DATA REPORT

Literature Review of Existing Treatment Technologies for Industrial Stormwater

Prepared for

Science Applications International Corporation

and

Washington State Department of Ecology

July 2011

Note:
Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

DATA REPORT

Literature Review of Existing Treatment Technologies for Industrial Stormwater

Prepared for

Science Applications International Corporation
18912 North Creek Parkway, Suite 101
Bothell, Washington 98101

and

Washington Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, Washington 98003

Prepared by

Herrera Environmental Consultants
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206.441.9080

July 22, 2011

Contents

Figures

Tables

1.0 Introduction

The Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) are working to clean up contaminated sediments and control sources of recontamination in the Lower Duwamish Waterway (LDW) under an Administrative Order on Consent with the City of Seattle, King County, the Port of Seattle, and The Boeing Company. The LDW site is an approximately 5.5-mile portion of the Lower Duwamish River which flows into Elliott Bay. The sediments along the river contain a wide range of contaminants due to years of industrial activity and runoff from residential areas. These contaminants include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), chlorinated dioxins and furans, metals, and phthalates.

Ecology is leading contaminant source control efforts in the LDW in cooperation with the City of Seattle, the Port of Seattle, King County, the City of Tukwila, and EPA. Source control is the process of finding and controlling releases of contaminants to the LDW. In order to support Ecology's source control efforts, Herrera Environmental Consultants (Herrera) conducted a literature review to identify technologies that could be used to treat industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. In addition, Herrera has also compiled information on technologies that could be used to treat contaminated groundwater for this same suite of contaminants.

This report summarizes information on the specific stormwater treatment technologies that were identified through this review. It includes a methods section that describes the procedures that were used to compile information about each treatment technology. The compiled information for each treatment technology is then summarized in a results section under the following general categories:

- Vendor information
- Treatment performance
- System design
- Installation and operation and maintenance (O&M) costs

Finally, a discussion section provides guidance on the appropriate application(s) for each general category of treatment technology and identifies logistical issues for monitoring their performance. The discussion section also identifies key data gaps in our understanding of treatment system performance and recommends future research to fill these data gaps.

It should be noted that this review is not intended to constitute a formal analysis of "all known, available, and reasonable methods of treatment", or AKART analysis as defined in Ecology (2010a). An AKART analysis consists of a review of all available technologies for a well-characterized waste stream (such as industrial process wastewaters or fully-characterized and quantified stormwater runoff), and an evaluation of the economic impact of such technologies for the specified site or business. This project, as currently conceived, would not be considered a complete AKART analysis, nor could it be approved by Ecology as such.

This report was prepared by Herrera under Ecology's "Hazardous Substances Site Investigation & Remediation for the Toxics Cleanup Program Contract No. C0700034" between Science Applications International Corporation (SAIC) and Ecology. Herrera is a subcontractor to SAIC under this contract.

2.0 Methods

As described above, Herrera conducted a literature review to identify technologies that could be used to treat industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. This review was intended to identify a broad range of possible technologies for different treatment applications within the LDW, including:

- Runoff treatment at end-of-pipe or point of compliance
- Treatment at the point of entry for runoff to stormwater conveyance system
- Above ground treatment of runoff prior to its point of entry to the conveyance system (e.g., roof-runoff interception)

Since the stormwater treatment technologies in the LDW will typically be used for retrofit applications, this review was not limited to technologies that have been approved through the Technology Assessment Protocol – Ecology (TAPE) process (Ecology 2008). This study primarily focused on proprietary stormwater treatment technologies that are not listed in Volume V of the *Stormwater Management Manual for Western Washington* (Ecology 2005). Most of the non-proprietary stormwater treatment technologies listed in Volume V of the *Stormwater Management Manual for Western Washington* (Ecology 2005) were removed from further research for this study due to aboveground footprint or infiltration requirements as summarized in the Step 3 (Screening Criteria) section below. If in the rare instance a large footprint best management practice (BMP) such as a wet pond or an infiltrating BMP such as bioretention or a media filter drain are deemed appropriate for a site, the reader should refer to Volume V of the *Stormwater Management Manual for Western Washington* (Ecology 2005); the *Low Impact Development Technical Guidance Manual for Puget Sound* (PSAT 2005); or the Washington State Department of Transportation *Highway Runoff Manual* (WSDOT 2010) for additional information on the BMP of interest. Only two non-proprietary stormwater treatment systems are included in this report: underground sand filters (e.g., Delaware Sand Filters and DC Sand Filters) since they may be applicable to retrofits in the LDW. Finally, source control BMPs such as street sweeping and catch basin cleaning discussed in Volume IV of the *Stormwater Management Manual for Western Washington* (Ecology 2005) are also not the focus of this study, but are critical for pollution prevention in the LDW.

The actual literature review and data compilation steps that were performed in conjunction with this effort are as follows:

1. Identify candidate treatment technologies
2. Categorize treatment technologies
3. Screen treatment technologies for potential application in the LDW
4. Compile detailed information on each treatment technology
5. Identify logistical issues for monitoring of each treatment technology

Each of these steps is described in more detail below.

Step 1. Identify Candidate Treatment Technologies

A candidate list of stormwater treatment technologies was compiled using the following resources:

- Web search
- Technologies approved through TAPE (Ecology 2008) and/or New Jersey Corporation for Advanced Technology (NJCAT) using the Technology Acceptance and Reciprocity Partnership [TARP] protocol (TARP 2003).
- Caltrans Treatment BMP Technology Report (Caltrans 2008)
- *Stormwater Management Manual for Western Washington* (Ecology 2005)

Step 2. Categorize Treatment Technologies

Stormwater treatment technologies were then classified as one of two main types:

- **Active treatment systems**: systems that require electricity to operate
- **Passive treatment systems**: systems that do not require electricity to operate and are generally lower cost alternatives when compared to active treatment systems

Within the active treatment system category, treatment systems were further classified into one of the following subcategories (see Figure 1):

- Chemical filtration
- Chemical treatment
- Electrocoagulation
- Filtration
- Ion exchange
- Reverse osmosis

Filtration was further categorized as one of the following types based on the technology description:

- Disc
- Media
- Pressure

Within the passive treatment system category, treatment systems were classified into one of the following subcategories (see Figure 1):

- Bioretention/filtration
- Drain inlet insert
- Hydrodynamic separation
- Media filtration
- Oil/water separator

Drain inlet inserts and media filtration systems were further categorized based on the technology description. Drain inlet inserts can generally be considered one of the following types (see Figure 1):

- Absorbent boom/fabric
- Media filtration
- Media filtration (cartridge)
- Combination system (screen and absorbent boom/fabric)
- Combination system (screen and media filtration)

Media filtration can generally be considered one of the following types (see Figure 1):

- Above ground (pump required)
- Cartridge
- Combination system (with hydrodynamic separation)
- Combination system (with oil/water separator)
- Up-flow

Step 3. Screen Treatment Technologies for Potential Application in the LDW

Technologies were subsequently screened for potential application in the LDW based on a list of screening criteria. These screening criteria reflect the unique logistical issues for treating stormwater in the LDW given the presence of historical sediment contamination, flat site topography, high groundwater table, and a broad list of target contaminants in runoff.

The screening criteria for active treatment systems are as follows:

- Systems must be designed for long-term (i.e., permanent) installation.

- Systems must be designed to treat a relatively wide range of flows and concentrations that are associated with stormwater runoff.

The screening criteria for passive treatment systems are as follows:

- Systems must have a minimal aboveground footprint due to the limited space available for retrofits (e.g., larger aboveground systems such as constructed wetlands, wet ponds, and Austin sand filters were removed).

- Systems must not rely on infiltration for treatment due to high water table and presence of historical soil and/or groundwater contamination (e.g., treatment technologies such as infiltration trenches, bioretention, and proprietary systems that provide storage for underground infiltration were removed).

- Systems must be able to effectively handle a large petroleum or chemical spill from industrial activities (e.g., porous pavement was removed).

- Systems should remove pollutants of concern; those systems with a focus on gross litter and debris removal were not considered (e.g., proprietary systems that have a trash basket catch basin insert design were removed).

- System design should be for a permanent installation; those systems with a construction site or temporary installation focus were not considered (e.g., catch basin filter sock designs were removed).

- Systems must be readily available; those systems with inactive vendor websites or discontinued product lines were not included.

Step 4. Compile Detailed Information on Each Treatment Technology

Once the list of potential active and passive stormwater treatment technologies was narrowed down to those that could potentially be useful in the LDW, the following steps were taken to collect information on each of the systems:

- Review and compile publically available information from vendor websites

- Send questionnaire to vendors

- Conduct follow-up phone contacts with vendors

The vendor questionnaire requested the following specific information:

- Manufacturer name
- Technology name
- Contact information (name, e-mail, phone, website)
- Treatment type/application

- Number of installations in the state of Washington
- Estimated installation cost [range]
- Estimated annual O&M cost [range]
- Design flow rate [range]
- System footprint [range]
- Required head loss [range]
- Internal or external bypass
- Above or below grade
- Median influent concentration [see parameter list below]
- Median effluent concentration [see parameter list below]
- Median percent removal [see parameter list below]

Based on the contaminants of concern in the LDW and the required monitoring parameters in the National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit (Ecology 2010b), treatment performance data for the following parameters were requested from the each vendor:

- Total suspended solids (TSS) [required for Timber Product Industry (24xx), Paper and Allied Products (26xx), and discharges to 303(d)-listed waters; many pollutants can also be associated with sediment particles, thus TSS removal can also be an indicator of pollutant removal of other parameters]

- Total phosphorus [required for Chemical and Allied Products (28xx), Food and Kindred Products (20xx), and discharges to 303(d)-listed waters]

- Total petroleum hydrocarbons (TPH) [required for Primary Metals (33xx), Metals Mining (10xx), Automobile Salvage and Scrap Recycling (5015 and 5093), and Metals Fabricating (34xx)]

- Oil and grease [this parameter is measured instead of TPH in some portions of the country]

- Total and dissolved copper [total copper is required for all Industrial Stormwater permittees]

- Total and dissolved lead [total lead is required for Primary Metals (33xx), Metals Mining (10xx), Automobile Salvage and Scrap Recycling (5015 and 5093), Metals Fabricating (34xx), and discharges to 303(d)-listed waters]

- Total and dissolved zinc [total zinc is required for all Industrial Stormwater permittees]

- Semivolatile organic compounds (SVOCs) [contaminant of concern in the LDW]

- Polycholrinated biphenyls (PCBs) [contaminant of concern in the LDW]
- Dioxins [contaminant of concern in the LDW]
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) [contaminant of concern in the LDW]

Additional monitoring parameters (turbidity, pH, and oil sheen) are required by the NPDES Industrial Stormwater General Permit for all industries; however, these parameters were not listed as contaminants of concern in the LDW or are not commonly used for determining pollutant removal performance; thus, data for these parameters were not requested from the vendors. Specific industrial groups are also required to collect additional monitoring parameters (ammonia total as nitrogen, biochemical oxygen demand [BOD_5], chemical oxygen demand [COD], nitrate/nitrite as nitrogen, and additional metals); however, since these parameters are not required for multiple industries and were not listed as contaminants of concern in the LDW, they were not included as part of this literature review.

Information compiled for each technology was summarized on a two-page Technology Summary Sheets that provides a picture or diagram of each system, and a consistent framework for presenting data on system design, treatment performance, installation costs, O&M costs, and the number of installations in Washington. In addition, more detailed product brochures, drawings, specifications, and O&M information that were obtained from the vendors for each technology were compiled for reference within this document.

3.0 Results

Using the methods identified in the previous section, a total of 91 passive and 18 active systems were identified for possible use in treating industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. Tables 1 and 2 identify these passive and active systems, respectively, with their associated treatment subcategories and vendor contact information. The Technology Summary Sheets that were prepared for each system are provided in Appendix A. The appendix includes a divider to separate information for passive and active systems; the Technology Summary sheets for individual systems are then organized alphabetically by system name.

Information presented in the Technology Summary Sheets was derived in part from questionnaire responses from the vendors for each system (see description of questionnaires in *Methods* section). Questionnaire responses were received from vendors for 58 percent of the passive systems and 67 percent of the active systems; these questionnaire responses are documented in Appendix B. The appendix includes a divider to separate information for passive and active systems; questionnaire responses for individual systems are then organized alphabetically by system name.

When no questionnaire response was obtained from a vendor for a specific treatment system, efforts were made to obtain the required information for this report based on a review of publically available information on that system from the vendor. Limited information was obtained through these reviews for 15 percent of the passive systems and 11 percent of the active system. Publically available product information (e.g., brochures, drawings, specifications, and O&M information) for all the treatment systems identified in Tables 1 and 2 has been compiled in Appendix C (provided electronically on CD). The appendix includes a divider to separate information for passive and active systems; product information for individual systems is then organized alphabetically by system name.

In addition to the appendices described above, the following summary tables are provided in the main body of this report to facilitate rapid comparisons of different treatment system attributes:

Table 3. Treatment system removal performance for total metals.

Table 4. Treatment system removal performance for dissolved metals.

Table 5. Treatment system removal performance for TSS.

Table 6. Treatment system removal performance for total petroleum hydrocarbons and oil and grease.

Table 7. Treatment system removal performance for total phosphorus.

Table 8. Treatment system removal performance for SVOCs, PCBs, dioxins, and cPAHs.

Table 9. Design information for passive systems.

Table 10. Design information for active systems.

Table 11. Installation and annual operation and maintenance costs for passive treatment systems.

Table 12. Installation and annual operation and maintenance costs for active treatment systems.

The information contained in Tables 3 through 12 has also been compiled in a separate Microsoft Excel® file to allow rapid sorting and review of the system treatment attributes; this file is designated Appendix D to this document and is provided electronically on CD.

In reviewing the aforementioned tables and appendices, it is important to note that most of the associated data were supplied by the treatment system vendors and have not been verified by an independent third-party. In a few select cases, independent verification of some treatment system attributes has occurred through TAPE and/or NJCAT. System attributes that are verified through TAPE may include removal performance for basic (TSS), enhanced (dissolved metals), phosphorus, and oil treatment. Typical system maintenance schedules are also verified through TAPE. NJCAT only verifies removal performance for TSS. Neither program verifies installation and annual operation and maintenance costs. The specific treatment systems that have been verified through TAPE and/or NJCAT are identified in Table 13. More detailed information on the systems that have been verified through TAPE is available through Ecology's website for emerging stormwater treatment technologies: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html. Detailed information on treatment systems that have been verified through NJCAT may also be obtained through the following website for the State of New Jersey Department of Environmental Protection: http://www.njstormwater.org/treatment.html.

4.0 Discussion

This section provides guidance on the appropriate application(s) for each general category of treatment technology, identifies logistical issues for monitoring performance, identifies key data gaps in our understanding of treatment system performance, and recommends future research to fill these data gaps.

4.1 Treatment Technology Applications

In general, land use in drainage basins to the LDW is predominantly industrial, although there are some limited areas of mixed residential/commercial land use in adjacent neighborhoods (e.g., South Park and Georgetown). Because industrial areas in the LDW are largely built-out (i.e., all the available space is either paved or occupied by buildings), many of the non-proprietary stormwater treatment technologies identified in the *Stormwater Management Manual for Western Washington* (Ecology 2005) are impractical due to their large aboveground footprint. Instead, proprietary treatment technologies that have been specifically designed for retrofit applications will generally be more useful for treating the contaminants of concern in the LDW. To overcome the numerous design restraints in built-out environments, these systems are typically designed to have a small footprint, have low head-loss requirements, and are easily scalable. Because of these attributes, these technologies can be more easily installed in a variety of sites and applications.

The most common treatment applications in industrial areas are the treatment of roof runoff (e.g., for treatment of zinc from galvanized metal roofs) or the treatment of stormwater from pollution generating impervious surfaces at the inlet to the storm drain system or at end-of-pipe. Pumping and treating groundwater, though not technically stormwater, is also a common application in industrial areas. A large variety of treatment technologies is generally available for these applications, including both passive and active systems. In general, passive treatment systems are less expensive to install, operate, and maintain than active systems; however, they typically do not provide as high a level of treatment in comparison to active systems. For the same level of treatment, a passive system usually occupies more space than an active system. The higher level of treatment achieved by active systems typically involves a multi-step process to optimize performance; due to this increased complexity, active systems often require a higher level of operator knowledge and have increased O&M costs.

Description of the most common treatment applications for the general treatment technology categories defined in this report are provided below. Table 14 also identifies common treatment applications for the specific treatment systems that are identified in Tables 1 and 2.

4.1.1 Passive Treatment

1. *Biofiltration/Filtration* – Bioretention systems (e.g., rain gardens) have been shown to achieve a high level of pollutant removal (Davis et al. 2009; Hsieh and

Davis 2005). Manufacturers have taken this technology and adapted it to the ultra-urban environment. These systems have a relatively small footprint and in general are not easily scalable. The majority of bioretention systems are easy to maintain. Bioretention systems are most commonly used to treat stormwater from pollution generating impervious surfaces either at the inlet to the storm drain system or at the end-of-pipe.

2. *Drain Inlet Insert* – These systems are small devices that occupy a catch basin or are inserted into the inlet of a storm drain. Because they are not scalable and occupy existing inlets, it is difficult to correctly size these technologies. They are relatively inexpensive, require minimal head loss, and need to be distributed throughout the site to treat large areas. Drain inserts are most commonly used to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system; however, some of these systems are also configured to treat roof runoff.

3. *Hydrodynamic Separation* – These devices can treat high flows in a very small footprint. Maintenance is similar to standard catch basin cleaning. Because these systems are not filters, they do not target dissolved pollutants and, in general, cannot remove fine silt and clay sized particles (Kim and Sansalone 2008). Hydrodynamic separators require minimal head loss. Hydrodynamic separation systems are most commonly used to treat stormwater from pollution generating impervious surfaces at end-of-pipe.

4. *Media Filtration* – Media filters are scalable systems that require head loss (varies from system to system) to drive the water through the filter media. They achieve a relatively high level of treatment for dissolved and particulate pollutants (Geosyntec and Wright Water 2008) but are generally more expensive to maintain than other passive treatment types. Media filtration systems are most commonly used to treat stormwater from pollution generating impervious surfaces either at the inlet to the storm drain system or at the end-of-pipe.

5. *Oil/Water Separators* – These systems target hydrocarbons with simple baffle technologies. They do not target other pollutants but are effective at reducing high concentrations of hydrocarbons and can provide some limited TSS and metals removal via sedimentation. These systems are most commonly used to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system.

4.1.2 Active Treatment

1. *Chemical Filtration* – Media filtration is more effective if the average particle size in the stormwater is large. Chemical filtration entails the addition of a flocculent to the stormwater prior to filtration in order to enhance the filtration process. Because the large particles cannot penetrate the media, surface occlusion is an

issue. Many systems use a backflush device to prevent surface occlusion. As with most active treatment devices, water is pumped into these systems and thus head loss restrictions are not an issue. In addition, most active treatment systems are above ground installations and consequently require a large footprint on the site (though less than conventional stormwater ponds). Chemical filtration systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

2. *Chemical Treatment* – To target specific analytes, these technologies are simple devices that add a chemical to the influent stormwater. Chemical treatment systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

3. *Electrocoagulation* – This technology applies a charge to the influent stream to generate flocculation. The device then settles or filters the floc to generate a clean waste stream. Removal of settled floc is a required and frequent maintenance procedure. This is an effective treatment method that can target dissolved and particulate pollutants, though operation and maintenance can be onerous. Electrocoagulation systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

4. *Filtration* – Pressurized filtration enhances the filtration process by increasing the pressure of the water as it moves through the filter. The filtration process is usually followed by a backflushing process to clean the media. As with all system with a backflush, the collected solids must be removed on a regular basis. Filtration systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

5. *Ion Exchange* – Ion exchange is a polishing step that specifically targets polar dissolved constituents. Pretreatment is required prior to ion exchange as suspended solids will clog the exchange columns. Ion exchange systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

6. *Reverse Osmosis* – These systems are highly effective at removing dissolved contaminants. Using a pump, these systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe and contaminated groundwater. These systems also require pre-treatment as particulate matter can foul the ion selective membrane and reduce performance.

4.2 Logistical Issues for Monitoring Treatment System Performance

In order to ensure that source control efforts in the LDW are effective, some monitoring of stormwater treatment system performance may be required pursuant to future permit requirements or other regulatory drivers. At a minimum, this monitoring would likely involve sampling to characterize contaminant concentrations in treatment system effluent to ensure they are below levels that could contribute to sediment recontamination in the LDW. Influent samples might also be required to determine the actual pollutant removal efficiency of the treatment system.

In general, the following logistical issues are frequently encountered when collecting samples to characterize influent and effluent contaminant concentrations for propriety treatment systems that are designed for retrofit applications:

- The conveyance system for stormwater entering and leaving the treatment system is below grade and not directly accessible; therefore, there is no convenient collection point for influent and/or effluent samples. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at end-of-pipe (e.g., biofiltration/filtration, hydrodynamic separation, and media filtration systems).

- Effluent from the stormwater treatment system is discharged directly into a conveyance pipe containing water from another up-gradient source; therefore, it is difficult to obtain a representative effluent sample that is uncontaminated by this other source. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts).

- The stormwater treatment system is configured in a manner that allows bypass water to mix directly with treated effluent; therefore, it is difficult to obtain a representative effluent sample that is not contaminated by the bypass water. This situation is frequently encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts) and at end-of-pipe (e.g., biofiltration/filtration, hydrodynamic separation, and media filtration systems).

- Influent enters the stormwater system as diffuse sheet flow; therefore, the flow is not sufficiently concentrated to facilitate collection of an influent sample. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts).

It is often possible to identify sampling procedures to overcome these logistical issues. For example, in situations where there is no convenient collection point for effluent samples at the direct outlet for a treatment system, it is often possible to collect samples at a downgradient access point in the stormwater conveyance system if no additional stormwater inputs have occurred from sources other than the treatment system. However, these sampling strategies typically need to be worked out on a case-by-case basis given the wide variety of treatment system configurations that exist and unique attributes of the stormwater conveyance system at any given monitoring site. Given this consideration, it is not practical to offer generalized sampling strategies to overcome the logistical issues for monitoring that are identified above.

4.3 Data Gaps

Although there are many stormwater treatment technology options, not all of them have been rigorously field tested. This is primarily due to the fact that field testing is expensive and many government agencies do not require field data to approve systems for use in their jurisdictions. Table 13 presents those systems which have gone through the TAPE or TARP field testing process, but even for these rigorously tested systems, there exists a lack of data related to the removal of toxic pollutants. Specifically, few have been tested for any metals besides copper and zinc, SVOCs, PCBs, dioxins, and cPAHs removal. This data gap exists for a number of reasons:

1. Removal of these toxics from stormwater is not the primary concern for the majority of the market.

2. Collection and analysis of these parameters is expensive.

3. Influent concentrations are highly variable, and thus achieving target reduction goals consistently is difficult.

The lack of rigorous field or laboratory testing by independent third parties is another major data gap that needs to be addressed before informed decisions can be made regarding selection of proprietary stormwater treatment systems. There is an obvious conflict of interest when companies test their own products and report the results as fact. In order to address this issue, many more jurisdictions have begun to require third-party verified data to support the performance claims of treatment technology vendors. Still others have been establishing their own verification protocols because the existing protocols (e.g., TAPE and TARP), do not address issues which can be locally important. For instance, TAPE and TARP do not require long-term monitoring to assess system performance over time, or maintenance past the 1- to 2-year time scale. Stormwater managers in Oregon have identified this as a data gap and have begun the process of establishing a monitoring protocol for long-term maintenance and system lifecycle assessments. However, until this monitoring protocol begins to produce results, the long-term performance of these systems and lifecycle expectations will remain a data gap.

4.4 Recommended Future Research

Though there any many treatment technologies on the market, few have been rigorously tested under variable field conditions. Even fewer have been subjected to long-term testing to quantify system lifecycles and long-term O&M requirements. It is recommended that more of these studies be conducted by third party entities so that objective results are available for a wide variety of systems. This is a difficult prospect for treatment technology manufacturers because of their rapid research and development timelines and the large investment required for long-term studies. Due to this consideration, local jurisdictions and/or Industrial Stormwater permittees may need to take on this monitoring themselves in order to reach more informed decisions on which treatment technologies are appropriate and effective for various stormwater treatment applications. As mentioned above, stormwater managers in Oregon have already initiated this process. In Washington, the Port of Seattle also has a long history of monitoring stormwater treatment system performance, including various downspout media filter configurations and oyster shell augmented filtration swales.

Though rigorous field studies exist for a select few treatment technologies, these studies have primarily addressed metals, nutrients, and solids removal. Very little data exist for the removal of toxic pollutants. It is recommended that future studies analyze other metals in addition to copper and zinc (e.g., mercury, cadmium, and chromium), SVOCs, PCBs, dioxins, and cPAHs. Such studies would need to occur in industrial areas because treatment cannot be verified unless influent concentrations are elevated. Alternatively, because of the expense and difficulty of conducting studies of toxics in stormwater, research on toxic pollutant affinity for various particle sizes could be conducted. Such a study would segregate and analyze various particle size fractions for concentrations of SVOCs, PCBs, dioxins, and cPAHs. This approach has been used by researchers to relate metals to particle size classes (Ran et al. 2000; Ranville et al. 1999); a similar approach could be used here for toxic organic chemicals. Once a relationship between particle size and pollutant concentration is developed, removal of various particle size categories by treatment technologies can be used as a proxy for removal of difficult-to-measure toxics.

5.0 References

Caltrans. 2008. Treatment BMP Technology Report. CTSW-RT-08-167.02.02. California Department of Transportation, Division of Environmental Analysis, Sacramento, California. April 2008.

Davis, A.P., W.F. Hunt, R.G. Traver, and M. Clar. 2009. Bioretention Technology: Overview of Current Practice and Future Needs. *Journal of Environmental Engineering-ASCE* 135(3):109-117.

Ecology. 2005. Stormwater Management Manual for Western Washington. Publication No. 05-10-029 through 05-10-033. Washington State Department of Ecology. Water Quality Program, Olympia, Washington. February 2005.

Ecology. 2008. Guidance for Evaluating Emerging Stormwater Treatment Technologies. Technology Assessment Protocol – Ecology (TAPE). Publication Number 02-10-037. Washington State Department of Ecology, Olympia, Washington.

Ecology. 2010a. Water Quality Permit Writer's Manual. Publication No. 92-109. Washington State Department of Ecology. Water Quality Program, Olympia, Washington. November 2010.

Ecology. 2010b. National Pollutant Discharge Elimination System Industrial Stormwater General Permit. Washington State Department of Ecology, Olympia, Washington. January 1, 2010.

Geosyntec and Wright Water. 2008. Analysis of Treatment System Performance: International Stormwater Best Management Practices (BMP) Database [1999-2008]. Prepared for Water Environment Research Foundation, American Society of Civil Engineers (Environmental and Water Resources Institute/Urban Water Resources Research Council), U.S. Environmental Protection Agency, Federal Highway Administration, and American Public Works Association, by GeoSyntec Consultants and Wright Water Engineers, Inc., Chicago, Illinois.

Hsieh, C.H. and A.P. Davis. 2005. Multiple-Event Study of Bioretention for Treatment of Urban Storm Water Runoff. *Water Science and Technology* 51(3-4):177-181.

Kim, J.Y. and J.J. Sansalone. 2008. Hydrodynamic Separation of Particulate Matter Transported by Source Area Runoff. *Journal of Environmental Engineering-ASCE* 134(11):912-922.

PSAT. 2005. Low Impact Development Technical Guidance Manual for Puget Sound. Puget Sound Action Team (PSAT) and Washington State University Pierce County Extension, Olympia, Washington. January 2005.

Ran, Y., J.M. Fu, G.Y. Sheng, R. Beckett, and B.T. Hart. 2000. Fractionation and Composition of Colloidal and Suspended Particulate Materials in Rivers. *Chemosphere* 41(1-2):33-43.

Ranville, J.F., D.J. Chittleborough, F. Shanks, R.J.S. Morrison, T. Harris, F. Doss, and R. Beckett. 1999. Development of Sedimentation Field-Flow Fractionation-Inductively Coupled Plasma Mass-Spectrometry for the Characterization of Environmental Colloids. *Analytica Chimica Acta* 381(2-3):315-329.

TARP. 2003. Protocol for Stormwater Best Management Practice Demonstrations. Prepared by the Technology Acceptance Reciprocity Partnership (http://www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp/pdffiles/Tier2protocol.pdf).

WSDOT. 2010. Highway Runoff Manual. Publication No. M 31 16.02. Washington State Department of Transportation, Olympia, Washington. May 2010.

FIGURES AND TABLES

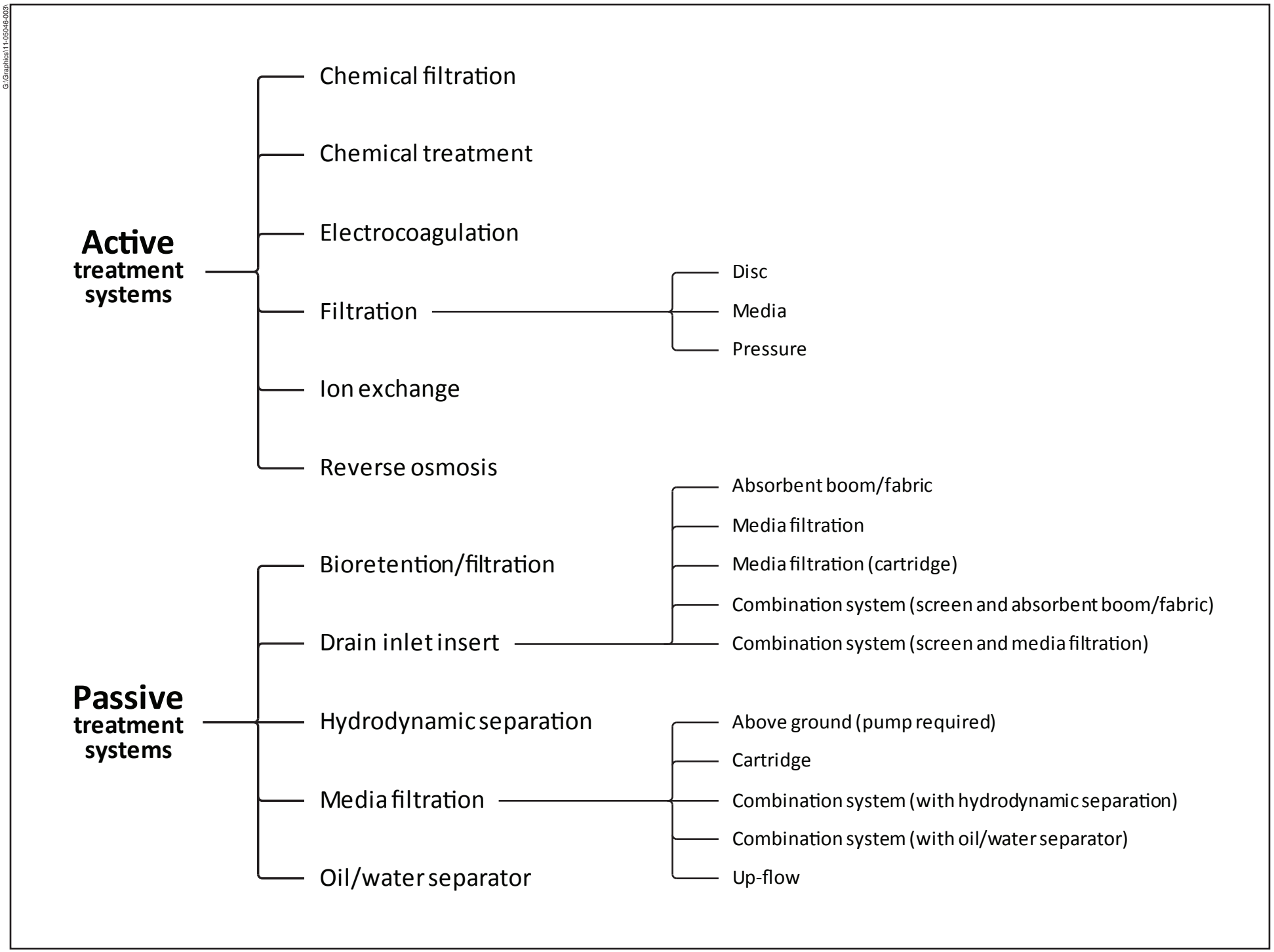


Figure 1. Treatment type categories for active and passive treatment systems.

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Bioretention/Filtration				
	Filterra® Curb Inlet System	Filterra, DBAAmericast, Inc.	www.filterra.com	877-345-1450
	Filterra® Roof Drain System	Filterra, DBAAmericast, Inc.	www.filterra.com	877-345-1450
	Modular Wetland System – Linear	Modular Wetland Systems, Inc./BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Silva Cell	DeepRoot Partners	www.deeproot.com	800 458 7668
	TREEPOD® Biofilter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	UrbanGreen BioFilter	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
Drain Inlet Insert				
Absorbent Boom/Fabric	ADsorb-It	Eco-Tec, Inc.	www.adsorb-it.com	888-668-8982
	Enviro-Drain®	Enviro-Drain, Inc.	www.enviro-drain.com	206-363-0316
	EnviroSafe™ Storm Safe HF10	Transpo Industries, Inc.	www.transpo.com	503-674-9180
	Ultra-Urban Filter™	Abtech Industries	abtechindustries.com	480-874-4000
Media Filtration	EcoVault™ Baffle Box	EcoSense International	www.ecosenseint.com	321-449-0324
	EnviroSafe™	Transpo Industries, Inc.	www.transpo.com	503-674-9180
	HUBER Hydro Filt	Huber Technology, Inc.	www.huber-technology.com	425-392-0491
	Hydro-Kleen™	ACF Environmental, Inc.	www.acfenvironmental.com	800-448-3636
	Raynfiltr™	Environmental Filtration, Inc.	www.raynfiltr.org	800-333-5234
Media Filtration (Cartridge)	StormBasin™	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
	StormPod™	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
	Triton Drop Inlet Insert	Revel Environmental Manufacturing, Inc./CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Downspout Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Flume Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Grate Inlet Skimmer Box	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Trench Drain Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Clean Way Downspout Filtration Unit	Clean Way	www.cleanwayusa.com	800-723-1373
	DrainPac™	United Storm Water, Inc.	www.unitedstormwater.com	877-71-STORM
	EnviroTrap Catch Basin Insert	Environment 21	www.ENV21.com	800-809-2801
	FloGard® Downspout Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® LoPro Matrix Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® LoPro Trench Drain Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard+PLUS®	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® Trash & Debris Guard	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	Inceptor®	Stormdrain Solutions	www.stormdrains.com	877-OUR-PIPE
	StormClean Catch Basin Insert	Clean Way	www.cleanwayusa.com	800-723-1373
	StormClean Curb Inlet Insert	Clean Way	www.cleanwayusa.com	800-723-1373
	StormClean Wall Mount Filtration Unit	Clean Way	www.cleanwayusa.com	800-723-1373
	Storm PURE™	Nyloplast/Hancor, Inc.	www.hancor.com	253-255-6302
	SwaleGard® Pre-filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
	ClearWater BMP	ClearWater Solutions, Inc.	www.clearwaterbmp.com	800-758-8817
	Coanda Curb Inlet Filter	Coanda, Inc.	www.coanda.com	714-389-2113
	Coanda Downspout Filter	Coanda, Inc.	www.coanda.com	714-389-2113

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Drain Inlet Inserts (cont.)				
	RSF (Rapid Stormwater Filtration) 100	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
	RSF (Rapid Stormwater Filtration) 1000	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
	RSF (Rapid Stormwater Filtration) 4000	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
Hydrodynamic Separation				
	Aqua-Swirl Concentrator	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
	BaySeparator®	BaySaver Technologies, Inc.	www.BaySaver.com	301-829-6470
	CDS™ Stormwater Treatment System	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
	Downstream Defender	Hydro International, Inc.	www.hydro-international.biz	207-756-6200
	FloGard® Dual-Vortex Hydrodynamic Separator	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	HydroGuard	Hydroworks	www.hydroworks.com	888-290-7900
	Nutrient Separating Baffle Box	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Stormceptor®	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	StormTrooper®	Park USA	www.park-usa.com	888-611-PARK
	StormTrooper® EX Extra-Duty	Park USA	www.park-usa.com	888-611-PARK
	Terre Kleen™	Terre Hill Concrete Products	www.terrehill.com	800-242-1509
	UniScreen	Environment 21	www.ENV21.com	800-809-2801
	UniStorm	Environment 21	www.ENV21.com	800-809-2801
	V2B1 Treatment System	Environment 21	www.ENV21.com	800-809-2801
	Vortechs System	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
Media Filtration				
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	StormwateRx	www.stormwaterx.com	503-233-4660
Cartridge	BayFilter®	BaySaver Technologies, Inc.	www.BaySaver.com	301-829-6470
	EcoSense™ Stormwater Filtration Systems	EcoSense International	www.ecosenseint.com	321-449-0324
	Perk Filter™	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	PuriStorm	Environment 21	www.ENV21.com	800-809-2801
	Sorbtive™ FILTER	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	Stormfilter using ZPG Media	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
	StormSafe™ Helix	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	Rotondo Environmental Solutions, LLC	www.rotondo-es.com	703-212-4830
	Underground Sandfilter (DC Sandfilter)	Rotondo Environmental Solutions, LLC	www.rotondo-es.com	703-212-4830
Combination System (with Hydrodynamic Separation)	Aqua-Filter System	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
	ecoStorm + ecoStorm Plus®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	Go-Filter	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	CrystalStream Technologies	http://crystalstream.com	800-748-6945
	HydroFilter	Hydroworks	www.hydroworks.com	888-290-7900
Up-Flow	Bio Clean Water Polisher	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Jellyfish™ Filter	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	Up-Flo™ Filter	Hydro International, Inc.	www.hydro-international.biz	207-756-6200

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Oil/Water Separator				
	ADS® Water Quality Unit	Advanced Drainage Systems, Inc	www.adspipe.com	800-821-6710
	BioSTORM	Bio-Microbics, Inc.	www.biomicrobics.com	800-753-3278
	Clara® Gravity Stormwater Separator Vault	StormwateRx	www.stormwaterx.com	503-233-4660
	CrystalClean Separator	CrystalStream Technologies	http://crystalstream.com	800-748-6945
	ecoLine A®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoLine B®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoSep®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoTop®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	First Flush 1640FF	ABT, Inc.	www.abtdrains.com	800-438-6057
	Hancor Storm Water Quality Unit	Hancor, Inc.	www.hancor.com	253-255-6302
	Kleerwater™	Brown-Minneapolis Tank Co./Kleerwater Technologies, LLC	www.kleerwater.net	800-999-TANK (8265)
	PSI Separator	PSI International, Inc.	www.psinternational.com	605-332-1885
	SNOUT®	Nyloplast/Hancor, Inc.	www.hancor.com	253-255-6302
	VortClarex	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667

Table 2. Active treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Chemical Filtration				
	Baker Tank with Sand Filter	BakerCorp	www.bakercorp.com	425-347-8811
	Chitosan-Enhanced Sand Filtration Using FlocClear™	Clear Creek Systems	www.clearcreeksystems.com	661-979-2525
	Purus® Stormwater Polishing System	StormwateRx	www.stormwaterx.com	503-233-4660
Chemical Treatment				
	ACISTBox®	Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	pHATBox®	Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	Wetsep	Waste & Environmental Technologies Ltd.	http://wetsep.com	(65) 64560040
Electrocoagulation				
	High-Flo Electrocoagulation	Kaselco	www.kaselco.com	361-594-3327
	OilTrap ElectroPulse Water Treatment System	OilTrap Environmental	www.oiltrap.com	360-943-6495
	Redbox	Morselt Borne BV	www.morselt.com	317-449-0324
	WaveIonics™	Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
Filtration				
Disc	Arkal Filter (Spin Klin System)	Arkal Filtration Systems/PEP (U.S. Distributor)	www.arkal-filters.com	(972)-4-6775140 (Israel)
Media	Fuzzy Filter	Schreiber		
	WaterTrak Pressurized Media Filter	Aquatech	www.aquatech.com	724-746-5300
	WaterTrak Ultrafiltration	Aquatech	www.aquatech.com	724-746-5300
Pressure	Arkal Media Filter	Arkal Filtration Systems/PEP (U.S. Distributor)	www.arkal-filters.com	(972)-4-6775140 (Israel)
Ion Exchange				
	Wastewater Ion Exchange System (WWIX)	Siemens Water Technologies Inc.	www.siemens.com	860-593-2063
	WaterTrak Ion Exchange	Aquatech	www.aquatech.com	724-746-5300
Reverse Osmosis				
	WaterTrak Reverse Osmosis	Aquatech	www.aquatech.com	724-746-5300

Table 3. Treatment removal performance for total metals.

Treatment Type	Treatment System Name	Total Copper			Total Lead			Total Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Passive Treatment Technologies											
Bioretention/Filtration											
	Filterra® Curb Inlet System	0.0081	0.0034	54%	NA	NA	NA	0.384	0.102	56%	
	Filterra® Roof Drain System	0.0081	0.0034	54%	NA	NA	NA	0.384	0.102	56%	
	Modular Wetland System – Linear	0.04	NA	>50%	NA	NA	NA	0.24	NA	>79%	
	Silva Cell	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert											
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	NA	NA	NA	0.018	0.0049	73%	0.335	0.175	48%	
	StormPod™	NA	NA	NA	0.018	0.0049	73%	0.335	0.175	48%	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	24.3	10.4	79%	Units reported by vendor appear to be anomalous
	Bio Clean Downspout Filter	NA	NA	76%	NA	NA	96%	NA	NA	69%	
	Bio Clean Flume Filter	NA	NA	NA	NA	NA	17%	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	1.9	0.1	95%	1.5	0.2	87%	13.7	0.73	95%	Units reported by vendor appear to be anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	0.08	0.07	9%	0.79	0.68	14%	0.3	0.24	20%	Testing is not complete for metals; therefore, these values are estimated.
	FloGard® Downspout Filter	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard® LoPro Matrix Filter	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard+PLUS®	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard® Trash & Debris Guard	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURE™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous

Treatment Type	Treatment System Name	Total Copper			Total Lead			Total Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Drain Inlet Insert (continued)											
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	48	15	69%	Units reported by vendor appear to be anomalous
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	48	15	69%	Units reported by vendor appear to be anomalous
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation											
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	CDS™ Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Downstream Defender	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	HydroGuard	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Nutrient Separating Baffle Box	0.017	0.01	41%	0.014	0.0065	54%	0.088	0.038	57%	
	Stormceptor®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	UniScreen	0.08	0.06	20%	0.79	0.56	27%	0.3	0.18	40%	Testing is not complete for metals; therefore, these values are estimated.
	UniStorm	0.08	0.06	20%	0.79	0.56	27%	0.3	0.18	40%	Testing is not complete for metals; therefore, these values are estimated.
	V2B1 Treatment System	0.08	0.05	40%	0.79	0.35	55%	0.5	0.09	70%	Testing is not complete for metals; therefore, these values are estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration											
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	0.152	0.008	94%	0.03	0.006	79%	0.425	0.061	85%	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Perk Filter™	0.052	0.02	62%	0.15	0.05	68%	0.25	0.1	61%	
	PuriStorm	0.08	0.04	50%	0.79	0.28	65%	0.5	0.06	80%	Testing is not complete for metals; therefore, these values are estimated.
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	0.04	0.03	47%	0.12	0.04	24%	0.23	0.13	62%	
	StormSafe™ Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoStorm + ecoStorm Plus®	0.019	0.009	53%	0.005	0.002	60%	0.17	0.073	57%	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HydroFilter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Jellyfish™ Filter	78	0.3	99%	35	5	86%	1.45	0.6	59%	Zinc concentrations are in mg/L.
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Treatment Type	Treatment System Name	Total Copper			Total Lead			Total Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Oil/Water Separator											
	ADS® Water Quality Unit	ND	ND	74%	ND	ND	74%	ND	ND	74%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	0.516	0.078	29.5	0.088	0.072	25.8	2.82	1.21	32	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Kleerwater™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies											
Chemical Filtration											
	Baker Tank with Sand Filter	150	75	50%	500	200	40%	2500	1000	50%	Units reported by vendor appear to be anomalous
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	0.28	0.083	86%	
Chemical Treatment											
	ACISTBox®	0.341	0.0179	95	0.25	0.05	80	2.12	1.04	51	
	pHATBox®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Wetsep	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Electrocoagulation											
	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	12.1	0.072	99.4%	14.1	0.039	99.7%	151	0.34	99.9%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaveIonics™	4.8	0.0074	100%	0.253	0.003	99%	0.516	0.0315	94%	
Filtration											
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	99.9%	Information obtained from product literature
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	99.9%	Information obtained from product literature
Ion Exchange											
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Reverse Osmosis											
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	

mg/L = milligrams per liter
NA = not available; vendor filled out treatment system questionnaire, but did not provide all data
ND = no data; vendor did not fill out treatment system questionnaire

Table 4. Treatment removal performance for dissolved metals.

Treatment Type	Treatment System Name	Dissolved Copper			Dissolved Lead			Dissolved Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Passive Treatment Technologies											
Bioretention/Filtration											
	Filterra® Curb Inlet System	0.0056	0.0033	44%	NA	NA	NA	0.194	0.082	54%	
	Filterra® Roof Drain System	0.0056	0.0033	44%	NA	NA	NA	0.194	0.082	54%	
	Modular Wetland System – Linear	0.757	0.0552	93%	0.543	0.1	81%	0.95	0.185	80%	
	Silva Cell	NA	NA	90%	NA	NA	NA	NA	NA	90%	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert											
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	StormPod™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Flume Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® LoPro Matrix Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard+PLUS®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Trash & Debris Guard	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURE™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Treatment Type	Treatment System Name	Dissolved Copper			Dissolved Lead			Dissolved Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Drain Inlet Insert (cont)											
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation											
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	42%	ND	ND	ND	ND	ND	38%	Information obtained from product literature
	CDS™ Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Downstream Defender	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Stormceptor®	NA	NA	28%	NA	NA	42%	NA	NA	35%	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	UniScreen	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UniStorm	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	V2B1 Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration											
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	0.084	0.006	93%	0.008	0.007	51%	0.196	0.06	73%	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Perk Filter™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PuriStorm	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	0.0046	0.0042	11%	NA	NA	NA	0.060	0.053	15%	
	StormSafe™ Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoStorm + ecoStorm Plus®	NA	NA	NA	NA	NA	NA	0.066	0.042	36%	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HydroFilter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	0.57	0.12	79%	0.38	0.01	98%	0.75	0.16	78%	
	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Treatment Type	Treatment System Name	Dissolved Copper			Dissolved Lead			Dissolved Zinc			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Oil/Water Separator											
	ADS® Water Quality Unit	ND	ND	74%	ND	ND	74%	ND	ND	74%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Kleerwater™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies											
Chemical Filtration											
	Baker Tank with Sand Filter	20	10	50%	40	20	50%	400	40	90%	Units reported by vendor appear to be anomalous
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	0.06	0.0074	88%	
Chemical Treatment											
	ACISTBox®	NA	NA	NA	NA	NA	NA	0.817	0.744	9%	
	pHATBox®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Wetsep	0.007	0.001	86%	0.018	<0.001	94%	NA	NA	NA	Zinc concentrations are in mg/L.
Electrocoagulation											
	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	8.2	0.072	99%	10.9	0.039	100%	78.6	0.34	99.9%	
	Redbox	NA	NA	99%	NA	NA	99%	NA	NA	99%	
	WaveIonics™	0.0235	0.005	79%	0.0157	0.0031	80%	0.12	0.02	83%	
Filtration											
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Ion Exchange											
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Reverse Osmosis											
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

Table 5. Treatment removal performance for total suspended solids.

Treatment Type	Treatment System Name	Total Suspended Solids (TSS) Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Notes
Passive Treatment Technologies					
Bioretention/Filtration					
	Filterra® Curb Inlet System	27.5	4.2	85%	
	Filterra® Roof Drain System	27.5	4.2	85%	
	Modular Wetland System – Linear	270	3	98%	
	Silva Cell	NA	NA	80%	
	TREEPOD® Biofilter	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	
Drain Inlet Insert					
Absorbent Boom/Fabric	ADsorb-It	V	V	80-99%	
	Enviro-Drain®	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	
	Ultra-Urban Filter™	NA	NA	80%	mm range.
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	
	EnviroSafe™	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	112	3	98%	
	StormPod™	112	3	98%	
	Triton Drop Inlet Insert	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	93%*	*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing.
	Bio Clean Downspout Filter	NA	NA	93%*	*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing.
	Bio Clean Flume Filter	73	51.6	29%	
	Bio Clean Grate Inlet Skimmer Box	978	329	66%	Units reported by vendor appear to be anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	
	DrainPac™	ND	ND	ND	
	EnviroTrap Catch Basin Insert	250	175	30%	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 180 microns was used.
	FloGard® Downspout Filter	100	20	80%	
	FloGard® LoPro Matrix Filter	100	20	80%	
	FloGard® LoPro Trench Drain Filter	100	20	80%	
	FloGard+PLUS®	100	20	80%	
	FloGard® Trash & Debris Guard	NA	NA	NA	
	Inceptor®	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	
	Storm PURE™	ND	ND	ND	
	SwaleGard® Pre-filter	100	20	80%	
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	43	5	80%	
	ClearWater BMP	ND	ND	ND	

Treatment Type	Treatment System Name	Total Suspended Solids (TSS) Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Notes
Drain Inlet Insert (cont.)					
Combination System (Screen and Media Filtration)	Coanda Curb Inlet Filter	1,500	1,376	8%	Units reported by vendor appear to be anomalous
	Coanda Downspout Filter	1,500	1,376	8%	Units reported by vendor appear to be anomalous
	RSF (Rapid Stormwater Filtration) 100	ND	ND	65%	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	49%	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	91%	Information obtained from product literature
Hydrodynamic Separation					
	Aqua Shield Aqua-Swirl Concentrator	137	12	86%	
	BaySeparator®	ND	ND	80%	Information obtained from product literature
	CDS™ Stormwater Treatment System	154	26	95%	
	Downstream Defender	ND	ND	50%	Information obtained from product literature
	FloGard® Dual-Vortex Hydrodynamic Separator	202	80	60%	
	HydroGuard	ND	ND	70%	Information obtained from product literature
	Nutrient Separating Baffle Box	366	48	87%	
	Stormceptor®	159	59	53%	
	StormTrooper®	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	
	Terre Kleen™	ND	ND	78%	Information obtained from product literature
	UniScreen	250	175	80%	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 110 microns was used.
	UniStorm	250	175	80%	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 110 microns was used.
	V2B1 Treatment System	ND	ND	63.8%	Information obtained from product literature
	Vortechs System	108	28	93%	
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	30	3.39	83%	
Cartridge	BayFilter®	ND	ND	80%	Information obtained from product literature
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	
	Perk Filter™	70	11	82%	
	PuriStorm	250	175	80%	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 60 microns was used.
	Sorbtive™ FILTER	ND	ND	84%	Information obtained from product literature
	Stormfilter using ZPG Media	83	23	82%	
	StormSafe™ Helix	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	43	5	80%	
	ecoStorm + ecoStorm Plus®	200	26	87%	
	Go-Filter	NA	NA	NA	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	
	HydroFilter	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	84.6	12.4	85%	
	Jellyfish™ Filter	74	8	89%	
	Up-Flo™ Filter	ND	ND	91%	Information obtained from product literature

Treatment Type	Treatment System Name	Total Suspended Solids (TSS)			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Oil/Water Separator					
	ADS® Water Quality Unit	ND	ND	80%	Information obtained from product literature
	BioSTORM	227	7.9	95.3%	
	Clara® Gravity Stormwater Separator Vault	284.5	173.5	47%	
	CrystalClean Separator	ND	ND	ND	
	ecoLine A®	NA	NA	NA	
	ecoLine B®	NA	NA	NA	
	ecoSep®	ND	ND	ND	
	ecoTop®	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	
	Kleerwater™	NA	NA	NA	
	PSI Separator	ND	ND	ND	
	SNOUT®	ND	ND	ND	
	VortClarex	NA	NA	NA	
Active Treatment Technologies					
Chemical Filtration					
	Baker Tank with Sand Filter	200	10	95%	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	
Chemical Treatment					
	ACISTBox®	NA	NA	NA	
	pHATBox®	NA	NA	NA	
	Wetsep	112	<2	98%	
Electrocoagulation					
	High-Flo Electrocoagulation	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	600	10	98%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	99%	
	WaveIonics™	200	5	98%	
Filtration					
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	
Media	Fuzzy Filter	10	2	70-95%	
	WaterTrak Pressurized Media Filter	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	
Reverse Osmosis					
	WaterTrak Reverse Osmosis	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

V = varies

Table 6. Treatment removal performance for total petroleum hydrocarbons and oil and grease.

Treatment Type	Treatment System Name	TPH			Oil and Grease			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Passive Treatment Technologies								
Bioretention/Filtration								
	Filterra® Curb Inlet System	43.4	1.2	97%	6.2	5.0 U	>18%	
	Filterra® Roof Drain System	43.4	1.2	97%	6.2	5.0 U	>18%	
	Modular Wetland System – Linear	19	0	>99%	4	U	>99%	
	Silva Cell	NA	NA	NA	NA	NA	NA	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert								
Absorbent Boom/Fabric	ADsorb-It	V	V	99-100%	V	V	99-100%	
	Enviro-Drain®	ND	ND	ND	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter™	>100	<10	90%	>100	<10	85%	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA	
	EnviroSafe™	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	NA	NA	NA	59.5	<5	>90%	
	StormPod™	NA	NA	NA	59.5	<5	>90%	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	
	Bio Clean Downspout Filter	NA	NA	NA	223.5	29.5	87%	Units reported by vendor appear to be anomalous
	Bio Clean Flume Filter	223	29.5	87%	360	62	83%	Units reported by vendor appear to be anomalous
	Bio Clean Grate Inlet Skimmer Box	NA	NA	NA	189	10.43	95%	Units reported by vendor appear to be anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	FloGard® Downspout Filter	35	7	80%	35	7	80%	
	FloGard® LoPro Matrix Filter	35	7	80%	35	7	80%	
	FloGard® LoPro Trench Drain Filter	35	7	80%	35	7	80%	
	FloGard+PLUS®	35	7	80%	35	7	80%	
	FloGard® Trash & Debris Guard	NA	NA	NA	NA	NA	NA	
	Inceptor®	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	
	Storm PURE™	ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	35	7	80%	35	7	80%	

Treatment Type	Treatment System Name	TPH			Oil and Grease			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Drain Inlet Insert (cont)								
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	
	ClearWater BMP	NA	NA	NA	NA	NA	NA	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation								
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	CDS™ Stormwater Treatment System	NA	NA	NA	22	5	64%	
	Downstream Defender	NA	NA	NA	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	4	ND	>99%	
	Stormceptor®	29	4	73%	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	
	Terre Kleen™	ND	ND	ND	ND	ND	ND	
	UniScreen	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	UniStorm	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	V2B1 Treatment System	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	
Media Filtration								
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	9.9	3	70%	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	
	Perk Filter™	20	5	75%	20	5	75%	
	PuriStorm	400	80	80%	400	80	80%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	NA	NA	NA	NA	NA	NA	
	StormSafe™ Helix	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	
	ecoStorm + ecoStorm Plus®	NA	NA	NA	NA	NA	NA	
	Go-Filter	NA	NA	NA	NA	NA	NA	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	
	HydroFilter	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	1.4	0	>99%	69.8	6.5	91%	
	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	

Treatment Type	Treatment System Name	TPH			Oil and Grease			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Oil/Water Separator								
	ADS® Water Quality Unit	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	
	Kleerwater™	NA	NA	NA	NA	NA	NA	
	PSI Separator	ND	ND	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	ND	ND	
	VortClarex	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies								
Chemical Filtration								
	Baker Tank with Sand Filter	NA	NA	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	
Chemical Treatment								
	ACISTBox®	3.12	0.38	88%	NA	NA	NA	
	pHATBox®	NA	NA	NA	NA	NA	NA	
	Wetsep	NA	NA	NA	NA	NA	NA	
Electrocoagulation								
	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	78	0.27	100%	136	<5.0	>96.3%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	NA	NA	NA	NA	
	WaveIonics™	45.6	0.25	99%	197	4.76	98%	Units reported by vendor appear to be anomalous
Filtration								
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	
Ion Exchange								
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	
Reverse Osmosis								
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	

mg/L = milligrams per liter
NA = not available; vendor filled out treatment system questionnaire, but did not provide all data
ND = no data; vendor did not fill out treatment system questionnaire
TPH = Total Petroleum Hydrocarbons
U = at or below detection limit
V = varies

Table 7. Treatment removal performance for total phosphorus.

Treatment Type	Treatment System Name	Total Phosphorus (TP)			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Passive Treatment Technologies					
Bioretention/Filtration					
	Filterra® Curb Inlet System	0.15	0.14	7%	during TAPE study. 69.5% efficiency ratio
	Filterra® Roof Drain System	0.15	0.14	7%	during TAPE study. 69.5% efficiency ratio
	Modular Wetland System – Linear	NA	NA	NA	
	Silva Cell	NA	NA	68%	
	TREEPOD® Biofilter	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	
Drain Inlet Insert					
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	
	Enviro-Drain®	NA	NA	NA	
	EnviroSafe™ Storm Safe HF10	NA	NA	NA	
	Ultra-Urban Filter™	NA	NA	NA	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	
	EnviroSafe™	NA	NA	NA	
	HUBER Hydro Filt	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	0.57	0.3	47%	
	StormPod™	0.57	0.3	47%	
	Triton Drop Inlet Insert	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	85.8	73.4	71-96%	anomalous
	Bio Clean Downspout Filter	NA	NA	NA	
	Bio Clean Flume Filter	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	18.6	0.452	98%	anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	
	DrainPac™	ND	ND	ND	
	EnviroTrap Catch Basin Insert	ND	ND	ND	

Treatment Type	Treatment System Name	Total Phosphorus (TP)			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Drain Inlet Insert (cont.)					
	FloGard® Downspout Filter	NA	NA	NA	
	FloGard® LoPro Matrix Filter	NA	NA	NA	
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	
	FloGard+PLUS®	NA	NA	NA	
	FloGard® Trash & Debris Guard	NA	NA	NA	
	Inceptor®	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	
	Storm PURE™	ND	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	
	ClearWater BMP	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	
Combination System (Screen and Media Filtration)	Coanda Downspout Filter	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	NA	NA	40%	
	RSF (Rapid Stormwater Filtration) 1000	NA	NA	30%	
	RSF (Rapid Stormwater Filtration) 4000	NA	NA	30%	
Hydrodynamic Separation					
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	80%	
	BaySeparator®	NA	NA	19.4%	
	CDS™ Stormwater Treatment System	NA	NA	NA	
	Downstream Defender	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	
	HydroGuard	NA	NA	NA	
	Nutrient Separating Baffle Box	1.49	0.44	70%	
	Stormceptor®	0.275	0.175	21.8%	
	StormTrooper®	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	
	Terre Kleen™	NA	NA	NA	
	UniScreen	ND	ND	ND	
	UniStorm	ND	ND	40%	Information obtained from product literature

Treatment Type	Treatment System Name	Total Phosphorus (TP) Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Notes
Hydrodynamic Separation (cont)					
	V2B1 Treatment System	ND	ND	40%	Information obtained from product literature
	Vortechs System	NA	NA	NA	
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	
Cartridge	BayFilter®	NA	NA	>50%	
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	
	Perk Filter™	NA	NA	NA	
	PuriStorm	ND	ND	ND	
	Sorbtive™ FILTER	ND	ND	>77%	Information obtained from product literature
	Stormfilter using ZPG Media	NA	NA	NA	
	StormSafe™ Helix	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	NA	NA	NA	
	ecoStorm + ecoStorm Plus®	NA	NA	NA	
	Go-Filter	NA	NA	NA	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	
	HydroFilter	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	2.07	0.63	70%	
	Jellyfish™ Filter	NA	NA	50%	
	Up-Flo™ Filter	NA	NA	NA	
Oil/Water Separator					
	ADS® Water Quality Unit	NA	NA	>43%	
	BioSTORM	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	
	ecoLine A®	NA	NA	NA	
	ecoLine B®	NA	NA	NA	

Treatment Type	Treatment System Name	Total Phosphorus (TP)			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Oil/Water Separator (cont.)					
	ecoSep®	ND	ND	ND	
	ecoTop®	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	
	Kleerwater™	NA	NA	NA	
	PSI Separator	ND	ND	ND	
	SNOUT®	ND	ND	ND	
	VortClarex	NA	NA	NA	
Active Treatment Technologies					
Chemical Filtration					
	Baker Tank with Sand Filter	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	
Chemical Treatment					
	ACISTBox®	NA	NA	NA	
	pHATBox®	NA	NA	NA	
	Wetsep	13.4	1.9	86%	
Electrocoagulation					
	High-Flo Electrocoagulation	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	NA	NA	NA	
	Redbox	NA	NA	NA	
	WaveIonics™	NA	NA	NA	
Filtration					
Disc	Arkal Filter (Spin Klin System)	NA	NA	NA	
Media	Fuzzy Filter	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	
Pressure	Arkal Media Filter	NA	NA	NA	

Treatment Type	Treatment System Name	Total Phosphorus (TP)			Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	
Reverse Osmosis					
	WaterTrak Reverse Osmosis	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

Table 8. Treatment removal performance for SVOCs, PCBs, dioxins, and CPAHs.

Treatment Type	Treatment System Name	SVOCs			PCBs			Dioxins			CPAHs		Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Removal (%)	
Passive Treatment Technologies													
Bioretention/Filtration													
	Filterra® Curb Inlet System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Filterra® Roof Drain System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Modular Wetland System – Linear	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Silva Cell	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert													
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter™	180	>4.4	40%	NA	NA	NA	NA	NA	NA	>100	605	Units reported by vendor appear to be anomalous
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe™	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin™	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	StormPod™	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Flume Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	400	150	0.625	400	150	0.625	400	150	0.625	400	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	FloGard® Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard® LoPro Matrix Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard+PLUS®	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard® Trash & Debris Guard	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURE™	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Treatment Type	Treatment System Name	SVOCs			PCBs			Dioxins			CPAHs		Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Removal (%)	
Drain Inlet Insert (cont)													
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation													
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	CDS™ Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Downstream Defender	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Stormceptor®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen™	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	UniScreen	400	150	63%	400	150	63%	400	150	63%	400	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	UniStorm	400	150	63%	400	150	63%	400	150	63%	400	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	V2B1 Treatment System	400	150	63%	400	150	63%	400	150	63%	400	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration													
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EcoSense™ Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Perk Filter™	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	75%	Units reported by vendor appear to be anomalous
	PuriStorm	400	80	80%	400	80	80%	400	80	80%	400	80%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

Treatment Type	Treatment System Name	SVOCs			PCBs			Dioxins			CPAHs		Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Removal (%)	
Cartridge (cont'd)	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.12	42%	
	StormSafe™ Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Oil/Water Separator													
	ADS® Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator												
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep®												
	ecoTop®												
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit												
	Kleerwater™	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator												
	SNOUT®												
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies													
Chemical Filtration													
	Baker Tank with Sand Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chemical Treatment													
	ACISTBox®	0.0199	0.00002	99.9%	NA	NA	NA	NA	NA	NA	0.00028	93%	
	pHATBox®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Wetsep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Electrocoagulation													
	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	28	0.43	98.4%	NA	NA	NA	NA	NA	NA	NA	NA	Units reported by vendor appear to
	Redbox	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaveIonics™	2.34	0.00002	100%	0.0024	0.00011	95.5%	NA	NA	NA	0.091	99.98%	
Filtration													
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Treatment Type	Treatment System Name	SVOCs			PCBs			Dioxins			CPAHs		Notes
		Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Effluent (mg/L)	Median Removal (%)	Median Influent (mg/L)	Median Removal (%)	
Ion Exchange													
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Reverse Osmosis													
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

cPAHs = carcinogenic polycyclic aromatic hydrocarbons
mg/L = milligrams per liter
NA = not available; vendor filled out treatment system questionnaire, but did not provide all data
ND = no data; vendor did not fill out treatment system questionnaire
PCBs = polychlorinated biphenyls
SVOCs = semivolatile organic compounds

Table 9. System design information for passive treatment systems.

Treatment Type	Treatment System Name	Design Flow Rate (gpm) Low	Design Flow Rate (gpm) High	System Footprint (sf) Low	System Footprint (sf) High	Required Head Loss (feet) Low	Required Head Loss (feet) High	Internal or External Bypass	Above or Below Grade	Bypass Notes
Bioretention/Filtration										
	Filterra® Roofdrain System	8.5	>50	16	72	2.5	2.5	Internal/External	Both	System footprint obtained from Western Washington Engineering Design Assistance Kit
	Filterra® System	8.5	>50	16	72	2.5	2.5	Internal/External	Both	System footprint obtained from Western Washington Engineering Design Assistance Kit
	Modular Wetland System – Linear	22.4	120	16	84	2	4	Internal	Both	External bypass in some situations
	Silva Cell	20 in/hr	3 in/hr	NA	NA	NA	NA	Internal/External	Below	
	TREEPOD® Biofilter	16	72	24	84	0	0.5	Internal	Both	
	UrbanGreen BioFilter	4	60	0	0	3	6	Internal/External	Below	
Drain Inlet Insert										
Absorbent Boom/Fabric	Adsorb-It	80/SF	100/SF	V	V	NA	NA	NA	Below	Per individual application
	Enviro-Drain®	2	71	0	0	NA	NA	NA	Below	Information obtained from product literature
	EnviroSafe™ Storm Safe HF10	900	9000	0	0	NA	NA	External	Below	Information obtained from product literature
	Ultra-Urban Filter™	190	500	0	0	0.5	1.5	Internal	Below	
Media Filtration	EcoVault™ Baffle Box	1,346	48,000	NA	NA	V	V	Internal/External	Below	
	EnviroSafe™	115	230	0	0	NA	NA	External	Below	Information obtained from product literature
	HUBER Hydro Filt	ND	ND	0	0	ND	ND	ND	Below	
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	ND	Below	
	Raynfiltr™	0	900	0	0	NA	NA	NA	Below	
Media Filtration (Cartridge)	StormBasin™	50	2,500	4	200	1.25	2.5	Internal/External	Below	
	StormPod™	50	2,500	4	200	1.25	2.5	Internal/External	Below	
	Triton Drop Inlet Insert	100	5,404	0	0	NA	NA	Internal/External	Below	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	381	898	0	0	0.5	2	External	Below	Installed in catch basin - does not affect basin hydraulics
	Bio Clean Downspout Filter	249	1,145	0.31 CF	1.57 CF	1	2	Internal	Above	High flow unimpeded - UPC approved and tested
	Bio Clean Flume Filter	116	583	1	6	0.083	0.5	Internal/External	Above	Internal bypass up to specific flow - configured to allow for high flow external bypass
	Bio Clean Grate Inlet Skimmer Box	224	8,980	0	0	0.5	2	Internal	Below	High flow rate
	Bio Clean Trench Drain Filter	28	86	0	0	4	12	Internal/External	Below	Internal bypass up to specific flow - configured to allow for high flow external bypass
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	Above	
	DrainPac™	ND	ND	ND	ND	ND	ND	ND	Below	
	EnviroTrap Catch Basin Insert	0	2700	NA	NA	0	0.5	NA	Below	
	FloGard® Downspout Filter	30	325	0.5	1.0	0	0.5	Internal	Above	
	FloGard® LoPro Matrix Filter	45	800	0.75	16	0	0.5	Internal	Above	
	FloGard® LoPro Trench Drain Filter	200	500	1.0	20	0	0.25	Internal	Above	
	FloGard+PLUS®	100	2,000	1.0	10	0	0.25	Internal	Above	
	FloGard® Trash & Debris Guard	50	500	0.5	4	0	0.25	Internal	Above	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	Above	
	Storm PURE™	ND	ND	ND	ND	ND	ND	ND	Below	
	SwaleGard® Pre-filter	100	800	4	16	0	0.5	Internal	Above	

Treatment Type	Treatment System Name	Design Flow Rate (gpm) Low	Design Flow Rate (gpm) High	System Footprint (sf) Low	System Footprint (sf) High	Required Head Loss (feet) Low	Required Head Loss (feet) High	Internal or External Bypass	Above or Below Grade	Bypass Notes
Drain Inlet Insert (cont)										
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	5/400*	100/940*	NA	NA	0	0	Internal/External	Below	* x/x = flow thru perlite/flow thru perlite + filter cloth
	ClearWater BMP	200	200	5	6	NA	NA	External	Above	Information obtained from product literature
	Coanda Curb Inlet Filter	50	360,000	2	2000	1.5	3	Internal	Above	Optional internal bypass is provided.
	Coanda Downspout Filter	50	360,000	2	2000	1.5	3	Internal	Above	Optional internal bypass is provided.
	RSF (Rapid Stormwater Filtration) 100	1,784	7,000	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 1000	12,000	18,162	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 4000	837	68,270	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
Hydrodynamic Separation										
	Aqua Shield Aqua-Swirl Concentrator	100	2,600	NA	NA	0.25	0.25	Internal/External	Below	
	BaySeparator®	450	1,350	0	0	NA	NA	NA	Below	Information obtained from product literature
	CDS™ Stormwater Treatment System	20	44,900	NA	NA	0.1	0.1	Internal/External	Below	
	Downstream Defender	500	7,800	0	0	0.5	0.9	NA	Below	Information obtained from product literature
	FloGard® Dual-Vortex Hydrodynamic Separator	150	6,500	7	113	0	3	Internal	Below	
	HydroGuard	360	3,232	0	0	0	2	NA	Below	Information obtained from product literature
	Nutrient Separating Baffle Box	148	8,858	0	0	0	0	Internal	Below	External bypass in some situations
	Stormceptor®	0	11,000	NA	NA	0.22	0.22	Internal	Below	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	Below	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	Below	
	Terre Kleen™	1.5	100	0	0	NA	NA	Internal	Below	Information obtained from product literature
	UniScreen	0	15700	20	135	0	0.5	Both	Above	
	UniStorm	0	15700	20	135	0	0.5	Both	Above	
	V2B1 Treatment System	0	63000	20	800	0	0.5	Both	Above	
	Vortechs System	50	22,450	NA	NA	0.1	0.1	Internal/External	Below	
Media Filtration										
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	10	350	14	320	4	7	External	Above	
Cartridge	BayFilter®	15	30	0	0	ND	ND	ND	Below	Information obtained from product literature
	EcoSense™ Stormwater Filtration Systems	25	1,662	NA	NA	V	V	Internal	Below	Hooded
	Perk Filter™	12	1,000	10	150	1.7	3.5	Internal	Below	
	PuriStorm	0	2000	9	600	0	0.5	Both	Above	
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	Below	
	Stormfilter using ZPG Media	2	44,900	8	6,050	1.8	12	Internal/External	Below	
	StormSafe™ Helix	3	9	160	250	0	3	Internal/External	Below	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	Below	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	Below	

Treatment Type	Treatment System Name	Design Flow Rate (gpm) Low	Design Flow Rate (gpm) High	System Footprint (sf) Low	System Footprint (sf) High	Required Head Loss (feet) Low	Required Head Loss (feet) High	Internal or External Bypass	Above or Below Grade	Bypass Notes
Media Filtration (cont)										
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	25	>960	NA	NA	0.8	0.8	Internal/External	Below	
	ecoStorm + ecoStorm Plus®	NA	180	NA	NA	0.41 (a)	NA	Internal/External	Below	Head loss based on: - Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units. - 360 gpm through the system, 180 gpm per filter. - Site specific model calibrated onsite at known flow rates. - Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units). - Filters assumed to be at the point of required maintenance (twice the head loss measured for new filters).
	Go-Filter	50	675	NA	NA	0.5	0.5	Internal/External	Below	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	Below	
	HydroFilter	ND	ND	ND	ND	ND	ND	ND	Below	
Up-Flow	Bio Clean Water Polisher	191	528	0	0	1	2	Internal	Below	High Flow Unimpeded
	Jellyfish™ Filter	60	2,300	12	113	1	2	Internal/External	Below	
	Up-Flo™ Filter	147	448	0	0	1.7	2.5	Internal	Below	Information obtained from product literature
Oil/Water Separator										
	ADS® Water Quality Unit	1,800	126,000	0	0	NA	NA	External	Below	
	BioSTORM	225	4,800	45	162	0.5	0.17	External	Below	
	Clara® Gravity Stormwater Separator Vault	5	1,120	0	150	0.5	1.5	Internal	Below	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	Below	
	ecoLine A®	25	626	12	70	6	6	V	Below	
	ecoLine B®	50	1,110	NA	NA	6	6	V	Below	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	Below	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	Below	
	First Flush 1640FF	449	538	0	0	0	0	NA	Below	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	Below	
	Kleerwater™	25	10,000	NA	NA	0	0	External	Below	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	Below	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	Below	
	VortClarex	100	2,000	0	0	0.1	0.1	Internal/External	Below	

CF = cubic feet
gpm = gallons per minute
in/hr = inches per hour
NA = not available; vendor filled out Treatment System Summary form, but did not provide all data
ND = no data; vendor did not fill out Treatment System Summary form
SF = square foot
V = varies

Table 10. System design information for active treatment systems.

Treatment Type	Treatment System Name	Design Flow Rate (gpm) Low	Design Flow Rate (gpm) High	System Footprint (sf) Low	System Footprint (sf) High	(feet) Low	(feet) High	Internal or External Bypass	Above or Below Grade	Notes
Chemical Filtration										
	Baker Tank with Sand Filter	15	>1000	1000	2500	NA	NA	NA	Above	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	< 25	> 2,000	< 25	> 2,000	NA	NA	External	Above	Offline facility
	Purus® Stormwater Polishing System	5	210	10	90	70	120	External	Above	
Chemical Treatment										
	ACISTBox®	100	> 1,000	200	> 2,000	NA	NA	NA	Above	
	pHATBox®	250	350	10	24	NA (a)	NA (a)	NA	Above	(a) Packaged in 4' -6' (w) x 2.5' (d) x 4' (t) industrial steel box w/hinged top opening lid. Additional storage space for additive will depend on volume of additive storage (up to 35-gal drums in box, larger must go external) - plus secondary containment).
	Wetsep	20	260	NA	NA	40	40	External	NA	
Electrocoagulation										
	High-Flo Electrocoagulation	2.5	> 1,200	40	4,000	2	20	External	Above	
	OilTrap ElectroPulse Water Treatment System	5	500	40	1,500	5	15	Internal/External	Above	
	Redbox	0.5	150	NA	NA	NA	NA	NA	Above	
	WaveIonics™	50	> 1,000	200	> 4,000	NA	NA	NA	Above	
Filtration										
Disc	Arkal Filter (Spin Klin System)	100	4400	16	16	0.1	14	NA	Above	Information obtained from product literature
Media	Fuzzy Filter	70	Unlimited	NA	NA	35	35	External	Above	
	WaterTrak Pressurized Media Filter	27	905	43	119	ND	ND	ND	Above	Information obtained from product literature
	WaterTrak Ultrafiltration	38	377	31	62	ND	ND	ND	Above	Information obtained from product literature
Pressure	Arkal Media Filter	44	150	16	16	3	28	NA	Above	Information obtained from product literature
Ion Exchange										
	Wastewater Ion Exchange System (WWIX)	1	5000	NA	NA	20	20	NA	Above	
	WaterTrak Ion Exchange	23	866	65	113	ND	ND	ND	Above	Information obtained from product literature
Reverse Osmosis										
	WaterTrak Reverse Osmosis	65	275	143	243	350	350	ND	Above	Information obtained from product literature

gpm = gallons per minute
NA = not available; vendor filled out Treatment System Summary form, but did not provide all data
ND = no data; vendor did not fill out Treatment System Summary form
SF = square foot

Table 11. Installation and annual operation and maintenance costs for passive treatment systems.

Treatment Type	Treatment System Name	Installation Cost		Annual O&M Cost		Notes
		Low	High	Low	High	
Bioretention/Filtration						
	Filterra® Curb Inlet System	$1,200	$7,500	$300	$3,000	
	Filterra® Roof Drain System	$1,200	$7,500	$300	$3,000	
	Modular Wetland System – Linear	$12,000	$25,000	$8.26/gal	$10.50/gal	
	Silva Cell	$4,000-5,600	$10,000-14,000	$100-200	100-200	Depends on selected tree species (small or large)
	TREEPOD® Biofilter	$10,000	$50,000	$400	$750	
	UrbanGreen BioFilter	$10,000	$250,000	$0.0001/gal	$0.0003/gal	
Drain Inlet Insert						
Absorbent Boom/Fabric	ADsorb-It	$0.91/SF	$0.91/SF	$0.91/SF	$0.91/SF	
	Enviro-Drain®	ND	ND	ND	ND	
	EnviroSafe™ Storm Safe HF10	ND	ND	ND	ND	
	Ultra-Urban Filter™	$400	$1,700	NA	NA	
Media Filtration	EcoVault™ Baffle Box	$25,000	$125,000	$200	$1,800	
	EnviroSafe™	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	
	Hydro-Kleen™	ND	ND	ND	ND	
	Raynfiltr™	$531	$554	NA	NA	
Media Filtration (Cartridge)	StormBasin™	$750	$2,000	$200	$800	
	StormPod™	$750	$2,000	$200	$800	
	Triton Drop Inlet Insert	$300	$2,500	$0.000002/gal	$0.00008/gal	
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket	$445	$1,600	$0.20/gal	$0.40/gal	
	Bio Clean Downspout Filter	$1,035	$1,200	$0.16/gal	$0.22/gal	
	Bio Clean Flume Filter	$660	$1,302	$0.23/gal	$0.74/gal	
	Bio Clean Grate Inlet Skimmer Box	$635	$1,800	$0.15/gal	$0.40/gal	
	Bio Clean Trench Drain Filter	$660	$1,302	$0.23/gal	$0.74/gal	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	$200	$1000	$0	$1000	
	FloGard® Downspout Filter	$1,500	$3,500	$75	$250	
	FloGard® LoPro Matrix Filter	$400	$1,000	$75	$300	
	FloGard® LoPro Trench Drain Filter	$600	$3,000	$75	$350	
	FloGard+PLUS®	$250	$1,800	$75	$350	
	FloGard® Trash & Debris Guard	$450	$1,500	$50	$200	
	Inceptor®	ND	ND	ND	ND	

Treatment Type	Treatment System Name	Installation Cost		Annual O&M Cost		Notes
		Low	High	Low	High	
Drain Inlet Insert (cont)						
	StormClean Catch Basin Insert	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	
	Storm PURE™	ND	ND	ND	ND	
	SwaleGard® Pre-filter	$4,500	$4,500	$75	$300	
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert	V	V	V	V	
	ClearWater BMP	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	$2,000	$3,500	$0	$0	
	Coanda Downspout Filter	$2,000	$3,500	$0	$0	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	
Hydrodynamic Separation						
	Aqua Shield Aqua-Swirl Concentrator	V	V	V	V	
	BaySeparator®	ND	ND	ND	ND	
	CDS™ Stormwater Treatment System	$10,000	$2,500,000	$0.00001/gal	$0.00001/gal	
	Downstream Defender	ND	ND	ND	ND	
	FloGard® Dual-Vortex Hydrodynamic Separator	$10,000	$100,000	$300	$3,500	
	HydroGuard	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	$10,000	$200,000	$0.33/gal	$0.84/gal	
	Stormceptor®	$3,000	$15,000	$500	$5,000	
	StormTrooper®	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	
	Terre Kleen™	ND	ND	ND	ND	
	UniScreen	$2000	$15000	0	$2000	
	UniStorm	$2000	$15000	0	$2000	
	V2B1 Treatment System	$2000	$15000	0	$2000	
	Vortechs System	$20,000	$500,000	$0.00001/gal	$0.00004/gal	
Media Filtration						
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	$5,000	$150,000	$0.0003/gal	$0.003/gal	
Cartridge	BayFilter®	ND	ND	ND	ND	
	EcoSense™ Stormwater Filtration Systems	$400	$2,000	$100	$500	
	Perk Filter™	$10,000	$200,000	$1,200	$10,000	
	PuriStorm	$3000	$25000	$0	$10000	
	Sorbtive™ FILTER	ND	ND	ND	ND	
	Stormfilter using ZPG Media	$10,000	$2,500,000	$0.00008/gal	$0.00024/gal	

Treatment Type	Treatment System Name	Installation Cost		Annual O&M Cost		Notes
		Low	High	Low	High	
Media Filtration (cont)						
	StormSafe™ Helix	$20,000	$60,000	$2,000	$6,000	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	
Combination System (with Hydrodynamic Separation)	Aqua Shield Aqua-Filter System	V	V	V	V	
	ecoStorm + ecoStorm Plus®	$8,900 (a)	$37,500 (a)	NA (b)	NA (b)	(a) Cost varies based on combination of units, number of units, and final design requirements. (b) $500 - $1000 per cleaning/backflush event; Minimum of 1X per year to monthly for stormwater.
	Go-Filter	V	V	V	V	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	
	HydroFilter	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	$25,000	$125,000	$5.24/gal	$7.85/gal	
	Jellyfish™ Filter	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	
Oil/Water Separator						
	ADS® Water Quality Unit					
	BioSTORM	$500	$2,000	$400	$4,000	
	Clara® Gravity Stormwater Separator Vault	$20,000	$52,000	$0.0005/gal	$0.01/gal	

Treatment Type	Treatment System Name	Installation Cost		Annual O&M Cost		Notes
		Low	High	Low	High	
Oil/Water Separator (cont.)						
	CrystalClean Separator	ND	ND	ND	ND	
	ecoLine A®	$6,700	$44,250	NA	NA	Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.
	ecoLine B®	$8,200	$81,900	NA	NA	Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.
	ecoSep®	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	
	First Flush 1640FF	$5,000	$10,000	$500	$3,000	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	
	Kleerwater™	V	V	V	V	
	PSI Separator	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	
	VortClarex	$10,000	$300,000	$0.00008/gal	$0.001/gal	

gal = gallon

NA = not available; vendor filled out treatment system questionaire, but did not provide all data

ND = no data; vendor did not complete treatment system questionaire

SF = square foot

V = varies

Table 12. Installation and annual operation and maintenance costs for active treatment systems.

Treatment Type	Treatment System Name	Installation Cost		Annual O&M Cost		Notes
		Low	High	Low	High	
Chemical Filtration						
	Baker Tank with Sand Filter	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	$15,000	>$250,000	<$0.001/gal	>0.003/gal	
	Purus® Stormwater Polishing System	$10,000	$140,000	$0.0024/gal	$0.0047/gal	
Chemical Treatment						
	ACISTBox®	$25,000	$400,000	NA	NA	
	pHATBox®	$19,500	$28,500	NA	NA	Depends on buffering capacity of waterstream, flow rate, total volume processed, specific pH adjustment additive selected, and final pH point required.
	Wetsep	$1,000	$2,500	$100/day	$250/day	
Electrocoagulation						
	High-Flo Electrocoagulation	$2,500	$2,200,000	$0.0005/gal	$0.01/gal	
	OilTrap ElectroPulse Water Treatment System	$25,000	$500,000	$0.002/gal	$0.005/gal	
	Redbox	$42,000	$1,000,000	$1,000	$20,000	
	WaveIonics™	$60,000	$850,000	$0.0008/gal	$0.008/gal	
Filtration						
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	
Ion Exchange						
	Wastewater Ion Exchange System (WWIX)	$3,000	$250,000	$3,000	$500,000	
	WaterTrak Ion Exchange	ND	ND	ND	ND	
Reverse Osmosis						
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	

gal = gallon

NA = not available; vendor filled out treatment system questionaire, but did not provide all data

ND = no data; vendor did not complete treatment system questionaire

Table 13. TAPE and NJCAT approvals for passive stormwater treatment technologies.

Treatment Type	Treatment System Name	Technology Assessment Protocol - Ecology (TAPE)					New Jersey Corporation for Advanced Technology (NJCAT)	
		Pretreatment	Basic	Enhanced	Phosphorus	Oil	50% TSS Removal	80% TSS Removal
Bioretention/Filtration								
	Filterra® Curb Inlet System		GULD	GULD		GULD		
	Silva Cell		GULD	GULD				
Hydrodynamic Separation								
	Aqua Shield Aqua-Swirl Concentrator	GULD					X	
	BaySeparator®	CULD					X	
	CDS™ Stormwater Treatment System	GULD	GULD			PULD	X	
	Downstream Defender	GULD					X	
	FloGard® Dual-Vortex Hydrodynamic Separator						X	
	HydroGuard						X	
	Nutrient Separating Baffle Box						X	
	Stormceptor®						X	
	Terre Kleen™						X	
	V2B1 Treatment System	PULD					X	
	Vortechs System	GULD					X	
Media Filtration								
Cartridge	BayFilter®		CULD	CULD	CULD			X
	Perk Filter™		GULD		GULD			
	Stormfilter using ZPG Media		GULD					X
Combination System (with Hydrodyanamic Separation)	Aqua Shield Aqua-Filter System		PULD	PULD	PULD	PULD		X
	ecoStorm + ecoStorm Plus®		CULD					
	Jellyfish™ Filter		PULD					X
	Up-Flo™ Filter		PULD					X
Oil/Water Separator								
	ecoSep®					PULD		

CULD = Conditional Use Level Designation
GULD = General Use Level Designation
PULD = Pilot Use Level Designation
TSS = Total Suspended Solids

Table 14. Treatment system applications.

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Bioretention/Filtration					
	Filterra® Roofdrain System	•			
	Filterra® System		•		
	Modular Wetland System – Linear		•	•	
	Silva Cell		•		
	TREEPOD® Biofilter		•	•	
	UrbanGreen BioFilter		•	•	
Drain Inlet Insert					
Absorbent Boom/Fabric	Adsorb-It		•		
	Enviro-Drain®		•		
	EnviroSafe™ Storm Safe HF10		•		
	Ultra-Urban Filter™		•		
Media Filtration	EcoVault™ Baffle Box		•		
	EnviroSafe™		•		
	HUBER Hydro Filt		•		
	Hydro-Kleen™		•		
	Raynfiltr™		•		
Media Filtration (Cartridge)	StormBasin™		•		
	StormPod™		•		
	Triton Drop Inlet Insert		•		
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Curb Inlet Basket		•		
	Bio Clean Downspout Filter	•			
	Bio Clean Flume Filter		•		

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Drain Inlet Insert (cont)					
	Bio Clean Grate Inlet Skimmer Box		•		
	Bio Clean Trench Drain Filter		•		
	Clean Way Downspout Filtration Unit	•			
	DrainPac™		•		
	EnviroTrap Catch Basin Insert		•		
	FloGard® Downspout Filter	•			
	FloGard® LoPro Matrix Filter		•		
	FloGard® LoPro Trench Drain Filter		•		
	FloGard+PLUS®		•		
	FloGard® Trash & Debris Guard		•		
	Inceptor®		•		
	StormClean Catch Basin Insert		•		
	StormClean Curb Inlet Insert		•		
	StormClean Wall Mount Filtration Unit		•		
	Storm PURE™		•		
	SwaleGard® Pre-filter		•		
Combination System (Screen and Media Filtration)	Aqua-Guardian™ Catch Basin Insert		•		
	ClearWater BMP		•		
	Coanda Curb Inlet Filter		•		
	Coanda Downspout Filter	•			
	RSF (Rapid Stormwater Filtration) 100		•		
	RSF (Rapid Stormwater Filtration) 1000		•		
	RSF (Rapid Stormwater Filtration) 4000		•		
Hydrodynamic Separation					
	Aqua Shield Aqua-Swirl Concentrator			•	
	BaySeparator®			•	
	CDS™ Stormwater Treatment System			•	
	Downstream Defender			•	

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Hydrodynamic Separation (cont)					
	FloGard® Dual-Vortex Hydrodynamic Separator			•	
	HydroGuard			•	
	Nutrient Separating Baffle Box			•	
	Stormceptor®			•	
	StormTrooper®			•	
	StormTrooper® EX Extra-Duty			•	
	Terre Kleen™			•	
	UniScreen			•	
	UniStorm			•	
	V2B1 Treatment System			•	
	Vortechs System			•	
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System			•	
Cartridge	BayFilter®			•	
	EcoSense™ Stormwater Filtration Systems		•		
	Perk Filter™		•	•	
	PuriStorm		•	•	
	Sorbtive™ FILTER			•	
	Stormfilter using ZPG Media		•	•	
	StormSafe™ Helix			•	
Combination System (with Hydrodyanamic Separation)	Aqua Shield Aqua-Filter System			•	
	ecoStorm + ecoStorm Plus®			•	
	Go-Filter			•	

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Media Filtration (cont)					
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher			•	
	HydroFilter			•	
Up-Flow	Bio Clean Water Polisher			•	
	Jellyfish™ Filter			•	
	Up-Flo™ Filter			•	
Oil/Water Separator					
	ADS® Water Quality Unit			•	
	BioSTORM		•	•	
	Clara® Gravity Stormwater Separator Vault		•	•	
	CrystalClean Separator			•	
	ecoLine A®			•	•
	ecoLine B®			•	
	ecoSep®			•	
	ecoTop®			•	•
	First Flush 1640FF		•	•	
	Hancor Storm Water Quality Unit			•	
	Kleerwater™			•	
	PSI Separator			•	
	SNOUT®		•		
	VortClarex		•	•	
Chemical Filtration					
	Baker Tank with Sand Filter			•	•
	Chitosan-Enhanced Sand Filtration Using FlocClear™			•	•
	Purus® Stormwater Polishing System			•	•
Chemical Treatment					
	ACISTBox®			•	•
	pHATBox®			•	•
	Wetsep			•	•

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Electrocoagulation					
	High-Flo Electrocoagulation			•	•
	OilTrap ElectroPulse Water Treatment System			•	•
	WaveIonics™			•	•
	Redbox			•	•
Filtration					
Disc	Arkal Filter (Spin Klin System)			•	•
Media	Fuzzy Filter			•	•
Filtration (cont)					
	WaterTrak Pressurized Media Filter			•	•
	WaterTrak Ultrafiltration			•	•
Pressure	Arkal Media Filter			•	•
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)			•	•
	WaterTrak Ion Exchange			•	•
Reverse Osmosis					
	WaterTrak Reverse Osmosis			•	•

APPENDIX A

Technology Summary Sheets

Appendix A Index (by Treatment System Name)

Appendix A Index (by Treatment System Name)

Appendix A Index (by Manufacturer/Vendor Name)

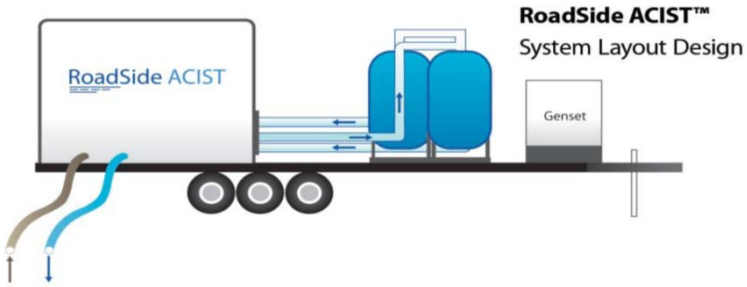
Appendix A Index (by Manufacturer/Vendor Name)

Active

Treatment Technology Summary Report

Manufacturer/Vendor: WaterTectonics
Name of Technology: ACIST
Technology Type: Chemical Treatment

Schematic



System Design Information

Design Flow Rate (gpm):
low: 100
high: >1000

System Footprint (sq. ft.):
200-2000

Required Head Loss (ft):
NA

Internal or External Bypass:
None - auto recirculation

Application
Stormwater/Process Water/ Wastewater/Ground Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):			3.12		0.0199			0.00028
Median Effluent (mg/L):			0.38		0.00002			0.00002
Median Removal (%):			88		99.9			93

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.341	0.25	2.12			0.817
Median Effluent (mg/L):	0.0179	0.05	1.04			0.744
Median Removal (%):	95	80	51			9

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 5

Estimated Costs

Estimated Installation Cost: **low:** $25,000 **high:** $400,000
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: WaterTectonics
Name of Technology: ACIST
Technology Type: Chemical Treatment

Treatment Notes

Field by operator; in-line real-time with sensors/data loggers for turbidity and pH; in-house and independent party grab/composite sampling; in-house and 3rd party independent analytical laboratory testing.

Additional Notes

Provided under DOE issued GULD as Chitosan-Enhanced Sandfiltration (CESF), a stand alone system. Water Tectonics expands CESF application for removal of LNAPL, NWTPH, cPAH/PAH's, and metals by system modification to include oil/water separation, enhanced pre-treatment, post SF micron filtration, and granular activated carbon and/or other media adsorption. As a stand-alone technology it is designated for turbidity and pH. If raw water turbidity is >600 NTU, pretreatment is required. CESF has limited to no ability to remove turbidity consisting of rock dust, rock flour, or other rock source fines that have not been geochemically weathered over time. Chitosan performance is typically compromised by acidic or alkaline pH conditions out side the neutral range. Performance data presented is from from full-scale use at temporary projects where RSA CESF technology was used in accordance with GULD specifications with modifications for enhanced removal components (e.g., granular activated carbon). Untreated construction water ranging from >25 NTU to > 5000 NTU (with pretreatment if over 600 NTU) have all been reduced to <10 NTU, but typically to <5 NTU. Flow ranges for various conventional system sizes range from 100 to over 1000 gpm for 24/7 continuous operations.

Treatment Technology Summary Report

Manufacturer/Vendor: Arkal Filtration Systems/PEP (U.S. Distributor)
Name of Technology: Arkal Filter (Spin Klin System)
Technology Type: Filtration(Disc)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 100
high: 4400

System Footprint (sq. ft.): 16

Required Head Loss (ft): 0.1,14

Internal or External Bypass:

Application

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			ND			
Median Effluent (mg/L):			ND			
Median Removal (%):			99.9			

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Arkal Filtration Systems/PEP (U.S. Distributor)
Name of Technology:	Arkal Filter (Spin Klin System)
Technology Type:	Filtration(Disc)

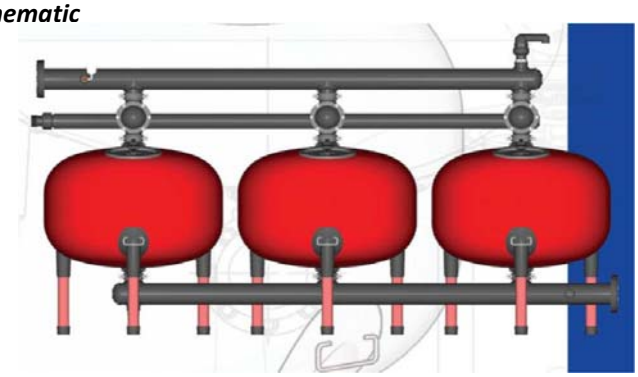
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Arkal Filtration Systems/PEP (U.S. Distributor)
Name of Technology: Arkal Media Filter
Technology Type: Filtration(Pressure)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 44
high: 150

System Footprint (sq. ft.): 16

Required Head Loss (ft): 3,28

Internal or External Bypass:

Application

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):			ND			
Median Effluent (mg/L):			ND			
Median Removal (%):			99.9			

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Arkal Filtration Systems/PEP (U.S. Distributor)
Name of Technology:	Arkal Media Filter
Technology Type:	Filtration(Pressure)

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: BakerCorp
Name of Technology: Baker Tank with Sand Filter
Technology Type: Filtration(Media)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 15
high: 1,000+

System Footprint (sq. ft.):
1000-2500

Required Head Loss (ft):
NA

Internal or External Bypass:
NA

Application
Stormwater/Process Water/ Wastewater/Groundwater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	200							
Median Effluent (mg/L):	10							
Median Removal (%):	95							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	150	500	2500	20	40	400
Median Effluent (mg/L):	75	200	1000	10	20	40
Median Removal (%):	50	40	50	50	50	90

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 1

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	BakerCorp
Name of Technology:	Baker Tank with Sand Filter
Technology Type:	Filtration(Media)

Treatment Notes

TSS, total metals, and dissolved metals removal will depend upon the degree that they will absorb to particulate matter. The values provided for these parameters are based upon a study done by Dungeness Environmental during 2009-2010. Dungeness Environmental does not have relevant data for the organics listed in this table. For any questions, please contact Chris Palczewski at Dungeness Environmental: 425-481-0600 or cpalczewski@dungenessenviro.com. Thank you.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Clear Creek Systems, Inc.
Name of Technology: Chitosan-Enhanced Sand Filtration Using FlocClear
Technology Type: Chemical Filtration

Schematic

System Design Information

Design Flow Rate (gpm):
low: < 25
high: > 2,000

System Footprint (sq. ft.):
< 25 - > 2,000

Required Head Loss (ft):
NA

Internal or External Bypass:
External - Offline Facility

Application
Stormwater/Process water/
Groundwater/Wastewater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: > 15 on the West Coast

Estimated Costs

Estimated Installation Cost: **low:** $15,000 **high:** >$250,000
Estimated Annual O&M Cost: **low:** < $0.001/gal **high:** > $0.003/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Clear Creek Systems, Inc.
Name of Technology:	Chitosan-Enhanced Sand Filtration Using FlocClear
Technology Type:	Chemical Filtration

Treatment Notes

Attached data was collected from grab samples that were analyzed by an accredited laboratory.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Schreiber LLC
Name of Technology: Fuzzy Filter
Technology Type: Filtration(Media)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 70
high: unlimited

System Footprint (sq. ft.):

Required Head Loss (ft): 3.5

Internal or External Bypass: External

Application Stormwater/Process Water/ Wastewater/Ground water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	10							
Median Effluent (mg/L):	2							
Median Removal (%):	70-95							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Schreiber LLC
Name of Technology: Fuzzy Filter
Technology Type: Filtration(Media)

Treatment Notes

Fuzzy Filter removes suspende solids 4 microns and above. The media is compressible so that pore size can be adjusted thru changes in compressioon of the media via the integral actuator connected to a perforated compression plate. Influent solids should be less than 100 mg/l with many typical applications processing water streams containing 20 mg/l and less.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: KASELCO, LLC
Name of Technology: High-Flo Electrocoagulation
Technology Type: Electrocoagulation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 2.5
high: 1,200+

System Footprint (sq. ft.):
40 - 4000

Required Head Loss (ft):
2,20

Internal or External Bypass:
External

Application
Stormwater/Process Water/ Groundwater/Wastewater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0 in WA, 2 in Vancouver

Estimated Costs

Estimated Installation Cost: **low:** $25,000 **high:** $2,200,000
Estimated Annual O&M Cost: **low:** $0.0005/gal **high:** $0.01/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	KASELCO, LLC
Name of Technology:	High-Flo Electrocoagulation
Technology Type:	Electrocoagulation

Treatment Notes

System Performance has been evaluated in lab as well as in field research applications and existing installations. Grab samples are analyzed both internally as well as by a third party lab.

Additional Notes

Have attached actual test result parameters. We are currently in the process of having detailed third party test evaluations and will supply those results as available.

Treatment Technology Summary Report

Manufacturer/Vendor: OilTrap Environmental Prod
Name of Technology: OilTrap ElectroPulse Water Treatment System
Technology Type: Electrocoagulation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 5
high: 500

System Footprint (sq. ft.):
40-1500

Required Head Loss (ft):
5,15

Internal or External Bypass:
Either

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	600		78	136	28	NA	NA	NA
Median Effluent (mg/L):	10		0.27	<5.0	0.43	NA	NA	NA
Median Removal (%):	98.3		99.6	>96.3	98.4	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	12.1	14.1	151	8.2	10.9	78.6
Median Effluent (mg/L):	0.072	0.039	0.34	0.072	0.039	0.34
Median Removal (%):	99.4	99.7	99.9	99.1	99.6	99.9

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 33

Estimated Costs

Estimated Installation Cost: **low:** $25,000 **high:** $500,000
Estimated Annual O&M Cost: **low:** $0.002/gal **high:** $0.005/gal

Treatment Technology Summary Report

Manufacturer/Vendor: OilTrap Environmental Prod
Name of Technology: OilTrap ElectroPulse Water Treatment System
Technology Type: Electrocoagulation

Treatment Notes

Samples were collected as routine grab samples and tested by an EPA certified laboratory.

Additional Notes

We have not worked with wastewater with PCB or dioxins. We generally see 90%+ in reduction of pesticides also.

Treatment Technology Summary Report

Manufacturer/Vendor: WaterTectonics
Name of Technology: pHATBox
Technology Type: Chemical Treatment

Schematic

System Design Information

Design Flow Rate (gpm):
low: 250
high: 350

System Footprint (sq. ft.):
10-24 (b)

Required Head Loss (ft):
N/A

Internal or External Bypass:
N/A

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(c)		(c)	(c)	(c)	(c)	(c)	(c)
Median Effluent (mg/L):	(c)		(c)	(c)	(c)	(c)	(c)	(c)
Median Removal (%):	(c)		(c)	(c)	(c)	(c)	(c)	(c)

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)
Median Effluent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)
Median Removal (%):	(c)	(c)	(c)	(c)	(c)	(c)

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 20+

Estimated Costs

Estimated Installation Cost: **low:** $ 19,500 **high:** $ 28,500
Estimated Annual O&M Cost: **low:** (a) **high:** (a)

Treatment Technology Summary Report

Manufacturer/Vendor: WaterTectonics
Name of Technology: pHATBox
Technology Type: Chemical Treatment

Treatment Notes

Field. Real-time with in-line probes. 2-point buffer calibration.

Additional Notes

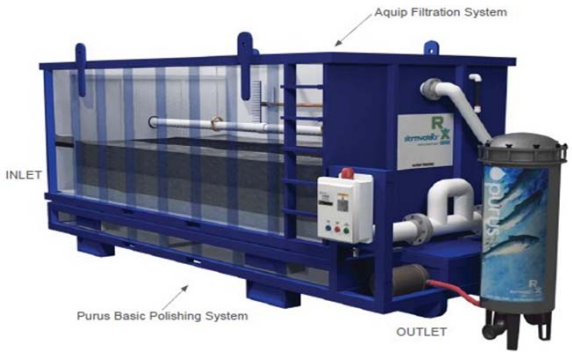
(a) Depends on buffering capacity of waterstream, flow rate, total volume processed, specific pH adjustment additive selected, and final pH point required.
(b) Packaged in 4' -6' (w) x 2.5' (d) x 4' (t) industrial steel box w/hinged top opening lid. Additional storage space for addtive will depend on volume of additive storage (up to 35-gal drums in box, larger must go external) - plus secondary containment). Unit has in-line pH probe for real time monitoring and data logger expandable for dual pH adjustment (multi injection/mixing loops), and flow recording. pH set-point(s) programmable into controller.
(c) Adjusts pH. System performance data - not applicable.

Additional Notes:
-Effective for controlling alkaline waters from cement/concrete operations using carbon dioxide.
-Suitable for inclusion as pH adustment component in variety of water treatment systems.
-pH set-points (high/low) variable for application.

Treatment Technology Summary Report

Manufacturer/Vendor: StormwateRx LLC
Name of Technology: Purus Stormwater Polishing System
Technology Type: Chemical Filtration

Schematic



System Design Information

Design Flow Rate (gpm):
low: 5
high: 210

System Footprint (sq. ft.):
10,90

Required Head Loss (ft):
70 - 120

Internal or External Bypass:
External

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):			YES		YES	YES		YES

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			0.28			0.06
Median Effluent (mg/L):			0.083			0.0074
Median Removal (%):			86			88

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: YES

Estimated Costs

Estimated Installation Cost: **low:** $10,000 **high:** $140,000
Estimated Annual O&M Cost: **low:** $0.0024/gal **high:** $0.0047/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	StormwateRx LLC
Name of Technology:	Purus Stormwater Polishing System
Technology Type:	Chemical Filtration

Treatment Notes

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

Additional Notes

Additional pollutant removal includes bacteria (>99%), PCBs, PAHs and toxic organics.

Treatment Technology Summary Report

Manufacturer/Vendor: Morselt Borne BV
Name of Technology: Redbox
Technology Type: Electrocoagulation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 0.5
high: 150

System Footprint (sq. ft.):

Required Head Loss (ft):
NA

Internal or External Bypass:
NA

Application
Wastewater/Process Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):	99							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):				99	99	99

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** $42,000 **high:** $1,000,000
Estimated Annual O&M Cost: **low:** $1,000 **high:** $20,000

Treatment Technology Summary Report

Manufacturer/Vendor: Morselt Borne BV
Name of Technology: Redbox
Technology Type: Electrocoagulation

Treatment Notes

Third part analysis has been performed in many cases. Results show very high removal rates, especially for heavy metals.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Aquatech
Name of Technology: WaterTrak Ion Exchange
Technology Type: Ion Exchange

Schematic

System Design Information

Design Flow Rate (gpm):
low: 23
high: 866

System Footprint (sq. ft.): 65,113

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Aquatech
Name of Technology:	WaterTrak Ion Exchange
Technology Type:	Ion Exchange

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Aquatech
Name of Technology: WaterTrak Pressurized Media Filter
Technology Type: Filtration(Media)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 27
high: 905

System Footprint (sq. ft.): 43,119

Required Head Loss (ft):

Internal or External Bypass:

Application

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Aquatech
Name of Technology:	WaterTrak Pressurized Media Filter
Technology Type:	Filtration(Media)

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Aquatech
Name of Technology: WaterTrak Reverse Osmosis
Technology Type: Reverse Osmosis

Schematic

System Design Information

Design Flow Rate (gpm):
low: 65
high: 275

System Footprint (sq. ft.):
143,243

Required Head Loss (ft):
350

Internal or External Bypass:

Application

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Aquatech
Name of Technology:	WaterTrak Reverse Osmosis
Technology Type:	Reverse Osmosis

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Aquatech
Name of Technology: WaterTrak Ultrafiltration
Technology Type: Filtration(Media)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 38
high: 377

System Footprint (sq. ft.): 31,62

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: low: high:
Estimated Annual O&M Cost: low: high:

Treatment Technology Summary Report

Manufacturer/Vendor:	Aquatech
Name of Technology:	WaterTrak Ultrafiltration
Technology Type:	Filtration(Media)

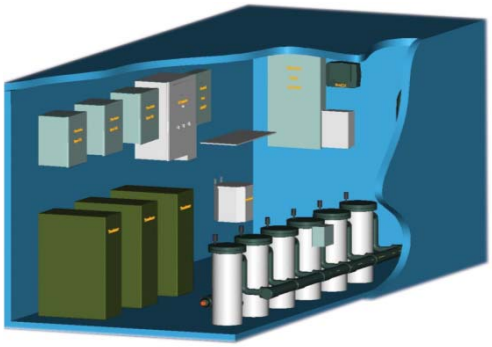
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: WaterTectonics
Name of Technology: Wavelonics
Technology Type: Electrocoagulation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 50
high: >1000

System Footprint (sq. ft.):
200-4000

Required Head Loss (ft):
NA

Internal or External Bypass:
NONE-auto recirculation

Application
Stormwater/Process Water/Wastewater/Ground water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):		200	45.6	197	2.34	0.0024		
Median Effluent (mg/L):		5	0.25	4.76	0.00002	0.00011		
Median Removal (%):		98	99	98	100	95		

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	4.8	0.253	0.516	0.0235	0.0157	0.12
Median Effluent (mg/L):	0.0074	0.003	0.0315	0.005	0.0031	0.02
Median Removal (%):	100	99	94	79	80	83

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 35+

Estimated Costs

Estimated Installation Cost: **low:** $60000 **high:** $850000
Estimated Annual O&M Cost: **low:** $0.0008/gal **high:** $0.008/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	WaterTectonics
Name of Technology:	WaveIonics
Technology Type:	Electrocoagulation

Treatment Notes

Field via hand-held instruments, Technology's in-line and real-time water quality monitoring system, Oversight Engineers/Project Owners, 3rd party analytical testing laboratories using both instantaneous grab and composting methods (manual and automated). System performance "Median" data presented below does not accommodate analytical data results for parameters report as ND (<MDL's, or <MCL's). All ND data was utilized in the calculations as the value of the MDL or MCL. Influent data is limited in that our Clients typically do not incur cost expenditure to evaluate raw water characteristics once the system has been designed, installed, and made operational. They focus on monitoring effluent quality. Further, effluent data generated by our Clients/System Owners do not typically provide us with DMR's they submit to Ecology or other regulatory agencies. Effluent data points do not reflect technology ability to achieve lower than reported results. Permit discharge limitations have historically varied from site to site, permit to permit , and therefore data reflect treatment efforts and not technology limitations.

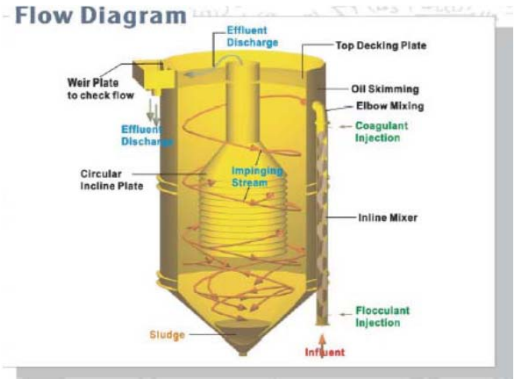
Additional Notes

WaveIonics electrocoagulation (EC) reactions will depend on the nature of constituents present, their reaction chemistry, pH sensitivity, and water conductivity. Bacteria disinfection has been demonstrated at laboratory and full-scale applications. Technology viability and optimization is recommended for non-conventional constituents of concern, or for complex matrices where interferences and competing conditions are problematic to conventional advanced treatment processes. System Performance data fields (above) call for "Median" data points that do not allow for presentation of worst-case conditions, nor do they adequately reflect "mean" conditions, both of which are more elevated than the "Median" data presented for influent characteristics. Effluent "median" data do not reflect <MDL or <MCL data as reported by laboratories. However, ND results utilized in the calculation were the numeric value of the actual MDL or MCL. SVOC and cPAH data reflect a summation of all individual constituents in SVOC or cPAH parameter suites as totals. PCB's are totals of all Arochlor congeners. Oil and Grease data reflect both Freon and Hexane extraction analytical methods. Technology has not been used to specifically remove Dioxins and when technology was utilized, Dioxins were not targeted for analytical testing. Other data available upon request for: bacteria; other heavy metals; color from humics, etc.

Treatment Technology Summary Report

Manufacturer/Vendor: Waste & Environmental Technologies Ltd.
Name of Technology: Wetsep
Technology Type: Chemical Treatment

Schematic



System Design Information

Design Flow Rate (gpm):
low: 20
high: 260

System Footprint (sq. ft.):

Required Head Loss (ft):
40 feet

Internal or External Bypass:
External Bypass

Application
Stormwater/Wastewater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	112	13.4						
Median Effluent (mg/L):	<2	1.9						
Median Removal (%):	98	86						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):				7 µg/L	18 µg/L	
Median Effluent (mg/L):				1 µg/L	<1 µg/L	
Median Removal (%):				86	94	

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 1

Estimated Costs

Estimated Installation Cost: **low:** $1000 **high:** $2500
Estimated Annual O&M Cost: **low:** $100/day **high:** $250/day

Treatment Technology Summary Report

Manufacturer/Vendor: Waste & Environmental Technologies Ltd.
Name of Technology: Wetsep
Technology Type: Chemical Treatment

Treatment Notes

The data can be stored and downloaded from data logger for flowrate, pH and Turbidity. Grab samples can also be taken at various points in the system to be varified by a third party (i.e. laboratory).
Please aslo find the Field Study for the WetSep filtration System

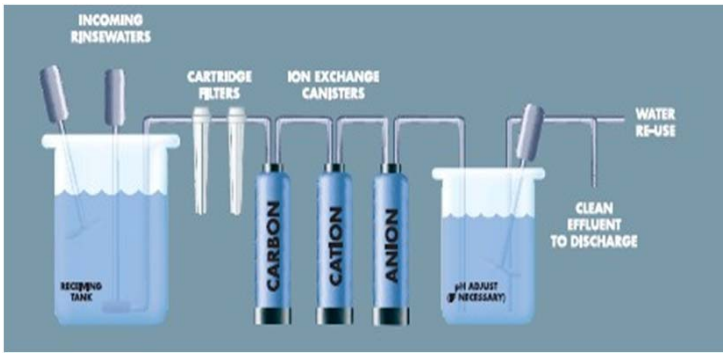
Additional Notes

The WetSep system was used in the State of Washington at the Canada/US border crossing. The main Contractor for this job was JE Dunn Construction. The main use of the unit was for treatment of construction waste runoff.

Treatment Technology Summary Report

Manufacturer/Vendor: Siemens
Name of Technology: Waste Water Ion Exchange System (WWIX)
Technology Type: Ion Exchange

Schematic



System Design Information

Design Flow Rate (gpm):
low: 1gpm
high: 5000gpm

System Footprint (sq. ft.):

Required Head Loss (ft):
20psi

Internal or External Bypass:
None

Application
Stormwater/Process Water/ Wastewater/Groundwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

*** Blank cells indicate no information was received from vendor**

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: >500

Estimated Costs

Estimated Installation Cost: **low:** $3,000 **high:** $250,000
Estimated Annual O&M Cost: **low:** $3,000 **high:** $500,000

Treatment Technology Summary Report

Manufacturer/Vendor: Siemens
Name of Technology: Waste Water Ion Exchange System (WWIX)
Technology Type: Ion Exchange

Treatment Notes

For stormwater treatment systems Siemens has media tailored to achieve low discharge levels as low as 1ppb and 12ppt for mercury. Siemens systems are typically sampled by customer and checked with on site test kits or samples shipped to local certified laboratories for evaluation.

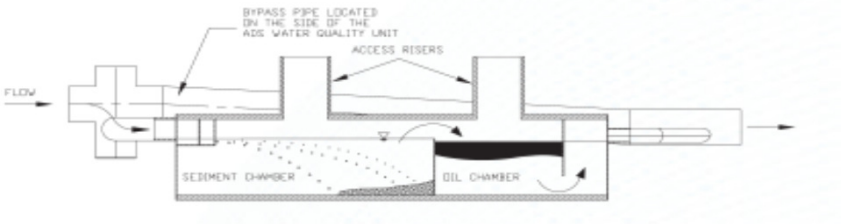
Additional Notes

Passive

Treatment Technology Summary Report

Manufacturer/Vendor: Advanced Drainage Systems, Inc
Name of Technology: ADS® Water Quality Unit
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 1800
high: 126000

System Footprint (sq. ft.): 0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA		ND				
Median Effluent (mg/L):	ND	NA		ND				
Median Removal (%):	80	>43		80				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	ND	ND	ND	ND	ND	ND
Median Effluent (mg/L):	ND	ND	ND	ND	ND	ND
Median Removal (%):	74	74	74	74	74	74

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Advanced Drainage Systems, Inc
Name of Technology: ADS® Water Quality Unit
Technology Type: Oil/Water Separator

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Eco-Tec, Inc
Name of Technology: ADsorb-it
Technology Type: Drain Inlet Inset (Absorbent Boom/Fabric)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 80/SF
high: 100/SF

System Footprint (sq. ft.):
Varies

Required Head Loss (ft):
NA

Internal or External Bypass:
Per individual application

Application
Stormwater, Groundwater, Wastewater, Process Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	Varies		Varies	Varies				
Median Effluent (mg/L):	Varies		Varies	Varies				
Median Removal (%):	80-99		99-100	99-100				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):	Varies	Varies	Varies	Varies	Varies	Varies

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 61

Estimated Costs

Estimated Installation Cost: **low:** $0.91/SF **high:** $0.91/SF
Estimated Annual O&M Cost: **low:** $0.91/SF **high:** $0.91/SF

Treatment Technology Summary Report

Manufacturer/Vendor:	Eco-Tec, Inc
Name of Technology:	ADsorb-it
Technology Type:	Drain Inlet Inset (Absorbent Boom/Fabric)

Treatment Notes

A variety of sampling methods have been implemented over the years based on specific installations of the ADsorb-it Filtration Fabric and associated application specific product configurations manufactured from the ADsorb-it Fabric. ADsorb-it is designed to be versatile in its installation for diverse filtration applications, thus it can be configured for Downspout, Drain Inlet Inset, Below Ground Vault, Above Ground Vault, Shoreline, Oil Water Separator, and General Stormwater applications. ADsorb-it is approved by the Department of Ecology (Ecology) for use as a Catch Basin Insert and is used by Ecology for spill response and general oil/water related issues.

Additional Notes

As can be seen on our web site at www.eco-tec-inc.com, miles of ADsorb-it Fabric were deployed along the Gulf Coast Shoreline as an Oil Fence to provide effective removal of advancing oils from the BP Deepwater Horizon Release. Additional testing data can be accessed on our web site simply by clicking on "Test Data" in the left hand column. As a note, ADsorb-it is highly effective at removing hydrocarbons, including fats, oils and greases (FOG) from water, thus any other contaminants that would be attached to the hydrocarbon such as PCBs would be removed in conjuncton with hydrocarbon / FOG removal. ADsorb-it is an environmentally compatible product in that it is: Made from waste fibers from the textile manufacturing industry, it effectively removes hydrocarbons and associated / attached contaminants from the environment, it can be cleaned and reused indefinitely, it can be disposed of as a fuel source with a higher BTU per pound value than coal and less than 1% residual ash.

Treatment Technology Summary Report

Manufacturer/Vendor: AquaShield, Inc.
Name of Technology: Aqua-Filter
Technology Type: Media Filtration(Combination System (with Hydrodyanamic Separation))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 25
high: 960+

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
0.8

Internal or External Bypass:
Both

Application
Stormwater/ Process Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	160							
Median Influent (mg/L):	43							
Median Effluent (mg/L):	5							
Median Removal (%):	80							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		PULD	PULD	PULD	PULD

	50% TSS Removal	80% TSS Removal
NJCAT		X

Other Approvals:

Local Installations

# of Installations in Washington: 13

Estimated Costs

Estimated Installation Cost: **low:** Site-specific **high:** Site-specific
Estimated Annual O&M Cost: **low:** Site-specific **high:** Site-specific

Treatment Technology Summary Report

Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Aqua-Filter
Technology Type:	Media Filtration(Combination System (with Hydrodyanamic Separation))

Treatment Notes

Independent lab by grab samples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.

Additional Notes

Aqua-Filter filtration cartridge has been verified by NJCAT. AF--5.3 model is currently undergoing independent TARP Tier II field testing in Maryland averaging 96% TSS removal. Anticipate completion in 2012. AF-4.2 model field tested at Univeristy of New Hampshire Stormwater Center, 80% TSS removal efficiency (see above parameters).

Treatment Technology Summary Report

Manufacturer/Vendor: AquaShield, Inc.
Name of Technology: Aqua-Guardian
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 5/400*
high: 100/940*

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
0

Internal or External Bypass:
Both

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	160							
Median Influent (mg/L):	43							
Median Effluent (mg/L):	5							
Median Removal (%):	80							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 15

Estimated Costs

Estimated Installation Cost: **low:** Site-specific **high:** Site-specific
Estimated Annual O&M Cost: **low:** Site-specific **high:** Site-specific

Treatment Technology Summary Report

Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Aqua-Guardian
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

Treatment Notes

* x/x = flow thru perlite/flow thru perlite + filter cloth. See Aqua-Filter, since this device uses same media. Independent lab by grab samples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.

Additional Notes

See Aqua-Filter since this device uses same filter media. Aqua-Filter filtration cartridge has been verified by NJCAT. AF-5.3 model is currently undergoing independent TARP Tier II field testing in Maryland averaging 96% TSS removal. Anticipate completion in 2012. AF-4.2 model field tested at Univeristy of New Hampshire Stormwater Center, 80% TSS removal efficiency (see above parameters).

Treatment Technology Summary Report

Manufacturer/Vendor: AquaShield, Inc.
Name of Technology: Aqua-Swirl
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 100
high: 2,600

System Footprint (sq. ft.):

Required Head Loss (ft):
0.25

Internal or External Bypass:
Both

Application
Stormwater/Process Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	192							
Median Influent (mg/L):	137							
Median Effluent (mg/L):	12							
Median Removal (%):	86							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	GULD				

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: 82

Estimated Costs

Estimated Installation Cost: **low:** Site-specific **high:** Site-specific
Estimated Annual O&M Cost: **low:** Site-specific **high:** Site-specific

Treatment Technology Summary Report

Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Aqua-Swirl
Technology Type:	Hydrodynamic Separation

Treatment Notes

Lab tested by Tennessee Tech University using autosamplers. Field by auto-composite sampling, 6 sample pairs per TARP.

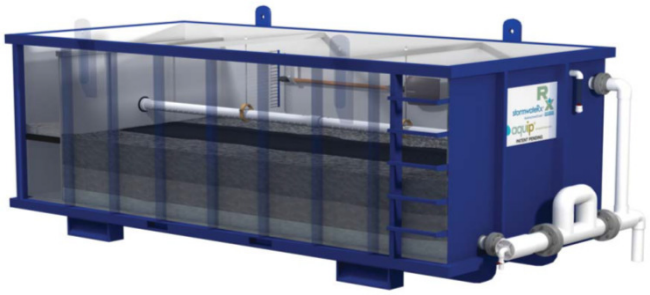
Additional Notes

Independent field testing underway per TARP Tier II in Maryland, anticipate completion in 2011. 16 storms and 14 inches of rain sampled to date. Sample parameters above are for field test. Lab testing verified by NJCAT.

Treatment Technology Summary Report

Manufacturer/Vendor: StormwateRx LLC
Name of Technology: Aquip Enhanced Filtration System
Technology Type: Media Filtration(Above ground (pump required))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 10
high: 350

System Footprint (sq. ft.):
14 - 320

Required Head Loss (ft):
4 - 7

Internal or External Bypass:
External

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	30			9.9				
Median Effluent (mg/L):	3.39			3				
Median Removal (%):	83		YES	70	YES	YES		YES

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.152	0.03	0.425	0.084	0.008	0.196
Median Effluent (mg/L):	0.008	0.006	0.061	0.006	0.007	0.06
Median Removal (%):	94	79	85	93	51	73

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 30

Estimated Costs

Estimated Installation Cost: **low:** $5,000 **high:** $150,000
Estimated Annual O&M Cost: **low:** $0.0003/gal **high:** $0.003/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	StormwateRx LLC
Name of Technology:	Aquip Enhanced Filtration System
Technology Type:	Media Filtration(Above ground (pump required))

Treatment Notes

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

Additional Notes

Non-detects were assumed to have the value of one half the detection limit.

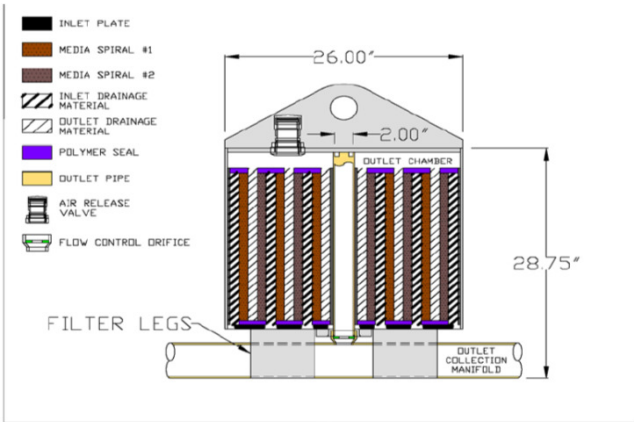
Aquip removes PCBs, PAHs and other toxic organics through particle filtration and absorption to one of the filtration media in the bed. VOC and SVOC removal is through absorption and biological degradation.

The Aquip is a secondary defense against oil and grease and removes TPH and soluble oils through biodegredataion, absorption and bio-mechanical means.

Treatment Technology Summary Report

Manufacturer/Vendor: BaySaver Technologies, Inc.
Name of Technology: BayFilter®
Technology Type: Media Filtration(Cartridge)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 15
high: 30

System Footprint (sq. ft.): 0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA		ND				
Median Effluent (mg/L):	ND	NA		ND				
Median Removal (%):	80	>50		80				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		CULD	CULD	CULD	

	50% TSS Removal	80% TSS Removal
NJCAT		X

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: BaySaver Technologies, Inc.
Name of Technology: BayFilter®
Technology Type: Media Filtration(Cartridge)

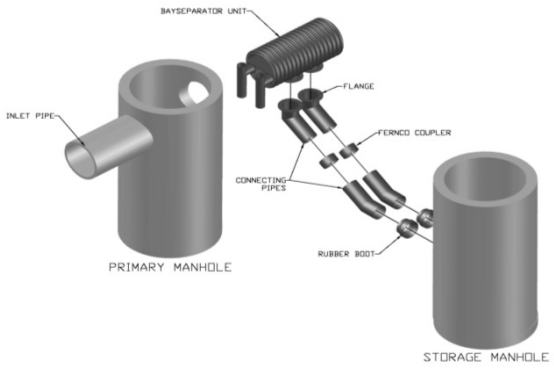
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: BaySaver Technologies, Inc.
Name of Technology: BaySeparator®
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 450
high: 1350

System Footprint (sq. ft.): 0

Required Head Loss (ft):

Internal or External Bypass:

Application

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA		ND				
Median Effluent (mg/L):	ND	NA		ND				
Median Removal (%):	80	19		80				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):				ND		ND
Median Effluent (mg/L):				ND		ND
Median Removal (%):				42		38

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	CULD				

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: BaySaver Technologies, Inc.
Name of Technology: BaySeparator®
Technology Type: Hydrodynamic Separation

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Curb Inlet Basket
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 381
high: 898

System Footprint (sq. ft.):
0

Required Head Loss (ft):
0.5-2

Internal or External Bypass:
External

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	85.8	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	73.4	NA	NA	NA	NA	NA	NA
Median Removal (%):	93*	14	NA	NA	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	24.3	NA	NA	NA
Median Effluent (mg/L):	NA	NA	10.4	NA	NA	NA
Median Removal (%):	NA	NA	79	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0 WA

Estimated Costs

Estimated Installation Cost: **low:** $445 **high:** $1,600
Estimated Annual O&M Cost: **low:** $0.20/gal **high:** $0.40/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Curb Inlet Basket
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

The Curb Inlet Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.
--Univerisity of Southern California Independent Field Testing (Turbidity in NTUs)
--Suspended Solids Retention Testing Full Scale Lab Testing

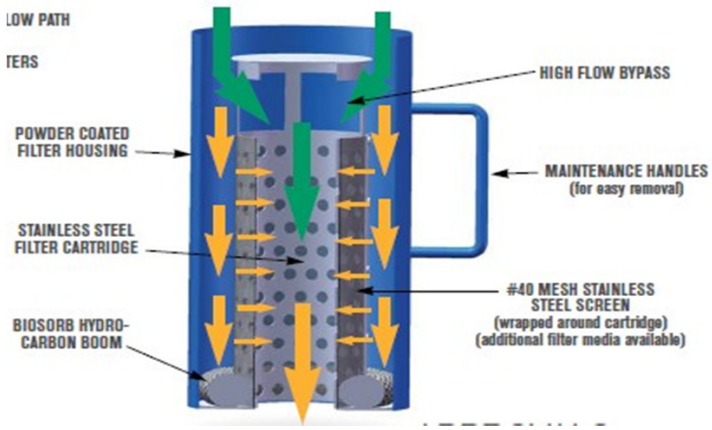
Additional Notes

*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing.

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Downspout Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 249
high: 1,145

System Footprint (sq. ft.):
0.31-1.57 (cu ft)

Required Head Loss (ft):
1,2

Internal or External Bypass:
Internal Bypass - High Flow Unimpeded

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	NA		223.5	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA		29.5	NA	NA	NA	NA
Median Removal (%):	93*	NA		87	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	76	96	69	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 17 (Port of Olympia)

Estimated Costs

Estimated Installation Cost: **low:** $1,035 **high:** $1,200
Estimated Annual O&M Cost: **low:** $0.16/gal **high:** $0.22/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Downspout Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by IAMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.
--Full Scale Laboratory Testing D-Tek Analytical
--X-Tex-Z-200 Testing for Metals - From Xextex Corporation, USA

Additional Notes

*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to downspout sizes 4" to 12".

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Flume Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 116
high: 583

System Footprint (sq. ft.):
1,6

Required Head Loss (ft):
0.083,0.5

Internal or External Bypass:
Internal Bypass

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	73	NA	223	360	NA	NA	NA	NA
Median Effluent (mg/L):	51.6	NA	29.5	62	NA	NA	NA	NA
Median Removal (%):	29	NA	87	83	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	17	NA	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0 WA

Estimated Costs

Estimated Installation Cost: **low:** $660 **high:** $1,302
Estimated Annual O&M Cost: **low:** $0.23/gal **high:** $0.74/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Flume Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

The Bio Clean Flume Filter has been tested indepedently in a full scale laboratory setting.. A series of 5 composite influent and effluent samples were collcted over a period of two days. The Flume Filter Tested utilized a series of three BioSorb Hydrocarbon Booms.
--Full Scale Laboratory Testing D-Tek Analytical

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Grate Inlet Skimmer Box
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 224
high: 8,980

System Footprint (sq. ft.):
0

Required Head Loss (ft):
0.5,2

Internal or External Bypass:
Internal - High Flow Rate

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	18.6	NA	189	NA	NA	NA	NA
Median Effluent (mg/L):	NA	0.452	NA	10.43	NA	NA	NA	NA
Median Removal (%):	86*	98	NA	95	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	1.9	1.5	13.7	NA	NA	NA
Median Effluent (mg/L):	0.1	0.2	0.73	NA	NA	NA
Median Removal (%):	95	87	95	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0 WA, 123 OR

Estimated Costs

Estimated Installation Cost: **low:** $635 **high:** $1,800
Estimated Annual O&M Cost: **low:** $0.15/gal **high:** $0.40/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Grate Inlet Skimmer Box
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

The Grate Inlet Skimmer Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.
--Longo Toyota - Independent Field Testing
--Suspended Solids Retention Testing Full Scale Lab Testing
--Reedy Creek Improvement District Independent Field Testing
--UC Irvine Independent Testing
--Whitman's Pond
--Creech Engineering

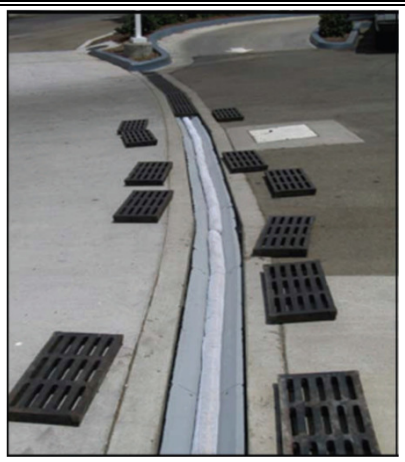
Additional Notes

*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing.

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Trench Drain Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 28
high: 86

System Footprint (sq. ft.):
0

Required Head Loss (ft):
4,12

Internal or External Bypass:
Internal Bypass

Application
Stormwater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	NA	NA	NA	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	NA	NA	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $660 **high:** $1,302
Estimated Annual O&M Cost: **low:** $0.23/gal **high:** $0.74/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Trench Drain Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

No testing has been done on the trench drain filter.

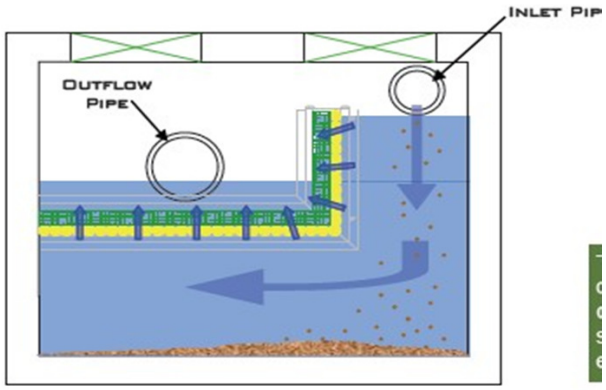
Additional Notes

The Bio Clean Trench Drain Filter comes standard with BioSorb Hydrocarbon booms or can use BioMediaGREEN. The filter is designed to utilize varoius media based upon pollutants of concern. The Trench Drain Filter can be used in various size trench drains.

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Bio Clean Water Polisher - Up Flow Filter
Technology Type: Hydrodynamic Separation(Up-Flow)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 191
high: 528

System Footprint (sq. ft.):
0

Required Head Loss (ft):
1,2

Internal or External Bypass:
Internal Bypass - High Flow
Unimpeded

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	84.6	2.07	1.4	69.8	NA	NA	NA	NA
Median Effluent (mg/L):	12.4	0.63	0	6.5	NA	NA	NA	NA
Median Removal (%):	85	70	>99	91	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	0.57	0.38	0.75
Median Effluent (mg/L):	NA	NA	NA	0.12	0.01	0.16
Median Removal (%):	NA	NA	NA	79	98	78

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $25,000 **high:** $125,000
Estimated Annual O&M Cost: **low:** $5.24/gal **high:** $7.85/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Bio Clean Water Polisher - Up Flow Filter
Technology Type:	Hydrodynamic Separation(Up-Flow)

Treatment Notes

The Bio Clean Water Polisher is a unique upflow media filter designed as a stand alone treatment unit or incorporated with the Nutrient Separating Baffle Box to form a complete treatment train. The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. The BioMediaGREEN has been independently tested in full scale labaratory testing. Media surface loading rate during the testing averaged 2-5 gpm with minimal head. A series of 8 composite influent and effluent grab samples we collected over a perioud of two days. --
BioMediaGREEN Performance Testing by Waves Environmental - Independent Full Scale Lab Testing

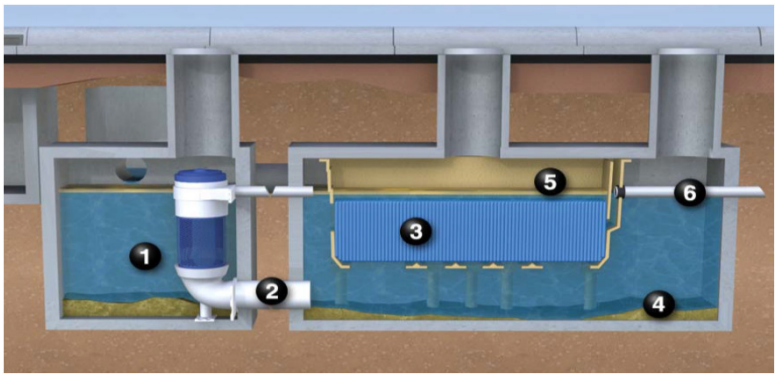
Additional Notes

The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. This material is made of billions of small fibers formed into solid blocks. The media composition consists of various oxides to allow for ion exchange and precipitation of dissolved pollutants. The physical structure of the media provides high peformance for the entrapment of particulate pollutants. The media has 80% void space which allows for double the hydraulic retention time when compared to granular media which leads to better overall performance. Another result of the void space is a high hydraulic conductivity. The media surface area loading rate for the media is approximately 7 gpm/sq ft surface area at a head pressure of 18".

Treatment Technology Summary Report

Manufacturer/Vendor: Bio-Microbics, Inc.
Name of Technology: BioStorm®
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 225
high: 4,800

System Footprint (sq. ft.):
45 - 162

Required Head Loss (ft):
0.5 - 0.17

Internal or External Bypass:
External

Application
Stormwater/Groundwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	227							
Median Effluent (mg/L):	7.9							
Median Removal (%):	95.3							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $500 **high:** $2,000
Estimated Annual O&M Cost: **low:** $400 **high:** $4,000

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio-Microbics, Inc.
Name of Technology:	BioStorm®
Technology Type:	Oil/Water Separator

Treatment Notes

TSS results are from grab samples done in a lab setting. Unit was tested from 50% of design flow up to 125%. Numbers reported below are at 100% of design flow.

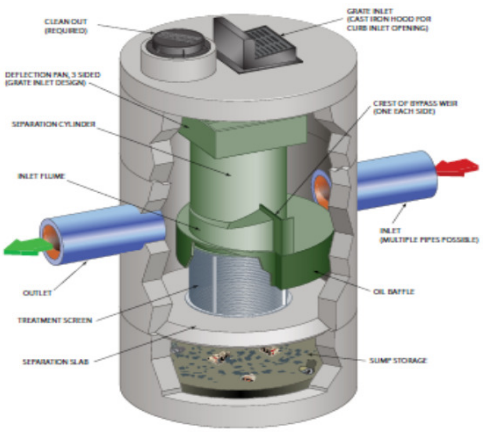
Additional Notes

Installation costs and O&M costs are estimates for the Washington area and do not include equipment or tank costs. Drawings and further information on the product can be obtained on our website at the following url: http://biomicrobics.com/?p=77

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: CDS
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 20
high: 44,900

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
0.1

Internal or External Bypass:
Both Available

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	154			22				
Median Effluent (mg/L):	26			5				
Median Removal (%):	95			64				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	GULD	GULD			PULD

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: > 250

Estimated Costs

Estimated Installation Cost: **low:** $10,000 **high:** $2.5M
Estimated Annual O&M Cost: **low:** $0.00001/gal **high:** $0.00001/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: CDS
Technology Type: Hydrodynamic Separation

Treatment Notes

The Manasquan Savings Bank Stormwater Treatment System Field Evalutaion: CDS Unit (2010). Field, Peer-Reviewed, Composite.

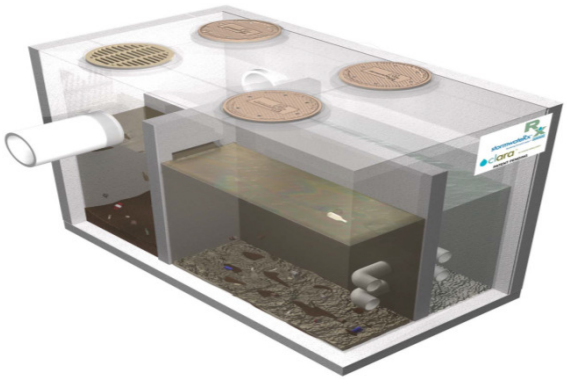
Additional Notes

Oil & Grease laboratory data using sorbents at flow rates of 25, 50, and 75% of design.

Treatment Technology Summary Report

Manufacturer/Vendor: StormwateRx LLC
Name of Technology: Clara Plug Flow Separator
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 5
high: 1120

System Footprint (sq. ft.):
0 - 150

Required Head Loss (ft):
0.5 - 1.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	284.5							
Median Effluent (mg/L):	173.5							
Median Removal (%):	47		YES	YES				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.516	0.088	2.82			
Median Effluent (mg/L):	0.078	0.072	1.21			
Median Removal (%):	30	26	32			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 2

Estimated Costs

Estimated Installation Cost: **low:** $20,000 **high:** $52,000
Estimated Annual O&M Cost: **low:** $0.0005/gal **high:** $0.001/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	StormwateRx LLC
Name of Technology:	Clara Plug Flow Separator
Technology Type:	Hydrodynamic Separation

Treatment Notes

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

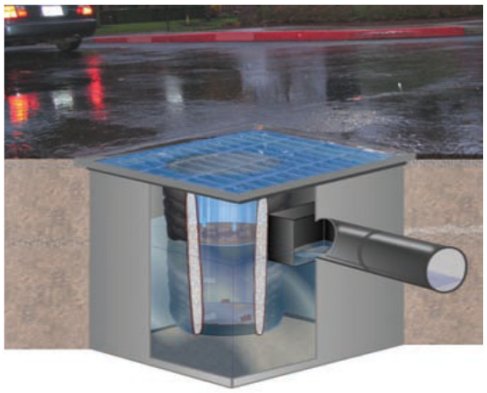
Additional Notes

The Clara uses four pre-engineered chambers with an internal high-flow bypass to trap pollutants such as heavy solids and oil and grease.

Treatment Technology Summary Report

Manufacturer/Vendor: Clean Way
Name of Technology: Clean Way Downspout Filtration Unit
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Clean Way
Name of Technology:	Clean Way Downspout Filtration Unit
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: ClearWater Solutions, Inc. *
Name of Technology: ClearWater BMP
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 200
high: 200

System Footprint (sq. ft.): 5,6

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	ClearWater Solutions, Inc. *
Name of Technology:	ClearWater BMP
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Coanda, Inc.
Name of Technology: Curb Inlet
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 50
high: 360,000

System Footprint (sq. ft.):
2-2000

Required Head Loss (ft):
1.5-3

Internal or External Bypass:
Internal

Application
Stormwater/Wastewater/
Process Water

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	1500							
Median Effluent (mg/L):	1376							
Median Removal (%):	8							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			48			
Median Effluent (mg/L):			15			
Median Removal (%):			69			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: A handful of private downspouts and area drains.

Estimated Costs

Estimated Installation Cost: **low:** $2,000 **high:** $3,500
Estimated Annual O&M Cost: **low:** $-0- **high:** $-0-

Treatment Technology Summary Report

Manufacturer/Vendor: Coanda, Inc.
Name of Technology: Curb Inlet
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Treatment Notes

USC (University of Southern California) obtained trash from Los Angeles Sanitation Services and United Stormwater. The Coanda BMP was filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the street. The water then entered the BMP at approximately 635 gallons per minute (gpm). The BMP was evaluated for pollutant removal potential by collecting water quality samples before it reached the BMP and then from under the BMP at different time intervals. The samples were evaluated by USC using chemical analysis to determine the water quality.

Additional Notes

A summary of the USC report can be found at: http://www.coanda.com/products/documents/usc_research_project.pdf.

Other case studies have been performed, demonstrating removal of trash, nutrients, metals, pesticides, and bacteria: http://www.coanda.com/products/documents/Rowlett_Case_Study_I.pdf

Treatment Technology Summary Report

Manufacturer/Vendor: Coanda, Inc.
Name of Technology: Downspouts
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 50
high: 360,000

System Footprint (sq. ft.):
2-2000

Required Head Loss (ft):
1.5-3

Internal or External Bypass:
Internal

Application
Stormwater/Wastewater/
Process water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	1500							
Median Effluent (mg/L):	1376							
Median Removal (%):	8							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			48			
Median Effluent (mg/L):			15			
Median Removal (%):			69			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: A handful of private downspouts and area drains.

Estimated Costs

Estimated Installation Cost: **low:** $2,000 **high:** $3,500
Estimated Annual O&M Cost: **low:** $-0- **high:** $-0-

Treatment Technology Summary Report

Manufacturer/Vendor: Coanda, Inc.
Name of Technology: Downspouts
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Treatment Notes

USC (University of Southern California) obtained trash from Los Angeles Sanitation Services and United Stormwater. The Coanda BMP was filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the street. The water then entered the BMP at approximately 635 gallons per minute (gpm). The BMP was evaluated for pollutant removal potential by collecting water quality samples before it reached the BMP and then from under the BMP at different time intervals. The samples were evaluated by USC using chemical analysis to determine the water quality.

Additional Notes

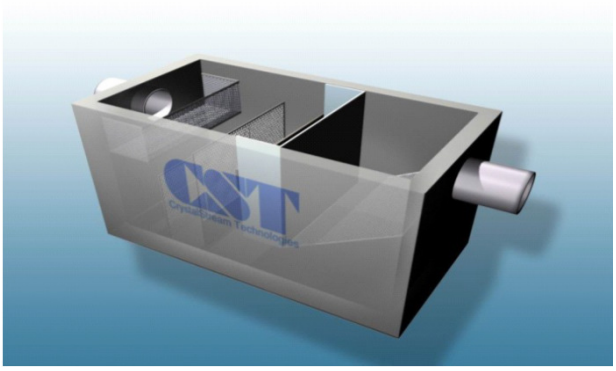
A summary of the USC report can be found at: http://www.coanda.com/products/documents/usc_research_project.pdf.

Other case studies have been performed, demonstrating removal of trash, nutrients, metals, pesticides, and bacteria: http://www.coanda.com/products/documents/Rowlett_Case_Study_I.pdf

Treatment Technology Summary Report

Manufacturer/Vendor: CrystalStream Technologies
Name of Technology: CrystalClean Separator
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	CrystalStream Technologies
Name of Technology:	CrystalClean Separator
Technology Type:	Oil/Water Separator

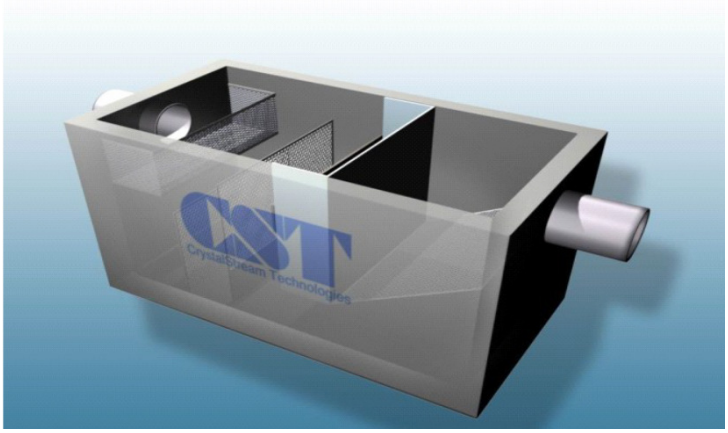
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CrystalStream Technologies
Name of Technology: CrystalCombo Hybrid Polisher
Technology Type: Media Filtration(Combination System (with Oil/Water Separator))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	CrystalStream Technologies
Name of Technology:	CrystalCombo Hybrid Polisher
Technology Type:	Media Filtration(Combination System (with Oil/Water Separator))

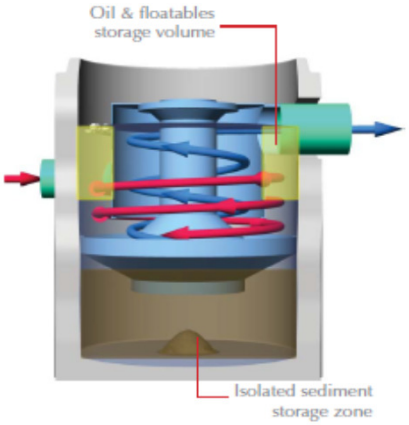
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Hydro International, Inc.
Name of Technology: Downstream Defender
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 500
high: 7800

System Footprint (sq. ft.): 0

Required Head Loss (ft): 0.5-0.9

Internal or External Bypass:

Application

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND							
Median Effluent (mg/L):	ND							
Median Removal (%):	50							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	GULD				

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Hydro International, Inc.
Name of Technology:	Downstream Defender
Technology Type:	Hydrodynamic Separation

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: United Storm Water, Inc.
Name of Technology: DrainPac™
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	United Storm Water, Inc.
Name of Technology:	DrainPac™
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems
Name of Technology: ecoLine a
Technology Type: Oil/Water Separator

Schematic

System Design Information

Design Flow Rate (gpm):
low: 25
high: 626

System Footprint (sq. ft.):
12-70

Required Head Loss (ft):
6.00" with clean coalescer

Internal or External Bypass:
Site specific design required

Application
Stormwater/Process Water/ Wastewater/Groundwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)		(b)	(b)	(b)	(b)	(b)	(b)

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 6

Estimated Costs

Estimated Installation Cost: **low:** $ 6,700 **high:** $ 44,250
Estimated Annual O&M Cost: **low:** (a) **high:** (a)

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems
Name of Technology: ecoLine a
Technology Type: Oil/Water Separator

Treatment Notes

CEN EN 858-1 Test Method for Class I Coalescing Separator
Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3* (Solubility of light liquid nil, unsaponifiable)
Water: Potable or purified surface water
Water turn over: Minimum four volumes of test units
Liquid flux: 25-40 m^3/m^2-h (10-15 gpm/ft^2)
Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

Additional Notes

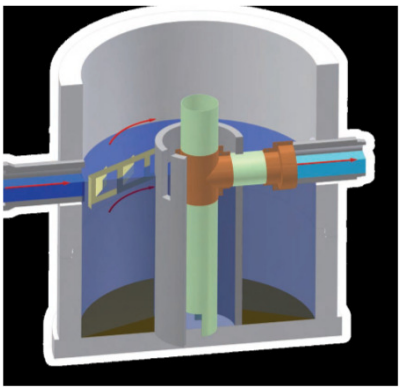
(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.

(b) Report Form's System performance data fields are not applicable. Product removes free-phase fluids such as floating oil and other petroleum hydrocarbon products (LNAPL - Light Non-Aqueous Phase Liquids).

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems
Name of Technology: ecoLine b
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 50
high: 1110

System Footprint (sq. ft.):
N/A

Required Head Loss (ft):
6.00" with clean coalescer

Internal or External Bypass:
Site specific design required

Application
Stormwater/Process Water/Wastewater/Ground Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)		(b)	(b)	(b)	(b)	(b)	(b)

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 7

Estimated Costs

Estimated Installation Cost: **low:** $ 8,200 **high:** $ 81,900
Estimated Annual O&M Cost: **low:** (a) **high:** (a)

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems
Name of Technology: ecoLine b
Technology Type: Oil/Water Separator

Treatment Notes

CEN EN 858-1 Test Method for Class I Coalescing Separator
Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3* (Solubility of light liquid nil, unsaponifiable)
Water: Potable or purified surface water
Water turn over: Minimum four volumes of test units
Liquid flux: 25-40 m^3/m^2-h (10-15 gpm/ft^2)
Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

Additional Notes

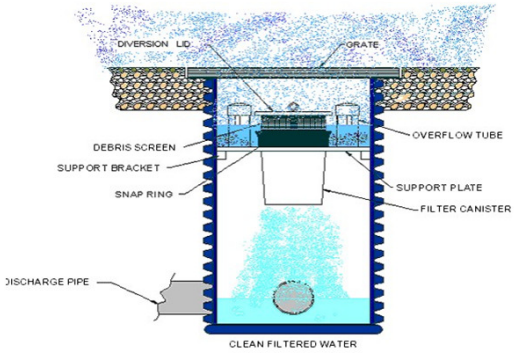
(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.

(b) Report Form's System performance data fields are not applicable. Product removes free-phase fluids such as floating oil and other petroleum hydrocarbon products (LNAPL - Light Non-Aqueous Phase Liquids).

Treatment Technology Summary Report

Manufacturer/Vendor: EcoSense International Inc.
Name of Technology: EcoSense Stormwater Filtertration systems, Catch basin inserts
Technology Type: Media Filtration(Cartridge)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 25
high: 1,662*

System Footprint (sq. ft.):

Required Head Loss (ft):
Varies*

Internal or External Bypass:
Internal, Hooded

Application
Stormwater/Process Water/
Wastewater/Groundwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $400 **high:** $2,000
Estimated Annual O&M Cost: **low:** $100 **high:** $500

Treatment Technology Summary Report

Manufacturer/Vendor:	EcoSense International Inc.
Name of Technology:	EcoSense Stormwater Filtertration systems, Catch basin inserts
Technology Type:	Media Filtration(Cartridge)

Treatment Notes

Third party lab and simulated field studies have been done in US, Italy, New Zealand and Canada on filters loaded with Melt Blown Polypropylene only. One study performed Grab samples on canisters loaded with surfactant modified zeolite and impregnated polyester pads. Results will be included with this submittal.

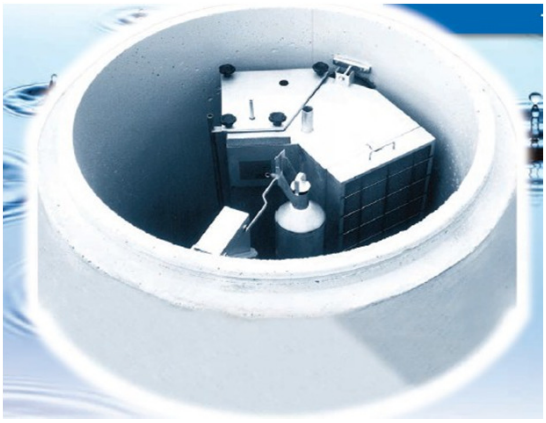
Additional Notes

EcoSense offers two media types for canister filters, but other media may be easily loaded. The system incorporates media filter canisters for low flows and "clean pass" hooded over-flows pipes. Multiple filters and over-flows may be installed depending on space available. Hooded over-flow effectively prevent floatables from bypassing canister filters. Debris, sediment, oils and grease (and contaminant associated) are effectively captured by the system. Debris collection baskets are also available especially designed to remove organic debris and trash. These systems are modular so that depending on catch basin sizes multiple baskets or filters or both may be installed.

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems, Inc./Water Tectonics, Inc.
Name of Technology: ecoSep®
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					PULD

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems, Inc./Water Tectonics, Inc.
Name of Technology: ecoSep®
Technology Type: Oil/Water Separator

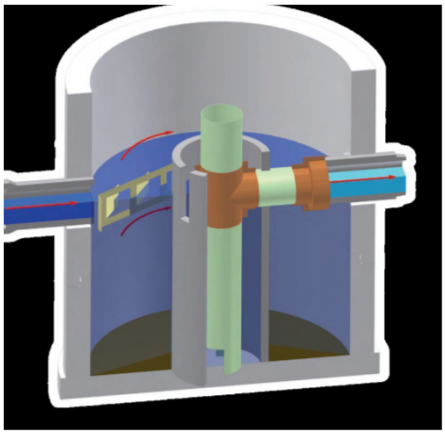
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems
Name of Technology: ecoStorm & ecoStorm Plus
Technology Type: Media Filtration(Combination System (with Hydrodyanamic Separation))

Schematic



System Design Information

Design Flow Rate (gpm):
low: No Min
high: 180

System Footprint (sq. ft.):
N/A

Required Head Loss (ft):
0.41' (c)

Internal or External Bypass:
Internal &/or External

Application
Stormwater/Process Water/ Wastewater/Ground Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	200							
Median Effluent (mg/L):	26							
Median Removal (%):	87							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.019	0.005	0.17			0.066
Median Effluent (mg/L):	0.009	0.002	0.073			0.042
Median Removal (%):	53	60	57			36

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		CULD			

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 9

Estimated Costs

Estimated Installation Cost: **low:** $8,900 (a) **high:** $37,500 (a)
Estimated Annual O&M Cost: **low:** (b) **high:** (b)

Treatment Technology Summary Report

Manufacturer/Vendor:	Royal Environmental Systems
Name of Technology:	ecoStorm & ecoStorm Plus
Technology Type:	Media Filtration(Combination System (with Hydrodyanamic Separation))

Treatment Notes

Field monitoring at the McRedmond Park site located in Redmond, WA. Auto sampler for flow-portional composite and time-based discrete collections. Independent analytical laboratory, and 3rd party data validation/statistical analysis of data points and sets.

Additional Notes

ecoStorm and ecoStorm plus can be utilized as separate stand-alone technologies or combined in serial component installation. Combined technologies are currently under TAPE evaluation through WADOE for stormwater. Performance data reflects both stormwater and non-stormwater installations.
(a) Cost varies based on combination of units, number of units, and final design requirements.
(b) $500 - $1000 per cleaning/backflush event; Minimum of 1x per yr. to monthly for stormwater.
(c) Headloss based on:
- Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units.
- 360 gpm through the system, 180 gpm per filter.
- Site specific model calibrated onsite at known flow rates.
- Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units).
- Filters assumed to be at the point of required maintenance (twice the headloss measured for new filters).
System Performance Data results shown are for qualifying events only, per Washington State TAPE requirements:
- Per TAPE requirements, removal requirements for influent concentration less than 100 mg/l are that effluent must be less than or equal to 20 mg/l.
- For parameters with no results presented above, they are not being monitored or were present at concentrations are below measurable thresholds.

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems, Inc./Water Tectonics, Inc.
Name of Technology: ecoTop®
Technology Type: Oil/Water Separator

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Royal Environmental Systems, Inc./Water Tectonics, Inc.
Name of Technology: ecoTop®
Technology Type: Oil/Water Separator

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: EcoSense International Inc.
Name of Technology: EcoVault
Technology Type: Drain Inlet Insert(Media Filtration)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 1,346
high: 48,000

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
Varies*

Internal or External Bypass:
Either or Both

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $25,000 **high:** $125,000
Estimated Annual O&M Cost: **low:** $200 **high:** $1,800

Treatment Technology Summary Report

Manufacturer/Vendor:	EcoSense International Inc.
Name of Technology:	EcoVault
Technology Type:	Drain Inlet Insert(Media Filtration)

Treatment Notes

A study has not been completed on this specific system. Studies have been performed on other manufactures version of the Type II Baffle Box. Minimum Performance claims are based on model studies performed at the Florida Institute of Technology: Pandit and Gopatakrishnan, 1996. The study mentioned was performed with a scale model Type 1 Baffle Box. Improvements such as media filtration and horizontal debris collection system were subsequently added.

Additional Notes

The EcoVault is unique among Type II baffle boxes. The standard model incorporates a high performance media filter into the last internal weir which treats low flows and remove a wide variety of contaminants including bacteria, mobile phosphate, ammonia, dissolved heavy metals and orgainics. TSS removal is expect to be 80% at the flows mentioned above. Course organic materials are captured and stored above the static WL greatly increasing overall nutrient removal. * Head Loss varies depending on the media filter's top elevation and is directly proportional. Debris loading also effects head loss.

Treatment Technology Summary Report

Manufacturer/Vendor: Enviro-Drain, Inc.
Name of Technology: Enviro-Drain®
Technology Type: Drain Inlet Insert(Absorbent Boom/Fabric)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 2
high: 71

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Enviro-Drain, Inc.
Name of Technology: Enviro-Drain®
Technology Type: Drain Inlet Insert(Absorbent Boom/Fabric)

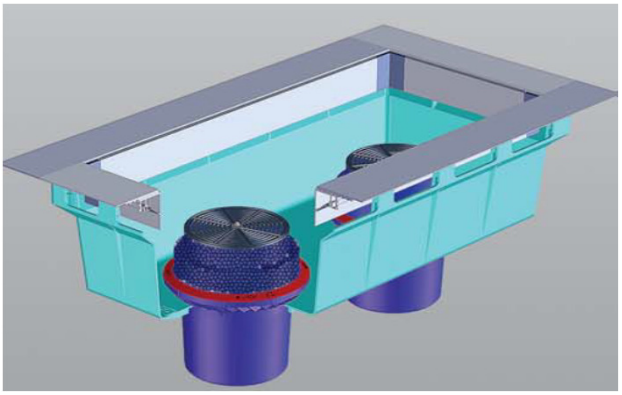
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Transpo Industries, Inc.
Name of Technology: EnviroSafe™
Technology Type: Drain Inlet Insert(Media Filtration)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 115
high: 230

System Footprint (sq. ft.): 0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Transpo Industries, Inc.
Name of Technology: EnviroSafe™
Technology Type: Drain Inlet Insert(Media Filtration)

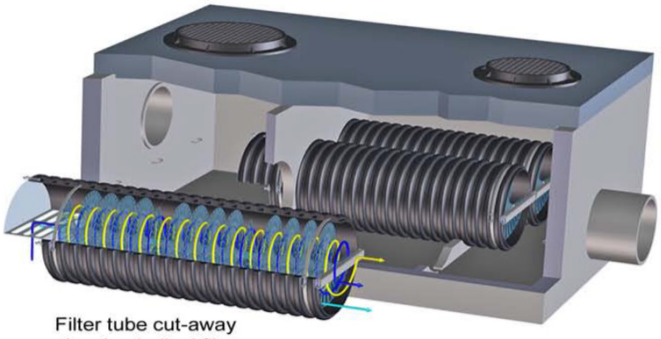
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Transpo Industries, Inc.
Name of Technology: EnviroSafe™ Storm Safe HF10
Technology Type: Drain Inlet Insert(Absorbent Boom/Fabric)

Schematic



Filter tube cut-away showing helical filters

System Design Information

Design Flow Rate (gpm):
low: 900
high: 9000

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Transpo Industries, Inc.
Name of Technology:	EnviroSafe™ Storm Safe HF10
Technology Type:	Drain Inlet Insert(Absorbent Boom/Fabric)

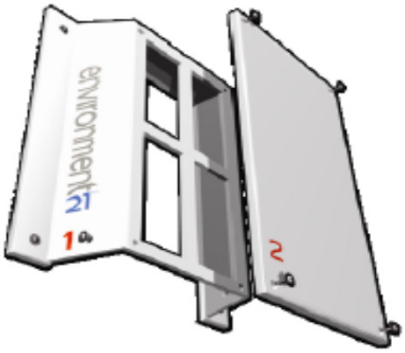
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: EnviroTrap Catch Basin Insert
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 0
high: 2700

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
0-0.5

Internal or External Bypass:
NA

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**150	**150	**150	**150	**150	**150
Median Removal (%):	*30		**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.07	***0.68	***0.24	NA	NA	NA
Median Removal (%):	***9	***13.6	***20	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $200 **high:** $1,000
Estimated Annual O&M Cost: **low:** 0 **high:** $1,000

Treatment Technology Summary Report

Manufacturer/Vendor:	Environment 21
Name of Technology:	EnviroTrap Catch Basin Insert
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 180 microns was used.
**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
***Testing is not complete for metals; therefore, these values are estimated.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Filterra, DBA Americast, Inc.
Name of Technology: Filterra Curb Inlet System
Technology Type: Bioretention/Filtration

Schematic

System Design Information

Design Flow Rate (gpm):
low: 8.5
high: 50+

System Footprint (sq. ft.):

Required Head Loss (ft):
2.5

Internal or External Bypass:
Can be either

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	10	12	12					
Median Influent (mg/L):	27.5	0.15	43.4					
Median Effluent (mg/L):	4.2	0.14	1.2					
Median Removal (%):	84.7	6.7	97.2					

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:				29		29
Median Influent (mg/L):				0.0056		0.194
Median Effluent (mg/L):				0.0033		0.082
Median Removal (%):				44		54

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		GULD	GULD		GULD

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 186

Estimated Costs

Estimated Installation Cost: **low:** $1,200 **high:** $7,500
Estimated Annual O&M Cost: **low:** $300 **high:** $3,000

Treatment Technology Summary Report

Manufacturer/Vendor:	Filterra, DBA Americast, Inc.
Name of Technology:	Filterra Curb Inlet System
Technology Type:	Bioretention/Filtration

Treatment Notes

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

Additional Notes

Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).

Treatment Technology Summary Report

Manufacturer/Vendor: Filterra, DBA Americast, Inc.
Name of Technology: Filterra Roof Drain System
Technology Type: Bioretention/Filtration

Schematic

System Design Information

Design Flow Rate (gpm):
low: 8.5
high: 50+

System Footprint (sq. ft.):

Required Head Loss (ft): 2.5

Internal or External Bypass: Internal

Application: Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	10	12	12					
Median Influent (mg/L):	27.5	0.15	43.4					
Median Effluent (mg/L):	4.2	0.14	1.2					
Median Removal (%):	84.7	6.7	97.2					

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:				29		29
Median Influent (mg/L):				0.0056		0.194
Median Effluent (mg/L):				0.0033		0.082
Median Removal (%):				44		54

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		GULD	GULD		GULD

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 1

Estimated Costs

Estimated Installation Cost: **low:** $1,200 **high:** $7,500
Estimated Annual O&M Cost: **low:** $300 **high:** $3,000

Treatment Technology Summary Report

Manufacturer/Vendor:	Filterra, DBA Americast, Inc.
Name of Technology:	Filterra Roof Drain System
Technology Type:	Bioretention/Filtration

Treatment Notes

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

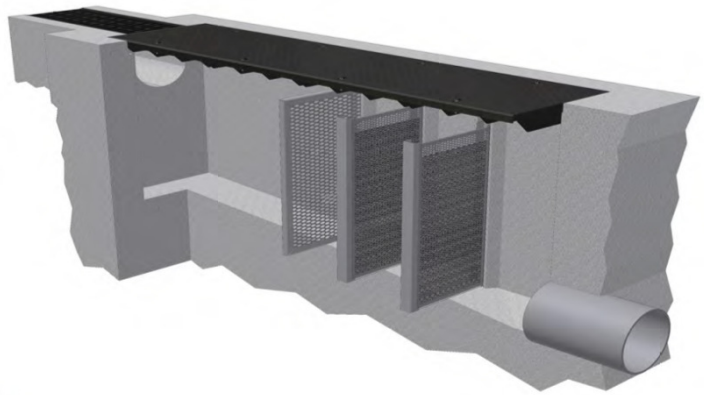
Additional Notes

Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).

Treatment Technology Summary Report

Manufacturer/Vendor: ABT, Inc.
Name of Technology: First Flush
Technology Type: Oil/water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 449
high: 538

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
NA

Internal or External Bypass:

Application
Stormwater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $5,000 **high:** $10,000
Estimated Annual O&M Cost: **low:** $500 **high:** $3,000

Treatment Technology Summary Report

Manufacturer/Vendor:	ABT, Inc.
Name of Technology:	First Flush
Technology Type:	Oil/water Separator

Treatment Notes

Lab test results are provided on the filter media performance and system hydraulic performace based on design capabilites. The installation cost if factoring material and cost of installation together...or an installed cost.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard Plus
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 100
high: 2000

System Footprint (sq. ft.):
1,10

Required Head Loss (ft):
0,0.25

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 100

Estimated Costs

Estimated Installation Cost: **low:** $250 **high:** $1800
Estimated Annual O&M Cost: **low:** $75 **high:** $350

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard Plus
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard Downspout Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 30
high: 325

System Footprint (sq. ft.):
0.5,1

Required Head Loss (ft):
0,1.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $1500 **high:** $3500
Estimated Annual O&M Cost: **low:** $75 **high:** $250

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	FloGard Downspout Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard Dual Vortex Seperator
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 150
high: 6,500

System Footprint (sq. ft.):
7 - 113

Required Head Loss (ft):
0 - 3

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	202							
Median Effluent (mg/L):	80							
Median Removal (%):	60							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: 10

Estimated Costs

Estimated Installation Cost: **low:** $10,000 **high:** $100,000
Estimated Annual O&M Cost: **low:** $300 **high:** $3,500

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	FloGard Dual Vortex Seperator
Technology Type:	Hydrodynamic Separation

Treatment Notes

Internal lab testing performed by Kristar. Third party lab testing was performed by Alden Research laboratories based in Holden Massachussets. No field studies have been completed at this date.

Additional Notes

No field studies have been completed at this time. Correlation of TSS removal with other POCs would indicate similar removal of Total metals.

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard LoPro Matrix Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 45
high: 800

System Footprint (sq. ft.):
0.75,16

Required Head Loss (ft):
0,0.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 10

Estimated Costs

Estimated Installation Cost: **low:** $400 **high:** $1000
Estimated Annual O&M Cost: **low:** $75 **high:** $300

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	FloGard LoPro Matrix Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard LoPro Trench Drain Filter
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 200
high: 500

System Footprint (sq. ft.):
1,20

Required Head Loss (ft):
0,0.25

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $600 **high:** $3000
Estimated Annual O&M Cost: **low:** $75 **high:** $350

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	FloGard LoPro Trench Drain Filter
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: FloGard Trash & Debris Guard
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 50
high: 500

System Footprint (sq. ft.):
0.5 - 4

Required Head Loss (ft):
0 - 0.25

Internal or External Bypass:
Internal

Application
Stormwater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $450 **high:** $1,500
Estimated Annual O&M Cost: **low:** $50 **high:** $200

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	FloGard Trash & Debris Guard
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

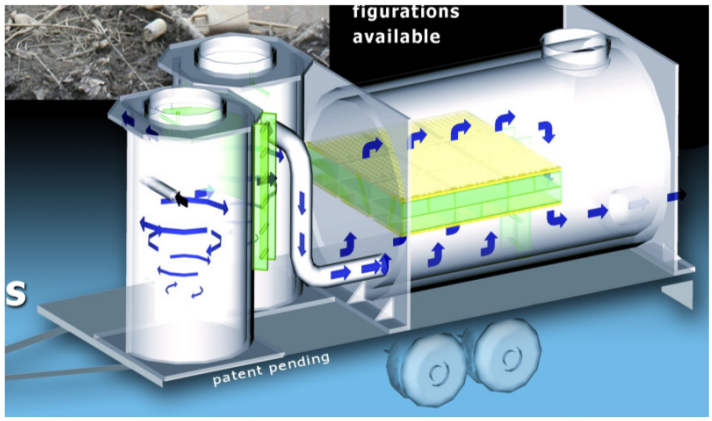
No Data Available

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: AquaShield, Inc.
Name of Technology: Go-Filter
Technology Type: Media Filtration(Combination System (with Hydrodyanamic Separation))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 50
high: 675

System Footprint (sq. ft.):

Required Head Loss (ft): 0.5

Internal or External Bypass: Both

Application Stormwater/Process water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** Site-specific **high:** Site-specific
Estimated Annual O&M Cost: **low:** Site-specific **high:** Site-specific

Treatment Technology Summary Report

Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Go-Filter
Technology Type:	Media Filtration(Combination System (with Hydrodyanamic Separation))

Treatment Notes

See Aqua-Filter for lab and field testing.

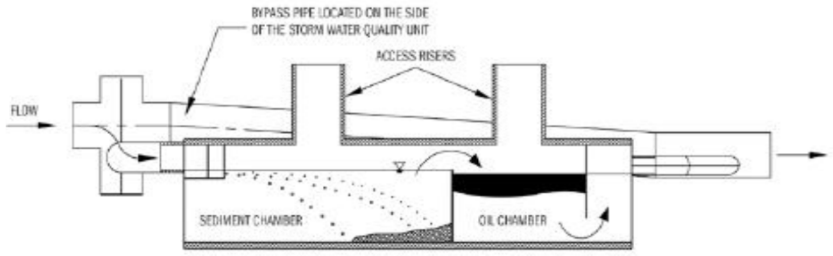
Additional Notes

Mobile device works on same principle as Aqua-Filter. Useful on construction sites for turbidity reduction in addition to sediment removal. Device components have been verified by NJCAT.

Treatment Technology Summary Report

Manufacturer/Vendor: Hancor, Inc.
Name of Technology: Hancor Storm Water Quality Unit
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Hancor, Inc.
Name of Technology: Hancor Storm Water Quality Unit
Technology Type: Oil/Water Separator

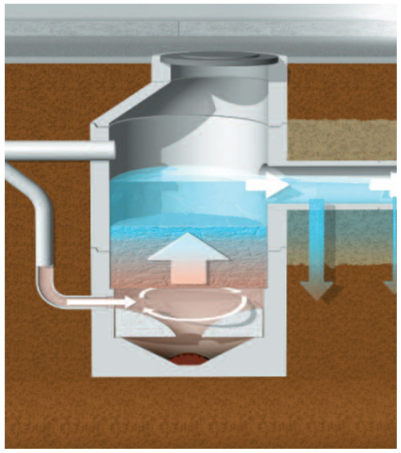
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Huber Technology, Inc.
Name of Technology: HUBER Hydro Filt
Technology Type: Drain Inlet Insert(Media Filtration)

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):
0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Huber Technology, Inc.
Name of Technology:	HUBER Hydro Filt
Technology Type:	Drain Inlet Insert(Media Filtration)

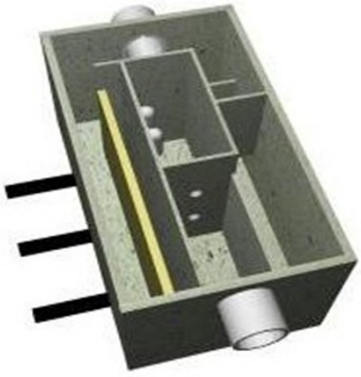
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Hydroworks
Name of Technology: HydroFilter
Technology Type: Media Filtration(Combination System (with Oil/Water Separator))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Hydroworks
Name of Technology: HydroFilter
Technology Type: Media Filtration(Combination System (with Oil/Water Separator))

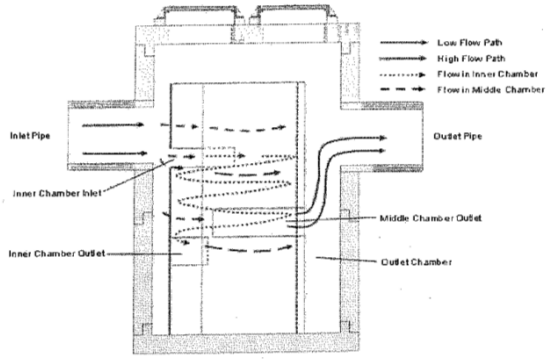
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Hydroworks
Name of Technology: HydroGuard
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 360
high: 3232

System Footprint (sq. ft.):
0

Required Head Loss (ft):
0-2

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND							
Median Effluent (mg/L):	ND							
Median Removal (%):	70							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Hydroworks
Name of Technology: HydroGuard
Technology Type: Hydrodynamic Separation

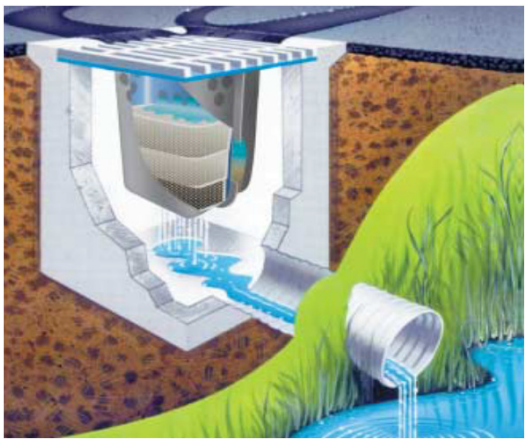
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: ACF Environmental, Inc.
Name of Technology: Hydro-Kleen™
Technology Type: Drain Inlet Insert(Media Filtration)

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: ACF Environmental, Inc.
Name of Technology: Hydro-Kleen™
Technology Type: Drain Inlet Insert(Media Filtration)

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Stormdrain Solutions
Name of Technology: Inceptor®
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Stormdrain Solutions
Name of Technology: Inceptor®
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

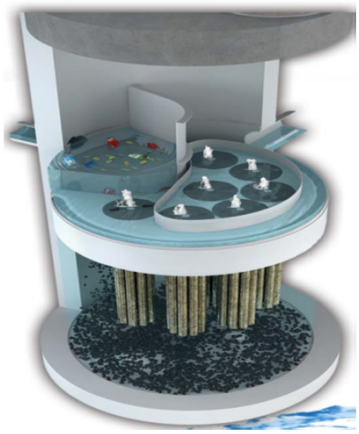
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Imbrium Systems
Name of Technology: Jellyfish Filter
Technology Type: Media Filtration(Up-Flow)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 60
high: 2300

System Footprint (sq. ft.):
12 - 113

Required Head Loss (ft):
1,2

Internal or External Bypass:
Internal or External Bypass

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	74							
Median Effluent (mg/L):	8							
Median Removal (%):	89							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	78	35	1.45			
Median Effluent (mg/L):	0.3	5	0.6			
Median Removal (%):	99	86	59			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		PULD			

	50% TSS Removal	80% TSS Removal
NJCAT		X

Other Approvals:

Local Installations

# of Installations in Washington: 1

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Imbrium Systems
Name of Technology:	Jellyfish Filter
Technology Type:	Media Filtration(Up-Flow)

Treatment Notes

Performance data is from third-party field study at University of Florida conducted according to the TARP protocol. Samples collected were grab samples of the entire crossection of flow. Twenty-one storm events have been monitored to date.

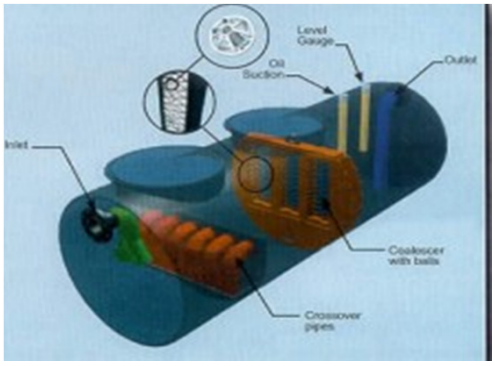
Additional Notes

Copper concentrations are in micrograms per liter. Zinc concentrations are in milligrams per liter. Lead concentraions are in micrograms per liter. The O&M cost ranges from $0.001/gal to $0.003/gal. Installation costs range from $8000 to $125,000.

Treatment Technology Summary Report

Manufacturer/Vendor: Brown Minneapolis Tank
Name of Technology: Kleerwater
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 25
high: 10,000

System Footprint (sq. ft.):

Required Head Loss (ft):
Gravity

Internal or External Bypass:
External

Application
Stormwater/Wastewater

*Treatment Performance **

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** Varies **high:** Varies
Estimated Annual O&M Cost: **low:** Varies **high:** Varies

Treatment Technology Summary Report

Manufacturer/Vendor:	Brown Minneapolis Tank
Name of Technology:	Kleerwater
Technology Type:	Oil/Water Separator

Treatment Notes

All data collected and verified by third party inspectors and Underwriters Laboratories (UL).

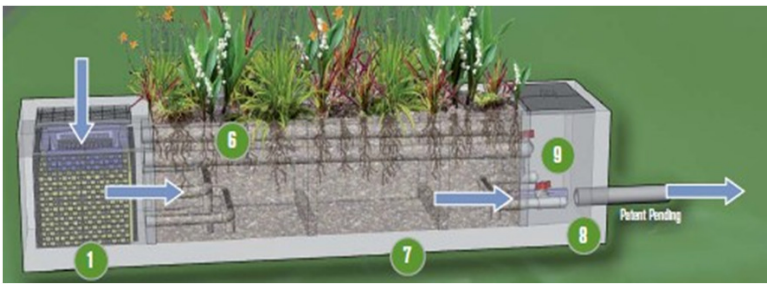
Additional Notes

• Underwriters Laboratories tested and listed per UL-2215
• Designed for no internal or confined space entry when performing routine maintenance.
• Kleerwater™ can handle larger influent flows, allowing for smaller separator tanks. With smaller separation tanks, less installation costs.
• Kleerwater™ separators utilizes Stokes Law for defining rates of rise of oil spheres in a liquid medium
• Unique patented oil separation process enhances oil from water separation efficiencies
• Separation efficiencies down to 5 ppm & lower. Note: Kleerwater™will not remove oils with a specific gravity of less than 0.95, dissolved hydrocarbons, or volatile organic compounds.
For additional information, please visit www.kleerwater.net

Treatment Technology Summary Report

Manufacturer/Vendor: Modular Wetland Systems, Inc.
Name of Technology: Modular Wetland Systems - Linear
Technology Type: Bioretention/Filtration

Schematic



System Design Information

Design Flow Rate (gpm):
low: 22
high: 120

System Footprint (sq. ft.):
16-84

Required Head Loss (ft):
2,4

Internal or External Bypass:
Internal (External in Some Situations)

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	270		19	4	NA	NA	NA	NA
Median Effluent (mg/L):	3		0	ND	NA	NA	NA	NA
Median Removal (%):	98		>99	>99	NA	NA	NA	NA

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	0.04	ND	0.24	0.757	0.543	0.95
Median Effluent (mg/L):	ND	ND	ND	0.0552	0.1	0.185
Median Removal (%):	>50		>79	93	81	80

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $12,000 **high:** $25,000
Estimated Annual O&M Cost: **low:** $8.26/gal **high:** $10.50/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Modular Wetland Systems, Inc.
Name of Technology:	Modular Wetland Systems - Linear
Technology Type:	Bioretention/Filtration

Treatment Notes

The Modular Wetland System Linear has been used in the field since 2008. The system has be independently tested in the laboratory and field under various conditions. A series of composite grab samples were used in the field and laboratory provide performance analysis on the system.
--Quarter Scale Independent Lab Testing
--Full Scale Independent Field Testing

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Bio Clean Environmental
Name of Technology: Nutrient Separating Baffle Box
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 148
high: 8,858

System Footprint (sq. ft.): 0

Required Head Loss (ft): 0

Internal or External Bypass: Internal (External in Some Situations)

Application Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	2	4	NA	2	NA			NA
Median Influent (mg/L):	366	1.49	NA	4	NA			NA
Median Effluent (mg/L):	48	0.44	NA	n/d	NA			NA
Median Removal (%):	86.8	70	NA	>99	NA			NA

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:	2	NA	0	NA	NA	NA
Median Influent (mg/L):	0.07	NA	0.318	NA	NA	NA
Median Effluent (mg/L):	0.042	NA	0.222	NA	NA	NA
Median Removal (%):	40	NA	30.25	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: 0 WA, 4 UT, 3 OR

Estimated Costs

Estimated Installation Cost: **low:** $10,000 **high:** $200,000
Estimated Annual O&M Cost: **low:** $0.33/gal **high:** $0.84/gal

Treatment Technology Summary Report

Manufacturer/Vendor:	Bio Clean Environmental
Name of Technology:	Nutrient Separating Baffle Box
Technology Type:	Hydrodynamic Separation

Treatment Notes

The Nutrient Separating Baffle Box has been in use since for over 10 years. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below. N/A stands for information not available - pollutant not tested in the report
--City of Santa Monica field data is independent and was performed over the course of 1 year.
--Brevard County field testing is independent and was peformed over 4 storm events - Micco & Indiatlantic
-- NJ CAT Full Scale Labratory Testing Tier 1

Additional Notes

The Nutrient Separating Baffle Box employees screening, three chambered hydrodynamic spearation and absoptive polymer media for the removal of gorss solids, TSS, particulate pollutants and hydrocarbons.

Treatment Technology Summary Report

Manufacturer/Vendor: Rotondo Environmental Solutions, LLC
Name of Technology: Perimeter Sandfilter (Delaware Sandfilter)
Technology Type: Media Filtration (Sand Filter)

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):
0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Rotondo Environmental Solutions, LLC
Name of Technology:	Perimeter Sandfilter (Delaware Sandfilter)
Technology Type:	Media Filtration (Sand Filter)

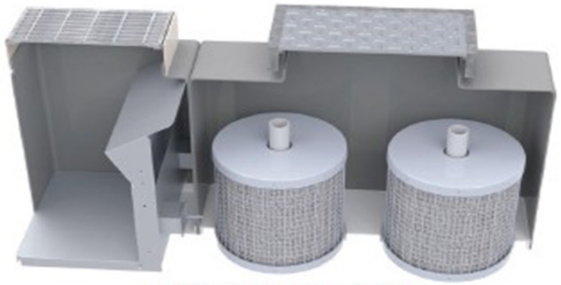
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: Perk Filter
Technology Type: Media Filtration(Cartridge)

Schematic



POD SYSTEM CONFIGURATION

System Design Information

Design Flow Rate (gpm):
low: 12
high: 1000

System Footprint (sq. ft.):
10,150

Required Head Loss (ft):
1.7,3.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	70		20	20				20
Median Effluent (mg/L):	11		5	5				5
Median Removal (%):	82		75	75				75

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.052	0.15	0.25			
Median Effluent (mg/L):	0.02	0.05	0.1			
Median Removal (%):	62	68	61			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		GULD		GULD	

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 15

Estimated Costs

Estimated Installation Cost: **low:** $10000 **high:** $200000
Estimated Annual O&M Cost: **low:** $1200 **high:** $10000

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	Perk Filter
Technology Type:	Media Filtration(Cartridge)

Treatment Notes

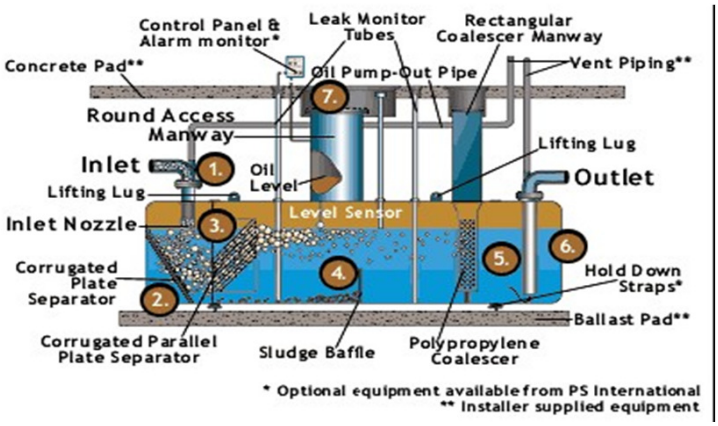
Internal lab testing performed by Kristar. Third party lab testing was performed by CSUS - OWP for TSS and subsequent "street Sweeipings" testing for metals and nutrients. Third Party field testing for GULD by Herrera.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: PSI International, Inc.
Name of Technology: PSI Separator
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	PSI International, Inc.
Name of Technology:	PSI Separator
Technology Type:	Oil/Water Separator

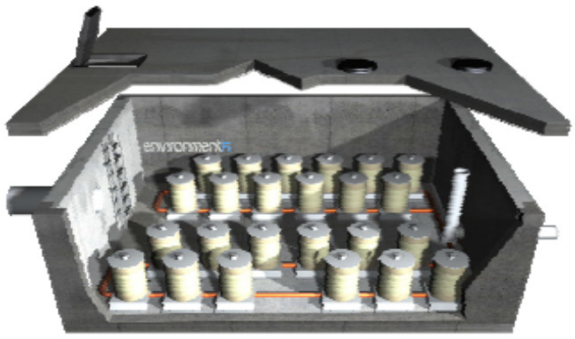
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: PuriStorm
Technology Type: Media Filtration(Cartridge)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 0
high: 2000

System Footprint (sq. ft.):
9-600

Required Head Loss (ft):
0-0.5

Internal or External Bypass:
Both

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**80	**80	**80	**80	**80	**80
Median Removal (%):	*80		**80	**80	**80	**80	**80	**80

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.04	***0.28	***0.06	NA	NA	NA
Median Removal (%):	***50	***65	***80	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** $3,000 **high:** $25,000
Estimated Annual O&M Cost: **low:** 0 **high:** $10,000

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: PuriStorm
Technology Type: Media Filtration(Cartridge)

Treatment Notes

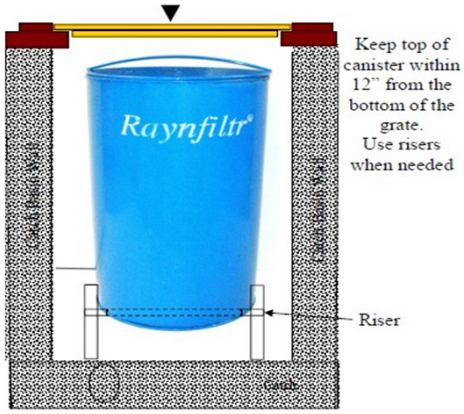
*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 60 microns was used.
**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
***Testing is not complete for metals; therefore, these values are estimated.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environmental Filtration Inc.
Name of Technology: Raynfiltr
Technology Type: Drain Inlet Insert(Media Filtration

Schematic



System Design Information

Design Flow Rate (gpm):
low: 0
high: 900

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 1 (airport)

Estimated Costs

Estimated Installation Cost: **low:** $531 **high:** $554
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Environmental Filtration Inc.
Name of Technology:	Raynfiltr
Technology Type:	Drain Inlet Insert(Media Filtration

Treatment Notes

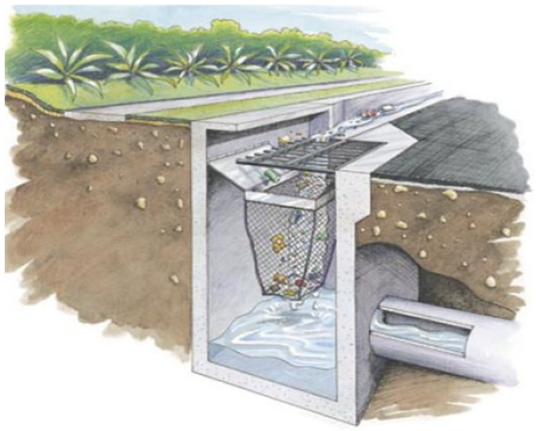
Additional Notes

Costs per catch basin

Treatment Technology Summary Report

Manufacturer/Vendor: EcoSol Wastewater Filtration Systems
Name of Technology: RSF (Rapid Stormwater Filtration) 100
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 1784
high: 7000

System Footprint (sq. ft.):

Required Head Loss (ft): 0.5

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	65	40						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	EcoSol Wastewater Filtration Systems
Name of Technology:	RSF (Rapid Stormwater Filtration) 100
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

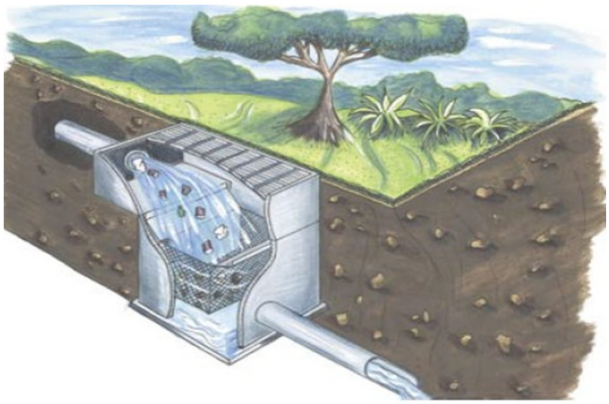
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: EcoSol Wastewater Filtration Systems
Name of Technology: RSF (Rapid Stormwater Filtration) 1000
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 12000
high: 18162

System Footprint (sq. ft.):
0

Required Head Loss (ft):
0.5

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	49	30						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	EcoSol Wastewater Filtration Systems
Name of Technology:	RSF (Rapid Stormwater Filtration) 1000
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

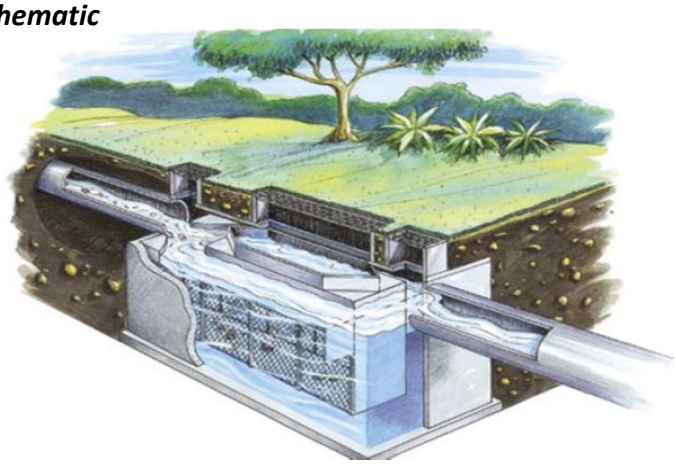
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: EcoSol Wastewater Filtration Systems
Name of Technology: RSF (Rapid Stormwater Filtration) 4000
Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 837
high: 68270

System Footprint (sq. ft.): 0

Required Head Loss (ft): 0.5

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	91	30						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	EcoSol Wastewater Filtration Systems
Name of Technology:	RSF (Rapid Stormwater Filtration) 4000
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

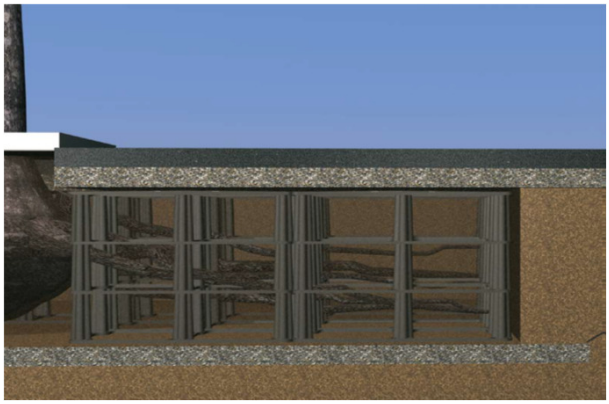
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Deep Root Partners, L.P.
Name of Technology: Silva Cell
Technology Type: Bioretention/Filtration

Schematic



System Design Information

Design Flow Rate (gpm):
low: 20"/hour
high: 3"/hour

System Footprint (sq. ft.):

Required Head Loss (ft):
n/a

Internal or External Bypass:
Optional

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):	80	68						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):				90+		90+

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		GULD	GULD		

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 7

Estimated Costs

Estimated Installation Cost: **low:** $4,000-$5,600 **high:** $10,000-$14,000
Estimated Annual O&M Cost: **low:** $100-$200 **high:** $100-$200

Treatment Technology Summary Report

Manufacturer/Vendor: Deep Root Partners, L.P.
Name of Technology: Silva Cell
Technology Type: Bioretention/Filtration

Treatment Notes

Data is based on a literature search. The water quality filtering values are based on research by Davis at University of Maryland and Hunt at the University of North Carolina.

Additional Notes

Prince Georges County Stormwater Manual, British Columbia Stormwater Manual, State of Washington Department of Ecology

Treatment Technology Summary Report

Manufacturer/Vendor: Nyloplast/Hancor, Inc.
Name of Technology: SNOUT®
Technology Type: Oil/Water Separator

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Nyloplast/Hancor, Inc.
Name of Technology: SNOUT®
Technology Type: Oil/Water Separator

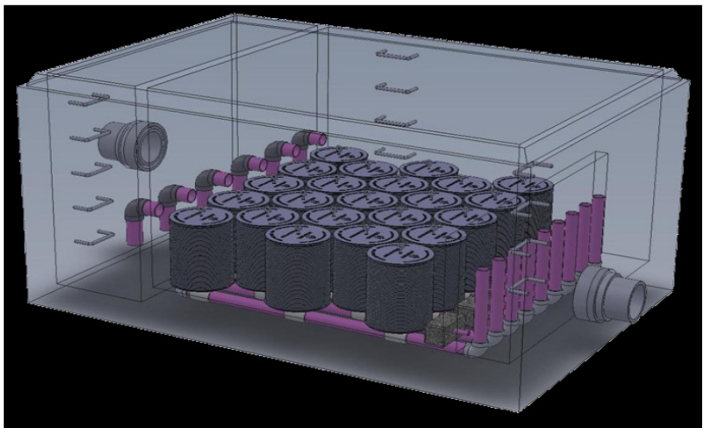
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Imbrium Systems Corp
Name of Technology: Sorbtive™ FILTER
Technology Type: Media Filtration(Cartridge)

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	ND						
Median Effluent (mg/L):	ND	ND						
Median Removal (%):	84	>77						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals: _____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Imbrium Systems Corp
Name of Technology: Sorbtive™ FILTER
Technology Type: Media Filtration(Cartridge)

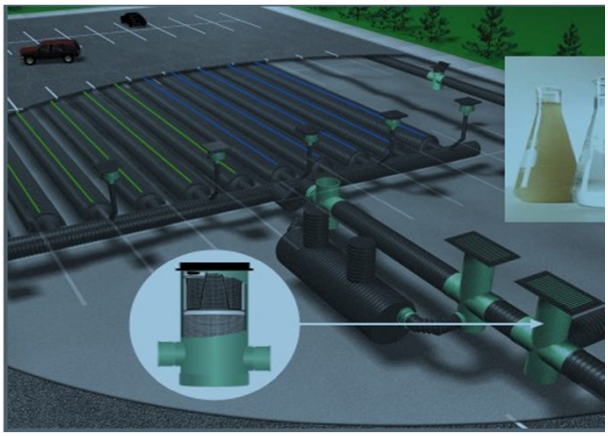
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Nyloplast/Hancor, Inc.
Name of Technology: Storm PURE™
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):
_____

Required Head Loss (ft):
_____

Internal or External Bypass:
_____

Application
_____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:
_____
_____
_____
_____

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Nyloplast/Hancor, Inc.
Name of Technology: Storm PURE™
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

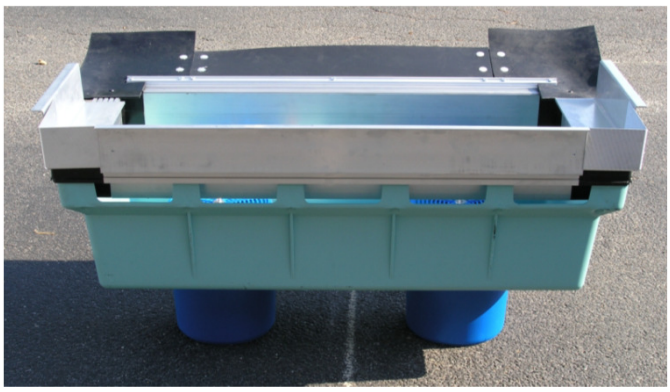
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: FABCO industries
Name of Technology: Stormbasin/Stormpod
Technology Type: Drain Inlet Insert(Media Filtration (Cartridge))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 50
high: >2500

System Footprint (sq. ft.):
4 - 200

Required Head Loss (ft):
1.25 - 2.5

Internal or External Bypass:
Both

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	111.9	0.57		59.5				
Median Effluent (mg/L):	2.7	0.3		<5				
Median Removal (%):	97.8	47		>90				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):		0.018	0.335			
Median Effluent (mg/L):		0.0049	0.175			
Median Removal (%):		73	48			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: <20

Estimated Costs

Estimated Installation Cost: **low:** $750 **high:** $2,000
Estimated Annual O&M Cost: **low:** $200 **high:** $800

Treatment Technology Summary Report

Manufacturer/Vendor:	FABCO industries
Name of Technology:	Stormbasin/Stormpod
Technology Type:	Drain Inlet Insert(Media Filtration (Cartridge))

Treatment Notes

FABCO stormbasin/stormpod has been tested in the lab and the field by 1st+3rd party's data was collected according to established protocols and consisted of barious methods including grab, auto, semi-auto and single event or composite samples

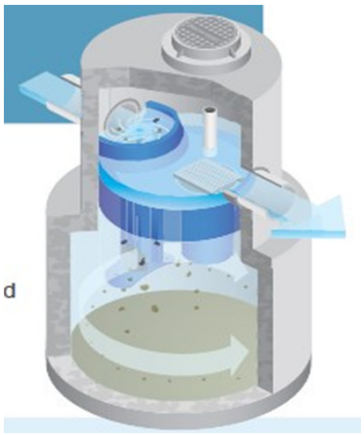
Additional Notes

FABCO was awarded a competition bid-soil source spec for large scale municupal deployment in the urban/ms4 stormdrain system of nassau county, long island, ny. Since 2009 FABCO was installed over 2000 stormbasins. Our performance approval as part of this spec-sediment TSS removal> 50% d50: 110 um. Hydrocarbons/oil&grease: >80%. .Phosphorus: >50%. Nitrogen >40%. Bacteria. >70%. Stormbasin is a great retrofit device for industrial facilities and is considered a structural BMP for pretreatment, source control or in spcc + swpp plans.

Treatment Technology Summary Report

Manufacturer/Vendor: Imbrium Systems
Name of Technology: Stormceptor
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 0
high: 11000

System Footprint (sq. ft.):

Required Head Loss (ft):
0.22

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	57	38	15					
Median Influent (mg/L):	159	0.275	29					
Median Effluent (mg/L):	59	0.175	4					
Median Removal (%):	53	21.8	73					

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):				27.5	41.8	35.3

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: 510+

Estimated Costs

Estimated Installation Cost: **low:** $3,000 **high:** $15,000
Estimated Annual O&M Cost: **low:** $500 **high:** $5,000

Treatment Technology Summary Report

Manufacturer/Vendor: Imbrium Systems
Name of Technology: Stormceptor
Technology Type: Hydrodynamic Separation

Treatment Notes

The data detailed below is aggregate of many field studies (8) as well as lab studies (2) including the NJCAT TARP program. Most studies were conducted 3rd party with both automatic and grab samplers. Individual test reports are available upon request.

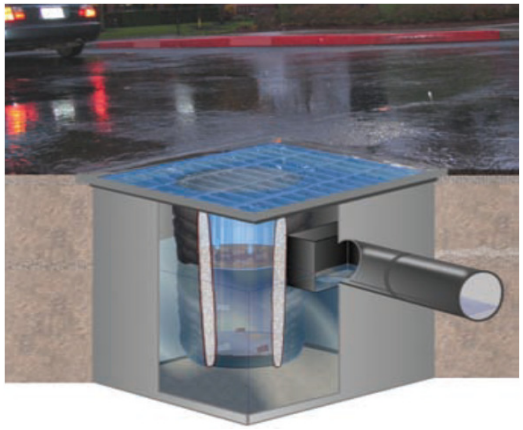
Additional Notes

Despite the above averages, the Stormceptor system, when sized with PCSWMM for Stormceptor has a 0.94 correlation (r-squared regression value) with field performance when an accurate PSD is used to size the unit. Therefore the Stormceptor can be confidently and accurately sized for TSS removal goals on the order of 80% TSS, if the proper consideration like a true PSD are taken into account. Furthermore, the laboratory evaluation indicates that the Stormceptor unit can achieve DOE level performance at flow rates larger than the indicated treatment flow rate on the DOE GULD. The flow rates listed in the DOE GULD are merely a hydraulic marker within the system that indicates when the unit begins to inhibit scour from the unit.

Treatment Technology Summary Report

Manufacturer/Vendor: Clean Way
Name of Technology: StormClean Catch Basin Insert
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Clean Way
Name of Technology:	StormClean Catch Basin Insert
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

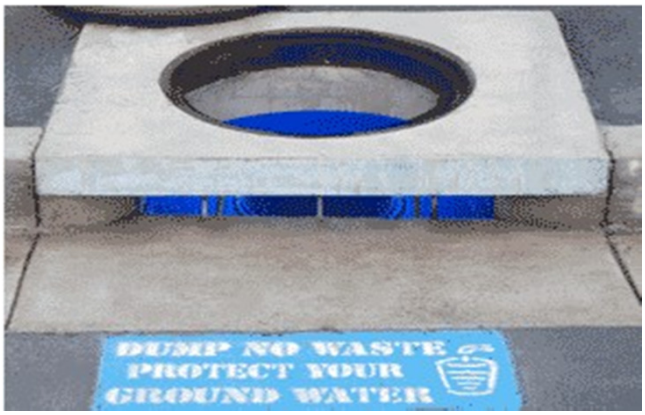
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Clean Way
Name of Technology: StormClean Curb Inlet Insert
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Clean Way
Name of Technology:	StormClean Curb Inlet Insert
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Clean Way
Name of Technology: StormClean Wall Mount Filtration Unit
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor:	Clean Way
Name of Technology:	StormClean Wall Mount Filtration Unit
Technology Type:	Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

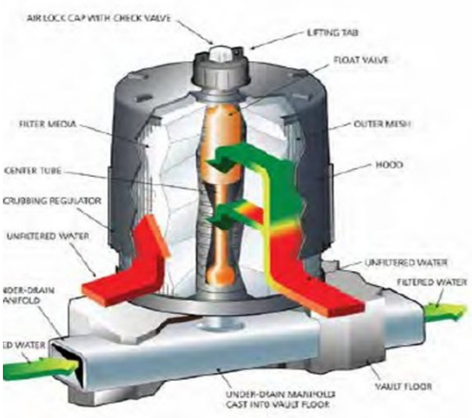
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Construction Products Inc.
Name of Technology: StormFilter - ZPG
Technology Type: Media Filtration(Cartridge)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 2
high: 44900

System Footprint (sq. ft.):
8 - 6,050

Required Head Loss (ft):
1.8 - 12

Internal or External Bypass:
Both available

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	83							0.12
Median Effluent (mg/L):	23							0.062
Median Removal (%):	82							42

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.0425	0.12	0.225	0.00464		0.0599
Median Effluent (mg/L):	0.0335	0.0435	0.12767	0.00423		0.0532
Median Removal (%):	47	24	62	11		15

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		GULD			

	50% TSS Removal	80% TSS Removal
NJCAT		X

Other Approvals:

Local Installations

# of Installations in Washington: > 500

Estimated Costs

Estimated Installation Cost: **low:** $10K **high:** $2.5 M
Estimated Annual O&M Cost: **low:** $0.00008/gal **high:** $0.00024/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Construction Products Inc.
Name of Technology: StormFilter - ZPG
Technology Type: Media Filtration(Cartridge)

Treatment Notes

a) Stormwater Management StormFilter Basic Treatment Application for General Use Level Designation (2005): field,flow-weighted, peer reviewed, composite samples; b) Milwaukee Riverwalk ETV; Third Party, Field, Flow weighted. c) Heritage Marketplace Field Evalution (2004): field, flow-weighted, peer reviewed, composite samples; d) EvTec Lake Union Ultra-Urban Stormwater Technology Evaluation Stormwater Management StormFilter (2008): field, third party, composite.

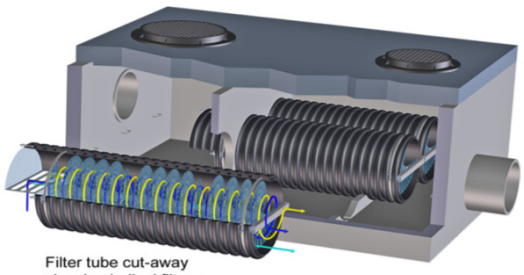
Additional Notes

TSS reference a; Metals references b & c; cPAHs reference d. cPAHs used Chrysene as the parameter as it was the median performance for the suite of requested analytes. Ranges were 33% to 47% for the entire suite. cPAH data contained 10% more GAC (by volume) than standard ZPG.

Treatment Technology Summary Report

Manufacturer/Vendor: Fabco Industries
Name of Technology: Stormsafe-helix
Technology Type: Media Filtration(Cartridge)

Schematic



Filter tube cut-away showing helical filters

System Design Information

Design Flow Rate (gpm):
low: 3
high: 9

System Footprint (sq. ft.):
160 - 250

Required Head Loss (ft):
0 - 3

Internal or External Bypass:
both

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: none

Estimated Costs

Estimated Installation Cost: **low:** $20,000 **high:** $60,000
Estimated Annual O&M Cost: **low:** $2,000 **high:** $6,000

Treatment Technology Summary Report

Manufacturer/Vendor: Fabco Industries
Name of Technology: Stormsafe-helix
Technology Type: Media Filtration(Cartridge)

Treatment Notes

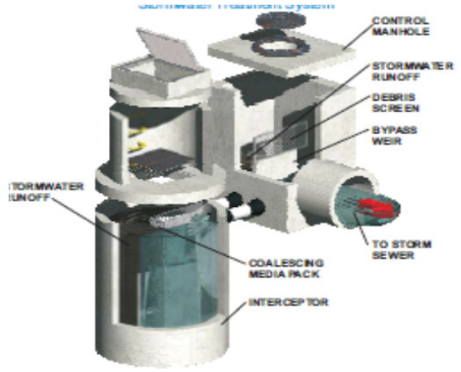
We have conducted lab and field studies as descried in our online reports, we are currently undergoing 3rd party field testing at a wastewater treatment plant, treating 10 acres of stormwater runoff.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Park USA
Name of Technology: StormTrooper®
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 0
high: 11000

System Footprint (sq. ft.):

Required Head Loss (ft): 0.22

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor:	Park USA
Name of Technology:	StormTrooper®
Technology Type:	Hydrodynamic Separation

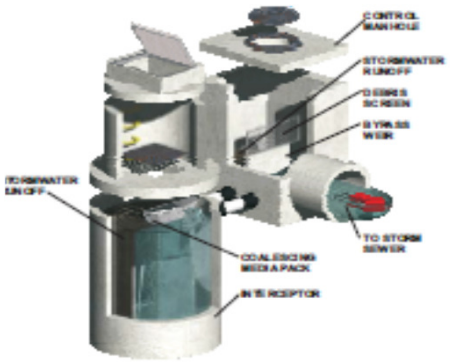
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Park USA
Name of Technology: StormTrooper® EX Extra-Duty
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.): _____

Required Head Loss (ft): _____

Internal or External Bypass: _____

Application _____

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Park USA
Name of Technology: StormTrooper® EX Extra-Duty
Technology Type: Hydrodynamic Separation

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: SwaleGard
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Schematic

System Design Information

Design Flow Rate (gpm):
low: 100
high: 800

System Footprint (sq. ft.):
4 - 16

Required Head Loss (ft):
0 - 0.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 2

Estimated Costs

Estimated Installation Cost: **low:** $4,500 **high:** $4,500
Estimated Annual O&M Cost: **low:** $75 **high:** $300

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: SwaleGard
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Treatment Notes

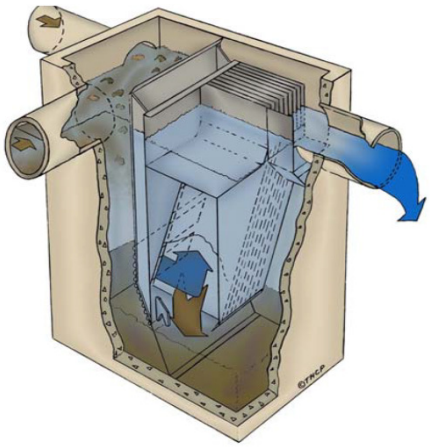
Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Terre Hill Concrete Products
Name of Technology: Terre Kleen™
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 1.5
high: 100

System Footprint (sq. ft.): 0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND							
Median Effluent (mg/L):	ND							
Median Removal (%):	78							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Terre Hill Concrete Products
Name of Technology: Terre Kleen™
Technology Type: Hydrodynamic Separation

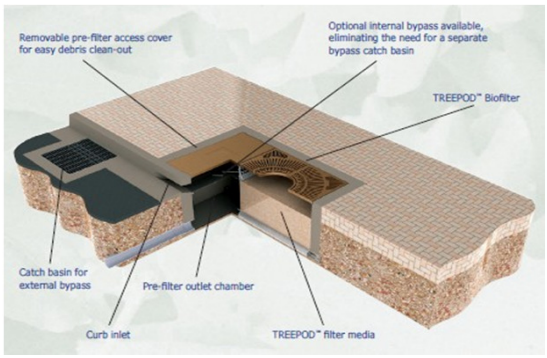
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Kristar Enterprises, Inc.
Name of Technology: TreePod Biofilter
Technology Type: Bioretention/Filtration

Schematic



System Design Information

Design Flow Rate (gpm):
low: 16
high: 72

System Footprint (sq. ft.):
24 - 84

Required Head Loss (ft):
0 - 0.5

Internal or External Bypass:
Internal

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	TBD		TBD	TBD				TBD
Median Effluent (mg/L):	TBD		TBD	TBD				TBD
Median Removal (%):	TBD		TBD	TBD				TBD

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD
Median Effluent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD
Median Removal (%):	TBD	TBD	TBD	TBD	TBD	TBD

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $10,000 **high:** $50,000
Estimated Annual O&M Cost: **low:** $400 **high:** $750

Treatment Technology Summary Report

Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	TreePod Biofilter
Technology Type:	Bioretention/Filtration

Treatment Notes

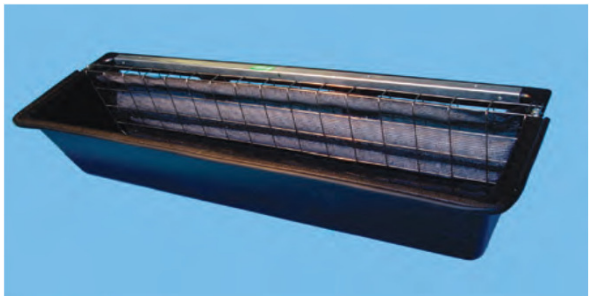
Internal Hydraulic testing only completed at this time. UNH field study for performance currently under way.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: Triton Drop Inserts
Technology Type: Drain Inlet Insert(Media Filtration (Cartridge))

Schematic



System Design Information

Design Flow Rate (gpm):
low: 100
high: 5404

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass:
Both available

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: > 100

Estimated Costs

Estimated Installation Cost: **low:** $300 **high:** $2,500
Estimated Annual O&M Cost: **low:** $0.000002/gal **high:** $0.00008/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: Triton Drop Inserts
Technology Type: Drain Inlet Insert(Media Filtration (Cartridge))

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: AbTech Industries
Name of Technology: Ultra Urban Filter
Technology Type: Drain Inlet Inset (Absorbent Boom/Fabric)

Schematic

System Design Information

Design Flow Rate (gpm):
low: 190
high: 500

System Footprint (sq. ft.):
0

Required Head Loss (ft):
0.5 - 1.5

Internal or External Bypass:
Internal Bypass

Application
Stormwater/Process Water

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):			>100	>100	180			>100
Median Effluent (mg/L):			<10	<10	>4.4			>10
Median Removal (%):	*80		90	85	**40			**60

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** $400 **high:** $1,700
Estimated Annual O&M Cost: **low:** NA **high:** NA

Treatment Technology Summary Report

Manufacturer/Vendor:	AbTech Industries
Name of Technology:	Ultra Urban Filter
Technology Type:	Drain Inlet Inset (Absorbent Boom/Fabric)

Treatment Notes

Primary analysis of AbTech Industries Ultra Urban Filter (UUF) was conducted in laboratory studies conducted by third parties using grab samples from established test protocols developed by federal and state regulatory entities. Field data was collected during studies conducted by municipalities to evaluate the effectiviness of the UUFs for deployment in the localized watershed. The testing methods used by the municipalities were governed by the state regulatory body, in which that municipality was located.

Additional Notes

* Data based on Particle Size Distribution (PSD) and not on mg/L. Samples tested were evaluated using a medium sand in the 0.355-0.300 mm range.

**Reduction of soluble dissolved hydrocarbons occurs when they become partitioned in the dispersed hydrocarbons and are removed simultaneously. Filtration of dissolved phase hydrocarbons through AbTech's UUFs will not occur, in substantial percent volumes, without the presence of dispersed hydrocarbons. Bench scale testing can be conducted on field samples to establish viability in a specific environment or to meet a specific discharge standard.

Total Metals Removal: Based on TSS testing the UUF has the ability to physically separate Total Metals from the water column, but AbTech products have no Chemical or Biological exchange during the filtration of Total Metals.

Treatment Technology Summary Report

Manufacturer/Vendor: Rotondo Environmental Solutions, LLC
Name of Technology: Underground Sandfilter (DC Sandfilter)
Technology Type: Media Filtration (Sand Filter)

Schematic

System Design Information

Design Flow Rate (gpm):
low: _____
high: _____

System Footprint (sq. ft.):
0

Required Head Loss (ft):

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: _____

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

Treatment Technology Summary Report

Manufacturer/Vendor: Rotondo Environmental Solutions, LLC
Name of Technology: Underground Sandfilter (DC Sandfilter)
Technology Type: Media Filtration (Sand Filter)

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: UniScreen
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 0
high: 15,700

System Footprint (sq. ft.):
20-135

Required Head Loss (ft):
0-0.5

Internal or External Bypass:
Both

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**150	**150	**150	**150	**150	**150
Median Removal (%):	*80		**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA
Median Removal (%):	***20	***27	***40	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $2,000 **high:** $15,000
Estimated Annual O&M Cost: **low:** 0 **high:** $2,000

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: UniScreen
Technology Type: Hydrodynamic Separation

Treatment Notes

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 150 microns was used.
**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
***Testing is not complete for metals; therefore, these values are estimated.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: UniStorm
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 0
high: 15,700

System Footprint (sq. ft.):
20-135

Required Head Loss (ft):
0-0.5

Internal or External Bypass:
NA

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250	ND	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	ND	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA
Median Removal (%):	***20	***27	***40	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $2,000 **high:** $15,000
Estimated Annual O&M Cost: **low:** 0 **high:** $2,000

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: UniStorm
Technology Type: Hydrodynamic Separation

Treatment Notes

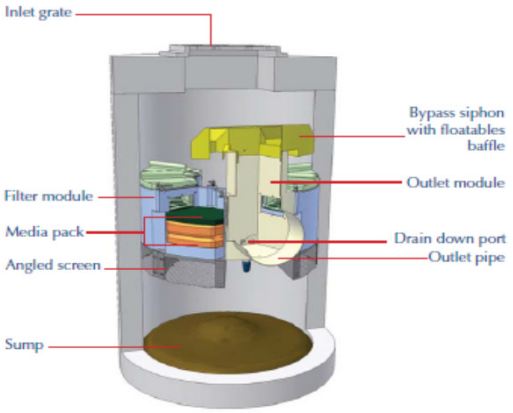
*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 150 microns was used.
**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
***Testing is not complete for metals; therefore, these values are estimated.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Hydro International, Inc.
Name of Technology: Up-Flo™ Filter
Technology Type: Media Filtration(up flow)

Schematic



System Design Information

Design Flow Rate (gpm):
low: 147
high: 448

System Footprint (sq. ft.): 0

Required Head Loss (ft): 1.7-2.5

Internal or External Bypass:

Application

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND							
Median Effluent (mg/L):	ND							
Median Removal (%):	91							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE		PULD			

	50% TSS Removal	80% TSS Removal
NJCAT		X

Other Approvals:

Local Installations

# of Installations in Washington:

Estimated Costs

Estimated Installation Cost: **low:** **high:**
Estimated Annual O&M Cost: **low:** **high:**

Treatment Technology Summary Report

Manufacturer/Vendor: Hydro International, Inc.
Name of Technology: Up-Flo™ Filter
Technology Type: Media Filtration(up flow)

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: UrbanGreen BioFilter
Technology Type: Bioretention/Filtration

Schematic

System Design Information

Design Flow Rate (gpm):
low: 4
high: 600

System Footprint (sq. ft.):

Required Head Loss (ft):
3,6

Internal or External Bypass:
Both available

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: > 25

Estimated Costs

Estimated Installation Cost: **low:** $10k **high:** $250K
Estimated Annual O&M Cost: **low:** $0.0001/gal **high:** $0.0003/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: UrbanGreen BioFilter
Technology Type: Bioretention/Filtration

Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: V2B1 Treatment System
Technology Type: Hydrodynamic Separation

Schematic

System Design Information

Design Flow Rate (gpm):
low: 0
high: 63000

System Footprint (sq. ft.):
20-800

Required Head Loss (ft):
0-0.5

Internal or External Bypass:
Both

Application
Stormwater

Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250	ND	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	ND	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	40	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Number of samples:						
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.05	***0.35	***0.09	NA	NA	NA
Median Removal (%):	***40	***55	***70	NA	NA	NA

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	PULD				

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: 0

Estimated Costs

Estimated Installation Cost: **low:** $2,000 **high:** $15,000
Estimated Annual O&M Cost: **low:** 0 **high:** $2,000

Treatment Technology Summary Report

Manufacturer/Vendor: Environment 21
Name of Technology: V2B1 Treatment System
Technology Type: Hydrodynamic Separation

Treatment Notes

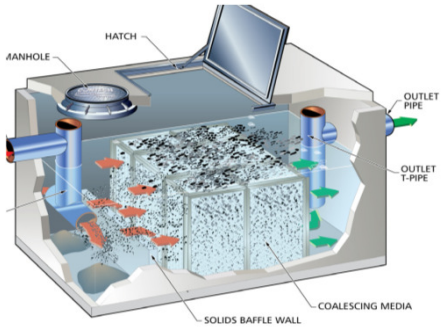
*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 110 microns was used.
**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
***Testing is not complete for metals; therefore, these values are estimated.

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: VortClarex
Technology Type: Oil/Water Separator

Schematic



System Design Information

Design Flow Rate (gpm):
low: 100
high: 2000

System Footprint (sq. ft.):

Required Head Loss (ft): 0.1

Internal or External Bypass: Both available

Application: Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					

	50% TSS Removal	80% TSS Removal
NJCAT		

Other Approvals:

Local Installations

# of Installations in Washington: >25

Estimated Costs

Estimated Installation Cost: **low:** $10K **high:** $300K
Estimated Annual O&M Cost: **low:** $0.00008/gal **high:** $0.001/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: VortClarex
Technology Type: Oil/Water Separator

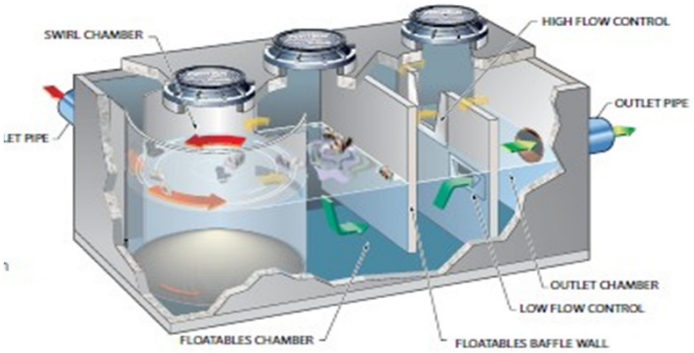
Treatment Notes

Additional Notes

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: Vortechs
Technology Type: Hydrodynamic Separation

Schematic



System Design Information

Design Flow Rate (gpm):
low: 50
high: 22450

System Footprint (sq. ft.):
NA

Required Head Loss (ft):
0.1

Internal or External Bypass:
Both Available

Application
Stormwater

Treatment Performance *

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	108							
Median Effluent (mg/L):	28							
Median Removal (%):	93							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

* blank cells indicate no information was received from vendor

Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	GULD				

	50% TSS Removal	80% TSS Removal
NJCAT	X	

Other Approvals:

Local Installations

# of Installations in Washington: > 100

Estimated Costs

Estimated Installation Cost: **low:** $20K **high:** $500K
Estimated Annual O&M Cost: **low:** $0.000001/gal **high:** $0.00004/gal

Treatment Technology Summary Report

Manufacturer/Vendor: CONTECH Stormwater Solutions, Inc.
Name of Technology: Vortechs
Technology Type: Hydrodynamic Separation

Treatment Notes

The WAWA Route 37 Stormwater Treatment System TARP TIER II Field Evalaution: Vortechs (2010). Field, Peer Reviewed, Composite.

Additional Notes

APPENDIX B

Technology Questionnaire Responses

Appendix B Index (by Treatment System Name)

Appendix B Index (by Treatment System Name)

Appendix B Index (by Manufacturer/Vendor Name)

Appendix B Index (by Manufacturer/Vendor Name)

Active

Manufacturer Technology Report

Manufacturer:	WaterTectonics	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	ACISTBox	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	5	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☑ Filtration (chemically enhanced)	☑ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** $ 25,000	**high:** $ 400,000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	**high:**

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** 100	**high:** >1000
System aboveground footprint (sq ft):	**low:** 200	**high:** >2000
Required head loss (ft):	**low:** N/A	**high:** N/A
Internal or External Bypass:	None - auto recirculation	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Field by operator; in-line real-time with sensors/data loggers for turbidity and pH; in-house and independent party grab/composite sampling; in-house and 3rd party independent analytical laboratory testing.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):		3.12		0.0199			0.00028
Median Effluent (mg/L):		0.38		0.00002			0.00002
Median Removal (%):		88%		99.9%			93%

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	0.341	0.25	2.12			0.817
Median Effluent (mg/L):	0.0179	0.05	1.04			0.744
Median Removal (%):	95%	80%	51%			9%

Notes, Comments, Additional References

Provided under DOE issued GULD as Chitosan-Enhanced Sandfiltration (CESF), a stand alone system. Water Tectonics expands CESF application for removal of LNAPL, NWTPH, cPAH/PAH's, and metals by system modification to include oil/water separation, enhanced pre-treatment, post SF micron filtration, and granular activated carbon and/or other media adsorption. As a stand-alone technology it is designated for turbidity and pH. If raw water turbidity is >600 NTU, pretreatment is required. CESF has limited to no ability to remove turbidity consisting of rock dust, rock flour, or other rock source fines that have not been geochemically weathered over time. Chitosan performance is typically compromised by acidic or alkaline pH conditions out side the neutral range. Performance data presented is from from full-scale use at temporary projects where RSA CESF technology was used in accordance with GULD specifications with modifications for enhanced removal components (e.g., granular activated carbon). Untreated construction water ranging from >25 NTU to > 5000 NTU (with pretreatment if over 600 NTU) have all been reduced to <10 NTU, but typically to <5 NTU. Flow ranges for various conventional system sizes range from 100 to over 1000 gpm for 24/7 continuous operations.

Manufacturer Technology Report

Manufacturer:	BakerCorp	**Contact Name:**	Tim Ferris
Name of Technology:	Baker Tank with Chitosan Enhanced Sand Filtration	**Contact Email:**	tferris@bakercorp.com
# of Installations in Washington:	1	**Contact Phone:**	206-793-6136
		Contact Website:	bakercorp.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☑ Filtration (chemically enhanced)	☑ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost): **low:** _____ **high:** _____

Estimated Annual O&M Cost ($/gallon treated): **low:** _____ **high:** _____

System Hydraulics/Design

Design Flow Rate (gpm): **low:** 15gpm **high:** 1,000gpm+

System aboveground footprint (sq ft): **low:** 1,000sq ft **high:** 2,500sq ft

Required head loss (ft): **low:** _____ **high:** _____

Internal or External Bypass: _____

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	200						
Median Effluent (mg/L):	10						
Median Removal (%):	95						

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	150	500	2500	20	40	400
Median Effluent (mg/L):	75	200	1000	10	20	40
Median Removal (%):	50	40	50	50	50	90

Notes, Comments, Additional References

TSS, total metals, and dissolved metals removal will depend upon the degree that they will absorb to particulate matter. The values provided for these parameters are based upon a study done by Dungeness Environmental during 2009-2010. Dungeness Environmental does not have relevant data for the organics listed in this table. For any questions, please contact Chris Palczewski at Dungeness Environmental: 425-481-0600 or cpalczewski@dungenessenviro.com. Thank you.

Manufacturer Technology Report

Manufacturer:	Clear Creek Systems, Inc.	**Contact Name:**	Jason Ziemer
Name of Technology:	Multiple Technologies	**Contact Email:**	jziemer@clearcreeksystems.com
# of Installations in Washington:	> 15 on the West Coast	**Contact Phone:**	253 670 4054
		Contact Website:	www.clearcreeksystems.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☑ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☑ Filtration (chemically enhanced)	☑ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** 15,000	**high:** >250,000
Estimated Annual O&M Cost ($/gallon treated):	**low:** < 0.001	**high:** > 0.003

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** < 25	**high:** > 2,000
System aboveground footprint (sq ft):	**low:** < 25	**high:** > 2,000
Required head loss (ft):	**low:** NA	**high:** NA
Internal or External Bypass:	External - Offline Facility	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Attached data was collected from grab samples that were analyzed by an accredited laboratory.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Clear Creek Systems, Inc. (CCS) provides a wide variety of water treatment equipment including particulate filtration, mixed media absorption, ion exchange, oil/water seperators, UV, RO, chemical treatment and chemically enhanced sand filtration. Our treatment systems are sized for specific site requirements using the Western Washington Hydrology Model 3. We select the appropriate treatment technology for a specific site by conducting either laboratory or field treatability and pilot testing. For this reason we have included a broad range of flow rates, costs and footprint requirements. We have attached some data and a Power Point presentation that further explains our approach and capabilities. In addition, much more information about CCS can be found at www.clearcreeksystems.com. We have attached some data for your review, but most of our clients have not released us to share the data that has been collected at their sites.

Manufacturer Technology Report

Manufacturer:	Schreiber LLC	**Contact Name:**	William Kunzman
Name of Technology:	Fuzzy Filter	**Contact Email:**	billk@schreiberwater.com
Technology Category:		**Contact Phone:**	205-655-7466
Technology Process:		**Contact Website:**	www.schreiberwater.com
# of Installations in Washington:	0		

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**		**high:**	
Estimated Annual O&M Cost:	**low:**		**high:**	

System Hydraulics

Design Flow Rate (gpm):	**low:**	70	**high:**	unlimited
Required head loss (ft):	3.5			
Internal or External Bypass:	external			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Fuzzy Filter removes suspende solids 4 microns and above. The media is compressible so that pore size can be adjusted thru changes in compressioon of the media via the integral actuator connected to a perforated compression plate. Influent solids should be less than 100 mg/l with many typical applications processing water streams containing 20 mg/l and less. Attached is a particle distribution analysis for removal of suspended solids from river water. Two recent projects under contruction include filtration of contaminated storm water collected within chemical plants. We also have several CSO installations, one of which can process 85 MGD for the city of Atlanta.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):	10								
Median Effluent (mg/L):	2								
% Removal:	70-95%								

Notes, Comments, Additional References

Fuzzy Filter removes suspende solids 4 microns and above. The media is compressible so that pore size can be adjusted thru changes in compressioon of the media via the integral actuator connected to a perforated compression plate. Influent solids should be less than 100 mg/l with many typical applications processing water streams containing 20 mg/l and less. Attached is a particle distribution analysis for removal of suspended solids from river water. Two recent projects under contruction include filtration of contaminated storm water collected within chemical plants. We also have several CSO installations, one of which can process 85 MGD for the city of Atlanta.

Manufacturer Technology Report

Manufacturer:	KASELCO, LLC	**Contact Name:**	Douglas Herber
Name of Technology:	High-Flo Electocoagulation	**Contact Email:**	dherber@kaselco.com
# of Installations in Washington:	0 in WA, 2 in Vancouver	**Contact Phone:**	361-594-3327
		Contact Website:	www.kaselco.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☑ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$25,000	**high:**	$2,200,000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	$0.0005	**high:**	$0.01

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	2.5	**high:**	1,200+	Can link systems in parallel for
System aboveground footprint (sq ft):	**low:**	40	**high:**	4000	larger capacity
Required head loss (ft):	**low:**	2	**high:**	20	
Internal or External Bypass:	External				

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

System Performance has been evaluated in lab as well as in field research applications and existing installations. Grab samples are analyzed both internally as well as by a third party lab.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Have attached actual test result parameters. We are currently in the process of having detailed third party test evaluations and will supply those results as available.

Manufacturer Technology Report

Manufacturer:	OilTrap Environmental Prd.	**Contact Name:**	Mike Davis
Name of Technology:	OilTrap ElectroPulse	**Contact Email:**	mike@oiltrap.com
# of Installations in Washington:	33	**Contact Phone:**	360.943.6495
		Contact Website:	www.oiltrap.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☐ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☑ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	25,000	**high:**	500000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	$0.002	**high:**	0.005

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	5	**high:**	500
System aboveground footprint (sq ft):	**low:**	40	**high:**	1500
Required head loss (ft):	**low:**	5	**high:**	15
Internal or External Bypass:	either			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Samples were collected as routine grab samples and tested by an EPA certified laboratory.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	600	78	136	28	Unknown	Unknown	Unknown
Median Effluent (mg/L):	10	0.27	<5.0	0.43	Unknown	Unknown	Unknown
Median Removal (%):	98.3	99.6	>96.3	98.4	Unknown	Unknown	Unknown

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	12.1	14.1	151	8.2	10.9	78.6
Median Effluent (mg/L):	0.072	0.039	0.34	0.072	0.039	0.34
Median Removal (%):	99.4	99.7	99.9	99.1	99.6	99.9

Notes, Comments, Additional References

I have not worked with wastewater with PCB or dioxins. We generally see 90%+ in reduction of pesticides also.

Manufacturer Technology Report

Manufacturer:	WaterTectonics	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	pHATBox	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	40 +	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☑ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** $ 19,500	**high:** $ 28,500
Estimated Annual O&M Cost ($/gallon treated):	**low:** (a)	**high:** (a)

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** 250	**high:** 350
System aboveground footprint (sq ft):	**low:** 10 (b)	**high:** 24 (b)
Required head loss (ft):	**low:** N/A	**high:** N/A
Internal or External Bypass:	N/A	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Field. Real-time with in-line probes. 2-point buffer calibration.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)	(c)
Median Effluent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)	(c)
Median Removal (%):	(c)	(c)	(c)	(c)	(c)	(c)	(c)

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)
Median Effluent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)
Median Removal (%):	(c)	(c)	(c)	(c)	(c)	(c)

Notes, Comments, Additional References

(a) Depends on buffering capacity of waterstream, flow rate, total volume processed, specific pH adjustment additive selected, and final pH point required.
(b) Packaged in 4' -6' (w) x 2.5' (d) x 4' (t) industrial steel box w/hinged top opening lid. Additional storage space for addtive will depend on volume of additive storage (up to 35-gal drums in box, larger must go external) - plus secondary containment). Unit has in-line pH probe for real time monitoring and data logger expandable for dual pH adjustment (multi injection/mixing loops), and flow recording. pH set-point(s) programmable into controller.
(c) Adjusts pH. System performance data - not applicable.

Additional Notes:
-Effective for controlling alkaline waters from cement/concrete operations using carbon dioxide.
-Suitable for inclusion as pH adustment component in variety of water treatment systems.
-pH set-points (high/low) variable for application.

Manufacturer Technology Report

Manufacturer:	StormwateRx LLC	**Contact Name:**	Ayn Generes
Name of Technology:	Purus Polishing System	**Contact Email:**	ayng@stormwaterx.com
# of Installations in Washington:	YES	**Contact Phone:**	800.680.3543
		Contact Website:	www.stormwaterx.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	10000	**high:**	140000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.0024	**high:**	0.0047

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	5	**high:**	210
System aboveground footprint (sq ft):	**low:**	10	**high:**	90
Required head loss (ft):	**low:**	70	**high:**	120
Internal or External Bypass:	External			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):		YES		YES	YES		YES

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):			0.28			.060
Median Effluent (mg/L):			0.083			0.0074
Median Removal (%):			86			88

Notes, Comments, Additional References

Additional pollutant removal includes bacteria (>99%), PCBs, PAHs and toxic organics.

Manufacturer Technology Report

Manufacturer:	Morselt Borne BV	**Contact Name:**	Harry Assink
Name of Technology:	Redbox	**Contact Email:**	info@morselt.com
Technology Category:		**Contact Phone:**	31742661166
Technology Process:		**Contact Website:**	www.morselt.com
# of Installations in Washington:			

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☐ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☑ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$42,000	**high:**	$1,000,000
Estimated Annual O&M Cost:	**low:**	$1,000	**high:**	$20,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	0.5	**high:**	150
Required head loss (ft):	n.a.			
Internal or External Bypass:	n.a.			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Third part analysis has been performed in many cases. Results show very high removal rates, especially for heavy metals.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:	99		99	99	99	99			

Notes, Comments, Additional References

The RedBox purifies industrial wastewater for many industries such as plating, paper, printing, paint manufacturing.

Manufacturer Technology Report

Manufacturer:	Siemens	**Contact Name:**	Adam Szczesniak
Name of Technology:	WWIX	**Contact Email:**	adam.szczesniak@siemens.com
Technology Category:		**Contact Phone:**	860-593-2063
Technology Process:	Regulated Metals Removal	**Contact Website:**	siemens.com/water
# of Installations in Washington:	>500		

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☑ Reverse osmosis	☑ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☑ Filtration (chemically enhanced)	☑ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	3,000	**high:**	250,000
Estimated Annual O&M Cost:	**low:**	3,000	**high:**	500,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	1gpm	**high:**	5000gpm
Required head loss (ft):	20psi			
Internal or External Bypass:	None			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Siemens manufactures an extensive line of water treatment equipment from mobile clarification, precipitation, membrane technologies and ion excahnge or adsorptive systems. For stormwater treatment systems Siemens has media tailored to achieve low discharge levels as low as 1ppb and 12ppt for mercury. Siemens systems are typically sampled by customer and checked with on site test kits or samples shipped to local certified laboratories for evaluation.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	WaterTectonics	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	Wavelonics	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	35+	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☑ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	60000	**high:**	850000
Estimated Annual O&M Cost:	**low:**	0.0008	**high:**	0.008

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	50	**high:**	>1000
System footprint (sq ft):	**low:**	200	**high:**	>4000
Required head loss (ft):	**low:**	NA	**high:**	NA
Internal or External Bypass:	NONE-auto recirculation for retreat			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field via hand-held instruments, Technology's in-line and real-time water quality monitoring system, Oversight Engineers/Project Owners, 3rd party analytical testing laboratories using both instantaneous grab and composting methods (manual and automated). System performance "Median" data presented below does not accommodate analytical data results for parameters report as ND (<MDL's, or <MCL's). All ND data was utilized in the calculations as the value of the MDL or MCL. Influent data is limited in that our Clients typically do not incur cost expenditure to evaluate raw water characteristics once the system has been designed, installed, and made operational. They focus on monitoring effluent quality. Further, effluent data generated by our Clients/System Owners do not typically provide us with DMR's they submit to Ecology or other regulatory agencies. Effluent data points do not reflect technology ability to achieve lower than reported results. Permit discharge limitations have historically varied from site to site, permit to permit , and therefore data reflect treatment efforts and not technology limitations.

	NTU's	TSS	TPH0	O&G	SVOCs	PCBs	Dioxins
Median Influent (mg/L):	830	200	45.6	197	2.34	0.0024	
Median Effluent (mg/L):	0.4	5	0.25	4.76	0.00002	0.00011	
Median Removal (%):	100	98	99	98	100	9505	

	Total Metals			Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	CPAHs
Median Influent (mg/L):	4.8	0.253	0.516	0.0235	0.0157	0.12	0.081
Median Effluent (mg/L):	0.0074	0.003	0.0315	0.005	0.0031	0.02	0.00002
Median Removal (%):	100	99	94	79	80	83	99.98

Notes, Comments, Additional References

Wavelonics electrocoagulation (EC) technology can be stand-alone, or part of a treatment train with supplemental components (see Treatment Type/Application, above) utilized for pre-treatment and/or polishing. EC facilitates the coagulation of suspended solids fines and/or dissolved species that are suitable for removal by conventional precipitation settling and/or filtration process steps. EC reactions will depend on the nature of constituents present, their reaction chemistry, pH sensitivity, and water conductivity. Bacteria disinfection has been demonstrated at laboratory and full-scale applications. Technology viability and optimization is recommended for non-conventional constituents of concern, or for complex matrices where interferences and competing conditions are problematic to conventional advanced treatment processes. Although a technology for application to a broad-spectrum of constituents, EC does not rely on treatment chemicals (e.g. polymers), it generates low solids volumes, is full-automated to reduce O&M labor, and cost-effectively converts AC power to DC. Power consumption is driven primarily by demand and loads of pumps, common to any mechanical water conveyance system plus optional control area HVAC. System Performance data fields (above) call for "Median" data points that do not allow for presentation of worst-case conditions, nor do they adequately reflect "mean" conditions, both of which are more elevated than the "Median" data presented for influent characteristics. Effluent "median" data do not reflect <MDL or <MCL data as reported by laboratories. However, ND results utilized in the calculation were the numeric value of the actual MDL or MCL. SVOC and cPAH data reflect a summation of all individual constituents in SVOC or cPAH parameter suites as totals. PCB's are totals of all Arochlor congeners. Oil and Grease data reflect both Freon and Hexane extraction analytical methods. Technology has not been used to specifically remove Dioxins and when technology was utilized, Dioxins were not targeted for analytical testing. Other data available upon request for: bacteria; other heavy metals; color from humics, etc.

Manufacturer Technology Report

Manufacturer:	Waste & Environmental Technologies Ltd.	**Contact Name:**	Dr. Alvin Ip
Name of Technology:	WetSep	**Contact Email:**	alvin@wastech.com.hk
Technology Category:	Above Ground Vault	**Contact Phone:**	(852) 2602-0308
Technology Process:	Water Treatment	**Contact Website:**	www.wastech.com.hk

# of Installations in Washington: 1

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☑ Filtration (chemically enhanced)	☑ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost: **low:** $1000 **high:** $2500

Estimated Annual O&M Cost: **low:** $100/day **high:** $250/day

System Hydraulics

Design Flow Rate (gpm): **low:** 20 **high:** 260

Required head loss (ft): 40 feet

Internal or External Bypass: External Bypass

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

The data can be stored and downloaded from data logger for flowrate, pH and Turbidity. Grab samples can also be taken at various points in the system to be varified by a third party (i.e. laboratory).
Please also find the Field Study for the WetSep filtration System

Parameter:	**SS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):	112	13.4	7 µg/L		0.3 µg/L	18 µg/L			
Median Effluent (mg/L):	<2	1.9	1 µg/L		<0.2 µg/L	<1 µg/L			
% Removal:	98%	86%	86%		50%	94%			

Notes, Comments, Additional References

The WetSep system was used in the State of Washington at the Canada/US border crossing. The main Contractor for this job was JE Dunn Construction. The main use of the unit was for treatment of construction waste runoff.

Passive

Manufacturer Technology Report

Manufacturer:	Eco-Tec, Inc	**Contact Name:**	Herb Pearse
Name of Technology:	ADsorb-it	**Contact Email:**	herb@eco-tec-inc.com
# of Installations in Washington:	61	**Contact Phone:**	253-884-6804
		Contact Website:	www.eco-tec-inc.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$0.91/SF	**high:**	$0.91/SF
Estimated Annual O&M Cost ($/gallon treated):	**low:**	$0.91/SF	**high:**	$0.91/SF

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	80/SF	**high:**	100/SF
System aboveground footprint (sq ft):	**low:**	Varies	**high:**	Varies
Required head loss (ft):	**low:**	NA	**high:**	NA
Internal or External Bypass:	Per individual application			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

A variety of sampling methods have been implemented over the years based on specific installations of the ADsorb-it Filtration Fabric and associated application specific product configurations manufactured from the ADsorb-it Fabric. ADsorb-it is designed to be versatile in its installation for diverse filtration applications, thus it can be configured for Downspout, Drain Inlet Inset, Below Ground Vault, Above Ground Vault, Shoreline, Oil Water Separator, and General Stormwater applications. ADsorb-it is approved by the Department of Ecology (Ecology) for use as a Catch Basin Insert and is used by Ecology for spill response and general oil/water related issues.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	Varies	Varies	Varies				
Median Effluent (mg/L):	Varies	Varies	Varies				
Median Removal (%):	80-99	99-100	99-100				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):	Varies	Varies	Varies	Varies	Varies	Varies

Notes, Comments, Additional References

Please see the attached report from the City of Tacoma as well as the VMS Full Scale and Field Tests for TSS removal. The 'filter blanket" referred to in the City of Tacoma Report is the ADsorb-it Fabric Product #EDB24-5, Contour Ditch Boom. Attached to this email is additional testing / application data and photographs to present a general spectrum of possible applications. As can be seen on our web site at www.eco-tec-inc.com, miles of ADsorb-it Fabric were deployed along the Gulf Coast Shoreline as an Oil Fence to provide effective removal of advancing oils from the BP Deepwater Horizon Release. Additional testing data can be accessed on our web site simply by clicking on "Test Data" in the left hand column. As a note, ADsorb-it is highly effective at removing hydrocarbons, including fats, oils and greases (FOG) from water, thus any other contaminants that would be attached to the hydrocarbon such as PCBs would be removed in conjuncton with hydrocarbon / FOG removal. ADsorb-it is an environmentally compatible product in that it is: Made from waste fibers from the textile manufacturing industry, it effectively removes hydrocarbons and associated / attached contaminants from the environment, it can be cleaned and reused indefinitely, it can be disposed of as a fuel source with a higher BTU per pound value than coal and less than 1% residual ash.

Manufacturer Technology Report

Manufacturer:	AquaShield, Inc.	**Contact Name:**	Mark Miller
Name of Technology:	Aqua-Filter	**Contact Email:**	mmiller@aquashieldinc.com
Technology Category:	Below Ground Vault	**Contact Phone:**	888-344-9044
Technology Process:	Vortex + Filtration	**Contact Website:**	www.aquashieldinc.com

# of Installations in Washington: 13

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☑ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	Site-specific	**high:**	Site-specific
Estimated Annual O&M Cost:	**low:**	Site-specific	**high:**	Site-specific

System Hydraulics

Design Flow Rate (gpm):	**low:**	25	**high:**	960+
Required head loss (ft):	0.8			
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Independent lab by grab samples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	160								
Median Influent (mg/L):	43								
Median Effluent (mg/L):	5								
% Removal:	80								

Notes, Comments, Additional References

Aqua-Filter filtration cartridge has been verified by NJCAT. AF--5.3 model is currently undergoing independent TARP Tier II field testing in Maryland averaging 96% TSS removal. Anticipate completion in 2012. AF-4.2 model field tested at Univeristy of New Hampshire Stormwater Center, 80% TSS removal efficiency (see above parameters).

Manufacturer Technology Report

Manufacturer:	AquaShield, Inc.	**Contact Name:**	Mark Miller
Name of Technology:	Aqua-Guardian	**Contact Email:**	mmiller@aquashieldinc.com
Technology Category:	Drain Inlet Insert	**Contact Phone:**	888-344-9044
Technology Process:	Filtration	**Contact Website:**	www.aquashieldinc.com

# of Installations in Washington: 15

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process wate

Estimated Costs

Estimated Installation Cost:	**low:**	Site-specific	**high:**	Site-specific
Estimated Annual O&M Cost:	**low:**	Site-specific	**high:**	Site-specific

System Hydraulics

Design Flow Rate (gpm):	**low:**	5/400*	**high:**	100/940*
Required head loss (ft):	0			
Internal or External Bypass:	Both			

* x/x = flow thru perlite/flow thru perlite + filter cloth

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

See Aqua-Filter, since this device uses same media. Independent lab by grab samples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	160								
Median Influent (mg/L):	43								
Median Effluent (mg/L):	5								
% Removal:	80								

Notes, Comments, Additional References

See Aqua-Filter since this device uses same filter media. Aqua-Filter filtration cartridge has been verified by NJCAT. AF-5.3 model is currently undergoing independent TARP Tier II field testing in Maryland averaging 96% TSS removal. Anticipate completion in 2012. AF-4.2 model field tested at Univeristy of New Hampshire Stormwater Center, 80% TSS removal efficiency (see above parameters).

Manufacturer Technology Report

Manufacturer:	AquaShield, Inc.	**Contact Name:**	Mark Miller
Name of Technology:	Aqua-Swirl	**Contact Email:**	mmiller@aquashieldinc.com
Technology Category:	Below Ground Vault	**Contact Phone:**	888-344-9044
Technology Process:	Hydrodynamic Sep.	**Contact Website:**	www.aquashieldinc.com

# of Installations in Washington: 82

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	Site-specific	**high:**	Site-specific
Estimated Annual O&M Cost:	**low:**	Site-specific	**high:**	Site-specific

System Hydraulics

Design Flow Rate (gpm):	**low:**	100	**high:**	2600
Required head loss (ft):	0.25			
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab tested by Tennessee Tech University using autosamplers. Field by auto-composite sampling, 6 sample pairs per TARP.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	192								
Median Influent (mg/L):	137								
Median Effluent (mg/L):	12								
% Removal:	86								

Notes, Comments, Additional References

Independent field testing underway per TARP Tier II in Maryland, anticipate completion in 2011. 16 storms and 14 inches of rain sampled to date. Sample parameters above are for field test. Lab testing verified by NJCAT.

Manufacturer Technology Report

Manufacturer:	StormwateRx LLC	**Contact Name:**	Ayn Generes
Name of Technology:	Aquip Enhanced Filtration Sys.	**Contact Email:**	ayng@stormwaterx.com
# of Installations in Washington:	30	**Contact Phone:**	800.680.3543
		Contact Website:	www.stormwaterx.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	5000	**high:**	150000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.0003	**high:**	0.003

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	10	**high:**	350
System aboveground footprint (sq ft):	**low:**	14	**high:**	320
Required head loss (ft):	**low:**	4	**high:**	7
Internal or External Bypass:	External			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	30		9.9				
Median Effluent (mg/L):	3.39		3				
Median Removal (%):	83	YES	70	YES	YES		YES

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	0.152	0.03	0.425	0.084	0.008	0.196
Median Effluent (mg/L):	0.008	0.006	0.061	0.006	0.007	0.06
Median Removal (%):	94	79	85	93	51	73

Notes, Comments, Additional References

Non-detects were assumed to have the value of one half the detection limit.

Aquip removes PCBs, PAHs and other toxic organics through particle filtration and absorption to one of the filtration media in the bed. VOC and SVOC removal is through absorption and biological degradation.

The Aquip is a secondary defense against oil and grease and removes TPH and soluble oils through biodegredataion, absorption and bio-mechanical means.

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Curb Inlet Basket	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	445	**high:**	1,600
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 0.20	**high:**	$ 0.40

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	381	**high:**	898
System aboveground footprint (sq ft):	**low:**	0	**high:**	0
Required head loss (ft):	**low:**	0.5	**high:**	2
Internal or External Bypass:	External - Installed in Catch Basin - Does Not Affect Basin Hydraulics			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Curb Inlet Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.
--Univerisity of Southern California Independent Field Testing (Turbidity in NTUs)
--Suspended Solids Retention Testing Full Scale Lab Testing

University of Southern California

	Turbidity	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	42	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	12.75	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	70	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	24.3	not tested	not tested	not tested	85.8
Median Effluent (mg/L):	not tested	not tested	10.4	not tested	not tested	not tested	73.4
Median Removal (%):	not tested	not tested	79	not tested	not tested	not tested	14

Suspended Solids Retention Test

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	93*	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

Notes, Comments, Additional References

*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing. The Bio Clean Curb Inlet Basket is available with the patented Easy Maintenance Shelf System which reduces maintenance time and slows down water velocity for added settling and pollutant removal. To see this system in action visit: http://www.biocleanenvironmental.com/product/video/?path=content/product/curb_inlet_baskets/Curb_Inlet_Basket-Product_Video.flv&w=768&h=576

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Downspout Filter	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	17 Port of Olympia (Upcoming 2011)	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	1,035	**high:**	1,200
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 0.16	**high:**	$ 0.22

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	249	**high:**	1,145
System aboveground footprint (sq ft):	**low:**	.31 (cu ft)	**high:**	1.57 (cu ft)
Required head loss (ft):	**low:**	1	**high:**	2
Internal or External Bypass:	Internal Bypass - High Flow Unimpeded - UPC Approved and Tested			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by IAMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.
--Full Scale Laboratory Testing D-Tek Analytical --X-Tex-Z-200 Testing for Metals - From Xextex Corporation, USA

Full Scale Laboratory Testing

	TSS	Turbidity (Sil-Co-Sil 106)	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	n/a	429	223.5	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	n/a	251	29.5	not tested	not tested	not tested	not tested
Median Removal (%):	93*	41	87	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

X-TEX FABRIC TESTING - For Metals Removal

	TSS	Turbidity (Sil-Co-Sil 106)	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not kwonw	not kwonw	not kwonw	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not kwonw	not kwonw	not kwonw	not tested	not tested	not tested	not tested
Median Removal (%):	76	96	69	not tested	not tested	not tested	not tested

Notes, Comments, Additional References

*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to downspout sizes 4" to 12".

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Flume Filter	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	660	**high:**	1,302
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate	**low:**	$ 0.23	**high:**	$ 0.74

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	116	**high:**	583
System aboveground footprint (sq ft):	**low:**	1	**high:**	6
Required head loss (ft):	**low:**	0.083	**high:**	0.5

Internal or External Bypass: Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Bio Clean Flume Filter has been tested indepedently in a full scale laboratory setting.. A series of 5 composite influent and effluent samples were collcted over a period of two days. The Flume Filter Tested utilized a series of three BioSorb Hydrocarbon Booms.
--Full Scale Laboratory Testing D-Tek Analytical

Full Scale Laboratory Testing

	TSS (Sil-Co-Sil 106)	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	73	223	360	NA	NA	NA	NA
Median Effluent (mg/L):	51.6	29.5	62	NA	NA	NA	NA
Median Removal (%):	29	87	83	NA	NA	NA	NA

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	17	NA	NA	NA	NA	NA

Notes, Comments, Additional References

The Bio Clean Flume Filter comes standard with BioSorb Hydrocarbon booms. The filter is designed to utilize varoius media based upon pollutants of concern. The Flume Filter is designed to be used in unique conditions in which sheet flow needs to be treated and no fall is available for other types of technologies.

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Grate Inlet Skimmer Box	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA, 123 OR	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	635	**high:**	1,800
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 0.15	**high:**	$ 0.40

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	224	**high:**	8,980
System aboveground footprint (sq ft):	**low:**	0	**high:**	0
Required head loss (ft):	**low:**	0.5	**high:**	2
Internal or External Bypass:	Internal - High Flow Rate			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Grate Inlet Skimmer Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.

--Suspended Solids Retention Testing Full Scale Lab Testing

--Longo Toyota - Independent Field Testing

--Reedy Creek Improvement District Independent Field Testing

--UC Irvine Independent Testing

--Whitman's Pond

--Creech Engineering

Longo Toyota - Independent Field Testing

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not tested	not tested	189	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	10.43	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	95	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	1.9	1.5	13.7	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	0.1	0.2	0.73	not tested	not tested	not tested	not tested
Median Removal (%):	95	87	95	not tested	not tested	not tested	not tested

Suspended Solids Retention Test

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	86*	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

Reedy Creek Improvement District

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Removal (%):	74	not tested	54	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not known
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not known
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	57

UC Irvine

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Removal (%):	53	not tested	90	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not known	not known	not known	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not known	not known	not known	not tested	not tested	not tested	not tested
Median Removal (%):	7	98	11	not tested	not tested	not tested	not tested

Whitman's Pond

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	978	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	329	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	66	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	18.6
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	0.452
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	98

Creech Engineering

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not known	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not known	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	73	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not known
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not known
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	79

Notes, Comments, Additional References

*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing. The Bio Clean Grate Inlet Skimmer Basket is backed by a 5 year unlimited warranty. It's the only catch basin filter to utilize multiple levels of screens to maxmize performance and treatment flow rate. The product is manufactured from marine grade fiberglass and stainless steel. It contains no cheap net, plastics or fabrics which can rip, tare and break under field conditions. For more information visit: http://www.biocleanenvironmental.com/product/grate_inlet_skimmer_box

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Trench Drain Filter	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	660	**high:**	1,302
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 0.23	**high:**	$ 0.74

System Hydraulics/Design

Design Flow Rate (gpm) Per Linear Foot:	**low:**	28	**high:**	86
System aboveground footprint (sq ft):	**low:**	0	**high:**	0
Required head loss (ft):	**low:**	4	**high:**	12

Internal or External Bypass: Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

No testing has been done on the trench drain filter.

Full Scale Laboratory Testing

	TSS (Sil-Co-Sil 106)	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**	**TP**
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

Notes, Comments, Additional References

The Bio Clean Trench Drain Filter comes standard with BioSorb Hydrocarbon booms or can use BioMediaGREEN. The filter is designed to utilize varoius media based upon pollutants of concern. The Trench Drain Filter can be used in various size trench drains.

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Bio Clean Water Polisher - Up Flow Filter	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	25,000	**high:**	125,000
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 5.24	**high:**	$ 7.85

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	191	**high:**	528
System aboveground footprint (sq ft):	**low:**	0	**high:**	0
Required head loss (ft):	**low:**	1	**high:**	2
Internal or External Bypass:	Internal Bypass - High Flow Unimpeded			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Bio Clean Water Polisher is a unique upflow media filter designed as a stand alone treatment unit or incorporated with the Nutrient Separating Baffle Box to form a complete treatment train. The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. The BioMediaGREEN has been independently tested in full scale labaratory testing. Media surface loading rate during the testing averaged 2-5 gpm with minimal head. A series of 8 composite influent and effluent grab samples we collected over a perioud of two days.
--BioMediaGREEN Performance Testing by Waves Environmental - Independent Full Scale Lab Testing

Full Scale Laboratory Testing

	TSS (Sil-Co-Sil 106)	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	84.6	1.4	69.8	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	12.4	0	6.5	not tested	not tested	not tested	not tested
Median Removal (%):	85	>99	91	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	0.57	0.38	0.75	2.07
Median Effluent (mg/L):	not tested	not tested	not tested	0.12	0.01	0.16	0.63
Median Removal (%):	not tested	not tested	not tested	79	98	78	70

Notes, Comments, Additional References

The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. This material is made of billions of small fibers formed into solid blocks. The media composition consists of various oxides to allow for ion exchange and precipitation of dissolved pollutants. The physical structure of the media provides high peformance for the entrapment of particulate pollutants. The media has 80% void space which allows for double the hydraulic retention time when compared to granular media which leads to better overall performance. Another result of the void space is a high hydraulic conductivity. The media surface area loading rate for the media is approximately 7 gpm/sq ft surface area at a head pressure of 18".

Manufacturer Technology Report

Manufacturer:	Bio-Microbics, Inc.	**Contact Name:**	Lucas Staus
Name of Technology:	BioSTORM	**Contact Email:**	sales@biomicrobics.com
# of Installations in Washington:	0	**Contact Phone:**	800-753-3278
		Contact Website:	www.biomicrobics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	500	**high:**	2000
Estimated Annual O&M Cost:	**low:**	400	**high:**	4000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	225	**high:**	4800
System footprint (sq ft):	**low:**	45	**high:**	162
Required head loss (ft):	**low:**	0.5	**high:**	0.17
Internal or External Bypass:	external			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

TSS results are from grab samples done in a lab setting. Unit was tested from 50% of design flow up to 125%. Numbers reported below are at 100% of design flow.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	227						
Median Effluent (mg/L):	7.9						
Median Removal (%):	95.3						

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Installation costs and O&M costs are estimates for the Washington area and do not include equipment or tank costs. Drawings and further information on the product can be obtained on our website at the following url: http://biomicrobics.com/?p=77

Manufacturer Technology Report

Manufacturer:	CONTECH Construction Products,	**Contact Name:**	Sean Darcy
Name of Technology:	CDS	**Contact Email:**	darcys@contech-cpi.cc
# of Installations in Washington:	> 250	**Contact Phone:**	503-258-3105
		Contact Website:	contech-cpi.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$10K	**high:**	$2.5M
Estimated Annual O&M Cost ($/gallon treated):	**low:**	$0.00001	**high:**	$0.00001

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	20	**high:**	44900
System aboveground footprint (sq ft):	**low:**	NA	**high:**	NA
Required head loss (ft):	**low:**	0.1	**high:**	
Internal or External Bypass:	Both Available			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Manasquan Savings Bank Stormwater Treatment System Field Evalutaion: CDS Unit (2010). Field, Peer-Reviewed, Composite.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	SSC<50 um
Median Influent (mg/L):	154		22					35
Median Effluent (mg/L):	26		5					9
Median Removal (%):	95		64					65

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Oil & Grease laboratory data using sorbents at flow rates of 25,50, and 75% of design.

Manufacturer Technology Report

Manufacturer:	StormwateRx LLC	**Contact Name:**	Ayn Generes
Name of Technology:	Clara Gravity Stormwater Separator	**Contact Email:**	ayng@stormwaterx.com
# of Installations in Washington:	2	**Contact Phone:**	800.680.3543
		Contact Website:	www.stormwaterx.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	20000	**high:**	52000
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.0005	**high:**	0.001

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	5	**high:**	1120
System aboveground footprint (sq ft):	**low:**	0	**high:**	150
Required head loss (ft):	**low:**	0.5	**high:**	1.5
Internal or External Bypass:	Internal			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection limit.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	284.5						
Median Effluent (mg/L):	173.5						
Median Removal (%):	47.0	YES	YES				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	0.516	0.088	2.82			
Median Effluent (mg/L):	0.078	0.072	1.21			
Median Removal (%):	29.5	25.8	32.0			

Notes, Comments, Additional References

The Clara uses four pre-engineered chambers with an internal high-flow bypass to trap pollutants such as heavy solids and oil and grease.

Manufacturer Technology Report

Manufacturer:	Coanda, Inc.	**Contact Name:**	Steve Esmond
Name of Technology:	Coanda Effect	**Contact Email:**	sesmond@coanda.com
# of Installations in Washington:	A handful of private downspouts and area drains.	**Contact Phone:**	(714) 272-1997
		Contact Website:	http://www.coanda.com/

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:** $2,000	**high:** $3,500		
Estimated Annual O&M Cost:	**low:** $-0-	**high:** $-0-	No installation has required maintenance to date	

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** 50	**high:** 360,000	
System footprint (sq ft):	**low:** 2	**high:** 2,000	
Required head loss (ft):	**low:** 1.5	**high:** 3	
Internal or External Bypass:	Optional internal bypass is provided.		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

USC (University of Southern California) obtained trash from Los Angeles Sanitation Services and United Stormwater. The Coanda BMP was filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the street. The water then entered the BMP at approximately 635 gallons per minute (gpm). The BMP was evaluated for pollutant removal potential by collecting water quality samples before it reached the BMP and then from under the BMP at different time intervals. The samples were evaluated by USC using chemical analysis to determine the water quality.

	TS	COD	TOC	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	1500	1262	1137				
Median Effluent (mg/L):	1376	1081	996				
Median Removal (%):	8%	14%	12%				

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			48			
Median Effluent (mg/L):			15			
Median Removal (%):			69%			

Notes, Comments, Additional References

A summary of the USC report can be found at: http://www.coanda.com/products/documents/usc_research_project.pdf.

Other case studies have been performed, demonstrating removal of trash, nutrients, metals, pesticides, and bacteria:
http://www.coanda.com/products/documents/Rowlett_Case_Study_I.pdf

Manufacturer Technology Report

Manufacturer:	Hydro International	**Contact Name:**	Fred Kraekel
Name of Technology:	Downstream Defender®	**Contact Email:**	fkraekel@hil-tech.com
Technology Category:	Below Ground Vault	**Contact Phone:**	207-321-3733
Technology Process:	Filter	**Contact Website:**	www.hydro-international.biz

# of Installations in Washington: _____

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

System Hydraulics

Design Flow Rate (gpm): **low:** _____ **high:** _____
Required head loss (ft): _____
Internal or External Bypass: _____

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Contact Hydro International for details.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator that is specifically designed to provide high removal efficiencies of urban runoff pollutants over a wide range of flow rates. It is commonly used in stormwater applications as either pretreatment or as a stand-alone treatment system. The unique flow-modifying internal components distinguish the Downstream Defender from simple swirl-type devices and conventional oil/grit separators by minimizing turbulence and head losses, enhancing separation, and preventing washout of previously stored pollutants. The high removal efficiencies and inherent low head losses of the Downstream Defender allow for a small footprint, making it a compact and economical solution for non-point source pollution. Contact Hydro International at 1-800-848-2706 or visit the website www. hydro-international.biz for more information.

Manufacturer Technology Report

Manufacturer:	Royal Environmental Systems	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	ecoLine A	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	6	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** $ 6,700	**high:** $ 44,250
Estimated Annual O&M Cost ($/gallon treated):	**low:** (a)	**high:** (a)

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** 25	**high:** 626
System aboveground footprint (sq ft):	**low:** 12	**high:** 70
Required head loss (ft):	**low:** 6.00" with clean coalescer	
Internal or External Bypass:	Site specific design required	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

CEN EN 858-1 Test Method for Class I Coalescing Separator
Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3* (Solubility of light liquid nil, unsaponifiable)
Water: Potable or purified surface water
Water turn over: Minimum four volumes of test units
Liquid flux: 25-40 m^3/m^2-h (10-15 gpm/ft^2)
Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)	(b)

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)

Notes, Comments, Additional References

(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.

(b) Report Form's System performance data fields are not applicable. Product removes free-phase fluids such as floating oil and other petroleum hydrocarbon products (LNAPL - Light Non-Aqueous Phase Liquids).

Manufacturer Technology Report

Manufacturer:	Royal Environmental Systems	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	ecoLine B	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	7	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$ 8,200	**high:**	$ 81,900
Estimated Annual O&M Cost ($/gallon treated):	**low:**	(a)	**high:**	(a)

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	50	**high:**	1110
System aboveground footprint (sq ft):	**low:**	N/A	**high:**	N/A
Required head loss (ft):	**low:**	6.00" with clean coalescer	**high:**	N/A
Internal or External Bypass:	Site specific design required			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

CEN EN 858-1 Test Method for Class I Coalescing Separator
Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3* (Solubility of light liquid nil, unsaponifiable)
Water: Potable or purified surface water
Water turn over: Minimum four volumes of test units
Liquid flux: 25-40 m^3/m^2-h (10-15 gpm/ft^2)
Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)	(b)

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)

Notes, Comments, Additional References

(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.

(b) Report Form's System performance data fields are not applicable. Product removes free-phase fluids such as floating oil and other petroleum hydrocarbon products (LNAPL - Light Non-Aqueous Phase Liquids).

Manufacturer Technology Report

Manufacturer:	EcoSense International Inc.	**Contact Name:**	Randy Burden
Name of Technology:	EcoSense Stormwater Filtration systems, Catc	**Contact Email:**	randy.burden@ecosenseint.com
Technology Category:		**Contact Phone:**	321-449-0324 / 321-5
Technology Process:	Oil/ Grease / sediment / debris removal	**Contact Website:**	www.ecosenseint.com
# of Installations in Washington:	0		

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$400.00	**high:**	$2,000
Estimated Annual O&M Cost:	**low:**	$100.00	**high:**	$500.00

System Hydraulics

Design Flow Rate (gpm):	**low:**	25	**high:**	1662*
Required head loss (ft):	Varies*			
Internal or External Bypass:	Internal, Hooded			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Third party Lab and simulated field studies have been done in US, Italy, New Zealand and Canada on filters loaded with Melt Blown Polypropylene only. One study performed Grab samples on canisters loaded with surfactant modified zeolite and impregnated polyester pads. Results will be included with this submittal.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

EcoSense offers two media types for canister filters, but other media may be easily loaded. The system incorporates media filter canisters for low flows and "clean pass" hooded over-flows pipes. Multiple filters and over-flows may be installed depending on space available. Hooded over-flow effectively prevent floatables from bypassing canister filters. Debris, sediment, oils and grease (and contaminant associated) are effectively captured by the system. Debris collection baskets are also available especially designed to remove organic debris and trash. These systems are modular so that depending on catch basin sizes multiple baskets or filters or both may be installed.

Manufacturer Technology Report

Manufacturer:	Royal Environmental Systems	**Contact Name:**	Jim Mothersbaugh
Name of Technology:	ecoStorm & ecoStorm Plus	**Contact Email:**	jim@watertectonics.com
# of Installations in Washington:	9	**Contact Phone:**	866-402-2298
		Contact Website:	www.watertectonics.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☑ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** 8900 (a)	**high:** 37500 (a)
Estimated Annual O&M Cost ($/gallon treated):	**low:** (b)	**high:** (b)

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** No Min	**high:** 180
System aboveground footprint (sq ft):	**low:** N/A	**high:** N/A
Required head loss (ft):	**low:** 0.41' (c)	**high:**
Internal or External Bypass:	Internal &/or External	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Field monitoring at the McRedmond Park site located in Redmond, WA. Auto sampler for flow-portional composite and time-based discrete collections. Independent analytical laboratory, and 3rd party data validation/statistical analysis of data points and sets.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	200						
Median Effluent (mg/L):	26						
Median Removal (%):	87%						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	0.019	0.005	0.17			0.066
Median Effluent (mg/L):	0.009	0.002	0.073			0.042
Median Removal (%):	53%	60%	57%			36%

Notes, Comments, Additional References

ecoStorm and ecoStorm plus can be utilized as separate stand-alone technologies or combined in serial component installation. Combined technologies are currently under TAPE evaluation through WADOE for stormwater. Performance data reflects both stormwater and non-stormwater installations.

(a) Cost varies based on combination of units, number of units, and final design requirements.

(b) $500 - $1000 per cleaning/backflush event; Minimum of 1x per yr. to monthly for stormwater.

(c) Headloss based on:

- Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units.
- 360 gpm through the system, 180 gpm per filter.
- Site specific model calibrated onsite at known flow rates.
- Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units).
- Filters assumed to be at the point of required maintenance (twice the headloss measured for new filters).

System Performance Data results shown are for qualifying events only, per Washington State TAPE requirements:

- Per TAPE requirements, removal requirements for influent concentration less than 100 mg/l are that effluent must be less than or equal to 20 mg/l.
- For parameters with no results presented above, they are not being monitored or were present at concentrations are below measurable thresholds.

Manufacturer Technology Report

Manufacturer:	EcoSense International I	**Contact Name:**	Randy Burden
Name of Technology:	EcoVault Baffle Box	**Contact Email:**	.burden@ecosenseint
Technology Category:	Below Ground Vault	**Contact Phone:**	-449-0324 / 321-544-9
Technology Process:	Type II Baffle Box	**Contact Website:**	www.ecosenseint.com
# of Installations in Washington:	0		

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$25,000.00	**high:**	$125,000
Estimated Annual O&M Cost:	**low:**	$200.00	**high:**	$1,800.00

System Hydraulics

Design Flow Rate (gpm):	**low:**	1346	**high:**	48,000
Required head loss (ft):	Varies*			
Internal or External Bypass:	Either or Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

A study has not been completed on this specific system. Studies have been performed on other manufactures version of the Type II Baffle Box. Minimum Performance claims are based on model studies performed at the Florida Institute of Technology: Pandit and Gopatakrishnan, 1996. The study mentioned was performed with a scale model Type 1 Baffle Box. Improvements such as media filtration and horizontal debris collection system were subsequently added.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

The EcoVault is unique among Type II baffle boxes. The standard model incorporates a high performance media filter into the last internal weir which treats low flows and remove a wide variety of contaminants including bacteria, mobile phosphate, ammonia, dissolved heavy metals and orgainics. TSS removal is expect to be 80% at the flows mentioned above. Course organic materials are captured and stored above the static WL greatly increasing overall nutrient removal. The cassette style media filter contains three filter components including surfactant modified zeolite, hydrophobic meltblown polypropylene and polyester fiber pads impregnated with Granulated Ferric Hydroxide, Natural Zeolite and select grade acid washed Activated Carbon. * Head Loss varies depending on the media filter's top elevation and is directly proportional. Debris loading also effects head loss.

Manufacturer Technology Report

Manufacturer:	Environment 21, LLC	**Contact Name:**	Dino Pezzimenti
Name of Technology:	EnviroTrap	**Contact Email:**	dino@env21.com
# of Installations in Washington:	0	**Contact Phone:**	585-815-4714
		Contact Website:	www.env21.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$200	**high:**	$1,000
Estimated Annual O&M Cost:	**low:**	0	**high:**	$1,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	2,700
System footprint (sq ft):	**low:**	NA	**high:**	NA
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	NA			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field studies are incomplete at this time and are still under evaluation.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	**150	**150	**150	**150	**150	**150
Median Removal (%):	*30	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.07	***0.68	***0.24	NA	NA	NA
Median Removal (%):	***9	***13.6	***20	NA	NA	NA

Notes, Comments, Additional References

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d_{50} of 180 microns was used.

**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

***Testing is not complete for metals; therefore, these values are estimated.

Manufacturer Technology Report

Manufacturer:	Filterra, DBA Americast, Inc.	**Contact Name:**	Will Harris
Name of Technology:	Filterra Curb Inlet System	**Contact Email:**	wharris@filterra.com
Technology Category:	Below Ground Vault	**Contact Phone:**	909-790-5239
Technology Process:	biofiltration	**Contact Website:**	www.filterra.com
# of Installations in Washington:	186		

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$1,200	**high:**	$7,500
Estimated Annual O&M Cost:	**low:**	$300	**high:**	$3,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	8.5	**high:**	50+
Required head loss (ft):	2.5			
Internal or External Bypass:	Can be either			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	10	12	29	29			12		
Median Influent (mg/L):	27.5	0.15	0.0056	0.194			43.4		
Median Effluent (mg/L):	4.2	0.14	0.0033	0.082			1.2		
% Removal:	84.7	6.7	44	54			97		

Notes, Comments, Additional References

Please refer to the attached Filterra Curb Inlet Model Overview Sheet for further information. Please note that the Filterra Curb Inlet Model can be designed and built with or without an internal high flow bypass compartment. Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).

Manufacturer Technology Report

Manufacturer:	Filterra, DBA Americast, Inc.	**Contact Name:**	Will Harris
Name of Technology:	Filterra Roof Drain System	**Contact Email:**	wharris@filterra.com
Technology Category:	Downspout	**Contact Phone:**	909-790-5239
Technology Process:	Biofiltration	**Contact Website:**	
# of Installations in Washington:	1		

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$1,200	**high:**	$7,500
Estimated Annual O&M Cost:	**low:**	$300	**high:**	$3,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	8.5	**high:**	50+
Required head loss (ft):	2.5			
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	10	12	29	29			12		
Median Influent (mg/L):	27.5	0.15	0.0056	0.194			43.4		
Median Effluent (mg/L):	4.2	0.14	0.0033	0.082			1.2		
% Removal:	84.7	6.7	44	54			97.2		

Notes, Comments, Additional References

Please refer to the attached Filterra Roof Drain System Model Overview Sheet for further information. Please note that the Filterra Roof Drain System can be designed and built with or without an internal high flow bypass compartment. System can be also designed and built for either above ground or below ground applications. Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).

Manufacturer Technology Report

Manufacturer:	ABT, Inc.	**Contact Name:**	Brad Short
Name of Technology:	First Flush 1640FF	**Contact Email:**	bshort@abtdrains.com
Technology Category:	Below Ground Vault	**Contact Phone:**	949-633-6111
Technology Process:	Gravity-Flow through	**Contact Website:**	www.abtdrains.com
# of Installations in Washington:	0		

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$5,000	**high:**	10,000
Estimated Annual O&M Cost:	**low:**	$500	**high:**	$3,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	449	**high:**	538
Required head loss (ft):				
Internal or External Bypass:	See detail for bypass.			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab test results are provide on the filter media performance and system hydraulic performace based on design capabilites. The installation cost if factoring material and cost of installation together...or an installed cost. See attached detail of the larger unit available from ABT. Installation in several states including CA.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	FloGard Downspout Filter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	0	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$1,500	**high:**	$3,500
Estimated Annual O&M Cost:	**low:**	$75	**high:**	$250

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	30	**high:**	325
System footprint (sq ft):	**low:**	0.5	**high:**	1
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:		Internal		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	100	35	35				35
Median Effluent (mg/L):	20	7	7				
Median Removal (%):	80	80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	Flo Gard Dual Vortex Separator	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	10	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$10,000	**high:**	$100,000
Estimated Annual O&M Cost:	**low:**	$300	**high:**	$3,500

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	150	**high:**	6,500
System footprint (sq ft):	**low:**	7	**high:**	113
Required head loss (ft):	**low:**	0	**high:**	3
Internal or External Bypass:		Internal		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Internal lab testing performed by Kristar. Third party lab testing was performed by Alden Research laboratories based in Holden Massachussets. No field studies have been completed at this date.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	202						
Median Effluent (mg/L):	80						
Median Removal (%):	60						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

No field studies have been completed at this time. Correlation of TSS removal with other POCs would indicate similar removal of Total metals.

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	FloGard LoPro Matrix Filter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	10	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$400	**high:**	$1,000
Estimated Annual O&M Cost:	**low:**	$75	**high:**	$300

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	45	**high:**	800
System footprint (sq ft):	**low:**	0.75	**high:**	16
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:		Internal		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	100	35	35				35
Median Effluent (mg/L):	20	7	7				
Median Removal (%):	80	80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	FloGard LoPro Trench Drain Filter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	0	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$600	**high:**	$3,000
Estimated Annual O&M Cost:	**low:**	$75	**high:**	$350

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	200	**high:**	500
System footprint (sq ft):	**low:**	1	**high:**	20
Required head loss (ft):	**low:**	0	**high:**	0.25
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	100	35	35				35
Median Effluent (mg/L):	20	7	7				
Median Removal (%):	80	80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	FloGard+Plus	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	100	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$250	**high:**	$1,800
Estimated Annual O&M Cost:	**low:**	$75	**high:**	$350

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	100	**high:**	2,000
System footprint (sq ft):	**low:**	1	**high:**	10
Required head loss (ft):	**low:**	0	**high:**	0.25
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	100	35	35				35
Median Effluent (mg/L):	20	7	7				
Median Removal (%):	80	80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	FloGard Trash & Debris Guard	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	0	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$450	**high:**	$1,500
Estimated Annual O&M Cost:	**low:**	$50	**high:**	$200

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	50	**high:**	500
System footprint (sq ft):	**low:**	0.5	**high:**	4
Required head loss (ft):	**low:**	0	**high:**	0.25
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

No Data Available

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	AquaShield, Inc.	**Contact Name:**	Mark Miller
Name of Technology:	Go-Filter	**Contact Email:**	mmiller@aquashieldinc.com
Technology Category:	Above Ground Vault	**Contact Phone:**	888-344-9044
Technology Process:	Vortex + Filtration	**Contact Website:**	www.aquashieldinc.com

# of Installations in Washington: 0

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☑ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	Site-specific	**high:**	Site-specific
Estimated Annual O&M Cost:	**low:**	Site-specific	**high:**	Site-specific

System Hydraulics

Design Flow Rate (gpm):	**low:**	50	**high:**	675
Required head loss (ft):	0.5			
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

See Aqua-Filter for lab and field testing.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

Mobile device works on same principle as Aqua-Filter. Useful on construction sites for turbidity reduction in addition to sediment removal. Device components have been verified by NJCAT.

Manufacturer Technology Report

Manufacturer:	Imbrium Systems	**Contact Name:**	Joel Garbon
Name of Technology:	Jellyfish Filter	**Contact Email:**	jgarbon@imbriumsystms.com
# of Installations in Washington:	1	**Contact Phone:**	503-706-6193
		Contact Website:	www.imbriumsystems.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost): **low:** _____ **high:** _____

Estimated Annual O&M Cost ($/gallon treated): **low:** _____ **high:** _____

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	60	**high:**	2300
System aboveground footprint (sq ft):	**low:**	12	**high:**	113
Required head loss (ft):	**low:**	1	**high:**	2
Internal or External Bypass:	Internal or External Bypass			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Performance data is from third-party field study at University of Florida conducted according to the TARP protocol. Samples collected were grab samples of the entire crossection of flow. Twenty-one storm events have been monitored to date.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	74						
Median Effluent (mg/L):	8						
Median Removal (%):	89						

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	78	35	1.45			
Median Effluent (mg/L):	0.3	5	0.6			
Median Removal (%):	99	86	59			

Notes, Comments, Additional References

Copper concentrations are in micrograms per liter. Zinc concentrations are in milligrams per liter. Lead concentraions are in micrograms per liter. The O&M cost ranges from $0.001/gal to $0.003/gal. Installation costs range from $8000 to $125,000.

Manufacturer Technology Report

Manufacturer:	Brown Minneapolis Tank	**Contact Name:**	Allan McComas
Name of Technology:	Kleerwater	**Contact Email:**	amccomas@bmt-tank.com
Technology Category:	Below Ground Vault	**Contact Phone:**	(360) 482-1724
Technology Process:		**Contact Website:**	bmt-tank.com

# of Installations in Washington:

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☑ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	Varies by size	**high:**	Varies by installation size
Estimated Annual O&M Cost:	**low:**	Nominal	**high:**	Nominal

System Hydraulics

Design Flow Rate (gpm):	**low:**	25 gpm	**high:**	10,000 gpm
Required head loss (ft):	Gravity			
Internal or External Bypass:	External			

System Performance

Breifly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

All data collected and verified by third party inspectors and Underwriters Laboratories (UL).

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

- Underwriters Laboratories tested and listed per UL-2215
- Designed for no internal or confined space entry when performing routine maintenance.
- Kleerwater™ can handle larger influent flows, allowing for smaller separator tanks. With smaller separation tanks, less installation costs.
- Kleerwater™ separators utilizes Stokes Law for defining rates of rise of oil spheres in a liquid medium
- Unique patented oil separation process enhances oil from water separation efficiencies
- Separation efficiencies down to 5 ppm & lower.
- Electronic audible and visual alarms available for preset level alarm notifications
- Separator material of construction: carbon steel.
- Single or double wall steel configurations available
- Handle continuous or intermittent influent flow rates.

Note: Kleerwater™will not remove oils with a specific gravity of less than 0.95, dissolved hydrocarbons, or volatile organic compounds.
For additional information, please visit www.kleerwater.net

Manufacturer Technology Report

Manufacturer:	Modular Wetland Systems, Inc.	**Contact Name:**	Greg Kent
Name of Technology:	Modular Wetland System - Linear	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	12,000	**high:**	25,000
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 8.26	**high:**	$ 10.50

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	22	**high:**	120
System aboveground footprint (sq ft):	**low:**	16	**high:**	84
Required head loss (ft):	**low:**	2	**high:**	4
Internal or External Bypass:	Internal (External in Some Situations)			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Modular Wetland System Linear has been used in the field since 2008. The system has be independently tested in the laboratory and field under various conditions. A series of composite grab samples were used in the field and laboratory provide performance analysis on the system. --Quarter Scale Independent Lab Testing
--Full Scale Independent Field Testing

Quarter Scale Lab Testing

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	270	19	4	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	3	0	n/d	not tested	not tested	not tested	not tested
Median Removal (%):	98	>99	>99%	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	not tested	not tested	not tested	0.757	0.543	0.95
Median Effluent (mg/L):	not tested	not tested	not tested	0.0552	0.1	0.185
Median Removal (%):	not tested	not tested	not tested	93	81	80

Full Scale Field Testing

	TSS	TPH - Motor Oil	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	45.67	0.83	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	8.24	0	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	82	>99	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**	
Median Influent (mg/L):	0.04	n/d	0.24	not tested	not tested	not tested	
Median Effluent (mg/L):	n/d	n/d	n/d	not tested	not tested	not tested	
Median Removal (%):	>50		>79	not tested	not tested	not tested	

Notes, Comments, Additional References

The Modular Wetland System Linear is a 4 stage treatment train that includes screening, separation, media filtration and biofiltration. This combination of treatment processes offers the most comprehensive range of stormwater treatment available. The treatment train concept employed helps to minimize overall maintenance costs.

Manufacturer Technology Report

Manufacturer:	Bio Clean Environmental	**Contact Name:**	Greg Kent
Name of Technology:	Nutrient Separating Baffle Box	**Contact Email:**	gkent@biocleanenvironmental.net
# of Installations in Washington:	0 WA, 4 UT, 3 OR	**Contact Phone:**	760-433-7640
		Contact Website:	www.biocleanenvironmental.net

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	10,000	**high:**	200,000
Estimated Annual O&M Cost ($/gallon treated - based on peak treatment flow rate):	**low:**	$ 0.33	**high:**	$ 0.84

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	148	**high:**	8,858
System aboveground footprint (sq ft):	**low:**	0	**high:**	0
Required head loss (ft):	**low:**	0	**high:**	0
Internal or External Bypass:	Internal (External in Some Situations)			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The Nutrient Separating Baffle Box has been in use since for over 10 years. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.
--City of Santa Monica field data is independent and was performed over the course of 1 year.
--Brevard County field testing is independent and was peformed over 4 storm events - Micco & Indiatlantic
-- NJ CAT Full Scale Labratory Testing Tier 1

Santa Monica Independent Field Data

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	366	not tested	4	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	48	not tested	n/d	not tested	not tested	not tested	not tested
Median Removal (%):	86.8	not tested	>99%	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	0.07	not tested	0.318	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	0.042	not tested	0.222	not tested	not tested	not tested	not tested
Median Removal (%):	40	not tested	30.25	not tested	not tested	not tested	not tested

Brevard County Stormwater Monitoring - Micco Basin

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	16.55	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	8.63	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	47.9	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	0.055
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	0.0425
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	23

Brevard County Storwater Monitoring - Indiatlantic

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	32.9	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	7.6	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	76.9	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	1.49
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	0.44
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	70

NJ CAT Testing - Tier 1 - 63 Micron Mean Particle Size PSD

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	varies	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	varies	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	67.3	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**	**TP**
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

Atlantic Beach Baffle Box Teasting - 5th St

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	85	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	27	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	68	not tested	not tested	not tested	not tested	not tested	not tested

	Total Metals			Dissolved Metals			Nutrients
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**	**TP**
Median Influent (mg/L):	0.017	0.014	0.088	not tested	not tested	not tested	0.31
Median Effluent (mg/L):	0.01	0.0065	0.038	not tested	not tested	not tested	0.21
Median Removal (%):	41	54	57	not tested	not tested	not tested	32

Notes, Comments, Additional References

The Nutrient Separating Baffle Box employees screening, three chambered hydrodynamic spearation and absoptive polymer media for the removal of gross solids, TSS, particulate pollutants and hydrocarbons. To see how the system operates visit:
http://www.biocleanenvironmental.com/video/?path=/content/product/ns_baffle_box/NS_Baffle_Box-Product_Video.flv&w=768&h=576
THE PATENTED SEPARATION AND DRY STATE STORAGE OF GROSS SOLIDS SUCH AS LEAVES AND GRASS CLIPPINGS MINIMIZES NUTRIENT LOADS SEE FOLLOWING ARTICLE
http://www.biocleanenvironmental.com/content/product/ns_baffle_box/Brochure%20-%20Leaching%20Article%20-%20NSBB.pdf

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	Perk Filter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	15	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$10,000	**high:**	$200,000
Estimated Annual O&M Cost:	**low:**	$1,200	**high:**	$10,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	12	**high:**	1,000
System footprint (sq ft):	**low:**	10	**high:**	150
Required head loss (ft):	**low:**	1.7	**high:**	3.5
Internal or External Bypass:		Internal		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Internal lab testing performed by Kristar. Third party lab testing was performed by CSUS - OWP for TSS and subsequent "street Sweeipings" testing for metals and nutrients. Third Party field testing for GULD by Herrera.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	70	20	20				20
Median Effluent (mg/L):	11	5	5				5
Median Removal (%):	82	75	75				75

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	0.052	0.15	0.25			
Median Effluent (mg/L):	0.02	0.05	0.1			
Median Removal (%):	62	68	61			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Environment 21, LLC	**Contact Name:**	Dino Pezzimenti
Name of Technology:	PuriStorm	**Contact Email:**	dino@env21.com
# of Installations in Washington:	0	**Contact Phone:**	585-815-4714
		Contact Website:	www.env21.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$3,000	**high:**	$25,000
Estimated Annual O&M Cost:	**low:**	0	**high:**	$10,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	2,000
System footprint (sq ft):	**low:**	9	**high:**	600
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field studies are not in progress at this time. Future studies are planned.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	**80	**80	**80	**80	**80	**80
Median Removal (%):	*80	**80	**80	**80	**80	**80	**80

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.04	***0.28	***0.06	NA	NA	NA
Median Removal (%):	***50	***65	***80	NA	NA	NA

Notes, Comments, Additional References

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d_{50} of 60 microns was used.

**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

***Testing is not complete for metals; therefore, these values are estimated.

Manufacturer Technology Report

Manufacturer:	Environmental Filtration, Inc.	**Contact Name:**	Lyle Clemenson
Name of Technology:	Raynfiltr	**Contact Email:**	cei@pconline.com
# of Installations in Washington:	1 (airport)	**Contact Phone:**	763-425-1167
		Contact Website:	www.raynfiltr.org

Treatment Type/Application *(check all that apply)*

☑ Downspout	☑ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☐ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	531	**high:**	554
Estimated Annual O&M Cost:	**low:**		**high:**	

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	900
System footprint (sq ft):	**low:**		**high:**	
Required head loss (ft):	**low:**		**high:**	
Internal or External Bypass:				

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Costs per catch basin

Manufacturer Technology Report

Manufacturer:	Deep Root Partners, L.P.	**Contact Name:**	Brenda Guglielmina
Name of Technology:	Silva Cell	**Contact Email:**	brenda@deeproot.com
Technology Category:	Below Ground Vault	**Contact Phone:**	
Technology Process:		**Contact Website:**	
# of Installations in Washington:	7		

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	4,000-$5,60	**high:**	),000-$14,000
Estimated Annual O&M Cost:	**low:**	$100-$200	**high:**	$100-$200

System Hydraulics

Design Flow Rate (gpm):	**low:**	20"/hour	**high:**	3"/hour
Required head loss (ft):	n/a			
Internal or External Bypass:	Optional			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

terature search. The water quality filtering values are based on research by Davis at University of Maryland and Hunt at the Universi

Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:	80%	68%	90%+	90%+	90%+				

Notes, Comments, Additional References

Prince Georges County Stormwater Manual, British Columbia Stormwater Manual, State of Washington Department of Ecology

Manufacturer Technology Report

Manufacturer:	FABCO industries	**Contact Name:**	Scott Gorneau
Name of Technology:	Stormbasin/Stormpod	**Contact Email:**	Sgorneau@fabco-industries.com
# of Installations in Washington:	<20	**Contact Phone:**	207.831.2795
		Contact Website:	www.fabco-industries.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☑ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☑ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	750	**high:**	2000
Estimated Annual O&M Cost:	**low:**	200	**high:**	800

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	50	**high:**	>2500
System footprint (sq ft):	**low:**	4	**high:**	200
Required head loss (ft):	**low:**	1.25	**high:**	2.5
Internal or External Bypass:	both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

FABCO stormbasin/stormpod has been tested in the lab and the field by 1st+3rd party's data was collected according to established protocols and consisted of barious methods including grab, auto, semi-auto and single event or composite samples

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	Total P	Total N
Median Influent (mg/L):	111.9		59.5					0.57	4
Median Effluent (mg/L):	2.7		<5					0.3	1.5
Median Removal (%):	97.8		>90					47	63

	Total Metals			Dissolved Metals			Bacteria		
	Cu	Pb	Zn	Cu	Pb	Zn	ECOLI	Fecal	Enter
Median Influent (mg/L):		0.018	0.335				1550	1600	430
Median Effluent (mg/L):		0.0049	0.175				270	430	230
Median Removal (%):		73	48				83	73	47

Notes, Comments, Additional References

FABCO was awarded a competition bid-soil source spec for large scale municupal deployment in the urban/ms4 stormdrain system of nassau county, long island, ny. Since 2009 FABCO was installed over 2000 stormbasins. Our performance approval as part of this spec-sediment TSS removal> 50% d50: 110 um. Hydrocarbons/oil&grease: >80%. .Phosphorus: >50%. Nitrogen >40%. Bacteria. >70%. Stormbasin is a great retrofit device for industrial facilities and is considered a structural BMP for pretreatment, source control or in spcc + swpp plans.

Manufacturer Technology Report

Manufacturer:	Imbrium Systems	**Contact Name:**	Justin Arnott
Name of Technology:	Stormceptor	**Contact Email:**	Jarnott@ImbriumSystems.com
Technology Category:	Below Ground Vault	**Contact Phone:**	(403) 389-9593
Technology Process:	Sedimentation	**Contact Website:**	www.imbriumsystems.com
# of Installations in Washington:	510+		

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$3,000	**high:**	$15,000
Estimated Annual O&M Cost:	**low:**	$500	**high:**	$5,000

System Hydraulics

Design Flow Rate (gpm):	**low:**	0	**high:**	11000
Required head loss (ft):	0.22			
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

The data detailed below is aggregate of many field studies (8) as well as lab studies (2) including the NJCAT TARP program. Most studies were conducted 3rd party with both automatic and grab samplers. Individual test reports are available upon request.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:	57	38					15		
Median Influent (mg/L):	159	0.275					29		
Median Effluent (mg/L):	59	0.175					4		
% Removal:	53	21.8	27.5	35.3		41.8	73		

Notes, Comments, Additional References

Despite the above averages, the Stormceptor system, when sized with PCSWMM for Stormceptor has a 0.94 correlation (r-squared regression value) with field performance when an accurate PSD is used to size the unit. Therefore the Stormceptor can be confidently and accurately sized for TSS removal goals on the order of 80% TSS, if the proper consideration like a true PSD are taken into account. Furthermore, the laboratory evaluation indicates that the Stormceptor unit can achieve DOE level performance at flow rates larger than the indicated treatment flow rate on the DOE GULD. The flow rates listed in the DOE GULD are merely a hydraulic marker within the system that indicates when the unit begins to inhibit scour from the unit.

Manufacturer Technology Report

Manufacturer:	CONTECH Construction Products Inc.	**Contact Name:**	Sean Darcy
Name of Technology:	StormFilter - ZPG	**Contact Email:**	darcys@contech-cpi.com
# of Installations in Washington:	> 500	**Contact Phone:**	503-258-3105
		Contact Website:	contech-cpi.com

Treatment Type/Application *(check all that apply)*

☑ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$10K	**high:**	$2.5 M
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.00008	**high:**	0.00024

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	2	**high:**	44900
System aboveground footprint (sq ft):	**low:**	8	**high:**	6050
Required head loss (ft):	**low:**	1.8	**high:**	12
Internal or External Bypass:	Both available			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

a) Stormwater Management StormFilter Basic Treatment Application for General Use Level Designation (2005): field,flow-weighted, peer reviewed, composite samples; b) Milwaukee Riverwalk ETV; Third Party, Field, Flow weighted. c) Heritage Marketplace Field Evalution (2004): field, flow-weighted, peer reviewed, composite samples; d) EvTec Lake Union Ultra-Urban Stormwater Technology Evaluation Stormwater Management StormFilter (2008): field, third party, composite.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	83						**0.12**
Median Effluent (mg/L):	23						**0.062**
Median Removal (%):	82						**42**

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	0.0425	0.12	0.225	0.00464		0.0599
Median Effluent (mg/L):	0.0335	0.0435	0.12767	0.00423		0.0532
Median Removal (%):	47	24	62	11		15

Notes, Comments, Additional References

TSS reference a; Metals references b & c; cPAHs reference d. cPAHs used Chrysene as the parameter as it was the median performance for the suite of requested analytes. Ranges were 33% to 47% for the entire suite. cPAH data contained 10% more GAC (by volume) than standard ZPG.

Manufacturer Technology Report

Manufacturer:	Fabco Industries	**Contact Name:**	Scott Gornean
Name of Technology:	Stormsafe-Helix	**Contact Email:**	Sgorneau@fabco-industries.com
# of Installations in Washington:	none	**Contact Phone:**	207-831-2795
		Contact Website:	www.fabco-industries.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☐ Stormwater
☐ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☑ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	20000	**high:**	60000
Estimated Annual O&M Cost:	**low:**	2000	**high:**	6000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	3	**high:**	9
System footprint (sq ft):	**low:**	160	**high:**	250
Required head loss (ft):	**low:**	0	**high:**	3
Internal or External Bypass:	both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

We have conducted lab and field studies as descried in our online reports, we are currently undergoing 3rd party field testing at a wastewater treatment plant, treating 10 acres of stormwater runoff.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals			Bateria	
	Cu	Pb	Zn	Cu	Pb	Zn	Total coli	Fecal
Median Influent (mg/L):							4388	3948
Median Effluent (mg/L):							1360	934
Median Removal (%):							69	76

Notes, Comments, Additional References

The Stormsafe-helix technology was released in 2010. The system is designed to treat high flow rates and is generally preceeded by a pretreatment device like a hydrodynamic separator. We offer two configurations of filters that target pathogen or oil&grease, applications include: pathogen/bacteria impaired water bodies. wastewater treatment palnts w/ stormwater discharges. beach outfalls, industrial discharges.

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	SwaleGard Pre-filter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	2	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$4,500	**high:**	$4,500
Estimated Annual O&M Cost:	**low:**	$75	**high:**	$300

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	100	**high:**	800
System footprint (sq ft):	**low:**	4	**high:**	16
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	Internal			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	100	35	35				35
Median Effluent (mg/L):	20	7	7				
Median Removal (%):	80	80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Kristar Enterprises, Inc.	**Contact Name:**	Michael Kimberlain
Name of Technology:	TreePod Biofilter	**Contact Email:**	mkimberlain@kristar.com
# of Installations in Washington:	0	**Contact Phone:**	(800) 579-8819
		Contact Website:	www.kristar.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☑ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$10,000	**high:**	$50,000
Estimated Annual O&M Cost:	**low:**	$400	**high:**	$750

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	16	**high:**	72
System footprint (sq ft):	**low:**	24	**high:**	84
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:		Internal		

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Internal Hydraulic testing only completed at this time. UNH field study for performance currently under way.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	TBD	TBD	TBD				TBD
Median Effluent (mg/L):	TBD	TBD	TBD				TBD
Median Removal (%):	TBD	TBD	TBD				TBD

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD
Median Effluent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD
Median Removal (%):	TBD	TBD	TBD	TBD	TBD	TBD

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	REM, Inc. (Revel Environmental Manufacturing)	**Contact Name:**	Marcel Sloane
Name of Technology:	TRITON Drop Inlet Insert	**Contact Email:**	marcel@remfilters.com
Technology Category:		**Contact Phone:**	(925) 858-8005
Technology Process:		**Contact Website:**	remfilters.com

# of Installations in Washington: Estimated: 100

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separartion	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☑ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$100	**high:**	$700
Estimated Annual O&M Cost:	**low:**	$40	**high:**	$120

System Hydraulics

Design Flow Rate (gpm):	**low:**	76	**high:**	9233
Required head loss (ft):	.5"			
Internal or External Bypass:	Internal 721 gpm to 23,000 gpm			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Treatment flow rates will vary depending on the filter cartridge & media configuration which is dependent upon the size and shape of the specific catch basin. See attached treatment flow rate matrix for the most common filter cartridge and media configurations.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

See attached University of California, Irvine Testing Protocols and Results

Manufacturer Technology Report

Manufacturer:	AbTech Industries	**Contact Name:**	Jonathan Thatcher
Name of Technology:	Ultra Urban Filter	**Contact Email:**	jthatcher@abtechindustries.com
# of Installations in Washington:		**Contact Phone:**	(480) 874-4000
		Contact Website:	abtechindustries.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☑ Drain Inlet Insert	☐ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☐ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☑ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:** $400	**high:** $1,700
Estimated Annual O&M Cost ($/gallon treated):	**low:**	**high:**

System Hydraulics/Design

Design Flow Rate (gpm):	**low:** 190	**high:** 500
System aboveground footprint (sq ft):	**low:** 0	**high:**
Required head loss (ft):	**low:** 0.5	**high:** 1.5
Internal or External Bypass:	Internal Bypass	

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Primary analysis of AbTech Industries Ultra Urban Filter (UUF) was conducted in laboratory studies conducted by third parties using grab samples from established test protocols developed by federal and state regulatory entities. Field data was collected during studies conducted by municipalities to evaluate the effectiveness of the UUFs for deployment in the localized watershed. The testing methods used by the municipalities were governed by the state regulatory body, in which that municipality was located.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):		>100	>100	180			>100
Median Effluent (mg/L):		<10	<10	>4.4			>10
Median Removal (%):	*80%	90%	85%	**40%			**60%

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

* Data based on Particle Size Distribution (PSD) and not on mg/L. Samples tested were evaluated using a medium sand in the 0.355-0.300 mm range.
**Reduction of soluble dissolved hydrocarbons occurs when they become partitioned in the dispersed hydrocarbons and are removed simultaneously. Filtration of dissolved phase hydrocarbons through AbTech's UUFs will not occur, in substantial percent volumes, without the presence of dispersed hydrocarbons. Bench scale testing can be conducted on field samples to establish viability in a specific environment or to meet a specific discharge standard.

Total Metals Removal: Based on TSS testing the UUF has the ability to physically separate Total Metals from the water column, but AbTech products have no Chemical or Biological exchange during the filtration of Total Metals.

Manufacturer Technology Report

Manufacturer:	Environment 21, LLC	**Contact Name:**	Dino Pezzimenti
Name of Technology:	UniScreen	**Contact Email:**	dino@env21.com
# of Installations in Washington:	0	**Contact Phone:**	585-815-4714
		Contact Website:	www.env21.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$2,000	**high:**	$15,000
Estimated Annual O&M Cost:	**low:**	0	**high:**	$2,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	15,700
System footprint (sq ft):	**low:**	20	**high:**	135
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field studies are not in progress at this time. Future studies are planned.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA
Median Removal (%):	***20	***27	***40	NA	NA	NA

Notes, Comments, Additional References

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d_{50} of 150 microns was used.

**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

***Testing is not complete for metals; therefore, these values are estimated.

Manufacturer Technology Report

Manufacturer:	Environment 21, LLC	**Contact Name:**	Dino Pezzimenti
Name of Technology:	UniStorm	**Contact Email:**	dino@env21.com
# of Installations in Washington:	0	**Contact Phone:**	585-815-4714
		Contact Website:	www.env21.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$2,000	**high:**	$15,000
Estimated Annual O&M Cost:	**low:**	0	**high:**	$2,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	15,700
System footprint (sq ft):	**low:**	20	**high:**	135
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	NA			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field studies are not in progress at this time. Future studies are planned.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA
Median Removal (%):	***20	***27	***40	NA	NA	NA

Notes, Comments, Additional References

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d_{50} of 150 microns was used.

**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

***Testing is not complete for metals; therefore, these values are estimated.

Manufacturer Technology Report

Manufacturer:	Hydro International	**Contact Name:**	Fred Kraekel
Name of Technology:	Up-Flo Filter®	**Contact Email:**	fkraekel@hil-tech.com
Technology Category:	Below Ground Vault	**Contact Phone:**	207-321-3733
Technology Process:	Filter	**Contact Website:**	www.hydro-international.biz

# of Installations in Washington: _____

Treatment Type/Application (check all that apply)

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost: **low:** _____ **high:** _____
Estimated Annual O&M Cost: **low:** _____ **high:** _____

System Hydraulics

Design Flow Rate (gpm): **low:** _____ **high:** _____
Required head loss (ft): _____
Internal or External Bypass: _____

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

Contact Hydro International for details.

Parameter:	**TSS**	**TP**	**Dis. Cu**	**Dis. Zn**	**Dis. Cd**	**Dis. Pb**	**TPH**	**cPAHs**	**PCBs**
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									

Notes, Comments, Additional References

The Up-Flo Filter® is a a high rate, upflow filtration system designed to remove fine suspended sediment and associated pollutants like nutrients and heavy metals, depending on the type of media used. The modular, subsurface filtration system is housed in a 4-ft diameter manhole or precast vault that can be retrofitted into an existing storm drain manhole or supplied as a complete system. The design incorporates gravitational separation of floating and settling materials, screening, and filtration of stormwater flows. A siphon-activated bypass conveys flows larger than the design filtration rate for on-line installations. Pollutant removals include TSS, nutrients (i.e. phophorus), synthetic organics, pesticides, herbicides and heavy metals (iron, chromium, copper and lead). The Up-Flo FIlter was issued a PULD by Washington DOE. Contact Hydro International at 1-800-848-2706 or visit the website www. hydro-international.biz for more information.

Manufacturer Technology Report

Manufacturer:	CONTECH Construction Products Inc.	**Contact Name:**	Sean Darcy
Name of Technology:	UrbanGreen BioFilter	**Contact Email:**	darcys@contech-cpi.com
# of Installations in Pacific Northwest:	> 25	**Contact Phone:**	503-258-3105
		Contact Website:	contech-cpi.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☐ Oil/Water Separation	☑ Filtration (media)	☑ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☑ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$10k	**high:**	$250K
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.0001	**high:**	0.0003

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	4	**high:**	600
System aboveground footprint (sq ft):	**low:**		**high:**	
Required head loss (ft):	**low:**	3	**high:**	6
Internal or External Bypass:	Both available			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	Environment 21, LLC	**Contact Name:**	Dino Pezzimenti
Name of Technology:	V2B1	**Contact Email:**	dino@env21.com
# of Installations in Washington:	0	**Contact Phone:**	585-815-4714
		Contact Website:	www.env21.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separartion	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost:	**low:**	$2,000	**high:**	$15,000
Estimated Annual O&M Cost:	**low:**	0	**high:**	$2,000

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	0	**high:**	63,000
System footprint (sq ft):	**low:**	20	**high:**	800
Required head loss (ft):	**low:**	0	**high:**	0.5
Internal or External Bypass:	Both			

System Performance

Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Third party lab studies are complete and the field studies are planned to begin within one year.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA
Median Effluent (mg/L):	***0.05	***0.35	***0.09	NA	NA	NA
Median Removal (%):	***40	***55	***70	NA	NA	NA

Notes, Comments, Additional References

*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d_{50} of 110 microns was used.

**Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

***Testing is not complete for metals; therefore, these values are estimated.

Manufacturer Technology Report

Manufacturer:	CONTECH Construction Products Inc.	**Contact Name:**	Sean Darcy
Name of Technology:	VortClarex	**Contact Email:**	darcys@contech-cpi.com
# of Installations in Pacific Northwest:	>25	**Contact Phone:**	503-258-3105
		Contact Website:	contech-cpi.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☑ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☐ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☐ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$10K	**high:**	$300K
Estimated Annual O&M Cost ($/gallon treated):	**low:**	0.00008	**high:**	0.001

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	100	**high:**	2000
System aboveground footprint (sq ft):	**low:**		**high:**	
Required head loss (ft):	**low:**	0.1	**high:**	
Internal or External Bypass:	Both available			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

Manufacturer Technology Report

Manufacturer:	CONTECH Construction Products, Inc.	**Contact Name:**	Sean Darcy
Name of Technology:	Vortechs System	**Contact Email:**	darcys@contech-cpi.com
# of Installations in Washington:	> 100	**Contact Phone:**	503-258-3105
		Contact Website:	contech-cpi.com

Treatment Type/Application *(check all that apply)*

☐ Downspout	☑ Oil/Water Separation	☐ Filtration (media)	☐ Ion exchange column	☑ Stormwater
☐ Drain Inlet Insert	☑ Settling	☐ Filtration (fabric)	☐ Reverse osmosis	☐ Groundwater
☑ Below Ground Vault	☑ Hydrodynamic Separation	☐ Filtration (biofiltration)	☐ Electrocoagulation	☐ Wastewater
☐ Above Ground Vault	☑ Floatables Baffle	☐ Filtration (chemically enhanced)	☐ Chemical Treatment	☐ Process water

Estimated Costs

Estimated Installation Cost (unit cost and construction cost):	**low:**	$20K	**high:**	$500K
Estimated Annual O&M Cost ($/gallon treated):	**low:**	$0.00001	**high:**	$0.00004

System Hydraulics/Design

Design Flow Rate (gpm):	**low:**	50	**high:**	22450
System aboveground footprint (sq ft):	**low:**	NA	**high:**	NA
Required head loss (ft):	**low:**	0.1	**high:**	
Internal or External Bypass:	Both Available			

System Performance

Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)

The WAWA Route 37 Stormwater Treatment System TARP TIER II Field Evalaution: Vortechs (2010). Field, Peer Reviewed, Composite.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	SSC<50 um
Median Influent (mg/L):	108							24
Median Effluent (mg/L):	28							8
Median Removal (%):	93							70

	Total Metals			Dissolved Metals		
	Cu	**Pb**	**Zn**	**Cu**	**Pb**	**Zn**
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Notes, Comments, Additional References

APPENDIX C

Technology Product Information

Appendix C Index (by Treatment System Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Active Treatment Systems								
ACISTBox®	Water Tectonics, Inc.	X						
Arkal Filter (Spin Klin System)	Arkal Filtration Systems/PEP (U.S. Distributor)					X		
Arkal Media Filter	Arkal Filtration Systems/PEP (U.S. Distributor)	X						
Baker Tank with Sand Filter	BakerCorp	X		X				
Chitosan-Enhanced Sand Filtration Using FlocClear™	Clear Creek Systems					X	X	
Fuzzy Filter	Schreiber	X		X	X		X	
High-Flo Electrocoagulation	Kaselco			X			X	
OilTrap ElectroPulse Water Treatment System	OilTrap Environmental	X		X			X	
pHATBox®	Water Tectonics, Inc.	X						
Purus® Stormwater Polishing System	StormwateRx	X						
Redbox	Morselt Borne BV	X						
Wastewater Ion Exchange System (WWIX)	Siemens Water Technologies Inc.	X						
WaterTrak Ion Exchange	Aquatech	X				X		
WaterTrak Pressurized Media Filter	Aquatech	X				X		
WaterTrak Reverse Osmosis	Aquatech	X				X		
WaterTrak Ultrafiltration	Aquatech	X				X		
WaveIonics™	Water Tectonics, Inc.	X					X	
Wetsep	Waste & Environmental Technologies Ltd.	X		X	X			
Passive Treatment Systems								
ADS® Water Quality Unit	Advanced Drainage Systems, Inc	X	X			X	X	X
Adsorb-It	Eco-Tec, Inc.	X	X				X	X
Aqua Shield Aqua-Filter System	AquaShieldTM, Inc.	X		X		X		X
Aqua Shield Aqua-Swirl Concentrator	AquaShieldTM, Inc.	X			X	X		X
Aqua-Guardian™ Catch Basin Insert	AquaShieldTM, Inc.	X				X		X
Aquip® Enhanced Stormwater Filtration System	StormwateRx	X			X			
BayFilter®	BaySaver Technologies, Inc.		X	X			X	X
BaySeparator®	BaySaver Technologies, Inc.		X	X			X	X
Bio Clean Curb Inlet Basket	BioClean Environmental Services, Inc.	X	X	X			X	
Bio Clean Downspout Filter	BioClean Environmental Services, Inc.	X	X				X	
Bio Clean Flume Filter	BioClean Environmental Services, Inc.	X						X
Bio Clean Grate Inlet Skimmer Box	BioClean Environmental Services, Inc.	X						X
Bio Clean Trench Drain Filter	BioClean Environmental Services, Inc.	X						X
Bio Clean Water Polisher	BioClean Environmental Services, Inc.	X	X					
BioSTORM	Bio-Microbics, Inc.	X	X			X		X
CDS™ Stormwater Treatment System	CONTECH Stormwater Solutions Inc.	X	X	X		X		
Clara® Gravity Stormwater Separator Vault	StormwateRx	X			X			
Clean Way Downspout Filtration Unit	Clean Way	X						X
ClearWater BMP	ClearWater Solutions, Inc.	X	X			X		
Coanda Curb Inlet Filter	Coanda, Inc.	X	X	X			X	
Coanda Downspout Filter	Coanda, Inc.	X						

Appendix C Index (by Treatment System Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Passive Treatment Systems (cont.)								
CrystalClean Separator	CrystalStream Technologies	X	X				X	X
CrystalCombo Hybrid Polisher	CrystalStream Technologies	X			X		X	X
Downstream Defender	Hydro International, Inc.	X	X	X		X		X
DrainPac™	United Storm Water, Inc.		X	X		X	X	X
ecoLine A®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X					
ecoLine B®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X		X	X		X
EcoSense™ Stormwater Filtration Systems	EcoSense International	X			X		X	
ecoSep®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X		X		X
ecoStorm ®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X	X	X		X
ecoStorm Plus®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X	X	X		X
ecoTop®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X				
EcoVault™ Baffle Box	EcoSense International	X					X	
Enviro-Drain®	Enviro-Drain, Inc.	X	X					
EnviroSafe™	Transpo Industries, Inc.	X						
EnviroSafe™ Storm Safe HF10	Transpo Industries, Inc.	X				X		
EnviroTrap Catch Basin Insert	Environment 21	X	X	X			X	
Filterra® Roofdrain System	Filterra, DBAAmericast, Inc.		X		X	X		X
Filterra® System	Filterra, DBAAmericast, Inc.		X		X	X		X
First Flush 1640FF	ABT, Inc.	X	X					
FloGard+PLUS®	Kristar Enterprises, Inc.	X	X			X		X
FloGard® Downspout Filter	Kristar Enterprises, Inc.	X	X			X		
FloGard® Dual-Vortex Hydrodynamic Separator	Kristar Enterprises, Inc.	X	X			X		
FloGard® LoPro Matrix Filter	Kristar Enterprises, Inc.	X	X			X		
FloGard® LoPro Trench Drain Filter	Kristar Enterprises, Inc.	X	X			X		
Flo-Gard® Trash & Debris Guard	Kristar Enterprises, Inc.	X	X			X		
Go-Filter	AquaShieldTM, Inc.	X						X
Hancor Storm Water Quality Unit	Hancor, Inc.	X		X		X	X	X
HUBER Hydro Filt	Huber Technology, Inc.	X			X			
HydroFilter	Hydroworks				X			
HydroGuard	Hydroworks	X	X			X	X	X
Hydro-Kleen™	ACF Environmental, Inc.	X			X			X
Inceptor®	Stormdrain Solutions	X					X	X
Jellyfish™ Filter	Imbrium Systems Corp	X	X	X		X		X
Kleerwater™	Brown-Minneapolis Tank Co./ Kleerwater Technologies, LLC	X		X	X			X
Modular Wetland System – Linear	Modular Wetland Systems, Inc./ BioClean Environmental Services, Inc.	X	X	X		X	X	X
Nutrient Separating Baffle Box	BioClean Environmental Services, Inc.	X	X	X			X	
Perimeter Sandfilter (Delaware Sandfilter)	Rotondo Environmental Solutions, LLC		X					
Perk Filter™	Kristar Enterprises, Inc.	X	X			X		
PSI Separator	PSI International, Inc.				X	X		X

Appendix C Index (by Treatment System Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Passive Treatment Systems (cont.)								
PuriStorm	Environment 21	X	X					
Raynfiltr™	Environmental Filtration, Inc.	X	X					
RSF (Rapid Stormwater Filtration) 100	EcoSol Wastewater Filtration Systems	X	X	X			X	X
RSF (Rapid Stormwater Filtration) 1000	EcoSol Wastewater Filtration Systems	X	X	X			X	X
RSF (Rapid Stormwater Filtration) 4000	EcoSol Wastewater Filtration Systems	X	X	X			X	X
Silva Cell	DeepRoot Partners	X		X	X	X		X
SNOUT®	Nyloplast/Hancor, Inc.	X						
Sorbtive™ FILTER	Imbrium Systems Corp	X	X			X	X	X
Storm PURE™	Nyloplast/Hancor, Inc.	X						
StormBasin™	Fabco Industries, Inc.	X	X			X	X	X
Stormceptor®	Imbrium Systems Corp	X	X	X		X		X
StormClean Catch Basin Insert	Clean Way	X	X					X
StormClean Curb Inlet Insert	Clean Way	X						X
StormClean Wall Mount Filtration Unit	Clean Way	X						X
Stormfilter using ZPG Media	CONTECH Stormwater Solutions Inc.	X	X	X		X	X	
StormPod™	Fabco Industries, Inc.	X	X			X	X	X
StormSafe™ Helix	Fabco Industries, Inc.	X			X	X		
StormTrooper®	Park USA	X	X					X
StormTrooper® EX Extra-Duty	Park USA	X	X					X
SwaleGard® Pre-filter	Kristar Enterprises, Inc.	X	X			X		
Terre Kleen™	Terre Hill Concrete Products		X	X				X
TREEPOD® Biofilter	Kristar Enterprises, Inc.	X	X			X		
Triton Drop Inlet Insert	Revel Environmental Manufacturing, Inc./ CONTECH Stormwater Solutions Inc.	X	X	X		X	X	
Ultra-Urban Filter™	Abtech Industries	X						
Underground Sandfilter (DC Sandfilter)	Rotondo Environmental Solutions, LLC		X					
UniScreen	Environment 21	X	X	X			X	
UniStorm	Environment 21	X	X	X		X	X	
Up-Flo™ Filter	Hydro International, Inc.	X	X	X		X	X	
UrbanGreen BioFilter	CONTECH Stormwater Solutions Inc.	X	X	X		X		X
V2B1 Treatment System	Environment 21	X	X	X			X	
VortClarex	CONTECH Stormwater Solutions Inc.	X	X	X		X		
Vortechs System	CONTECH Stormwater Solutions Inc.	X	X	X		X	X	X

Appendix C Index (by Manufacturer/Vendor Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Active Treatment Systems								
Aquatech	WaterTrak Ion Exchange	X				X		
Aquatech	WaterTrak Pressurized Media Filter	X				X		
Aquatech	WaterTrak Reverse Osmosis	X				X		
Aquatech	WaterTrak Ultrafiltration	X				X		
Arkal Filtration Systems/PEP (U.S. Distributor)	Arkal Filter (Spin Klin System)					X		
Arkal Filtration Systems/PEP (U.S. Distributor)	Arkal Media Filter	X						
BakerCorp	Baker Tank with Sand Filter	X		X				
Clear Creek Systems	Chitosan-Enhanced Sand Filtration Using FlocClear™					X	X	
Kaselco	High-Flo Electrocoagulation			X			X	
Morselt Borne BV	Redbox	X						
OilTrap Environmental	OilTrap ElectroPulse Water Treatment System	X		X			X	
Schreiber	Fuzzy Filter	X		X	X		X	
Siemens Water Technologies Inc.	Wastewater Ion Exchange System (WWIX)	X						
StormwateRx	Purus® Stormwater Polishing System	X						
Waste & Environmental Technologies Ltd.	Wetsep	X		X	X			
Water Tectonics, Inc.	ACISTBox®	X						
Water Tectonics, Inc.	pHATBox®	X						
Water Tectonics, Inc.	WaveIonics™	X					X	
Passive Treatment Systems								
ABT, Inc.	First Flush 1640FF	X	X					
Abtech Industries	Ultra-Urban Filter™	X						
ACF Environmental, Inc.	Hydro-Kleen™	X			X			X
Advanced Drainage Systems, Inc	ADS® Water Quality Unit	X	X			X	X	X
AquaShieldTM, Inc.	Aqua Shield Aqua-Filter System	X		X		X		X
AquaShieldTM, Inc.	Aqua Shield Aqua-Swirl Concentrator	X			X	X		X
AquaShieldTM, Inc.	Aqua-Guardian™ Catch Basin Insert	X				X		X
AquaShieldTM, Inc.	Go-Filter	X						X
BaySaver Technologies, Inc.	BayFilter®		X	X			X	X
BaySaver Technologies, Inc.	BaySeparator®		X	X			X	X
BioClean Environmental Services, Inc.	Bio Clean Curb Inlet Basket	X	X	X			X	
BioClean Environmental Services, Inc.	Bio Clean Downspout Filter	X	X				X	
BioClean Environmental Services, Inc.	Bio Clean Flume Filter	X						X
BioClean Environmental Services, Inc.	Bio Clean Grate Inlet Skimmer Box	X						X
BioClean Environmental Services, Inc.	Bio Clean Trench Drain Filter	X						X
BioClean Environmental Services, Inc.	Bio Clean Water Polisher	X	X					
BioClean Environmental Services, Inc.	Nutrient Separating Baffle Box	X	X	X			X	
Bio-Microbics, Inc.	BioSTORM	X	X			X		X
Brown-Minneapolis Tank Co./ Kleerwater Technologies, LLC	Kleerwater™	X		X	X			X

Appendix C Index (by Manufacturer/Vendor Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Passive Treatment Systems (cont.)								
Clean Way	Clean Way Downspout Filtration Unit	X						X
Clean Way	StormClean Catch Basin Insert	X	X					X
Clean Way	StormClean Curb Inlet Insert	X						X
Clean Way	StormClean Wall Mount Filtration Unit	X						X
ClearWater Solutions, Inc.	ClearWater BMP	X	X			X		
Coanda, Inc.	Coanda Curb Inlet Filter	X	X	X			X	
Coanda, Inc.	Coanda Downspout Filter	X						
CONTECH Stormwater Solutions Inc.	CDS™ Stormwater Treatment System	X	X	X		X		
CONTECH Stormwater Solutions Inc.	Stormfilter using ZPG Media	X	X	X		X	X	
CONTECH Stormwater Solutions Inc.	UrbanGreen BioFilter	X	X	X		X		X
CONTECH Stormwater Solutions Inc.	VortClarex	X	X	X		X		
CONTECH Stormwater Solutions Inc.	Vortechs System	X	X	X		X	X	X
CrystalStream Technologies	CrystalClean Separator	X	X				X	X
CrystalStream Technologies	CrystalCombo Hybrid Polisher	X			X		X	X
DeepRoot Partners	Silva Cell	X		X	X	X		X
EcoSense International	EcoSense™ Stormwater Filtration Systems	X			X		X	
EcoSense International	EcoVault™ Baffle Box	X					X	
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 100	X	X	X			X	X
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 1000	X	X	X			X	X
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 4000	X	X	X			X	X
Eco-Tec, Inc.	Adsorb-It	X	X				X	X
Enviro-Drain, Inc.	Enviro-Drain®	X	X					
Environment 21	EnviroTrap Catch Basin Insert	X	X	X			X	
Environment 21	PuriStorm	X	X					
Environment 21	UniScreen	X	X	X			X	
Environment 21	UniStorm	X	X	X		X	X	
Environment 21	V2B1 Treatment System	X	X	X			X	
Environmental Filtration, Inc.	Raynfiltr™	X	X					
Fabco Industries, Inc.	StormBasin™	X	X			X	X	X
Fabco Industries, Inc.	StormPod™	X	X			X	X	X
Fabco Industries, Inc.	StormSafe™ Helix	X			X	X		
Filterra, DBAAmericast, Inc.	Filterra® Roofdrain System		X		X	X		X
Filterra, DBAAmericast, Inc.	Filterra® System		X		X	X		X
Hancor, Inc.	Hancor Storm Water Quality Unit	X		X		X	X	X
Huber Technology, Inc.	HUBER Hydro Filt	X			X			
Hydro International, Inc.	Downstream Defender	X	X	X		X		X
Hydro International, Inc.	Up-Flo™ Filter	X	X	X		X	X	
Hydroworks	HydroFilter				X			
Hydroworks	HydroGuard	X	X			X	X	X
Imbrium Systems Corp	Jellyfish™ Filter	X	X	X		X		X

Appendix C Index (by Manufacturer/Vendor Name)

Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Graphic/ Schematic	O&M Manual	Testing	Other
Passive Treatment Systems (cont.)								
Imbrium Systems Corp	Sorbtive™ FILTER	X	X			X	X	X
Imbrium Systems Corp	Stormceptor®	X	X	X		X		X
Kristar Enterprises, Inc.	FloGard+PLUS®	X	X			X		X
Kristar Enterprises, Inc.	FloGard® Downspout Filter	X	X			X		
Kristar Enterprises, Inc.	FloGard® Dual-Vortex Hydrodynamic Separator	X	X			X		
Kristar Enterprises, Inc.	FloGard® LoPro Matrix Filter	X	X			X		
Kristar Enterprises, Inc.	FloGard® LoPro Trench Drain Filter	X	X			X		
Kristar Enterprises, Inc.	Flo-Gard® Trash & Debris Guard	X	X			X		
Kristar Enterprises, Inc.	Perk Filter™	X	X			X		
Kristar Enterprises, Inc.	SwaleGard® Pre-filter	X	X			X		
Kristar Enterprises, Inc.	TREEPOD® Biofilter	X	X			X		
Modular Wetland Systems, Inc./ BioClean Environmental Services, Inc.	Modular Wetland System – Linear	X	X	X		X	X	X
Nyloplast/Hancor, Inc.	SNOUT®	X						
Nyloplast/Hancor, Inc.	Storm PURE™	X						
Park USA	StormTrooper®	X	X					X
Park USA	StormTrooper® EX Extra-Duty	X	X					X
PSI International, Inc.	PSI Separator				X	X		X
Revel Environmental Manufacturing, Inc./ CONTECH Stormwater Solutions Inc.	Triton Drop Inlet Insert	X	X	X		X	X	
Rotondo Environmental Solutions, LLC	Perimeter Sandfilter (Delaware Sandfilter)		X					
Rotondo Environmental Solutions, LLC	Underground Sandfilter (DC Sandfilter)		X					
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoLine A®	X	X					
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoLine B®	X	X		X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoSep®	X	X	X		X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoStorm ®	X	X	X	X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoStorm Plus®	X	X	X	X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoTop®	X	X	X				
Stormdrain Solutions	Inceptor®	X					X	X
StormwateRx	Aquip® Enhanced Stormwater Filtration System	X			X			
StormwateRx	Clara® Gravity Stormwater Separator Vault	X			X			
Terre Hill Concrete Products	Terre Kleen™		X	X				X
Transpo Industries, Inc.	EnviroSafe™	X						
Transpo Industries, Inc.	EnviroSafe™ Storm Safe HF10	X				X		
United Storm Water, Inc.	DrainPac™		X	X		X	X	X

The contents of this appendix are provided on a CD

APPENDIX D

Excel Versions of Tables 3 through 12

The contents of this appendix are provided on a CD