Appendix G

Preliminary Drainage and Storm Water Quality Report

NATOMA SENIOR APARTMENTS

PRELIMINARY DRAINAGE
&
STORM WATER QUALITY REPORT

August 19, 2022

Prepared For:

Vintage Housing
369 San Miguel Drive, Suite 135
Newport Beach, CA 92660

Prepared By:

TSD Engineering, Inc.
785 Orchard Dr., Suite 110
Folsom, CA 95630

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

This study presents the preliminary hydrologic analysis for the Natoma Senior Apartment project, located southeast of the intersection of E. Natoma Street and Prison Road, in the City of Folsom, see Figure 1. Vicinity Map. The project proposes to construct a senior living apartment building, associated utilities drive aisles, parking and landscaping on approximately 4.9 acres of undeveloped land.

The proposed storm drain system has been designed and analyzed in accordance with:

- City of Folsom Design and Procedures Manual and Improvement Standards, Section 19: Storm Drainage, dated February 2020. (City Manual)
- Sacramento City/County Drainage Manual Volume 2: Hydrology Standards, dated December 1996. (County Manual)
- Stormwater Quality Design Manual for the Sacramento Region, dated July 2018. (SWQ Manual)

The site consists of open space with a fairly dense oak tree canopy and a drainage channel traversing the site adjacent to E. Natoma Street. The Oak Parkway Trail separated the project site from residential properties to the south. The Cimmaron Hill Sub-division is located east of the project site and the entrance to Folsom State Prison (Prison) and the Johnny Cash Trail are located on the northwest side of E. Natoma Street. The proposed storm drain system will be required to:

- Maintain existing storm drain conveyance for offsite sheds.
- Implement Source Control Measures
- Hydromodification Control
  - Per Figure 5-2 Hydromodification Management Applicability Map of the SWQ Manual, the project site is located in an area exempt from the hydromodification control requirements. Hydromodification control is **not required**.
- Implement Low Impact Development Measures
- Storm Water Treatment
  - Capture and infiltrate or treat the runoff from the project site generated by the 85th percentile storm; and/or
  - Flow based treatment for the flow generated by the 85th percentile storm, multiplied by a factor of 2.
- Implement Full Trash Capture Measures
  - Remove particles larger than 5 mm from the system prior to discharging from the site.

A 36-inch culvert under the southernmost driveway is proposed to allow drainage through the existing channel to continue as well as mitigate the increased flows due to the development of the site. The 36-inch culvert will restrict runoff, detaining water in the existing to channel. The developed discharge rates at a culvert downstream from the site the site have been estimated to be equal to existing conditions for the 10-year, 24-hour storm event and lower for the 100-year, 24-hour storm event by 5.84 cfs. The estimated discharge rates are summarized in the table below:

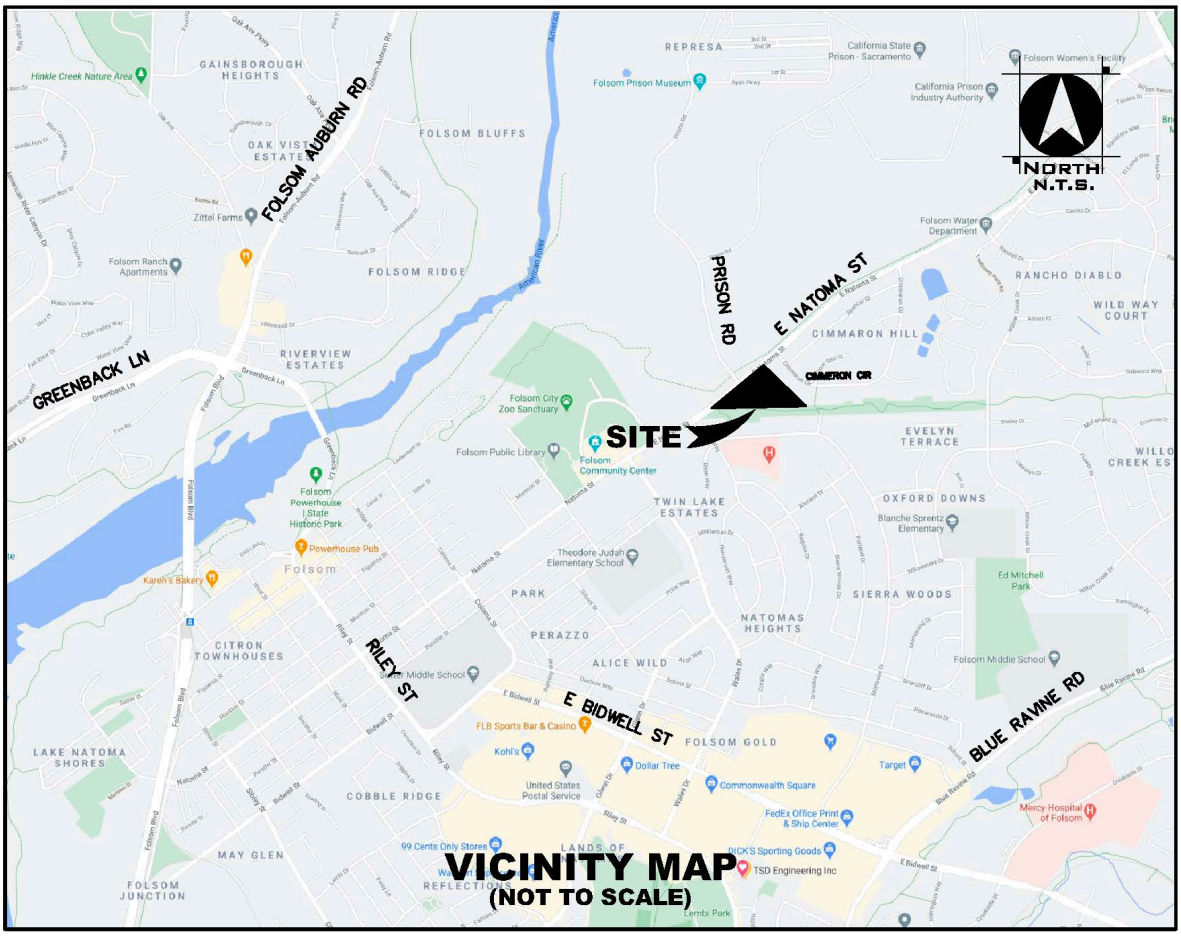
Peak Discharge Rates (Downstream from Project Site)

	Q_{10} (cfs)	Q_{100} (cfs)
Existing Conditions	75.3	112.3
Developed Conditions	75.3	106.46

II. INTRODUCTION

This study presents the preliminary hydrologic analysis for the Natoma Senior Apartment project, located southeast of the intersection of E. Natoma Street and Prison Road, in the City of Folsom, APN: 071-0320-042, see Figure 1. Vicinity Map. The project proposes to construct a senior living apartment building, associated utilities drive aisles, parking and landscaping on approximately 4.9 acres of undeveloped land.

Figure 1. Vicinity Map



The proposed storm drain system has been designed and analyzed in accordance with:

- City of Folsom Design and Procedures Manual and Improvement Standards, Section 19: Storm Drainage, dated February 2020. (City Manual)
- Sacramento City/County Drainage Manual Volume 2: Hydrology Standards, dated December 1996. (County Manual)
- Stormwater Quality Design Manual for the Sacramento Region, dated July 2018. (SWQ Manual)

III. BACKGROUND

The project site is located on the southeast side of East Natoma Street, at the intersection with Prison Road, covering approximately 4.9 acres of undeveloped land. The site consists of open space with a fairly dense oak tree canopy and a drainage channel traversing the site adjacent to E. Natoma Street. The Oak Parkway Trail separates the project site from residential properties to the south. The Cimmaron Hill Sub-division is located east of the project site and the entrance to Folsom State Prison (Prison) and the Johnny Cash Trail are located on the northwest side of E, Natoma Street.

The existing channel conveys runoff from a portion of the Cimmaron Hill Subdivision as well as runoff from a portion of the Prison open space. Runoff from the Prison property is conveyed to the existing channel through a 24-inch culvert that crosses E. Natoma Street. The channel conveys runoff to a 48-inch culvert that crosses and discharges on the northwest side of E. Natoma Street, ultimately discharging in to the American River approximately 2,500 feet west of E. Natoma Street.

The existing 24-inch culvert that conveys runoff from the Prison site limits the contribution of runoff to the existing channel from the prison site. The 24-inch culvert has a maximum flow rate of 23.3 cfs based on the size, slope and maximum headwater elevation. It is assumed that once the ponding area upstream of the 24-inch culvert if full, runoff will release overland, following the bike trail to trench drains located under the Prison Road bridge, ultimately reaching the American River through Robbers Ravine.

A multi-family residential project is proposed for the site that will create more than an acre of impervious area. In accordance with the SWQ Manual, the project is required to:

- Implement Source Control Measures
  - Inlet stamps and signage to prohibit non-stormwater discharge.
- Hydromodification Control
  - Per Figure 5-2 Hydromodification Management Applicability Map of the SWQ Manual, the project site is located in an area exempt from the hydromodification control requirements.
  - Hydromodification control is **not required**.
- Implement Low Impact Development Measures
  - Install interceptor trees and preserve existing tree canopy
  - Disconnect impervious surface areas
  - Achieve a minimum of 100 points, calculated using the LID Worksheets provided with the SWQ Manual.
- Storm Water Treatment
  - Capture and infiltrate or treat the runoff from the project site generated by the 85th percentile storm; and/or
  - Flow based treatment for the flow generated by the 85th percentile storm, multiplied by a factor of 2.
- Implement Full Trash Capture Measures
  - Remove particles larger than 5 mm from the system prior to discharging from the site.

IV. METHODOLOGY

Preliminary hydrologic analysis was performed using the Sacramento Method within the SacCalc software. The Sacramento Method estimates runoff based on:

- Shed Area
- Mean Elevation
- Precipitation Zone 3 (See County Manual Figure 2-11 in Appendix A)
- Land use and Hydrologic Soil Classification

Discharge rates for existing conditions and fully developed conditions were determined for the 10-year and 100-year, 24-hour storm events for each contributing sub-shed, offsite and onsite. Flows from each sub-shed were added, neglecting all losses, at junction nodes.

Bentley Culvert Master software was used to determine the maximum flow rate through culverts conveying stormwater to and from the drainage channel based on:

- Pipe material, size and slope
- Maximum headwater elevation based on topography
- Assumed tailwater elevation equal to the top of pipe at outlet

The Bentley Culvert Master reports can be seen Appendix C.

V. EXISTING CONDITIONS

See the Existing Condition Shed Map in Appendix A. Contributing areas to the drainage channel include:

- The Cimmaron Subdivision, east of the site.
- The Prison site that can be conveyed through the 24-inch culvert.
- The Sub-division south of the project site
- The proposed project site (Open Space)
- Portions of E. Natoma Street.

site soils have a Group D Hydrologic Soil classification, meaning infiltration rates through the soil is relatively low. Input data used to estimate the runoff under existing conditions is tabulated in Table 1 below:

Table 1. SacCalc Input Data – Existing Conditions

Shed	Area (ac.)	Mean Elevation (ft.)	Precipitation Zone (Figure 2-11)	Land use
XA1	20	400	Zone 3	100% MDR
XA2	56	425	Zone 3	100% Open Space
XA3	11	350	Zone 3	10% Highway 20% MDR 70% Open Space

The contributing runoff was determined using the SacCalc software and summed at junction nodes to estimate the cumulative flow. This analysis neglects losses through friction and travel time and should be considered conservative. SacCalc reports can be seen in Appendix B, contributing discharge rates from each shed and the cumulative discharge rate at each junction node are summarized in Table 2 below:

Table 2. Existing Conditions Peak Discharge Rates

Shed / Model Design Point	Contributing 10-Year Q (cfs)	Cumulative 10-Year Q (cfs)	Contributing 100-Year Q (cfs)	Cumulative 100-Year Q (cfs)
XA1	34	-	57	-
XA2	23.3*	-	23.3*	-
XA1 – XA2	-	57.3	-	80.3
XA3	18	-	32	-
XA1 – XA3	-	75.3	-	112.3

* Contributing flow from Shed XA2 is limited by the capacity of the existing 24-inch culvert

VI. DEVELOPED CONDITIONS

The developed site will consist of a 3-story apartment building, associated parking and drive aisles and landscaping. The existing drainage channel will remain and will be required to maintain the existing drainage patterns, conveying the runoff generated onsite and offsite, as is the case under existing conditions.

The proposed project will take place entirely within SHED XA3 as shown on the Existing Conditions Shed Map, see appendix A. Under developed conditions, Shed XA3 has been divided into seven sub-sheds to estimate the runoff at discharge at junction locations throughout the site based on the developed land use.

A 36-inch culvert is proposed to be installed under the southernmost driveway to allow runoff to continue to flow trough the existing channel. The 36-inch culvert will restrict the developed flows, causing water to back up in the existing channel. The existing channel will function as a detention basin in high intensity storm events. Bentley Culvert Master was used to determine the maximum flow rate through the 36-inch culvert, based on the size, slope and estimated headwater elevations. The preliminary analysis considers the worst possible scenario under the following assumptions:

- 10-year, 24-hour storm event
  - HGL_{10} = Maximum depth while not exceeding a maximum discharge rate through the 36-inch culvert of 63.8 cfs
    - 75.3 cfs – 4.2 cfs (A3-6) – 7.3(A3-7) cfs = 63.8 cfs
  - Flow Rates above the mitigated flow rate will require detention in the existing channel. The volume available must exceed the volume required for mitigation.
- 100-year, 24-hour storm event
  - HGL_{100} = Maximum water surface elevation = 335
    - Minimum of 1-foot of freeboard within the channel required.
  - Maximum flow rate through the 36-inch culvert based on HGL_{100} (See Culvert Master Report in Appendix C)

Runoff was estimated using the Sacramento Method within SacCalc software, employing the same methods used to determine the runoff under existing conditions. Input data used to estimate the runoff under developed conditions for Shed A3 are tabulated in Table 3 below:

Table 3. SacCalc Input Data – Developed Conditions

Shed	Area (ac.)	Mean Elevation (ft.)	Precipitation Zone (Figure 2-11)	Land use
A3-1	2.7	350	Zone 3	100% MDR
A3-2	1.0	345	Zone 3	100% Apartments
A3-4	0.3	340	Zone 3	100% Highway
A3-5	1.0	330	Zone 3	100% Open Space
A3-6	2.0	345	Zone 3	100% Apartments
A3-7	4.3	340	Zone 3	10% Highway 40% MDR 50% Open Space

The contributing runoff was determined using the SacCalc software and summed at junction nodes to estimate the cumulative flow. This analysis neglects losses through friction and travel time and should be considered conservative. SacCalc reports can be seen in Appendix B, contributing discharge rates from each shed and the cumulative discharge rate at each junction node are summarized in Table 4 below:

Table 4. Developed Conditions Peak Discharge Rates

Shed / Model Design Point	Contributing 10-Year Q (cfs)	Cumulative 10-Year Q (cfs)	Contributing 100-Year Q (cfs)	Cumulative 100-Year Q (cfs)
XA1	34	-	57	-
A3-1	4.6	-	7.8	-
XA1 – XA3-1	-	38.6	-	64.8
A3-2	2.1	-	3.7	-
XA1 – A3-2	-	40.7	-	68.5
XA2	23.3*	-	23.3*	-
XA – A3-3	-	64	-	91.8
A3-4	0.6	-	1.1	-
A3-5	1.2	-	2.4	-
XA – A3-5	-	**63.9	-	**87.16
A3-6	4.2	-	7.3	-
A3-7	7.2	-	12	-
XA – A3-7	-	75.3	-	106.46

* Contributing flow from Shed XA2 is limited by the capacity of the existing 24-inch culvert (See Culvert Master Report in Appendix C)

** Flow restricted through 36-inch culvert (See Culvert Master Reports in Appendix C)

Comparison of the runoff rates under existing and developed conditions show equal flow rates under existing and developed conditions during the 10-year, 24-hour storm event. flows have been reduced from 112.3 cfs under existing conditions to 106.46 cfs under developed conditions. The existing channel has the capacity to detain flows exceeding the maximum flow through the 36-inch culvert, while maintaining adequate freeboard within the channel. The development of the site will maintain existing drainage paths and will not have a negative effect on the existing storm system.

VII. STORM WATER QUALITY

The proposed is a multi-family residential project creating more than an acre of impervious area. In accordance with the SWQ Manual, the project is required to:

- Implement Source Control Measures
  - Inlet stamps and signage to prohibit non-stormwater discharge.
- Hydromodification Control
  - Per Figure 5-2 Hydromodification Management Applicability Map of the SWQ Manual, the project site is located in an area exempt from the hydromodification control requirements.
  - Hydromodification control is **not required**.
- Implement Low Impact Development Measures
  - Install interceptor trees and preserve existing tree canopy
  - Disconnect impervious surface areas
  - Achieve a minimum of 100 points, calculated using the LID Worksheets provided with the SWQ Manual.
- Storm Water Treatment
  - Capture and infiltrate or treat the runoff from the project site generated by the 85th percentile storm; and/or
  - Flow based treatment for the flow generated by the 85th percentile storm, multiplied by a factor of 2.
- Implement Full Trash Capture Measures
  - Remove particles larger than 5 mm from the system prior to discharging from the site.

The project proposes to:

- Stamp inlets to prohibit non-storm water discharge
- Plant Interceptor trees
- Disconnect roof areas by designing to roof drains that discharge to the surface and are routed through vegetated swales prior to entering the underground storm drain system.
- drain paved areas overland to bio-retention basins sized to retain the runoff generated by the 85th percentile storm.
- Install pipe screens in the system prior to discharging from the site to remove particles large than 5 mm. (Full Trash Capture)

The proposed site has been divided into drainage management areas as show on the Drainage Management Area Map in Appendix C. The LID Worksheets from the SWQ Manual were used to analyze each DMA to confirm adequate treatment and LID points are achieved. The LID worksheets can be seen in Appendix D.

VIII. CONCLUSION

Preliminary hydrologic and hydraulic analysis estimates no increased runoff rate during the 10-year, 24-hour storm event and a decrease of 5.84 cfs during 100-year, 24-hour storm event due to the development of the site as proposed. The hydrologic estimations neglect losses due to friction, travel time and proposed onsite storage and should be considered conservative.

Table 5. Peak Discharge Rates Comparison at the 36" Culvert

Storm Event	Existing (XA1 – XA3) (cfs)	Mitigated Developed (XA – A3-7) (cfs)
10-Year	75.3	75.3
100-Year	112.3	106.46

The preliminary analysis presented in this report show the development site will not increase the flow rate through the existing channel during the 10-year, 24-hour storm event. Flow rates through the existing channel are estimated to decrease during the 100-year, 24-hour storm event. The existing channel has the capacity, upstream from the proposed 36-inch culvert, to detain flows exceeding the capacity of the culvert while maintain at least 1-foot of freeboard. The offsite areas draining through the existing channel and associated underground system will not be negatively affected by the development of this project.

IX. REFERENCES

- City of Folsom Design and Procedures Manual and Improvement Standards, Section 19: Storm Drainage, dated February 2020. (City Manual)
- Sacramento City/County Drainage Manual Volume 2: Hydrology Standards, dated December 1996. (County Manual)
- Stormwater Quality Design Manual for the Sacramento Region, dated July 2018. (SWQ Manual)

APPENDIX A- FIGURES

Existing Conditions Shed Map Overall

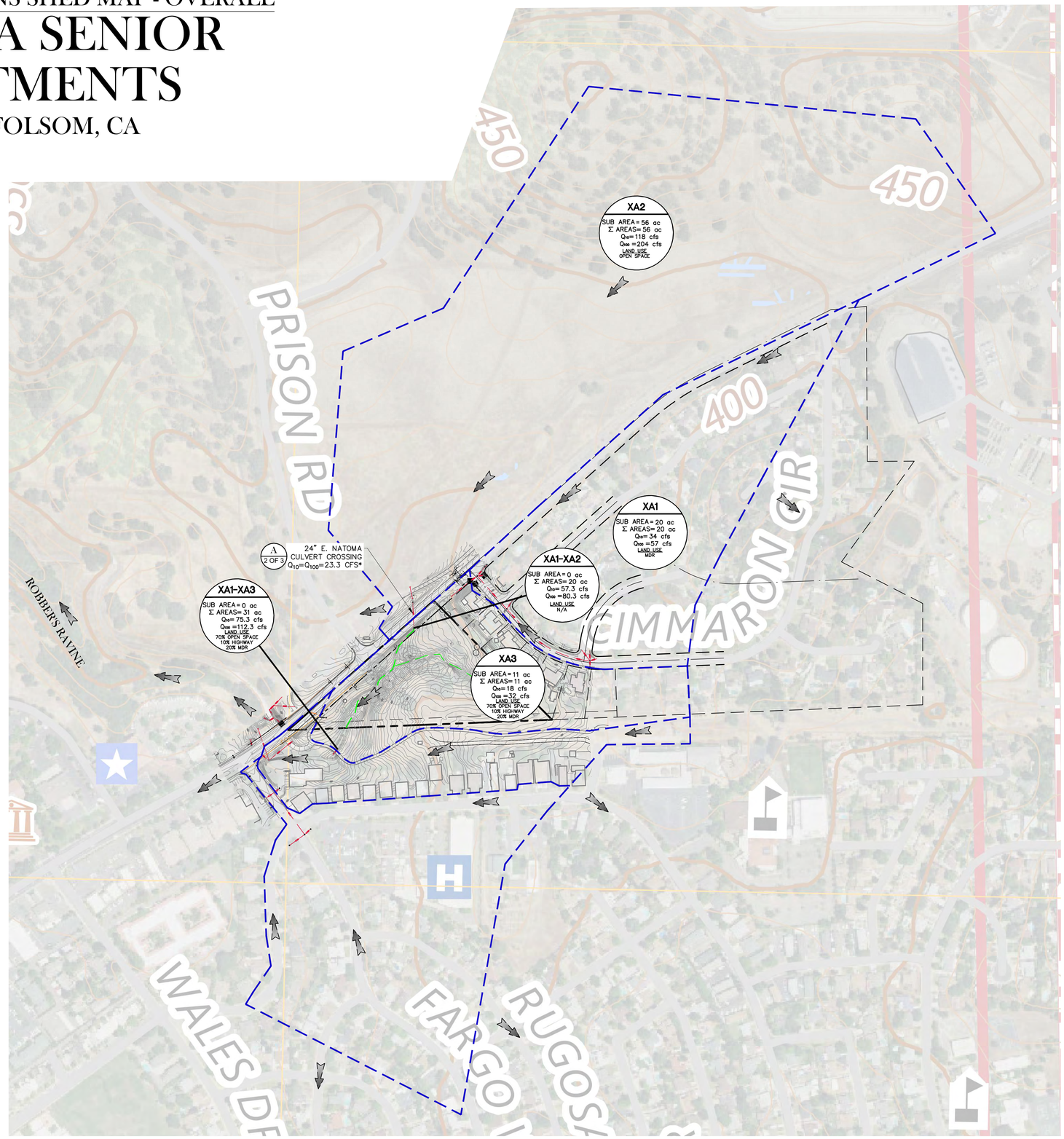
Existing Conditions Shed Map - Onsite

Developed Conditions Shed Map - Onsite

EXISTING CONDITIONS SHED MAP - OVERALL

NATOMA SENIOR APARTMENTS

CITY OF FOLSOM, CA



LEGEND

PROPOSED	DESCRIPTION
12"SD	EXISTING STORM DRAIN
	SHED BOUNDARY
XA2 / SUB AREA = 56 ac / Σ AREAS= 56 ac / Q100= 118 cfs / Q100 =204 cfs / LAND USE OPEN SPACE	"SUBSHED ID" / "SUBSHED AREA" / TOTAL AREA / TOTAL Q_{10} / TOTAL Q_{100} / LAND USE
	OVERLAND RELEASE

N

W E

S

scale: 1"=200'

200 0 100 200 400

EXISTING SHED MAP
OVERALL
AUGUST 16, 2022

TSD ENGINEERING, INC.
expect more.
785 Orchard Drive, Suite #110
Folsom, CA 95630
Phone: (916) 608-0707
Fax: (916) 608-0701

P:\Projects\401-002\03 REPORTS\HYDROLOGY AND HYDRAULICS\Entitlements\2022-0815 Prelim Drainage Report - Second Submittal\Exhibits\Prelim Overall Shed Map.dwg, Marcus Lewis, 16:11:55, 08-16-22

EXISTING CONDITIONS SHED MAP - PROJECT SITE

NATOMA SENIOR APARTMENTS

CITY OF FOLSOM, CA

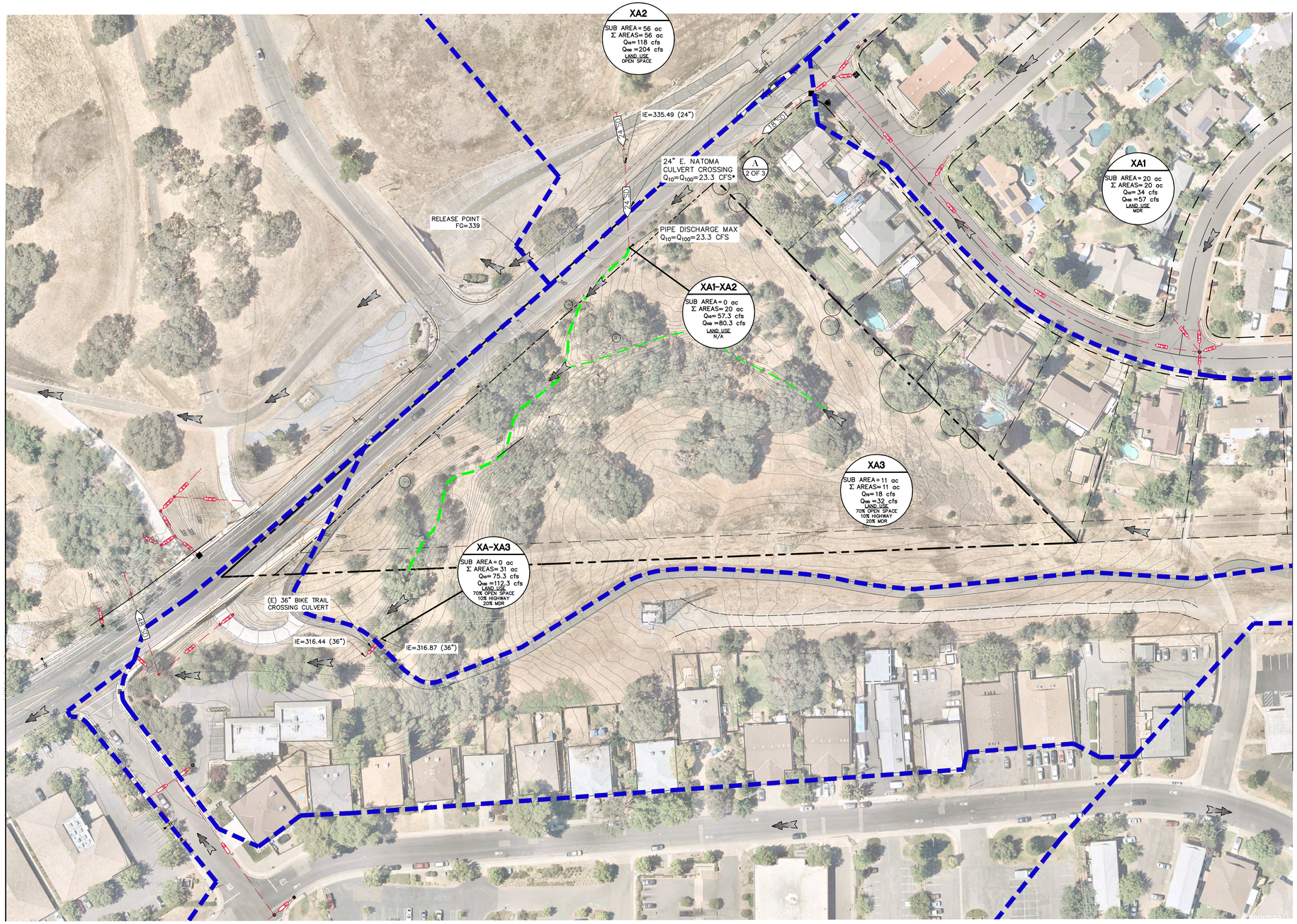
NATOMA SENIOR APARTMENTS HYDROLOGY

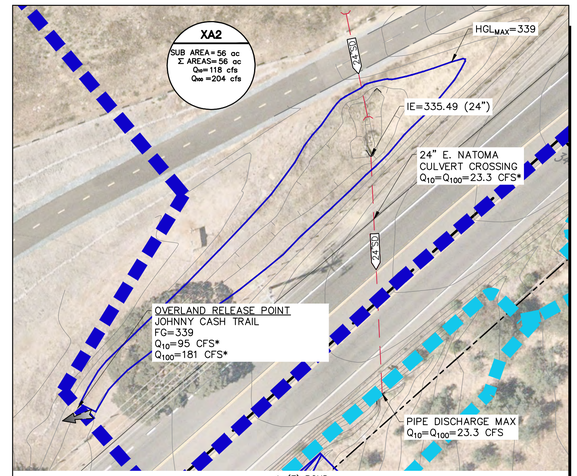
SHED / MODEL DESIGN POINT	CONTRIBUTING 10-YEAR RUNOFF Q_{10}	CUMULATIVE 10-YEAR RUNOFF Q_{10}	CONTRIBUTING 100-YEAR RUNOFF Q_{100}	CUMULATIVE 100-YEAR RUNOFF Q_{100}
	(CFS)	(CFS)	(CFS)	(CFS)
XA1	34	-	57	-
XA2	23.3[1]	-	23.3[1]	-
XA1 - XA2	-	57.3	-	80.3
XA3	18	-	32	-
XA1 - XA3	-	75.3	-	112.3

(1) MAXIMUM DISCHARGE THROUGH (E) 24-INCH CULVERT BASED ON MAX HEADWATER ELEVATION

LEGEND

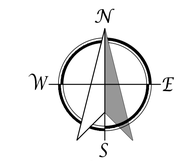
PROPOSED	DESCRIPTION
12"SD	EXISTING STORM DRAIN
	SHED BOUNDARY
XA2 SUB AREA=56 ac, Σ AREAS=56 ac, Q_{10}=118 cfs, Q_{100}=204 cfs, LAND USE OPEN SPACE	"SUBSHED ID", "SUBSHED AREA", TOTAL AREA, TOTAL Q_{10}, TOTAL Q_{100}, LAND USE
	OVERLAND RELEASE





* (E) POND
MAX HGL=339
MAX DISCHARGE THROUGH (E) 24" CULVERT=23.3 CFS
Q EXCEEDING 23.3 CFS WILL OVERTOP POND AND OVERLAND RELEASE DOWN THE JOHNNY CASH TRAIL

1 EXISTING 24" E. NATOMA CULVERT CROSSING
SCALE: 1"=30'



scale: 1"=60'

60 0 30 60 120

EXISTING SHED MAP
AUGUST 16, 2022

TSD ENGINEERING, INC.
expect more.
785 Orchard Drive, Suite #110
Folsom, CA 95630
Phone: (916) 608-0707
Fax: (916) 608-0701

P:\Projects\401-002\03 REPORTS\HYDROLOGY AND HYDRAULICS\Entitlements\2022-1015 Prelim Drainge Report - Second Submittal\Exhibits\Prelim Overall Shed Map.dwg, Marcus Lewis, 08:45:45, 08-17-22

DEVELOPED CONDITIONS SHED MAP

NATOMA SENIOR APARTMENTS

CITY OF FOLSOM, CA

CHANNEL STORAGE CAPACITY

ELEVATION (FT)	DEPTH (FT)	AVAILABLE STORAGE (FT^3)
327	0	0
328	1	920
329	2	2,310
330	3	4,845
331	4	8,877
332	5	14,735
332.2[1]	5.2	17,360
333	6	27,858
334	7	46,433
335[2]	8	71,300

(1) 10-YEAR MAX HGL
(2) 100-YEAR MAX HGL

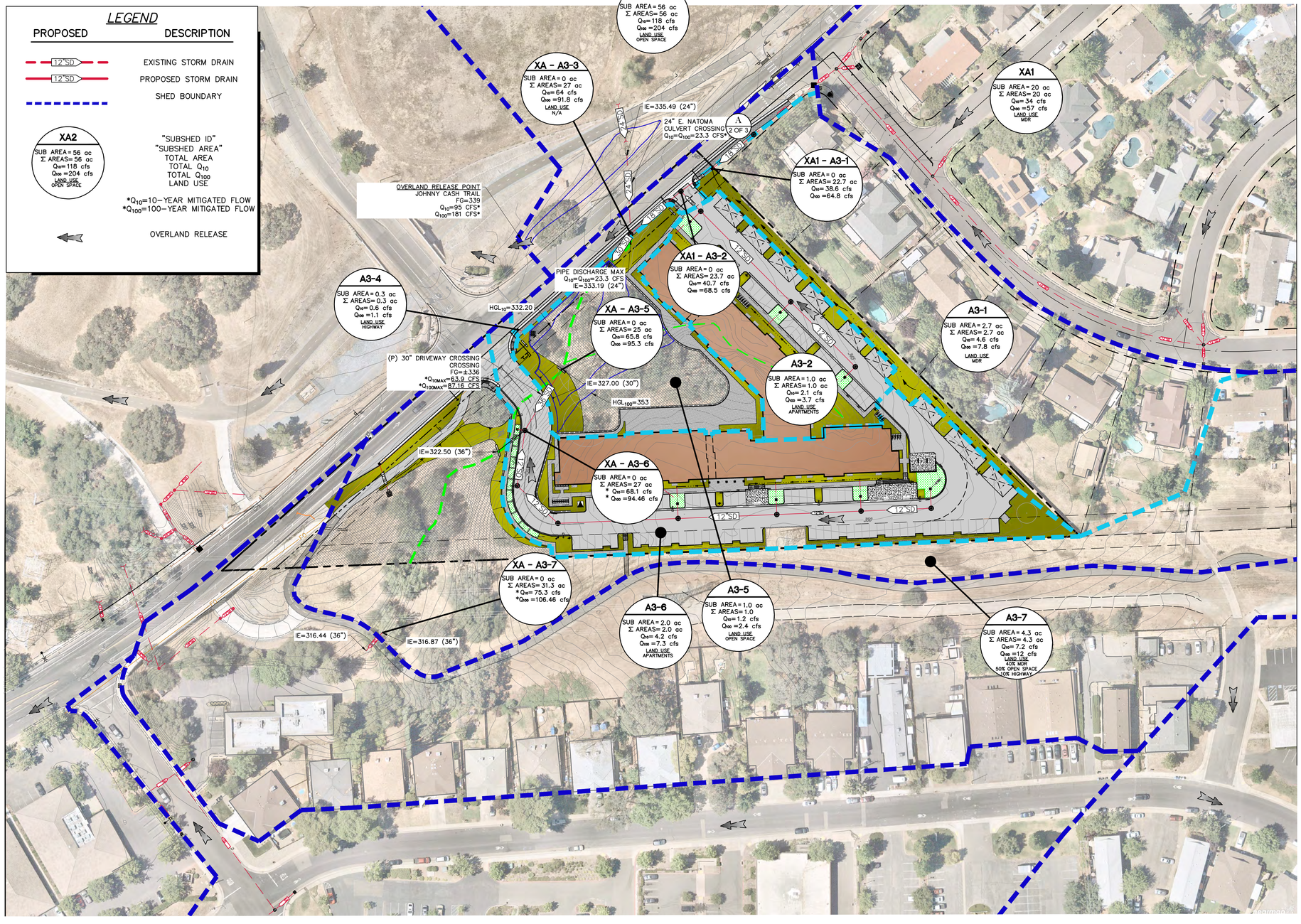
NATOMA SENIOR APARTMENTS HYDROLOGY

SHED / MODEL DESIGN POINT	CONTRIBUTING 10-YEAR RUNOFF Q_{10}	CUMULATIVE 10-YEAR RUNOFF Q_{10}	CONTRIBUTING 100-YEAR RUNOFF Q_{100}	CUMULATIVE 100-YEAR RUNOFF Q_{100}
	(CFS)	(CFS)	(CFS)	(CFS)
XA1	34	-	57	-
A3-1	4.6	-	7.8	-
XA1 - XA3-1	-	38.6	-	64.8
A3-2	2.1	-	3.7	-
XA1 - XA3-1	-	40.7	-	68.5
XA2	23.3[1]	-	23.3[1]	-
XA - A3-3	-	64	-	91.8
A3-4	0.6	-	1.1	-
A3-5	1.2	-	2.4	-
XA - A3-5	-	63.9[2]		87.16[2]
A3-6	4.2	-	7.3	-
A3-7	7.2	-	12	-
XA - A3-7 (E) 36" CULVERT @ BIKE TRAIL	-	75.3	-	106.46

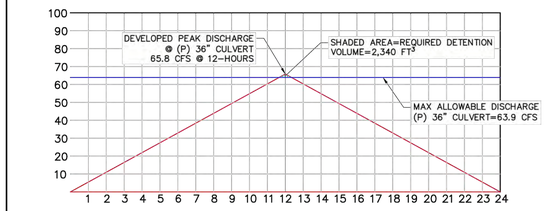
(1) MAXIMUM DISCHARGE THROUGH (E) 24-INCH CULVERT BASED ON MAX HEADWATER ELEVATION
(2) MAXIMUM DISCHARGE THROUGH (P) 36-INCH CULVERT BASED ON MAX HEADWATER ELEVATION

LEGEND

PROPOSED	DESCRIPTION
12"SD	EXISTING STORM DRAIN
12"SD	PROPOSED STORM DRAIN
	SHED BOUNDARY
XA2 SUB AREA=56 ac Σ AREAS=56 ac Q_{10}=118 cfs Q_{100}=204 cfs LAND USE OPEN SPACE	"SUBSHED ID" "SUBSHED AREA" TOTAL AREA TOTAL Q_{10} TOTAL Q_{100} LAND USE
	*Q_{10}=10-YEAR MITIGATED FLOW *Q_{100}=100-YEAR MITIGATED FLOW
	OVERLAND RELEASE



10-YEAR, 24-HOUR DEVELOPED CONDITIONS PEAK FLOW STORAGE REQUIREMENTS



CULVERT DISCHARGE CALCULATIONS:

MAX MITIGATED FLOW THROUGH (P) 36" CULVERT= 63.9 CFS

HEAD(H) REQUIRED TO DISCHARGE @ 63.9 CFS = 5.2-FEET

(P) 36" CULVERT INVERT ELEVATION= 327.00

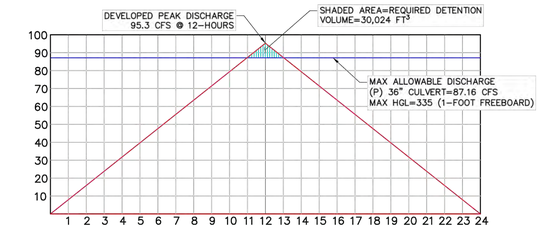
MAX ALLOWABLE WATER SURFACE ELEVATION = 327.00 + 5.2 = 332.20

AVAILABLE STORAGE IN CHANNEL @ ELEVATION 332.20 = 31,573 FT^3

REQUIRED STORAGE TO MITIGATE PEAK FLOW = 2,340 FT^3

AVAILABLE STORAGE EXCEEDS STORAGE REQUIED FOR PEAK FLOW MITIGATION

100-YEAR, 24-HOUR DEVELOPED CONDITIONS PEAK FLOW STORAGE REQUIREMENTS



CULVERT DISCHARGE CALCULATIONS:

MAX WATER SURFACE ELEVATION (1-FOOT FREEBOARD) = 335.00

(P) 36" CULVERT INVERT ELEVATION= 327.00

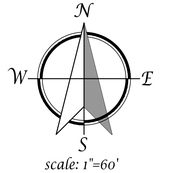
HEAD(H) AT (P) 36" CULVERT = 335-327 = 8-FEET

MAX DISCHARGE AT (P) 36" CULVERT [H=8-FEET] = 87.16 CFS

AVAILABLE STORAGE IN CHANNEL @ ELEVATION 335 = 71,300 FT^3

REQUIRED STORAGE TO MITIGATE PEAK FLOW = 30,024 FT^3

AVAILABLE STORAGE EXCEEDS STORAGE REQUIED FOR PEAK FLOW MITIGATION



scale: 1"=60'

60 0 30 60 120

DEVELOPED SHED MAP
AUGUST 16, 2022

TSD ENGINEERING, INC.
expect more.
785 Orchard Drive, Suite #110
Folsom, CA 95630
Phone: (916) 608-0707
Fax: (916) 608-0701

P:\Projects\401-002\03 REPORTS\HYDROLOGY AND HYDRAULICS\Entitlements\2022-0815 Prelim Drainge Report - Second Submittal\Exhibits\Prelim Overall Shed Map.dwg, Marcus Lewis, 08:45:59, 08-17-22

APPENDIX B - HYDROLOGY

Existing and Developed SacCalc Report

10-year and 100-year 24-hour

View HEC-1 output

Sacramento method results
(Project: Natoma Senior Living)
(100-year, 1-day rainfall)

ID	Peak flow (cfs)	Time of peak (hours)	Basin area (sq. mi)	Peak stage (feet)	Peak storage (ac-ft)	Diversion volume (ac-ft)
XA1	57.	12:05	.03			
XA2	204.	12:02	.09			
A3-1	7.8	12:05	.00			
A3-2	3.7	12:02	.00			
A3-4	1.1	12:02	.00			
A3-5	2.4	12:09	.00			
A3-6	7.3	12:02	.00			
A3-7	12.	12:05	.01			
XA3	32.	12:05	.02			

(10-year, 1-day rainfall)

ID	Peak flow (cfs)	Time of peak (hours)	Basin area (sq. mi)	Peak stage (feet)	Peak storage (ac-ft)	Diversion volume (ac-ft)
XA1	34.	12:05	.03			
XA2	118.	12:02	.09			
A3-1	4.6	12:05	.00			
A3-2	2.1	12:02	.00			
A3-4	.6	12:02	.00			
A3-5	1.2	12:12	.00			
A3-6	4.2	12:02	.00			
A3-7	7.2	12:05	.01			
XA3	18.	12:05	.02			

APPENDIX C- HYDRAULICS

Culvert Master Reports

Culvert Calculator Report
(E) 24" E. Natomas Crossing

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	339.00	ft	Headwater Depth/Height	1.76	
Computed Headwater Elev	339.00	ft	Discharge	23.32	cfs
Inlet Control HW Elev.	339.00	ft	Tailwater Elevation	335.19	ft
Outlet Control HW Elev.	338.75	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	335.49	ft	Downstream Invert	333.19	ft
Length	100.00	ft	Constructed Slope	0.023000	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	1.24	ft
Slope Type	Steep		Normal Depth	1.21	ft
Flow Regime	N/A		Critical Depth	1.72	ft
Velocity Downstream	11.43	ft/s	Critical Slope	0.009875	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	338.75	ft	Upstream Velocity Head	1.03	ft
Ke	0.50		Entrance Loss	0.51	ft

Inlet Control Properties					
Inlet Control HW Elev.	339.00	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
(P) 36" Driveway Crossing 10-Year

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	335.00	ft	Headwater Depth/Height	1.73	
Computed Headwater Elev	332.20	ft	Discharge	63.90	cfs
Inlet Control HW Elev.	332.20	ft	Tailwater Elevation	324.00	ft
Outlet Control HW Elev.	331.86	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	327.00	ft	Downstream Invert	322.50	ft
Length	122.00	ft	Constructed Slope	0.040984	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.55	ft
Slope Type	Steep		Normal Depth	1.45	ft
Flow Regime	Supercritical		Critical Depth	2.57	ft
Velocity Downstream	17.33	ft/s	Critical Slope	0.008557	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	331.86	ft	Upstream Velocity Head	1.53	ft
Ke	0.50		Entrance Loss	0.76	ft

Inlet Control Properties					
Inlet Control HW Elev.	332.20	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
(P) 36" Driveway Crossing 100-Year

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	335.00	ft	Headwater Depth/Height	2.67	
Computed Headwater Eleva	335.00	ft	Discharge	87.16	cfs
Inlet Control HW Elev.	335.00	ft	Tailwater Elevation	324.00	ft
Outlet Control HW Elev.	333.54	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	327.00	ft	Downstream Invert	322.50	ft
Length	122.00	ft	Constructed Slope	0.040984	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.89	ft
Slope Type	Steep		Normal Depth	1.75	ft
Flow Regime	Supercritical		Critical Depth	2.83	ft
Velocity Downstream	18.53	ft/s	Critical Slope	0.014764	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	333.54	ft	Upstream Velocity Head	2.48	ft
Ke	0.50		Entrance Loss	1.24	ft

Inlet Control Properties					
Inlet Control HW Elev.	335.00	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

APPENDIX D- STORM WATER QUALITY

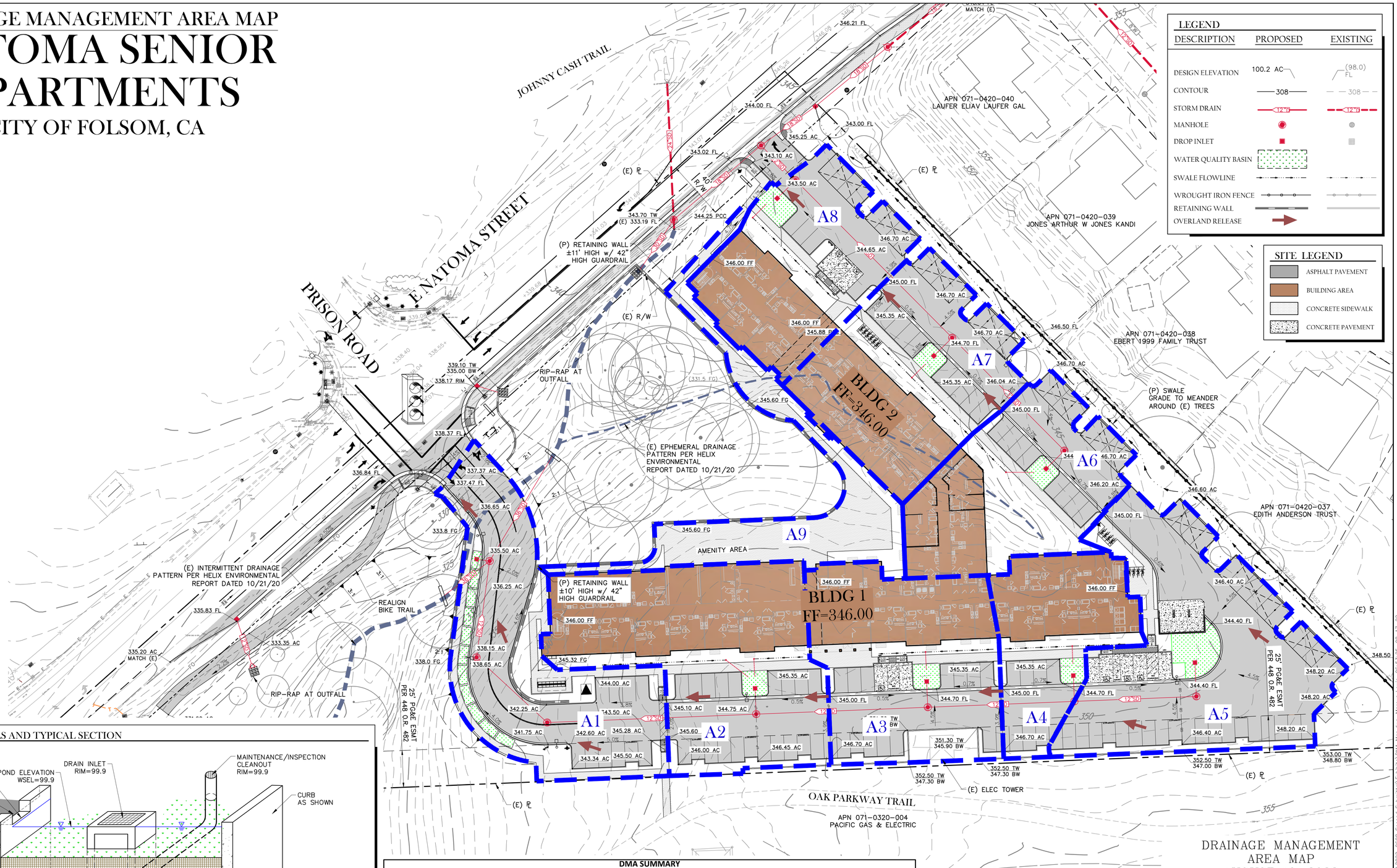
Drainage Management Area Map

LID Worksheets

DRAINAGE MANAGEMENT AREA MAP

NATOMA SENIOR APARTMENTS

CITY OF FOLSOM, CA



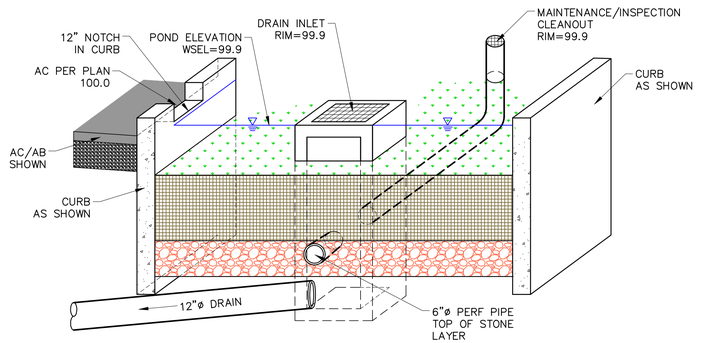
LEGEND

DESCRIPTION	PROPOSED	EXISTING
DESIGN ELEVATION	100.2 AC	(98.0) FL
CONTOUR	308	308
STORM DRAIN	12"Ø	12"Ø
MANHOLE		
DROP INLET		
WATER QUALITY BASIN		
SWALE FLOWLINE		
WROUGHT IRON FENCE		
RETAINING WALL		
OVERLAND RELEASE		

SITE LEGEND

- ASPHALT PAVEMENT
- BUILDING AREA
- CONCRETE SIDEWALK
- CONCRETE PAVEMENT

BIORETENTION DETAILS AND TYPICAL SECTION

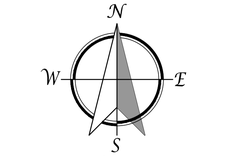


NOTES:

1. ELEVATIONS SHOWN ARE TO SHOW DESIGN RELATIONSHIPS.

DMA SUMMARY

DMA	AREA (SF)	AREA OF BIO-RETENTION (SF)	PONDING DEPTH (FT)	DISCONNECTED ROOF DRAINS (SF)	DISCONNECTED PAVEMENT (SF)	LANDSCAPING (SF)	PERMEABLE PAVEMENT (SF)	INTERCEPTOR TREES		LID POINTS FROM WORKSHEET
								EVERGREEN	DECIDUOUS	
A1	17320	995	1	-	-	2125	-	-	2	207.4
A2	19665	440	1	10065	-	2435	-	-	1	149.7
A3	15760	470	1	6075	-	2340	-	-	1	163.0
A4	9405	175	1	5115	-	1210	-	-	1	140.1
A5	20825	1280	1	-	-	1975	-	-	4	201.4
A6	13525	405	1	4005	-	3265	-	-	4	176.4
A7	15190	470	1	6400	-	1355	-	-	4	156.6
A8	13000	405	1	5290	-	1210	-	-	4	157.8
A9	9820	-	-	-	9820	-	-	-	-	201.4



scale: 1"=30'

30 0 15 30 60

DRAINAGE MANAGEMENT AREA MAP
AUGUST 16, 2022

TSD ENGINEERING, INC.
expect more.
785 Orchard Drive, Suite #110
Folsom, CA 95630
Phone: (916) 608-0707
Fax: (916) 608-0701

P:\Projects\401-0022\03 REPORTS\SW2\Entitlements\2022-0608 Second Submittal\Exhibits\DMA Map.dwg, Marcus Lewis, 08:53:25, 08-17-22

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

Name of Drainage Shed: A1
Location of project: Folsom

Fill in Blue Highlighted boxes

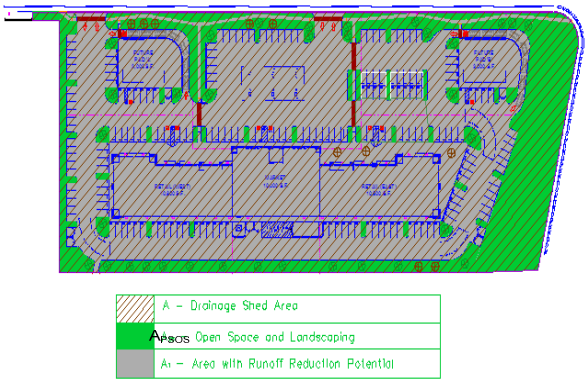
Step 1 - Open Space and Pervious Area Credits

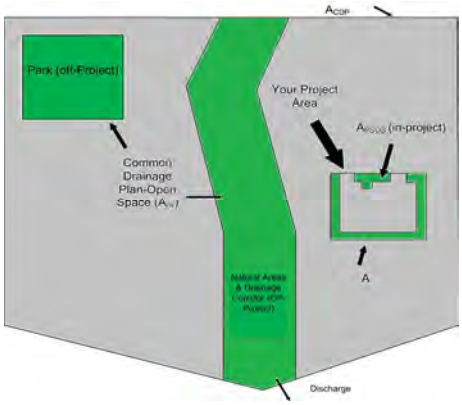
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.40	acres	A	
Project-Specific Open Space (In-project, communal)**	0.05	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	0.05	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	$A - A_{PSOS}$ =	0.35	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.88		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	13	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0	acres			=	0.00	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	0.00	acres
Runoff Reduction Credit (Step 2)					$(A_C / A_T)*100$ =	0	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

	1		Box K4
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.	2	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	200	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	200	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: 995 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.34 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.34 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 194.7 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 207.4

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

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.02 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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 | 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.: 0.06 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A2
Location of project: Folsom

Fill in Blue Highlighted boxes

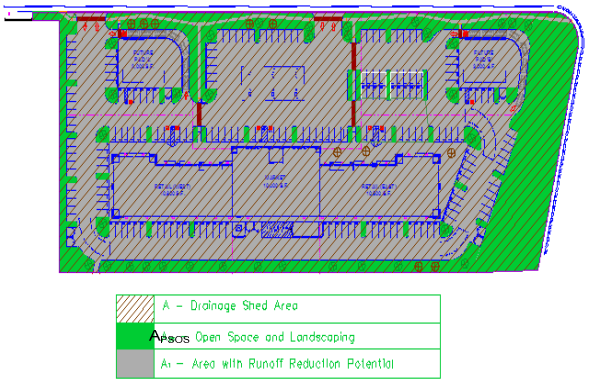
Step 1 - Open Space and Pervious Area Credits

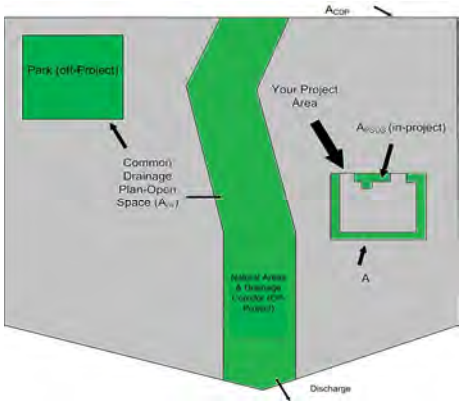
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.45	acres	A	
Project-Specific Open Space (In-project, communal)**	0.06	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	0.06	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	$A - A_{PSOS}$ =	0.39	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.87		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	13	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.23	acres			=	0.23	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		0.23	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		59	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.	1	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	100	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	100	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: 440 sq ft
Subdrain Elevation: 150 inches
Ponding Depth, inches: 12 inches

0.15 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.15 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 77.3 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 149.7

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

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.02 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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 | 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.: 0.05 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A3
Location of project: Folsom

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.

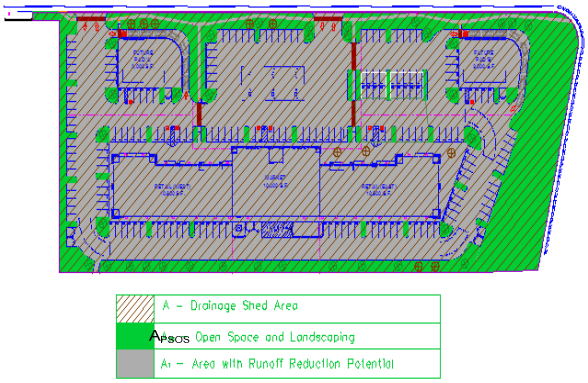
1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	acres	A_{OS}	**see area example below**
a. Natural storage reservoirs and drainage corridors	0	acres		
b. Buffer zones for natural water bodies	0	acres		
c. Natural areas including existing trees, other vegetation, and soil	0	acres		
d. Common landscape area/park	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.36	acres	A	
Project-Specific Open Space (In-project, communal)**	0.05	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	0.05	acres		
e. Flood Control/Drainage basins	0.00	acres		

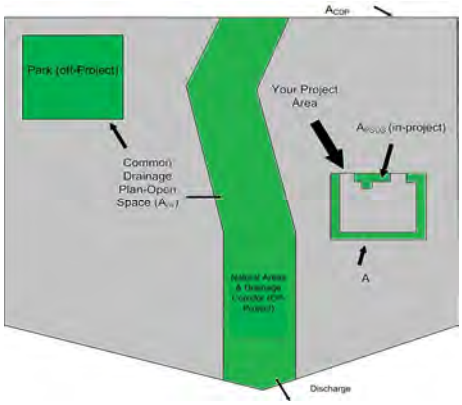
** Doesn't include impervious areas within individual lots and surrounding individual units. That is accounted for below using Form D-1a in Step 2.

Area with Runoff Reduction Potential	$A - A_{PSOS}$ =	0.31	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.86		I

Open Space & Pervious Area LID Credit (Step 1)

$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ = 14 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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.14	acres			=	0.14	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		0.14	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		45	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.		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.	1	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	100	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	100	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: 470 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.16 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.16 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 103.8 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 163.0

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

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.02 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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: 0.36 A | 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.: 0.06 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A4
Location of project: Folsom

Fill in Blue Highlighted boxes

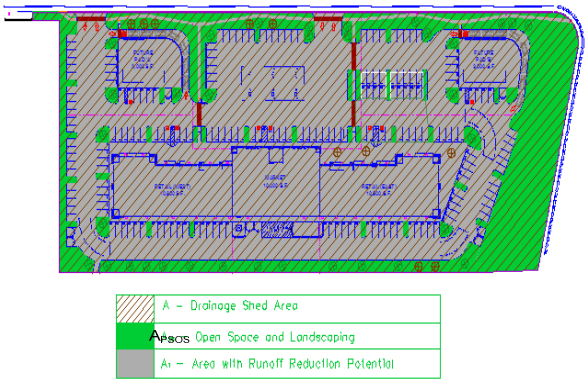
Step 1 - Open Space and Pervious Area Credits

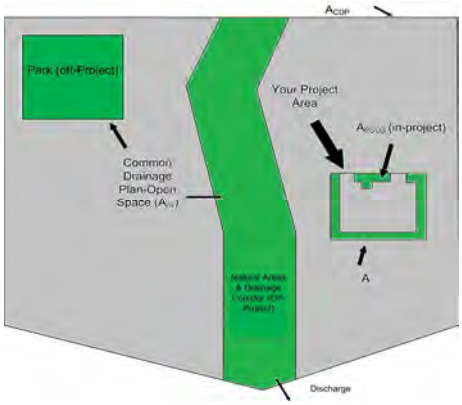
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.22	acres	A	
Project-Specific Open Space (In-project, communal)**	0.03	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	0.03	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	$A - A_{PSOS}$ =	0.19	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.86		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	14	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.12	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		0.12	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		63	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

	1		Box K4
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.	1	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	100	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	100	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 175 sq ft
Subdrain Elevation 8 inches
Ponding Depth, inches 12 inches | 0.06 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 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft 0 soil_surface_area | 0.00 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 | 0.06 A_{LIDc}

Runoff Management Credit (Step 3) A_{LIDC}/A_T*200 = 63.1 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 140.1

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

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = 0.04 I_A

STOP: No additional treatment needed

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) 0.20 i

Obtain A_{AT} from Step 3 0.01 A_{AT}

Use C = 0.95 0.95 C

Flow = 0.95 * i * A_{AT} 0.00 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 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. 0.08 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12) 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A5
Location of project: Folsom

Fill in Blue Highlighted boxes

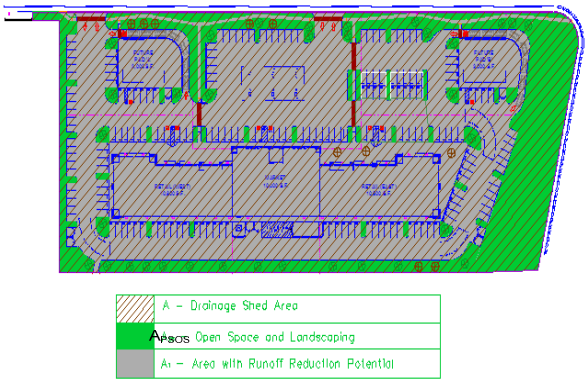
Step 1 - Open Space and Pervious Area Credits

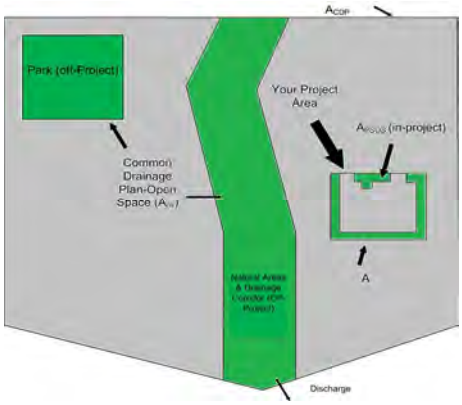
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.48	acres	A	
Project-Specific Open Space (In-project, communal)**	0.03	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	0.03	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	$A - A_{PSOS}$ =	0.45	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.94		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	6	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0	acres			=	0.00	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		0.00	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		0	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.	4	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	400	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	400	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: 1,280 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.44 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.44 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 194.8 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 201.4

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

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = 0.02 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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: 0.48 A | 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.: 0.06 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A6
Location of project: Folsom

Fill in Blue Highlighted boxes

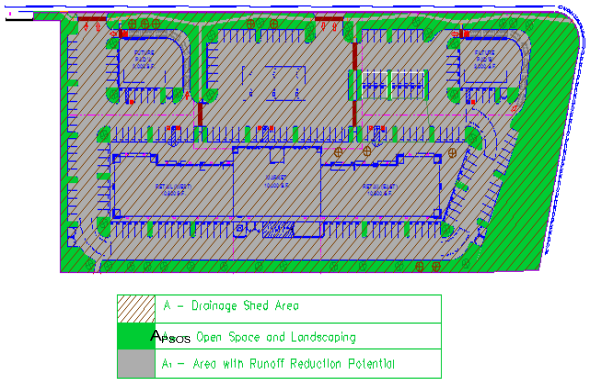
Step 1 - Open Space and Pervious Area Credits

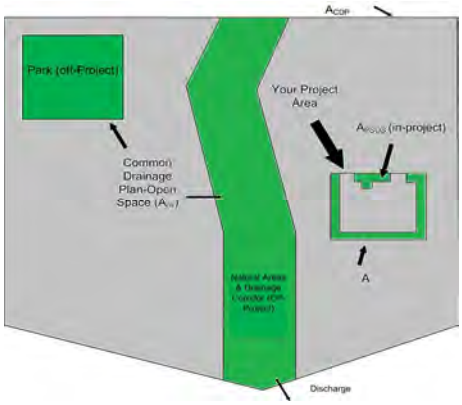
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.31	acres	A	
Project-Specific Open Space (In-project, communal)**	0.07	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	0.07	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	$A - A_{PSOS}$ =	0.24	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.77		I
Open Space & Pervious Area LID Credit (Step 1)	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	23	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.09	acres			=	0.09	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		0.09	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		38	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.	4	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	400	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	400	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: 405 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.14 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.14 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 115.6 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 176.4

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

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = 0.03 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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: 0.31 A | 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.: 0.07 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A7
Location of project: Folsom

Fill in Blue Highlighted boxes

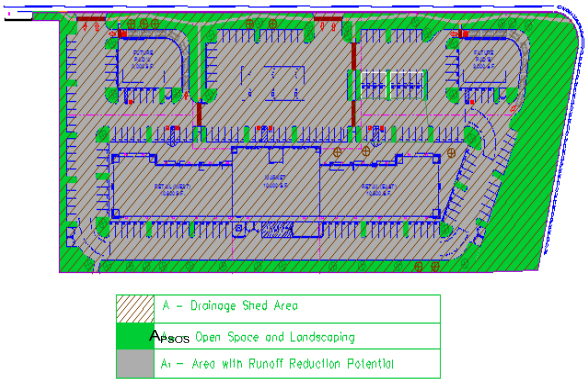
Step 1 - Open Space and Pervious Area Credits

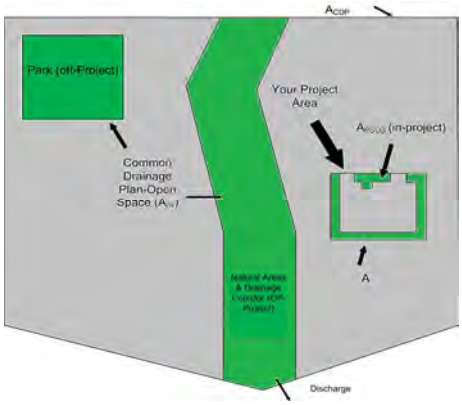
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.35	acres	A	
Project-Specific Open Space (In-project, communal)**	0.03	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	0.03	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	$A - A_{PSOS}$ =	0.32	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.91		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	9	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.15	acres			=	0.15	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		0.15	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		47	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

	1		Box K4
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.	4	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	400	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	400	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: 470 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.16 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.16 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 100.6 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 156.6

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

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = 0.02 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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: 0.35 A | 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.: 0.06 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A8
Location of project: Folsom

Fill in Blue Highlighted boxes

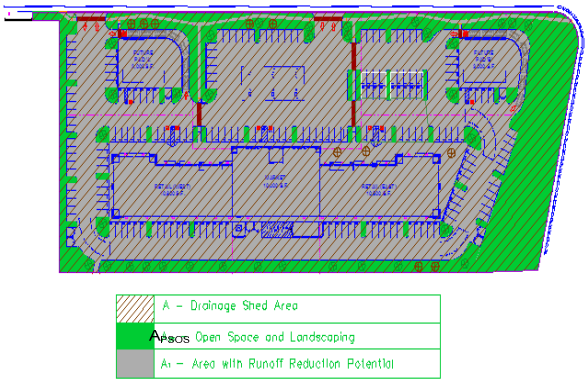
Step 1 - Open Space and Pervious Area Credits

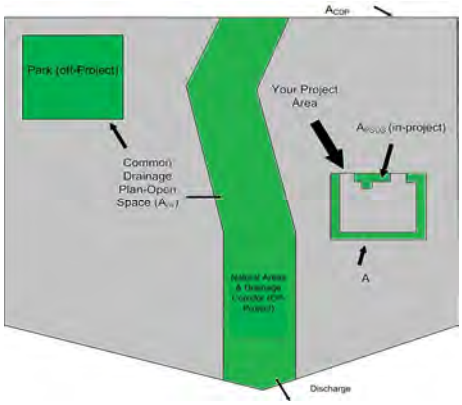
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.30	acres	A	
Project-Specific Open Space (In-project, communal)**	0.03	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	0.03	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	$A - A_{PSOS}$ =	0.27	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.90		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	10	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)	0.0000	acres			=	0.00	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0.12	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		0.12	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		45	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.	4	trees	Box L3
4. Multiply Box L3 by 100 and enter result in Box L4	400	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	400	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: 405 sq ft
Subdrain Elevation: 8 inches
Ponding Depth, inches: 12 inches

0.14 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: 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft: 0 soil_surface_area | 0.00 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 | 0.14 A_{LIDc}

Runoff Management Credit (Step 3) | A_{LIDC}/A_T*200 = 102.7 pts

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 157.8

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

Adjusted Area for Flow-Based, Non-LID Treatment | $A_T - A_C - A_{LIDC}$ = 0.01 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment | A_{AT} / A = 0.03 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: 0.01 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: 0.00 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: 0.30 A | 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.: 0.07 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012

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

Name of Drainage Shed: A9
Location of project: Folsom

Fill in Blue Highlighted boxes

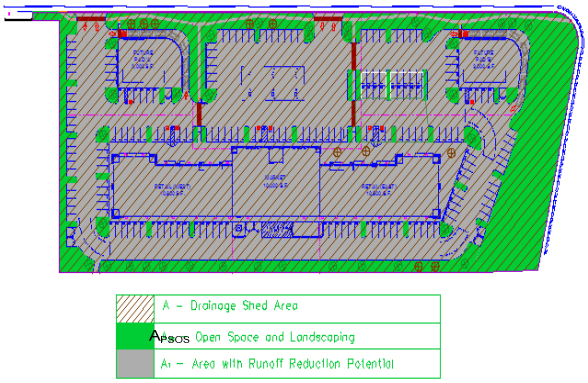
Step 1 - Open Space and Pervious Area Credits

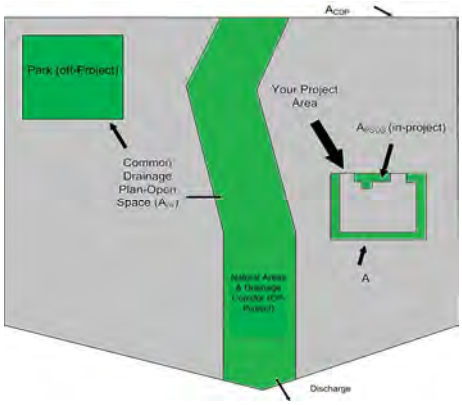
Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area	0	acres	A_{CDP}	
Common Drainage Plan Open Space (Off-project)	0	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	0	acres		
e. Regional Flood Control/Drainage basins	0	acres		
1 b. Project Drainage Shed Area (Total)	0.23	acres	A	
Project-Specific Open Space (In-project, communal)**	0.06	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	0.06	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	$A - A_{PSOS}$ =	0.17	acres	A_T
Assumed Initial Impervious Fraction	A_T / A =	0.74		I
Open Space & Pervious Area LID Credit (Step 1)				
	$(A_{OS}/A_{CDP}+A_{PSOS}/A)x100$ =	26	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)	0.17	acres	x	0.4	=	0.068	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)	0.2300	acres			=	0.23	acres
Disconnected Roof Drains (see Fact Sheet and/or Table D-2b for summary of requirements)	0	acres			=	0.00	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		0.30	acres
Runoff Reduction Credit (Step 2)				$(A_C / A_T)*100$ =		175	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 ____ sq ft
Subdrain Elevation ____ inches
Ponding Depth, inches ____ inches | 0.00 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 0.00 capture_vol_inf | 0.00 acres

Sizing Option 2: Infiltration BMP surface area, sq ft 0 soil_surface_area | 0.00 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 | 0.00 A_{LIDc}

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

Total LID Credits (Step 1+2+3) LID compliant, check for treatment sizing in Step 4 201.4

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

Adjusted Area for Flow-Based, Non-LID Treatment $A_T - A_C - A_{LIDC}$ = -0.13 A_{AT}

Adjusted Impervious Fraction of A for Volume-Based, Non-LID Treatment A_{AT} / A = -0.56 I_A

STOP: No additional treatment needed

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): 0.20 i

Obtain A_{AT} from Step 3: -0.13 A_{AT}

Use C = 0.95: 0.95 C

Flow = 0.95 * i * A_{AT}: -0.02 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: 0.23 A ____ 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.: 0.00 P_0

Calculate treatment volume (acre-ft):

Treatment volume = A x (P_0 / 12): 0.00 Acre-Feet

v06232012