

Design Standards and Permitting Requirements

Media Filter Drain (MFD)

DESCRIPTION

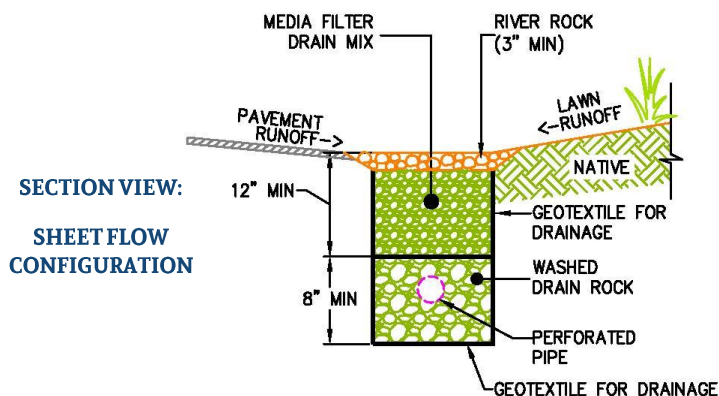
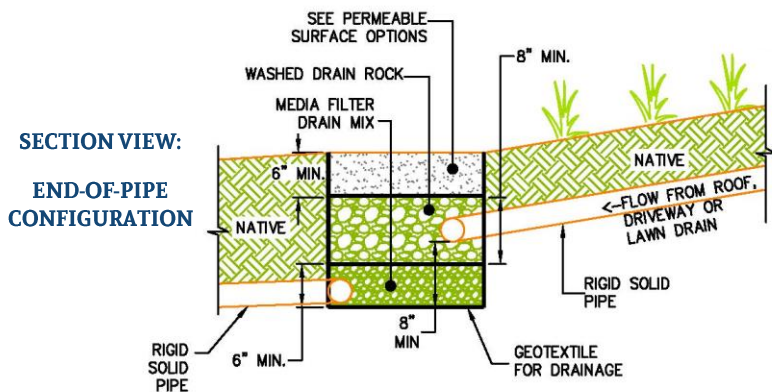
An underground drainage facility, consisting of specially-mixed media (MFD mix), intended to treat runoff from hard surfaces and lawn and landscaped areas. Configurations are slightly different depending on how runoff enters the facility (via pipe or sheet flow). This facility does have an underdrain and requires either a controlled bypass structure or an overflow to function properly.

METHOD OF PHOSPHORUS REDUCTION

Treatment via media (MFD mix). Runoff entering the facility passes through the media, where perlite, dolomite, and gypsum provide physical, chemical, and biological treatment for total and dissolved phosphorus.



Above: useful yard space on top of a MFD



ADDITIONAL DESIGN FEATURES

Enhance the look of your MFD with one or more of the following site-specific options:

"Patio MFD" where spaced pavers* with gaps create a useable outdoor living space.

"Sidewalk MFD" where pea gravel or spaced pavers* create durable pathways.

* See Design Standards for HIP Permeable Pavement Surfacing. Restrictions and limitations apply to certain properties

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.



MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All Media Filter Drain projects must meet these minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

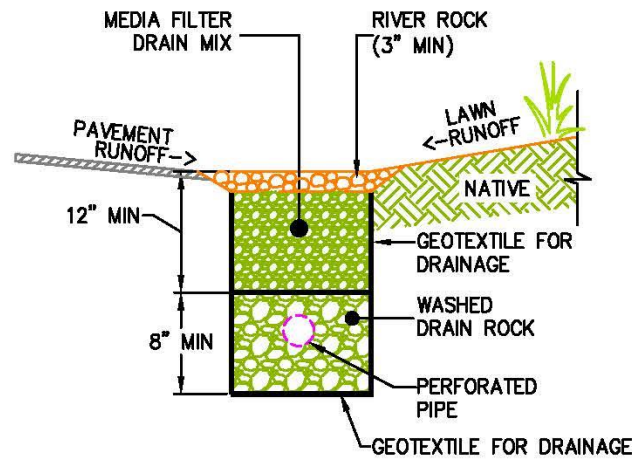
- For MFD trenches accepting sheet flow, trench must be at least 24" wide in all locations
- MFD mix at least 12" deep throughout (sheet flow design)
- For MFD trenches accepting piped flow, the trench must be at least 36" wide in all locations
- MFD mix at least 6" deep throughout (end-of-pipe design)
- Total slope of trench less than 2%
- No single trench longer than 50', use multiple trenches
- Bottom of MFD mix cannot contact groundwater

LOCATION

- **Critical Areas:** setback requirements near critical areas (wetlands, shorelines, or creeks) and their buffers will vary depending on site specifics. Consult with the HIP Coordinator for requirements pertaining to each unique site.
- **Slopes:** unless approved by a licensed geotechnical engineer, MFDs cannot be placed on slopes >10% and must be at least 10' upgradient from slopes >15% and 50' upgradient from slopes steeper than 35%
- **Separation:** at a minimum, all MFDs must be at least: 25' from shorelines or creeks (distance may be reduced if soil investigation demonstrates feasibility; check with HIP Coordinator), 5' from known public and private utilities, 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space. Septic tanks must be protected by placing the trench at least 5' from tanks and 10' upgradient and 30' downgradient from drain fields and drain field reserve areas
- **Property Lines:** MFDs cannot be located in public rights-of-way and should be placed at least 10' from neighboring property lines except in some specific cases. Consult with the HIP Coordinator to determine site-specific setback requirements.

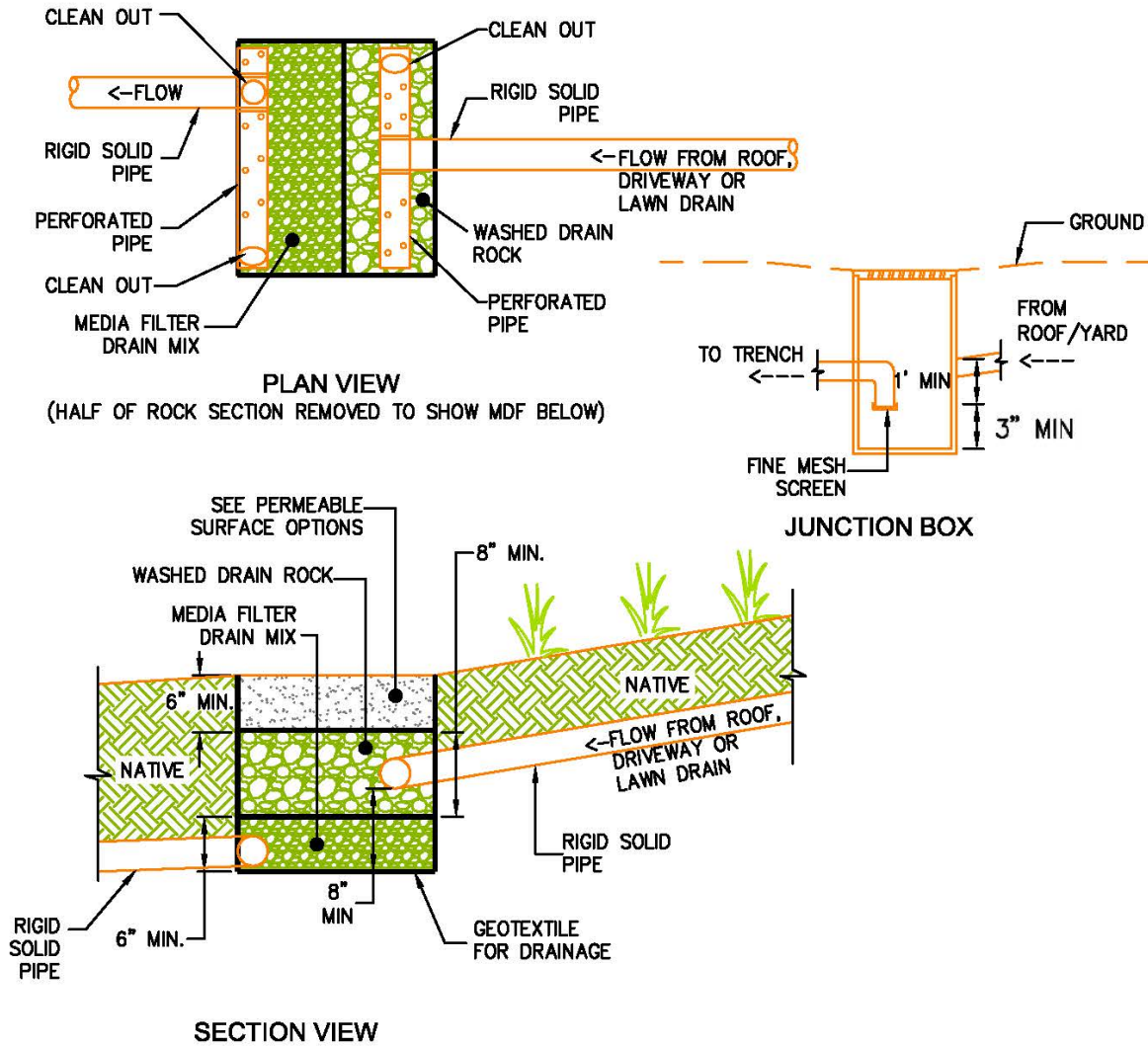
CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Lay fabric in trench and pin to edge
4. Install bottom layer* of material to bed underdrain pipe
5. Install underdrain pipe and stub out
6. Fold fabric over bottom layer
7. Place fabric over remaining trench
8. Install second layer* of material in 6" lifts over fabric
9. Install dispersion inlet (runnel with grade board or perforated pipe)
10. Fold fabric over second layer, cut to fit.
11. Connect underdrain pipe to downstream drainage system
12. Install conveyance to dispersion inlet
13. Connect roof/driveway/yard drains to conveyance
14. Install surfacing (optional)
15. Stabilize disturbed soils
16. Remove erosion controls



SECTION VIEW

MEDIA FILTER DRAIN ; SHEET FLOW CONFIGURATION
 HIP BMP "C.1", TYPICAL NTS



MEDIA FILTER DRAIN END-OF-PIPE CONFIGURATION
HIP BMP "C.2", TYPICAL NTS

Design Standards and Permitting Requirements

Media Filter Drain (MFD) - Clean Beach

DESCRIPTION

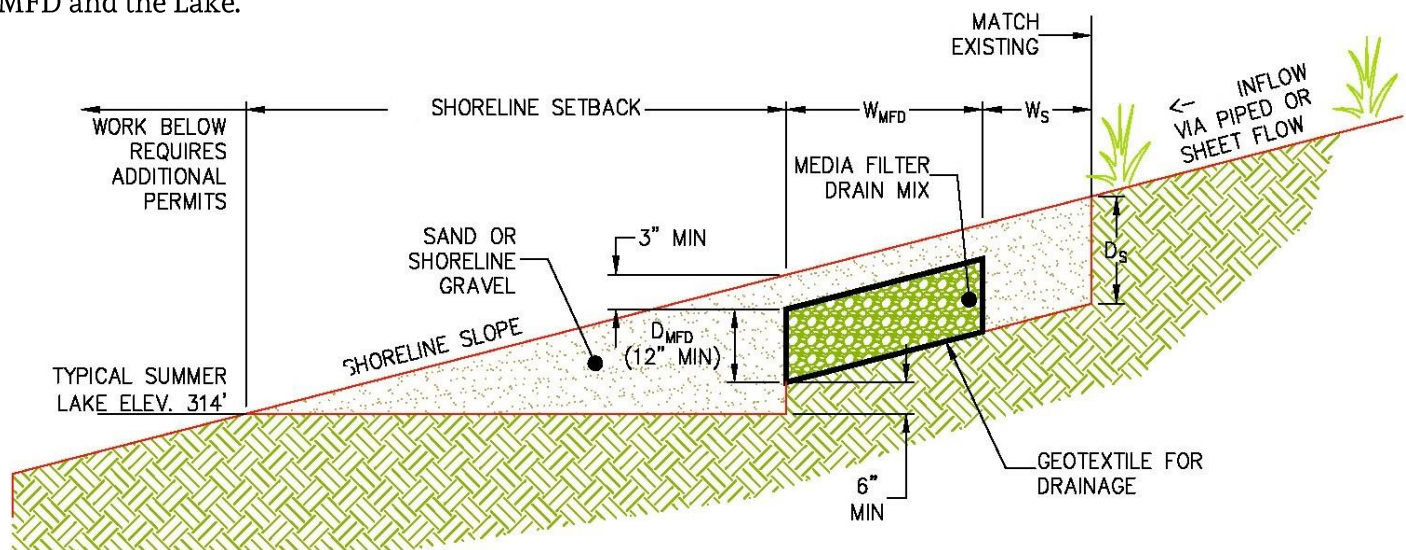
An underground drainage facility, consisting of specially-mixed media (MFD mix), intended to treat runoff from hard surfaces and lawn and landscaped areas. Along the shoreline, MFDs can be coupled with a beach made of treatment sand and native landscaping to enhance the performance of the system. This facility does not require an underdrain or structural overflow because excess water will flow into the sand filter beach. Runoff enters the facility via pipe or sheet flow per to "HIP BMP C.1 and C.2". Projects within Whatcom County must be designed per 30% Clean Beach requirements (see below). Projects within the City of Bellingham can utilize up to 100% clean beach along the shoreline.



Above: Bloedel Donovan Beach MFD

METHOD OF PHOSPHORUS REDUCTION

Treatment via media (MFD mix). Runoff entering the facility passes through the media and sand layers, where perlite, dolomite, and gypsum provide physical, chemical, and biological treatment for total and dissolved phosphorus. Excess runoff is treated by sand between the MFD and the Lake.



Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All Clean Beach projects must meet the following minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

- For MFD trenches accepting sheet flow, the trench must be at least 24" wide in all locations
- For MFD trenches accepting piped flow, the trench must be at least 36" wide in all locations
- MFD mix at least 12" deep throughout
- Total slope of trench less than 2%
- No single trench longer than 50', use multiple trenches
- Bottom of MFD mix cannot contact groundwater
- Any non-lawn vegetation along the shoreline must be retained or replaced 3:1 elsewhere on site (see additional requirements if designing a 30% clean beach)
- Permeable surfacing is not permissible in a clean beach design

LOCATION

Conformance with MFD Standards: Clean beach MFD trenches must adhere to the minimum requirements for Critical Areas, Slopes, Separation, and Property Lines described in the HIP Standards for Media Filter Drains. Unless recommended by the HIP Coordinator, Clean Beach MFD trenches must be located at least 25' from the Lake Whatcom ordinary high water mark (OHWM). Placing MFD trenches closer to the shoreline (15' minimum setback) may be possible on some sites if soil investigations demonstrate feasibility.

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Place non-woven geotextile (for drainage) onto subgrade
4. Install MFD mix in 6" lifts
5. Pull geotextile edges up and around MFD material, creating a MFD "burrito"
6. Backfill clean sand around and over MFD burrito and match to grade
7. Place drain rock layer and distribution piping*
8. Install conveyance to dispersion inlet*
9. Connect roof/driveway/yard drains to conveyance*
10. Stabilize disturbed soils
11. Remove erosion controls

*Additional steps for end-of-pipe configuration



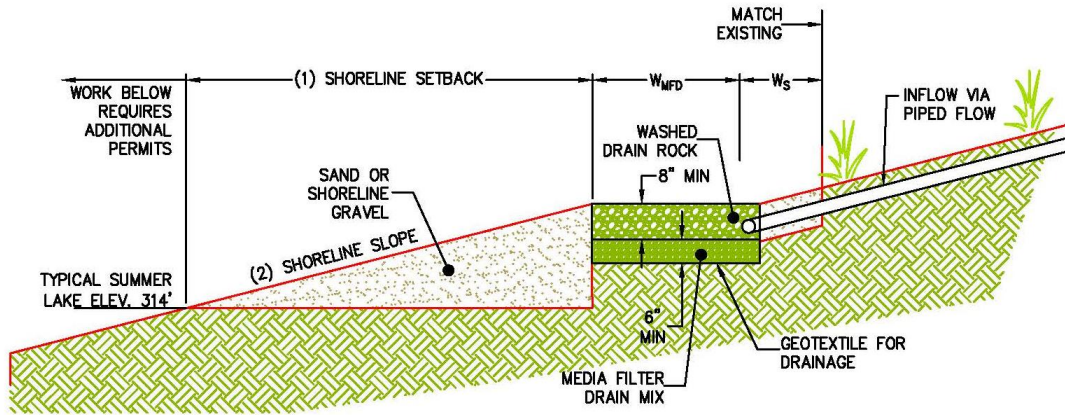
30% CLEAN BEACH OPTION WITH NATIVE LANDSCAPING BUFFER

Shoreline native vegetation provides benefits by reducing phosphorus and nutrients from entering the lake while providing habitat for fish and birds. Shoreline vegetation also provides visual interest and lower maintenance cost compared to lawns.

With the 30% clean beach option, 30% of the property's shoreline is converted to beach and 70% of the shoreline has native landscaping. Projects located within Whatcom County outside of city limits need to adhere to the 30% clean beach requirements listed below. HIP participants within the City of Bellingham may choose to incorporate any amount of native shoreline vegetation as part of their clean beach project design.

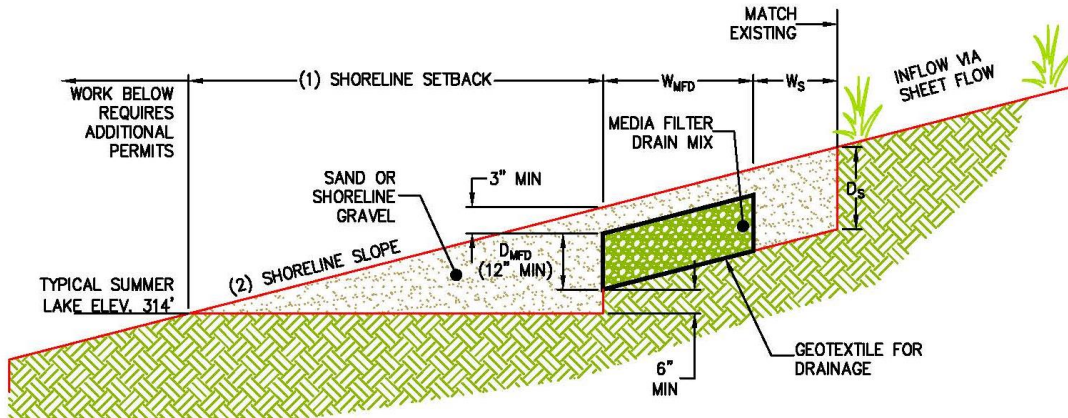
30% Clean Beach Requirements:

- Refer to the 30% clean beach plan view for conceptual configurations and notes
- See sectional view C.3 detail and notes
- Follow the HIP Native Landscaping BMP design standards included in this manual
- The minimum square footage of native shoreline planting installed must be equal to the total parcel shoreline length x 15'. Planting areas should be contiguous with the shoreline. Planting area shape can vary with a minimum buffer depth of 5' from the shoreline
- Maximum beach width at the shoreline is 30% of total shoreline length; above the shoreline beach width may vary up to the maximum width necessary to capture flow from the MFD



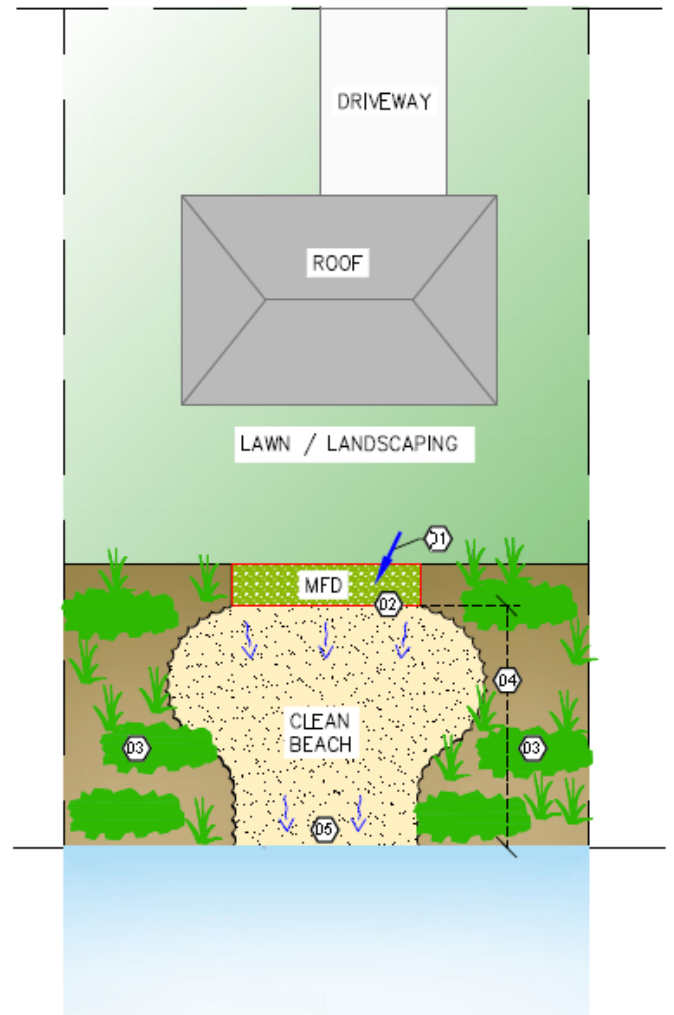
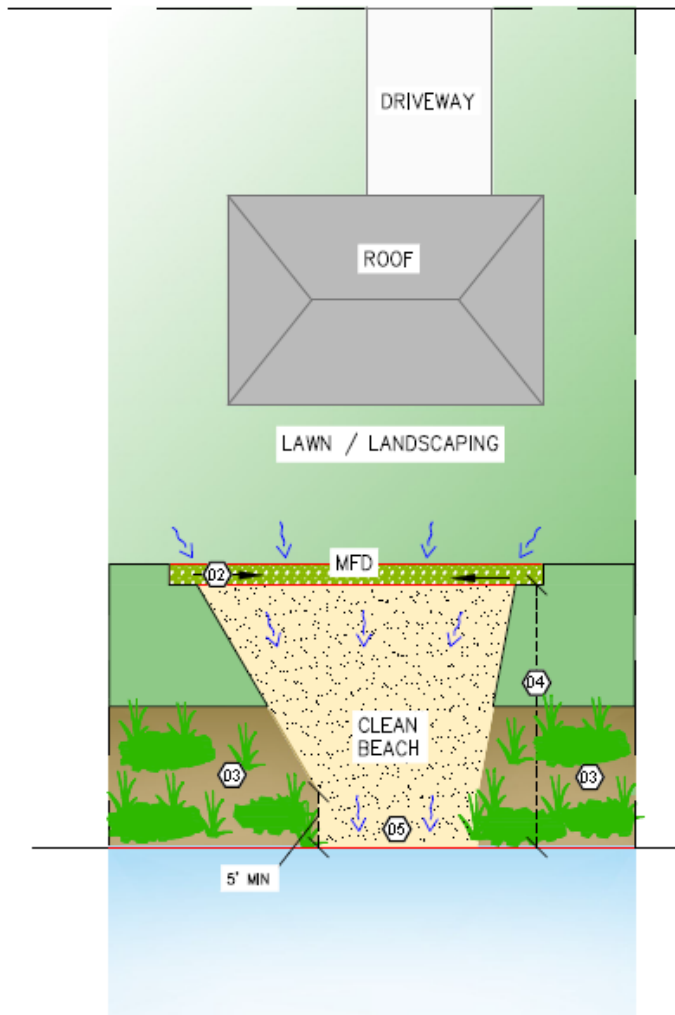
MEDIA FILTER DRAIN - CLEAN BEACH CONFIGURATION **SECTION VIEW**
HIP BMP "C.3" TYPICAL END OF PIPE **NTS**

- (1) 25' RECOMMENDED SHORELINE SETBACK. MAYBE REDUCED TO 15' IF SOIL INVESTIGATION DEMONSTRATES BOTTOM OF MFD IS ABOVE HIGH GROUNDWATER ELEVATION.
- (2) MATCH EXISTING SLOPE TO GREATEST EXTENT FEASIBLE RECOMMENDED MAXIMUM SLOPE IS 7:1 (4:1 SLOPE MAY BE STABLE ON CERTAIN SITES).



MEDIA FILTER DRAIN - CLEAN BEACH CONFIGURATION **SECTION VIEW**
HIP BMP "C.3" TYPICAL **NTS**

- (1) 25' RECOMMENDED SHORELINE SETBACK. MAYBE REDUCED TO 15' IF SOIL INVESTIGATION DEMONSTRATES BOTTOM OF MFD IS ABOVE HIGH GROUNDWATER ELEVATION
- (2) MATCH EXISTING SLOPE TO GREATEST EXTENT FEASIBLE. RECOMMENDED MAXIMUM SLOPE IS 7:1. 4:1 SLOPE MAYBE BE STABLE ON CERTAIN SITES



**MEDIA FILTER DRAIN
30% CLEAN BEACH**

**PLAN VIEW
NTS**

NOTES

- ① INFLOW VIA SHEET OR PIPED FLOW.
 - ② DIRECT OUTFLOW FROM MFD TOWARDS CLEAN BEACH TO GREATEST EXTENT POSSIBLE. SURFACE GRADING AND SLOPING MDF TRENCH (2% MAX) ALLOWED.
 - ③ SHORELINE NATIVE LANDSCAPING. PROVIDE MINIMUM PLANTED AREA EQUAL TO TOTAL PARCEL SHORELINE LENGTH X 15'. MINIMUM 5' PLANTING BUFFER WIDTH AT SHORELINE.
 - ④ 25' STANDARD MFD SETBACK. REDUCED TO 15' WITH SUBSURFACE SOIL INVESTIGATION AND ADEQUATE GROUNDWATER CLEARANCE.
 - ⑤ PROVIDE MAXIMUM 30% CLEAN BEACH AT SHORELINE FOR WHATCOM COUNTY PROJECTS.
- * PLAN VIEW SHOWN IS FOR CONCEPTUAL PURPOSES ONLY. MFD CONFIGURATIONS SHALL MEET ALL MINIMUM REQUIREMENTS IN HIP DESIGNER MANUAL AND MUST BE APPROVED BY PLANNING DEPARTMENT.



Design Submittal

Media Filter Drain System

Section I: System and Sizing Summary

<input type="checkbox"/>	I have provided a site plan and facility cross-section.
<input type="checkbox"/>	I have defined the area that will drain into the MFD by piping.
That area is _____ ft ² of impervious surface and/or _____ ft ² of lawn/landscape	
<input type="checkbox"/>	I have defined the area that will drain into the MFD by sheet flow.
That area is _____ ft ² of impervious surface and/or _____ ft ² of lawn/landscape	
<input type="checkbox"/>	I have sized the MFD using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
My trench will need to be at least _____ feet wide and _____ ft ² in filter area	

Section II: Site-Specific Planning

<input type="checkbox"/>	I have determined that the MFD is at least 5' from known public and private utilities.
<input type="checkbox"/>	I have determined that the MFD is at least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space.
<input type="checkbox"/>	I have determined that the MFD is not on or next to a slope steeper than 15% and not within 50' upgradient of a slope steeper than 35%.
<input type="checkbox"/>	I have developed an erosion control plan for the excavation of the trench and completed a site-specific SWPPP that is included with this application.



Sizing Calculator

Media Filter Drain System

Instructions: Measure hard surface area and lawn/landscaping surface area draining to trench. Characterize flow as sheet flow or piped flow. Insert values in the table below and use the following formula to calculate the size of MFD trench that is needed to adequately manage the runoff directed to the system. Sheet flow trenches must be at least 2' wide while piped flow trenches must be at least 3' wide in order for this calculation to be applicable. Runoff from a pipe that crosses at least 25' of lawn or landscape before reaching the trench can be considered sheet flow.

Drainage Type	Hard Surface (square feet)	Hard Surface Multiplier	Lawn/Landscape (square feet)	Lawn/LS Multiplier	Minimum Trench Area (square feet)
Sheet Flow	[<input type="text"/> <input type="text"/>	<input type="text"/> 0.03	[<input type="text"/> <input type="text"/>	<input type="text"/> 0.01	<input type="text"/>
Piped Flow	[<input type="text"/> <input type="text"/>	<input type="text"/> 0.04	[<input type="text"/> <input type="text"/>	<input type="text"/> 0.01	<input type="text"/>
Total area of trench needed (add trench areas above):					<input type="text"/>