Appendix L

Low Impact Development Plan
Submitted To:
CITY OF LONG BEACH

LOW IMPACT DEVELOPMENT (LID) PLAN

FOR LONG BEACH INDUSTRIAL PARK
LONG BEACH, CA

11/4/2018
Job No. 06.198.000

Prepared For:
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PROACTIVE ENGINEERING CONSULTANTS
I. PROJECT DESCRIPTION

The Long Beach Industrial project is located in the City of Long Beach, Los Angeles County, California. See Vicinity Map – Figure 1. The site is located at Latitude 33° 46' 0.24" North Longitude 118° 6' 8.79" West. The proposed development area is generally bound by industrial facilities to the north east and south and Studebaker Road to the west.

The total project area is approximately 6.6 acres. Existing access to the site is currently provided from Studebaker Road.

A. EXISTING LAND USE

The existing land uses are based on aerial topography and on-site visits of watershed areas. The site is 6.6 acres and served as petroleum facilities and consisted of two large storage tanks and related infrastructure.
The Long Beach Industrial Park is generally bound by industrial development sites. Most flow patterns begin on the northwest side of the project site and flow towards the southeasterly edge of the site. The site is currently bounded by berms designed to contain spills from the previous industrial activities within the site. Runoff from the site is currently routed to the ocean through an existing storm drain pipe.

B. PROPOSED LAND USE

The improvements in the Long Beach Industrial Park will consist of two industrial buildings with loading docks, drive aisles, parking areas and landscape areas.

Stormwater runoff will sheet flow into gutters and be collected by grated inlets which release the flow into Corrugated Metal Pipe (CMP) Underground Water Quality Basin. The CMP Underground Water Quality Basins will convey water to a Modular Wetland System (MWS), a biotreatment type BMP. Runoff generated by the 0.75 inch storm will be captured and treated within the Underground Water Quality Basins and MWS unit. Stormwater runoff generated by storms greater than 0.75 inch storm will bypass the MWS unit and flow to a proposed pump. The proposed pump will convey runoff to the existing storm drain pipe located in the southeast corner of the project site. Prior to entering the Underground Water Quality Basin, runoff will receive pretreatment through the implementation of filter insert in grate inlets. All proposed BMP’s and drainage infrastructure within the Long Beach Industrial Park will be operated and maintained by the Property Owners Association (POA).

II. LOW IMPACT DEVELOPMENT (LID) REQUIREMENTS

In order to protect natural drainage systems, receiving water and other water bodies from development and urban runoff, the Los Angeles County Department of Public Works has developed the Low Impact Development Standards Manual (LID Standards Manual), dated February 2014. This study was performed in accordance with the LID Standards Manual.

A. Project Identification: Designated or Non-Designated

According to the LID Standards Manual, a project can either be classified as Designated or Non-Designated. The Long Beach Industrial Park project is identified as Designated since the following conditions is met: Industrial parks with 10,000 square feet or more of surface area

Table 1 and 2 summarize the source control BMP’s implemented in this project. Source control fact sheets are included in Appendix D.

B. Source Control Measures

Table 1 and 2 summarize the source control BMP’s implemented in this project. Source control fact sheets are included in Appendix D.

C. Non-Source Control Measures

Catch Basin Inspections - Catch basins shall be inspected and cleaned monthly, as part of

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regular landscape maintenance, and more frequently during the rainy season (October 1st through April 30th). Cleaning shall include the removal of debris and sediment in the basin. Prior to rainy season and no later than October 1st of each year, inspect and clean out catch basins. Catch basin should be also inspected after major storm events and cleaned out before the sump is 40% full.

Street Sweeping - Private parking lots and street shall be vacuum swept on a monthly basis, at a minimum. The procedure will be intensified around October 1st of each year prior to the “first flush” storm. It will be the responsibility of the POA to schedule sweeping for these private areas. See Table 1 for a summary of non-structural BMP’s to be implemented.

**TABLE 1: NON-STRUCTURAL SOURCE CONTROL BMPS**

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Included</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>R1</td>
<td>Automobile Repair &amp; Maintenance</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R2</td>
<td>Automobile Washing</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R3</td>
<td>Automobile Parking</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R4</td>
<td>Home &amp; Garden Care Activities</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R5</td>
<td>Disposal of Pet Waste</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>R6</td>
<td>Disposal of Green Waste</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R7</td>
<td>Household Hazardous Waste</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>R8</td>
<td>Water Conservation</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>
### TABLE 2: STRUCTURAL SOURCE CONTROL BMPS

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>If not applicable, state brief reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Included</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>S1</td>
<td>Storm Drain Message and Signage</td>
<td>✗</td>
<td>All catch basins/grated inlets within the project will be stenciled.</td>
</tr>
<tr>
<td>S2</td>
<td>Outdoor Material Storage Area</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Outdoor Trash Storage and Waste Handling Area</td>
<td>✗</td>
<td>Trash enclosed areas are proposed within the project.</td>
</tr>
<tr>
<td>S4</td>
<td>Outdoor Loading/Unloading Dock Area</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>Outdoor Vehicle/Equipment Repair/Maintenance Area</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>Outdoor Vehicle/Equipment/Accessory Washing Area</td>
<td>✗</td>
<td>There are no fuel/maintenance areas within the proposed project.</td>
</tr>
<tr>
<td>S7</td>
<td>Fuel and Maintenance Area</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>S8</td>
<td>Landscape Irrigation Practices</td>
<td>✗</td>
<td>Irrigation practices will be conducted as highlighted in the provided brochure S8.</td>
</tr>
<tr>
<td>S9</td>
<td>Building Materials Selection</td>
<td>✗</td>
<td>Selection of building materials as highlighted in the provided brochure S9.</td>
</tr>
<tr>
<td>S10</td>
<td>Animal Care and Handling Facilities</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>S11</td>
<td>Outdoor Horticulture Areas</td>
<td>✗</td>
<td>Landscape areas will be properly maintained.</td>
</tr>
</tbody>
</table>

**D. Treatment Control Measures**

Stormwater runoff will sheet flow into gutters and be collected by grated inlets which release the
flow into Corrugated Metal Pipe (CMP) Underground Water Quality Basin. The CMP Underground Water Quality Basins will convey water to a Modular Wetland System (MWS), a biotreatment type BMP. The LID Standards Manual requires treatment the stormwater runoff volume of the greater: 0.75-inch, 24-hour event or the 85th percentile, 24-hour rain event. Table 3, summarizes the stormwater runoff volumes of each subarea. Since the 85th percentile storm (0.45 in) is less than the 0.75 inch storm, the 0.75 inch storm is selected as the design storm size.

1. Infiltration Viability

Based on the LID Standards Manual, infiltration BMP’s are appropriate for soils with a minimum in-situ infiltration rate of 0.3 in/hr. If in-situ infiltration rates exceed 2.4 in/hr, then stormwater runoff will need to be fully treated with an upstream stormwater quality control measure prior to infiltration to protect groundwater quality. Locations where the seasonal high groundwater level is within 10 feet of the surface are not allowed to use infiltration type BMPs. Since the existing and proposed site elevations are within or less than 10 feet above sea level, infiltration BMP’s are not feasible. Thus, the project will rely on proprietary biotreatment BMP’s to meet stormwater quality requirements. The proposed water quality system will be designed to capture the required Stormwater Quality Design Volume (SWQDv) generated by the 0.75 inch storm.

2. Stormwater Quality Design Volume (SWQDv) & Basin Sizing Calculations

Hydrocalc, a program created by the County of Los Angeles Department of Public Works Water Resources, was used to calculate the SWQDv. This program enables a user to input the 85th 24-hour or 0.75-inch 24 hr rainfall data along with watershed area, the longest flow path from watershed boundary to outlet, and slope. The program then calculates volume of stormwater runoff that must be retained at a project site. Detailed hydrology calculations are enclosed in Appendix B.

The project was divided into four subareas. Stormwater Quality Volumes were calculated for each of the subareas. Each of these subareas will have a CMP Underground Infiltration Basin. Once the SWQDv was determined, each CMP Underground Infiltration Basin was sized. Sizing of the CMP Underground Infiltration Basins was determined based on the Design Your Own Detention System (DYODS) spreadsheets provided by Contech. The CMP Underground Infiltration Basins are composed of perforated corrugated metal piping. See Table 3 for a summary of calculations. See detailed calculations in Appendix C.

<table>
<thead>
<tr>
<th>TABLE 3: STRUCTURAL SOURCE CONTROL BMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAINAGE AREA</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>W (ft)</td>
</tr>
</tbody>
</table>
E. Rainwater Harvesting

Stormwater runoff harvest is required when a project is not available to retain and treat the SWQDv or ΔSWQDv through infiltration and/or bioretention. The proposed development will treat the stormwater runoff through the implementation of CMP Underground Infiltration Basins. Thus, stormwater runoff harvesting is not required for this project.

F. Hydromodification

As specified in the LID Standards Manual, all projects located within natural drainage systems that have not been improved or drainage systems that are tributary to a natural drainage system are required to implement hydromodification controls. The proposed project is exempt from this requirement since it is not located within natural drainage systems and runoff generated by the project will be routed to an existing storm drain pipe in the southeast corner of the project site. The proposed project is not tributary to a natural drainage system.

G. Pollutants of Concern

The following pollutants are expected from the proposed development. The pollutants of concern are determined based on land use. The pollutants of concern associated with single family residential and multifamily residential land use as specified in the LID Standards Manual are listed below:

- Suspended Solids 14 mg/L
- Total Phosphorus 0.13 mg/L
- Total Nitrogen 1.28 mg/L
- Total Kjeldahl Nitrogen 1.09 mg/L
- Total Cadmium 0.3 ug/L
- Total Copper 6 ug/L
- Total Chromium 2.8 ug/L
- Total Lead 2.5 ug/L
- Zinc 23 ug/L
- Total Zinc 23 ug/L
- Total Cadmium 0.3 ug/L
- Total Kjeldahl Nitrogen 1.09 mg/L

Table 4 show the CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs. Table 4 lists the water bodies the project discharges runoff to. The TMDLs for each pollutant are shown on the table 4.

<table>
<thead>
<tr>
<th>WATER BODY NAME</th>
<th>POLLUTANT</th>
<th>TMDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS CERRITOS ESTUARY</td>
<td>POLLUTANTS NOT LISTED ON 303 (d) LIST</td>
<td>N/A</td>
</tr>
<tr>
<td>ALAMITOS BAY</td>
<td>INDICATOR BACTERIA</td>
<td>TMDL COMPLETION 2019</td>
</tr>
<tr>
<td></td>
<td>OXYGEN DISSOLVED</td>
<td>TMDL COMPLETION 2027</td>
</tr>
<tr>
<td>SAN PEDRO BAY NEAR/OFF SHORE</td>
<td>CHLORDANE</td>
<td>BEING ADDRESSED WITH USEPA APPROVED TMDL</td>
</tr>
<tr>
<td>ZONES</td>
<td>CHLORPYRIFOS</td>
<td>PCB’S (POLYCHLORINATED BIPHENYLS)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>----------------------------------</td>
</tr>
</tbody>
</table>

III. STORMWATER QUALITY DESIGN VOLUME (SWQDV) TREATMENT

As previously described in this report, catch basin filter inserts, CMP Underground Water Quality Basin and MWS Unit will be utilized to mitigate pollutants. The Flo Guard catch basin filter inserts are designed to remove sediment, gross solids, trash and petroleum hydrocarbons. The drain inserts will utilize fossil rock absolvent pouches to achieve maximum pollutant removal efficiency. The drain inserts will serve as pre-treatment as indicated in the Los Angeles County LID manual. The CMP Underground Water Quality Basin will dewater though the MWS unit in less than permitted maximum 96-hour retention time.

A. Inspection and Maintenance Responsibility

Table 5 identifies the entities responsible for long-term inspection and maintenance of all treatment control systems.
### TABLE 5: INSPECTION AND MAINTENANCE RESPONSIBILITY
**LONG BEACH INDUSTRIAL PARK**

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>RESPONSIBLE PARTY</th>
<th>DESCRIPTION OF INSPECTION AND MAINTENANCE ACTIVITY</th>
<th>FREQUENCY OF MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch Basin Stenciling</td>
<td>Property Owners Association (POA) - Has yet to be established.</td>
<td>Stencil above catch basins as required.</td>
<td>Visually inspect every 6 months. Restencil when lettering faded and hard to read but at minimum once every five years.</td>
</tr>
<tr>
<td>Catch Basin Inspection</td>
<td>POA - See above</td>
<td>Inspect and clear catch basins of debris.</td>
<td>Prior to rainy season and no later than October 1st of each year, inspect and clean out catch basins. Catch basin should be also inspected after major storm events and cleaned out before the sump is 40% full.</td>
</tr>
<tr>
<td>Catch Basin Filter Inserts</td>
<td>POA - See above</td>
<td>Inspect and remove sediment and debris.</td>
<td>Prior to rainy season and no later than October 1st of each year, inspect and clean out filter inserts. Filter inserts should be also inspected after major storm events and cleaned out before the sump is 40% full.</td>
</tr>
<tr>
<td>CMP Underground Water Quality Basin</td>
<td>POA - See above</td>
<td>Inspect and remove sediment and debris.</td>
<td>Visually inspect every 6 months.</td>
</tr>
<tr>
<td>Modular Wetland System (MWS) Unit</td>
<td>POA - See above</td>
<td>Inspect and remove sediment and debris. Follow manufacturer's maintenance guidelines.</td>
<td>Visually inspect every 6 months.</td>
</tr>
</tbody>
</table>

**NOTE:**

PROPERTY OWNERS ASSOCIATION (POA) WILL BE RESPONSIBLE FOR MAINTAINING ALL BMP'S.
IV. OPERATIONS AND MAINTENANCE

All treatment control and storm drain systems will be maintained and operated by the POA. Preventive maintenance shall be conducted as specified in Table 6. A sample Drainage Maintenance Covenant is included in Appendix E. See Appendix E for detailed inspections and maintenance guides.
LOW IMPACT DEVELOPMENT PLAN (LID) EXHIBIT
APPENDIX B
STORMWATER QUALITY DESIGN VOLUME (SWQDV) CALCULATIONS
# Peak Flow Hydrologic Analysis

File location: Z:/06.198.000 Long Beach/Hydro/WQMP/SWQDCV/LONG BEACH Report.pdf  
Version: HydroCalc 1.0.2

## Input Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td>LONG BEACH</td>
</tr>
<tr>
<td>Subarea ID</td>
<td>A</td>
</tr>
<tr>
<td>Area (ac)</td>
<td>6.62</td>
</tr>
<tr>
<td>Flow Path Length (ft)</td>
<td>1010.0</td>
</tr>
<tr>
<td>Flow Path Slope (vft/hft)</td>
<td>0.0141</td>
</tr>
<tr>
<td>0.75-inch Rainfall Depth (in)</td>
<td>0.75</td>
</tr>
<tr>
<td>Percent Impervious</td>
<td>0.9</td>
</tr>
<tr>
<td>Soil Type</td>
<td>3</td>
</tr>
<tr>
<td>Design Storm Frequency</td>
<td>0.75 inch storm</td>
</tr>
<tr>
<td>Fire Factor</td>
<td>0</td>
</tr>
<tr>
<td>LID</td>
<td>True</td>
</tr>
</tbody>
</table>

## Output Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeled (0.75 inch storm) Rainfall Depth (in)</td>
<td>0.75</td>
</tr>
<tr>
<td>Peak Intensity (in/hr)</td>
<td>0.1593</td>
</tr>
<tr>
<td>Undeveloped Runoff Coefficient (Cu)</td>
<td>0.1</td>
</tr>
<tr>
<td>Developed Runoff Coefficient (Cd)</td>
<td>0.82</td>
</tr>
<tr>
<td>Time of Concentration (min)</td>
<td>45.0</td>
</tr>
<tr>
<td>Clear Peak Flow Rate (cfs)</td>
<td>0.8649</td>
</tr>
<tr>
<td>Burned Peak Flow Rate (cfs)</td>
<td>0.8649</td>
</tr>
<tr>
<td>24-Hr Clear Runoff Volume (ac-ft)</td>
<td>0.3365</td>
</tr>
<tr>
<td>24-Hr Clear Runoff Volume (cu-ft)</td>
<td>14657.0624</td>
</tr>
</tbody>
</table>

![Hydrograph (LONG BEACH: A)](image)
ISOHYETAL MAPS
APPENDIX C
CONTECH CMP UNDERGROUND WATER QUALITY BASIN CALCULATIONS
### Project Summary
- **Date:** 11/3/2018
- **Project Name:** LONG BEACH - DMA A
- **City / County:** EL SEGUNDO, LOS ANGELES COUNTY
- **State:** Los Angeles
- **Designed By:** Proactive Engineering
- **Company:** Proactive Engineering
- **Telephone:** 951-280-3300

### Corrugated Metal Pipe Calculator
- **Storage Volume Required (cf):** 14,700
- **Limiting Width (ft):** 22.00
- **Invert Depth Below Asphalt (ft):** 14.00
- **Solid or Perforated Pipe:** Solid
- **Shape Or Diameter (in):** 60
- **Number Of Headers:** 2
- **Spacing between Barrels (ft):** 2.50
- **Stone Width Around Perimeter of System (ft):** 1
- **Depth A: Porous Stone Above Pipe (in):** 6
- **Depth C: Porous Stone Below Pipe (in):** 6
- **Stone Porosity (0 to 40%):** 40

### System Sizing
- **Pipe Storage:** 14,746 cf
- **Porous Stone Storage:** 0 cf
- **Total Storage Provided:** 14,746 cf
- **Number of Barrels:** 3
- **Length per Barrel:** 237.0 ft
- **Length Per Header:** 20.0 ft
- **Rectangular Footprint (W x L):** 22. ft x 249. ft

### CONTECH Materials
- **Total CMP Footage:** 751 ft
- **Approximate Total Pieces:** 32 pcs
- **Approximate Coupling Bands:** 33 bands
- **Approximate Truckloads:** 8 trucks

### Construction Quantities**
- **Total Excavation:** 2841 cy
- **Porous Stone Backfill For Storage:** 0 cy stone
- **Backfill to Grade Excluding Stone:** 2295 cy fill

**Construction quantities are approximate and should be verified upon final design.**
MODULAR WETLAND SIZING CALCULATIONS
Modular Wetlands System™ Linear
Biofiltration

Comprehensive Stormwater Solutions

BioClean
A Forterra Company
OVERVIEW

The Bio Clean Modular Wetlands System™ Linear (MWS Linear) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pretreatment, the MWS Linear incorporates an advanced pretreatment chamber that includes separation and prefiltre cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, in turn reducing maintenance costs and improving performance.

The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature’s stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands, our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature’s presence and rejuvenate waterways in urban areas.

PERFORMANCE

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With its advanced pretreatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature’s ability to process, transform, and remove even the most harmful pollutants.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>66%</td>
<td>REMOVAL OF DISSOLVED ZINC</td>
</tr>
<tr>
<td>69%</td>
<td>REMOVAL OF TOTAL ZINC</td>
</tr>
<tr>
<td>38%</td>
<td>REMOVAL OF DISSOLVED COPPER</td>
</tr>
<tr>
<td>64%</td>
<td>REMOVAL OF TOTAL PHOSPHORUS</td>
</tr>
<tr>
<td>45%</td>
<td>REMOVAL OF NITROGEN</td>
</tr>
<tr>
<td>50%</td>
<td>REMOVAL OF TOTAL COPPER</td>
</tr>
<tr>
<td>95%</td>
<td>REMOVAL OF MOTOR OIL</td>
</tr>
<tr>
<td>67%</td>
<td>REMOVAL OF ORTHO PHOSPHORUS</td>
</tr>
<tr>
<td>85%</td>
<td>REMOVAL OF TSS</td>
</tr>
</tbody>
</table>
APPROVALS

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world.

WASHINGTON STATE TAPE APPROVED
The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft² loading rate. The highest performing BMP on the market for all main pollutant categories.

DEQ ASSIGNMENT
The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Regulation technical criteria.

MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVED
Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP EVALUATION
The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

RHODE ISLAND DEM APPROVED
Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR
OPERATION

The MWS Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure 1 and Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

PRETREATMENT

1. PREPARATION

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

2. PRE-FILTER CARTRIDGES

- Over 25 sq. ft. of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber
2x to 3x more surface area than traditional downward flow bioretention systems.

**BIOFILTRATION**

**HORIZONTAL FLOW**
- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

**PATENTED PERIMETER VOID AREA**
- Vertically extends void area between the walls and the WetlandMEDIA on all four sides
- Maximizes surface area of the media for higher treatment capacity

**WETLANDMEDIA**
- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

**DISCHARGE**

**FLOW CONTROL**
- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media’s capacity
- Extends the life of the media and improves performance

**DRAINDOWN FILTER**
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated
CONFIGURATIONS

The MWS Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available “pipe-in” options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

**CURB TYPE**
The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.

**GRATE TYPE**
The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.

**VAULT TYPE**
The system’s patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the “pipe-in” design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

**DOWNSPOUT TYPE**
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.
ORIENTATIONS

SIDE-BY-SIDE
The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END
The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)
The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system’s treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

EXTERNAL DIVERSION WEIR STRUCTURE
This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN
This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION
This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the MWS Linear to be installed anywhere space is available.
The MWS Linear can be used in stand-alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

<table>
<thead>
<tr>
<th>MODEL #</th>
<th>DIMENSIONS</th>
<th>WETLANDMEDIA SURFACE AREA (sq.ft.)</th>
<th>TREATMENT FLOW RATE (cfs)</th>
</tr>
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<tbody>
<tr>
<td>MWS-L-4-4</td>
<td>4’ x 4’</td>
<td>23</td>
<td>0.052</td>
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<tr>
<td>MWS-L-4-6</td>
<td>4’ x 6’</td>
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<td>0.073</td>
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<td>MWS-L-4-8</td>
<td>4’ x 8’</td>
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<td>MWS-L-4-13</td>
<td>4’ x 13’</td>
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<td>0.144</td>
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<tr>
<td>MWS-L-4-15</td>
<td>4’ x 15’</td>
<td>76</td>
<td>0.175</td>
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<tr>
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<td>4’ x 17’</td>
<td>90</td>
<td>0.206</td>
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<tr>
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<td>103</td>
<td>0.237</td>
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<td>4’ x 21’</td>
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<tr>
<td>MWS-L-6-8</td>
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<td>MWS-L-8-8</td>
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<td>0.230</td>
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<td>0.577</td>
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<tr>
<td>MWS-L-8-24</td>
<td>9’ x 25’</td>
<td>302</td>
<td>0.693</td>
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</table>
Many states require treatment of a water quality volume and do not offer the option of flow-based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume-based design installed downstream of ponds, detention basins, and underground storage systems.

### SPECIFICATIONS

#### VOLUME-BASED

<table>
<thead>
<tr>
<th>MODEL #</th>
<th>TREATMENT CAPACITY (cu. ft.) @ 24-HOUR DRAINDOWN</th>
<th>TREATMENT CAPACITY (cu. ft.) @ 48-HOUR DRAINDOWN</th>
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<tbody>
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<tr>
<td>MWS-L-8-24</td>
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</table>
APPLICATIONS

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system’s superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

**INDUSTRIAL**
Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

**STREETS**
Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

**COMMERCIAL**
Compared to bioretention systems, the MWS Linear can treat far more area in less space, meeting treatment and volume control requirements.

**RESIDENTIAL**
Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

**PARKING LOTS**
Parking lots are designed to maximize space and the MWS Linear’s 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

**MIXED USE**
The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable “live-work” spaces.

More applications include:
- Agriculture
- Reuse
- Low Impact Development
- Waste Water
**PLANT SELECTION**

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What’s not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature’s secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the MWS Linear’s micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

**INSTALLATION**

The MWS Linear is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

**MAINTENANCE**

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pretreatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What’s left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.
APPENDIX D
SOURCE CONTROL BMP'S
STRUCTURAL BMP’S
S-1: Storm Drain Message and Signage

Purpose

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

General Guidance

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

Design Specifications

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.

- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., "No Dumping – Drains to the Ocean") are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

Maintenance Requirements

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner’s association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.
S-1: Storm Drain Message and Signage

NOTES:
1. STORM DRAIN MESSAGE SHALL BE APPLIED IN SUCH A WAY AS TO PROVIDE A CLEAR, LEGIBLE IMAGE.
2. STORM DRAIN MESSAGE SHALL BE PERMANENTLY APPLIED DURING THE CONSTRUCTION OF THE CURB AND GUTTER USING A METHOD APPROVED BY THE LOCAL AGENCY.

Figure D-1. Storm Drain Message Location – Curb Type Inlet

Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet
S-3: Outdoor Trash Storage and Waste Handling Area

Purpose

Stormwater runoff from areas where trash is stored or handled can be polluted. Loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or receiving waters. Waste handling operations (i.e., dumpsters, litter control, waste piles) may be sources of stormwater pollution.

Design Specifications

Wastes from commercial and industrial sites are typically hauled away for disposal by either public or commercial carriers that may have design or access requirements for waste storage areas. Design specifications for waste handling areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. The design specifications, listed below in Table D-3, are recommendations and are not intended to conflict with requirements established by the waste hauler. The design specifications are intended to enhance local codes and ordinances while addressing stormwater runoff concerns. The waste hauler should be contacted prior to the design of trash storage and collection areas to determine established and accepted guidelines for designing trash collection areas. All hazardous waste must be handled in accordance with the legal requirements established in Title 22 of the California Code of Regulations. Conflicts or issues should be discussed with LACDPW staff.

Table D-3. Design Specifications for Outdoor Trash Storage and Waste Handling Area

<table>
<thead>
<tr>
<th>Design Feature</th>
<th>Design Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surfacing</td>
<td>• Construct/pave outdoor trash storage and waste handling area with Portland cement concrete or an equivalent impervious surface.</td>
</tr>
<tr>
<td>Screens/Covers</td>
<td>• Install a screen or wall around trash storage area to prevent off-site transport of loose trash.</td>
</tr>
<tr>
<td></td>
<td>• Use lined bins or dumpsters to reduce leaking of liquid wastes.</td>
</tr>
<tr>
<td></td>
<td>• Use waterproof lids on bins/dumpsters or provide a roof to cover storage area enclosure (LACDPW discretion) to prevent precipitation from entering containers.</td>
</tr>
<tr>
<td>Grading/Drainage</td>
<td>• Berm and/or grade waste handling area to prevent stormwater run-on.</td>
</tr>
<tr>
<td></td>
<td>• Locate waste handling area at least 35 feet from storm drains.</td>
</tr>
<tr>
<td></td>
<td>• Divert drainage from adjoining roofs and pavement away from adjacent trash storage areas.</td>
</tr>
<tr>
<td>Signs</td>
<td>• Post signs on all dumpsters and/or inside enclosures prohibiting disposal of liquids and hazardous materials in accordance with any waste disposal ordinance.</td>
</tr>
</tbody>
</table>
S-3: Outdoor Trash Storage and Waste Handling Area

Accumulated Water

Stormwater runoff, non-stormwater runoff, and spills will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and regulations, and cannot be discharged directly to the storm drain or sanitary sewer system without appropriate permitting. Contact LACDPW (1-888-CLEAN-LA) for information regarding discharge of contaminated accumulated water.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g., screens, covers, signs) must be maintained by the owner/operator as required by local codes and ordinances. Outdoor trash storage and waste handling areas must be checked periodically to ensure containment of accumulated water and prevention of stormwater run-on. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.
S-8: Landscape Irrigation Practices

Purpose

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

General Guidance

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

Design Specifications

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.\(^1\) The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

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\(^1\) If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.
For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.²

- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

**Maintenance Requirements**

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

² As determined by the City of Los Angeles, Building and Safety Division
S-9: Building Materials Selection

Purpose

Building materials can potentially contribute pollutants of concern to stormwater runoff through leaching. For example, metal buildings, roofing, and fencing materials may be significant sources of metals in stormwater runoff, especially due to acidic precipitation. The use of alternative building materials can reduce pollutant sources in stormwater runoff by eliminating compounds that can leach into stormwater runoff. Alternative building materials may also reduce the need to perform maintenance activities (i.e., painting) that involve pollutants of concern, and may reduce the volume of stormwater runoff. Alternative materials are available to replace lumber and paving.

Design Specifications

Lumber

Decks and other house components constructed using pressure-treated wood that is typically treated using arsenate, copper, and chromium compounds are hazardous to the environment. Pressure-treated wood may be replaced with cement-fiber or vinyl.

Roofs, Fencing, and Metals

Minimizing the use of copper and galvanized (zinc-coated) metals on buildings and fencing can reduce leaching of these pollutants into stormwater runoff. The following building materials are conventionally made of galvanized metals:

- Metal roofs;
- Chain-link fencing and siding; and
- Metal downspouts, vents, flashing, and trim on roofs.

Architectural use of copper for roofs and gutters should be avoided. As an alternative to copper and galvanized materials, coated metal products are available for both roofing and gutter application. Vinyl-coated fencing is an alternative to traditional galvanized chain-link fences. These products eliminate contact of bare metal with precipitation or stormwater runoff, and reduce the potential for stormwater runoff contamination. Roofing materials are also made of recycled rubber and plastic.

Green roofs may be an option. Green roofs use vegetation such as grasses and other plants as an exterior surface. The plants reduce the velocity of stormwater runoff and absorb water to reduce the volume of stormwater runoff. One potential problem with using green roofs in the Los Angeles County area is the long, hot and dry summers, which may kill the plants if they are not watered. See the Green Roof Fact Sheet (RET-7) in Appendix E.
Pesticides

The use of pesticides around foundations can be reduced through the use of alternative barriers. Sand barriers can be applied around foundations to deter termites, as they cannot tunnel through sand. Metal shields also block termites from tunneling. Additionally, diatomaceous earth can be used to repel or kill a wide variety of other pests.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g., signs) must be maintained by the owner/operator as required by local codes and ordinances. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.
S-11: Outdoor Horticulture Areas

Purpose

Horticulture areas may potentially contribute nutrients, bacteria, organics, sediment, and other pollutants to the stormwater runoff. Irrigation runoff provides a pathway for pollutants to enter the storm drain system. Implementation of source control measures can reduce the potential for pollutant mobilization from outdoor horticulture areas into stormwater runoff.

General Guidance

- Do not allow wash water from the horticulture area to drain directly to the storm drain system or receiving waters.

Maintenance Requirements

Preventative maintenance includes weeding, pruning back excess plant growth, and removing leaf and other debris. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.
NON-STRUCTURAL BMP’S
R-1
AUTOMOBILE REPAIR AND MAINTENANCE

Automobile repair and maintenance activities have the potential to contribute directly to storm drain systems primarily through spills or the dumping of waste fluids being conveyed to the storm drain. Automotive fluids, such as oils, greases, and solvents, are hydrocarbon based, and may contain metals, chlorinated hydrocarbons, and other toxic compounds. Removal of caked dirt and grime from an automobile increases the sediment load to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting automobile repair and maintenance activities. Remember - The ocean starts at your front door.

Required Activities

- Recycle used oil and antifreeze by taking them to service stations and other recycling centers. Never pour oil in storm drains or other areas.

- Do not perform repair and maintenance activities during rain events.

- Immediately clean up and contain any spills. Dispose of all waste and adsorbent materials properly.

- Store hazardous materials and wastes (including, but not limited to, fluids, solvents, parts containing fluids, batteries) indoors, under cover, or in watertight containers.

- Perform automobile maintenance and repairs over impervious surfaces such as concrete, so spills and waste material should be readily cleaned up. Use drip pans, plastic sheeting, etc. to contain spills and waste material.

- Dispose of cleaning solvents at the designated hazardous waste center.

Recommended Activities

- Conduct auto repair activities at a commercial repair facility
- Perform automobile repair and maintenance activities under a covered area.
- Do not buy fluids containing target pollutants (e.g. degreasers containing PERC).
- Monitor parked or stored vehicles and equipment for leaks and place pans under leaks to collect fluids for proper disposal or recycling.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600 Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
Automobile washing activities have the potential to contribute pollutants because road dust washed from vehicles may contain metals and hydrocarbons. Any leaking fluids washed from the automobile may be carried to the storm drain by the wash water. Detergents used for automobile washing may also contain phosphorus and foaming agents, which contribute to the eutrophication of receiving waterbodies. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting automobile washing activities. Remember - The ocean starts at your front door.

Required Activities

- Shake floor mats into trashcan or vacuum to clean. Do not shake over ground.

- If using cleaners (such as acid based wheel cleaners) use a rag to wipe them on and off, do not rinse them off with water.

- If possible, divert runoff from automobile washing to a grassy surface large enough to contain and allow complete infiltration

- Dispose of excess wash water into the sanitary sewer (i.e. via sink, or toilet) or onto a landscaped area that will allow for complete infiltration.

- Conduct engine degreasing at a commercial facility that is set up to handle that type of waste.

Recommended Activities

- When possible, use commercial wash facilities
- Wash vehicles over pervious surfaces such as lawns and gravel areas
- Choose soaps, cleaners, or detergents labeled “non-toxic”, “phosphate free”, or “biodegradable”. Vegetable and citrus-based products are typically safest for the environment.
- Turn off water when not actively washing down automobile.
- If available, use established neighborhood wash areas, where runoff is properly controlled and managed.

The activities outlined in this fact sheet target the following pollutants:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Outcome</th>
</tr>
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R-3
AUTOMOBILE PARKING

Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before parking your car. Remember - The ocean starts at your front door.

Required Activities

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.

- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.

- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

Recommended Activities

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).

- Limit vehicle parking to covered areas.

- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

The activities outlined in this fact sheet target the following pollutants:

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HOME AND GARDEN CARE ACTIVITIES

HOME CARE

Many hazardous materials may be used in and around residences during routine maintenance activities (such as: oils, paints, cleaners, bleaches, pesticides, glues, solvents, and other products). Improper or excessive use of these products can increase the potential for pollutants to be transported to the storm drain by runoff. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting home care activities. Remember - The ocean starts at your front door.

Required Activities

- Clean out painting equipment in an area where the waste can be contained and properly disposed of (latex – sewer, oil based – household hazardous waste center).

- Rinse off cement mixers and cement laden tools in a contained washout area. Dispose of dried concrete waste in household trash.

- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers. Dispose of them at a household hazardous waste center.

- Household wash waters (e.g. washer machine effluent, mop water, etc.) must be disposed of in the sanitary sewer.

- Pool and spa water may be discharged to the storm drain if residual chlorine is less than 0.1 mg/L, the pH is between 6.5 and 8.5, and the water is free from any unusual coloration. (Call 714-834-6107 to obtain information on a pool drain permit). Pool filter media must be contained and disposed of properly.

Recommended Activities

- Only purchase the types and amounts of materials needed.
- Share unused portions of products with neighbors or community programs (latex paint)

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
GARDEN CARE

Garden activities may contribute pollutants via soil erosion, green waste, fertilizer and pesticide use. Plant and garden care activities such as landscape maintenance, fertilization, and pesticide application have the potential to discharge significant quantities of pollutants to the storm drain system. Nonvegetated surfaces may allow for significant erosion leading to high sediment loads. Other pollutants such as pesticides may adsorb onto the soil particles and be transported off-site. Excess fertilizer and pesticide pollutants from over application may be carried to the storm drain by dissolving in irrigation runoff or rainwater. Green wastes may also contain organic matter and may have adsorbed fertilizers and pesticides.

Excessive irrigation is often the most significant factor in home and garden care activities. Pollutants may dissolve in irrigation water and then be transported to the storm drain, or particles and materials coated with fertilizers and pesticides may be suspended in the irrigation flow and carried to the storm drain. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting garden care activities. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Minimize the use of pesticides and fertilizers. Read the labels and follow directions to avoid improper use. Do not apply chemicals if it is windy or about to rain.
- Properly clean up and dispose of spills of gardening chemicals, fertilizers, or soils. If possible, return the spilled material to the container for future use.
- Lawn and garden care products must be stored in closed labeled containers, in covered areas, or off-ground and under protective tarps.
- Household hazardous waste must be properly disposed at a household hazardous waste center.
- Cover nonvegetated surfaces to prevent erosion.

Recommended Activities

- Utilize xeriscaping and use of drought and insect resistant landscaping.
- Cultivate garden often to control weeds
- Use integrated pest management (IPM). Planting pest repelling plants (e.g. Marigolds) or using pest eating insects (e.g. ladybugs) may reduce the need for pesticides.
- Do not leave food (human or pet) outside overnight
- Remove fruit and garden waste

For additional information contact:
County of Orange, OC Watershed
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or visit our website at: www.ocwatersheds.com
**R-5**  
**DISPOSAL OF PET WASTES**

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

**Required Activities**

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.

- Properly dispose of unused flea control products (shampoo, sprays, or collars).

- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.

- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.

- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.

- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

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For additional information contact:  
County of Orange, OC Watershed  
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL  
or visit our website at: [www.ocwatersheds.com](http://www.ocwatersheds.com)
• Install gutters that will divert roof runoff away from livestock areas.

Recommended Activities

• In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.

• Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.

• Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.

• Maintain healthy and vigorous pastures with at least three inches of leafy material.

• Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.

• Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant from nearby creeks or storm drains.

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County of Orange, OC Watershed
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or visit our website at: www.ocwatersheds.com
Green wastes entering the storm drain may clog the system creating flooding problems. Green wastes washed into receiving waters create an oxygen demand as they are decomposed, reducing the available oxygen for aquatic life. Pesticide and nutrient residues may be carried to the receiving water with the green wastes. The pollution prevention activities outlined in this fact sheet are used to prevent the discharge of pollutants to the storm drain system.

Think before disposing of any green wastes – Remember - The ocean starts at your front door.

Required Activities

- Green wastes can not be disposed of in the street, gutter, public right-of-way, storm drain, or receiving water. Dispose of green wastes as a part of the household trash. If the quantities are too large, arrange a pick up with the local waste hauler.

- After conducting yard or garden activities sweep the area and properly dispose of the clippings and waste. Do not sweep or blow out into the street or gutter.

Recommended Activities

- Utilize a commercial landscape company to conduct the landscape activities and waste disposal.

- Utilize native plants and drought tolerant species to reduce the water use and green waste produced.

- Use a lawn mower that has a mulcher so that the grass clippings remain on the lawn and do not have to be collected and disposed of.

- Compost materials in a designated area within the yard.

- Recycle lawn clippings and greenery waste through local programs if available.

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For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember – The ocean starts at your front door.

**Required Activities**

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.

- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.

- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

**Recommended Activities**

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

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For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatershed.com
WATER CONSERVATION

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.

- Do not hose off outside surfaces to clean, sweep with a broom instead.

Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.

- Use xeriscaping and drought tolerant landscaping to reduce the watering needs.

- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.

- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.

- Wash automobiles at a commercial car wash employing water recycling.

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County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
TREATMENT CONTROL BMP’S
CMP UNDERGROUND INFILTRATION BASIN
Corrugated Metal Pipe Infiltration System

Solutions Guide
Stormwater Solutions from Contech

Selecting the Right Stormwater Solution Just Got Easier...

It’s simple to choose the right stormwater solution to achieve your goals with the Contech Stormwater Solutions Staircase. First, select the runoff reduction practices that are most appropriate for your site, paying particular attention to pretreatment needs. If the entire design storm cannot be retained, select a treatment best management practice (BMP) for the balance. Finally, select a detention system to address any outstanding downstream erosion.

Learn more about all of our stormwater technologies at www.ContechES.com/stormwater

DYODS Design Your Own Detention or Infiltration System

The Contech Design Your Own Detention System (DYODS™) tool fully automates the layout process for stormwater detention and infiltration systems and produces CAD and PDF files that can be used for creating plans and specs, and for estimating total installed costs.

To use the Design Your Own Detention or Infiltration System tool, visit: www.ContechES.com/DYODS
Subsurface Infiltration as a Stormwater Management Strategy

The only sure way to eliminate stormwater pollution is to eliminate stormwater runoff. In recognition of this fact, Green Infrastructure and Low Impact Development based stormwater management regulations prioritizing runoff reduction have proliferated throughout the United States. Where site conditions allow, infiltration is typically the most cost effective and reliable runoff reduction approach. In urban environments where there are competing demands for land, subsurface infiltration can provide many of the benefits of landscape based systems but without requiring dedicated land area. Infiltration systems are commonly comprised of a pretreatment component designed to remove sediment, trash, and oil, followed by plastic, metal or concrete storage units surrounded by permeable stone creating a high voids storage gallery. Infiltration systems are typically designed to support vehicular loading and to withstand lateral pressures from surrounding soil that allows the overlying land to be used for virtually any non-building application.

Subsurface infiltration meets the objectives of LID by reducing runoff with the added benefit of saving land space in urban environments.

Learn more at www.ContechES.com/cmp-detention
The purpose of the storage vessel is to hold stormwater runoff underground while allowing it to infiltrate the surrounding soil. For the majority of applications, corrugated metal pipe (CMP) is the “go to” material for subsurface infiltration.

- 75+ year service life guidance for certain materials/coatings in recommended environments.
- Various pipe coatings and materials are available to accommodate site-specific needs: Aluminized Steel Type 2 (ALT2), Galvanized, CORLIX® Aluminum, and Polymer Coated.
- Wide range of gages, corrugations, and shapes, in diameters 12” – 144”.
- Pipe can be fully or partially perforated for infiltration, retention, or groundwater recharge applications.
- Custom access risers and manifolds provide direct access for maintenance.
- Outlet control devices can be incorporated within the system, eliminating the need for a separate structure.
- Customizable - a variety of fittings allow CMP to match most layout configurations.
- May be designed for heavy loading and high maximum cover.
- Contributes to LEED points.
- Available locally, quick turnaround time.
- The most economical installed solution.

With its low cost, a wide variety of diameters, layout configurations, and materials, no other material can match CMP’s flexibility and versatility.

* Service life guidance provided by National Corrugated Steel Pipe Association (NCSPA) and/or AK Steel Corporation. See NCSPA.org website or consult your engineer of record for additional information on service life, recommended environments and field studies on various materials and coatings. Corrosive environments, such as seawater and road/de-icing salt infiltration, and other environments with pH and resistivity outside of the recommended range may cause premature corrosion and reduce actual service life. Because site conditions vary, Contech does not guarantee or warrant service life guidance for materials and coatings.
Addressing the Question of Longevity

Some engineers are hesitant to use corrugated metal pipe (CMP) for infiltration because they have heard about CMP drainage culverts that have corroded due to abrasion. Factors affecting longevity differ between culvert and infiltration applications. Culverts experience high velocity flows carrying abrasive sediment, which can wear off galvanized coatings used in older CMP culverts. Infiltration systems are designed for storage rather than conveyance, so velocity and abrasive forces are minimized. In addition, improved CMP coatings, such as Aluminized Type 2 (ALT2), are more abrasion resistant and have demonstrated superior in-ground performance against abrasion in long-term durability studies. Field studies also have indicated that ALT2 coating may extend service life in wider pH and resistivity ranges than galvanized coatings. Confirming and maintaining recommended environmental conditions helps ensure system longevity projected by the long term studies. Finally, properly designed infiltration systems include pretreatment, flow control and a stone backfill envelope that can reduce exposure to abrasion.

- National Corrugated Steel Pipe Association (NCSBA) service life guidance of 75+ years for certain materials/coatings in recommended environments.
- CMP infiltration systems can be designed to meet HS-20 or greater load requirements with proper depths of cover.
- With low flows, CMP infiltration systems have little susceptibility to abrasion inside the pipe that holds stormwater runoff.
- Various pipe coatings and materials are available to accommodate site-specific needs: Aluminized Steel Type 2 (ALT2), Galvanized, CORLIX® Aluminum, and Polymer Coated.
- CMP infiltration systems are to be surrounded by clean crushed rock to provide increased storage capacity and reduce contact with native soils. The entire system may be wrapped with fabric or liner on the sides and top to help further reduce contact with native soils.
- CMP infiltration systems may be used in wide range of recommended environments. AK Steel Corporation’s field studies and technical guidance indicate 75 year service life guidance for 16 gage Alt2 for pH of 5-9 and resistivity greater than 1,500 ohm-cm and 100 year service life guidance for 16 gage Alt2 for pH of 6-8 and resistivity greater than 5,000 ohm-cm.
- Corrosive environments, such as seawater and road/de-icing salt infiltration, acidic minewater, and sanitary sewage, and other environments with pH and resistivity outside of the recommended range may cause premature corrosion and reduce actual service life.
- Infiltration systems are to be inspected and maintained in accordance with Contech’s guidelines. See CMP Detention/Infiltration Design Guide for additional information on CMP infiltration systems.

Learn more at www.ContechES.com/cmp-detention
Maximizing Vertical Space: Every Inch Counts

One of the most overlooked advantages of CMP is its ability to maximize vertical storage space. Increasing the depth of a CMP infiltration system allows for more water storage in the same footprint. For example, doubling the diameter of pipe yields four times as much storage volume in the pipe. This provides a significant cost savings per cubic foot of storage. In addition, more vertical storage space means a smaller footprint, less excavation, and lower project costs.

Contech's Corrugated Metal Pipe Detention systems maximize vertical storage space.

Sizing

Round Pipe – CMP → 6-in to 144-in

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Alternative Materials for Subsurface Infiltration

There may be instances where alternative materials are needed for subsurface infiltration due to site specific needs.

**Plastic Chambers**

Plastic chambers are best suited to shallow depth applications; minimum cover is 18 inches, and maximum cover is 96 inches. Some benefits of chambers are:

- Chambers may be beneficial for sites with limited vertical storage.
- Lightweight and installed by hand.
- Heavy equipment is not required to set units into place.
- Centralized stocking locations for short lead times.

**Concrete Structures/Vaults**

Some concrete structures and vaults are best suited for high loading applications such as railroads or airports. Concrete units are also ideal in corrosive environments or areas with high salinity. Some benefits of concrete structures are:

- Wide range of spans and heights.
- Greater underground infiltration storage in a smaller footprint.
- Ample and easy maintenance access.
- Fast installation.

Learn more at www.ContechES.com/cmp-detention
Edie and Lew Wasserman Building, UCLA
Westwood, California
- The new six-story, 100,000 square foot Edie and Lew Wasserman Building was built on a very dense site that needed to meet sustainability requirements.
- The design needed to maximize infiltration volume, match existing inverts, and work around existing utilities.
- The stormwater management systems included a CDS pretreatment system and a CMP infiltration system using 57” of 72” perforated CMP.
- Perforated CMP was selected to avoid utilities, minimize excavation, meet the City of LA LID requirements, contribute to the building’s LEED certification, and to provide space for the buildings “outdoor room” and gardens.

Creative Office Space
El Segundo, California
- A stormwater infiltration solution was needed for a new group of office buildings.
- The owner wanted to maximize the use of the parking area in the urban setting.
- The site had a tight footprint and multiple utility constraints, requiring the design of five separate systems.
- A total of 860 LF of perforated CMP was installed providing of 25,265 CF of storage.
- Perforated CMP was selected for its design flexibility, cost effectiveness, and ease of installation.

City Center Regional Stormwater Facility
Mountlake Terrace, Washington
- The city of Mountlake Terrace, Washington needed a new stormwater retention facility to provide stormwater treatment and downstream flood control.
- There was limited footprint for 80,000 CF of runoff, and the system was required to be very deep, with about 15’ of cover.
- Engineers designed a system consisting of a CDS pretreatment system in front of 800 linear feet of 120” diameter, perforated, aluminized type 2 CMP that allows the runoff to slowly infiltrate the surrounding soil.
- Perforated CMP was selected for its ability to accommodate the deep bury, the relatively small footprint, and cost effectiveness.
The Right Partner Can Make All the Difference

Regardless of your project’s objectives and constraints, our team of stormwater design engineers, regulatory managers, and local stormwater consultants are here to provide you with expert advice and assistance. If your goal is to eliminate or detain runoff, you can rely on Contech for a wide range of subsurface infiltration, detention, and rainwater harvesting solutions. If treatment is needed, our landscape-based biofiltration or subsurface filtration designs can fit into virtually any site and can be tailored to address specific pollutants.

At every stage of your project, count on Contech to provide engineering services including:

- Regulatory guidance and permitting assistance
- Preliminary standard details and/or site specific final CAD drawings and specifications
- Law Impact Development design assistance
- Engineering calculations for hydraulics/hydrology, rainwater harvesting, and detention/retention
- Online “Design Your Own” tools
- Review of preliminary site design, feasibility screening, and layout assistance
- Value engineering – cost estimates and options analysis
- Pre-construction support, project scheduling, and contractor coordination
- Installation and construction support
- Maintenance support:
  » Guidance manuals
  » Demonstrations
  » Qualified contractor identification

The result: an efficient design process, the right product, greater land space savings, and faster permitting. The entire Contech stormwater team welcomes the opportunity to work with you on your stormwater projects.

To get started, please visit www.conteches.com/local/resources or call us at 800-338-1122.
Dig Deeper

Find all the information you need at www.ContechES.com, including field and laboratory test results, approvals, brochures, design guides, standard details, and specifications within the product section of our site.

Connect with Us

We’re here to make your job easier – and that includes being able to get in touch with us when you need to. Go to www.ContechES.com/ConnectwithContech.

While you’re there, be sure to check out our upcoming seminar schedule or request an in-house technical presentation.

Start a Project

If you are ready to begin a project, contact your local representative to get started. Or you can check out our design toolbox for all our online resources at www.ContechES.com/designtoolbox.

Links to Stormwater Tools:

To use the Land Value Calculator, visit: www.ContechES.com/LVC
(look under the Stormwater Management section to download the Land Value Calculator)

To use the Design Your Own Detention System tool, visit: www.ContechES.com/dyods

To use the Design Your Own Hydrodynamic Separator tool, visit: www.ContechES.com/dyonds

To use the Rainwater Harvesting Runoff Reduction Calculator tool, visit: www.ContechES.com/rwh-calculator

To use the LID Site Planner, visit: www.ContechES.com/LIDsiteplanner
DRAIN INSERTS
Drain Inserts

Description
Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience
The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages
- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations
Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines
Refer to manufacturer’s guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations
- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics

Removal Effectiveness
See New Development and Redevelopment Handbook-Section 5.
one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where settling occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations
Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance
Few products have performance data collected under field conditions.

Siting Criteria
It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines
Follow guidelines provided by individual manufacturers.

Maintenance
Likely require frequent maintenance, on the order of several times per year.

Cost
- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998
FloGard +Plus is a catch basin insert filter designed to remove sediment, gross solids, trash, and petroleum hydrocarbons from stormwater runoff. FloGard +Plus is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas. Rated filter flow capacities are designed to exceed the required “first flush” treatment flow rate, and the unique dual-bypass design typically exceeds catch basin inlet capacity.

**How It Works:**
Flows entering the unit pass through the filter liner basket for removal of sediment, trash, and debris. Optional Fossil Rock™ sorbent pouches installed in the basket effect hydrocarbon capture. As the storm flow exceeds the treatment flow rate, treatment will continue and excess flows will pass through the dual-bypass openings near the top of the unit.

**Economical Treatment**
Quick, easy, and cost-effective to install, inspect, and maintain.

**Efficient Performance**
Removes pollutants at the inlet where they are easiest to catch.

**Versatile Applications**
Appropriate and easy to use on new construction or retrofit projects.

**Flexible Design**
Available in a wide variety of sizes and configurations, including custom options.

**Durable Construction**
Built to last and withstand the loads from captured pollutants.

**Environmentally Friendly**
No standing water minimizes vector, bacteria, and odor problems.

**Proven Performance**
Field and laboratory tested with up to 86%\(^1\) removal of TSS and 80%\(^2\) removal of oils and grease.

---

1. University of Auckland laboratory testing of local street sweep material.
2. UCLA laboratory study.
FloGard +Plus Catch Basin Insert Filter

Catch basin insert designed to capture sediment, gross solids, trash, and petroleum hydrocarbons from low (first flush) flows, even during the most extreme weather conditions.

Example Types, Sizes, and Capacities

Additional sizes, including regional and custom options are available.

**FloGard Combination Inlet**

<table>
<thead>
<tr>
<th>SPECIFIER CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL NO.</td>
</tr>
<tr>
<td>INLET ID</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>FGP-1635FGO6</td>
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<tr>
<td>FGP-1836FGO6</td>
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<tr>
<td>FGP-2234FGO6</td>
</tr>
<tr>
<td>FGP-2436FGO6</td>
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**FloGard Flat Grated Inlet**

<table>
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</thead>
<tbody>
<tr>
<td>MODEL NO.</td>
</tr>
<tr>
<td>INLET ID</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>FGP-12F</td>
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<tr>
<td>FGP-2436F</td>
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<tr>
<td>FGP-2448F</td>
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</tr>
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<td>FGP-1633F</td>
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<td>FGP-2234F</td>
</tr>
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</table>

**FloGard Circular Grated Inlet**

<table>
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<th>SPECIFIER CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL NUMBER</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
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<td>FGP-RF15F</td>
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<td>FGP-RF18F</td>
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<tr>
<td>FGP-RF20F</td>
</tr>
<tr>
<td>FGP-RF21F</td>
</tr>
<tr>
<td>FGP-RF22F</td>
</tr>
<tr>
<td>FGP-RF24F</td>
</tr>
<tr>
<td>FGP-RF30F</td>
</tr>
<tr>
<td>FGP-RF36F</td>
</tr>
</tbody>
</table>

Visit our website: oldcastlestormwater.com or call (800) 579-8819 for additional sizes and options.
APPENDIX E
MAINTENANCE COVENANT
TO BE COMPLETED DURING FINAL ENGINEERING
COVENANT AND AGREEMENT
REGARDING THE MAINTENANCE OF LOW IMPACT DEVELOPMENT (LID) & NATIONAL POLLUTANTS DISCHARGE ELIMINATION SYSTEM (NPDES) BMPs

The undersigned, ________________________________________ ("Owner"), hereby certifies that it owns the real property described as follows ("Subject Property"), located in the County of Los Angeles, State of California:

LEGAL DESCRIPTION

ASSESSOR’S ID #: ----- TRACT NO. ----- LOT NO. ----- 

ADDRESS: __________________________________________ 

Owner is aware of the requirements of the County of Los Angeles’ Green Building Standards Code, Title 31, Section 4.106.4 (LID), and National Pollutant Discharge Elimination System (NPDES) permit. The following post-construction BMP features have been installed on the Subject Property:

☐ Porous pavement
☐ Cistern/rain barrel
☐ Infiltration trench/pit
☐ Bioretention or biofiltration
☐ Rain garden/planter box
☐ Disconnect impervious surfaces
☐ Dry Well
☐ Storage containers
☐ Landscaping and landscape irrigation
☐ Green roof
☒ CMP UNDERGROUND WATER QUALITY BASINS
☐ DRAIN INSERT FILTERS, MODULAR WETLANDS SYSTEM

The location, including GPS x-y coordinates, and type of each post-construction BMP feature installed on the Subject Property is identified on the site diagram attached hereto as Exhibit 1.

Owner hereby covenants and agrees to maintain the above-described post-construction BMP features in a good and operable condition at all times, and in accordance with the LID/NPDES Maintenance Guidelines, attached hereto as Exhibit 2.

Owner further covenants and agrees that the above-described post-construction BMP features shall not be removed from the Subject Property unless and until they have been replaced with other post-construction BMP features in accordance with County of Los Angeles’ Green Building Standards Code, Title 31 and NPDES permit.

Owner further covenants and agrees that if Owner hereafter sells the Subject Property, Owner shall provide printed educational materials to the buyer regarding the post-construction BMP features that are located on the Subject Property, including the type(s) and location(s) of all such features, and instructions for properly maintaining all such features.

Owner makes this Covenant and Agreement on behalf of itself and its successors and assigns. This Covenant and Agreement shall run with the Subject Property and shall be binding upon owner, future owners, and their heirs, successors and assigns, and shall continue in effect until the release of this Covenant and Agreement by the County of Los Angeles, in its sole discretion.

Owner(s):

By: ________________________________________________ Date: ____________________________

By: ________________________________________________ Date: ____________________________

(PLEASE ATTACH NOTARY)

REFERENCE

PLAN CHECK NO.: ----- DISTRICT OFFICE NO.: -----
INSPECTION AND MAINTENANCE GUIDES
Inspection & Maintenance Guide for

Corrugated Steel Pipe Underground Infiltration Systems

**Safety:** Before entering into any storm sewer or underground detention/infiltration system check to make sure all OSHA and local safety regulations and guidelines are observed during the maintenance process. Hard hats, safety glasses, steel-toed boots and any other appropriate personal protective equipment shall be worn at all times.

**Frequency:** Inspections shall be completed annually.

**Inspection Check List:**

- **✓ Check quality of parking lot surface.**
  - Is there evidence of potholes or sinkholes?
  - Is there evidence of an unusual amount of silt and soil build-up on the surface?

- **✓ Check for pipe symmetry (uniform curvature).**
  - Flexible steel pipe is designed to handle minor deflections. Pipe structures deflected more than 7% from design shape, or those that show localized distortions may require further investigation.

- **✓ Check for pipe joint quality.**
  - Is there evidence of backfill material infiltrating into the pipe structure?

- **✓ Silt Deposition**
  - If accumulated silt is interfering with the operation of the infiltration system (i.e.: blocking infiltration holes or if silt deposition has significantly reduced the storage capacity of the system) it should be removed. This can be accomplished by the use of a “clam shell” device or vectortruck.
Maintenance:

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment wash-down areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.
## Inspection & Maintenance Log:

### _"" Diameter System

<table>
<thead>
<tr>
<th>Date</th>
<th>Depth of Sediment</th>
<th>Accumulated Trash</th>
<th>Maintenance Performed</th>
<th>Maintenance Personnel</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/01/99</td>
<td>2&quot;</td>
<td>None</td>
<td>Removed Sediment</td>
<td>B. Johnson</td>
<td>Installed</td>
</tr>
<tr>
<td>03/01/00</td>
<td>1&quot;</td>
<td>Some</td>
<td>Removed Sediment and Trash</td>
<td>B. Johnson</td>
<td>Swept parking lot</td>
</tr>
<tr>
<td>06/01/00</td>
<td>0&quot;</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09/01/00</td>
<td>0&quot;</td>
<td>Heavy</td>
<td>Removed Trash</td>
<td>S. Riley</td>
<td></td>
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<tr>
<td>12/01/00</td>
<td>1&quot;</td>
<td>None</td>
<td>Removed Sediment</td>
<td>S. Riley</td>
<td></td>
</tr>
<tr>
<td>04/15/01</td>
<td>2&quot;</td>
<td>Some</td>
<td>Removed Sediment and Trash</td>
<td>ACE Environmental Services</td>
<td></td>
</tr>
</tbody>
</table>

**SAMPLE**
Inspection Guidelines for Modular Wetland System - Linear

Inspection Summary

- Inspect Pre-Treatment, Biofiltration and Discharge Chambers – average inspection interval is 6 to 12 months.
  - (15 minute average inspection time).
- NOTE: Pollutant loading varies greatly from site to site and no two sites are the same. Therefore, the first year requires inspection monthly during the wet season and every other month during the dry season in order to observe and record the amount of pollutant loading the system is receiving.

System Diagram
Inspection Overview

As with all stormwater BMPs inspection and maintenance on the MWS Linear is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the MWS Linear:

- Modular Wetland Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- 7/16” open or closed ended wrench.
- Large permanent black marker (initial inspections only – first year)
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.

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Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the MWS Linear are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The MWS Linear can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system and all of its chambers.
- Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, debris and sediment accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick estimate the amount of trash, debris and sediment in this chamber. Record this depth on the inspection form.
• Through visual observation inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediments on the cartridges, any build-up on the top of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can further be inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber – see notes above regarding confined space entry). Record the color of the material. New material is a light green in color. As the media becomes clogged it will turn darker in color, eventually becoming dark brown or black. Using the below color indicator record the percentage of media exhausted.

![Color Indicator](image)

• The biofiltration chamber is generally maintenance free due to the system’s advanced pre-treatment chamber. For units which have open planters with vegetation it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection and indicate through visual observation or digital photographs if trimming of the vegetation is needed.

• The discharge chamber houses the orifice control structure and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL). The water level of the flowing water should be compared to the watermark level on the side walls which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form is there is any difference in level from watermark in inches.
NOTE: During the first few storms the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where a line should be drawn. This line is a reference point for future inspections of the system:

Using a permanent marker draw a 6 inch long horizontal line, as shown, at the higher water level in the MWS Linear discharge chamber.

Water level in the discharge chamber is a function of flow rate and pipe size. Observation of water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when system is at 100% capacity (water level at maximum level in pre-treatment chamber). If future water levels are below this mark when system is at 100% capacity this is an indicator that maintenance to the pre-filter cartridges may be needed.

Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.
**Maintenance Indicators**

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18”.

- Excessive accumulation of sediment in the pre-treatment chamber of more than 6” in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pre-filter cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged replacement is required.

- Overgrown vegetation.

- Water level in discharge chamber during 100% operating capacity (pre-treatment chamber water level at max height) is lower than the watermark by 20%.

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**Inspection Notes**

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.
Maintenance Guidelines for Modular Wetland System - Linear

**Maintenance Summary**

- Remove Sediment from Pre-Treatment Chamber – average maintenance interval is 12 to 24 months.
  - *(10 minute average service time).*
- Replace Pre-Filter Cartridge Media – average maintenance interval 12 to 24 months.
  - *(10-15 minute per cartridge average service time).*
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - *(Service time varies).*

**System Diagram**

![System Diagram](image-url)

1. Pre-treatment Chamber
2. Biofiltration Chamber
3. Discharge Chamber

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Maintenance Overview

The time has come to maintain your Modular Wetland System Linear (MWS Linear). To ensure successful and efficient maintenance on the system we recommend the following. The MWS Linear can be maintained by removing the access hatches over the systems various chambers. All necessary pre-maintenance steps must be carried out before maintenance occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once traffic control has been set up per local and state regulations and access covers have been safely opened the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepare a pre-checks (OSHA, safety, confined space entry) are performed.

Maintenance Equipment

Following is a list of equipment required for maintenance of the MWS Linear:

- Modular Wetland Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight and eye protection.
- 7/16” open or closed ended wrench.
- Vacuum assisted truck with pressure washer.
- Replacement BioMediaGREEN for Pre-Filter Cartridges if required (order from manufacturer).
Maintenance Steps

1. **Pre-treatment Chamber** *(bottom of chamber)*

   A. Remove access hatch or manhole cover over pre-treatment chamber and position vacuum truck accordingly.
   B. With a pressure washer spray down pollutants accumulated on walls and pre-filter cartridges.
   C. Vacuum out Pre-Treatment Chamber and remove all accumulated pollutants including trash, debris and sediments. Be sure to vacuum the floor until pervious pavers are visible and clean.
   D. If Pre-Filter Cartridges require media replacement move onto step 2. If not, replace access hatch or manhole cover.

---

**Removal of access hatch to gain access below.**

**Insertion of vacuum hose into separation chamber.**

**Removal of trash, sediment and debris.**

**Fully cleaned separation chamber.**

---

[www.modularwetlands.com](http://www.modularwetlands.com)
2. Pre-Filter Cartridges (attached to wall of pre-treatment chamber)

A. After finishing step 1 enter pre-treatment chamber.

B. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.

![Pre-filter cartridges with tops on.](image1)

![Inside cartridges showing media filters ready for replacement.](image2)

C. Place the vacuum hose over each individual media filter to suck out filter media.

![Vacuuming out of media filters.](image3)

D. Once filter media has been sucked use a pressure washer to spray down inside of the cartridge and it’s containing media cages. Remove cleaned media cages and place to the side. Once removed the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.

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E. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture provided refilling trey and place on top of cartridge. Fill trey with new bulk media and shake down into place. Using your hands slightly compact media into each filter cage. Once cages are full removed refilling trey and replace cartridge top ensuring bolts are properly tightened.

F. Exit pre-treatment chamber. Replace access hatch or manhole cover.

3. Biofiltration Chamber (middle vegetated chamber)

A. In general, the biofiltration chamber is maintenance free with the exception of maintaining the vegetation. Using standard gardening tools properly trim back the vegetation to healthy levels. The MWS Linear utilizes vegetation similar to surrounding landscape areas therefore trim vegetation to match surrounding vegetation. If any plants have died replace plants with new ones:
Inspection Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.
Inspection Form

Modular Wetland System, Inc.  
P. 760.433-7640  
F. 760-433-3176  
E. Info@modularwetlands.com

www.modularwetlands.com
### Inspection Report

**Modular Wetlands System**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Project Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(city) (Zip Code)</td>
</tr>
</tbody>
</table>

**Owner / Management Company**

Contact_____________ Phone ( ) –

Inspector Name_____________ Date ____ / ____ / _________ Time _________ AM / PM

**Type of Inspection**

- [ ] Routine
- [ ] Follow Up
- [ ] Complaint
- [ ] Storm

**Storm Event in Last 72-hours?**

- [ ] No
- [ ] Yes

**Weather Condition**

**Additional Notes**

---

### Inspection Checklist

**Modular Wetland System Type (Curb, Grate or UG Vault):** ______ Size (22’, 14’ or etc.): ______

<table>
<thead>
<tr>
<th>Structural Integrity:</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?</td>
<td></td>
<td></td>
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<tr>
<td>Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?</td>
<td></td>
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<tr>
<td>Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Working Condition:**

<table>
<thead>
<tr>
<th>Working Condition:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?</td>
<td></td>
</tr>
<tr>
<td>Is there standing water in inappropriate areas after a dry period?</td>
<td></td>
</tr>
<tr>
<td>Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?</td>
<td></td>
</tr>
<tr>
<td>Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in pre-treatment chamber.</td>
<td></td>
</tr>
<tr>
<td>Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?</td>
<td></td>
</tr>
<tr>
<td>Any signs of improper functioning in the discharge chamber? Note issues in comments section.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Inspection Items:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?</td>
<td></td>
</tr>
<tr>
<td>Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.</td>
<td></td>
</tr>
<tr>
<td>Is there a septic or foul odor coming from inside the system?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste:</th>
<th>Yes</th>
<th>No</th>
<th>Recommended Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment / Silt / Clay</td>
<td></td>
<td></td>
<td>No Cleaning Needed</td>
</tr>
<tr>
<td>Trash / Bags / Bottles</td>
<td></td>
<td></td>
<td>Schedule Maintenance as Planned</td>
</tr>
<tr>
<td>Green Waste / Leaves / Foliage</td>
<td></td>
<td></td>
<td>Needs Immediate Maintenance</td>
</tr>
</tbody>
</table>

**Plant Information**

- Damage to Plants
- Plant Replacement
- Plant Trimming

**Additional Notes:**

---

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176
Maintenance Report
# Cleaning and Maintenance Report

## Modular Wetlands System

### Project Address

<table>
<thead>
<tr>
<th>Site Map #</th>
<th>GPS Coordinates of Insert</th>
<th>Manufacturer / Description / Sizing</th>
<th>Trash Accumulation</th>
<th>Foliage Accumulation</th>
<th>Sediment Accumulation</th>
<th>Total Debris Accumulation</th>
<th>Condition of Media 25/50/75/100 (will be changed @ 75%)</th>
<th>Operational Per Manufactures' Specifications (If not, why?)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lat:</td>
<td>MWS Catch Basins</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Long:</td>
<td>MWS Sedimentation Basin</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Media Filter Condition</td>
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<td></td>
<td></td>
<td>Plant Condition</td>
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<td></td>
<td></td>
<td>Drain Down Media Condition</td>
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<td></td>
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<td></td>
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<td>Discharge Chamber Condition</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Drain Down Pipe Condition</td>
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<tr>
<td></td>
<td></td>
<td>Inlet and Outlet Pipe Condition</td>
<td></td>
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</tr>
</tbody>
</table>

### Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176