Preparing and Documenting Your LID Design

For Stormwater Treatment and Flow Control

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Contra Costa
Clean Water Program

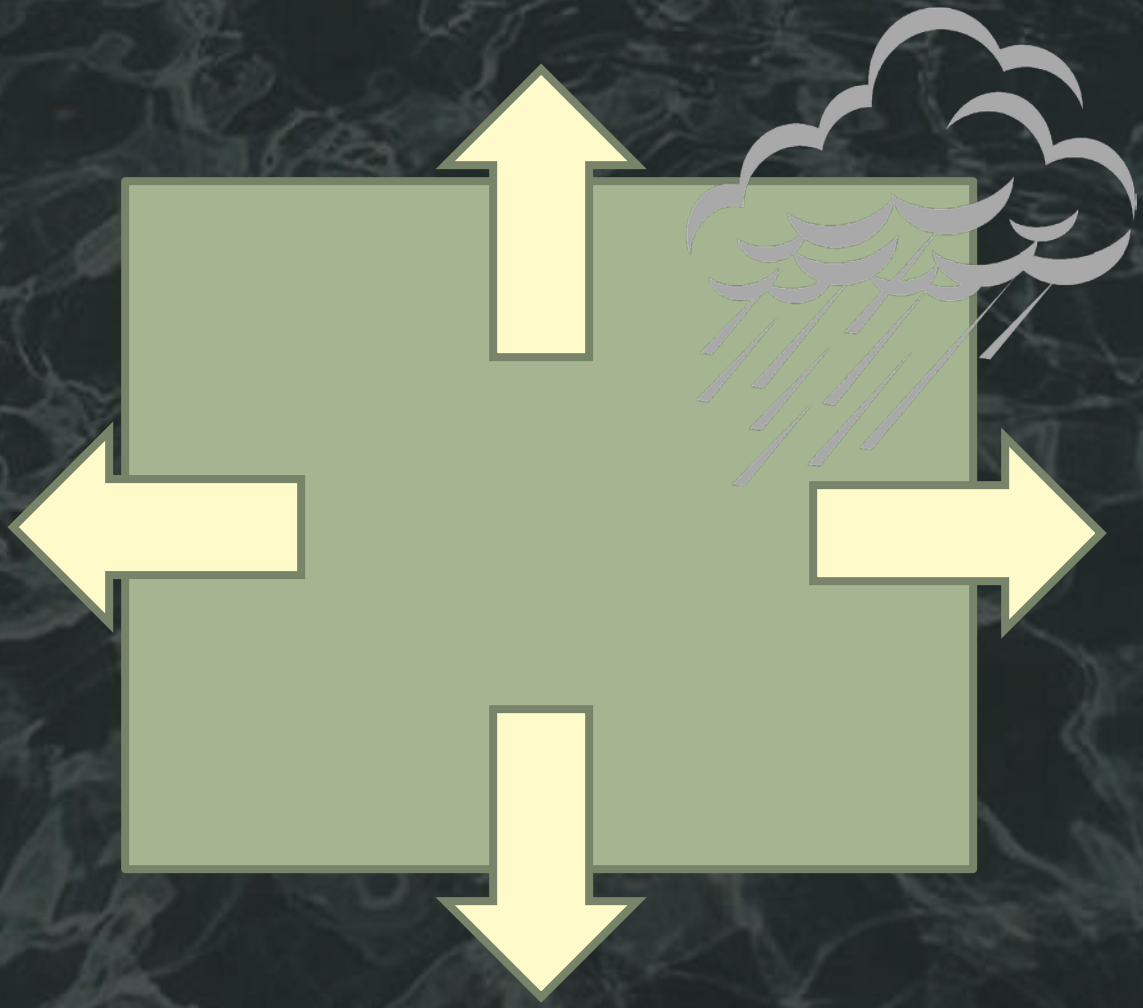
Topics

- Principles for LID Site Design
- Drainage Management Areas
  - Delineation
  - Definition
  - Self-treating and Self-retaining DMAs
  - DMAs draining to Integrated Management Practices
- IMP Selection and Design
- Setting up Calculations
- Using the IMP Calculator

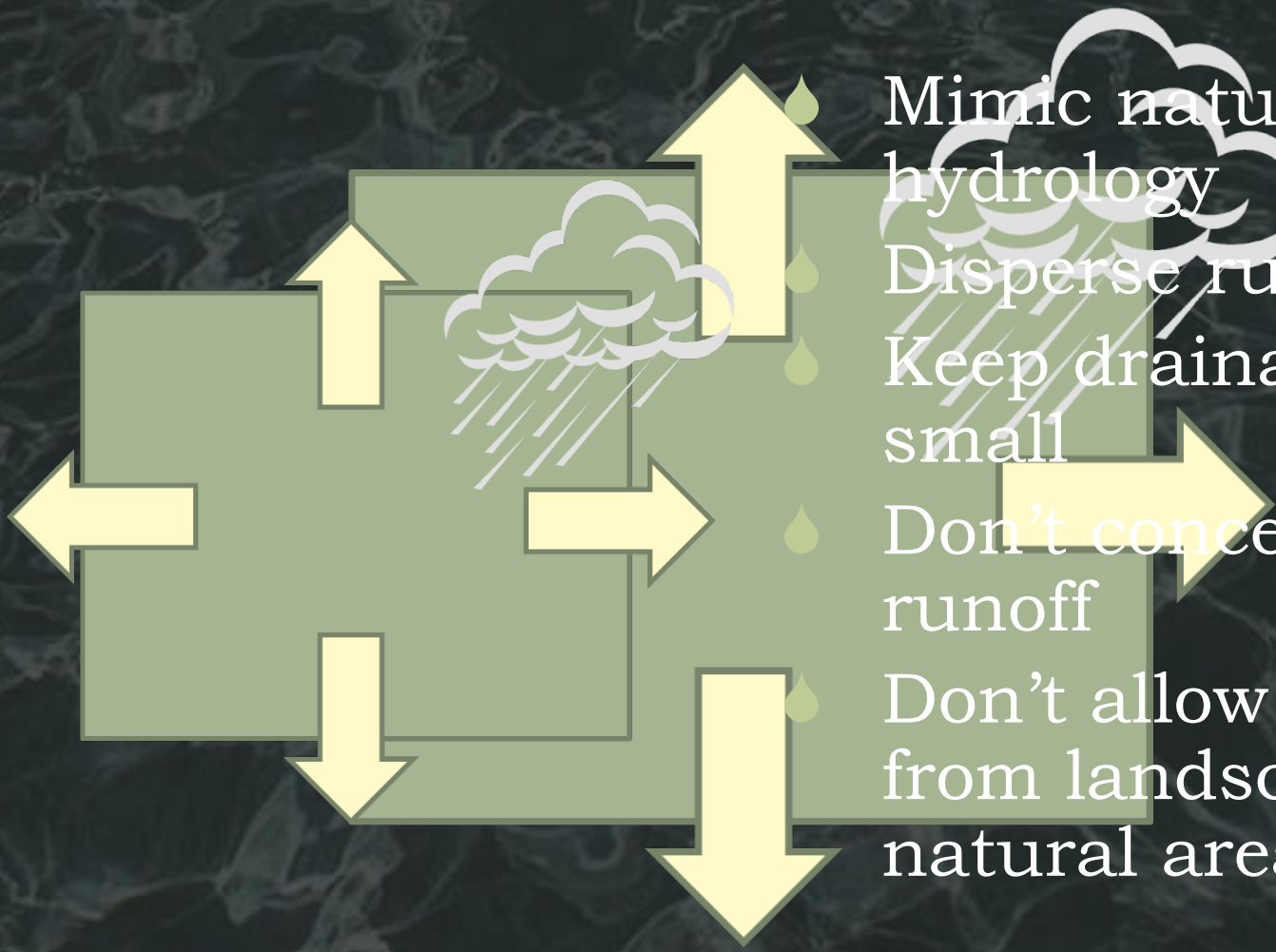
LID Site Design Principles

Paved or
Roof Area

LID Site Design Principles

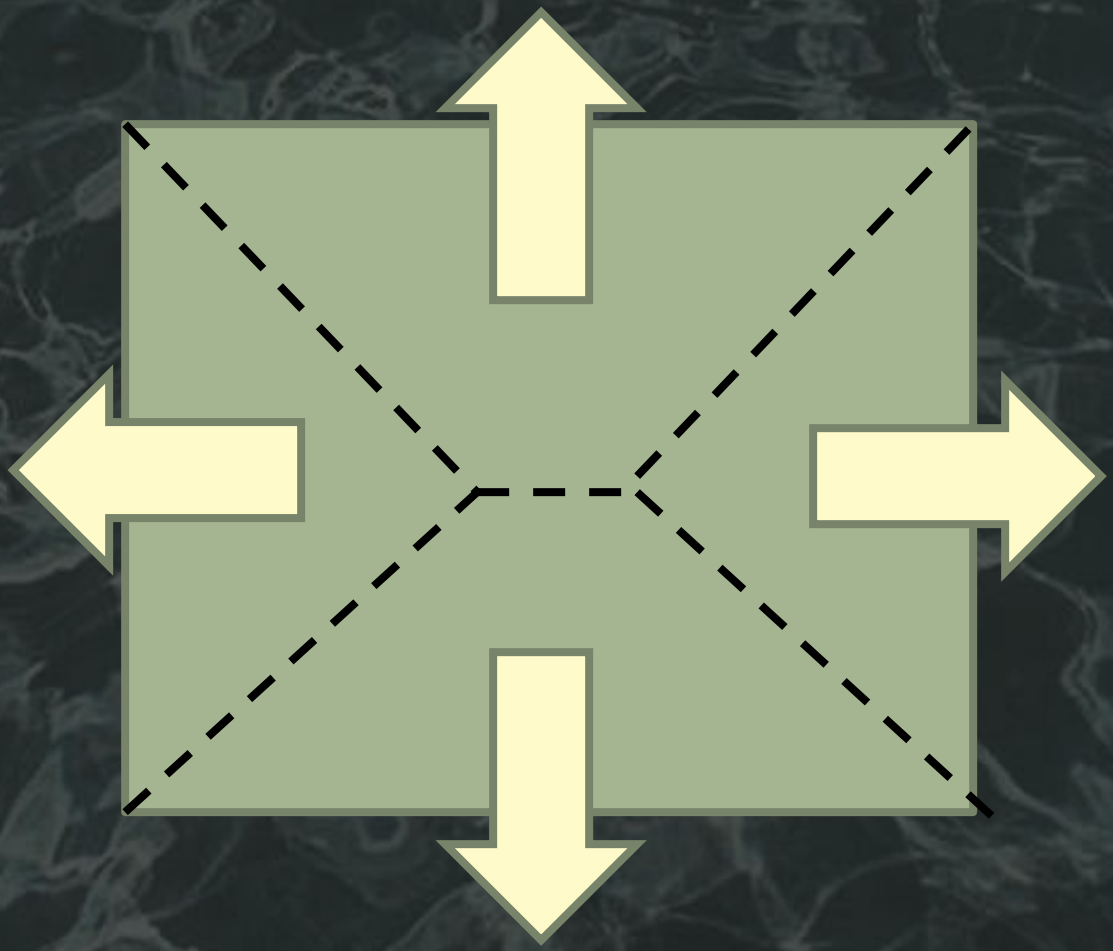


LID Site Design Principles

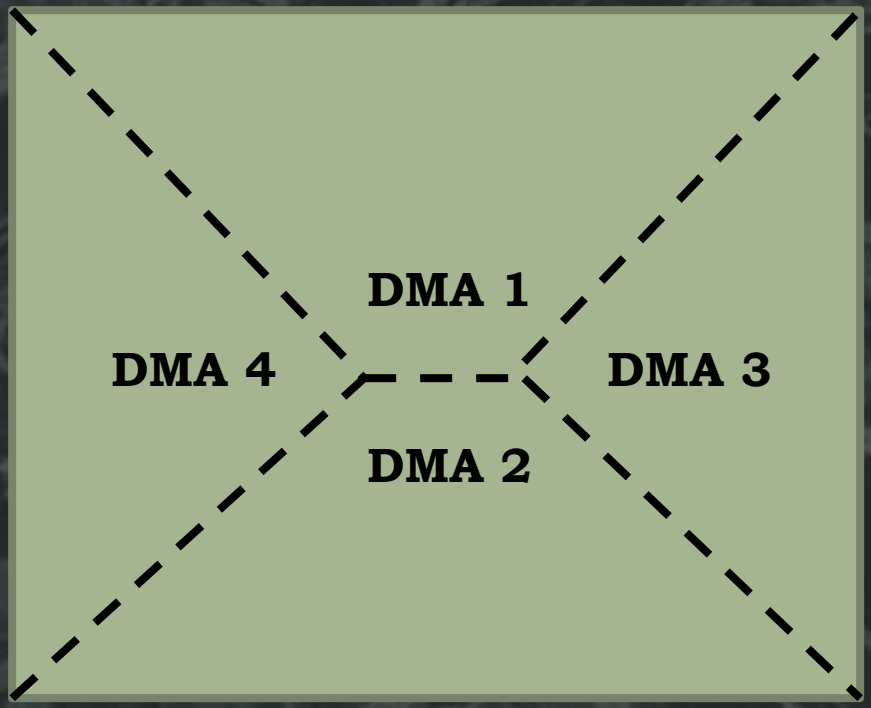


- Mimic natural hydrology
- Disperse runoff
- Keep drainage areas small
- Don’t concentrate runoff
- Don’t allow run-on from landscaped or natural areas

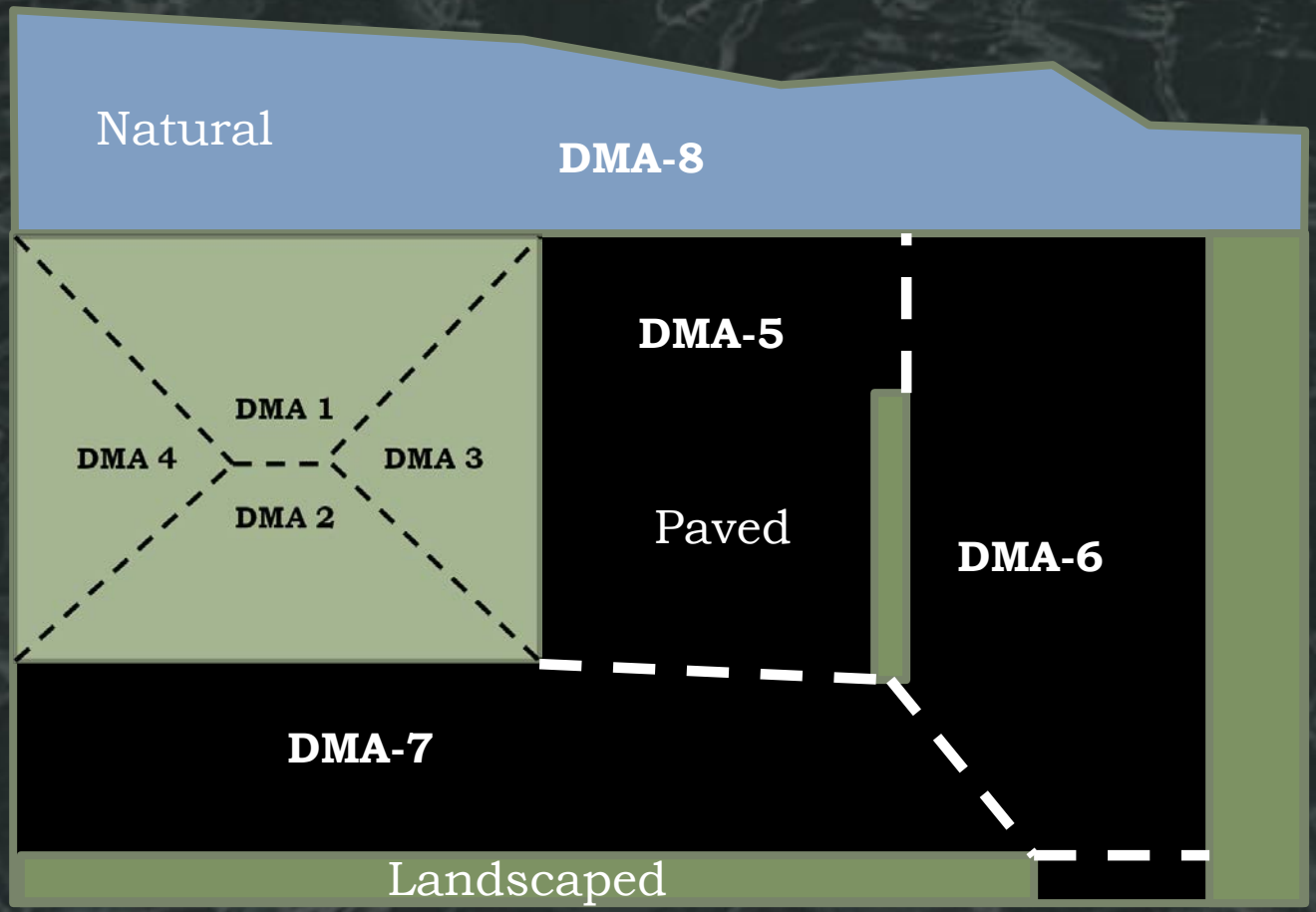
Drainage Management Areas



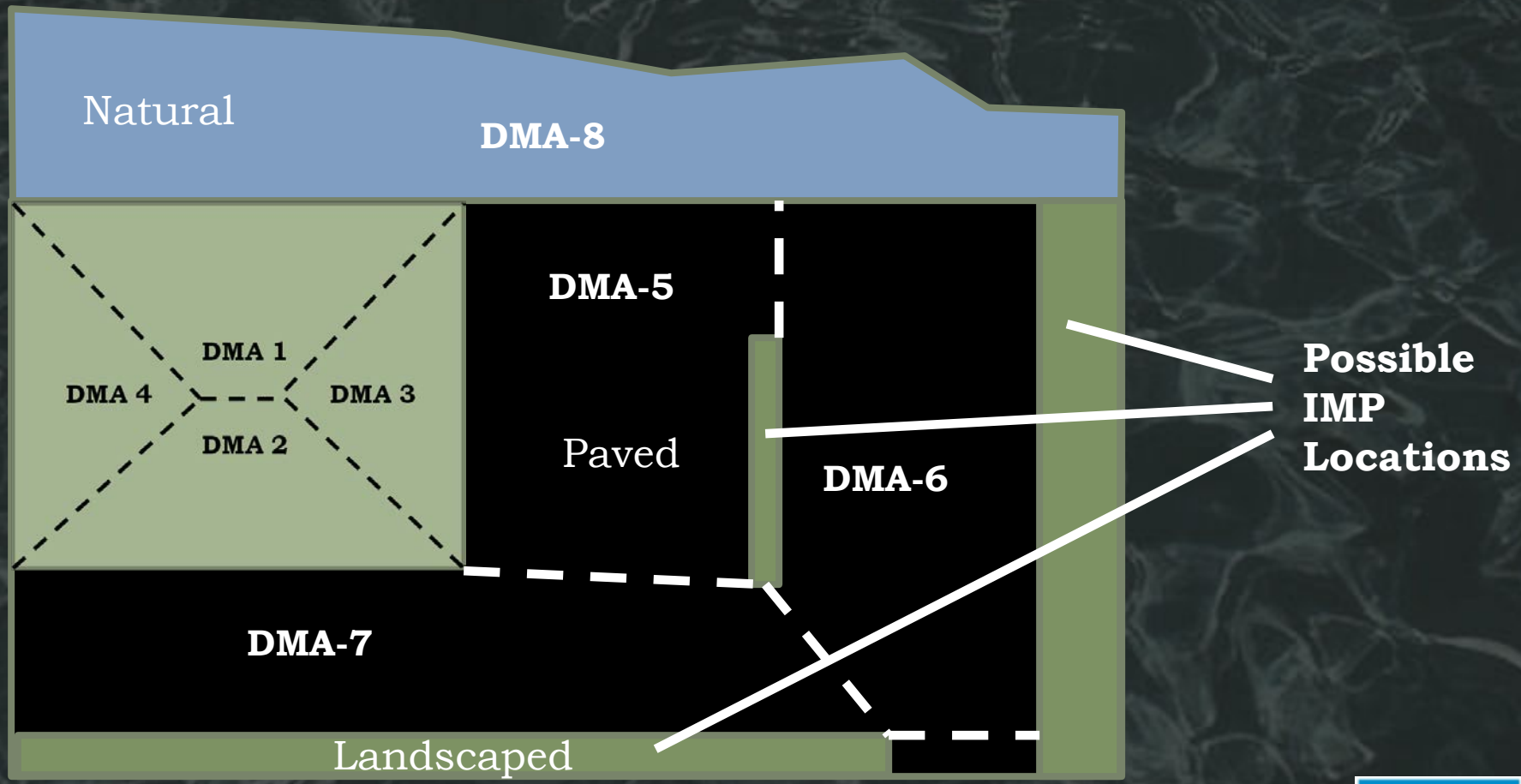
Drainage Management Areas



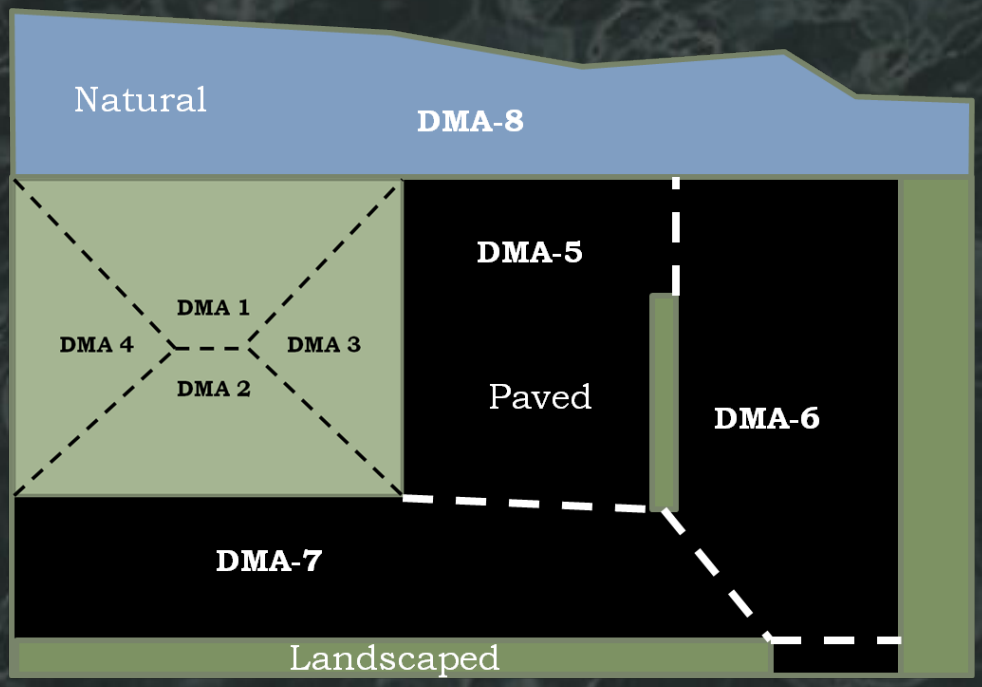
Drainage Management Areas



Drainage Management Areas

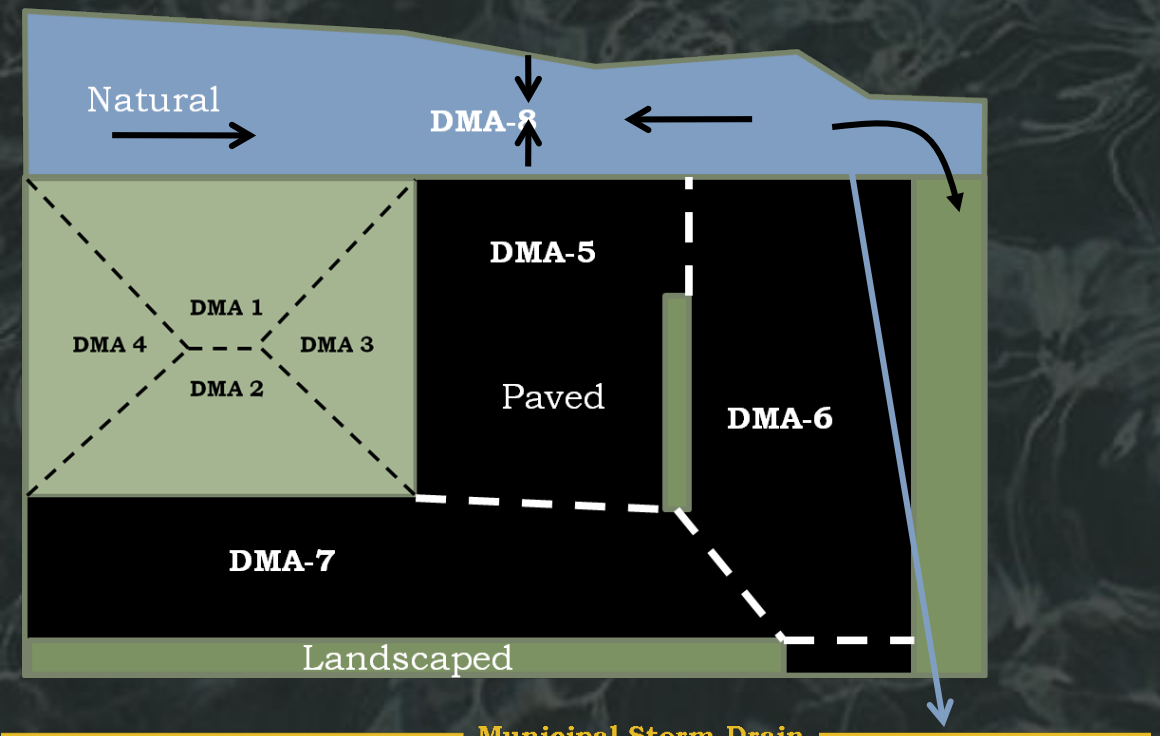


Options – Pervious DMAs



- DMA-8
  - Self-treating?
  - Self-retaining?
  - Drain to IMP?

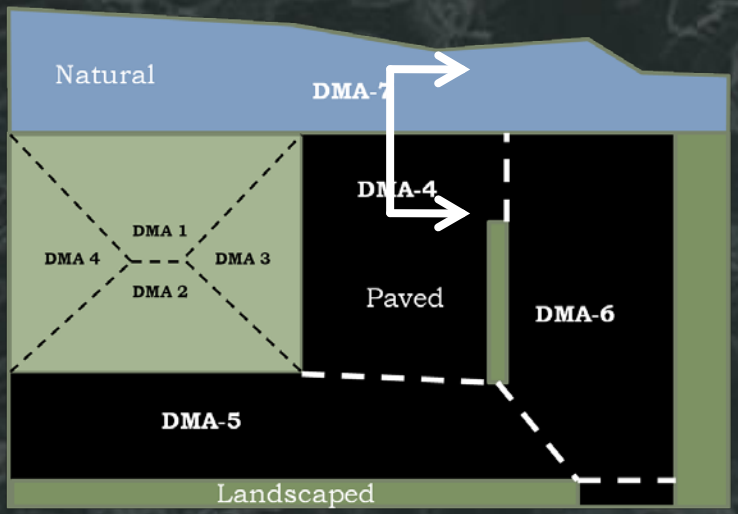
DMA 8



- Self-Treating
  - Drain directly to storm drain system
- Self-Retaining
  - Retain first inch of rainfall without producing runoff
- Drain to IMP
  - Use runoff factor to account for contribution

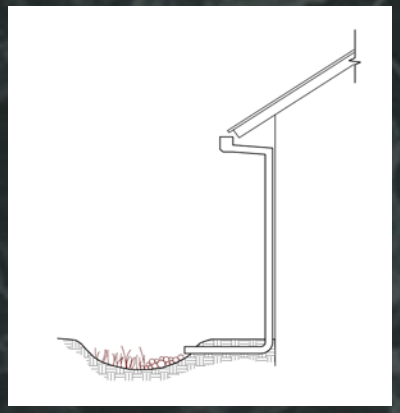
Best choice may depend on slope and relative elevation

Details



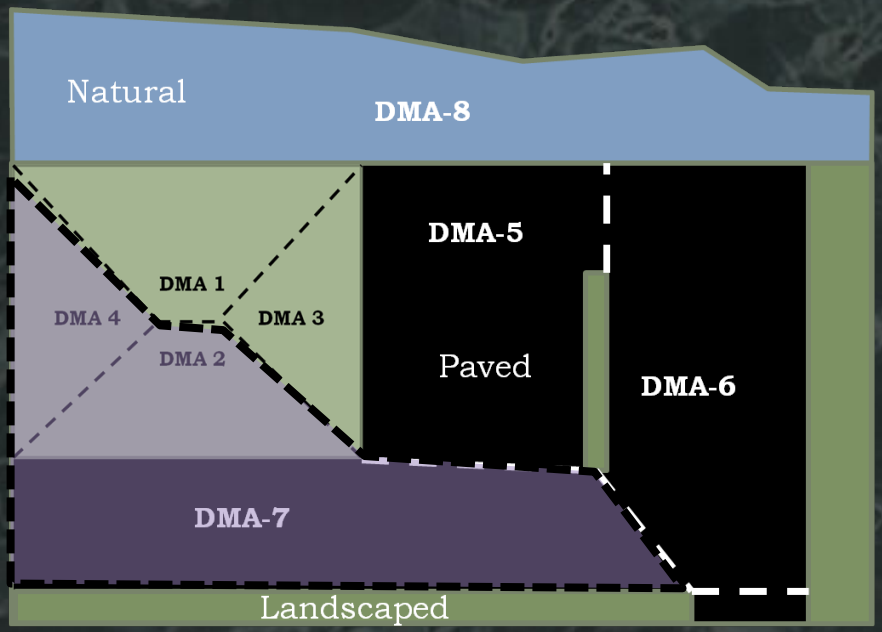
Use a curb to avoid run-on from self-treating areas

Grade self-retaining areas to drain inward. Set any area drains to pond 3"-4"



Consider that adjacent roofs or paved areas could drain to self-retaining areas (not to exceed 1:1)

Options – Combining DMAs



Option to combine DMAs if they have identical runoff factors (for example, roofs and paving) and drainage is routed to the same location.

Carefully follow grade breaks and roof ridges to delineate DMAs

Plan-checking DMAs

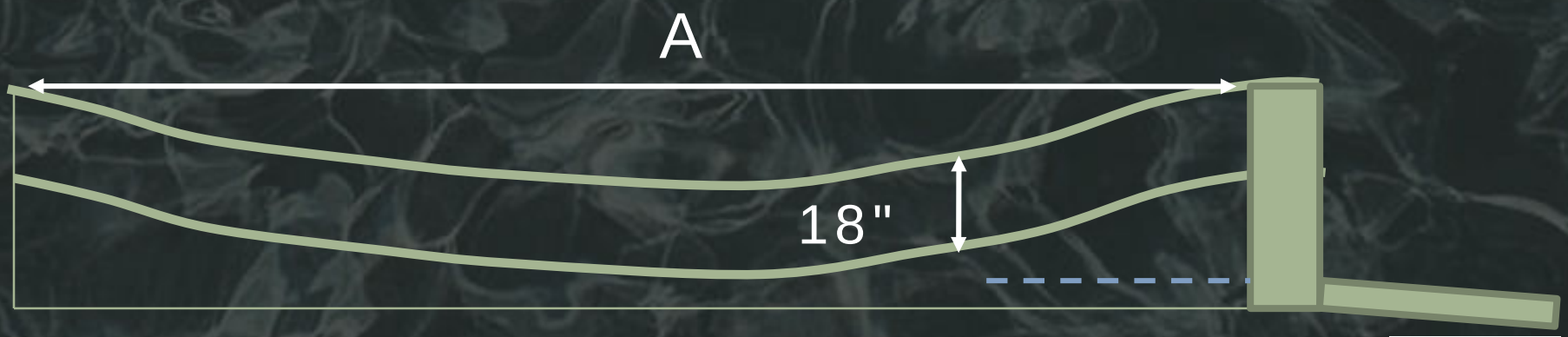
- Consistency with grading, paving, and architectural plans
  - Some municipalities require the stormwater compliance exhibit be drawn over a screen of the grading plan
- Sufficient head to ensure drainage across the DMA and from the DMA to the receiving IMP
- Follow-through in final design and during construction

IMPs

- Integrated Management Practices
- Bioretention facilities
  - Applicable to most sites
- Flow-through planters
  - Bioretention without infiltration
  - Use on elevated plazas and near foundations
- Dry wells and infiltration basins
  - Good solution where soils are highly permeable
- Cisterns and vaults
  - Used in combination with bioretention

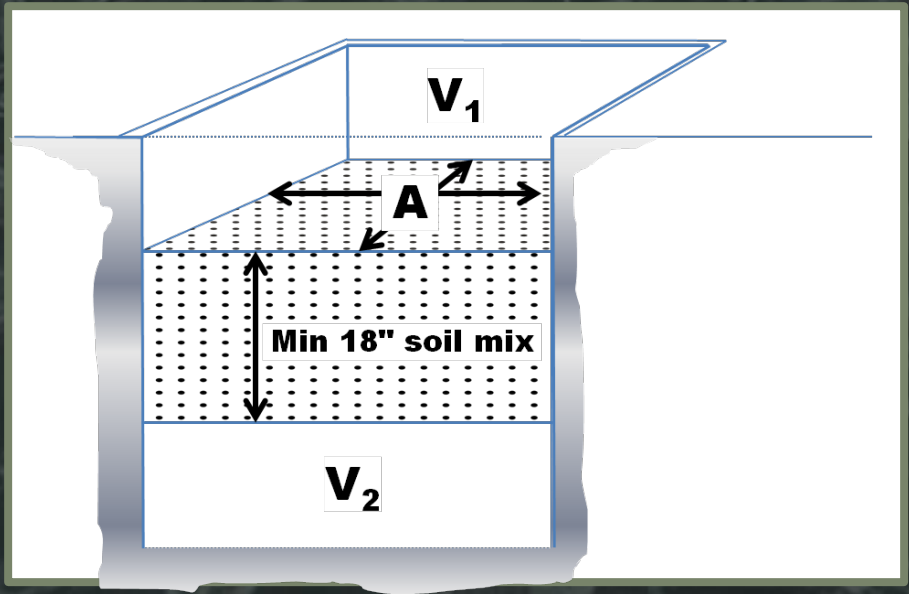
Sizing Bioretention

- Treatment only
  - Sized to 4% of equivalent impervious area
  - Design to ensure entire treatment area is flooded prior to overflow
  - Class 2 perm layer provides some storage
  - Underdrain discharges directly to storm drain



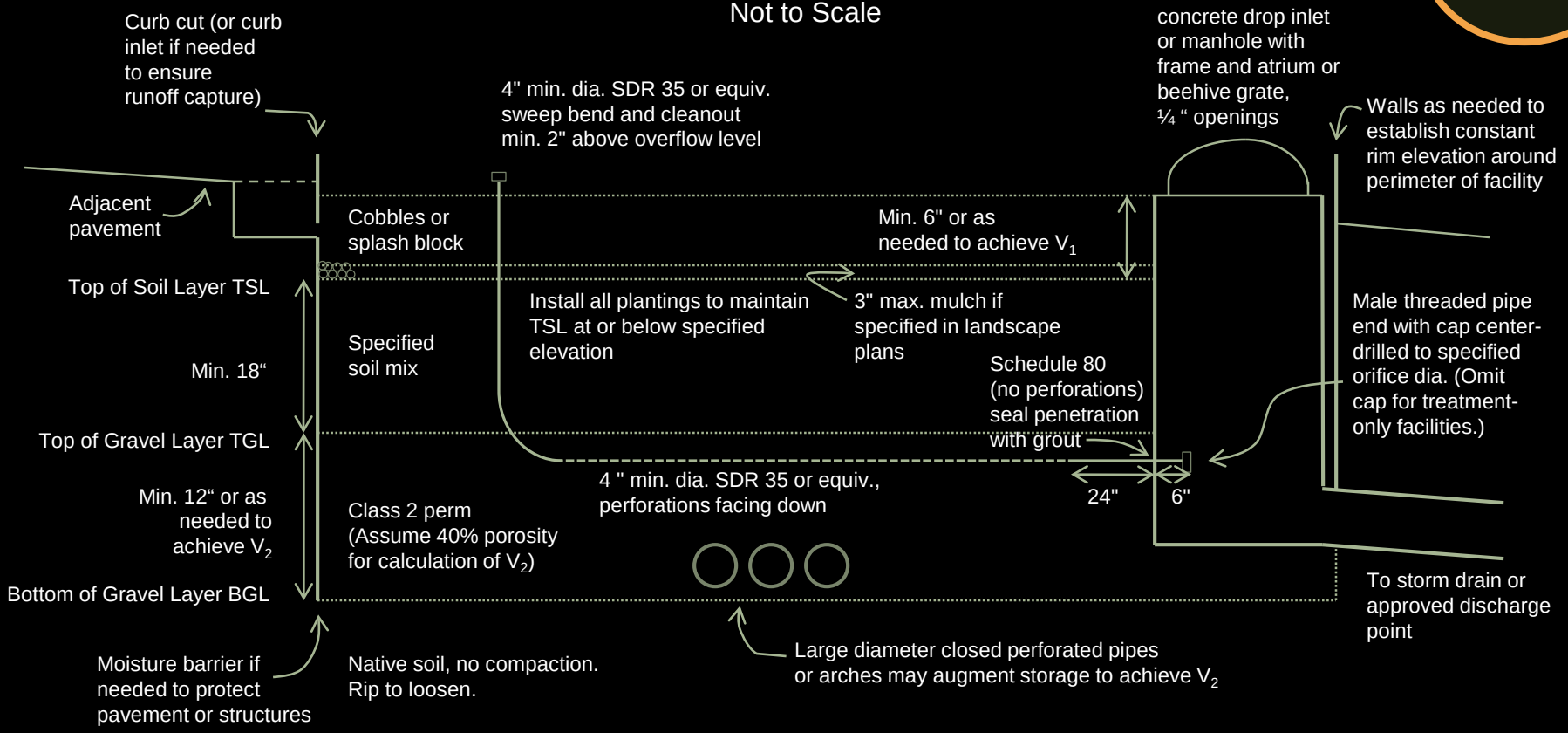
Sizing Bioretention

- Treatment + Flow Control
  - A, V_1 and V_2
  - 12" surface depth and 18" deep gravel layer
  - Design flexibility if same volumes are achieved
  - Orifice limits maximum underdrain discharge



Bioretention Facility

Cross-section
Not to Scale

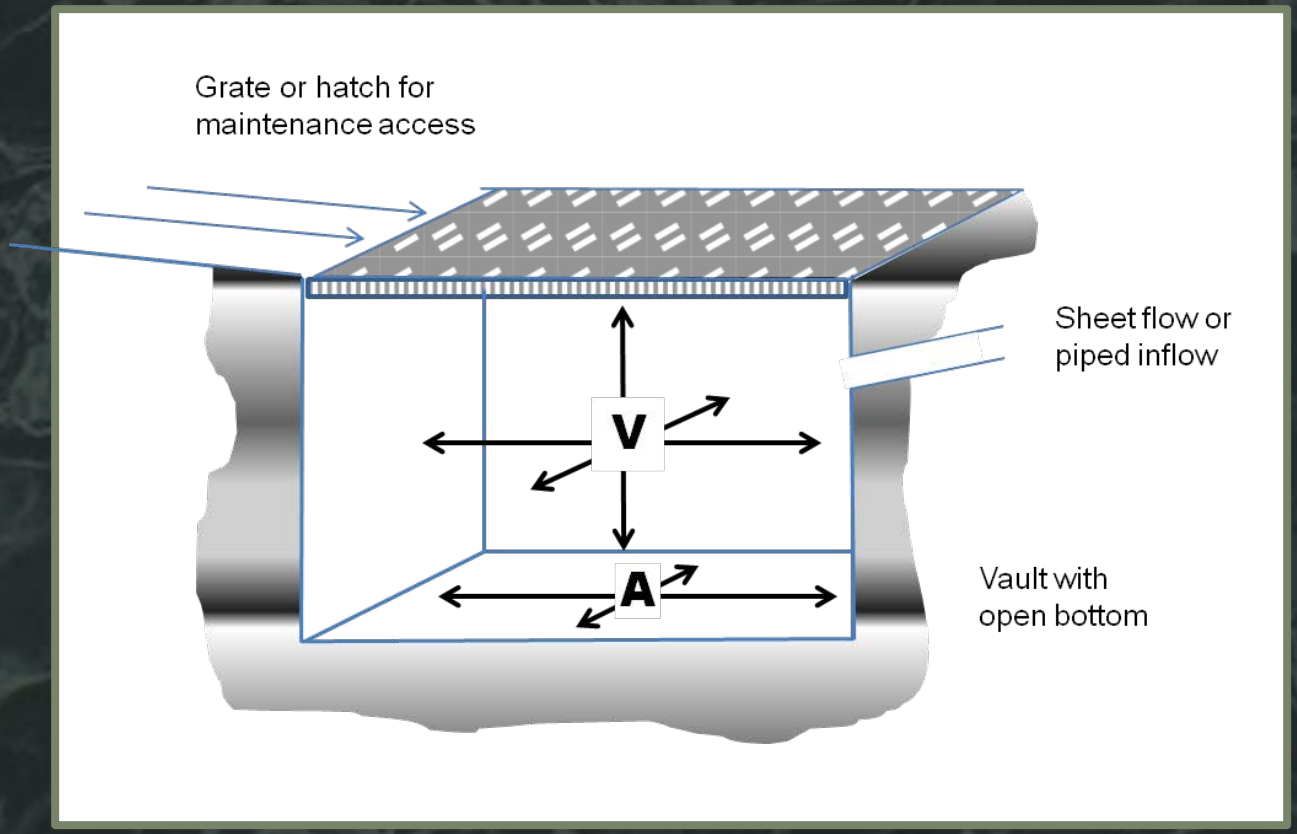


Notes:

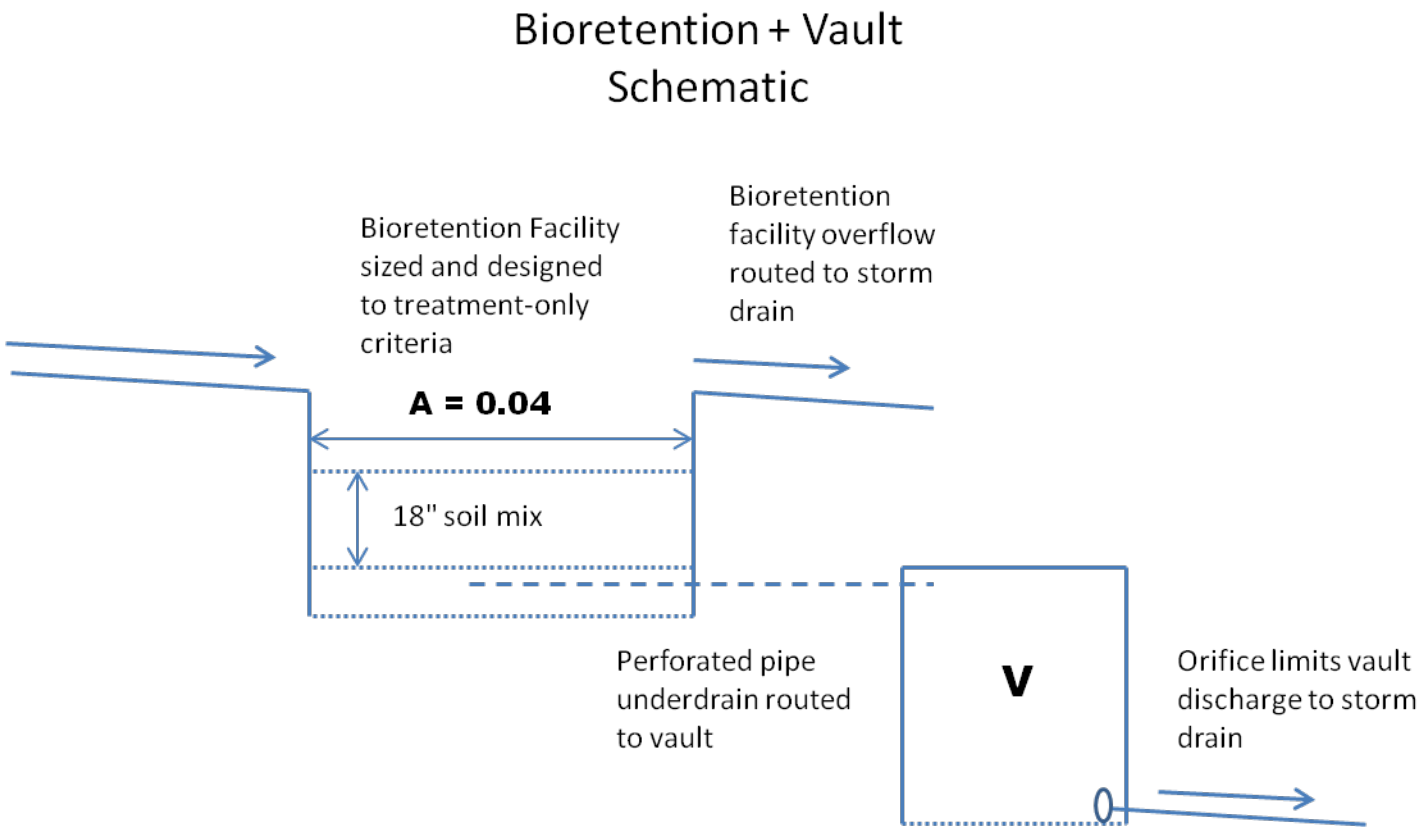
- No liner, no filter fabric, no landscape cloth.
- Maintain BGL. TGL, TSL throughout facility area at elevations to be specified in plan.
- Class 2 perm layer may extend below and underneath drop inlet.
- Preferred elevation of perforated pipe underdrain is near top of gravel layer.
- See Appendix B for soil mix specification, planting and irrigation guidance.
- See Chapter 4 for factors and equations used to calculate V_1, V_2, and orifice diameter.

Sizing Dry Wells

- Treatment + Flow Control
  - A and V

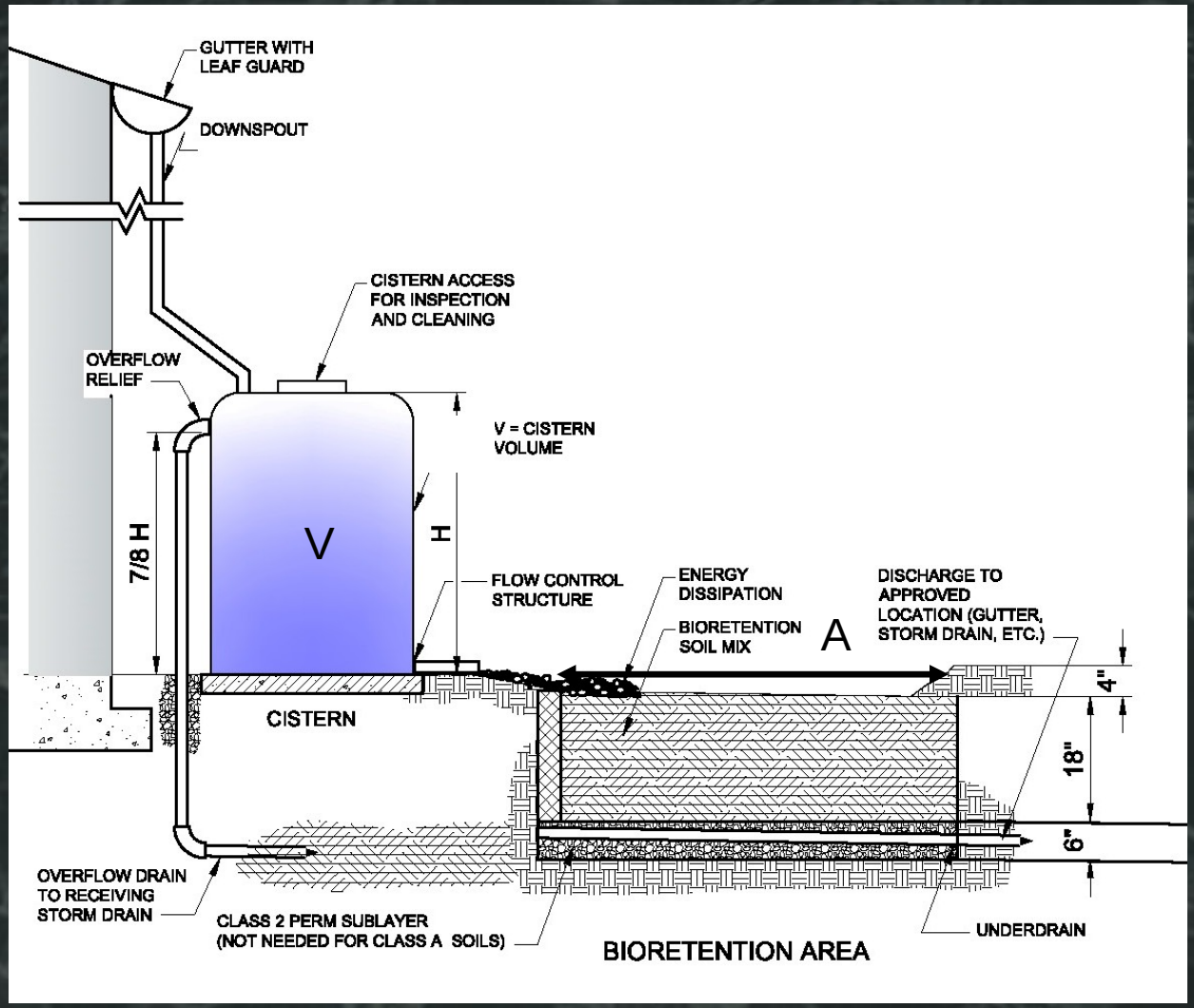


Bioretention + Vault

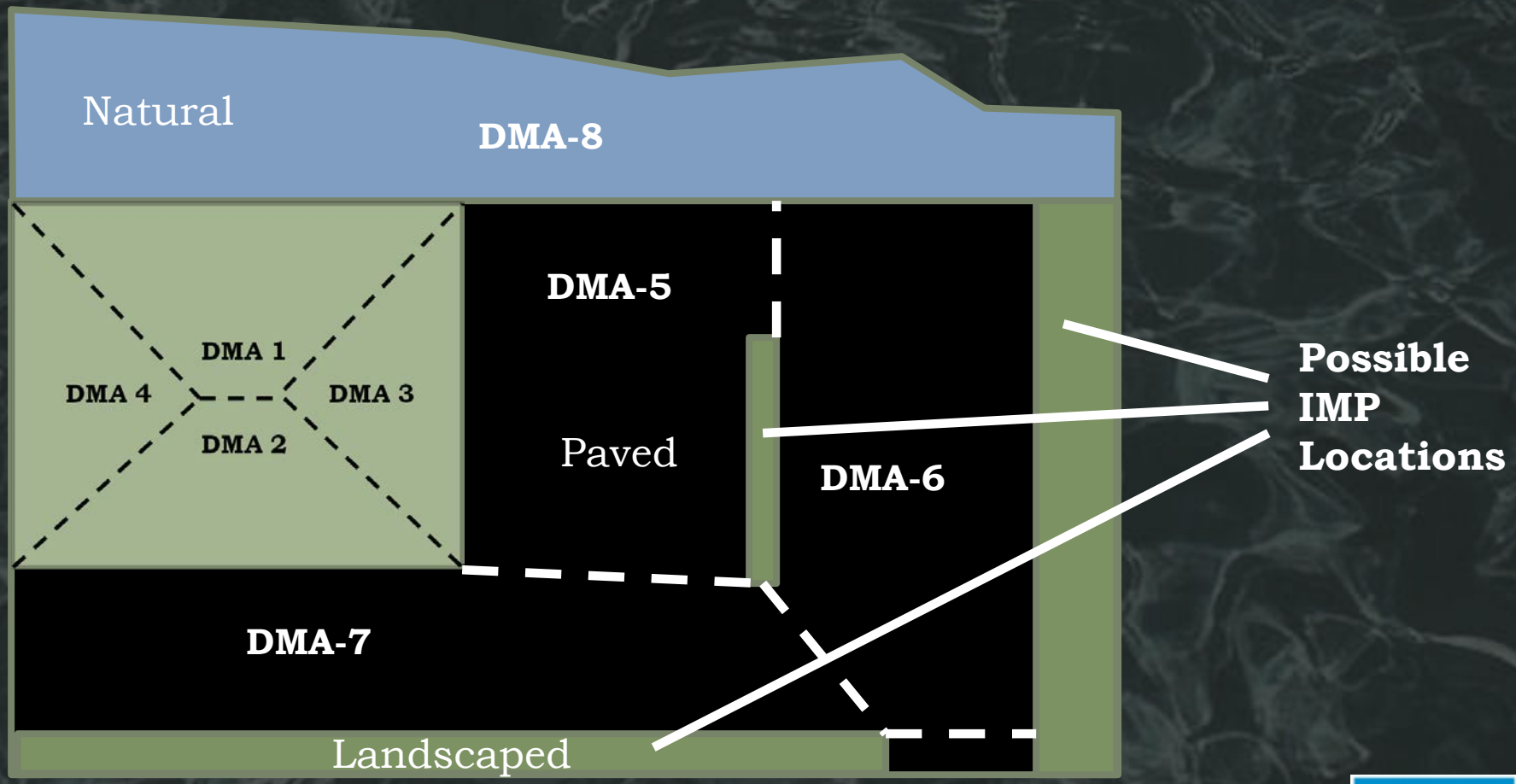


Cistern + Bioretention

V



Example Site



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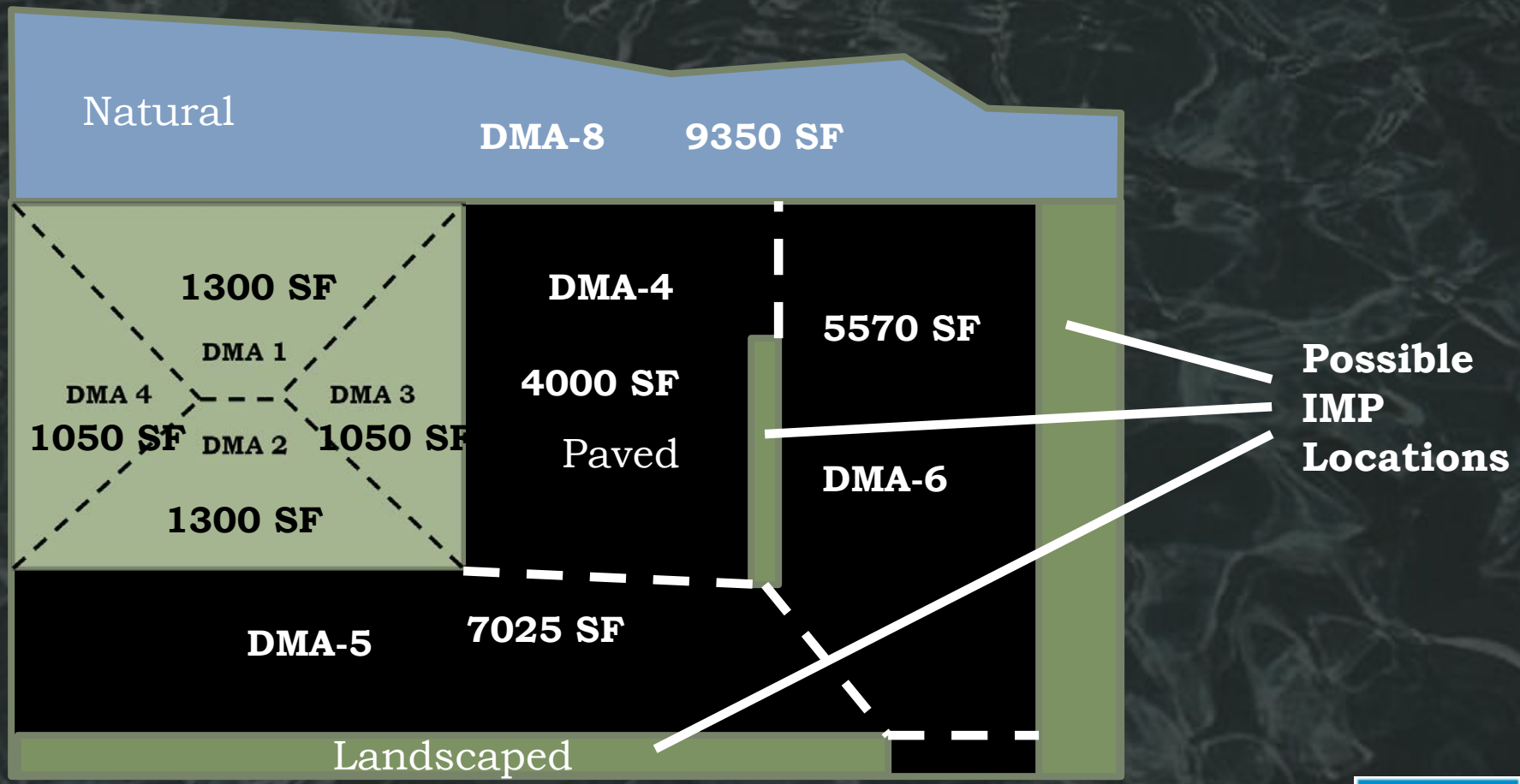

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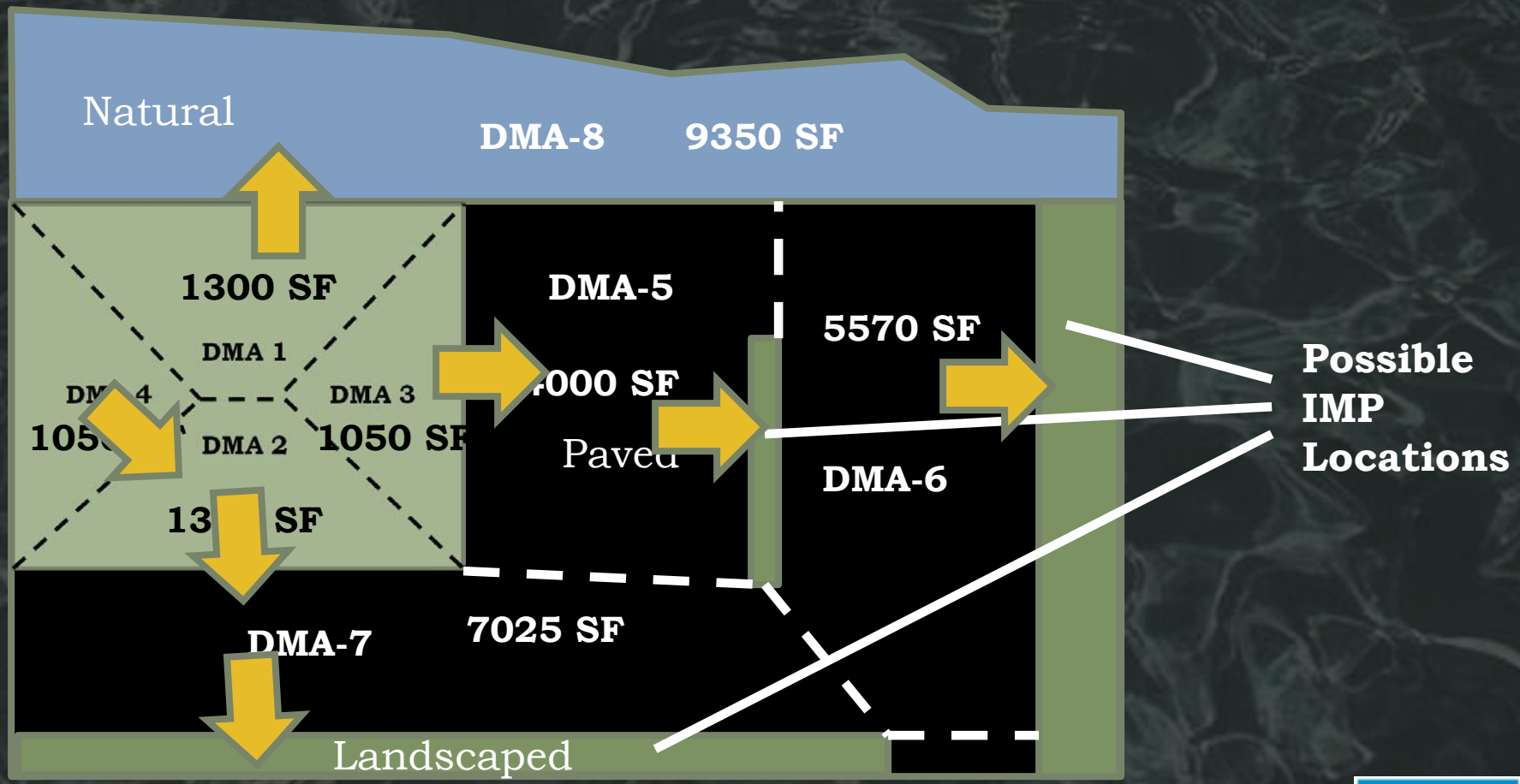

Setting Up Calculations

- Self-retaining Area

DMA Name	Square Feet
DMA-8	9350

- Area Draining to Self-retaining Area

DMA	Square Feet	Surface	Runoff Factor	Receiving DMA	Receiving Area
DMA-1	1300	Roof	1.0	DMA-8	9350

Setting Up Calculations

- Areas Draining to IMPs

DMA	Area	Surface	Runoff Factor	Area × Runoff Factor	Soil Type			
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
					IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A				
				V1				
				V2				
				Orifice Size:				

Setting Up Calculations

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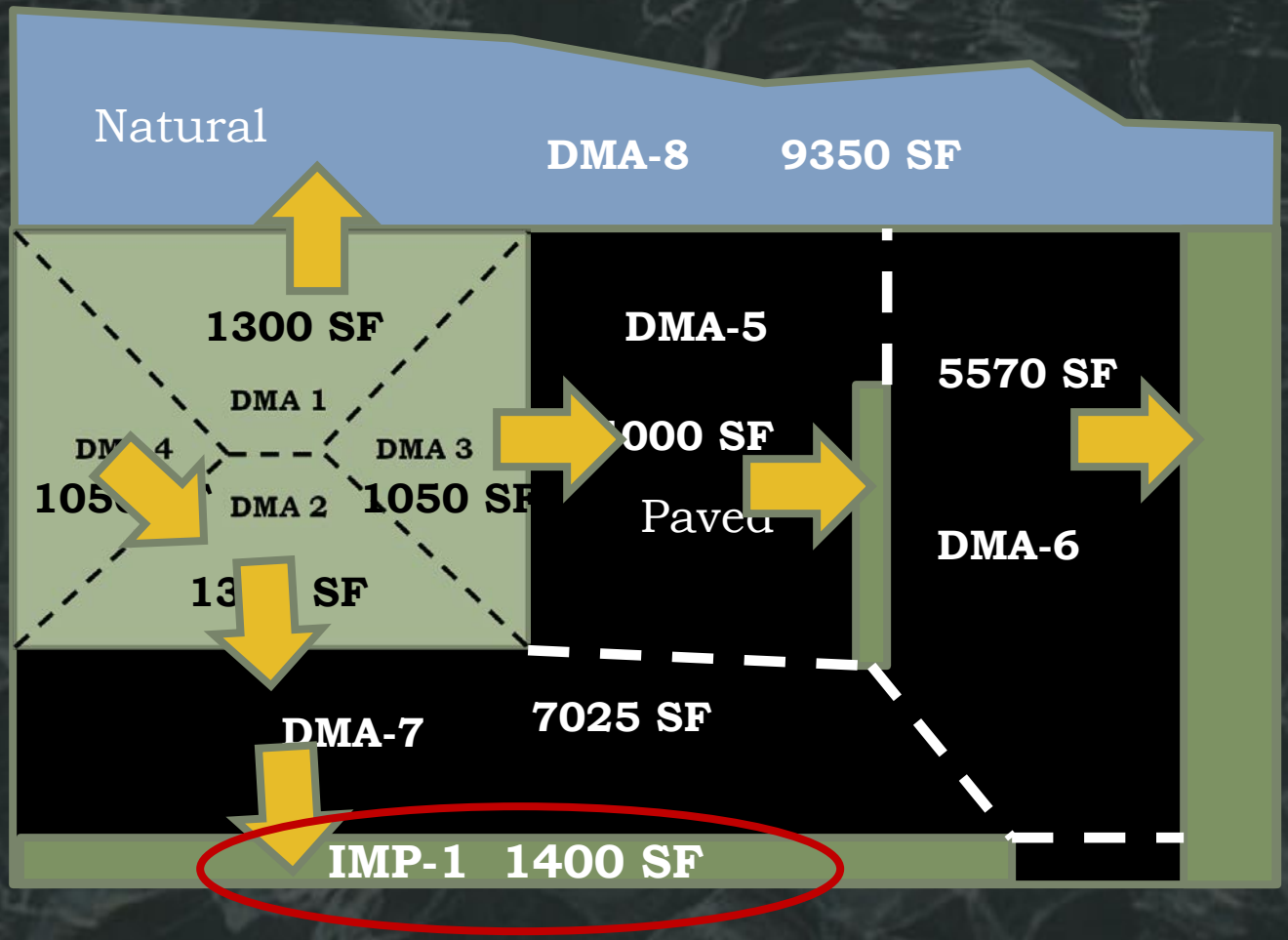
DMA	Area	Surface	Runoff Factor	Area x Runoff Factor	Soil Type			
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
				9375	IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A	0.06	1.0	562.5	
				V1	0.04	1.0	375.0	
				V2	0.05	1.0	468.8	
				Orifice Size:				

Example Site



Setting Up Calculations

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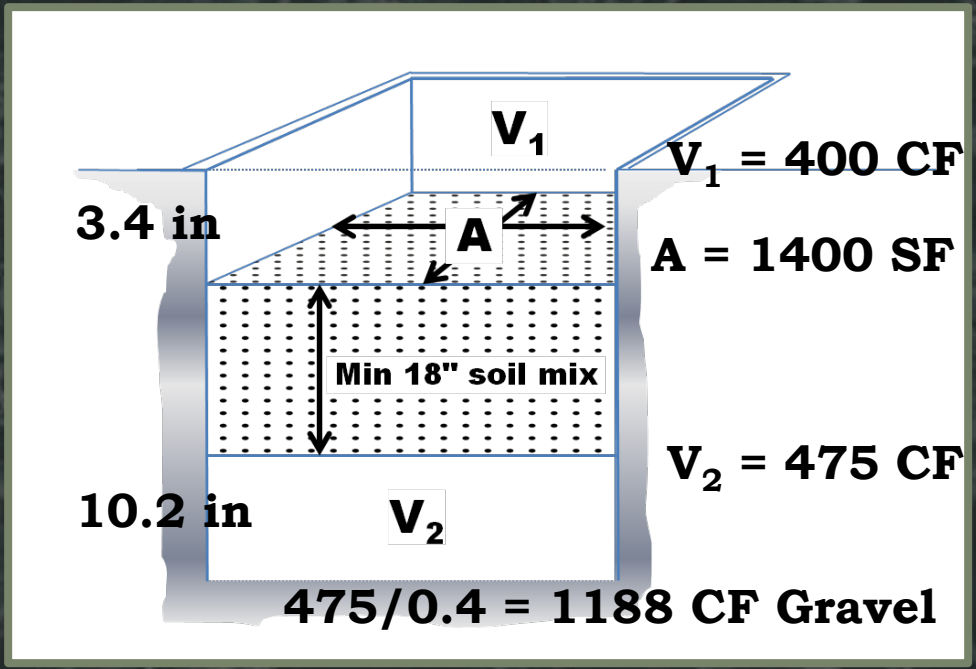
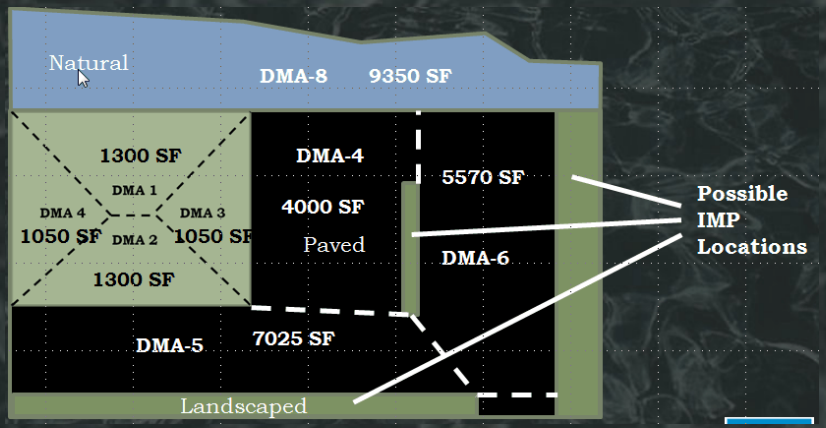
DMA-2	1050	Roof	1.0	1050	D			
DMA-4	1300	Roof	1.0	1300				
DMA-7	7025	Paved	1.0	7025				
				9375	IMP Sizing Factor	Rain Adjust Factor	Min Area or Volume	Proposed Area or Volume
				A	0.06	1.0	562.5	1400
				V1	0.04	1.0	375.0	400
				V2	0.05	1.0	468.8	475
				Orifice Size:				0.6 in.

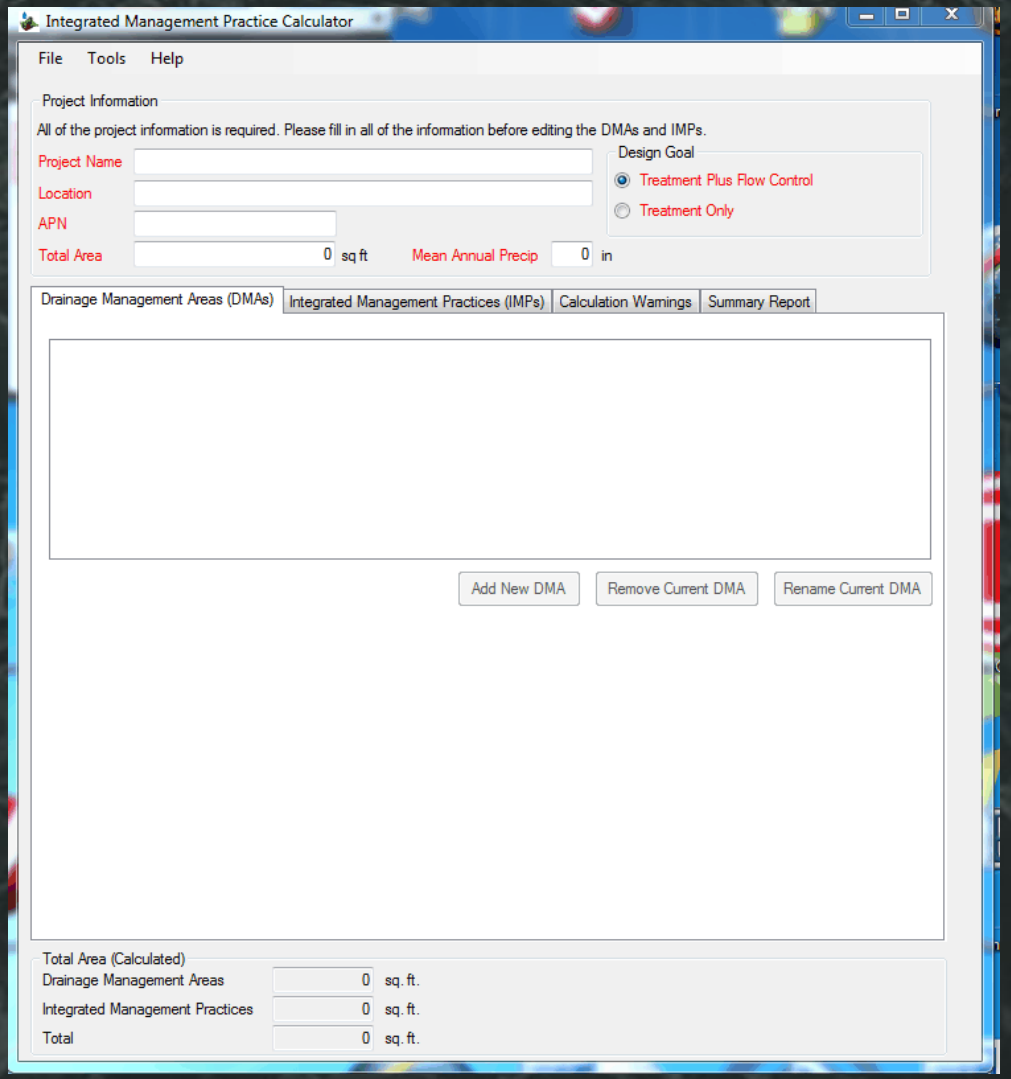
Sizing Bioretention



Using the IMP Calculator

	A	B	C
1			
2	**DMA**	**SF**	**Surface**
3			
4	**1**	**1300**	**Roof**
5	**2**	**1050**	**Roof**
6	**3**	**1300**	**Roof**
7	**4**	**1050**	**Roof**
8	**5**	**4000**	**Paved**
9	**6**	**5570**	**Paved**
10	**7**	**7025**	**Paved**
11	**8**	**9350**	**Landscape**
12			
13			





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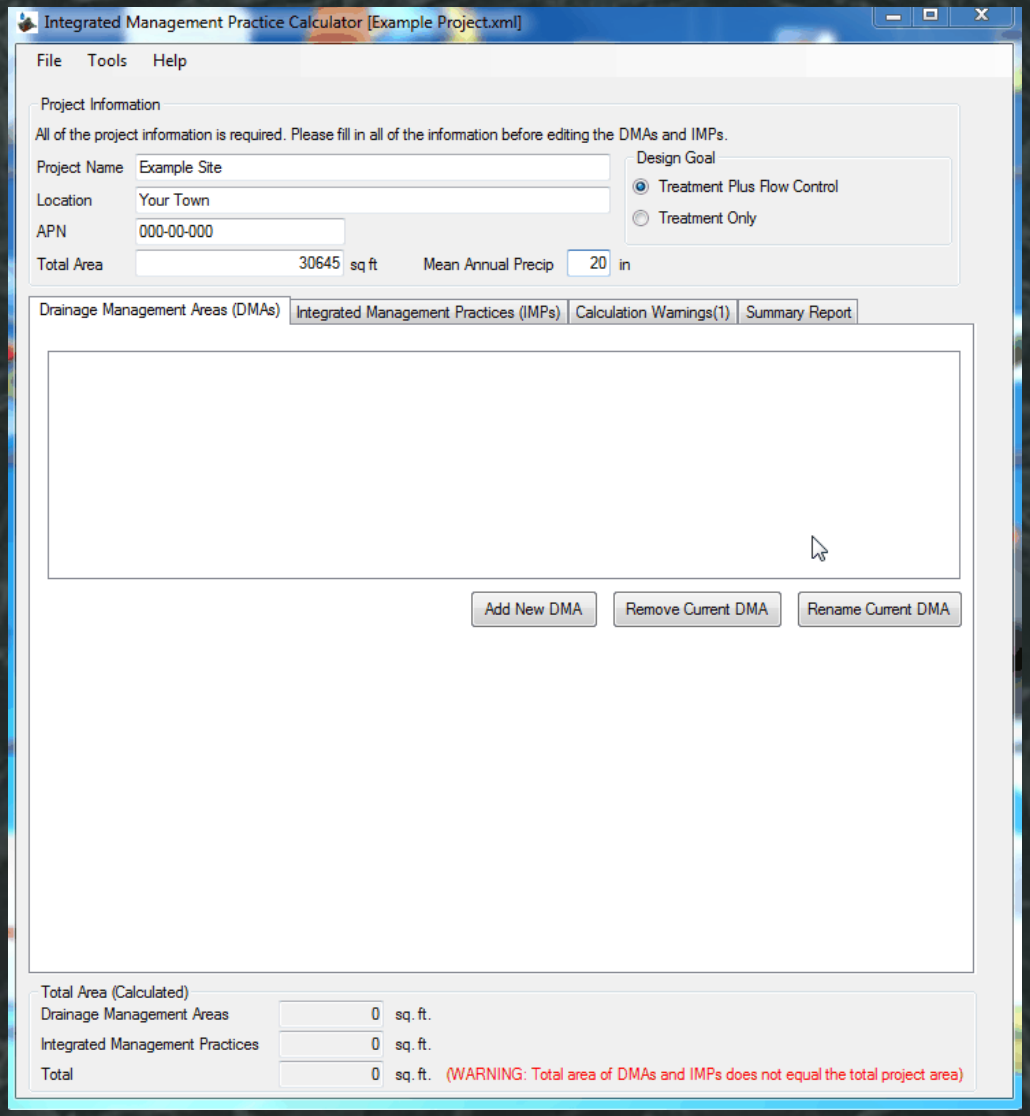

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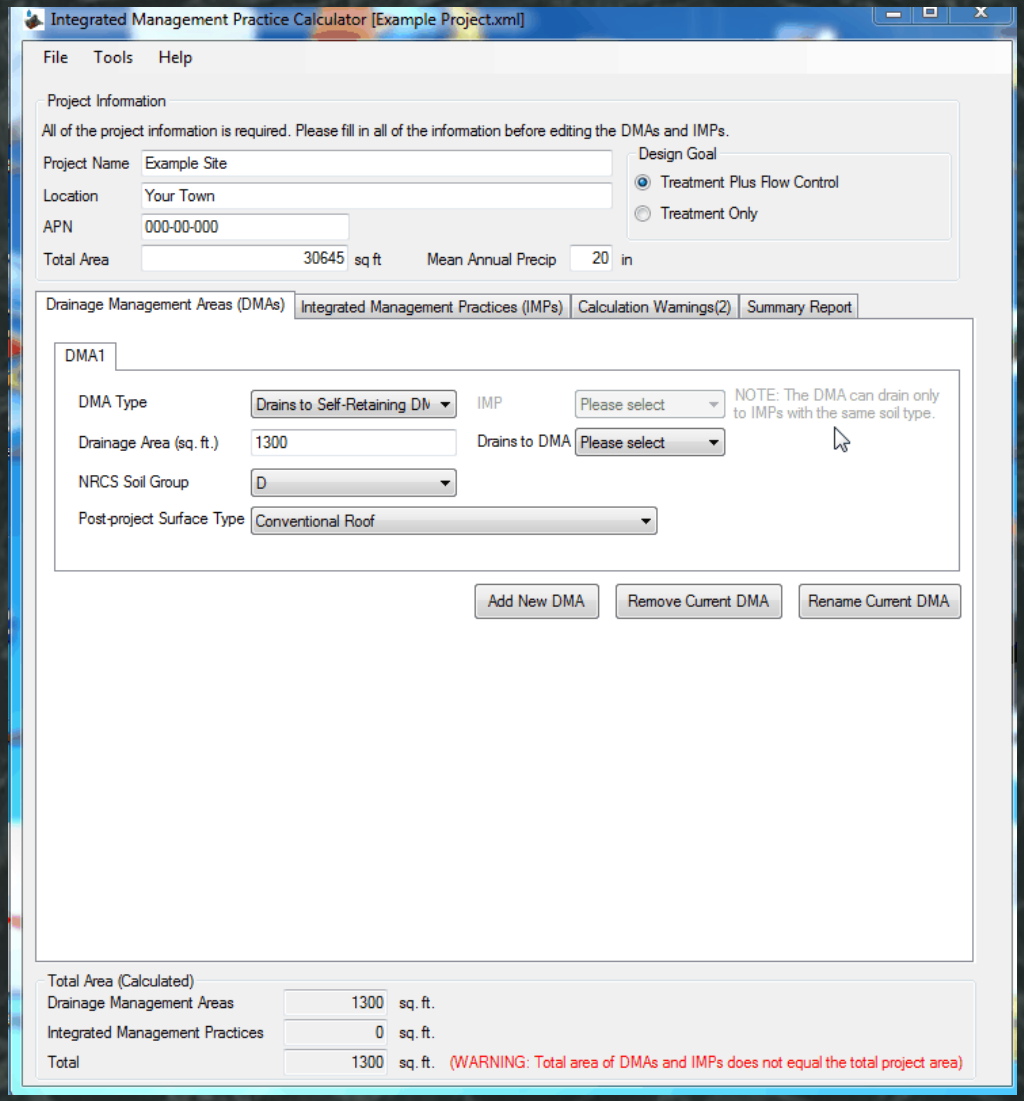

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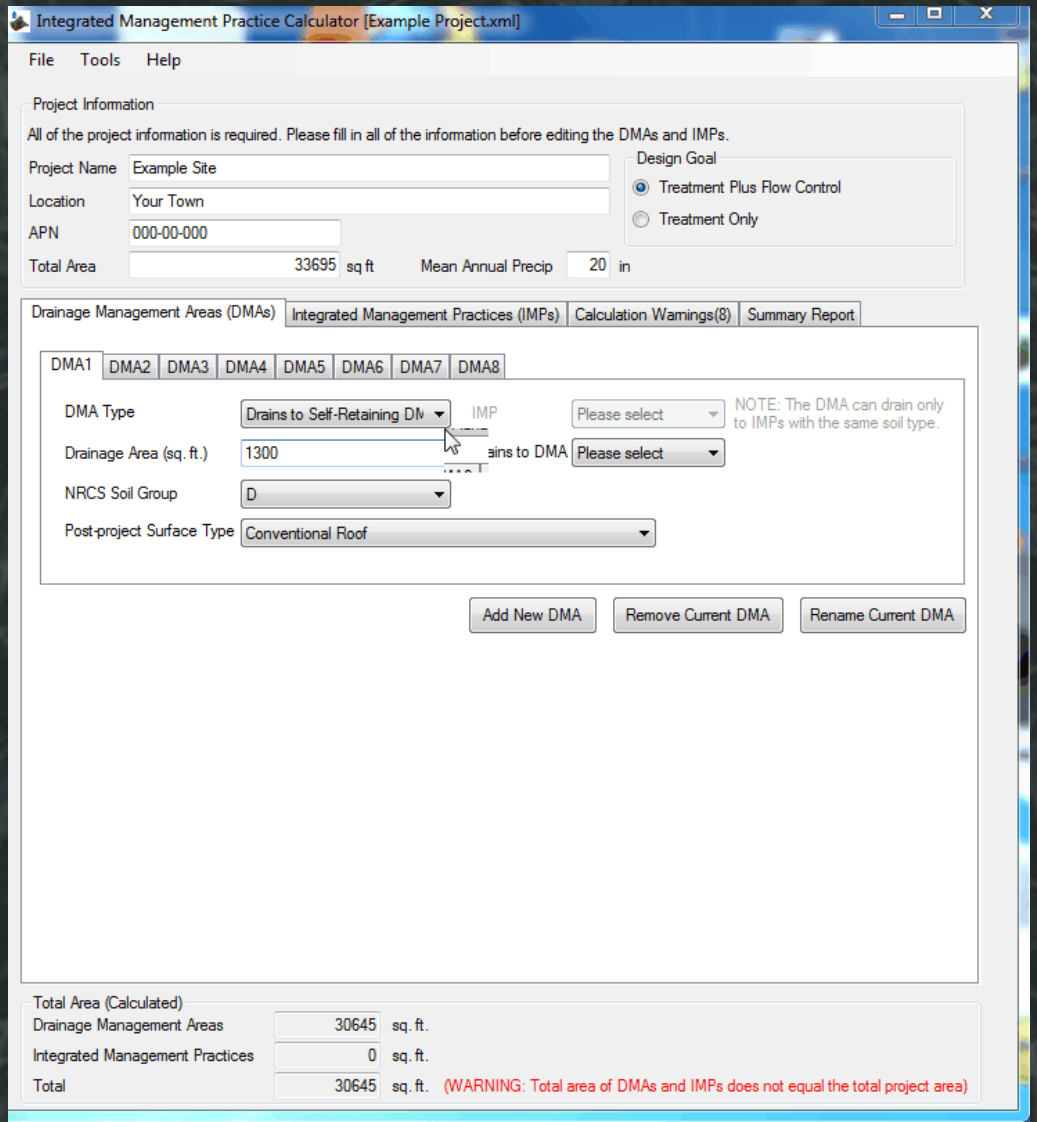

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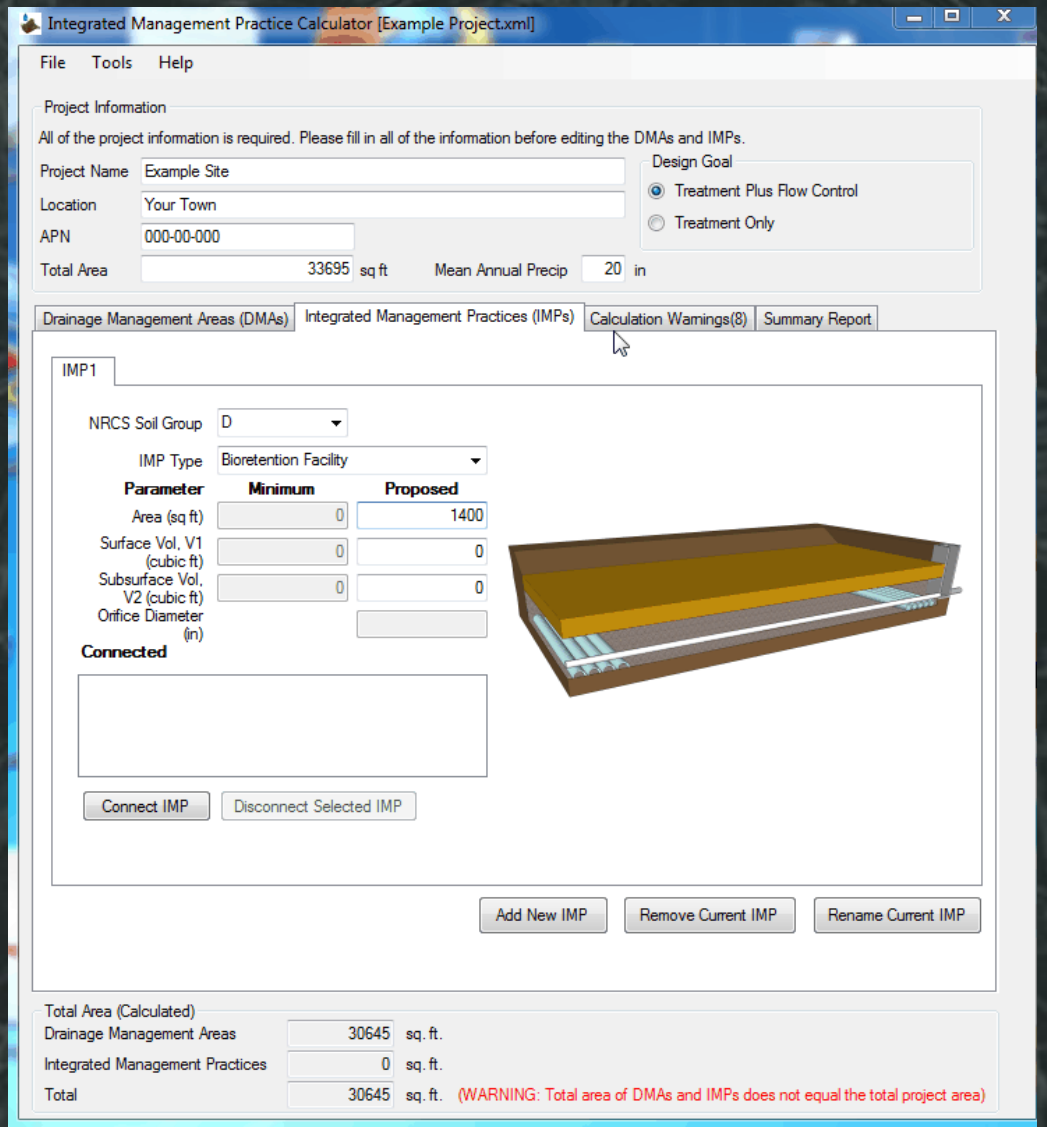

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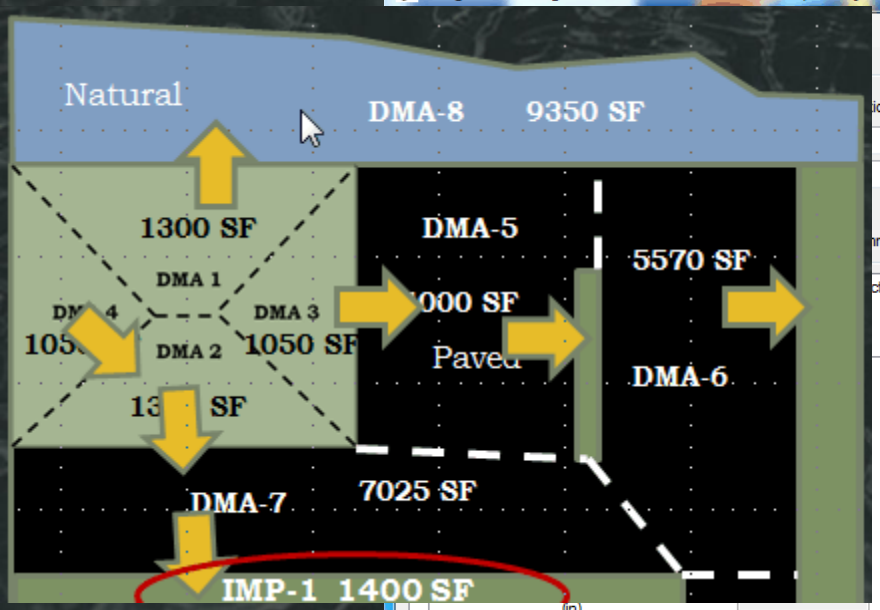

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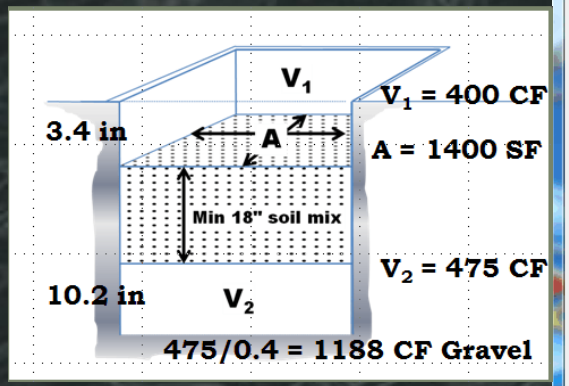


Integrated Management Practice Calculator [Example Project.xml]

File Tools Help

Project Information

All of the project information is required. Please fill in all of the information before editing the DMAs and IMPs.

Project Name: Example Site
Location: Your Town
APN: 000-00-000
Total Area: 33695 sq ft
Mean Annual Precip: 20 in

Design Goal
- (•) Treatment Plus Flow Control
- ( ) Treatment Only

Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(3) | Summary Report

IMP1 | IMP2

NRCS Soil Group: D
IMP Type: Bioretention Facility

Parameter	Minimum	Proposed
Area (sq ft)	460	1400
Surface Vol, V1 (cubic ft)	387	390
Subsurface Vol, V2 (cubic ft)	506	510
Orifice Diameter (in)		0.83

Connected: DMA4 DMA2 DMA7

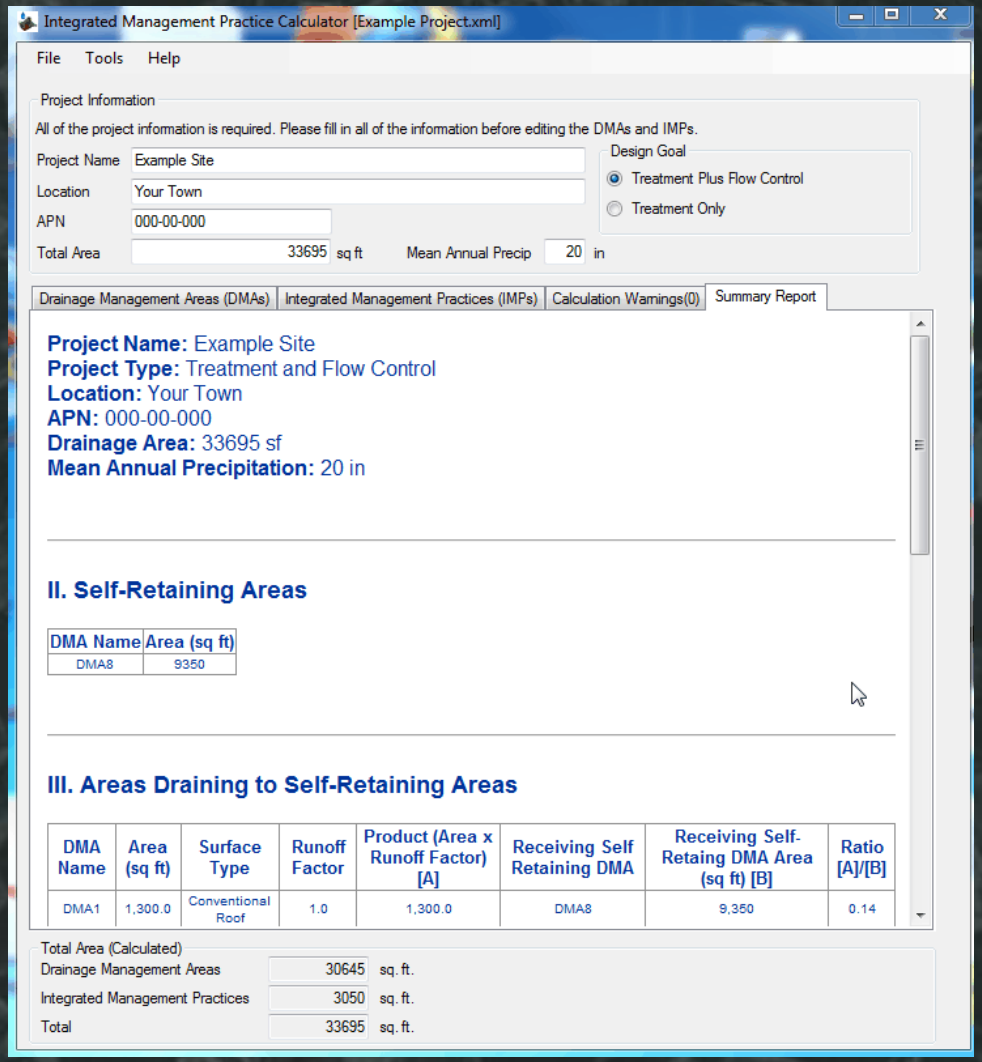
Connect IMP | Disconnect Selected IMP

Add New IMP | Remove Current IMP | Rename Current IMP

Total Area (Calculated)

Drainage Management Areas	30645	sq. ft.
Integrated Management Practices	3050	sq. ft.
Total	33695	sq. ft.

Using the IMP Calculator



Discussion