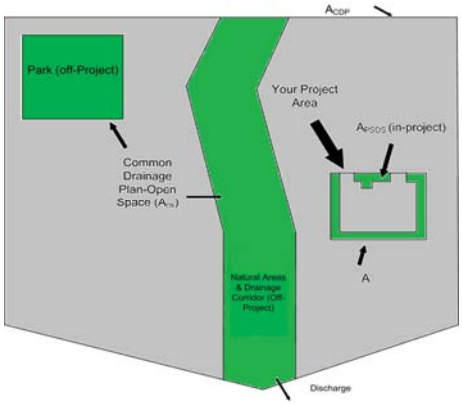
** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential	$A - A_{PSOS} =$	0.1602	acres	A_T
Assumed Initial Impervious Fraction	$A_T / A =$	0.75		I

Open Space & Pervious Area LID Credit (Step 1)

$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100 =$ 50 pts





Step 2 - Runoff Reduction Credits

Runoff Reduction Treatments	Impervious Area Managed			Efficiency Factor		Effective Area Managed (A_C)	
Porous Pavement:							
Option 1: Porous Pavement (see Fact Sheet, excludes porous pavement used in Option 2)		acres	x	1	=	0.000	acres
Option 2: Disconnected Pavement (see Fact Sheet, excludes porous pavement used in Option 1)	use Form D-2a for credits →					0.00	acres
Landscaping used to Disconnect Pavement (see Fact Sheet)	0.0110	acres			=	0.01	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.028	acres			=	0.03	acres
Ecoroof (see Fact Sheet)	0	acres			=	0.00	acres
Interceptor Trees (see Fact Sheet)	use Form D-2b for credits →					0.00	acres
Total Effective Area Managed by Runoff Reduction Measures				A_C		0.04	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100 =$		24	pts

Table D-2a

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete/Asphalt	0.60
Modular Block Pavement &	0.75
Reinforced Grass Pavement	1.00

Table D-2b

Maximum roof size	Minimum travel distance
≤ 3,500 sq ft	21 ft
≤ 5,000 sq ft	24 ft
≤ 7,500 sq ft	28 ft
≤ 10,000 sq ft	32 ft

Form D-2a: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding Disconnected Pavement credit guidelines

Effective Area Managed (A_C)

Pavement Draining to Porous Pavement

2. Enter area draining onto Porous Pavement	0.00	acres	Box K1
3. Enter area of Receiving Porous Pavement (excludes area entered in Step 2 under Porous Pavement)	0.00	acres	Box K2
4. Ratio of Areas (Box K1 / Box K2)	0.00		Box K3

5. Select multiplier using ratio from Box K3 and enter into Box K4

Ratio (Box D)	Multiplier
Ratio is ≤ 0.5	1.00
Ratio is > 0.5 and < 1.0	0.83
Ratio is > 1.0 and < 1.5	0.71
Ratio is > 1.5 and < 2.0	0.55

Box K4: 1

6. Enter Efficiency of Porous Pavement (see table below) — Box K5

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete Asphalt Pavement	0.60
Modular Block Pavement Porous Gravel Pavement	0.75
Reinforced Grass Pavement	1.00

7. Multiply Box K2 by Box K5 and enter into Box K6	0.00	acres	Box K6
8. Multiply Boxes K1,K4, and K5 and enter the result in Box K7	0.00	acres	Box K7

9. Add Box K6 to Box K7 and multiply by 60%, and enter the Result in Box K8 — 0.00 acres
This is the amount of area credit to enter into the "Disconnected Pavement" Box of Form D-2

Form D-2b: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines

New Evergreen Trees

1. Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.	0	trees	Box L1
2. Multiply Box L1 by 200 and enter result in Box L2	0	sq. ft.	Box L2

New Deciduous Trees

3. Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.	0	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	0	sq. ft.	Box L4

Existing Tree Canopy

5. Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.	0	sq. ft.	Box L5
6. Multiply Box L5 by 0.5 and enter the result in Box L6	0	sq. ft.	Box L6

Total Interceptor Tree EAM Credits

Add Boxes L2, L4, and L6 and enter it into Box L7	0	sq. ft.	Box L7
Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter result in Box L8 This is the amount of area credit to enter into the "Interceptor Trees" Box of Form D-2	0.00	acres	Box L8

Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

(see Fact Sheet) | - enter gallons, for simple rain barrels | 0.00 acres

Automated-Control Capture and Use System

(see Fact Sheet, then enter impervious area managed by the system) | 0.00 acres

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

(see Fact Sheet)

Bioretention Area: 458 sq ft
Subdrain Elevation: 27 inches
Ponding Depth, inches: 6 inches

0.0784 acres

Impervious Area Managed by Infiltration BMPs

(see Fact Sheet)

Drawdown Time, hrs: drawdown_hrs_inf
Soil Infiltration Rate, in/hr: soil_inf_rate

Sizing Option 1: Capture Volume, acre-ft: capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: soil_surface_area | 0.0000 acres

Basin or trench? approximate BMP depth: 0.00 ft

Impervious Area Managed by Amended Soil or Mulch Beds

(see Fact Sheet) | Mulched Infiltration Area, sq ft: - mulch_area | 0.00 acres

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs | 0.07841 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 97.9 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 172.5

Does project require hydromodification management? If yes, proceed to using SacHM.

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.0428 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.20 I_A

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Calculate treatment flow (cfs): Flow = Runoff Coefficient x Rainfall Intensity x Area

Look up value for i in Table D-2c (Rainfall Intensity): 0.18 i

Obtain A_{AT} from Step 3: 0.04 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.01 cfs

Table D-2c

Rainfall Intensity			
Roseville	i =	0.20	in/hr
Sacramento	i =	0.18	in/hr
Folsom	i =	0.20	in/hr

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet): WQV = Area x Maximized Detention Volume (P_0)

Obtain A from Step 1: 0.22 A | 12 hrs Specified Draw Down time

Obtain P_0: Maximized Detention Volume from figures E-1 to E-4 in Appendix E of this manual using I_A from Step 2.: 0.12 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.002131 Acre-Feet

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Appendix D-2: Commercial Sites: Low Impact Development (LID) Credits and Treatment BMP Sizing Calculations

Name of Drainage Shed: DMA-02
Location of project: Sacramento

Fill in Blue Highlighted boxes

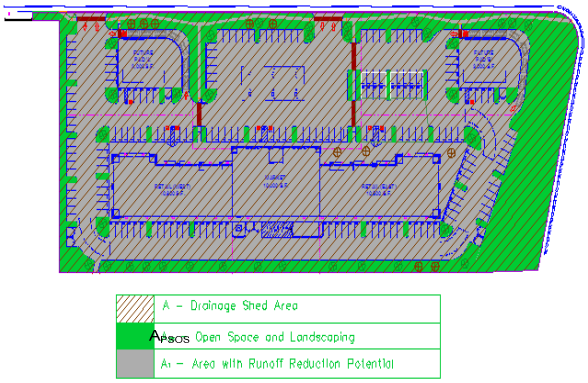
Step 1 - Open Space and Pervious Area Credits

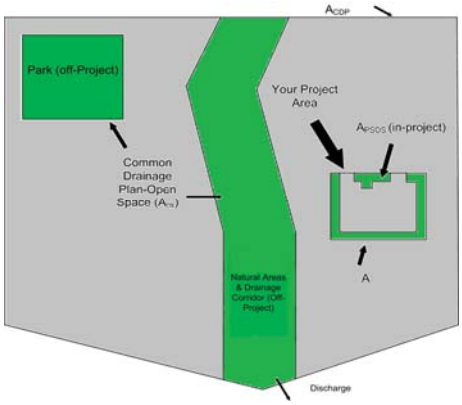
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	488	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	121	acres	A_{OS}	**see area example below**
a. Natural storage reservoirs and drainage corridors	0	acres		
b. Buffer zones for natural water bodies	0	acres		
c. Natural areas including existing trees, other vegetation, and soil	0	acres		
d. Common landscape area/park	107	acres		
e. Regional Flood Control/Drainage basins	14	acres		
1 b. Project Drainage Shed Area (Total)	1.024	acres	A	
Project-Specific Open Space (In-project, communal)**	0.1801	acres	A_{PSOS}	
a. Natural storage reservoirs and drainage corridors	0.00	acres		
b. Buffer zones for natural water bodies	0.00	acres		
c. Natural areas including existing trees, other vegetation, and soil	0.00	acres		**see area example below**
d. Landscape area/park	0.1801	acres		
e. Flood Control/Drainage basins	0.00	acres		

** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential	$A - A_{PSOS}$ =	0.8434	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.82		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	42	pts	





Step 2 - Runoff Reduction Credits

Runoff Reduction Treatments	Impervious Area Managed			Efficiency Factor		Effective Area Managed (A_C)	
Porous Pavement:							
Option 1: Porous Pavement (see Fact Sheet, excludes porous pavement used in Option 2)	0	acres	x		=	0.000	acres
Option 2: Disconnected Pavement (see Fact Sheet, excludes porous pavement used in Option 1)	use Form D-2a for credits →					0.00	acres
Landscaping used to Disconnect Pavement (see Fact Sheet)	0.0410	acres			=	0.04	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.121	acres			=	0.12	acres
Ecoroof (see Fact Sheet)	0	acres			=	0.00	acres
Interceptor Trees (see Fact Sheet)	use Form D-2b for credits →					0.00	acres
Total Effective Area Managed by Runoff Reduction Measures				A_C		0.16	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		19	pts

Table D-2a

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete/Asphalt	0.60
Modular Block Pavement &	0.75
Reinforced Grass Pavement	1.00

Table D-2b

Maximum roof size	Minimum travel distance
≤ 3,500 sq ft	21 ft
≤ 5,000 sq ft	24 ft
≤ 7,500 sq ft	28 ft
≤ 10,000 sq ft	32 ft

Form D-2a: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding Disconnected Pavement credit guidelines

Effective Area Managed (A_C)

Pavement Draining to Porous Pavement

2. Enter area draining onto Porous Pavement	0.00	acres	Box K1
3. Enter area of Receiving Porous Pavement (excludes area entered in Step 2 under Porous Pavement)	0.00	acres	Box K2
4. Ratio of Areas (Box K1 / Box K2)	0.00		Box K3

5. Select multiplier using ratio from Box K3 and enter into Box K4

Ratio (Box D)	Multiplier
Ratio is ≤ 0.5	1.00
Ratio is > 0.5 and < 1.0	0.83
Ratio is > 1.0 and < 1.5	0.71
Ratio is > 1.5 and < 2.0	0.55

Box K4: 1

6. Enter Efficiency of Porous Pavement (see table below) — Box K5

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete Asphalt Pavement	0.60
Modular Block Pavement Porous Gravel Pavement	0.75
Reinforced Grass Pavement	1.00

7. Multiply Box K2 by Box K5 and enter into Box K6	0.00	acres	Box K6
8. Multiply Boxes K1,K4, and K5 and enter the result in Box K7	0.00	acres	Box K7
9. Add Box K6 to Box K7 and multiply by 60%, and enter the Result in Box K8 This is the amount of area credit to enter into the "Disconnected Pavement" Box of Form D-2			0.00 acres

Form D-2b: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines

New Evergreen Trees

1. Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.	0	trees	Box L1
2. Multiply Box L1 by 200 and enter result in Box L2	0	sq. ft.	Box L2

New Deciduous Trees

3. Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.	0	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	0	sq. ft.	Box L4

Existing Tree Canopy

5. Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.	0	sq. ft.	Box L5
6. Multiply Box L5 by 0.5 and enter the result in Box L6	0	sq. ft.	Box L6

Total Interceptor Tree EAM Credits

Add Boxes L2, L4, and L6 and enter it into Box L7	0	sq. ft.	Box L7
Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter result in Box L8 This is the amount of area credit to enter into the "Interceptor Trees" Box of Form D-2	0.00	acres	Box L8

Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

(see Fact Sheet) | - | enter gallons, for simple rain barrels | 0.00 | acres

Automated-Control Capture and Use System

(see Fact Sheet, then enter impervious area managed by the system) | 0.00 | acres

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

(see Fact Sheet)

Bioretention Area	922	sq ft
Subdrain Elevation	27	inches
Ponding Depth, inches	6	inches

0.1578 acres

Impervious Area Managed by Infiltration BMPs

(see Fact Sheet)

Drawdown Time, hrs		drawdown_hrs_inf
Soil Infiltration Rate, in/hr		soil_inf_rate

Sizing Option 1: Capture Volume, acre-ft | capture_vol_inf | 0.00 | acres

Sizing Option 2: Infiltration BMP surface area, sq ft | soil_surface_area | 0.0000 | acres

Basin or trench? | approximate BMP depth | 0.00 | ft

Impervious Area Managed by Amended Soil or Mulch Beds

(see Fact Sheet) | Mulched Infiltration Area, sq ft | - | mulch_area | 0.00 | acres

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs | 0.15784 | A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = | 37.4 | pts

Total LID Credits (Step 1+2+3) Warning: More LID Is Required 99.0

Does project require hydromodification management? If yes, proceed to using SacHM.

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = | 0.5236 | A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = | 0.51 | I_A

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Calculate treatment flow (cfs): Flow = Runoff Coefficient x Rainfall Intensity x Area

Look up value for i in Table D-2c (Rainfall Intensity) | 0.18 | i

Obtain A_{AT} from Step 3 | 0.52 | A_{AT}

Use C = 0.95 | 0.95 | C

Flow = 0.95 * i * A_{AT} | 0.09 | cfs

Table D-2c

Rainfall Intensity			
Roseville	i =	0.20	in/hr
Sacramento	i =	0.18	in/hr
Folsom	i =	0.20	in/hr

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet): WQV = Area x Maximized Detention Volume (P_0)

Obtain A from Step 1 | 1.02 | A | 12 | hrs | Specified Draw Down time

Obtain P_0: Maximized Detention Volume from figures E-1 to E-4 in Appendix E of this manual using I_A from Step 2. | 0.25 | P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12) | 0.021276 | Acre-Feet

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Appendix D-2: Commercial Sites: Low Impact Development (LID) Credits and Treatment BMP Sizing Calculations

Name of Drainage Shed: DMA-03
Location of project: Sacramento

Fill in Blue Highlighted boxes

Step 1 - Open Space and Pervious Area Credits

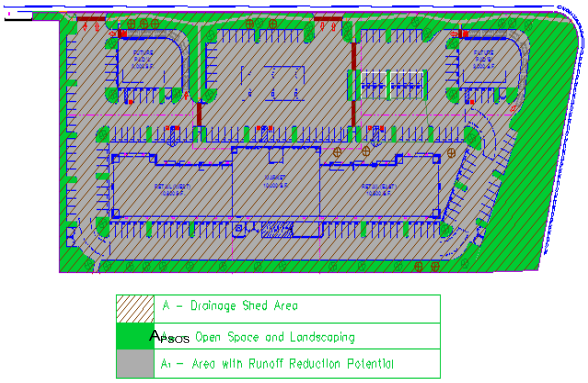
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

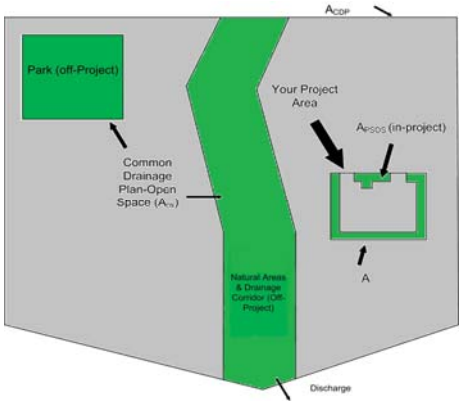
1 a. Common Drainage Plan Area	488	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	121	acres	A_{OS}	**see area example below**
a. Natural storage reservoirs and drainage corridors	0	acres		
b. Buffer zones for natural water bodies	0	acres		
c. Natural areas including existing trees, other vegetation, and soil	0	acres		
d. Common landscape area/park	107	acres		
e. Regional Flood Control/Drainage basins	14	acres		
1 b. Project Drainage Shed Area (Total)	0.399	acres	A	
Project-Specific Open Space (In-project, communal)**	0.0621	acres	A_{PSOS}	
a. Natural storage reservoirs and drainage corridors	0.00	acres		
b. Buffer zones for natural water bodies	0.00	acres		
c. Natural areas including existing trees, other vegetation, and soil	0.00	acres		**see area example below**
d. Landscape area/park	0.0621	acres		
e. Flood Control/Drainage basins	0.00	acres		

** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential	$A - A_{PSOS}$ =	0.3373	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.84		I

Open Space & Pervious Area LID Credit (Step 1)
$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ = 40 pts





Step 2 - Runoff Reduction Credits

Runoff Reduction Treatments	Impervious Area Managed			Efficiency Factor		Effective Area Managed (A_C)	
Porous Pavement:							
Option 1: Porous Pavement (see Fact Sheet, excludes porous pavement used in Option 2)	0	acres	x		=	0.000	acres
Option 2: Disconnected Pavement (see Fact Sheet, excludes porous pavement used in Option 1)	use Form D-2a for credits →					0.00	acres
Landscaping used to Disconnect Pavement (see Fact Sheet)	0.0104	acres			=	0.01	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.0321	acres			=	0.03	acres
Ecoroof (see Fact Sheet)	0	acres			=	0.00	acres
Interceptor Trees (see Fact Sheet)	use Form D-2b for credits →					0.00	acres
Total Effective Area Managed by Runoff Reduction Measures				A_C		0.04	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		13	pts

Table D-2a

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete/Asphalt	0.60
Modular Block Pavement &	0.75
Reinforced Grass Pavement	1.00

Table D-2b

Maximum roof size	Minimum travel distance
≤ 3,500 sq ft	21 ft
≤ 5,000 sq ft	24 ft
≤ 7,500 sq ft	28 ft
≤ 10,000 sq ft	32 ft

Form D-2a: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding Disconnected Pavement credit guidelines

Effective Area Managed (A_C)

Pavement Draining to Porous Pavement

2. Enter area draining onto Porous Pavement	0.00	acres	Box K1
3. Enter area of Receiving Porous Pavement (excludes area entered in Step 2 under Porous Pavement)	0.00	acres	Box K2
4. Ratio of Areas (Box K1 / Box K2)	0.00		Box K3

5. Select multiplier using ratio from Box K3 and enter into Box K4

Ratio (Box D)	Multiplier
Ratio is ≤ 0.5	1.00
Ratio is > 0.5 and < 1.0	0.83
Ratio is > 1.0 and < 1.5	0.71
Ratio is > 1.5 and < 2.0	0.55

Box K4: 1

6. Enter Efficiency of Porous Pavement (see table below) — Box K5

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete Asphalt Pavement	0.60
Modular Block Pavement Porous Gravel Pavement	0.75
Reinforced Grass Pavement	1.00

7. Multiply Box K2 by Box K5 and enter into Box K6	0.00	acres	Box K6
8. Multiply Boxes K1,K4, and K5 and enter the result in Box K7	0.00	acres	Box K7
9. Add Box K6 to Box K7 and multiply by 60%, and enter the Result in Box K8 This is the amount of area credit to enter into the "Disconnected Pavement" Box of Form D-2			0.00 acres

Form D-2b: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines

New Evergreen Trees

1. Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.		trees	Box L1
2. Multiply Box L1 by 200 and enter result in Box L2	0	sq. ft.	Box L2

New Deciduous Trees

3. Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.	0	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	0	sq. ft.	Box L4

Existing Tree Canopy

5. Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.	0	sq. ft.	Box L5
6. Multiply Box L5 by 0.5 and enter the result in Box L6	0	sq. ft.	Box L6

Total Interceptor Tree EAM Credits

Add Boxes L2, L4, and L6 and enter it into Box L7	0	sq. ft.	Box L7
Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter result in Box L8 This is the amount of area credit to enter into the "Interceptor Trees" Box of Form D-2	0.00	acres	Box L8

Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

(see Fact Sheet) - enter gallons, for simple rain barrels | 0.00 acres

Automated-Control Capture and Use System

(see Fact Sheet, then enter impervious area managed by the system) | 0.00 acres

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

(see Fact Sheet)

Bioretention Area 690 sq ft
Subdrain Elevation 27 inches
Ponding Depth, inches 6 inches | 0.1181 acres

Impervious Area Managed by Infiltration BMPs

(see Fact Sheet)

Drawdown Time, hrs drawdown_hrs_inf
Soil Infiltration Rate, in/hr soil_inf_rate

Sizing Option 1: Capture Volume, acre-ft capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft soil_surface_area | 0.0000 acres

Basin or trench? approximate BMP depth 0.00 ft

Impervious Area Managed by Amended Soil or Mulch Beds

(see Fact Sheet) Mulched Infiltration Area, sq ft - mulch_area | 0.00 acres

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs | 0.11812 A_{LIDc}

Runoff Management Credit (Step 3) A_{LIDC}/A_T*200 = 70.0 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 123.0

Does project require hydromodification management? If yes, proceed to using SacHM.

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.1768 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.44 I_A

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Calculate treatment flow (cfs): Flow = Runoff Coefficient x Rainfall Intensity x Area

Look up value for i in Table D-2c (Rainfall Intensity) 0.18 i

Obtain A_{AT} from Step 3 0.18 A_{AT}

Use C = 0.95 0.95 C

Flow = 0.95 * i * A_{AT} 0.03 cfs

Table D-2c

Rainfall Intensity			
Roseville	i =	0.20	in/hr
Sacramento	i =	0.18	in/hr
Folsom	i =	0.20	in/hr

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet): WQV = Area x Maximized Detention Volume (P_0)

Obtain A from Step 1 0.40 A 12 hrs Specified Draw Down time

Obtain P_0: Maximized Detention Volume from figures E-1 to E-4 in Appendix E of this manual using I_A from Step 2. 0.22 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12) 0.007270 Acre-Feet

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Appendix D-2: Commercial Sites: Low Impact Development (LID) Credits and Treatment BMP Sizing Calculations

Name of Drainage Shed: DMA-04
Location of project: Sacramento

Fill in Blue Highlighted boxes

Step 1 - Open Space and Pervious Area Credits

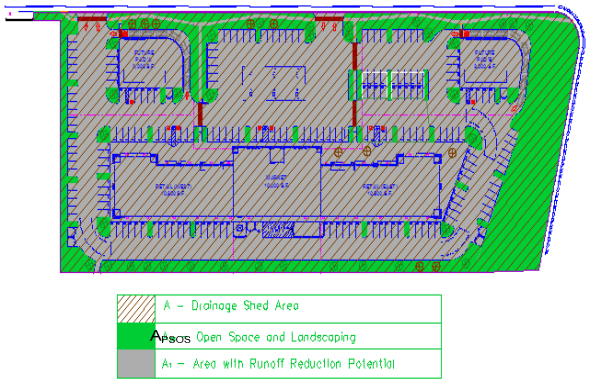
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

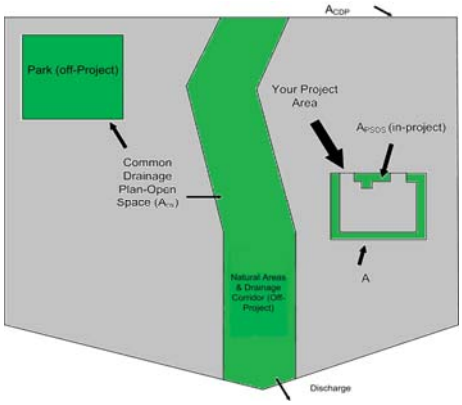
1 a. Common Drainage Plan Area	488	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	121	acres	A_{OS}	**see area example below**
a. Natural storage reservoirs and drainage corridors	0	acres		
b. Buffer zones for natural water bodies	0	acres		
c. Natural areas including existing trees, other vegetation, and soil	0	acres		
d. Common landscape area/park	107	acres		
e. Regional Flood Control/Drainage basins	14	acres		
1 b. Project Drainage Shed Area (Total)	0.451	acres	A	
Project-Specific Open Space (In-project, communal)**	0.0583	acres	A_{PSOS}	
a. Natural storage reservoirs and drainage corridors	0.00	acres		
b. Buffer zones for natural water bodies	0.00	acres		
c. Natural areas including existing trees, other vegetation, and soil	0.00	acres		**see area example below**
d. Landscape area/park	0.058	acres		
e. Flood Control/Drainage basins	0.00	acres		

** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential	$A - A_{PSOS}$ =	0.3930	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.87		I

Open Space & Pervious Area LID Credit (Step 1)
$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ = 38 pts





Step 2 - Runoff Reduction Credits

Runoff Reduction Treatments	Impervious Area Managed			Efficiency Factor		Effective Area Managed (A_C)	
Porous Pavement:							
Option 1: Porous Pavement (see Fact Sheet, excludes porous pavement used in Option 2)	0	acres	x		=	0.000	acres
Option 2: Disconnected Pavement (see Fact Sheet, excludes porous pavement used in Option 1)	use Form D-2a for credits →					0.00	acres
Landscaping used to Disconnect Pavement (see Fact Sheet)	0.0444	acres			=	0.04	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.120684	acres			=	0.12	acres
Ecoroof (see Fact Sheet)	0	acres			=	0.00	acres
Interceptor Trees (see Fact Sheet)	use Form D-2b for credits →					0.00	acres
Total Effective Area Managed by Runoff Reduction Measures				A_C		0.17	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		42	pts

Table D-2a

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete/Asphalt	0.60
Modular Block Pavement &	0.75
Reinforced Grass Pavement	1.00

Table D-2b

Maximum roof size	Minimum travel distance
≤ 3,500 sq ft	21 ft
≤ 5,000 sq ft	24 ft
≤ 7,500 sq ft	28 ft
≤ 10,000 sq ft	32 ft

Form D-2a: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding Disconnected Pavement credit guidelines

Effective Area Managed (A_C)

Pavement Draining to Porous Pavement

2. Enter area draining onto Porous Pavement	0.00	acres	Box K1
3. Enter area of Receiving Porous Pavement (excludes area entered in Step 2 under Porous Pavement)	0.00	acres	Box K2
4. Ratio of Areas (Box K1 / Box K2)	0.00		Box K3

5. Select multiplier using ratio from Box K3 and enter into Box K4

Ratio (Box D)	Multiplier
Ratio is ≤ 0.5	1.00
Ratio is > 0.5 and < 1.0	0.83
Ratio is > 1.0 and < 1.5	0.71
Ratio is > 1.5 and < 2.0	0.55

Box K4: 1

6. Enter Efficiency of Porous Pavement (see table below) — Box K5

Porous Pavement Type	Efficiency Multiplier
Cobblestone Block Pavement	0.40
Pervious Concrete Asphalt Pavement	0.60
Modular Block Pavement Porous Gravel Pavement	0.75
Reinforced Grass Pavement	1.00

7. Multiply Box K2 by Box K5 and enter into Box K6	0.00	acres	Box K6
8. Multiply Boxes K1,K4, and K5 and enter the result in Box K7	0.00	acres	Box K7

9. Add Box K6 to Box K7 and multiply by 60%, and enter the Result in Box K8 — 0.00 acres
This is the amount of area credit to enter into the "Disconnected Pavement" Box of Form D-2

Form D-2b: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines

New Evergreen Trees

1. Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.	0	trees	Box L1
2. Multiply Box L1 by 200 and enter result in Box L2	0	sq. ft.	Box L2

New Deciduous Trees

3. Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.	0	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	0	sq. ft.	Box L4

Existing Tree Canopy

5. Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.	0	sq. ft.	Box L5
6. Multiply Box L5 by 0.5 and enter the result in Box L6	0	sq. ft.	Box L6

Total Interceptor Tree EAM Credits

Add Boxes L2, L4, and L6 and enter it into Box L7	0	sq. ft.	Box L7
Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter result in Box L8 This is the amount of area credit to enter into the "Interceptor Trees" Box of Form D-2	0.00	acres	Box L8

Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

(see Fact Sheet) | - | enter gallons, for simple rain barrels | 0.00 | acres

Automated-Control Capture and Use System

(see Fact Sheet, then enter impervious area managed by the system) | 0.00 | acres

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

(see Fact Sheet)

Bioretention Area | - | sq ft
Subdrain Elevation | - | inches
Ponding Depth, inches | | inches | 0.0000 | acres

Impervious Area Managed by Infiltration BMPs

(see Fact Sheet)

Drawdown Time, hrs | | drawdown_hrs_inf
Soil Infiltration Rate, in/hr | | soil_inf_rate

Sizing Option 1: Capture Volume, acre-ft | | capture_vol_inf | 0.00 | acres

Sizing Option 2: Infiltration BMP surface area, sq ft | | soil_surface_area | 0.0000 | acres

Basin or trench? | | approximate BMP depth | 0.00 | ft

Impervious Area Managed by Amended Soil or Mulch Beds

(see Fact Sheet) | Mulched Infiltration Area, sq ft | - | mulch_area | 0.00 | acres

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs | 0.00000 | A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = | 0.0 | pts

Total LID Credits (Step 1+2+3) | Warning: More LID Is Required | 79.7

Does project require hydromodification management? If yes, proceed to using SacHM.

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = | 0.2279 | A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = | 0.50 | I_A

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Calculate treatment flow (cfs): Flow = Runoff Coefficient x Rainfall Intensity x Area

Look up value for i in Table D-2c (Rainfall Intensity) | 0.18 | i

Obtain A_{AT} from Step 3 | 0.23 | A_{AT}

Use C = 0.95 | 0.95 | C

Flow = 0.95 * i * A_{AT} | 0.04 | cfs

Table D-2c

Rainfall Intensity			
Roseville	i =	0.20	in/hr
Sacramento	i =	0.18	in/hr
Folsom	i =	0.20	in/hr

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet): WQV = Area x Maximized Detention Volume (P_0)

Obtain A from Step 1 | 0.45 | A | 12 | hrs | Specified Draw Down time

Obtain P_0: Maximized Detention Volume from figures E-1 to E-4 in Appendix E of this manual using I_A from Step 2. | 0.24 | P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12) | 0.009207 | Acre-Feet

v06232012

APPENDIX D

PROPRIETARY INFORMATION

Bioretention
Trash Best Management Practices (BMP)
Minimum Specifications

Figure A: CA State University-Sacramento Bioretention BMP

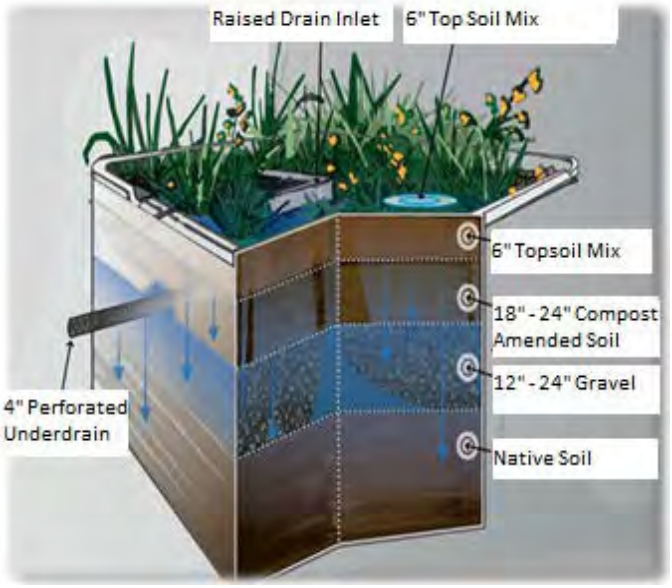


Figure B. American Common Bio-Swale Detail

Description

Bioretention BMPs, including bio-swales, remove pollutants from storm water runoff through physical filtration as storm water passes through media layers. The treatment area consists of: a ponding layer; vegetated, mulched, and engineered soil layer; and supporting bed layer of sand or gravel. Bioretention BMPs can be a variety of shapes and sizes. Storm water entering the treatment area evapotranspires or gradually passes through the mulch/soil/gravel layers where it then infiltrates into native soil or collects in an underdrain that conveys to a discharge point.

Performance and Design

The bioretention BMP must be designed to trap trash particles that are 5 mm or greater and prevent offsite migration, and the design must include:

1. A screen[1] that prohibits the discharge of particles 5 mm or greater at the BMP overflow or bypass outlet;
2. A treatment capacity equal to or greater than the volume collected during the region specific one-year, one-hour storm event from the applicable drainage area; or a capacity to carry at least the same flows of the corresponding storm drain; and
3. Stamped and signed design plans by a registered California licensed professional civil engineer (see Bus. & Prof. Code Section 6700, et seq.).

Maintenance

Regular maintenance is required to maintain adequate trash capture capacity and to ensure that trapped trash does not migrate offsite. The owner should establish a maintenance schedule based on site-specific factors, including the size of the bioretention BMP trench, storm frequency, and characterization of upstream trash and vegetation accumulation. Trash capture and maintenance may be improved by addition of various forms of pretreatment, such as upstream swales or forebays.

[1] Upon approval by the Regional Water Quality Control Board Executive Officer, an external design feature or up-gradient structure designed to bypass flows exceeding the region specific one-year, one-hour, storm event does not require a 5 mm screen.

FlexStorm Pure™
Inlet Filters

FlexStorm Pure inlet filters are the preferred choice for permanent inlet protection and stormwater runoff control. Constructed of stainless steel, FlexStorm Pure inlet filters will fit any drainage structure and are available with site-specific filter bags providing various levels of filtration.

Applications

- Car washes
- Commercial
- Loading ramps
- Industrial
- Gas stations
- Parking lots
- Dock drains
- Maintenance

Features

- Custom stainless steel frames are configured to fit into any drainage structure
- Flow and bypass rates meet specific inlet requirements
- Works below grade with bypass to drain area if bag is full
- Installed and maintained by one worker, without additional equipment

Benefits

- Stainless steel frame provides extended service life
- Easily replaceable filter bags
- Meets stringent removal requirements:
  - All bags rated >80% removal efficiency of street sweep-size particles
  - Optional FXP/PCP bags can be used for hydrocarbon removal when required

ADS™

FlexStorm Pure Inlet Filters Specification

Material and Performance

The filter is comprised of a stainless steel frame and a replaceable geotextile filter bag attached to the frame with a stainless steel locking band. The filter bag hangs suspended below the grate that shall allow full bypass flow into the drainage structure if the bag is completely filled with sediment. The standard woven polypropylene "FX" filters bags are rated for 200 gpm/sqft with a removal efficiency of 82% when filtering a USDA Sandy Loam sediment load. The post-construction PCP filter bags are rated for 137 gpm/sqft and have been third-party tested at 99% TSS removal.

Installation

1. Remove the grate from the inlet.
2. Clean debris from the ledges of the inlet.
3. Place the inlet filter onto the load bearing ledges of the structure.
4. Replace the grate and confirm it is not elevated more than ⅛" (3 mm).

Frequency of Inspections

1. Inspection should occur following rain events greater than ½" (13 mm).
2. Filter inspections should occur a minimum of three times per year, and in snowfall affected regions, inspections prior to and after snowfall season.
3. Industrial application site inspections (loading ramps, wash racks & maintenance facilities) to be scheduled on a recurring basis no less than four times per year or as needed.

Maintenance Guidelines

1. Empty the filter bag manually or by industrial vacuum taking care not to damage the geotextile bag when more than half filled or during scheduled inspection period.
2. Remove compacted silt from sediment bag and flush with medium spray.
3. "PCP" style bags should be pressed or wrung to recover retained oils.
4. Oil skimmer pouches solidify and darken when saturated, indicating time for replacement.
5. Dispose of all oil-contaminated products and recovered oils in accordance with EPA guidelines. Oil skimmer pouches, since a solidifier, will not leach and can be disposed of directly.
6. Inspect and replace bag if torn or punctured.

Filter Bag Replacement

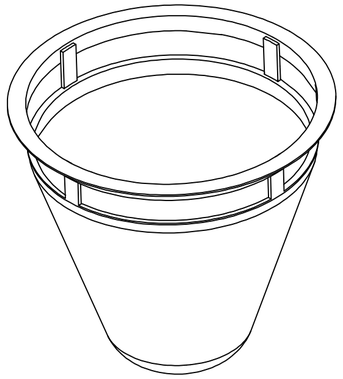
1. Remove the bag by loosening or cutting off clamping band.
2. Take the new correctly sized sediment bag and secure hose clamping band to the frame channel as previously removed.
3. Ensure bag is secure and there is no slack around perimeter.

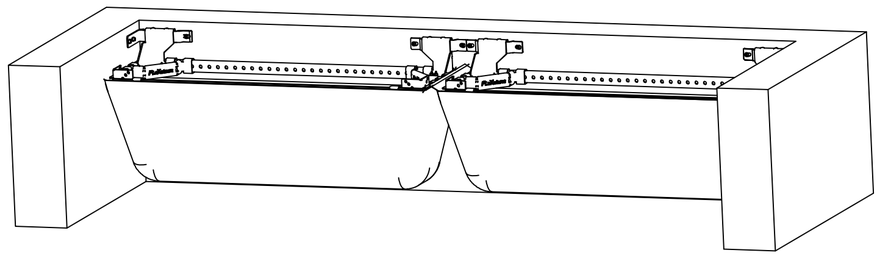
Build America, Buy America (BABA)

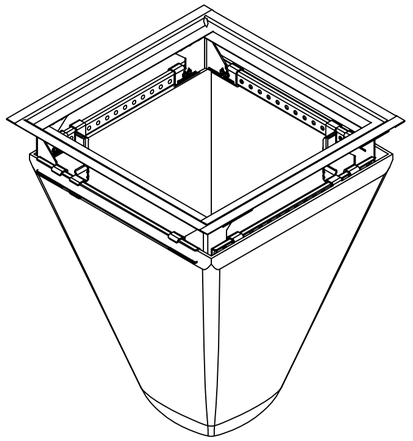
For any questions related to Build America, Buy America (BABA) Act compliance contact an ADS representative.

adspipe.com
800-821-6710

ADS FLEXSTORM PURE INLET FILTERS





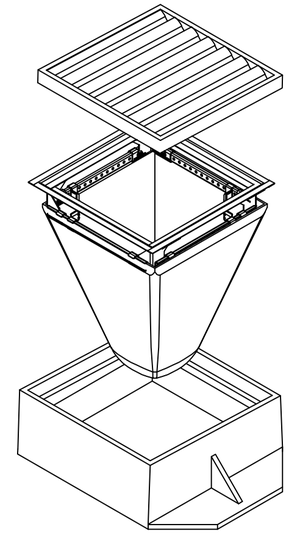


ROUND INLET FILTER		
Clear Opening Size	Style P/N	Minimum Bypass Flow Rate (CFS)
Small: 10" - 16" Dia.	62SHDR	1.6
Medium: 17" - 24" Dia.	62MHDR	2.7
Large: 25" - 36" Dia.	62LHDR	3.8

CURB OPEN THROAT INLET FILTER	
Basin Width Size	Style P/N
Up to 4' Width (1 Piece Set)	62HDWM1
4' - 8' Width (2 Piece Set)	62HDWM2
8' - 12' Width (3 Piece Set)	62HDWM3
12' - 16' Width (4 Piece Set)	62HDWM4

SQUARE/RECTANGULAR INLET FILTER		
Clear Opening Size	Style P/N	Minimum Bypass Flow Rate (CFS)
Small: Up to 64" Perimeter	62SHD	2.4
Medium: 65" - 96" Perimeter	62MHD	3.5
Large: 97" - 120" Perimeter	62LHD	5.0
Extra-Large: 121" or Greater Perimeter	62XLHD	7.2

SPECIFICATIONS BY NOMINAL SIZE RANGE (MIN. VALUES)					
Nominal Bag Size	Solids Storage (CuFt)	Flow Rate (CFS)*		Oil Retention (Oz)**	
		FX/FXP	PCP	FXP	PCP
Small	1.6	1.2	0.8	89	168
Medium	2.1	1.7	1.2	89	204
Large	3.8	2.7	1.8	89	262
Extra Large	4.2	3.6	2.4	178	319
TSS Removal Rate		82%	N/A	Large scale 3rd party testing per ASTM D 7351 using 7% concentration USDA Sandy Loam	
TSS Removal Rate		NA	99%	Large Scale testing at 90 GPM using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D.	
TPH Removal Rate		NA	97%	Large Scale testing at 90 GPM with used motor oil at 243 mg/L measuring per EPA Method 1664A.	
*Filter bag at 50% max solids storage capacity					
**Filter bag at 50% oil capacity and oil skimmer pouch at 100% oil capacity					



INSTALLATION INSTRUCTIONS:

1. REMOVE GRATE
2. CLEAN GRATE LEDGE
3. SET INLET FILTER ON LOAD BEARING LEDGE OF STRUCTURE
4. REPLACE GRATE

NOTES:

1. ALL FRAMING IS CONSTRUCTED OF 304 STAINLESS STEEL.

2. TOTAL BYPASS CAPACITY WILL VARY WITH EACH SIZE DRAINAGE STRUCTURE. ADS DESIGNS FRAMING BYPASS TO MEET OR EXCEED THE DESIGN FLOW OF THE PARTICULAR DRAINAGE STRUCTURE.

3. UPON ORDERING, CONFIRMATION OF THE INLET SPECIFICATION, PRECAST/FOUNDRY CASTING MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE AN INLET FILTER.

4. ALL FILTERS MEET ASTM D8057 SPECIFICATIONS.

5. FOR WRITTEN SPECIFICATIONS AND MAINTENANCE GUIDELINES VISIT WWW.ADSPIPE.COM.

ALL PRODUCTS MANUFACTURED
BY ADVANCED DRAINAGE SYSTEMS
WWW.ADSPIPE.COM
PH. 1-800-821-6710

Our reason is water.™

SIZE	DATE	DWG NO	REV
C	02/06/2023	ADS FLEXSTORM PURE	A
SCALE N/A			SHEET 1 OF 1

Aaron Bernatchy (CWE)

From: Wint Tun <wtun@cityofsacramento.org>
Sent: Wednesday, June 5, 2024 4:01 PM
To: Aaron Bernatchy (CWE); Emmerson Zapata
Cc: Bob Eynck (CWE)
Subject: RE: Woodspring Suites Hotel at Centerpointe P24-013
Attachments: 2018 Commercial LID CreditsPW-withregionalbasin5NORTH_LID.xlsx

***** CAUTION: THIS EMAIL IS FROM AN EXTERNAL (i.e. NON-CWE) SENDER. *****

Aaron,

Your interpretation is correct. The regional detention basin provides the necessary treatment; therefore, you are required to implement Low Impact Development (LID) measures and achieve 100 LID credits for the site. Please ensure that you include the LID worksheet with your study as specified in the comments. Since the project is located in the North Natomas Area, you can receive some credits for the Common Drainage Plan Open Space (Off-Project). See the attached LID worksheet for Basin 15's Common Drainage Plan Open Space Credits. Be sure to fill in the specific Project Drainage Shed Area and the specific open space acreage.

I have confirmed that your proposed project does not require an onsite detention basin since the city's drainage system can handle up to 95% imperviousness. The post-project imperviousness shown on Sheet SM2 is 85.2%, which is within the city's allowed limit. However, this project still requires the implementation of LID and Full Trash Capture measures, as well as the inclusion of an LID worksheet as mentioned above.Additionally, the 10-year and 100-year HGL at node 5319 are 9.897 and 10.474 respectively.

Please include the city benchmark number and datum information used for the project in your report. If the runoff is directed into the drainage on the north, the neighboring properties must be under the same ownership. If they are not, an agreement must be provided for the construction of drainage across the neighboring property. This additional information should also be included in your report.

If you have any further questions or need additional clarification, please let me know.

Thank You,

Wint Tun
Assistant Civil Engineer
Department of Utilities
1395 35th Ave
(916) 808-6241

City of
SACRAMENTO
Department of Utilities