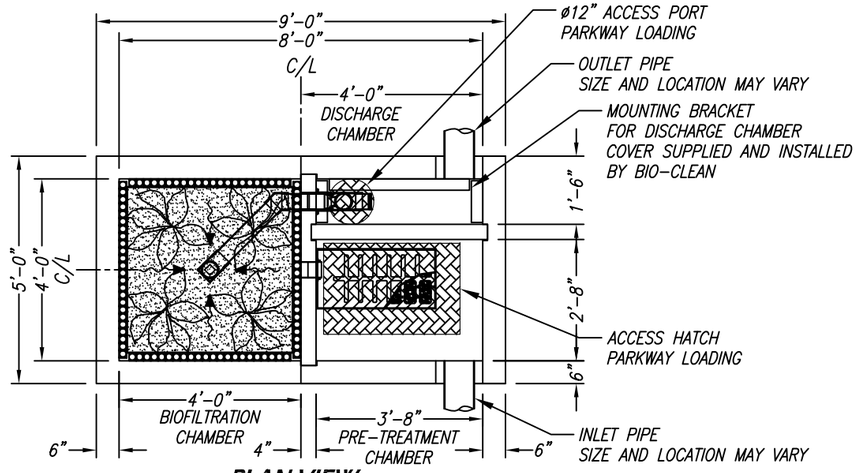
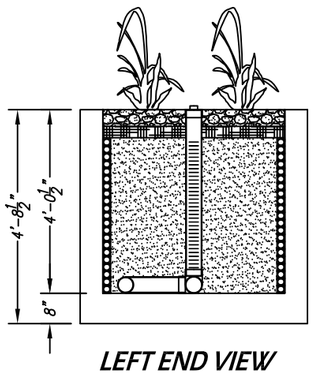
MODULAR WETLAND SYSTEMS - LINEAR 2.0
4-8 VAULT TYPE

FLOW RATES
PEAK TREATMENT FLOW RATE = .116 CFS OR 52.0 GPM
PEAK BYPASS FLOW RATE = OPTIONAL
SPECIFICATIONS
INSTALL AT SURFACE
O.D. DIMENSIONS = 9' X 5' X 4.7'
TOP OF VAULT TO INVERT OUT = 4.13'
SEDIMENT STORAGE CAPACITY = 1000 LBS OR 23.5 CF

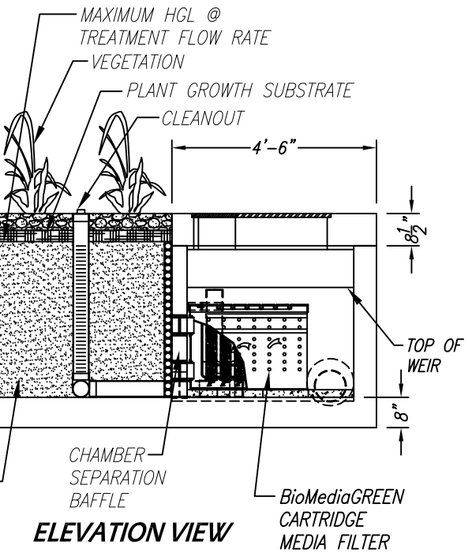
***NOTE:**
MWS UNIT CAN BE CONSTRUCTED WITH INLET ON EITHER SIDE. FOR INLET ON OPPOSITE SIDE ENTIRE UNIT WILL BE MIRRORED.



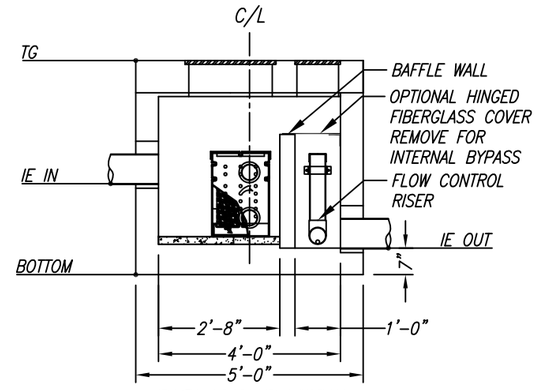
PLAN VIEW



LEFT END VIEW
BIOFILTRATION CHAMBER



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE CHAMBER

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.6 SF
SIDE SURFACE AREA = 25.2 SF
ENDS = 2
3.7' L x 3.4' H = 12.6 SF
END SURFACE AREA = 25.2 SF
TOTAL WETLAND MEDIA SURFACE AREA **= 50.4 SF**
WETLAND MEDIA LOADING RATE 52.0 GPM / 50.4 SF **= 1.03 GPM/SF**
PRETREATMENT FILTER SURFACE AREA CALCS
SIDES = 2
0.50' L x 1.67' H = 0.84 SF
SIDE SURFACE AREA = 1.68 SF
ENDS = 2
0.25' L x 1.67' H = 0.42 SF
END SURFACE AREA = 0.84 SF
TOTAL PRETREATMENT SURFACE AREA 2.52 SF x 14 FILTERS **= 35.28 SF**
PRETREATMENT FILTER LOADING RATE 52.0 GPM / 35.28 SF **= 1.47 GPM/SF**

LEGEND

- 2" DRAIN CELL PERIMETER INLET WATER TRANSFER SYSTEM
- WETLAND MEDIA
- PLANT/ROOT MOISTURE RETENTION LAYER
- MANHOLE / ACCESS HATCH

INSTALLATION NOTES:

1. INSTALL UNIT ON LEVEL BED OF GRAVEL OF AT LEAST 6" IN DEPTH.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH fc=5,000 PSI.
3. REINFORCING: ASTM A-615, GRADE 60.
4. RATED FOR PARKWAY LOADING 300 PSF.
5. JOINT SEALANT: BUTYL RUBBER SS-S-00210
6. PLANTING SUPPLIED AND INSTALLED BY CONTRACTOR PER MANUFACTURES RECOMMENDATIONS UNLESS OTHER WISE STATED ON CONTRACT.

MODULAR WETLAND SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
www.ModularWetlands.com

	NAME	DATE
DRAWN	jrh	1/9/13
REVIEWED		

COMMENTS:

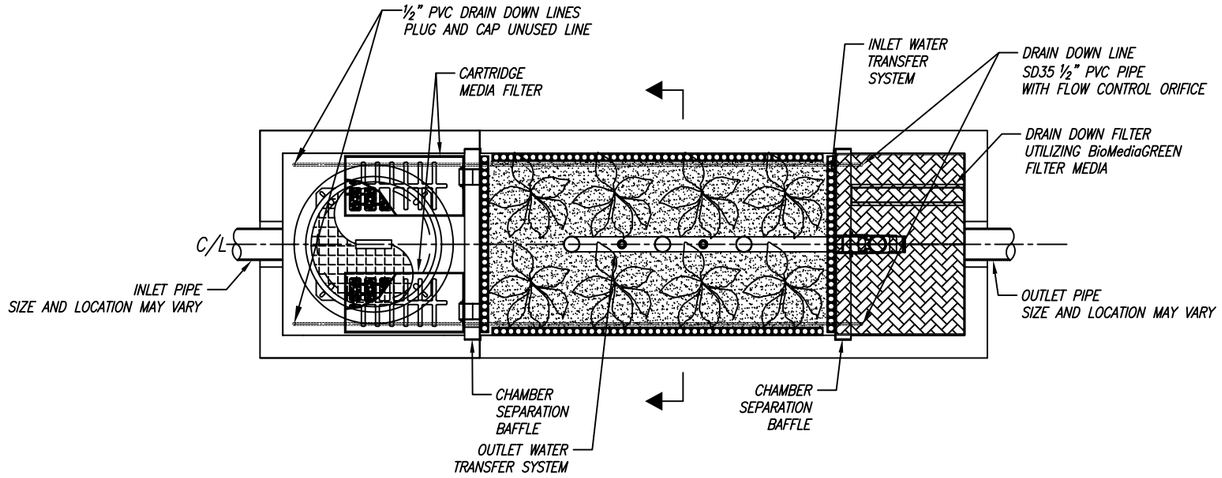
TITLE: MWS LINEAR 2.0 VAULT TYPE

SIZE	DWG. NO.	REV
	MWS-L-4-8-V	

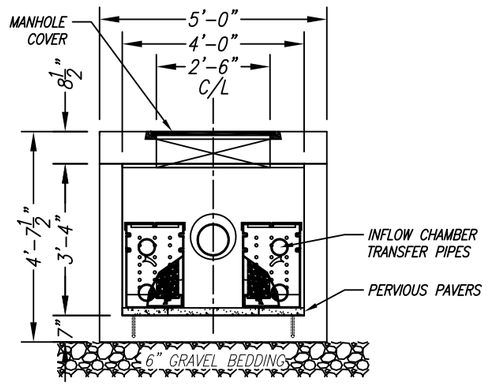
SCALE 1:40 | UNITS = INCHES | SHEET 1 OF 1

MODULAR WETLAND SYSTEMS - LINEAR 2.0
15' VAULT TYPE

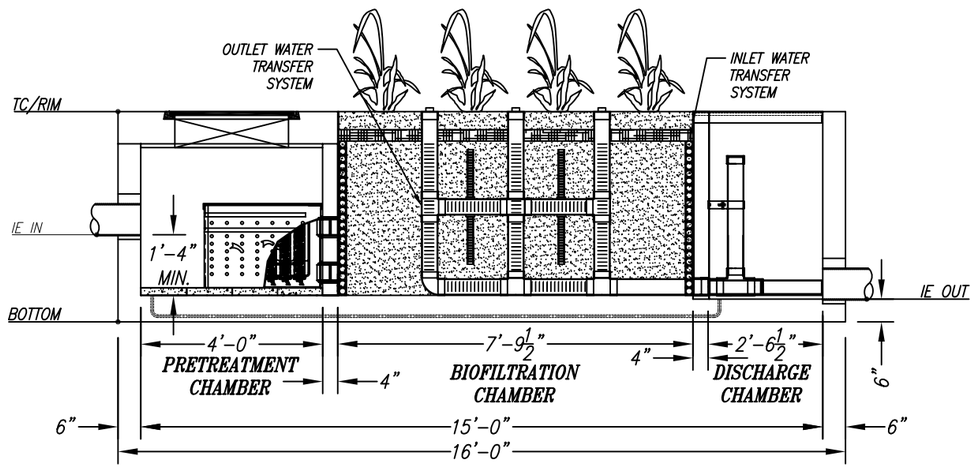
FLOW RATES
PEAK TREATMENT FLOW RATE = .175 CFS OR 78.5 GPM
PEAK BYPASS FLOW RATE = N/A
SPECIFICATIONS
INSTALL AT SURFACE
O.D. DIMENSIONS = 16' X 5' X 4.7'
TOP OF VAULT TO INVERT OUT = 4.13'
SEDIMENT STORAGE CAPACITY = 1000 LBS OR 23.5 CF



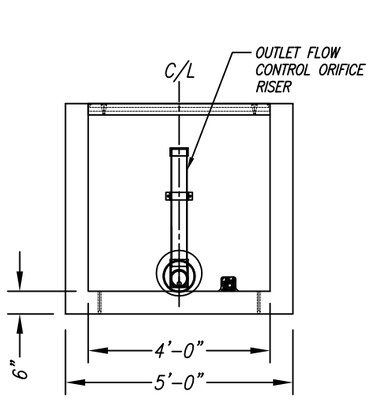
BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
7.5' L x 3.4' H = 25.5 SF
SIDE SURFACE AREA = 51.0 SF
ENDS = 2
3.7' L x 3.4' H = 12.6 SF
END SURFACE AREA = 25.2 SF
TOTAL WETLAND MEDIA SURFACE AREA **= 76.2 SF**
WETLAND MEDIA LOADING RATE 78.5 GPM / 76.2 SF **= 1.0 GPM/SF**
PRETREATMENT FILTER SURFACE AREA CALCS
SIDES = 2
0.50' L x 1.67' H = 0.84 SF
SIDE SURFACE AREA = 1.68 SF
ENDS = 2
0.25' L x 1.67' H = 0.42 SF
END SURFACE AREA = 0.84 SF
TOTAL PRETREATMENT SURFACE AREA 2.52 SF x 28 FILTERS **= 70.56 SF**
PRETREATMENT FILTER LOADING RATE 78.5 GPM / 70.56 SF **= 1.11 GPM/SF**



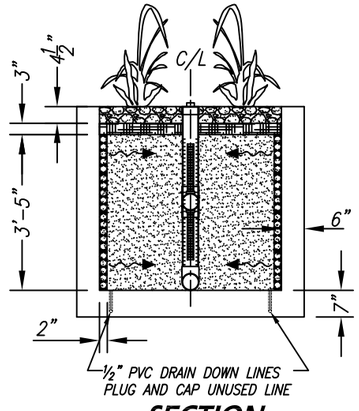
LEFT END VIEW
PRETREATMENT CHAMBER



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE CHAMBER



SECTION
BIOFILTRATION CHAMBER

LEGEND

- 2" DRAIN CELL PERIMETER INLET WATER TRANSFER SYSTEM
- WETLAND MEDIA
- PLANT/ROOT MOISTURE RETENTION LAYER
- MANHOLE / ACCESS HATCH

INSTALLATION NOTES:

1. INSTALL UNIT ON LEVEL BED OF GRAVEL OF AT LEAST 6" IN DEPTH.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH fc=5,000 PSI.
3. REINFORCING: ASTM A-615, GRADE 60.
4. RATED FOR PARKWAY LOADING 300 PSF.
5. JOINT SEALANT: BUTYL RUBBER SS-S-00210

MODULAR WETLAND SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
www.ModularWetlands.com

	NAME	DATE
DRAWN	Luis	1/25/13
EDITED		

COMMENTS:

TITLE: MWS LINEAR 2.0 VAULT TYPE

SIZE	DWG. NO.	REV
	MWS-L-4-15-V	

SCALE 1:40 | UNITS = INCHES | SHEET 1 OF 1

Bio-Clean Round R-GISB Media Filters

(Public right-of-way and maintained by the
County of San Diego)

BIO CLEAN ROUND RGISB Media Filter (PUBLIC RIGHT-OF WAY)							
IMP No.	**DMA No.**	**Basin Area (acre)**	**Runoff Coefficient "C"**	**Intensity- (inch/hour)**	**Required Treatment Flow "Q" (CFS)**	**BIO-CLEAN Curb Inlet Media Filter Model # (See Appendix D)**	**Maximum Treatment Flow Capacity of BIO-CLEAN Curb Inlet Media Filter (See Appendix D)**
IMP #16	116	0.86	1	0.20	0.17	BC-RGISB-MF-22-24	0.19
IMP #17	117	0.50	1	0.20	0.10	BC-RGISB-MF-22-24	0.19
IMP #18	118	0.24	1	0.20	0.05	BC-RGISB-MF-22-24	0.19
IMP #19	119	0.79	1	0.20	0.16	BC-RGISB-MF-22-24	0.19
IMP #20	120	0.44	0.78	0.20	0.07	BC-RGISB-MF-22-24	0.19

ROUND HIGH CAPACITY GISB MEDIA FILTER WITH EASY MAINTENANCE SHELF SYSTEM

FOR USE IN CURB INLETS

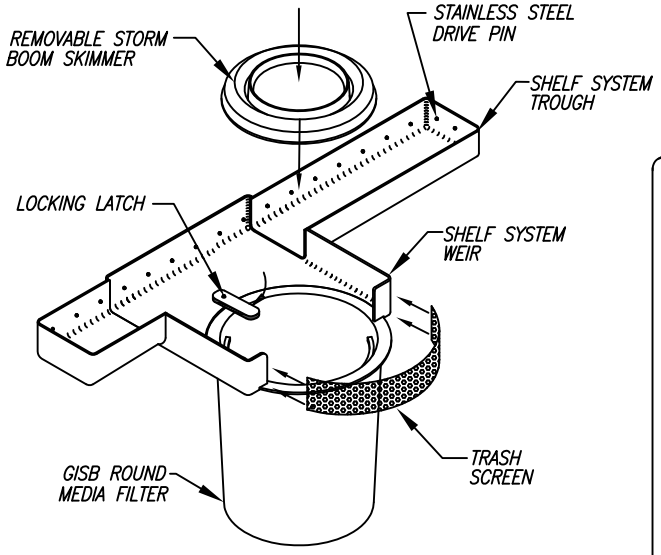


FIGURE 1:
DETAIL OF PARTS

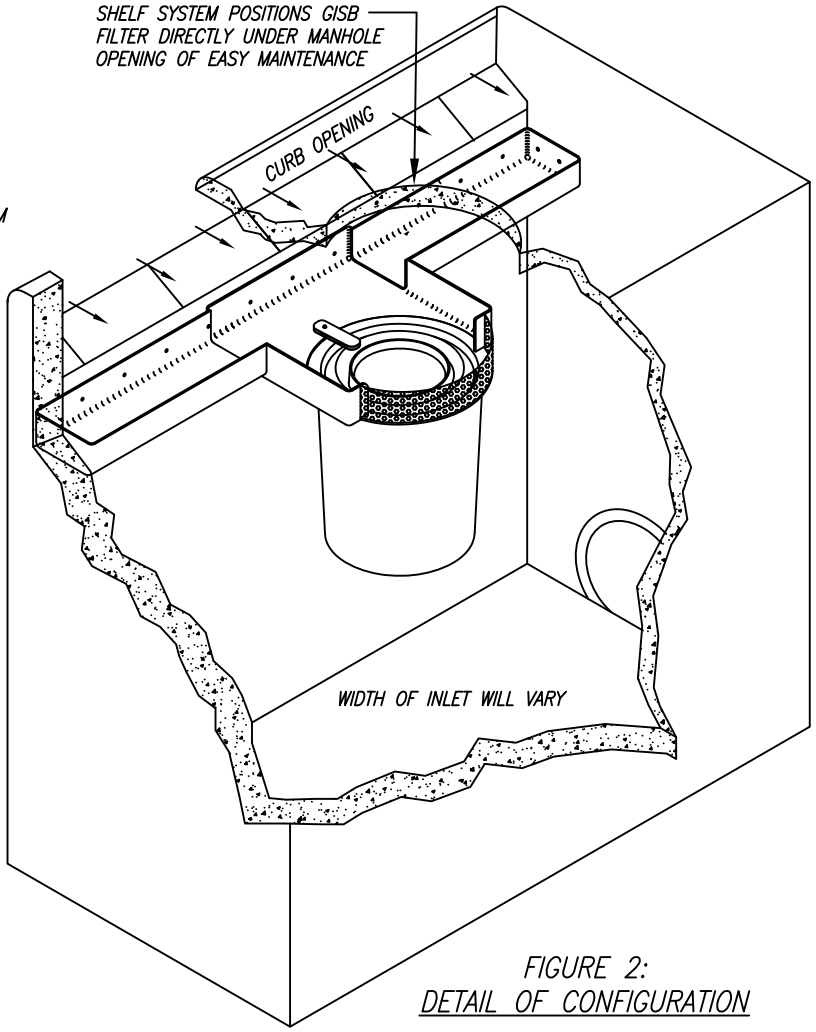


FIGURE 2:
DETAIL OF CONFIGURATION

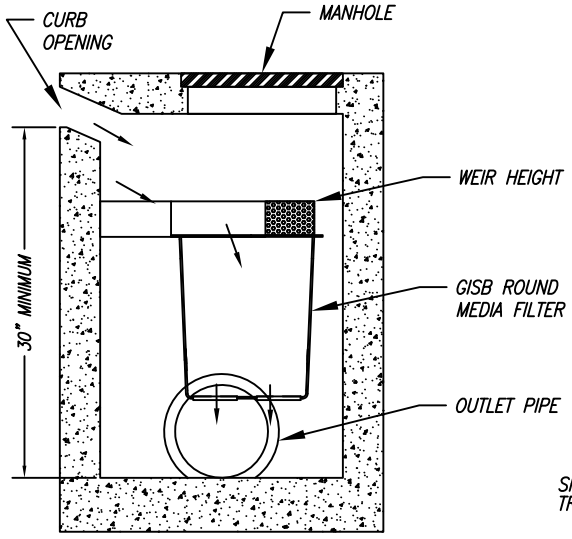


FIGURE 4:
DETAIL OF PROFILE

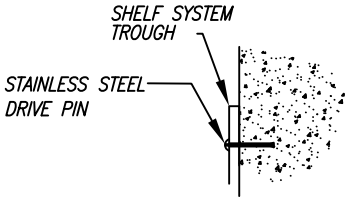


FIGURE 3:
DETAIL OF MOUNTING

NOTES:

1. SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
2. SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SHELF SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
5. FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
6. FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING MOUNTING HARDWARE.
7. FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'

DRAWING: GISB MEDIA FILTER SYSTEM		PATENTED	
TREATMENT FLOW RATE: 0.19 CFS		MODEL #: BC-RGISB-MF-22-24-HC	
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. PO BOX 869 OCEANSIDE, CA 92049 PHONE:760-433-7640 FAX:760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE:	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: J.R.H.	UNITS = INCHES	REVISIONS:	DATE:

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

WWW.BIOCLEANENVIRONMENTAL.COM

MODEL # BC-RGISB-MF-22-24-HC
ROUND HIGH CAPACITY MEDIA FILTER

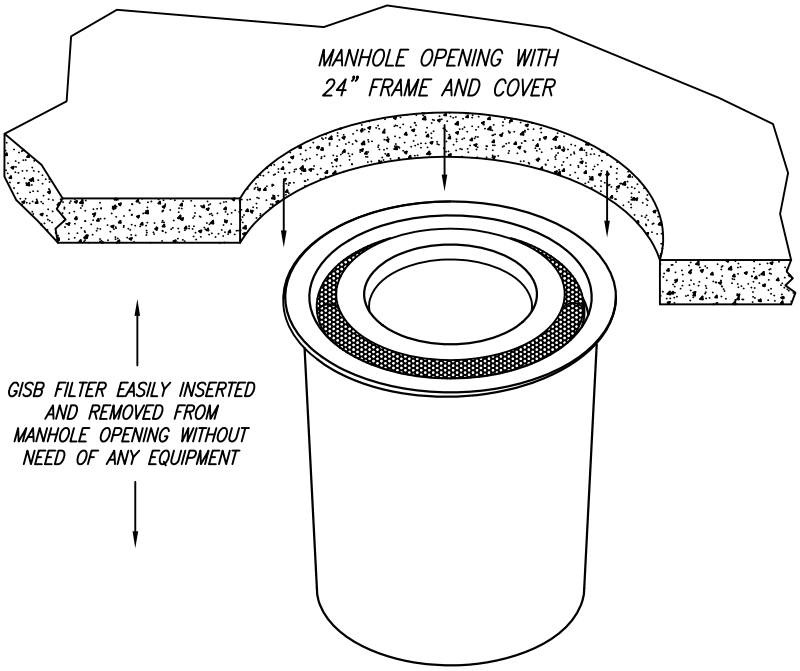


FIGURE 1:
DETAIL OF INSTALLATION

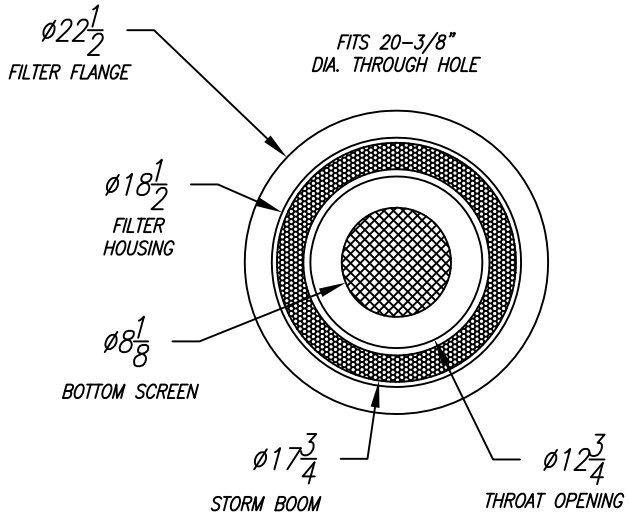


FIGURE 2:
DETAIL OF DIAMETERS

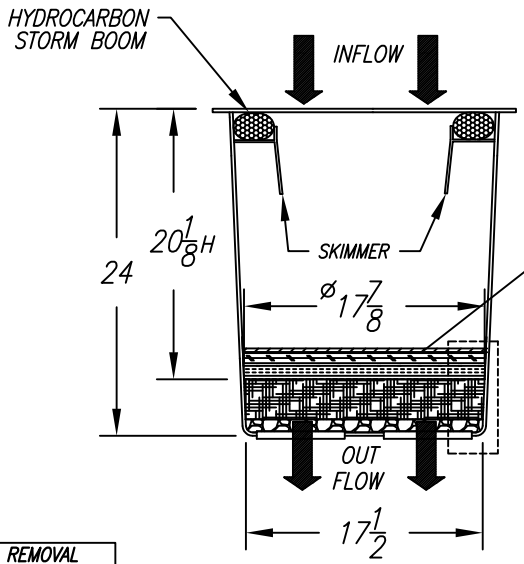


FIGURE 3:
DETAIL OF PARTS

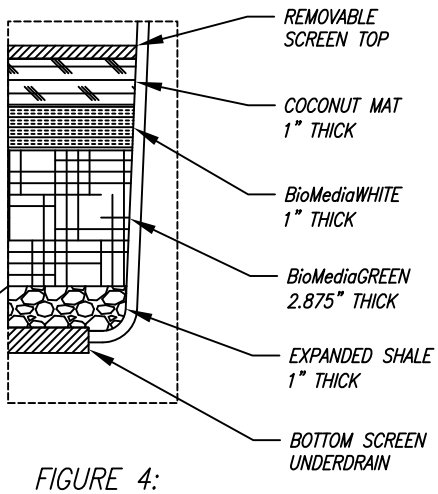


FIGURE 4:
DETAIL OF MEDIA PACK

BioMediaGREEN REMOVAL EFFICIENCIES	
TOTAL SUSPENDED SOLIDS "SIL-CO-SIL 106"	85%
TOTAL PHOSPHORUS	69%
ORTHO PHOSOPHORUS	41%
DISSOLVED COPPER	79%
DISSOLVED LEAD	98%
DISSOLVED ZINC	78%
FECAL COLIFORM BACTERIA	68%
TPH	99%

FLOW RATES – GISB MEDIA FILTER

*MEDIA PACK TREATMENT FLOW RATE				.19 CFS
SURFACE AREA	MAX HEAD	BMG MEDIA THICKNESS	HYDRAULIC CONDUCTIVITY	
$\pi * .76^2 = 1.76$ SF	20.125 IN	2.875 IN	363 M/D	
**TRASH SCREEN TREATMENT FLOW RATE				.88 CFS
SURFACE AREA	MAX HEAD	OPEN AREA	ORIFICE SHAPES	
2.17*0.36 = .78 SF	4.5 IN	49%	ROUND	

BMG DENOTES BioMediaGREEN

*FILTER FLOW RATE CALCULATED USING A HYDRAULIC-CONDUCTIVITY FLOW CALCULATOR (DARCIAN FLOW). HYDRAULIC CONDUCTIVITY OF BioMediaGREEN VERIFIED IN LABORATORY EVALUATION. VARIABLES LISTED ABOVE

**SCREEN FLOW RATE CALCULATED USING THE FOLLOWING EQUATION

$Q = SO * c_d * A \sqrt{2 * g * h}$ $\quad c_d =$ COFFICIENT of DISCHARGE $= .67$

DRAWING: GISB MEDIA FILTER DETAILS		PATENTED		SEE PAGE 1 FOR NOTES
TREATMENT FLOW RATE: 0.19 CFS		MODEL #: BC-RGISB-MF-22-24-HC		
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:		
BIO CLEAN ENVIRONMENTAL SERVICES, INC. PO BOX 869 OCEANSIDE, CA 92049 PHONE:760-433-7640 FAX:760-433-3176		REVISIONS:	DATE:	BIO CLEAN® ENVIRONMENTAL SERVICES, INC. WWW.BIOCLEANENVIRONMENTAL.COM
		REVISIONS:	DATE:	
DATE:	SCALE: SF = 15	REVISIONS:	DATE:	
DRAFTER: J.R.H.	UNITS = INCHES	REVISIONS:	DATE:	PAGE 2

DOUBLE ROUND HIGH CAPACITY GISB MEDIA FILTER WITH EASY MAINTENANCE SHELF SYSTEM

FOR USE IN CURB INLETS

SIZED FOR CITY OF TUSTIN MODIFIED INLET TYPE OL

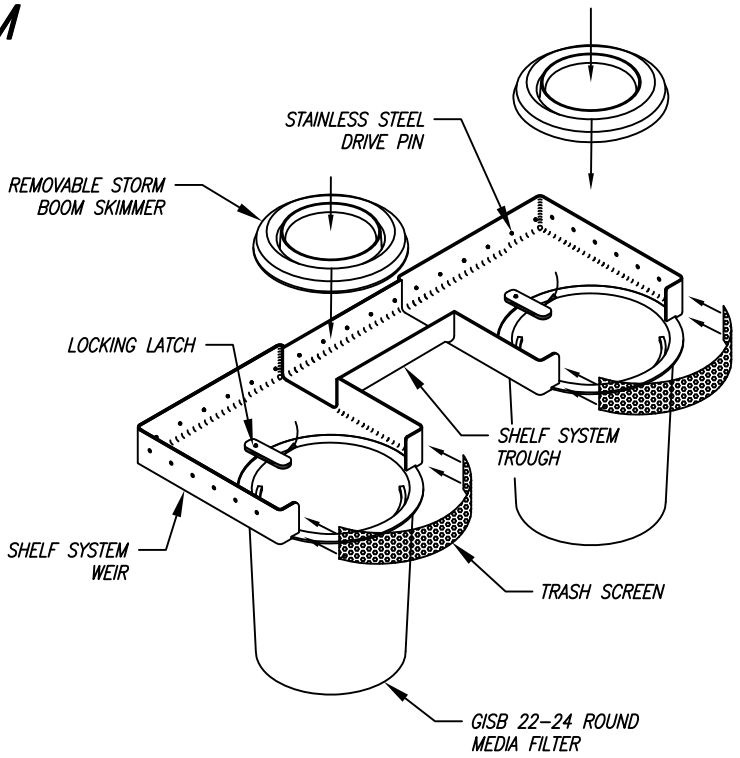


FIGURE 1:
DETAIL OF PARTS

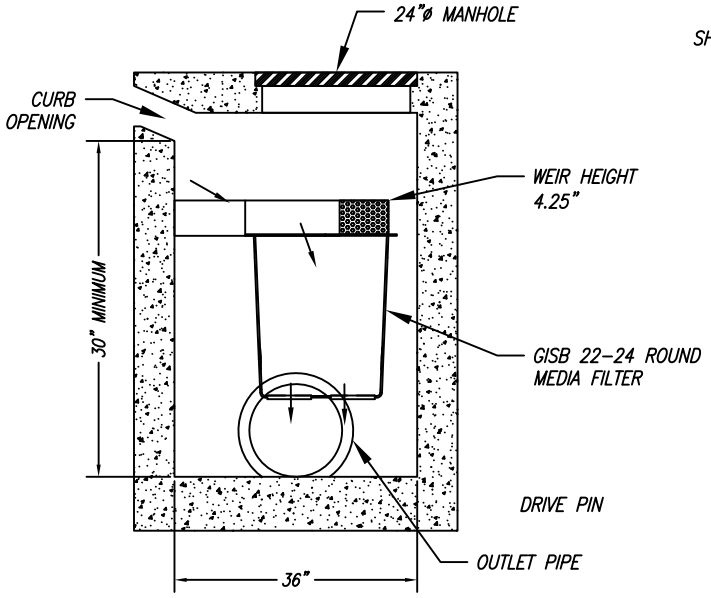


FIGURE 4:
DETAIL OF PROFILE

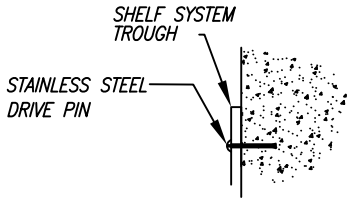


FIGURE 3:
DETAIL OF MOUNTING

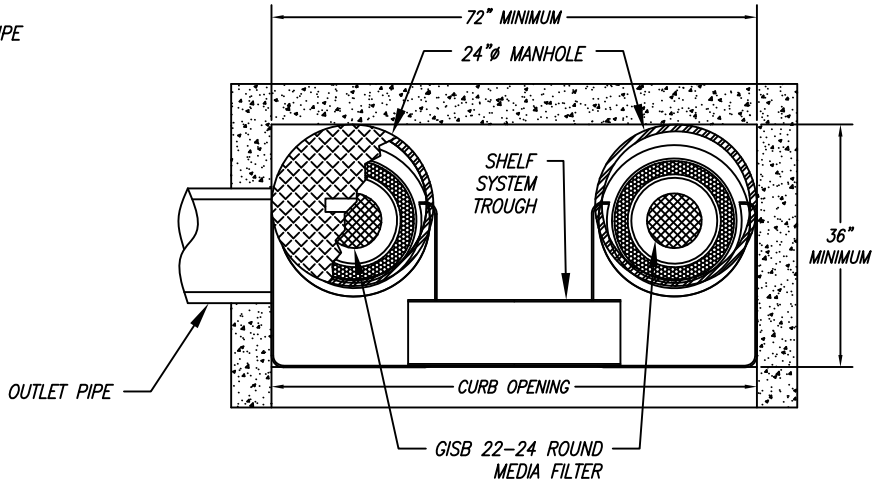


FIGURE 2:
DETAIL OF CONFIGURATION

DRAWING: DOUBLE GISB MEDIA FILTER SYSTEM		PATENTED	SEE PAGE 1 FOR NOTES
TREATMENT FLOW RATE: 0.38 CFS		MODEL #: BC-RGISB-MF-22-24-HC	
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. PO BOX 869 OCEANSIDE, CA 92049 PHONE:760-433-7640 FAX:760-433-3176		REVISIONS: / DATE:	BIO CLEAN® ENVIRONMENTAL SERVICES, INC.
		REVISIONS: / DATE:	WWW.BIOCLEANENVIRONMENTAL.COM
DATE:	SCALE: SF = 15	REVISIONS: / DATE:	
DRAFTER: J.R.H.	UNITS = INCHES	REVISIONS: / DATE:	PAGE 3

ROUND HIGH CAPACITY GISB MEDIA FILTER WITH EASY MAINTENANCE SHELF SYSTEM

FOR USE IN CURB INLETS WITH WINGS

SIZED FOR CITY OF TUSTIN STANDARD INLET TYPE OL

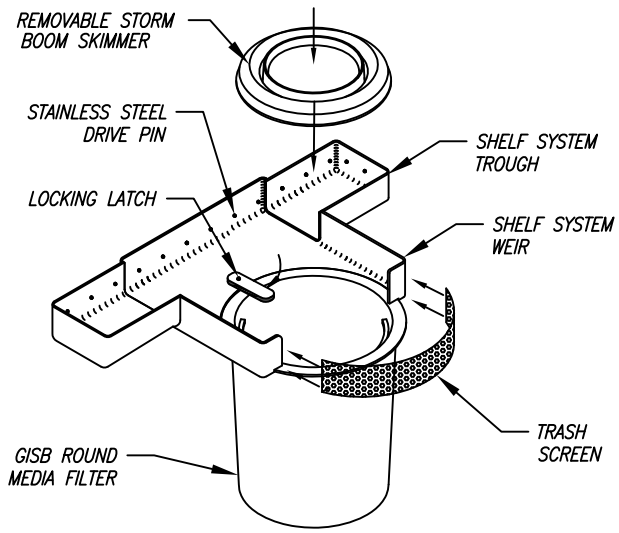


FIGURE 1:
DETAIL OF PARTS

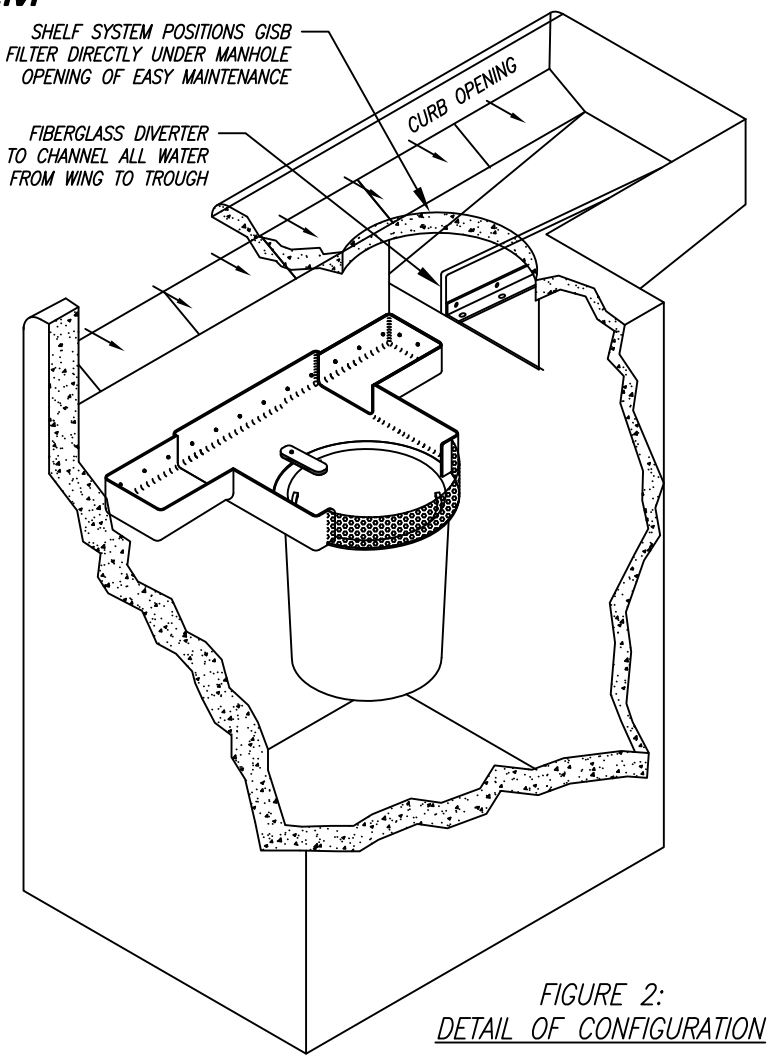


FIGURE 2:
DETAIL OF CONFIGURATION

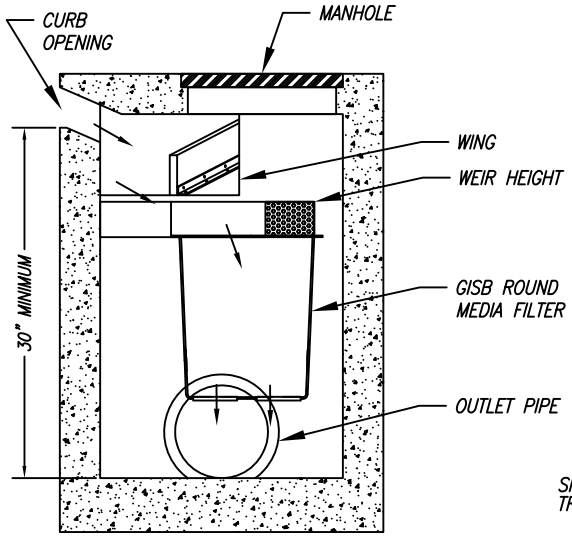


FIGURE 4:
DETAIL OF PROFILE

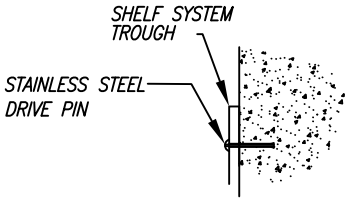


FIGURE 3:
DETAIL OF MOUNTING

NOTES:

1. SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
2. SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SHELF SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
5. FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
6. FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING MOUNTING HARDWARE.
7. FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'

DRAWING: GISB MEDIA FILTER SYSTEM		PATENTED	
TREATMENT FLOW RATE: 0.19 CFS		MODEL #: BC-RGISB-MF-22-24-HC	
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. PO BOX 869 OCEANSIDE, CA 92049 PHONE:760-433-7640 FAX:760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE:	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: J.R.H.	UNITS = INCHES	REVISIONS:	DATE:

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ATTACHMENT E

(N/A – Soil infiltration not proposed)

Geotechnical Certification Sheet

(if applicable)

The design of stormwater treatment and other control measures proposed in this plan requiring specific soil infiltration characteristics and/or geological conditions has been reviewed and approved by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

N/A	N/A
Name and registration #	Date

ATTACHMENT F

(To be completed at Construction Documents)

Maintenance Plan

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

The following is a general outline to create your project specific Maintenance Plan. A Maintenance Plan is a living document and field conditions may require modifications to the Maintenance Plan.

I. Inspection, Maintenance Log and Self-Verification Forms (Examples are provided in Appendix F of the San Diego County SUSMP)

II. Updates, Revisions and Errata

III. Introduction

A. Narrative overview describing the site; drainage areas, routing, and discharge points; and treatment facilities.

IV. Responsibility for Maintenance

A. General

(1) Name and contact information for responsible individual(s).

(2) Organization chart or charts showing organization of the maintenance function and location within the overall organization.

(3) Insert a copy of the recorded maintenance agreement.

(4) Maintenance Funding

(1) Sources of funds for maintenance

(2) Budget category or line item

(3) Description of procedure and process for ensuring adequate funding for maintenance

B. Staff Training Program

C. Records

D. Safety

V. Summary of Drainage Areas and Stormwater Facilities

A. Drainage Areas

(1) Drawings showing pervious and impervious areas (copied or adapted from initial SWMP).

(2) Designation and description of each drainage area and how flow is routed to the corresponding facility.

B. Treatment and Flow-Control Facilities

(1) Drawings showing location and type of each facility

(2) General description of each facility (Consider a table if more than two facilities)

(1) Area drained and routing of discharge.

(2) Facility type and size

VI. Facility Documentation

A. "As-built" drawings of each facility (design drawings in the draft Plan)

B. Manufacturer's data, manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a "placeholder" in the draft plan for information not yet available).

C. Specific operation and maintenance concerns and troubleshooting

VII. Maintenance Schedule or Matrix

A. Maintenance Schedule for each facility with specific requirements for:

(1) Routine inspection and maintenance

(2) Annual inspection and maintenance

(3) Inspection and maintenance after major storms

B. Service Agreement Information

Assemble and make copies of your maintenance plan. One copy must be submitted to the County, and at least one copy kept on-site. Here are some suggestions for formatting the maintenance plan:

- Format plans to 8½" x 11" to facilitate duplication, filing, and handling.
- Include the revision date in the footer on each page.
- Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed-up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

BIORETENTION MAINTENANCE

Bio-Retention Basins, Landscape Areas, and Slopes:

The property owner will be responsible for maintaining the property so that the BMPs provided can function effectively. This will include oversight of any contractor hired, e.g. a landscape maintenance company.

The operational and maintenance needs of Landscape Areas and Slopes are:

- Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals.
- Trash, debris, grass trimmings, tree pruning, and leaf collection.
- Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas.
- Removal of graffiti.
- Erosion and structural maintenance to prevent the loss of soil and maintain the performance of the Slopes.

The Slopes will be inspected and inspection visits will be completely documented:

- Once a year at minimum
- After extended periods of wet weather.

Aesthetic maintenance is important for public acceptance of new facilities. Functional maintenance of slopes is important for performance and safety reasons. Both forms of maintenance will be combined into an overall Storm Water Management System Maintenance.

The following activities will be included in the aesthetic maintenance program:

- Grass Trimming. Trimming of grass will be done around fences, at the inlets and outlet structures, and sampling structures.
- Weed Control. Weeds will be removed through mechanical means. Herbicide will not be used because these chemicals may impact the water quality monitoring.

Functional maintenance has two components which consist of preventative maintenance and corrective maintenance

Preventative Maintenance activities to be instituted for Landscape Areas are:

- Grass Mowing. Vegetation is designed to be kept short to limit the development of faunal habitats.
- Trash and Debris. During each inspection and maintenance visit to the site, debris and trash removal will be conducted to reduce the potential for inlet and outlet

structures and other components from becoming clogged and inoperable during storm events.

- Sediment Removal. Sediment accumulation, as part of the operation and maintenance program in landscape areas will be monitored. Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas.
- Mechanical and Electronic Components. Regularly scheduled maintenance will be performed on fences, gates, locks, and sampling and monitoring equipment in accordance with the manufacturers' recommendations.
- Fertilization and Irrigation. The irrigation system and fertilization (if necessary) will be professionally designed and maintained.
- Elimination of Mosquito Breeding Habitats. The most effective mosquito control program is one that eliminates potential breeding habitats.

Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of landscape areas and slopes. Corrective maintenance activities include:

- Removal of Debris and Sediment. Sediment, debris, and trash, which prevent vegetative growth, will be removed and properly disposed. Temporary arrangements will be made for handling the sediments until a permanent arrangement is made. Vegetation will be reestablished after sediment removal.
- Structural Repairs. Once deemed necessary, repairs to structural components of a Slope will be done within 10 working days. Qualified individuals (i.e., the designers and contractors) will conduct repairs where structural damage has occurred.
- Erosion Repair. Where a reseeding program has been ineffective, or where other factors have created erosive conditions (i.e., pedestrian traffic, concentrated flow, etc.), corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of a slope. There are a number of corrective actions that can be taken. These include erosion control blankets, riprap, sodding, or reduced flow through the area. Designers or contractors will be consulted to address erosion problems if the solution is not evident.
- Elimination of Animal Burrows. Animal burrows will be filled and steps taken to remove the animals if burrowing problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated. If the BMP performance is affected, abatement will begin. Otherwise, abatement will be performed annually in September.
- General Facility Maintenance. In addition to the above elements of corrective maintenance, general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.

Hazardous Waste

Suspected hazardous wastes will be analyzed to determine disposal options. Hazardous wastes generated onsite will be handled and disposed of according to applicable local, state, and federal regulations. A solid or liquid waste is considered a hazardous waste if it exceeds the criteria listed in the CCR, Title 22, Article 11.

Erosion Control

The property owner shall ensure that temporary erosion control BMPs are maintained such that full performance is achieved. The erosion control shall be monitored on a weekly basis and prior to any rain events and fix/replace as needed..

Inlet Signage

Signs/markers shall be installed and maintained on each grated inlet. Any stenciling shall be inspected at the beginning and end of each rainy season and repaired or replaced, as needed.

MODULAR WETLANDS SYSTEM MAINTENANCE

BIO-CLEAN ROUND R-GISB MEDIA FILTERS MAINTENANCE

MAINTENANCE

MWS – Linear

Hybrid Stormwater Filtration System

Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92049

www.modularwetlands.com
P 760-433-7640
F 760-433-3179

MAINTENANCE

Maintenance Summary –

- **<u>Clean Bio Clean® Catch Basin Filter</u> – average maintenance interval is 3 to 6 months.**
  - **(*15 minute service time*).**

- **<u>Clean Separation (sediment) Chamber</u> – average maintenance interval is 6 to 18 months.**
  - **(*30 minute service time*).**

- **<u>Replace Cartridge Filter Media (BioMediaGREEN™)</u> – average maintenance interval 6 – 12 months.**
  - **(*45 minute service time*).**

- **<u>Replace Drain Down Filter Media (BioMediaGREEN™)</u> – average maintenance interval is 6 to 12 months.**
  - **(*5 minute service time*).**

- **<u>Trim Vegetations</u> – average maintenance interval is 3 to 6 months.**
  - **(*15 minute service time*).**

- **<u>Evaluate Wetland Media Flow Hydraulic Conductivity</u> – average inspection interval is once per year.**
  - ***(5 minute inspection time).***

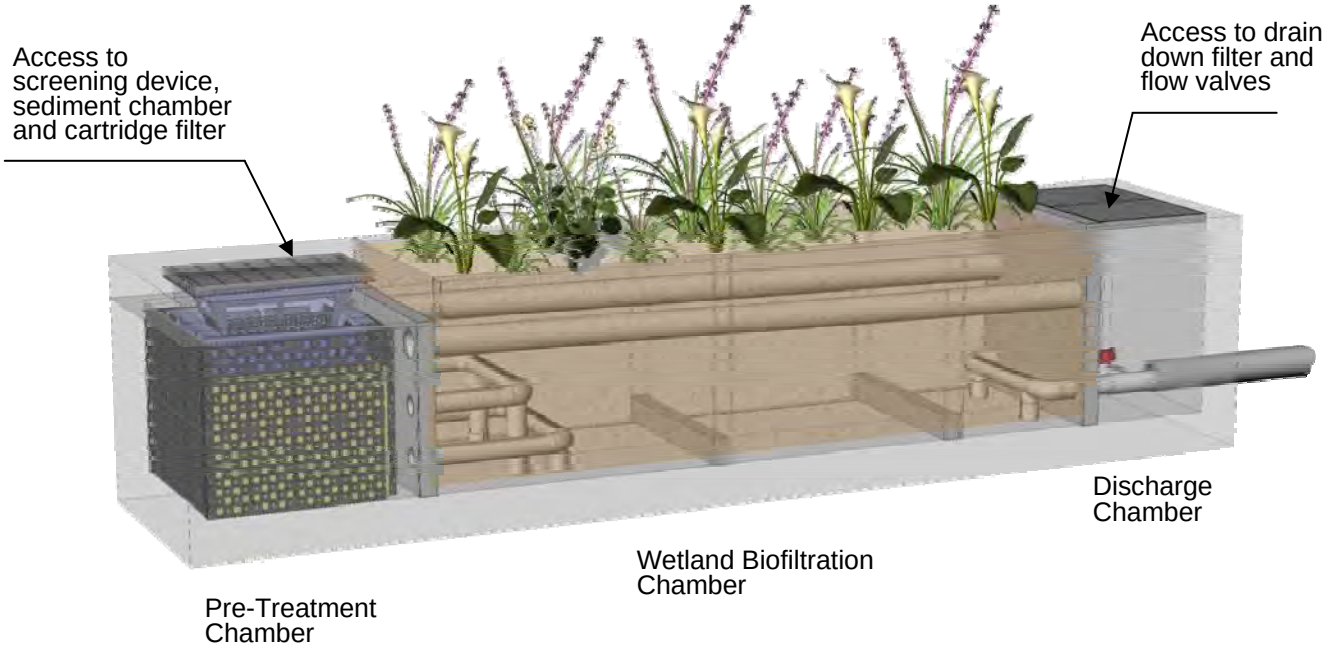
- **<u>Wetland Media Replacement</u> – average maintenance interval is 5 to 20 years.**
  - **(*6 hours*).**

For more information on maintenance procedures, to order replacement media or find an authorized service company please contact:

Modular Wetland Systems, Inc
2972 San Luis Rey Road
Oceanside, CA 92058

Phone: 760-433-7640
Fax: 760-433-3176
Email: info@modularwetlands.com

System Diagram –



Maintenance Overview –

A. Every installed MWS – Linear unit is to be maintained by the Supplier, or a Supplier approved contractor. The cost of this service varies among providers.

B. The MWS – Linear is a multi-stage self-contained treatment train for stormwater treatment. Each stage protects subsequent stages from clogging. Stages include: screening, separation, cartridge media filtration, and biofiltration. The biofiltration stage contains various types of vegetation which will require annual evaluation and trimming.

1. <u>Clean Bio Clean® Catch Basin Filter</u> – Screening is provided by well proven catch basin filter. The filter has a trash and sediment capacity of 2 (curb type) and 4 (grate type) cubic feet. The filter removes gross solids, including litter, and sediments greater than 200 microns. This procedure is easily done by hand or with a small industrial vacuum device. This filter is located directly under the manhole or grate access cover.

2. <u>Clean Separation (sediment) Chamber</u> – separation occurs in the pre-treatment chamber located directly under the curb or grated inlet. This chamber has a capacity of approximately 21 cubic feet for trash, debris and sediments. This chamber targets TSS, and particulate metals and nutrients. This procedure can be performed with a standard vacuum truck. This chamber is located directly under the manhole or grate access cover.

3. <u>Replace Cartridge Filter Media (BioMediaGREEN™)</u> – Primary filtration is provided by a horizontal flow cartridge filter utilizing BioMediaGREEN blocks. Each cartridge has a media surface area of 35 square feet. The large surface area will insure long term operation without clogging. The cartridge filter with BioMediaGREEN targets fine TSS, metals, nutrients, hydrocarbons, turbidity and bacteria. Media life depends on local loading conditions and can easily be replaced and disposed of without any equipment. The filters are located in the pre-treatment chamber. Entry into chamber required to replace BioMediaGREEN blocks. Each cartridge contain 14 pieces of 20" tall BioMediaGREEN.

4. <u>Replace Drain Down Filter Media (BioMediaGREEN™)</u> – A drain down filter, similar in function to the perimeter filter is located in the discharge chamber. This filter allows standing water to be drained and filtered out of the separation chamber. This addresses any vector issues, by eliminating all standing water within this system. Replacement of media takes approximately 5 minutes and is performed without any equipment.

5. <u>Trim Vegetations</u> – The system utilizes multiple plants in the biofiltration chamber to provide enhanced treatment for dissolved pollutants including nutrients and metals. The vegetation will need to be maintained (trimmed) as needed. This can be done as part of the project normal landscape maintenance. **NO FERTILIZER SHALL BE USED IN THIS CHAMBER.**

<u>6. Evaluate Wetland Media Flow Hydraulic Conductivity</u> – The systems flow can be assessed from the discharge chamber. This should be done during a rain event. By viewing into the discharge chamber the flow out of the system can be observed. If little to know flow is observed from the lower valve or orifice plate this is a sign of potential wetland media (biofiltration) maintenance needs.

<u>7. Wetland Media Replacement</u> – biofiltration is provided by an advance horizontal flow vegetated wetland. This natural filter contains a mix of sorptive media that supports abundant plant life. This biofilter targets the finest TSS, dissolved nutrients, dissolved metals, organics, pesticides, oxygen demanding substances and bacteria. This filter provides the final polishing step of treatment. If prior treatment stages are properly maintained, the life of this media can be up to 20 years. Replacement of the media is simple. Removal of spent media can be done with a shovel of a vacuum truck.

C. The MWS – Linear catch basin filter, separation chamber, cartridge filter media and wetland media are designed to allow for the use of vacuum removal of captured pollutants and spent filter media by centrifugal compressor vacuum units without causing damage to the filter or during normal cleaning and maintenance. Filter and chambers can be cleaned from finish surface through standard manhole or grate access.

Maintenance Procedures –

1. <u>Clean Bio Clean® Catch Basin Filter</u> – Modular Wetland Systems, Inc. recommends the **catch basin filter** be inspected and cleaned a minimum of once every six months and replacement of hydrocarbon booms once a year. The procedure is easily done with the use of any standard vacuum truck. *This procedure takes approximately 15 minutes.*

1. Remove grate or manhole to gain access to catch basin filter insert. Remove the deflector shield (grate type only) with the hydrocarbon boom attached. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
2. Remove all trash, debris, organics, and sediments collected by the inlet filter insert. Removal of the trash and debris can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screen of the filter.
3. Evaluation of the hydrocarbon boom shall be performed at each cleaning. If the boom is filled with hydrocarbons and oils it should be replaced. Attach new boom to basket with plastic ties through pre-drilled holes in basket. Place the deflector shield (grate type only) back into the filter.
4. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
5. The hydrocarbon boom may be classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).

2. <u>Clean Separation (sediment) Chamber</u> – Modular Wetland Systems, Inc. recommends the **separation chamber** be inspected and cleaned a minimum of once a year. The procedure is easily done with the use of any standard vacuum truck. *This procedure takes approximately 30 minutes.*

1. Remove grate or manhole to gain access to the catch basin filter.
2. Remove catch basin filter. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
3. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
4. Vacuum out separation chamber and remove all accumulated debris and sediments.
5. Replace catch basin filter, replace grate or manhole cover.
6. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

3. <u>Replace Cartridge Filter Media (BioMediaGREEN™)</u> – Modular Wetland Systems, Inc. recommends the **cartridge filters** media be inspected and cleaned a minimum of once a year. The procedure will require prior maintenance of separation chamber. *Replacement of media takes approximately 45 minutes.*

1. Remove grate or manhole to gain access to the catch basin filter.
2. Remove catch basin filter. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
3. Enter separation chamber.
4. Unscrew the two ½" diameter bolts holding the lid on each cartridge filter and remove lid and place outside of unit.
5. Remove each of the 14 BioMediaGREEN filter blocks in each cartridge and remove from chamber for disposal.
6. Spray down the outside and inside of the cartridge filter to remove any accumulated sediments.
7. Replace with new BioMediaGREEN filter blocks insuring the blocks are properly lined up and seated in the bottom.
8. Replace the lid and tighten down bolts.
9. Replace catch basin filter, replace grate or manhole cover.
10. Transport all debris, trash, organics, spent media and sediments to approved facility for disposal in accordance with local and state requirements.

4. <u>Replace Drain Down Filter Media (BioMediaGREEN™)</u> – Modular Wetland Systems, Inc. recommends the **drain down filter** be inspected and maintained a minimum of once a year. *Replacement of media takes approximately 5 minutes.*

1. Open hatch of discharge chamber
2. Enter chamber, unlatch drain down filter cover.
3. Remove BioMediaGREEN filter block
4. Replace with new block, replace and latch cover.
5. Exit chamber, close and lock down the hatch.
6. Transport spent media to approved facility for disposal in accordance with local and state requirements.

5. <u>Trim Vegetations</u> – Modular Wetland Systems, Inc. recommends the plants/vegetation be inspected and maintained a minimum of once a year. It is also recommended that the plants receive the same care as other landscaped areas. **Note: No fertilizer is to be used on this area.** *Trimming of vegetation takes approximately 15 minutes.*

<u>6. Evaluate Wetland Media Flow Hydraulic Conductivity</u> – Modular Wetland Systems, Inc. recommends system flow be inspected and observed a minimum of once a year. This needs to be done during a rain event. *Inspection and Observation takes approximately 5 minutes.*

1. Open hatch of discharge chamber
2. Observe the level of flow from the bottom valve or orifice plate.
3. If flow is steady and high the system is operating normally.

4. If little or no flow is observed exiting the valve possible maintenance to the biofiltration wetland chamber may be needed. Contact Modular Wetlands for further assistance.
5. Exit chamber, close and lock down the hatch.

7. Wetland Media Replacement – Modular Wetland Systems, Inc. recommends the wetland media be replaced a minimum of one every 20 years. *Inspection takes approximately 15 minutes. Replacement of rock media takes approximately 6 hours and requires a vacuum truck.*

1. Remove plants from the wetland chamber.
2. Use a vacuum truck or shovel to remove all wetland media.
3. Spray down the walls and floor of the chamber and vacuum out any accumulated pollutants.
4. Spray down perforated piping and netting of flow matrix and the inflow and outflow end to remove any accumulated pollutants.
5. Vacuum out any standing water from the media removal and insure the chamber is cleaning.
6. Use a small backhoe to fill chamber with new media. Call Modular Wetland Systems, Inc. for media delivery information.
7. Install BioMediaGREEN filter blocks across over the entire filter bed. Fill with media until 9” from top. The install filter blocks which are 3” thick. Fill the top 6” inches with wetland media.
8. Plant new vegetation in the same configuration and quantity as old vegetation. Dig down until the BioMediaGREEN is exposed. Cut out a small circle of the BioMediaGREEN. Remove plant from container including soil ball and place in the whole cut out of the BioMediaGREEN. Cover up with wetland media.
9. Spray down the plants and media with water to saturate.
10. Continue supplemental irrigation (spray or drip) for at lest 90 days.

7. Other Maintenance Notes –

1. Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanism. .
2. The owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.
3. Any person performing maintenance activities must have completed a minimum of OSHA 24-hour hazardous waste worker (hazwoper) training.
4. Remove access manhole lid or grate to gain access to filter screens and sediment chambers. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
5. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
6. The hydrocarbon boom is classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).

Maintenance Sequence –

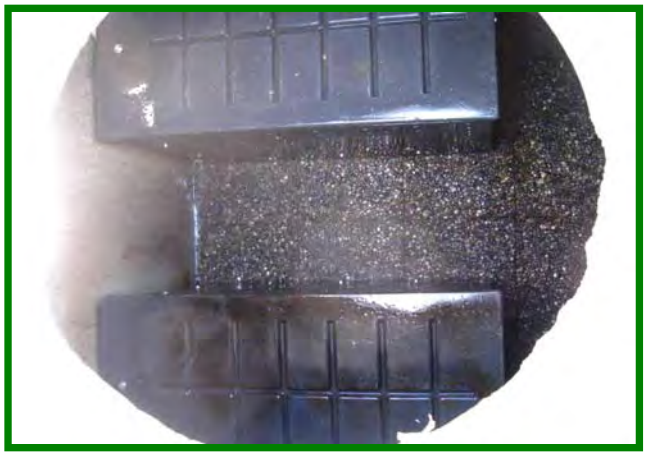
Access Pre-Treatment Chamber by Removing Manhole or Grate Cover

Assess Pollutant Loading in Catch Basin Filter and Sediment Chamber

Vacuum Catch Basin Filter

Remove Catch Basin Filter

Vacuum out the Sediment Chamber



Enter Chamber Remove Lids of Cartridge Filters

Remove Spent BioMediaGREEN Filter Blocks

Spray Down and Clean Cartridge Filter Housing

Replace with New BioMediaGREEN Filter Blocks and Replace Lid, then Catch Basin Filter and Replace Manhole or Grate

Open Discharge Chamber Lid to Asses Wetland Media Flow Rate and Replace Drain Down Filter Near Bottom

Evaluate Vegetation and Trim if Needed. Maintenance Complete.

Please Contact Modular Wetland Systems, Inc. for More Information:

760-433-7640

info@modularwetlands.com

BIO-CLEAN ROUND R-GISB MEDIA FILTERS MAINTENANCE

Round Curb Inlet Filter (R-GISB)

PROVEN STORMWATER TREATMENT TECHNOLOGY

BIO CLEAN ENVIRONMENTAL SERVICES, INC.

Overview

The Bio Clean Round Curb Inlet Filter (R-GISB) is a favorite amongst cities and municipalities nationwide. Many agencies have chosen this system as their standard due to its quick cleaning time and large storage capacity.

Its patented 'Shelf System' allows cleaning to be done in less than 15 minutes, and its larger storage capacity of 3.85 cubic feet allows for maximized cleaning intervals and minimized attention required by maintenance crews.

The modularized design of the 'Shelf System' for curb inlets makes it adaptable to any size or type catch basin.

Its multi-stage filtration screens allow this device to meet "full trash capture" requirements by removing 100% of trash & debris 5 mm and greater. Made of marine grade fiberglass and high grade stainless steel these filters come in standard and custom designs.

This filtration system addresses a wide array of pollutants including trash & debris, sediments, TSS, nutrients, metals, and hydrocarbons.

Includes the Patented 'Shelf System'

Higher Storage Capacity & 15 Minute Service Time

Advantages

- 8 Year Warranty
- Works in Any Size Catch Basin
- No Nets or Geofabrics
- 15+ Year User Life
- Meets **LEED** Requirements
- Patented Shelf System
- Fiberglass Construction

Performance

- 74%-86% Removal of TSS
- 54% Removal of Oils & Grease
- 57%-71% Removal of Phosphorus
- 56%-60% Removal of Nitrogen

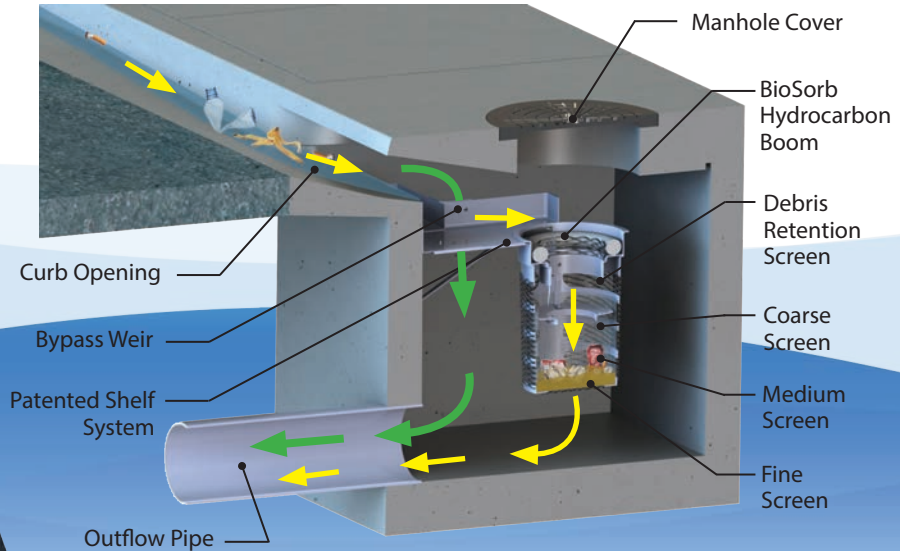
Specifications

Model #	Treatment Flow (CFS)	Bypass Flow (CFS)
BC-RGISB-22-24	2.4	Unlimited

Operation

Bypass Flow Path

Treatment Flow Path



www.BioCleanEnvironmental.com

Round Curb Inlet Filter (R-GISB)

PROVEN STORMWATER TREATMENT TECHNOLOGY

Media Filter

The Bio Clean Round Curb Inlet Media Filter (RGISB-MF) is an advanced level filtration device designed with a multi-layered media filter for increased removal efficiencies.

Performance

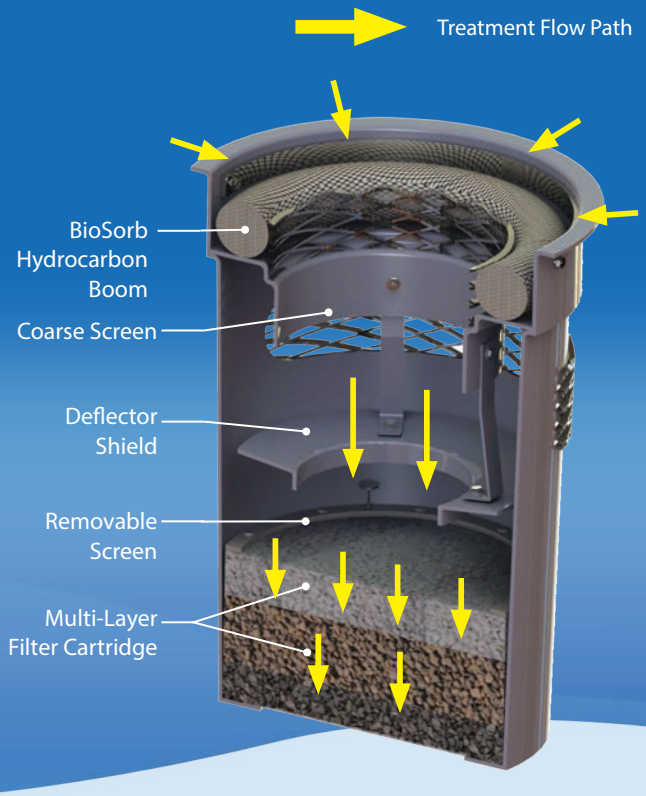
- 85% Removal of Fine TSS
- 69% Removal of Dissolved Phosphorus
- 95% Removal of Copper
- 87% Removal of Lead
- 95% Removal of Zinc
- 90% to 95% Removal of Oils & Grease
- 68% Removal of Fecal Coliform (bacteria)

Specifications

Model #	Media Treatment Flow (CFS)	Screen Treatment Flow (CFS)	Bypass Flow (CFS)
BC-RGISB-MF-22-24	0.12	2	Unlimited

Higher Flow Rate Models Available

Operation

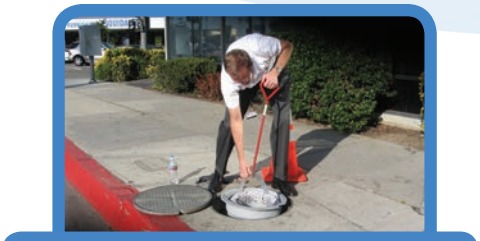


Installation & Maintenance

- Cleaned Without Catch Basin Entry ✓
- Cleaned Easily With Vac Truck ✓
- 15 Minute Service Time ✓

Application

- Parking Lots
- Roadways



Easily Removed without Entry into Basin

Always Positioned Under Manhole Opening

Approvals

City and County of Honolulu

County of San Diego

County of Orange

Meets Full Capture Requirements

2972 San Luis Rey Rd
Oceanside, CA 92058
p 760.433.7640 f 760.433.3176
www.BioCleanEnvironmental.com

BIO CLEAN

ATTACHMENT G

(To be completed at Construction Documents)

Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPs in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.

ATTACHMENT G

(To be completed at Construction Documents)

Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPs in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.

ATTACHMENT H

HMP Study

(See Attachment D)

ATTACHMENT I

Geomorphic Assessment

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of $0.3Q_2$ or a "High" low flow threshold of $0.5Q_2$.)

(See "Hydromodification Screening for Lake Jennings Marketplace" under separate cover prepared by Chang Consultants.)

ATTACHMENT J

HMP Exemption Documentation

N/A

ATTACHMENT K

Addendum

LAKE JENNINGS MARKETPLACE
WATER QUALITY TREATMENT AND STORAGE EXHIBIT

Bio-Retention Basin + Vault Treatment and Storage Calculations

IMP No.	DMA No.	Basin Area (acre)	Total Tributary Area to Unit (acre)	Sizing Factor $0.5Q_2$	Minimum Amount of Treatment Area Required (sq-ft)	Actual Treatment Area Provided (sq-ft)	Vault Sizing Factor $0.5Q_2$	Size Vault- (cu- ft)
1	101	0.33	0.33	0.04	575	621	0.14	2012
2	102	1.55	1.55	0.04	2701	2770	0.14	9453
3	103	0.56	0.56	0.04	976	976	0.14	3415
4	104	0.35	0.35	0.04	610	680	0.14	2134
5	105	0.23	0.23	0.04	401	430	0.14	1403
6	106	0.21	0.21	0.04	366	543	0.14	1281
7	107	0.37	0.37	0.04	645	724	0.14	2256
9	109	1.83	1.83	0.04	3189	3618	0.14	11160
10	110	0.62	0.62	0.04	1080	1552	0.14	3781
11	111	0.54	0.54	0.04	941	1103	0.14	3293
							TOTAL	40188

Bio-Retention Basin + Hydromodification Calculations

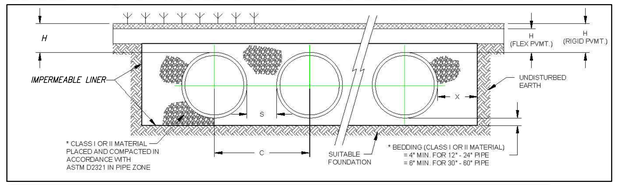
IMP No.	DMA No.	Basin Area (acre)	Total Tributary Area to Unit (acre)	Area Sizing Factor $0.5Q_2$	Minimum Amount of Treatment Area Required (sq-ft)	Actual Treatment Area Provided (sq-ft)	V1-Sizing Factor $0.5Q_2$	Volume V1	V2-Sizing Factor $0.5Q_2$	Volume V2
12	112	0.49	0.49	0.075	1601	1700	0.0625	1334	0.045	960

Modular Wetland Treatment Calculations

IMP No.	DMA No.	Basin Area (acre)	Total Tributary Area to Unit (acre)	Maximum Treatment Area Allowable (see Attachment D)
8 (L-4-8)	108	0.46	0.46	0.57
13 (L-4-4)	113	0.14	0.14	0.25
14 (L-4-8)	114	0.47	0.47	0.57
15 (L-4-15)	115	0.87	0.87	0.87

OVERALL VAULT SIZING

IMP No.	DMA No.	Basin Area (acre)	Vault Sizing Factor	Vault Size (cu-ft)
8	108	0.46	0.14	2805
13	113	0.14	0.14	854
14	114	0.47	0.14	2866
15	115	0.87	0.14	5306
IMP #1 through IMP #7, IMP #9 through IMP #11				40188
			TOTAL	52019



BIO CLEAN ROUND RGISB Media Filter (PUBLIC RIGHT-OF WAY)

IMP No.	DMA No.	Basin Area (acre)	Runoff Coefficient "C"	Intensity- (inch/hour)	Required Treatment Flow "Q" (CFS)	BIO-CLEAN Curb Inlet Media Filter Model # (See Appendix D)	Maximum Treatment Flow Capacity of BIO-CLEAN Curb Inlet Media Filter (See Appendix D)
IMP #16	116	0.86	1	0.20	0.17	BC-RGISB-MF-22-24	0.19
IMP #17	117	0.50	1	0.20	0.10	BC-RGISB-MF-22-24	0.19
IMP #18	118	0.24	1	0.20	0.05	BC-RGISB-MF-22-24	0.19
IMP #19	119	0.79	1	0.20	0.16	BC-RGISB-MF-22-24	0.19
IMP #20	120	0.44	0.78	0.20	0.07	BC-RGISB-MF-22-24	0.19

LEGEND:

BIO-RETENTION PLUS VAULT

BIO-RETENTION PLUS HYDROMODIFICATION

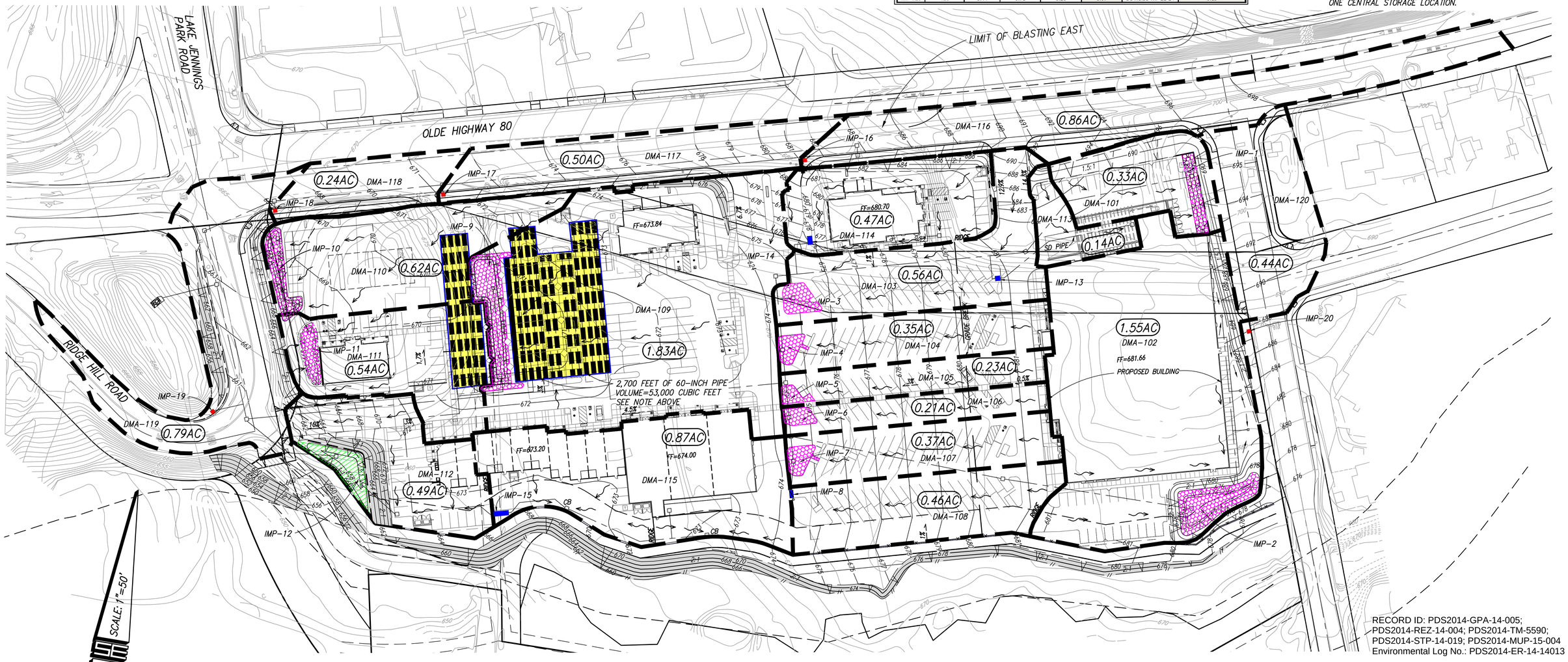
MODULAR WETLAND SYSTEM

60" STORAGE PIPE (SEE SECTION HEREON)

BIO CLEAN ROUND R-GISB

100-YEAR STORM NOTE

THE 100-YEAR STORM VOLUME FOR THE PROPOSED SITE IS APPROXIMATELY 24,000 CUBIC FEET WHICH IS WITHIN THE CAPACITY OF THE PROPOSED STORAGE SYSTEM. IT IS INTENDED THAT THE STORAGE SYSTEM FOR THIS SITE WILL BE MULTI-PURPOSED AND WILL ADDRESS HYDROMODIFICATION AND 100-YEAR FLOW ATTENTION IN ONE CENTRAL STORAGE LOCATION.



RECORD ID: PDS2014-GPA-14-005;
PDS2014-REZ-14-004; PDS2014-TM-5590;
PDS2014-STP-14-019; PDS2014-MUP-15-004
Environmental Log No.: PDS2014-ER-14-14013

SEE FULL SIZE EXHIBIT IN POCKET OF THIS REPORT

REVISED 01-30-15
REVISED 10-29-14

STUART ENGINEERING
7525 METROPOLITAN DRIVE STE. 308
SAN DIEGO, CA 92108 (619) 296-1010
FAX (619) 296-9276 SE@stuartengineering.com

DESIGNER:	NH
DRAWN:	AMJ
DATE:	3-12-14
JOB NO.:	921-13-06