

# FT-1

## Vegetated Swale

### BMP MAINTENANCE FACT SHEET FOR FLOW-THRU STRUCTURAL BMP FT-1 VEGETATED SWALE

**Vegetated swales** are shallow, open channels that are designed to remove storm water pollutants by physically straining/filtering runoff through vegetation in the channel. An effectively designed vegetated swale achieves uniform sheet flow through densely vegetated areas. Vegetated swales may include a gravel drainage layer underneath the swale to enhance infiltration. They may include weirs or check dams to slow flow and/or maintain uniform flow in the swale. Typical vegetated swale components include:

- Inflow distribution mechanisms (e.g., flow spreader)
- Surface flow
- Vegetated surface layer
- Check dams (if required)
- Optional aggregate storage layer with underdrain(s)

#### Normal Expected Maintenance

Vegetated swales require routine maintenance to: remove accumulated materials such as sediment, trash, and debris; maintain vegetation health; and maintain integrity of side slopes, channel bottom, inlets, energy dissipaters, weirs or check dams, and outlets to ensure runoff will be conveyed as uniform flow throughout the swale (i.e., flow will spread uniformly across the width of the swale as it is conveyed from upstream to downstream). A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

#### Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from deposited materials or overgrowth of vegetation within the swale blocking drainage conveyance or blocking an outlet structure, or localized erosion issues that cause channelization and prevent uniform flow throughout the swale. The specific cause of the drainage issue must be determined and corrected. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
- Sediment, trash, or debris accumulation blocking drainage becomes a chronic issue observed at every inspection. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

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**SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR FT-1 VEGETATED SWALE**

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to vegetation.	<ul style="list-style-type: none"> <li>• Inspect monthly. If accumulated materials are observed blocking drainage, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event.</li> <li>• Remove any accumulated materials found at each inspection.</li> </ul>
Obstructed inlet or outlet structure	Clear blockage.	<ul style="list-style-type: none"> <li>• Inspect monthly and after every 0.5-inch or larger storm event.</li> <li>• Remove any accumulated materials found at each inspection.</li> </ul>
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.	<ul style="list-style-type: none"> <li>• Inspect annually.</li> <li>• Maintenance when needed.</li> </ul>
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	<ul style="list-style-type: none"> <li>• Inspect monthly.</li> <li>• Maintenance when needed.</li> </ul>
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	<ul style="list-style-type: none"> <li>• Inspect monthly.</li> <li>• Maintenance when needed.</li> </ul>
Overgrown vegetation	Mow or trim as appropriate.	<ul style="list-style-type: none"> <li>• Inspect monthly.</li> <li>• Maintenance when needed.</li> </ul>

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SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR FT-1 VEGETATED SWALE (Continued from previous page)		
Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	<ul style="list-style-type: none"> <li>• Inspect monthly.</li> <li>• Maintenance when needed.</li> </ul>
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	<ul style="list-style-type: none"> <li>• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>• Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.</li> </ul>
Standing water in BMP following a storm event	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	<ul style="list-style-type: none"> <li>• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>• Maintenance when needed.</li> </ul>
Presence of mosquitos/larvae  For images of egg rafts, larva, pupa, and adult mosquitos, see <a href="http://www.mosquito.org/biology">http://www.mosquito.org/biology</a>	<p>If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water.</p> <p>If mosquitos persist following corrective measures to remove standing water, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.</p>	<ul style="list-style-type: none"> <li>• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>• Maintenance when needed.</li> </ul>

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### References

American Mosquito Control Association.

<http://www.mosquito.org/>

California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.

<https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook>

County of San Diego. 2014. Low Impact Development Handbook.

<http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html>

San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet FT-1.

[http://www.projectcleanwater.org/index.php?option=com\\_content&view=article&id=250&Itemid=220](http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220)

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Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:		Responsible Party Name and Phone Number:
Property Address of BMP:		Responsible Party Address:

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 1 of 4			
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Accumulation of sediment, litter, or debris Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Remove and properly dispose of accumulated materials, without damage to the vegetation <input type="checkbox"/> If accumulation of sediment, litter, or debris is observed blocking drainage, increase the frequency of inspection and maintenance* <input type="checkbox"/> Other / Comments:		
Poor vegetation establishment Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Re-seed, re-plant, or re-establish vegetation per original plans <input type="checkbox"/> Other / Comments:		

\*Increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. If sediment, trash, or debris accumulation blocking drainage becomes a chronic issue, add pretreatment measures within the watershed to intercept the materials.

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Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 2 of 4			
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Dead or diseased vegetation Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans  <input type="checkbox"/> Other / Comments:		
Overgrown vegetation Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Mow or trim as appropriate  <input type="checkbox"/> Other / Comments:		
Obstructed inlet or outlet structure Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Clear blockage  <input type="checkbox"/> Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Repair or replace as applicable  <input type="checkbox"/> Other / Comments:		

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Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 3 of 4			
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Erosion due to concentrated irrigation flow  Maintenance Needed?  <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Repair/re-seed/re-plant eroded areas and adjust the irrigation system  <input type="checkbox"/> Other / Comments:		
Erosion due to concentrated storm water runoff flow  Maintenance Needed?  <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan  <input type="checkbox"/> If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction  <input type="checkbox"/> Other / Comments:		

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Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 4 of 4			
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Standing water in BMP following a storm event* Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage.  <input type="checkbox"/> Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see <a href="http://www.mosquito.org/biology">http://www.mosquito.org/biology</a> Maintenance Needed? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.**  <input type="checkbox"/> Other / Comments:		

\*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from deposited materials or overgrowth of vegetation within the swale blocking drainage conveyance or blocking an outlet structure, or localized erosion issues that cause channelization and prevent uniform flow throughout the swale. The specific cause of the drainage issue must be determined and corrected. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

\*\*If mosquitos persist following corrective measures to remove standing water, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.