

Welcome to the IMP Sizing Tool

Errata (12/18/06): In the Summary Report produced by the IMP Sizing Tool, the labels for swale widths and swale depths will be reversed. This will be corrected in the next build.

This **Help File** covers the basic operation of the IMP Sizing Tool. This software assists with the planning and sizing the stormwater facilities by allowing you to define **Drainage Management Areas** (DMAs) and **Integrated Management Practices** (IMPs) in accordance with the **Stormwater C.3 Guidebook**.

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Getting Started with the IMP Sizing Tool

The **IMP Sizing Tool** can help you compute the minimum IMP sizes that meet stormwater **Treatment Only** or **Treatment Plus Flow Control** requirements of the C.3 provision of the Contra Costa Clean Water Program's NPDES permit, issued in 2006. This tool is not a hydrologic model; instead this tool compiles the results of long-term hydrologic modeling simulations of IMPs and applies various sizing adjustments that account for variations in rainfall patterns and runoff from different land surface types. The calculations used by the tool and steps for sizing IMPs by-hand are contained in **Appendix I of the Stormwater C.3 Guidebook**, which is located on the Program's web site, <http://www.cccleanwater.org/construction/nd.php>. You should become familiar with Appendix I and use it to verify the minimum sizes computed by the **IMP Sizing Tool**.

The **IMP Sizing Tool** consists of three sections as illustrated in the figure below. The first section contains basic information that applies to the entire project, such as its name, location and the project site's mean annual precipitation (abbreviated as MAP). The second section describes the drainage characteristics of the site: the drainage management areas or **DMAs** and proposed stormwater control **IMPs**. This section also tracks calculation warnings and dynamically produces a preview of the project's summary report. The third section compares the project site area and the combined areas of all **DMAs** and **IMPs**. After delineating the project site and laying out IMPs, the total area of the **DMAs** and **IMPs** should match the total project site area.

Project Information: Basic characteristics that describe the entire site

Multiple Tabs: Describes DMAs, IMPs, Calculation Warnings and preview of Summary Report

Calculation Check: Compares DMA & IMP area with Total Project Area

Starting a New Project: Entering Project Information

The **Project Information** section contains information that applies to the entire site. You must fill out this section before unlocking the remainder of the tool where you will enter specific information about the site drainage and IMP layout.

Hint: the **Project Name**, **Total Area** and **Mean Annual Precipitation** fields must be filled in before adding DMAs or IMPs.

Project Name: Name of development or portion of development evaluated with the IMP Sizing Tool. The Project Name will appear at the top of the Summary Report generated by the tool for submittal to plan reviewers.

Location: General location of the project site. This information also appears at the top of the Summary Report.

APN: Associated parcel number for the project. Useful for redevelopment projects. Should be provided if available.

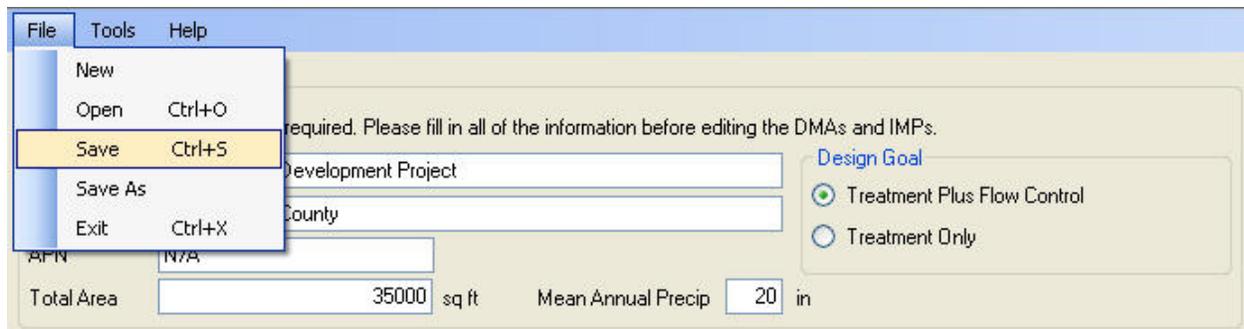
Total Area: The total area of the project site. As a calculation check/quality control feature, the IMP Sizing Tool tracks the areas of DMAs and IMPs to ensure they equal the total project site area.

Mean Annual Precipitation: IMP sizes vary to reflect local rainfall patterns. Enter the approximate mean annual precipitation for the project site. A countywide isohyetal map is available in Appendix H of the Guidebook or at <http://www.cccleanwater.org/construction/nd.php>. Most developable lands within the County have **mean annual precipitation totals between 8 and 25 inches**. If you enter a value beyond this range, the **IMP Sizing Tool** will issue a **Calculation Warning** and ask you to verify the entered MAP value is correct.

Design Goal: Select **Treatment Only** or **Treatment Plus Flow Control**, as required for the project site. You should know the stormwater design goal before starting the IMP Sizing Tool, but if the design goal were to change, you could switch from one setting to the other (e.g. from **Treatment Plus Flow Control** to **Treatment Only**) without losing any information entered. The tool dynamically updates any computed minimum IMP sizes.

Saving and Opening Projects

At any point during the process, you can save your project and reopen it later to continue working on a project. The files are small and portable for e-mailing or transferring between computers.



Adding DMAs and IMPs

Below the **Project Information** section is a set of four tabs. The left-most tabs are used to enter information about **DMAs** and **IMPs**. The right-most tabs summarize **Calculation Warnings** and generate a preview of the project's **Summary Report**.

The **IMP Sizing Tool** will allow you to enter **DMAs** and **IMPs** in any order. Most users will begin by entering the DMAs already identified in the site plan drawings and then fit IMPs into the available spaces. For more information about delineating DMAs and planning IMPs, see **Chapter 5 of the Stormwater C.3 Guidebook**.

Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(2) | Summary Report

DMA1

DMA Type: Please select (dropdown) IMP: Please select (dropdown) NOTE: The DMA can drain only to IMPs with the same soil type.

Drainage Area (sq. ft.): 0 Drains to DMA: Please select (dropdown)

NRCS Soil Group: Please select (dropdown)

Post-project Surface Type: Please select (dropdown)

Add New DMA Remove Current DMA Rename Current DMA

Adding a new DMA

To add a new DMA, select the  button and then choose the appropriate DMA type from the dropdown list shown in the illustration below. Each new DMA will appear as a sub-tab within the DMA tab (with additional DMAs appearing to the right of DMA1 shown below). You can enter all of the project site's DMAs together to streamline the process. The **IMP Sizing Tool** has no practical upper limit to the number of DMAs. Review the **Stormwater C.3 Guidebook** for a complete description of the DMA types.

Drainage Management Areas (DMAs) | Integrated Management Practices (IMPs) | Calculation Warnings(2) | Summary Report

DMA1

DMA Type: Please select (dropdown) IMP: Please select (dropdown) NOTE: The DMA can drain only to IMPs with the same soil type.

Drainage Area (sq. ft.): 0 Drains to DMA: Please select (dropdown)

NRCS Soil Group: Please select (dropdown)

Post-project Surface Type: Please select (dropdown)

Add New DMA Remove Current DMA Rename Current DMA

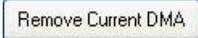
Drains to IMP: These DMAs will drain to an IMP. Please remember DMAs must include only one soil type and must drain to a single IMP (although multiple DMAs of the same soil group can drain to the same IMP).

Self-Treating: These are portions of the project site that do not produce increased runoff rates and volumes and do not drain to the stormwater drainage network. Self-Treating DMAs are often portions of the project site that are left undeveloped.

Self-Retaining: These DMAs are graded to retain up to 1 inch of rainfall on the surface and may also accept runoff from adjacent portions of the project site. The **Stormwater C.3 Guidebook** describes the site preparation requirements for **Self-Retaining Areas**, which are particularly important in areas with poorly draining clay soils.

Drains to Self-Retaining DMA: These DMAs drain via overland flow onto **Self-Retaining Areas**. As an example, roof leaders could discharge to a **Self-Retaining Area** that has been graded to hold the additional runoff. For sites subject to the **Treatment Only** requirements, up to 2 square feet of land may

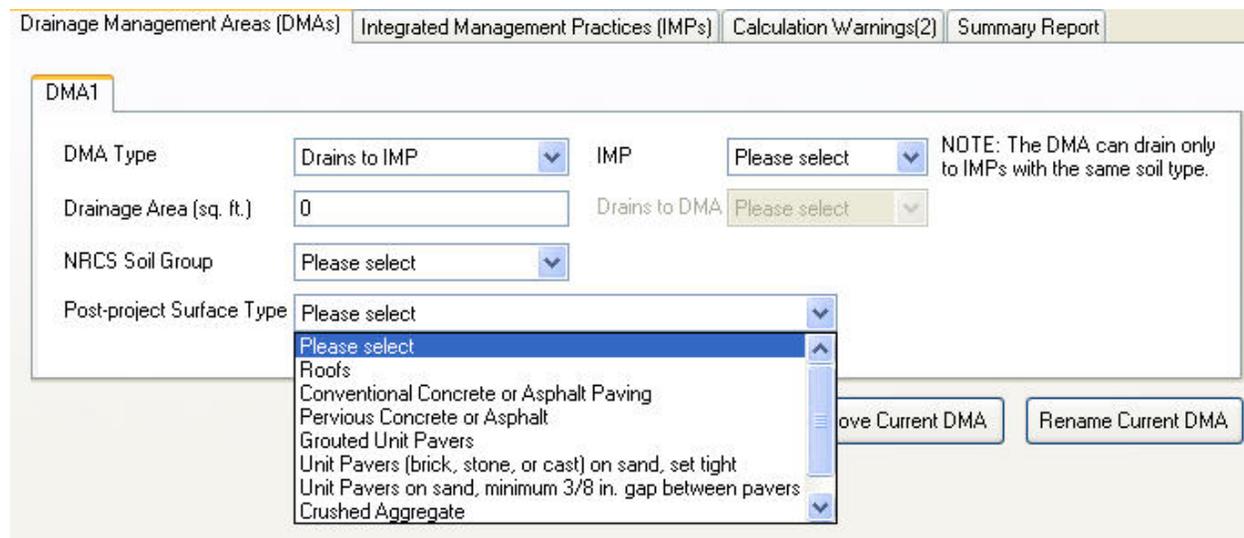
drain to each square foot of **Self-Retaining Area** (i.e. a 2 to 1 ratio). For sites subject to **Treatment Plus Flow Control**, the maximum ratio is 1 to 1.

The **IMP Sizing Tool** also allows you to **Remove a DMA** by clicking on the  button or to **Rename a DMA** to match your site development plan's naming convention by clicking the  button.

Describing a new DMA

The information required to describe each DMA depends on the type of DMA selected. **Self-Treating** and **Self-Retaining** DMAs are the simplest to describe, because they do not increase the amount of stormwater infrastructure. For these two DMA types, you only need to enter the drainage area. For the **Drains to Self-Retaining** DMA type, you must enter the drainage area and the name of the **Self-Retaining** DMA to which it drains.

The most common and most complex DMA to describe is the **Drains to IMP** type. The illustration below shows the required information.



The screenshot shows the 'Drainage Management Areas (DMAs)' tab of the software. The 'DMA1' form is active, displaying the following fields and options:

- DMA Type:** A dropdown menu set to 'Drains to IMP'.
- IMP:** A dropdown menu set to 'Please select'.
- NOTE:** The DMA can drain only to IMPs with the same soil type.
- Drainage Area (sq. ft.):** A text input field containing '0'.
- Drains to DMA:** A dropdown menu set to 'Please select'.
- NRCS Soil Group:** A dropdown menu set to 'Please select'.
- Post-project Surface Type:** A dropdown menu with a list of options: 'Please select', 'Roofs', 'Conventional Concrete or Asphalt Paving', 'Pervious Concrete or Asphalt', 'Grouted Unit Pavers', 'Unit Pavers (brick, stone, or cast) on sand, set tight', 'Unit Pavers on sand, minimum 3/8 in. gap between pavers', and 'Crushed Aggregate'.

At the bottom right of the form, there are two buttons: 'Remove Current DMA' and 'Rename Current DMA'.

Drainage Area: The total drainage area of the DMA. This area **should not include** the area of any IMPs that will be incorporated within the delineated boundaries of the DMA. If the **Drainage Area** is left to the default value of 0 square feet, the **IMP Sizing Tool** will add a **Calculation Warning** that will appear on the **Calculation Warnings** tab and within the **Summary Report**.

NRCS Soil Group: The four soil groups are known as A, B, C and D. Group A soils are the most permeable and Group D soils are the least permeable. Visit <http://soils.usda.gov> for more information about the soil groupings.

Post-project Surface Type: The **Contra Costa Clean Water Program** encourages developers to limit site runoff by using alternatives to conventional pavement wherever practical. The **IMP Sizing Tool** contains land surface adjustment factors that will reduce the minimum size for an IMP, if the tributary area consists of surfaces that produce less runoff. **Appendix I of the Stormwater C.3 Guidebook** describes the land surface adjustment factors.

IMP: Select the name of the **associated IMP**. If you have not defined any IMPs yet, the dropdown list will be blank. After adding IMPs, return to the DMA section to link the DMA to an IMP.

Adding a new IMP

Similar to the DMA tab, the IMP tab contains separate buttons for adding, deleting and renaming IMPs. The IMP Sizing Tool will estimate the minimum size for any of the seven IMPs described in the **Stormwater C.3 Guidebook** to meet either **Treatment Plus Flow Control** or **Treatment Only** requirements.

The first step when adding a new IMP to a project is to specify the soil type draining to the IMP. Remember, multiple DMAs can drain to a single IMP so long as DMAs all share the same soil type.

The screenshot shows the 'Integrated Management Practices (IMPs)' tab selected in a software interface. At the top, there are four tabs: 'Drainage Management Areas (DMAs)', 'Integrated Management Practices (IMPs)', 'Calculation Warnings(3)', and 'Summary Report'. Below the tabs, there is a section for 'IMP1' with a 'Soil Group' label. A dropdown menu is open, showing 'Please select' at the top and a list of options: 'A', 'B', 'C', and 'D'. At the bottom of the interface, there are three buttons: 'Add New IMP', 'Remove Current IMP', and 'Rename Current IMP'.

After specifying the Soil Group of the DMAs draining to the IMP, select the type of IMP to use. **The IMP Sizing Tool only offers IMPs that are allowable for the specified soil type** (see illustrations below). For example, Dry Wells are only available when Group A or Group B soils are selected. Flow-Through Planters are only available when Group C or Group D soils are selected.

IMP1

Soil Group

Type

- In-Ground Planter
- Bioretention Basin
- Vegetated Grassy Swale
- Flow Through Planter

Minimum Area (sq ft)

Planned Area (sq ft)

Max Underdrain Flow (cfs)

IMP currently attached to the following DMAs:

IMP1

Soil Group

Type

- In-Ground Planter
- Bioretention Basin
- Vegetated Grassy Swale
- Dry Well
- Infiltration Trench
- Infiltration Basin

Minimum Area (sq ft)

Planned Area (sq ft)

IMP currently attached to the following DMAs:

Applicability of IMP Types in Various Soil Types

IMP Type	Soil Groups
In-Ground Planter	All Soils
Flow-Through Planter	Group C, D only
Vegetated Grassy (Dry) Swale	All Soils
Bioretention Area	All Soils
Dry Well	Group A, B only
Infiltration Trench	Group A, B only
Infiltration Basin	Group A, B only

Describing a new IMP

The IMP sizing tool will compute the minimum allowable size for any IMPs on the project site, based on type of IMP selected and information provided about the project site, such as the properties of the tributary DMAs (drainage area, soil type, land cover) and local mean annual precipitation. It will also require you to enter an initial planned area for any IMPs on the project site. The planned IMP area may be measured from any preliminary site development plan drawings.

IMP1

Soil Group

Type

Minimum Area (sq ft)

Planned Area (sq ft)

Max Underdrain Flow (cfs)

IMP currently attached to the following DMAs:

DMA1

Soil Group: Select the appropriate NRCS soil group for the IMP. This should match the soil group for the DMAs you plan to drain to this IMP.

Type: Select the IMP type that is planned for this portion of the project site.

Minimum Area: The information in this box is computed by the IMP Sizing Tool based on the IMP selected and the project site's properties. For more information about this calculation, review **Appendix I of the Stormwater C.3 Guidebook**.

Planned Area: Enter the planned area included in your project's site development plan. Both the planned area and the minimum area will be included in the Summary Report to streamline the project review process. If the **Planned Area** is less than the **Minimum Area**, a **Calculation Warning** will be issued.

Max Underdrain Flow: For installations in Group C and Group D soils, the IMPs should include an underdrain to slowly discharge captured stormwater. An underdrain is necessary because Group C and D soils have limited capacity to infiltrate stormwater. Design the flow control orifice to match the Max Underdrain Flow when stormwater ponds to the top of the gravel layer. For more information, review **Appendix I of the Stormwater C.3 Guidebook** and IMP design fact sheets on the Program's web site, <http://www.cccleanwater.org/construction/nd.php>.

IMP currently attached to the following DMAs: This box reports the connection between IMPs and DMAs.

Hint: After defining the project's IMPs, return to the DMA tab and associate the IMPs with the appropriate DMAs, using the **IMP drop down list**.

Entering IMP-Specific Information

Some of the IMP designs include length and width dimensions, while others include only the total IMP area. The illustrations below demonstrate the additional information required for some of the IMPs. Refer to the **Stormwater C.3 Guidebook** for more specific information about the design of IMPs.

Vegetated or Grassy (Dry) Swale

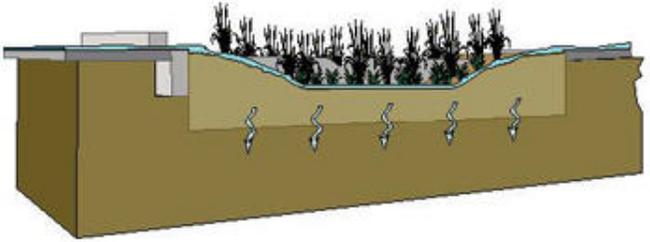
The IMP Sizing Tool will compute a required length to correspond with your entered values for bottom width and depth. If your design allows some flexibility for accommodating different depths or swale widths, deeper and wider swales will have smaller required lengths.

Bottom Width: Select values of 2, 4 or 6 feet

Depth: Select values of 0.5, 1.0 or 1.5 feet.

For designs with widths and depths between these values, select the closest values larger (e.g. wider, deeper) and smaller (e.g. narrower, shallower) than your intended design, and then interpolate between the upper and lower **Minimum Lengths** to estimate the appropriate minimum swale length for your project.

IMP1	
Soil Group	D
Type	Vegetated Grassy Swale
Bottom Width (ft)	4.0
Depth (ft)	1.0
Minimum Length (ft)	64
Planned Length (ft)	100
Max Underdrain Flow (cfs)	0.045764
IMP currently attached to the following DMAs:	
DMA1	



NOTE: The top width of the swale is 12 ft based on a 4:1 slope. The top width is used in calculating the surface area of the IMP.

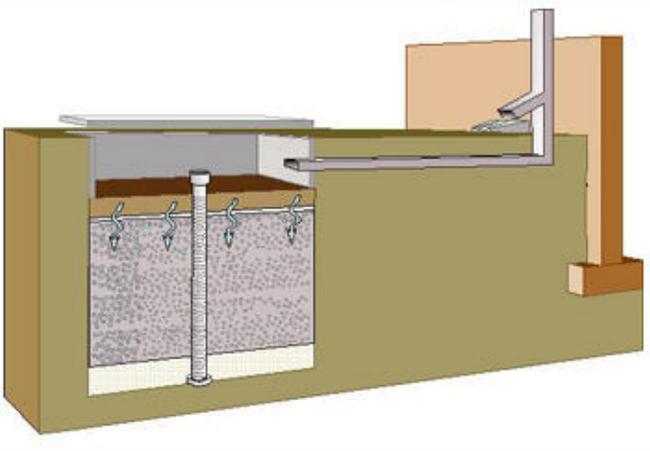
Dry Well and Infiltration Basin

The IMP Sizing Tool allows you to specify a design depth for these IMPs. For the Dry Well, this refers to the depth of the gravelly storage materials within the Dry Well. For the Infiltration Basin, this refers to the above-ground ponding depth within the Infiltration Basin.

Depth (Dry Well): Select values of 3, 4, 5 or 6 feet.

Depth (Infiltration Basin): Select values of 0.5, 1.0, 1.5, 2.0, 2.5 or 3.0 feet.

Dry Well IMP	
Soil Group	A
Type	Dry Well
Depth (ft)	5.0
Minimum Area (sq ft)	0
Planned Area (sq ft)	100
IMP currently attached to the following DMAs:	



Infiltration Trench

The IMP Sizing Tool allows you to specify both the depth of the gravelly storage layer and the height of the berm used to capture and route stormwater into the Infiltration Trench.

Depth: Select values of 3, 4 or 5 feet.

Berm Height: Select values of 0.5 or 1.0 feet.

Infiltration Trench IMP

Soil Group:

Type:

Depth (ft):

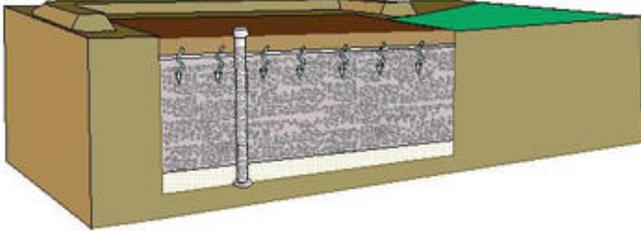
Berm Height (ft):

Minimum Area (sq ft):

Planned Area (sq ft):

IMP currently attached to the following DMAs:

DMA1



Reviewing Calculation Warnings

The **Calculation Warnings** tab collects and reports important calculation warnings and errors for a project. The information included in this section could include missing or zero data, IMPs that are undersized, mismatches between total project area and DMA+IMP area, and other relevant messages. The **Calculation Warnings** tab is updated dynamically every time you change any project information and is a useful way to check the validity and completeness of your work.

The information is also included with the **Summary Report** when a report is exported.

Warning Type	Source	Description	Suggestion
Project	Project	The Mean Annual Precip of 6 in. is outside of the expected range.	Check to make sure that the proper Mean Annual Precip has been entered.
DMA	DMAs/IMPs	The total area of the project is not equal to the total area of the DMAs and the IMPs.	Modify the correct area so that they are equal.
DMA	DMA6	The IMP that this DMA drains to has not been selected.	Set the IMP that this DMA drains to.

Preparing a Summary Report

The **Summary Report** tab captures all relevant information about your project in one location. After you are finished describing your project, entering DMAs, sizing IMPs, checking Calculation Warnings, exporting the Summary Report as part of your submittal for municipal review.

The screenshot shows the 'Integrated Management Practice Calculator' software window. The 'Tools' menu is open, highlighting 'Export to Summary Report HTML File'. The main interface is divided into several sections:

- Project Information:** Includes fields for Project Name (Example Site Development Project), Location (Contra Costa County), APN (N/A), Total Area (35000 sq ft), and Mean Annual Precip (20 in).
- Design Goal:** Radio buttons for 'Treatment Plus Flow Control' (selected) and 'Treatment Only'.
- Summary Report Tab:** A scrollable area containing a summary of project data:
 - Project Name:** Example Site Development Project
 - Project Type:** Flow Control and Water Quality
 - Location:** Contra Costa County
 - APN:** N/A
 - Drainage Area:** 35000 (sf)
 - Mean Annual Precipitation:** 20 (in)
- Drainage Management Areas Draining to IMPs:** A table with columns for IMP and Tributary DM. The IMP section has columns for Name, Type, Soil Group, Rain Adj. Factor, Sizing Factor, Dim. 1 (ft), Dim. 2 (ft), Min. Size, Planned Size, and Max Underdrain Flow (cfs). The Tributary DM section has columns for Name, Surface Type, Area, and Runoff Factor. A row for 'Vegetated' is partially visible.
- Total Area (Calculated):** A summary table at the bottom:

Drainage Management Areas	30000	sq. ft.
Integrated Management Practices	5100	sq. ft.
Total	35100	sq. ft. (Total area of DMAs and IMPs is within 0% of the total project area)