

*Gutter Bin® Eco Curb Inlet Filter (CIF)*



# FROG CREEK PARTNERS, LLC

Device Application for Full Trash Capture  
Certification of the Gutter Bin® Eco Curb Inlet  
Filter and the Mundus Bag® water filter

## 1. Cover Letter

November 8<sup>th</sup>, 2019

Ms. Eileen Sobeck  
Executive Director  
California State Water Resources Control Board  
Division of Water Quality  
P.O. Box 100  
Sacramento, CA 95812-100

**Re: Application for Trash Treatment Control Device – Gutter Bin® Eco Curb  
Inlet Filter & Mundus Bag® water filter**

Dear Director Sobeck:

Frog Creek Partners, LLC is pleased to submit this **updated** application for Certification as a Full Capture System - Trash Treatment Control Device for the Gutter Bin® Eco Curb Inlet Filter. We submit this application in accordance with the California State Water Resources Control Board Trash Treatment Control Device Application Requirements and it includes the following minimum requisite sections:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Information
5. Operation and Maintenance Information
6. Reliability Information
7. Field/Lab Testing Information and Analysis

I appreciate your review of our application and the work that you do to keep our watersheds clean. If you require additional information, please feel free to contact me at [brian@frogcreek.partners](mailto:brian@frogcreek.partners) or 307.439.9570.

With kind regards,



Brian Deurloo  
President & Founder  
Frog Creek Partners

## 1.A. General description of the Device.

The patent pending Gutter Bin® stormwater filtration system Eco Curb Inlet Filter (“CIF”) is a proven permanent or temporary stormwater filter for use in removing pollution from stormwater curb inlet model catch basins. The CIF consists of five general parts: 1) the suspension frame, 2) the filter hanger, 3) the gutter channel spanning the inlet opening 4) the interface funnel that transports stormwater from the gutter channel to the filter hanger, and 5) the Mundus Bag® water filter. The CIF may also be referred to as “Device” or “Devices” in the remainder of this application.

The CIF is installed directly under the curb inlet’s existing manhole cover and within the catch basin. The CIF is suspended by three (3) or more concrete anchor bolts from the top of the curb inlet’s catch basin. Alternatively, The CIF can be suspended from an adjustable manhole frame hanger (MFH) that is placed on the manhole’s shelf.

In either installation method, the CIF’s filter hanger is suspended below the inlet’s manhole below to a depth that allows stormwater to flow from the gutter channel, then into the interface funnel, and then into the filter hanger with Mundus Bag. The Mundus Bag can be pulled out through the manhole cover during service.

A gutter channel is installed with concrete anchor bolts spanning the curb inlet opening with its base slightly below the bottom lip of the curb inlet opening. The gutter channel is installed with a slight downward slope towards the interface funnel to facilitate water flow and prevent clogging from trash. Most standard installations of the CIF have a gutter channel on either side of the interface funnel to accommodate the manhole location as the gutter channel or the interface funnel must span the entire width of the curb inlet opening to ensure full trash capture. When the edge of a manhole opening is located less than six (6) inches from the wall of a catch basin, then a gutter channel is likely not required on that side of the curb inlet opening because the interface funnel is wide enough to touch the catch basin wall thereby capturing all water from that side of the curb inlet. If the edge of the manhole opening is farther than six (6) inches away from the wall of the catch basin, then a gutter channel is likely required.

The interface funnel is bolted to the wall below the curb inlet opening and in line with the manhole opening. The interface funnel diverts water from the gutter channel and into the filter hanger so water can flow downward through the Mundus Bag. All parts of the CIF overlap to create a shingle effect, so water and pollution is not lost at the transitions.

A removable and flexible Mundus Bag® (“MB”) water filter is placed in the circular receiver of the Device’s filter hanger. The reusable or single-use MB, when used in conjunction with the Device, captures 100% of trash 5mm or greater in size because the

Mundus Bag's maximum orifice size is less than 5mm. The MB drops into the Device's filter hanger receiver and captures target pollutants while retaining pollution with a backflow preventer integrated into the MB. The

The modular and scalable design of the Device allows it to fit within a variety of curb inlet storm drain configurations and sizes. The Device captures a wide range of pollutants including trash, gross pollutants, vegetative waste, sediment, hydrocarbons, and heavy metals. The Device is a passive, gravity flow device that can allow water to bypass the MB in high flow events by overflowing the filter hanger and gutter channel, thereby minimizing flooding risks. The Device also allows water to bypass (aka overflow) even if the MB is 100% full of material or if stormwater flow exceeds the Mundus Bag's hydraulic capacity. The Device requires routine maintenance to remove captured pollutants and/or replace filtration media on an as-needed basis.

The patent pending Mundus Bag® water filter is a customizable filter media that is used in conjunction with Gutter Bin® stormwater filtration system products to remove 100% of trash from stormwater inlets. The Mundus Bag (MB) can be adjusted to different lengths and cleaned through the bottom of the filter, rather than just the top like all other types of stormwater filters. Frog Creek Partners ("FCP") offers a variety of sizes and filtering configurations to suit the customer's and environment's needs. The MB's flexible design allows it hang straight or bend within irregularly shaped or shallow catch basin. Total trash capture model Mundus Bags (TTC-MB) are reusable and are standard on all Devices. Other Mundus Bags that provide additional filtration are optional and may have limited reusability.

The MB may embody additional filtration media to enhance filtration capabilities including but not limited to:

- 1) MYCELX filter media. MYCELX is an anti-fungal, anti-microbial and certified environmentally safe media that removes fuel, oil, grease, emulsified oils, pesticides, and heavy metals from water;
- 2) Proprietary activated carbon-based filtration pillows for heavy metal removal;
- 3) Non-woven or woven filter material (usually geotextile); and/or
- 4) Perforated metal filter basket (with or without a releasable bottom closure).

## 1.B. The applicant's contact information and location.

### Corporate contact at manufacturing facility:

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Frog Creek Partners, LLC  
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Casper, WY 82601  
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## 1.C. The Device's manufacturing location.

Frog Creek Partners' products are designed and manufactured in the United States. FCP engages multiple manufacturing subcontractors to produce all or part of the metal and fabric components with strict QA/QC oversight by Frog Creek Partners. Gutter Bin Eco Curb Inlet Filters are assembled at the FCP manufacturing facility in Casper, Wyoming and the MBs are fabricated in Casper, Wyoming.

## 1.D. A brief summary of any field/lab testing results that demonstrate the Device's functions as described within the application.

The Frog Creek Partners' CIF and Mundus Bag water filter successfully captured and retained 100% of trash 5mm or greater in size in multiple tests in water flows that exceeded a design one-year, one-hour storm event. Repeated tests successfully captured cigarette butts and trash without resuspension given the MB's high storage capacity, low differential pressure, and backflow preventer. The MB's large screen openings (less than 5mm in size) allowed ample hydraulic capacity and did not blind from sand and sediment loading.

Multiple third party validated field and lab tests proved the Devices' successful performance. FCP conducted the lab test at FCP headquarters in Casper, Wyoming. FCP used a "trash recipe" as recommended by Stormwater Environment Manufacturers Association (SWEMA). The Device captured 100% of the trash recipe in flowrates ranging from 15 gpm to 500 gpm. Multiple MB models were tested to ensure that the both the TTC-MB (Total Trash Capture MB) and the TDS-MB (Trash, Debris & Sediment MB) performed to State Water Resource Control Board ("SWRCB") requirements for 100% trash capture.

100% trash capture test results = SUCCESSFUL - PASS TEST.

## 1.E. A brief summary of Device limits, and operational, sizing, and maintenance considerations.

### **Limitations**

The Device's limitations are one of the CIF's strongest attributes as the product has few limits. MB does have limited capacity to hold pollutants before it needs to be replaced or evacuated, but this can be solved by installing the largest MB possible for the catch basin and by scheduling regular maintenance. Field test prove that a 13" MB can hold over 150 pounds of sediment and a 16" MB can hold over 200 pounds of sediment if both are fastened at a depth of approximately 3.5 feet below the Mundus Hoop. Industrial grade thread and high-quality sewing prevent the MB from ripping. The MB can be configured to capture sediment, heavy metals, hydrocarbons and 100% of trash. The UV protected and industrial strength fabric used in the MB may need replacement every one (1) to two (2) years depending upon the fabric or filter media used. To avoid fabric limitations, a metal basket of the anticorrosive type may be used to maximize filtration media life. The fabric style MB is preferred because of its ease of maintenance and flexible nature.

### **Operation**

The Device has very few moving parts and is a passive filtration device. Once installed, minimal operational oversight is required except during servicing. One can easily introduce vector controls in, around, or below the Device. The vector control devices/media can be placed in one of many locations around the Device including:

- 1) attached to the surface of the filter hanger or frame;
- 2) inside the Mundus Bag;
- 3) placed on the gutter channel of the CIF so the vector control material is washed into the catch basin during the next storm;
- 4) through the manhole and below the CIF in the catch basin; or
- 5) attached to the exterior of the MB's tail to act as a wick during moisture events.

### **Sizing**

FCP offers custom made and adjustable Devices to fit a plethora of curb inlet configurations. For most installations, the only personalized element is the length of the Device's gutter channel which is the dependent upon the length of the inlet's opening. For curb inlets with multiple manholes, the Device may be installed with one or more filter hangers to maximize filtration and flow. FCP (or designee) measures and records each catch basin prior to engineering so the fit and function align with the Engineer's requirements for a specific application. The Device's unique suspension methods

means it will fit into in almost any curb inlet. Additionally, the distance by which the filter hanger is suspended below the curb inlet's manhole and the overall MB length can be adjusted so that the Devices can fit both deep and shallow curb inlet catch basins with varying hydraulic capacities and overflow requirements.

## **Maintenance**

The Device is one of the most easily maintained curb inlet filters on the market.

Experience has shown that the **CIF and MB can be manually cleaned within three to five minutes per maintenance cycle**. The Device, as all storm drain filter systems, has its own unique maintenance interval requirements that depend upon local climate, pollution load, staffing, and network infrastructure. Low traffic area installations may only need to be inspected and/or maintained once per year. High traffic areas with frequent gatherings of people and sensitive discharge requirements may require monthly Device inspection and/or maintenance. FCP recommends that **each Gutter Bin be inspected at least twice per year to ensure proper function and filtration**.

Maintenance frequency is also driven by the intensity of filtration efforts. For example, industrial facilities who require sediment, heavy metal, hydrocarbon, and trash (SHHT) removal may need more frequent inspection to stay in compliance with their industrial general permit (IGP). FCP offers the SHHT-MB to remove the aforementioned contaminants. Maintenance is performed by removing the inlet's manhole cover, visually inspecting the Device, and removal/replacement of the filter media and MB. Depending on the type of MB used, it may either be emptied of pollutants and reused; or the MB may be disposed of and replaced. Once maintained, the inlet cover is replaced.

### **1.F. Description or list of locations where Device has been installed.**

The city of Santa Maria, California is the site of a successful field test of the Device since January 2019. The customer performs the service at these locations.

Outside of California, the following cities use the Devices for stormwater pollution capture:

- Parker, Colorado
- Colorado Springs, Colorado
- Denver, Colorado
- Sheridan, Wyoming

References available upon request.

### 1.G. Certification Clause.

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*



Brian Deurloo  
President  
Frog Creek Partners, LLC



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## Table of Acronyms

<b>Abbreviation or Acronym</b>	<b>Explanation</b>	<b>Abbreviation or Acronym</b>	<b>Explanation</b>
		<i>l</i>	liters
<i>AOS</i>	apparent opening size	<i>lbs</i>	pounds
<i>ARS</i>	automatic retractable screen	<i>m</i>	meters
<i>bbls</i>	barrels	<i>MB</i>	Mundus Bag® water filter
<i>BFP</i>	back flow preventer	<i>MFH</i>	manhole frame hanger
<i>BMP</i>	best management practice	<i>MH</i>	Mundus Hoop
<i>CAMP</i>	Clean and Measure Pollution Service	<i>min</i>	minutes
<i>CDC</i>	Center for Disease Control	<i>mm</i>	millimeters
<i>CFS</i>	Channel Filter System	<i>MS4</i>	municipal separate storm sewer system
<i>cfs</i>	cubic feet per second	<i>MVCAC</i>	Mosquito Vector Control Assoc. of California
<i>CIF</i>	Curb Inlet Filter	<i>ND</i>	non detect
<i>cm</i>	centimeters	<i>NDA</i>	nondisclosure agreement
<i>COB</i>	close of business	<i>NJCAT</i>	New Jersey Corporation for Advanced Technology
<i>CRM</i>	customer relationship manager	<i>NPDES</i>	National Pollutant Discharge Elimination System
<i>CSS</i>	combined sewer system	<i>OD</i>	outside dimensions
<i>dia</i>	diameter	<i>OGB</i>	Original Gutter Bin
<i>DIF</i>	Drop Inlet Filter	<i>PCT</i>	Patent Cooperation Treaty
<i>DIF-C</i>	Drop Inlet Filter for Combination inlets	<i>PE</i>	professional engineer
<i>dP</i>	differential pressure	<i>POA</i>	percent open area
<i>EOP</i>	end of pipe	<i>PPE</i>	personal protection equipment
<i>EOY</i>	end of year	<i>PPP</i>	public private sponsorships
<i>EPA</i>	Environmental Protection Agency	<i>PSI</i>	pounds per square inch
<i>FCP</i>	Frog Creek Partners	<i>s</i>	seconds
<i>FH</i>	Filter Hanger	<i>SAT</i>	suspender anchor tab
<i>ft</i>	feet	<i>SHHT</i>	Sediment, Heavy Metals, Hydrocarbons, Trash
<i>ga</i>	gallons	<i>SPCC</i>	Spill, Prevention Control, and Countermeasure
<i>GAC</i>	granulated activated carbon	<i>SS</i>	stainless steel
<i>GB</i>	Gutter Bin® stormwater filtration system	<i>SWEMA</i>	Stormwater Environment Manufacturers Assoc.
<i>GPM</i>	gallons per minute	<i>SWPPP</i>	Stormwater Pollution Prevention Plan
<i>ID</i>	inside dimension	<i>SWRCB</i>	Stormwater Resources Control Board
<i>IF</i>	Interface Funnel	<i>TAPE</i>	Technology Assessment Protocol - Ecology
<i>IFE</i>	interface funnel extender	<i>TDS</i>	trash debris & sediment (for Mundus Bags)
<i>IGP</i>	Industrial General Permit	<i>TDS</i>	total dissolved solids (for water sampling)
<i>in</i>	inches	<i>TMDL</i>	Total Maximum Daily Load
<i>IP</i>	Intellectual Property	<i>TSS</i>	total suspended solids
		<i>TTC</i>	total trash capture
		<i>UGF</i>	Under Grate Frame
		<i>USPTO</i>	United States Patent and Trademark Office

## 3. Physical Description

### 3.A. Description of how the Device works to trap all particles that are 5mm or greater in size and how it is sized for varying flow volumes.

The Devices use gravity and overlapping parts to direct stormwater water along the gutter channel, across the interface funnel and onto the filter hanger where the MB is situated. The filter hanger has a backsplash that directs all water and pollution from a

design storm into the MB water filter while allowing bypass in high flow events. There are no holes in the CIF or MB that exceed 5mm in size. The MB hoop diameter is slightly larger than the receiver's diameter in the filter hanger thereby preventing the MB hoop from falling through the receiver. The Device's filter hanger positions the MB below the catch basin's manhole for easy access during inspection and servicing. For curb inlets with multiple manholes, the Device may be installed with one or more filter hangers to maximize filtration and flow. When double manholes are present and only one filter hanger is used, it is best to install the filter hanger in the manhole that is farthest downstream to minimize costs and capture more trash.

Devices are sized to fit each catch basin. As a result, the Device size is directly proportional to the size of the catch basin and performance characteristics generally scale with the increase overall hydraulic capacity of a larger frame. The Device's gutter channel is adjusted for length to span the entire length of the inlet opening and height to fit the depth of the catch basin. The area above the top of the Device's gutter channel and filter hanger backsplash is where water can bypass (aka overflow) if water flow exceeds the MB hydraulic capacity. The greater the distance between the catch basin's roof and the top of the CIF components equates to greater overflow capacity. In the event where the center of the manhole opening is greater than 20" away from the catch basin wall towards the inlet opening, then the system may require an interface funnel extender to bridge the gap. The CIF overflow capacity will meet or exceed pre-existing hydraulic capacity of the catch basin outlet pipe if correctly installed and as directed by the Engineer.

The Device and the MB incorporate the following design features to ensure full capture of all particles 5mm or greater in size:

- An adjustable backflow preventer at the mouth of the MB prevents resuspension or expulsion of captured pollutants in times of high precipitation or system backflush;
- High flow and downward pressure of water causes trash to pack near the bottom of the MB; and
- No holes in the Device or MB that exceed 5mm in size except in bypass area.

The filter media normally comprises of polypropylene netting material with a maximum aperture size of less than 5mm in size. An expandable and adjustable backflow preventer at the entrance to the filter media can expand to accept larger trash during high flow and can constrict at low flow, thereby capturing and retaining 100% trash. The bottom of the MB is fastened to prevent trash loss but can be opened during service to allow pollutants to drop out for bag reuse.

The MB's net material has excellent wear & tear characteristics, UV protection, and chemical resistance. The MB's flexible structure allows installation in a variety of environments and catch basin configurations. The net material normally comprises of polypropylene or propylene but can be substituted with any other suitable material(s) (i.e. plastic, fiberglass, fabric, carbon, etc.) that capture trash 5mm or greater in size. FCP can also offer a more rigid style filter media in the form of a perforated basket constructed of plastic, stainless steel, carbon, or other material that suits the environment and customer's needs. The rigid style basket offers greater longevity with the same 100% trash capture capabilities but, is less flexible in pollutant removal capabilities and shape.

A typical MB for CIF applications comprises of:

- **Mundus Hoop ("MH"):** a reusable hoop that serves as a rigid connection mechanism between the MB and the Device's filter hanger and receiver. The MH can also be permanently integrated to the MB;
- **Anchor Wrap:** industrial grade fabric and expandable closure located at the top of the MB to fasten the MB to the MH.
- **Lifting Strap:** a strap attached to the anchor wrap allows for easy handling and weighing of the MB;
- **Backflow Preventer ("BFP"):** an adjustable and flexible device located at the inlet of the MB to prevent captured pollutants from escaping the filter during high water flow or system backflush;
- **Filter Media ("FM"):** a porous media incorporated to the MB that allows water to flow through while capturing target pollutants. A typical FM used with the trash capture MB is a chemical and UV resistant polypropylene netting with a 4mm maximum aperture size. Alternative filter media such as geofabric, MYCELX, and activated carbon can also be used to capture sediment, hydrocarbons, and heavy metals. Alternatively, a removeable perforated rigid basket can be used as a gross pollutant trap; and
- **Bag Tie:** a removable fastener attached to the end of the MB to provide closure. A removable bag tie allows a service technician to dump contents from the bottom of the MB.

FCP can provide specialty MYCELX infused products to safely capture and retain hydrocarbons from stormwater in a plethora of configurations and environments. FCP is seeking partnerships and facilities to explore ways to recycle components of the MB water filter and its captured pollutants.

The patent pending Mundus Bag has many advantages, including:

- 100% trash capture and retention;
- Easily cleaned - pull, dump, replace;
- High quality; UV resistant, chemical resistant, tear resistant material;
- Flexible tubular shape – fits in more places than rigid baskets;
- Adjustable and expandable backflow preventer – opens/closes to accept large pollutants and prevents loss of captured pollutants;
- Adjustable height – for shallow and deep applications;
- Customizable filtration – targeted pollution removal to fit the environment;
- Easily lifted – lifting strap allow person or machine to lift and weigh bag;
- Reusable – the total trash capture (TTC) model is reusable;
- Disposable – The TTC-MB and TDS-MB can also be thrown away;
- Closure strap – the MB can be cinched up tight on both ends to encapsulate trash for cleaner disposal;
- No vac truck needed – an industrial vac truck requires a lot of maintenance, it's highly intensive to run, and the removed pollutants from other devices must be decanted, loaded and hauled to a dump;
- Cleaned by vac truck – a vac truck crew can evacuate the contents of an MB with proper instruction by FCP and minor alterations to the standard MB;
- Minimal waste handling – the MB and/or the trash only needs to be handled once. Where a vac truck requires the waste to be handled three times (suck, decant, load, haul, dump at landfill;
- MYCELX capable – one of the cleanest hydrocarbon capture medias on the market. So much so, it is approved for use in the Galapagos National Park for bilge water cleaning; and
- Environmentally friendly - FCP is seeking partnerships and facilities to explore methods to recycle components of the MB water filter and/or its captured pollutants.

### 3.B. Design drawings for all standard Device sizes including dimensions, and alternative configurations.

Please refer to Appendix C for design drawings and Device specifications. The Device can be installed via two methods: suspended by three (3) or more concrete anchors placed near the top of the curb inlet's catch basin or suspended from an adjustable manhole frame hanger placed on the manhole's shelf. For some catch basins where the distance between the center of manhole and the curb inlet opening is greater than 20-inches, an optional interface funnel extender can be used to span the distance between the CIF's interface funnel and its filter hanger. Typically, the filter hanger and interface funnel are common parts while the gutter channel and the optional interface funnel

extender can be cut to fit the specific application. The two suspension options mean that the Device will fit in almost any curb inlet catch basin. Additionally, the distance by which the filter hanger is suspended below the MFH and the overall MB length can be adjusted so that the Devices can fit both deep and shallow catch inlet catch basins with varying hydraulic capacities.

The Device is engineered to fit the following catch basin dimensions:

- Curb inlet opening (open area measured parallel to the street): 12 inches to 30+ feet (or longer for custom built)
- Manhole Diameter (measured from wall to wall): 12 to 48 inches
- Catch Basin Depth (measured from the bottom lip of the catch basin mouth): 24 inches minimum depth

The Device can be altered, or custom made to suit the customer's need and the environment in which it operates.

The alternative Device configurations comprise of:

1. **Concrete Anchor Point Suspension:** the preferred method to anchor and suspend the filter hanger is with three stainless-steel suspenders from three anchor bolts drilled and set into the concrete opening below the manhole cover. Suspender anchor tabs (SAT) connect the concrete anchor bolts to the suspenders. The suspenders may be either chain or a rigid bar. The Device's filter hanger is suspended by three (3) concrete anchors from the top of the curb inlet's catch basin; or
2. **Adjustable Manhole Frame Hanger:** An optional way to hang the filter hanger is with an adjustable manhole frame hanger (MFH). The MFH is an adjustable frame that rests below the manhole cover and engages the manhole frame to create a solid support in which to hang the filter hanger. The MFH is used when the catch basin frame lacks enough concrete or structure to drill and set concrete anchor bolts below the manhole cover. The Devices filter hanger is suspended from the MFH with three suspenders. The suspenders may be either chain or a rigid bar;
3. **Mundus Bag:** can be in flexible or rigid structure as described in the application;

### 3.C. If the Device is designed with an internal bypass, explain how the bypass only operates for volumes greater than the design storm.

The Device's bypass (aka overflow) is located above the filter hanger backsplash and the MB water filter. A secondary bypass exists above the gutter channel that is fastened

to the catch basin wall below the curb inlet opening. The bypass becomes active when stormwater flow exceeds the hydraulic capacity of the MB or when the MB is full of material. In bypass mode, the water spills over the side of the filter hanger backsplash and exits through the outlet pipe while the MB continues to filter stormwater. In the unlikely event that bypass above the filter hanger backsplash cannot accommodate the excessive water flow, then water can also bypass the Device above the gutter channel.

All TTC-MB and TDS-MB model Mundus Bags have the hydraulic capacity to easily accommodate a one (1) hour, one (1) year design storm event prior to entering bypass mode. During testing, the average size CIF for California installations repeatedly accommodated 500 gpm with several inches of freeboard remaining within the gutter channel and filter hanger that could accommodate several hundred more gallons of water per minute. See Appendix C for the hydraulic capacity information pertaining to the MB water filter.

The Device has an adjustable overflow that acts as an internal bypass. The adjustable overflow is defined by the space between the bottom of the catch basin's roof and the top of the filter hanger backsplash. This overflow can be adjusted by raising and lowering the filter hanger based on the hydraulic capacity needs of the environment and the relative catch basin depth. For example, if the catch basin has a 12" outlet pipe, then the Device overflow open area must be equal to or greater than the open area of the outlet pipe, in this case 113 sq. in. A CIF with 16" MB that is placed with the top of the backsplash just 2 inches below the catch basin roof will have a bypass open area of 120 sq. in. which exceeds the hydraulic capacity of a 12" outlet pipe. Most CIF installation are placed several inches (8 to 24") below the roof of the catch basin which results in an overflow capacity that will far exceed even large 24" outlet pipes. The adjustable overflow forms a space in which stormwater will overtop the edges of the filter hanger and cascade down to the bottom of the catch basin. Therefore, the unique design of the Devices provides unparalleled overflow capability. The Engineer is responsible for confirming that the flowrate and bypass capacity of the Device meet or exceed infrastructure and hydraulic capacity requirements.

The Engineer is a person who designs, builds, specifies or maintains stormwater infrastructure for FCP's customer or end-user.

### **3.D. Engineering plans/diagrams for a typical installation.**

Typical installation configuration engineering plans may be found in Appendix C.

### **3.E. Photographs, if any, of pre-and post-installation examples.**

Photographs showing the typical installation of the Device are found below.





*Image 1 - Pre-installation view showing CIF components*



*Image 2 - Pre-installation view showing optional adjustable MFH*



*Image 3 - Pre-installation view showing gutter channel*



*Image 4 - Determining proper placement of the gutter channel*



*Image 5 - Marking initial anchor bolt position prior to drilling*



*Image 6 - Drilling initial anchor bolt for gutter channel*



*Image 7 - Installation of the gutter channel using gussets*



*Image 8 - Installation of interface funnel*



*Image 9 – Test fitting optional adjustable MFH and determining ideal distance from which to suspend the filter hanger*



*Image 10 - Assembling optional MFH, filter hanger and suspenders prior to installation in catch basin*



*Image 11 - Attaching the final suspender to the rear/north side of the filter hanger after installation*



*Image 12 - Installation of Mundus Bag*



*Image 13 - Fully installed CIF with interface funnel, filter hanger, and MB (TTC-MB) viewed from above*

### 3.F. Device maximum trash capture capacity.

The calculation for the MB trash capacity is very simple with the formula (*radius and height in inches*):

$$(3.14 \times r^2 \times h) / 1,728 = \text{volume (cu. ft.)}$$

$$(\pi) \times (\text{radius squared} \times \text{height}) / (1,728 \text{ cubic inches/ft}^3) = \text{volume in cubic feet}$$



Table 1 - Mundus Bag® water filter specifications

Model	Bag dia (inches)	Max capacity (cu.ft)	Aperture size - particle retention (mm) (X 1000 for micron)	Min/Max length of filter (in)	Max capture load (lbs)	Max load rating of filter bag (lbs)	Empty bag flow rate (gpm)	Reusable	Est. useful life (months)
TTC-9	9	1.77	3.5	12/48	33	291	1,037	Yes	6-18
TTC-9D*	9D	1.77	3.5	12/48	33	291	2,074	Yes	6-18
TTC-13	13	3.14	3.5	12/48	59	517	2,153	Yes	6-18
TTC-14	14	4.27	3.5	12/48	80	704	2,615	Yes	6-18
TTC-16	16	5.58	3.5	12/48	104	920	3,447	Yes	6-18
TDS-9	9	1.77	0.21	12/48	242	291	1,037	No	3-12
TDS-9D*	9D	1.77	0.21	12/48	242	291	2,074	No	3-12
TDS-13	13	3.14	0.21	12/48	431	517	1,935	No	3-12
TDS-14	14	4.27	0.21	12/48	587	704	2,125	No	3-12
TDS-16	16	5.58	0.21	12/48	766	920	2,428	No	3-12
HST-9	9	1.77	0.21	12/48	242	291	1,037	Partial	3-12
HST-9D*	9D	1.77	0.21	12/48	242	291	2,074	Partial	3-12
HST-13	13	3.14	0.21	12/48	431	517	1,935	Partial	3-12
HST-14	14	4.27	0.21	12/48	587	704	2,125	Partial	3-12
HST-16	16	5.58	0.21	12/48	766	920	2,428	Partial	3-12
SHHT-9	9	1.41	0.10	24/72	194	233	410	Partial	3-12
SHHT-9D*	9D	1.41	0.10	24/72	194	233	820	Partial	3-12
SHHT-13	13	2.51	0.10	24/72	242	414	581	Partial	3-12
SHHT-14	14	3.42	0.10	24/72	431	563	637	Partial	3-12
SHHT-16	16	4.47	0.10	24/72	587	736	728	Partial	3-12

Please refer to the MB specification sheet in Appendix C for specific filter media capacities.

The same sizing variances can be applied to the rigid style filter media for maximum trash capture and extended service intervals. Field experience has shown that the 13" total trash capture model Mundus Bag (TTC-MB) can easily hold up to 70 pounds of trash and debris. Additionally, field experience demonstrates that a 13" TDS-MB can hold over 150 pounds of sediment and a 16" TDS-MB can hold over 200 pounds of sediment when both are fastened at a depth of approximately 3.5 to 4 feet below the Mundus Hoop.

### 3.G. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes.

Please refer to the MB spec sheet in Appendix C for specific filter media hydraulic capacities.

The Devices and MB are designed for a filtering hydraulic capacity of at least a one (1) hour, one (1) year storm event. The smallest diameter total trash capture MB (TTC-9) can accommodate a flowrate of 2.31 cfs (1,037 gpm) when empty or half full. If a flowrate into a storm inlet exceeds the maximum flowrate capacity of an MB, then the water will bypass the MB water filter through the overflow and thereby minimizing the risk of localized flooding.

Table 2 - Hydraulic capacity & trash capture volume for Mundus Bag model MB-TTC

Mundus Bag dia. (in)	MB length (in)	Max flowrate of empty MB (cfs)	Max flowrate of MB half full (cfs)	Max capture volume (ft <sup>3</sup> )
<b>9</b>	48	2.31	2.31	1.77
<b>13</b>	48	4.80	4.80	3.14
<b>14</b>	48	5.83	5.83	4.27
<b>16</b>	48	7.68	7.68	5.58

\* Additional sizes of Mundus Bags may be added to product line to suit customer's needs. Any new sized MB's will meet or exceed a design storm as required by the State Water Board with 100% trash capture.

The differential pressure (dP) created by the Device and MB is negligible when empty. The Device offers minimal flow resistance. The dP increases as the MB accumulates trash. The system maintains full hydraulic capacity until the MB is approximately 75% full. At this point, water accumulates on the filter hanger until such time that it overtops the walls of the filter hanger and enters bypass mode.

As an example of the high flow capabilities of the Device, in a controlled test environment FCP introduced trash and 1.14 cfs (500 gpm) of water to a CIF equipped with a 16" TTC-MB model MB. The tests were also performed using the TDS-MB model MB with excellent results. The Device still maintained 100% trash capture and complete water flow through the MB without bypass. Therefore, a properly sized Device can easily and effectively capture 100% of trash in a high flow environment and especially during the first flush.

The Device is also highly capable of catching 100% of gross pollutants 5mm or greater in size during non-stormwater discharge (aka dry weather runoff). All low flow water and pollution is funneled into the MB. The first flush of a rainstorm will push any pollutants into the MB that may be deposited on the gutter channel of the Device because the dry weather runoff may have lacked the volume to transport the pollutants into the MB.

### 3.H. Each material and material grade used to construct the Device.

The Device and MB are constructed of durable, weather resistant, high strength materials to provide a long service life. The materials used in the construction of the Device and the MB are as follows:

- **Concrete Anchor Bolts:** Stainless steel (SS) of varying gauge;
- **Suspender Anchor Tabs (SAT):** Stainless steel (SS) of varying gauge;
- **Device Filter Hanger:** SS of varying gauge;
- **Filter Hanger Suspenders:** SS of varying gauge, SS chain or rigid bar, and/or plastic;

- **Mundus Bag Hoop:** SS, fiberglass, or plastic of varying diameter or gauge;
- **Mundus Bag Anchor Fabric:** marine grade, environmentally safe material;
- **Mundus Bag Lifting Handle:** marine grade webbing;
- **Mundus Basket:** SS of varying gauge with orifice opening less than 5mm in size (rigid alternative to MB);
- **Mundus Bag Netting Outer Shell:** polypropylene, propylene, or similarly durable fabric with orifice opening less than 5mm in size;
- **Mundus Bag Closure Fastener:** industrial grade zip tie (or other approved device);

FCP uses stainless steel (SS) for the construction of the Devices but may use alternative environmentally safe materials for certain components (i.e. plastic, weathering steel, cast iron, carbon, fiberglass, rubber, silicone, etc.) if allowed by local, state and Federal regulations. California Device models are 100% stainless steel (or approved alternative). These materials are used throughout the entire line of Gutter Bin models and are the most durable materials available for these products. Adherence to current installation and maintenance procedures are required to ensure the design service life of the Devices and filter media.

### 3.I. Conditions under which the Device re-introduces previously trapped trash.

The Device is designed and engineered to capture and permanently retain all particles 5mm or greater in size. The backflow preventer (BFP) in the MB expands during high flow and restricts during low flow thereby capturing and retaining trash and pollution. The method in which the BFP captures and retains trash is similar to how a crab trap works - it is easy to enter but difficult to exit. Conditions in which the Device and MB might reintroduce previously trapped trash include:

- If the Device becomes blinded because it is not properly maintained and pollutants are allowed to accumulate beyond the specified allowable limit, then water may accumulate on the filter hanger to such an extent that it will overtop its walls and overflow, thus bypassing the Device's filtration system;
- If the MB is damaged, then it may cause a condition that would allow for the reintroduction of captured pollutants. The filter media should be replaced if holes appear that are greater than 5mm in size;
- Unusual weather events that exceed the filter flow capacity of the Device may cause a condition that would allow for the re-introduction of captured pollutants.
- Backflow of the stormwater network may cause pollutants to reintroduce to the system. Backflow may be caused by a downstream stormwater network

obstruction or from extreme tidal flows near coastal installations. The MB backflow preventer will prevent most, if not all, of the previously captured trash from escaping.

### 3.J. Estimated design life of the Device.

The CIF has a design life of 25 years assuming the proper installation, maintenance and service of the Device. The total trash capture (TTC-MB model) MBs are reusable and have a service life of one (1) to two (2) years, depending upon site conditions. Trash, debris and sediment (TDS model) MBs with a liner and are a single use filter with a maximum service life of 12 to 18 months, depending upon site conditions.

### 3.K.

Removed at the direction of the California State Water Resources Control Board.

### 3.L. Optional components.

FCP offers the following optional components:

1. **Manhole Frame Hanger Suspension:** An optional way to hang the filter hanger is with an adjustable manhole frame hanger (MFH). The MFH is an adjustable frame that rests below the manhole cover and engages the manhole frame to create a solid support in which to hang the filter hanger. The MFH is used when the catch basin frame lacks enough concrete or structure to drill and set concrete anchor bolts below the manhole cover. The Devices filter hanger is suspended from the MFH with three suspenders. The suspenders may be either chain or a rigid bar;
2. **Interface Funnel Extender:** In instances where the center of the manhole is located 20" or more from the curb inlet opening, then an interface funnel extender can bridge this gap between the interface funnel and filter hanger; and/or
3. **MYCELX Filter Media:** MYCELX is an anti-algal, anti-microbial, and certified environmentally safe material proven to remove all or part of fuel, oil, grease, emulsified oils, pesticides, and heavy metals from stormwater. MYCELX is not required for full trash capture but FCP provides it as an optional filter media for use in the MB.
4. **Mundus Bag Sediment Liner:** nonwoven or woven fabric of varying thickness and sieve rating can be used as well as other effective medias;
5. **Mundus Bag Proprietary Granulated Activated Carbon (GAC):** a proprietary mixture of environmentally safe media for heavy metal removal also known as Performer™.
6. **Vacuum Truck Friendly MB:** One of the main attributes of the Gutter Bin stormwater filtration system and the Mundus Bag water filter is that together they

provide measurable and quantifiable results. This is because the MB is removable so it can be individually weighed to determine how much pollution is being recovered over time and location. However, many organizations prefer to use vacuum trucks (aka “vac trucks” or “suck trucks”) because it is easy for them. For this reason, FCP offers a vac truck friendly MB that can be locked into the filter hanger and embodies a more robust filter media that stands up to the rigors of repeated vacuum cycles. The apparent opening size (AOS) for this media is less than 5mm in size to ensure full trash capture. The vac truck friendly MB comes in a rigid perforated SS basket form and a flexible fabric. The vac truck friendly MB fastens to the filter hanger in same way as the MB does and locks in.

It is important to note that the MYCELX Oil-Free Technology is proven to be an effective and safe hydrocarbon capture media that is used in sensitive areas around the world. MYCELX hydrocarbon capture media is approved by Lloyd's of London for environmentally friendly, type C emulsion, 99% hydrocarbon removal. MYCELX is approved for hydrocarbon removal in the Galapagos Islands, Galapagos National Park. Vessels operating in the Galapagos National Park Reserve are required to have a bilge water treatment system and MYCELX is approved for this application.

## 4. Installation Guidance

### 4.A. Device installation considerations.

Frog Creek Partners can provide detailed instructions in written format to the installer to ensure proper installation techniques. Further, FCP offers video instruction on our website and can also provide virtual reality (VR) videos for viewing with the installers' VR headset (FCP can also provide the customer/installer a VR headset for instructional purposes).

Device installation requires a hand trowel, wrench, hand level, silicone (optional), hammer drill with a masonry bit, a hammer, handheld grinder with cutting wheel, and grate puller (installs in 20 minutes for standard inlets with experienced crew and up to 60 minutes for unique curb inlet configurations).

### Size & Placement Considerations

The following instructions are the fitting procedures and considerations for the Device and MB installation:

1. **Measure & Quantify:** The most important measurements are described in a, b, c, d and e below, but the other catch basin dimensions that will prove useful are as follows:
  - a. length of the curb inlet opening measured parallel to the street



- b. distance between the manhole opening and the curb inlet opening (measured perpendicular to street)
  - c. diameter of the manhole opening and shelf
  - d. distance from the manhole shelf to the bottom of the curb inlet opening
  - e. total depth of catch basin from cover shelf to bottom of catch basin
  - f. internal width and length dimensions of the catch basin
  - g. distance between cover shelf and top of outlet pipe
  - h. position of the catch basin's manhole relative to the curb inlet opening (measured parallel to street)
  - i. diameter of outlet pipe
  - j. width and height of curb inlet opening
  - k. dimensions of any obstructions within the catch basin than may impede Device insertion (ladder, grouting, abnormal catch basin configurations)
  - l. thickness of manhole covering at perimeter and at the thickest point with two (2) inches (50mm) of the perimeter.
  - m. FCP can provide measurement data sheets or access to the FCP filed app for customers to record catch basin measurements
2. **Sizing:** Select or engineer the appropriately sized Device based on the catch basin dimensions. FCP provides custom built and adjustable Devices for unusual curb inlet applications;
3. **Mundus Bag Selection:** Select the appropriate MB model based on the following considerations:
- a. Device filter hanger MB receiver size. Multiple diameters of MBs are available (e.g. 9", 13", 14" and 16" as outlined in the MB spec sheet in Appendix C) to fit the different sized Devices;
  - b. FCP offers the following models of Mundus Bag:
    - TTC-MB (Total Trash Capture Mundus Bag): standard MB offered in California for 100% trash capture with an apparent opening size (AOS) less than 5mm. This MB can be selected to capture 100% of trash.
    - TDS-MB (Trash, Debris, & Sediment Mundus Bag): optional MB that is tested and proven to capture 100% of trash 5mm or greater in size plus sediment and debris. This MB can be selected to capture other pollutants in addition to 100% trash.
    - SHHT-MB (Sediment, Heavy metals, Hydrocarbons & Trash Mundus Bag): optional MB that is tested and proven to capture 100% of trash 5mm or greater in size plus sediment, heavy metals, and hydrocarbons. The MB embodies MYCELX filter

- media to target the hydrocarbons and heavy metals. This MB can be selected to capture other pollutants in addition to 100% trash.
- Vacuum Friendly Mundus Bag (VAC-MB): optional VAC-MB can be locked into the filter hanger and embodies a more robust filter media that stands up to the rigors of repeated vacuum cycles. The apparent opening size (AOS) for this media is less than 5mm in size to ensure 100% trash capture. The VAC-MB is offered in a rigid perforated SS basket form and a flexible fabric. This MB can be selected to capture 100% of trash.
- c. Other target pollutants such as sediment, hydrocarbons and/or heavy metals;
- d. Hydraulic capacity; and
- e. Desired maintenance frequency.

#### 4.B. Device installation procedures

**Special Note:** To ensure the best results and personnel safety, the catch basin and immediate areas should be thoroughly cleaned within one (1) week prior to Device installation to remove potentially hazardous material and objects from the work area.

##### 1. Site Preparation:

- a. Deploy safety equipment, ensure proper PPE is worn, and necessary permits are in place (if necessary). No confined space entry is required for site prep work. All site preparation activities can take place with personnel above the catch basin;
- b. Remove the curb inlet manhole cover;
- c. Clean the immediate area and catch basin by hand or with a vacuum truck to remove debris from the catch basin;
- d. Clean the curb inlet manhole shelf of existing pollutants or debris with hand trowel or gloved hand.

To ensure the best results and personal safety, the catch basin should be cleaned 1-7 days prior to Device installation.

##### 2. Device Installation:

- a. Deploy safety equipment, ensure proper PPE is worn, and necessary permits are in place (if necessary). Confined space entry may be required. (Engineer or customer is responsible for confined space determination and permit);
- b. Required tools:
  - i. 7/16" wrench. The Device may require an alternative size wrench);

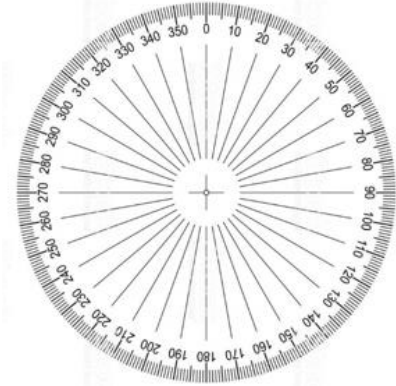
- ii. hammer drill with an 1/4" masonry bit;
  - iii. hammer;
  - iv. black marker (Sharpie®)
  - v. metal punch
  - vi. handheld grinder with cutoff wheel;
  - vii. hand level; and
  - viii. silicone.
- c. Attach the gutter channel to the catch basin wall below to the mouth of the inlet. This is performed by:
- i. determine the overall length of the curb inlet opening and place aside enough gutter channel to span the entire length. The gutter channel comes in four (4)' lengths for easy handling and shipping.
  - ii. insert the interface funnel (IF) into the manhole. Position the center of the IF where a perpendicular line from the curb inlet opening would intersect the center of the manhole opening. Hold the IF at this point of intersection and at a distance about two (2) inches below the curb inlet opening. The longer the catch basin, the lower one should place the IF to allow the gutter channel to be sloped enough for gravity water flow. The IF can be placed one (1) inch below the curb inlet opening for short curb inlet (2 to 6 feet). The IF should be placed at least two (2) or three (3) inches or more below the curb inlet opening for very long curb inlets (7 feet or greater).
  - iii. Mark the IF mounting holes with a marker and drill two holes to a depth recommended by the concrete anchor bolt manufacturer's recommendations. Insert the concrete anchor bolts, set anchors, and mount the IF over the anchor bolts.
  - iv. place a gusset over each anchor bolts and position them so they sit flush against the back wall of the IF. Hand tighten a washer and nut onto the anchor bolt which secures the IF and gussets in place. Leave enough space between the IF and the catch basin wall so the gutter channel can rest on top of and between the IF and the catch basin wall. The gussets provide rigidity to the structure and help support the gutter channels during high water flow.
  - v. Start installing the gutter channel from the IF and working outwards towards the curb inlet wall. Rest one end of the gutter channel on top of the IF and allow it to overlap at least one inch

(this will provide shingling effect as water runs downslope). Using a hand level, ensure that there is a slight downward slope of the gutter channel towards the IF. Mark two locations for drilling. Set aside the gutter channel, drill holes, and set anchor bolts. Place the gutter channel over the anchor bolts and then place a gusset over each anchor bolt as well. Hand tighten a washer and nut on the anchor bolt to loosely secure the gutter channel and gusset to the catch basin wall.

- vi. Repeat the gutter channel placement on both sides of the interface funnel until the span of the curb inlet opening is covered to the edge. The upstream gutter channels should overlap the downstream gutter channels so water can flow unimpeded towards the interface funnel. One may need to cut the gutter channel to length at both ends. FCP also offers channel wings which are small spacers attached to the end of a gutter channel to cover the gap between the gutter channel and the catch basin wall. Silicone can also be used to fill this gap to prevent pollution loss during low flow events.
  - vii. Once the IF and gutter channel span the entire length of the curb inlet opening, one can use a wrench to snug tighten all the nuts to secure the IF, gutter channel, and gussets to the catch basin wall. Overtightening may loosen the anchor bolts.
- d. Hang and position the filter hanger with the following work method:
- i. Suspend Anchor Tab (SAT) install: If the catch basin has enough concrete structure below the manhole frame, then FCP recommends hanging the filter hanger (FH) with concrete anchor bolts and SATs secured to the concrete manhole opening.

1. Locate the point of the manhole opening directly opposite the curb inlet opening.

This will be the zero (0) degree point for compass measurement. Drill and set an anchor bolt in the concrete at the 0, 120, and 240-degree points (location may vary by 10-20 degrees).



2. Secure an SAT over each concrete anchor and hand tighten with washer and nut.
  3. Attach chains to the filter hanger at the 120° and 240° degree point. Lower the filter hanger into the manhole opening to a point where the filter hanger will rest slightly below the interface funnel to allow for gravity water flow. Feed the chain ends (opposite the filter hanger) through the SATs. Secure the chain to the SATs with a fastener or by bending the integrated tabs through a chain link.
  4. Insert a rigid suspender through the SAT and down through the hole located on the filter hanger at the zero (0°) degree mark. Fasten the filter hanger in place so the filter hanger is level. The rigid suspender prevents the filter hanger from rotating during operation.
  5. Optional: The interface funnel should overlap the filter hanger. If it does not, use an interface funnel extender to bridge the gap between the filter hanger and the interface funnel. The interface funnel extender is locked in place with bendable tabs.
- ii. For adjustable manhole frame hanger (MFH) Suspension: If the catch basin does not have sufficient concrete structure below the manhole frame to drill and set anchor bolts, then FCP recommends hanging the filter hanger (FH) with an optional MFH through the following methods:
1. Make sure the manhole shelf is clean and free of debris.
  2. Locate the point of the manhole opening directly opposite the curb inlet opening. This will be the zero (0°) degree point for compass measurement.

3. Bend the pre-cut MFH into a circular shape. The MFH can pack flat and be hand-bent on site to fit multiple sized manhole diameters.
4. Position the MFH onto the manhole cover shelf so that the fastener is at the 180° mark (toward the street) and expand the MFH by bending. The MFH must overlap the shelf at least three-quarter (3/4) the distance between the shelf inside dimension (ID) and outside dimension (OD) to adequately support the load of a full MB. For a one (1) inch grate shelf, the MFH must overlap the shelf by ¾".
5. Attach chains to the filter hanger at the 120° and 240° degree point. Lower the filter hanger into the manhole opening to a point where the filter hanger will rest slightly below the interface funnel to allow for gravity water flow. Feed the chain ends (opposite the filter hanger) through the chain stays on the MFH. Secure the chain to the chain stays with a fastener or by bending the integrated tabs through a chain link. If the filter hanger cannot fit inside of the MFH frame, then attach the filter hanger chains to the MFH and lower the two parts into the hole together.
6. Insert a rigid suspender through the MFH hole and down through the hole located on the filter hanger at the zero (0) degree mark. Fasten the filter hanger in place so the filter hanger is level. The rigid suspender prevents the filter hanger from rotating during operation.
7. Optional: The interface funnel should overlap the filter hanger. If it does not, use the optional interface funnel extender to bridge the gap between the filter hanger and the interface funnel. The interface funnel extender is locked in place with bendable tabs on each end.

### **3. Mundus Bag Installation:**

- a. Align the bends in the Mundus Hoop (MH) with the MB handle attachment points. The handle of the MB and the bends of the MH will be parallel with the street when inserted into the Device. This allows the handle to be draped over the MB handle hook so the handle does not impede water flow and the MB is easily removed during service. *In unusual cases, the handle may not be parallel to the street and the MB*

*needs to be inserted so the handle is parallel to the bends in the filter hanger register. **Always align the handle with the bends;***

- b. Pull the top of the MB thru the inside of the MH a few inches and fold the elastic anchor fabric over the top and outside of the MH. This secures the MB to the MH. (method is akin to pulling the top of a tube sock thru the inside of a bracelet and wrapping the top of the sock over the bracelet). The elastic band around the anchor fabric will hold the MB to the Mundus Hoop (MH). When the MB and MH are secured within the filter hanger, then the added friction will hold the MB in place and prevent it from falling through the filter hanger hole. Make sure that the handle is parallel with the bends in MH;
- c. Grab the handle or hoop of the MB, step on the bottom of the MB and pull snugly away from each other. This equilaterally aligns the MB around the MH;
- d. Secure the bottom of the MB with the recommended fastener at a position based on the desired overall length of the MB. NOTE: for shallower catch basins, the end of the MB may be trimmed to provide an overall shorter length. The MB should not be so long that it can block the outlet;
- e. Adjust the backflow preventer to design aperture by pulling the backflow preventer (BFP) cord and sliding the fastener into position. The BFP should usually be tightened at least a little bit for ease of maintenance later but not tightened so much that it prevents the inflow of trash. A four (4) to eight (8) inch opening is usually sufficient for a TTC-16 Mundus Bag BFP;
- f. Drop MB with MH into the receiver so the handle aligns with the bends in the filter hanger receiver. Adjust for a snug fit;
- g. Attach or place any additional filtration media inside or to the MB - *not required for full trash capture;*

4. **Installation Completion:** Replace the inlet covering and remove safety equipment.

**Total Installation Time:** 20 to 60 minutes

#### 4.C. Methods for diagnosing and correcting installation errors.

Frog Creek Partners maintains a rigorous quality assurance and quality control (QA/QC) processes and standards. Prior to the shipment of any Device or MB, each part is inspected, and cross-referenced with the field measurements and capacity considerations. A manifest of each component of the Device is delivered to the

customer and we recommend each customer perform an inspection upon receipt to confirm conformity to the desired application of the Device. FCP offers standard sized configurations, however there are instances where the Device has been customized or varies from typical designs. This is not an issue as long as the dimensions are documented. FCP can build Devices for about any curb inlet configuration.

Checklists are provided to assist each Device installation and maintenance visit:

#### **Site Preparation and Selection:**

- The manhole cover shelf is a uniform surface and dimensions;
- There is enough space for the installation of the Device, its adjustable overflow and MB;
- Prior to installation, the catch basin should be clean and be free of sediment, debris, and harmful pollutants like hypodermic needles, sharp metal, and broken glass.

#### **Installation Error Considerations:**

- The wall of the catch basin directly under the curb inlet opening should be relatively flat and straight for proper mounting of the gutter channel. Gaps may be filled using a California approved marine grade sealant (i.e. 100% silicone). If there is a curve or bend to the wall, a customized gutter channel may need to be fabricated;
- The concrete of the wall of the catch basin under the inlet opening must in good condition and of enough depth to receive the gutter channel's anchor bolts per the manufacturer's recommendations (usually at least 2-inches);
- The concrete at the top of the catch basin should be in good condition and of enough depth to receive the anchor bolts to suspend the filter hanger from the SATs. Alternatively, the filter hanger may be suspended from an optional MFH placed on the manhole cover shelf;
- The filter hanger should suspend freely under the manhole. Some catch basins may have structures that impede this (i.e. ladder, concrete/brick shelf, etc.) Modifying the adjustable overflow (the distance between the catch basin roof and the filter hanger) may rectify this situation;
- The MB hoop should fit snugly into the Device's receiver. The receiver and Mundus hoop are bent to fit one another. If the MB does not fit snugly is bent and the MB hoop may need to be rotated to achieve a snug fit;
- The MB should be fully extended vertically to ensure maximum hydraulic capacity and trash capture capacity. If the catch basin is too shallow to allow for full extension, then either shorten the MB (see above) or curve the MB so it rests



on the catch basin floor. However, under no circumstances, should the tail of the MB obstruct the outlet connector pipe;

- It should be noted that some catch basins may be inadequately constructed and may be prone to retaining small amounts of water. This can cause proliferation of mosquito breeding. The preferred course of action is to repair any deficiencies in the catch basin construction that may cause standing water prior to installation of the Device. It is important that the deficient areas be visible and accessible by the mosquito vector control personnel if repairs to the catch basin have not occurred prior to Device installation. The Engineer and MVCAC personnel can make this determination.

The Device is designed to meet site-specific water quality treatment requirements. Conformance with the Engineer's Plans and Specifications and proper installation is paramount to ensure proper Device operation.

#### 4.D. Optional components guide: An explanation of the condition or circumstance that would necessitate the implementation of that component and render it no longer optional.

In the event where the concrete of the roof of the catch basin is not in good condition or does not have enough depth to receive the concrete anchor bolts (2-inches or greater), then the adjustable MFH must be used to suspend the filter hanger.

In the event where the center of the manhole opening is greater than 20" away from the catch basin wall towards the inlet opening, then the system will require an interface funnel extender to bridge the gap.

In the event where a piece of gutter channel doesn't quite fit up against the catch basin wall, then silicon can fill the gap or FCP offers a gutter channel wing. The gutter channel wing fastens to the end of the gutter channel and can extend outward to capture water/pollution and divert it onto the gutter channel.

## 5. Operation and Maintenance Information

### 5.A. Device inspection frequency considerations, and inspection procedures.

Upon inspection, the MB water filter should be emptied if it is more than half full of trash and debris, or as directed by the Engineer, city, or contract. The MB can be 75% full and still work properly in most instances but allowing filtration capacity for future rain events is important.

During inspection, the following should be checked:

- Visually inspect the MB for abnormal pooling of water inside the bag. Pooling of water is indicative of a MB that requires replacement or emptying due to pollutants or debris blinding the openings in the filter;
- Pooling of water in the MB can also be indicative of too much hydrocarbon loading from stormwater runoff. Add MYCELX to rectify the problem;
- Visually inspect the MB to determine if the filter media has any holes greater than 5mm in size. Replace MB if necessary;
- Visually inspect the Device to check if any significant gaps exist between the gutter channel and the wall of the catch basin;
- Visually inspect the filter hanger for accumulated debris. Excessive accumulation of debris on the filter hanger may indicate a full MB that needs emptying or replacing;
- Inspect the CIF frame to make sure all components look or feel secure;
- Inspect after first rain event greater than ¼”;
- Inspect after every storm of ½” or greater;
- Inspect every one (1) to two (2) months during the first year than at least quarterly thereafter;
- See 5.C. for more information.

## 5.B. Maintenance frequency consideration, procedures, and a description of necessary equipment and materials.

The Device may be serviced in one of two simple ways through manual maintenance or vac truck maintenance as described below:

**Manual maintenance:** To service the Device manually within three (3) to seven (7) minutes, follow these steps:

**Equipment needed for manual maintenance:** PPE, safety equipment, cover removal tool, broom, weight scale, FCP Field App mobile device, replacement media, disposal receptacle (trash bag, dumpster, trailer, etc.).

1. **Deploy safety equipment:** place cones around area and make sure it is safe to remove manhole cover. Wear personal protective equipment (PPE). No confined space entry is required. All maintenance personnel may be above the catch basin during the maintenance of the Device;
2. **Remove covering:** Use grate puller or another tool to remove the manhole cover to expose the Device;

3. **Stuff Mundus Bag (:** Push overflowing pollutions (if any) into the MB with hand tool or spray wand. Be sure to inspect back splash around filter hanger and remove any debris that may have blocked the screen;
4. **Remove & record:** Remove MB by lifting handle or hoop. Weigh the bag with a common crane scale (FCP can provide if necessary). Record weight of MB and any other pollution data such as density, pollutant type, etc. Dispose of properly and in accordance with local laws;
5. **Dump and dispose:** The MB has the unique capability of being reused or replaced. To dump, remove fastener at the bottom of the MB. Dump contents into approved receptacle. Alternatively, one can dispose of the whole MB if filtration media is compromised. Dispose of filter media and captured pollutants in accordance with local regulations or as directed by the Engineer;
6. **Replace MB & cover:** Close the bottom of the MB with a zip tie or wire, replace the bag into the receiver on the Device's filter hanger, and replace the cover.

It is important to note that this method is the most efficient way to perform maintenance on a low volume of Gutter Bins and in space restricted areas. Service can be done in conjunction with a service hand cart, 4-wheeler with trailer/bed, or a pickup truck. A low height trailer can also be useful.

**Vac truck maintenance:** To service the Device with a vac truck within four (4) to 12 minutes, follow these steps:

**Equipment needed for vac truck maintenance:** PPE, safety equipment, vacuum truck, cover removal tool, weight scale, FCP Field App mobile device, replacement media, disposal receptacle (vac truck vessel), and replacement media.

**Prepare vac truck:** deploy safety equipment (cones, lights, etc.) and vac truck for operation (turn on pumps, adjust valves, deploy boom, etc.).

1. **Remove covering:** Use hook or another tool to remove the manhole cover to expose the Gutter Bin;
2. **Stuff MB (optional):** Push overflowing pollutions (if any) into the MB with hand tool or spray wand. Be sure to inspect trash screen around filter hanger and remove any debris that may have blocked the screen;
3. **Record (optional):** Lift MB by pulling up handle or hoop. Weigh the bag with a common crane scale. Record weight of MB plus any other pollution data such as density, pollutant type, etc.;
4. **Evacuate MB:** Vacuum contents out of MB. The bag may be sucked inside out so one may have to push the bag right side out and realign the MB. Be careful that the MB is not sucked into the vacuum. One may need to secure the MB to

the MH to prevent loss of flexible filter media. A vac truck crew can evacuate the contents of an MB with proper instruction by FCP and minor alterations to the standard MB;

7. **Replace MB & cover:** replace the MB (or reuse existing MB if TTC-MB is used) into the receiver on the Device's filter hanger, drape handle over handle hook, and replace the cover;
5. **Prepare vac truck for relocation:** gather safety equipment, turn off pumps, close valves, deploy boom, etc.

It is important to note that the use of a vac truck can be highly inefficient due to its maintenance requirements, truck purchase costs, and the fact that it requires the waste removed by a vac truck to be handled at least three (3) times before it reaches the landfill (suck, decant, load, haul, dump). It may also take a few minutes longer to service a Gutter Bin with a vac truck rather than doing it manually because of the set-up/take-down time required to operate a vac truck.

As with any manufactured device, there may be product limits that need acceptance or correction. At times, it may be prudent to relocate or modify the Device or move to another location as polluting behaviors and infrastructure changes.

Each Device installation is unique based on location conditions and targeted pollutants.

- The inspection frequency mainly depends upon climate events and pollutant load.
  - Inspect after the first and second rain event to ensure proper function (break-in period);
  - For construction sites, one should inspect the Device after each storm event greater than ½" of precipitation or heavy snow melt;
  - For post construction and permanent installations, one should inspect the Device three (3) to four (4) times per year or as directed by the Engineer.

Maintenance frequency considerations include:

- **Typical pollutant load:** areas with bulky trash and debris may require more frequent service intervals to ensure that pollutants don't bypass the MB via the Device's adjustable overflow;
- **Local climate conditions:** areas with heavy rainfall or snowfall may require a more frequent maintenance cycle if pollutant load is high. During the autumn leaf fall, more frequent maintenance may be required. High rainfall does not always equate to more frequent service visits;

- **Infrastructure constraints:** curb inlets with large drainage areas and high pollutant loads may require more frequent service intervals. Smaller curb inlets may require smaller diameter MBs thereby decreasing the pollutant capacity and shortening the service interval;
- **Type of MB being used:** Total Trash Capture (TTC-MB) model MBs typically have a longer service life than the Total Debris & Sediment (TDS-MB) model MB because the TTC-MB allows anything smaller than 5mm to pass the filtration system. The VAC-MB can last for several years. Replace or empty a MB if it is more than 75% full or if MB water filter has blinded and as directed by the Engineer.

It is important that the Device be maintained to ensure proper function, minimize any pollution bypass and mitigate flooding risks during extreme weather events. The Engineer may prescribe an alternative means of maintenance per local regulations, site requirements, and/or contract requirement. Captured pollutants and spent media must be disposed of in accordance with all Federal, State, and Local Laws and Regulations.

### 5.C. Effects of delayed maintenance on Device structural integrity, performance, odors.

Delayed maintenance may cause the MB to become completely full of material thereby causing stormwater to bypass the filter system and the Device not performing as designed. It is unlikely that a completely full MB will affect the structural integrity of the Device because of its solid frame suspension system and configuration. The MB will drain between rainstorms but there may be trash within the bag that holds water and causes odors. Performance and odor problems can be solved by more frequent servicing of the Device.

### Maintenance Troubleshooting:

- Pooling of water inside of a MB is most likely indicative of:
  - A full MB that needs emptying or replacement;
  - A TDS-MB model with a sediment capture liner with too fine of filter is clogging due to hydrocarbon loading. A coarser filter material can be substituted or MYCELX can be added to the filter chain to remove hydrocarbons before they foul the sediment liner. A sediment liner is not required for full trash capture.
- Pooling of water below the Device can be caused from the catch basin sump or irregularities in the catch basin construction.
- A compromised MB is likely indicative that it has exceeded its specified service life.

#### 5.D. Device maintenance and vector control accessibility

FCP submitted the vector control application for the CIF Device to the Mosquito Vector Control Association of California (MVCAC) on June 26th, 2019. FCP received CIF Device approval from the MVCAC on October 11th, 2019. In verbal and written communications between FCP, MVCAC and the SWRCB personnel, it was determined that a sample port (aka “view port”) is not necessary for the CIF Device because curb inlet type catch basins generally have adequate space for vector inspection and maintenance even with the CIF Device inserted into the catch basin. Please see Appendix E for the MVCAC approval letter.

#### 5.E. Repair procedures for the Device’s structural components.

To repair a worn or broken part of the Device, one must simply remove the Device from the catch basin and identify the part that needs replacement. Because of the Device’s modular design, usually only a small part may need to be replaced rather than the whole unit. Take a picture of the part and contact FCP for a replacement part and instructions for repair. FCP offers a 7-year warranty as described in Section 6.C.

### 6.0 Reliability Information

#### 6.A. Estimated design life of Device components before major overhaul.

The Device has a minimum design life of 25 years assuming the proper installation, maintenance and service of the Device. The total trash capture (TTC-MB model) MBs are reusable and have a service life of one (1) to two (2) years, depending upon site conditions. Trash, debris and sediment (TDS model) MBs with a liner are generally single use filters because of their fine filtration capabilities and have a maximum service life of 12 months, depending upon site conditions. Major overhauls of the Device are not expected and FCP provides a 7-year warranty as described in 6.C.

#### 6.B. Device sensitivity to loadings other than trash (i.e. leaves, sediment).

The Device has an excellent ability to capture vegetation (including leaves and grass clippings) with any MB model. The MB backflow preventer helps minimize or prevent loss of pollutants after capture. Typically, leaves and debris are quite bulky. Therefore, the maintenance frequency should be increased during seasonal leaf drop or after high wind events such as the Santa Ana winds. Delayed maintenance of the Devices in areas with high leaf drop can cause the curb inlet opening to be covered with leaves and cause flooding. If a Device is seriously neglected, then debris may eventually clog the Device overflow and cause flooding. Frequent and proper maintenance of the Devices will increase the likelihood of successful trash capture and high flow bypass.

Devices equipped with geotextile-lined MBs (TDS-MB) will also capture significant amounts of sediment. Therefore, maintenance frequency should be increased after sediment runoff causing events such as intense heavy rainfall, nearby construction activity, road sanding, chip sealing, etc.

One can switch or alternate the types of MB throughout the year. If the customer requires finer filtration most of the year to capture sediment, then the TDS-MB (trash, debris & sediment) is used. In the fall when leaves are dropping, then one can temporarily replace the TDS-MB with the TTC-MB (total trash capture) to capture particles 5mm or greater in size. This temporary replacement will allow finer particles to bypass the system. Advantageously, if the captured particles are mainly vegetative waste, then the customer may be able to compost the captured material.

In areas where hydrocarbons are prevalent and a TDS model MB is used, then one may require the use of MYCELX to remove hydrocarbons from the stormwater to prevent blinding of the filter due to hydrocarbon loading.

#### **6.C. Warranty information.**

The Device material and product construction are warranted for seven (7) years from the date of purchase. Device replacement parts will be supplied at no charge to the end user provided the Device unit was properly installed and serviced for its intended use as a full trash capture device per the Engineer's recommendations and as specified in this application or most current FCP product and service recommendations. MBs have a warranty on workmanship for one (1) year from date of install provided the customer properly records service details as recommended by FCP and/or the Engineer.

The Gutter Bin stormwater filtration system Eco Curb Inlet Filter (CIF) and MB (MB) water filter are pre-engineered filtration systems designed to meet site-specific water quality treatment requirements. Conformance with the Engineer's Plans and Specifications and the manufacturer's recommendations is essential to ensure proper operation and function of the Device.

#### **6.D. Customer support information.**

Frog Creek Partners corporate and California offices are open during normal business hours. Customer support can be reached via telephone and/or email 24 hours per day and 7 days per week. Contact information:

**Email:** [support@frogcreek.partners](mailto:support@frogcreek.partners)

**Phone:** 307-797-7720

**Website:** [www.frogcreek.partners](http://www.frogcreek.partners)

Frog Creek Partners maintains a nationwide agreement with APEX Companies to provide installation and service capabilities upon request. However, FCP, the city, the customer, or an approved local contractor can perform the install and maintenance as required by the Engineer or customer.

## 7. Field/Lab Testing Information and Analysis

### 7.A. Provide available field or lab testing information that demonstrates Device functionality and performance.

Appendix A contains the Device and field test results. Summary test results prove 100% trash capture and retention. Results = SUCCESSFUL TEST – PASS.

Please refer to Appendix B for third party certification of FCP's testing.

Multiple Device configurations successfully removed 100% of trash 5mm or greater in size from water flows ranging from 15 to 500 gpm in multiple third-party validated lab tests. The tests were conducted in FCP's headquarters with a third-party professional engineer present to verify the test results. FCP used a "trash recipe" as recommended by Stormwater Environment Manufacturers Association (SWEMA). Two types of MBs were tested with the Device to ensure that both the Total Trash Capture (TTC-16) MB and Trash, Debris & Sediment (TDS-16) MB performed to SWRCB requirements.

#### **Overview of test platform and testing procedure for the FCP CIF and MB**

An FCP Device with a 64 in. gutter channel, a 21 in. diameter UFG, and a filter hanger with a 16" MB were installed into a wooden test platform simulating a curb inlet catch basin 51 in. wide, 64 in. long and 53 in. deep. The catch basin had a 113 sq. in. outlet at the bottom with 4mm wire mesh covering the opening (to capture any escaped trash during the test). A 15 ft. long by 30 in. wide gutter mounted to the side of the catch basin allowed for a long channel run, easy trash introduction, and adjustable frame for multiple simulation angles. The gutter was sloped slightly towards the catch basin from the longitudinal and transverse axis to simulate slopes of the typical road and gutter designs (~2%). Water and trash were introduced to the test platform on the uphill side of the gutter.

FCP used a "trash recipe" as prescribed by SWEMA. The trash recipe comprised of:

- 30 cigarette filters
- Six (6) pieces of paper cut into 2" wide by 12" long strips
- 10 wood popsicle sticks
- Six (6) pieces of plastic cup cut into 2" wide by 5" long strips
- Six (6) pieces of plastic bag cut into 2" wide by 12" long strips



- Six (6) pieces of cardboard cut into 2" wide by 8" long strips
- Six (6) pieces of cloth cut into 2" wide by 12" long strips
- six (6) pieces of aluminum cans cut into 2" wide by 5" long strips
- 15 pieces of Styrofoam packing peanuts

FCP endeavored to re-use as many of the trash recipe components from one test to the other to simulate weathering in the field. FCP found it necessary to replace some pieces of cardboard and paper between tests because of deterioration.

Prior to each test, the entire trash recipe was laid out on a table and organized by material type. Each piece was counted, and the trash recipe was recorded and photographed to get a "before picture". The trash recipe was mixed with water in a 5-gallon bucket and set aside until introduced to the test platform. FCP kept detailed notes on individual data worksheets recording the trash count (before & after), water flow, device type, witness, filter type, date, time, and any relevant notes from each test.

Water was introduced into the test platform upstream of the CIF in several ways to achieve the desired flowrate. A 3" hose from an adjustable hydrant meter was able to produce flows between 50 gpm to 350 gpm. In higher flow tests, FCP used a water truck with either gravity flow or pressurized flow to gain larger flowrates up to an additional 150 gpm. A garden hose was used intermittently with a flow rate ranging from 13 to 15 gpm. When the desired flowrate was steady, FCP personnel introduced the 5-gallon bucket with trash recipe into the water flow upstream of the Device and MB. Multiple video cameras were used to capture visual data. A virtual reality camera was placed at gutter level outside and across from the curb inlet opening of the simulated catch basin providing a 360-degree view of the test. Another camera was placed directly above the filter hanger to capture the introduction of water and trash into the Device in detail. To simulate high flow, FCP ran both the hydrant meter hose and pressurized water truck hose onto the test platform upstream of the Device with all water going into the inlet. A 4mm screen covered the outlet of the simulated catch basin to capture any pollutants that may have bypassed the Devices during testing.

When each test was completed, FCP personnel removed the MB and any trash residing on the gutter channel, interface funnel or the filter hanger from the Device and dumped the captured trash onto a table. Each piece of trash was organized, counted, recorded and then photographed for an "after picture". All trash 5mm or greater in size was captured by the Device during each test.

100% trash capture test results = SUCCESSFUL - PASS TEST.

All Devices tested successfully captured 100% of trash in the lab. The Devices have also been tested for multiple seasons in snow, ice, rain and hail with successful trash capture results and hydraulic capacity.

FCP tested two types of MBs in the Device trash capture test. Both the Total Trash Capture MB (TTC-16) and the Trash, Debris & Sediment MB (TDS-16) performed perfectly and the Device achieved 100% trash capture in every test. Both MBs also retained 100% of their trash even after the flow subsided to 0 gpm. Therefore, the Device and MBs achieved 100% trash capture and retention in all tests.

A third-party professional engineer was present to independently verify that the Frog Creek Partners' products did indeed pass the trash capture test as required by the California State Water Resources Control Board. The third-party professional engineer's certification letters can be found in Appendix B.

All tests of the Device and MB were filmed. FCP can provide YouTube links to these videos upon request. Select pictures of the trash capture test and results can be found in Appendix A.

The Gutter Bin® stormwater filtration system and MB® water filter are patent pending and registered trademarks of Frog Creek Partners, LLC. All pictures and content of this application are copyrighted by Frog Creek Partners, LLC 2019.

**Get Your Mind into the Gutter™**

**Because Clean Water is a Good Thing™**

## Testing Photographs



*Image 14 - Adjustable hydrant meter water source - up to 350 gpm*



*Image 15 - Test platform with water sluice visible*



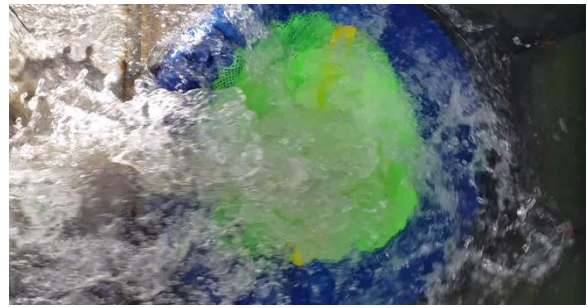
*Image 16 - Test platform with curb inlet mouth and CIF visible*



*Image 17 - Overhead view of TDS-MB installed in test CIF*



*Image 18 - Test platform water introduction at 500 GPM*



*Image 19 - Overhead view of TTC-MB after introduction of water at 500 GPM*



*Image 20 - Introduction of simulated trash during 500 GPM test*



*Image 21 - Simulated trash being ingested by CIF at 500 GPM*



*Image 22 - Overhead view of simulated trash entering TTC-MB during 500 gpm test*



*Image 23 - Overhead view of TTC-MB after 500 gpm test*

## APPENDIX A - TEST RESULTS

### Data worksheet for Gutter Bin 100% trash capture test

Frog Creek Partners, LLC

Casper, Wyoming USA

Testing completed by: BDeurloo, CTippie, DBell & TLane (Manuf Works)

Testing witnessed by: Dr. Dave Bell, PE & Terry Lane of Manufacturing Works. US Senator Mike Enzi

<b>Test #</b>	<b>1</b>		
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)		
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)		
<b>Date:</b>	17-Apr-2019		
<b>Time:</b>	11:30 AM		
<b>Flow Rate (before test):</b>	51 gpm	193 l/min	0.11 cfs
<b>Flow Rate (during test):</b>	51 gpm	193 l/min	0.11 cfs
<b>Flow Rate (after test):</b>	51 gpm	193 l/min	0.11 cfs

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. Replaced paper after test. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	<b>2</b>		
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)		
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)		
<b>Date:</b>	17-Apr-2019		
<b>Time:</b>	12:15 PM		
<b>Flow Rate (before test):</b>	100 gpm	379 l/min	0.22 cfs
<b>Flow Rate (during test):</b>	100 gpm	379 l/min	0.22 cfs
<b>Flow Rate (after test):</b>	100 gpm	379 l/min	0.22 cfs

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. Replaced paper after test. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	3			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	12:40 PM			
<b>Flow Rate (before test):</b>	150 gpm	568 l/min	0.33 cfs	
<b>Flow Rate (during test):</b>	150 gpm	568 l/min	0.33 cfs	
<b>Flow Rate (after test):</b>	150 gpm	568 l/min	0.33 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	4			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	1:30 PM			
<b>Flow Rate (before test):</b>	200 gpm	757 l/min	0.45 cfs	
<b>Flow Rate (during test):</b>	200 gpm	757 l/min	0.45 cfs	
<b>Flow Rate (after test):</b>	200 gpm	757 l/min	0.45 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. Blue paper is disintegrating, replaced it. 100% trash capture and retention. SUCCESSFUL TEST - PASS			



<b>Test #</b>	5			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	2:00 PM			
<b>Flow Rate (before test):</b>	300 gpm	1136 l/min	0.67 cfs	
<b>Flow Rate (during test):</b>	300 gpm	1136 l/min	0.67 cfs	
<b>Flow Rate (after test):</b>	300 gpm	1136 l/min	0.67 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	6			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	2:20 PM			
<b>Flow Rate (before test):</b>	350 gpm	1325 l/min	0.78 cfs	
<b>Flow Rate (during test):</b>	350 gpm	1325 l/min	0.78 cfs	
<b>Flow Rate (after test):</b>	350 gpm	1325 l/min	0.78 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant water only. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	7			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Total Trash Capture (TTC-16)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	3:00 PM			
<b>Flow Rate (before test):</b>	500 gpm	1893 l/min	1.11 cfs	
<b>Flow Rate (during test):</b>	500 gpm	1893 l/min	1.11 cfs	
<b>Flow Rate (after test):</b>	500 gpm	1893 l/min	1.11 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant full open = 350gpm, Water truck with pump on = 135 gpm, plus garden hose = 15 gpm. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>	8			
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)			
<b>Filter Media:</b>	Mundus Bag™ - Trash, Debris & Sediment (TDS-12)			
<b>Date:</b>	17-Apr-2019			
<b>Time:</b>	3:20 PM			
<b>Flow Rate (before test):</b>	50 gpm	189 l/min	0.11 cfs	
<b>Flow Rate (during test):</b>	350 gpm	1325 l/min	0.78 cfs	
<b>Flow Rate (after test):</b>	350 gpm	1325 l/min	0.78 cfs	

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Hydrant full open = 350gpm. Performed test with sediment bag to show minimal back flow pressure and that the bag would hold trash that was captured. 100% trash capture and retention. SUCCESSFUL TEST - PASS			



<b>Test #</b>	9				
<b>Device:</b>	Gutter Bin® - Eco Curb Inlet Filter (CIF)				
<b>Filter Media:</b>	Mundus Bag™ - Trash, Debris & Sediment (TDS-12)				
<b>Date:</b>	22-Apr-2019				
<b>Time:</b>	3:45 PM				
<b>Flow Rate (before test):</b>	15	gpm	57	l/min	0.03 cfs
<b>Flow Rate (during test):</b>	15	gpm	57	l/min	0.03 cfs
<b>Flow Rate (after test):</b>	15	gpm	57	l/min	0.03 cfs

Component	Pre-Test Count	Post-Test Count	Test Outcome
Cigarette Filter	30	30	PASS
Newspaper	6	6	PASS
Wood (popsickle stick)	10	10	PASS
Plastic (Moldable)	6	6	PASS
Plastic (Film)	6	6	PASS
Cardboard	6	6	PASS
Cloth	6	6	PASS
Metal (folded foil)	6	6	PASS
Styrofoam	15	15	PASS
<b>Comments:</b> Garden hose = 15 gpm. US Senator Mike Enzi present to witness and observe. 100% trash capture and retention. SUCCESSFUL TEST - PASS			

<b>Test #</b>					
<b>Device:</b>					
<b>Filter Media:</b>					
<b>Date:</b>					
<b>Time:</b>					
<b>Flow Rate (before test):</b>		gpm	0	l/min	0.00 cfs
<b>Flow Rate (during test):</b>		gpm	0	l/min	0.00 cfs
<b>Flow Rate (after test):</b>		gpm	0	l/min	0.00 cfs

Component	Pre-Test Count	Post-Test Count	Test Comments
Cigarette Filter	30		
Newspaper	6		
Wood (popsickle stick)	10		
Plastic (Moldable)	6		
Plastic (Film)	6		
Cardboard	6		
Cloth	6		
Metal (folded foil)	6		
Styrofoam	15		
<b>Comments:</b>			

## APPENDIX B - CERTIFICATION OF FIELD TEST RESULTS

**David A. Bell Associates, Inc.**

542 South 350 East  
Farmington, UT 84025  
1920 Plateau St.  
Laramie, WY 82070  
801.540.8742

To whom it may concern:

The Frog Creek Partners ("FCP") patent pending Gutter Bin ® Eco Curb Inlet Filter (CIF) and the patent pending Mundus Bag™ water filter were tested on April 18, 2019.

Frog Creek Partners (FCP) determined that the Storm Water Equipment Manufacturers Association (SWEMA)'s Laboratory Protocol and trash recipe provides a strong baseline testing method for confirming a 100% trash capture in accordance with the California State Water Board's current requirements. FCP's testing was fundamentally based on the SWEMA protocol and followed best reasonable practice throughout the entirety of the trash capture test regime.

I am a professional engineer with more than 30 years of water-related product design and field/deployment and process validation testing. FCP asked if I would be an independent witness and third party observer/resident expert. I am registered as a Professional Engineer in Utah and Wyoming. My PhD and research specialty is computational fluid dynamics. I have been involved in projects involving blood flow in the tissues, produced water reclamation in the oil and gas field and the modeling of multi-contaminant, turbulent wastewater flows. I have numerous patents relating to this work covering years of field experience.

Now, under my observation, FCP's CIF and multiple Mundus Bag™ configurations passed all testing regimes without failure when subjected to water flow rates ranging from 50 gallons per minute (50 GPM) to 500 GPM. At no time during these tests, using simulated trash and conducted in accordance with the SWEMA Laboratory Protocol, were any escaping trash particulates observed.

In concurrence and observation with testing I can attest that the Frog Creek Partners Gutter Bin ® Eco Curb Inlet Filter (CIF) and the Mundus Bag™ water filter passed all testing protocols and procedures as outlined in the document without any failure. I neither asked for nor received any compensation or remuneration for my observations.

Sincerely,

David A. Bell, PhD, PE  
David A. Bell Associates, Inc.



Date: 5/15/19



406 S 21<sup>st</sup> Street  
Laramie, WY 82070  
<https://www.manufacturing-works.com>

To whom it may concern:

The Frog Creek Partners ("FCP") patent pending Gutter Bin® Curb Inlet Filter (Eco Curb) and patent pending Mundus Bag™ filter media were tested on April 17<sup>th</sup>, 2019.

It has been determined that following Stormwater Equipment Manufacturers Association (SWEMA) Laboratory Protocol to Assess Trash Removal (April 26, 2018) provides a strong baseline testing method and trash recipe to confirm 100% trash capture in accordance with and exceeding California State Water Board's current requirements. FCP's testing was based fundamentally on the SWEMA document following best reasonable practices where possible.

FCP engaged Manufacturing Works for observance of testing and to provide expert assistance. Manufacturing Works is a manufacturing consultancy located in Wyoming. Local Manufacturing Works project manager Terry Lane was in attendance for the testing. Terry has a distinguished career that includes systematic testing of emergency communications shelters, protocols, and equipment.

The Gutter Bin® Curb Inlet Filter (Eco Curb) and Mundus Bag™ filter media passed all testing without any failures under water flow levels of 50 gallons per minute (GPM) to approximately 500 GPM with no simulated trash escaping the device per the SWEMA Laboratory Protocol.

*In concurrence and observation with testing I can attest that the Frog Creek Partners Gutter Bin® Curb Inlet Filter and Mundus Bag™ passed all testing protocols and procedures as outlined in this document without any failure.*

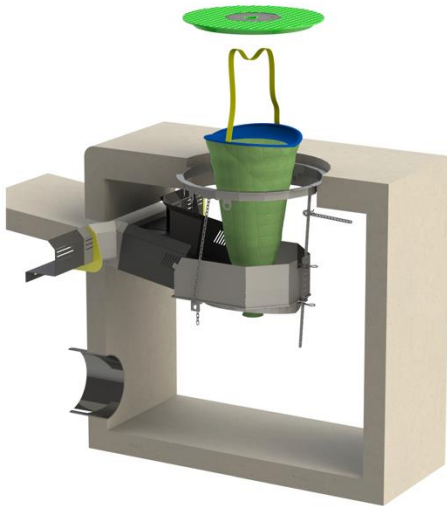
Sincerely,

 4-17-19  
Terry Lane, MBA  
Account & Project Manager  
Manufacturing Works  
307-259-9658

## APPENDIX C - SPECIFICATION SHEETS & ENGINEERING DRAWINGS

# Eco Curb Inlet Filter (CIF)

## Gutter Bin® Stormwater Filtration System



### 100% TRASH CAPTURE RATED

The patent pending Gutter Bin Eco Curb Inlet Filter provides unparalleled protection for curb inlet catch basins and accepts the full line of Mundus Bag® water filters.

### Product Highlights

- Flexible design fits most curb inlet basins
- Stainless steel, weathering steel and/or plastic construction to meet local & federal regulations
- Massive overflow meets or exceeds maximum hydraulic capacity of the catch basin
- Removable components for man or TV camera access
- Vector control & water sampling compatible
- Variable depth for deep or shallow catch basins
- Compatible with all 16 inch Mundus Bags for sediment, hydrocarbon, heavy metal and trash removal
- Can be used in conjunction with automatic retractable screens (ARS) and connector pipe screens (CPS)
- Use as a pre-treatment solution for downstream filtration systems
- 7 year limited warranty

### Installation and Servicing

- Installs in 30 minutes - confined space entry may be required
- Requires minimal drilling only
- Servicing performed in 2 minutes or less
- To service: remove cover, vacuum or replace soiled Mundus Bag, replace cover



typical Type-R curb inlet



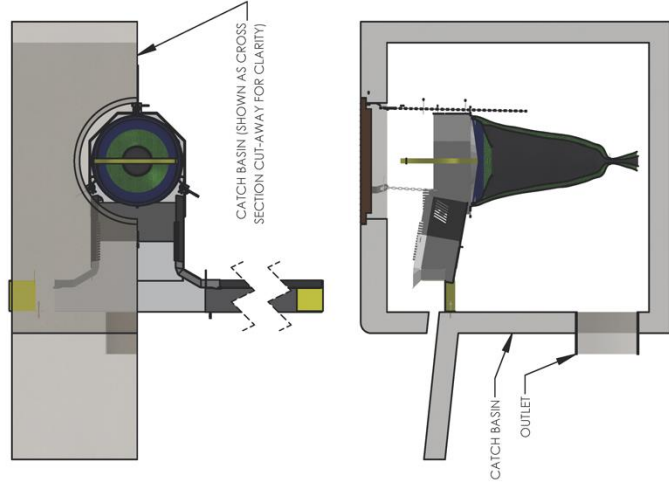
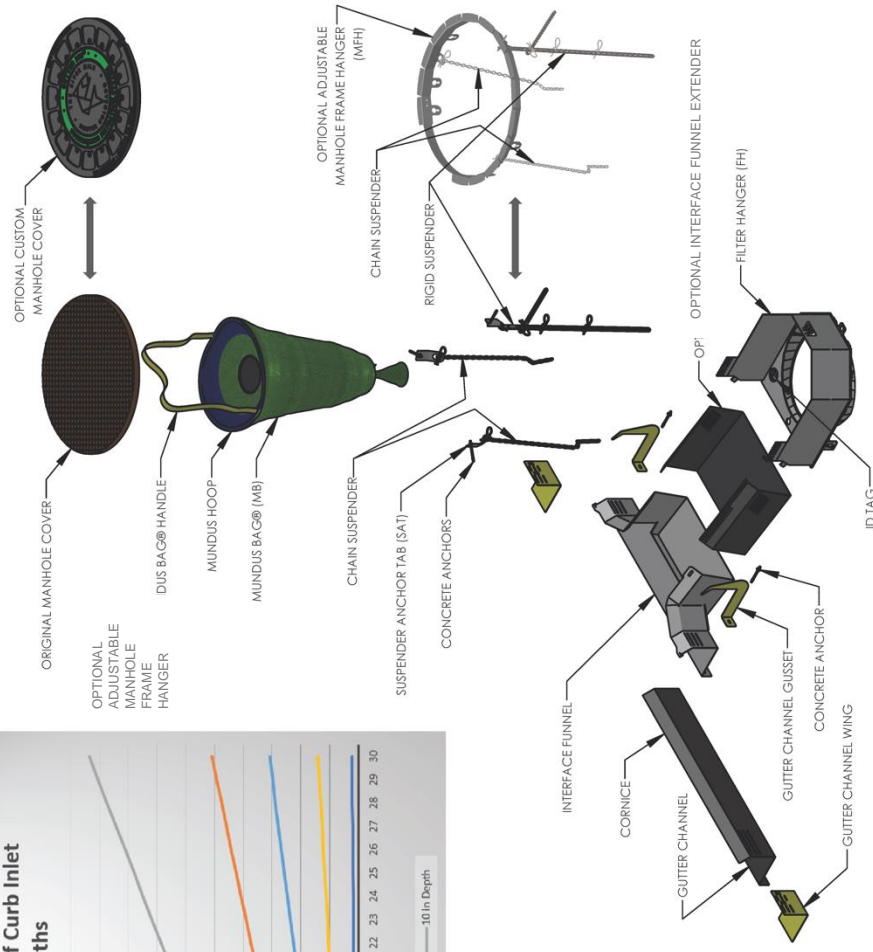
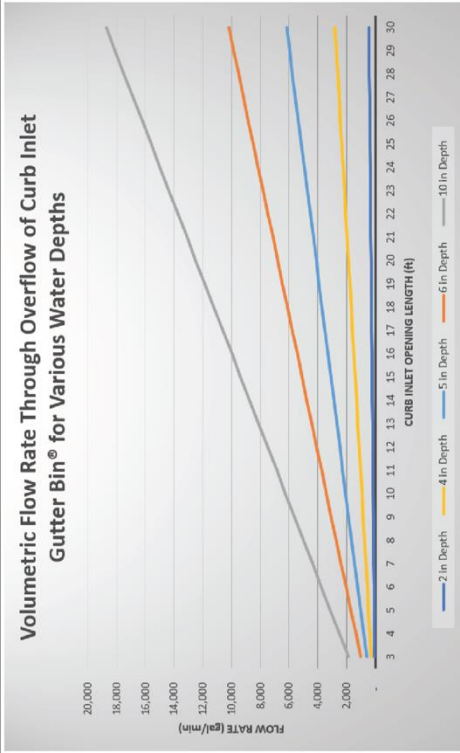
800 West Yellowstone Hwy  
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307.797.7720  
heya@frogcreek.partners  
[www.FrogCreek.Partners](http://www.FrogCreek.Partners)

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**CONFIDENTIAL PATENT PENDING**  
SHEET 001

**FROG CREEK PARTNERS**  
FROG CREEK PARTNERS, LLC  
800 W. Yellowstone Hwy  
Casper, WY 82601  
Ph: (307) 439-9570  
www.frogcreek.com  
brian@frogcreek-partners

**REVISIONS**

REV	DATE	REVISION
1.4.1	11/7/2019	TJS UPDATED NOMENCLATURE TO MATCH OTHER PCP DOCUMENTATION

**PROJECT**

GUTTER BIN® ECO CURB INLET FILTER (CIF)

DESIGNED BY: TJS

CHECKED BY: BMD

DATE: 11/7/2019

SCALE: 1/2" = 1'-0"

PORT SCALE DRAWING: A

**MANHOLE**

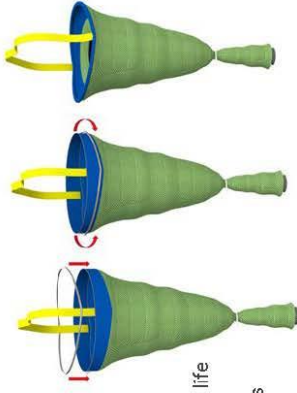
**GUTTER BIN®**

# Mundus Bag™

## Gutter Bin® Filtration Media

100% TRASH CAPTURE

The patent pending Mundus Bag™ water filter removes a broad spectrum of sediment, trash and hydrocarbons from stormwater. It integrates fully with the complete line of Gutter Bin stormwater filtration systems.



### Product Specifications

- Adjustable backflow preventer
- Variable depth for deep or shallow catch basins
- Integrated lifting straps for quick removal
- UV resistant durable construction for extended field life
- Single use and reusable models available
- Easily weighed for measurable & quantifiable results
- Cleaned by dumping, vac truck or bag replacement
- To service: load Mundus Hoop, wrap anchor, ready to filter

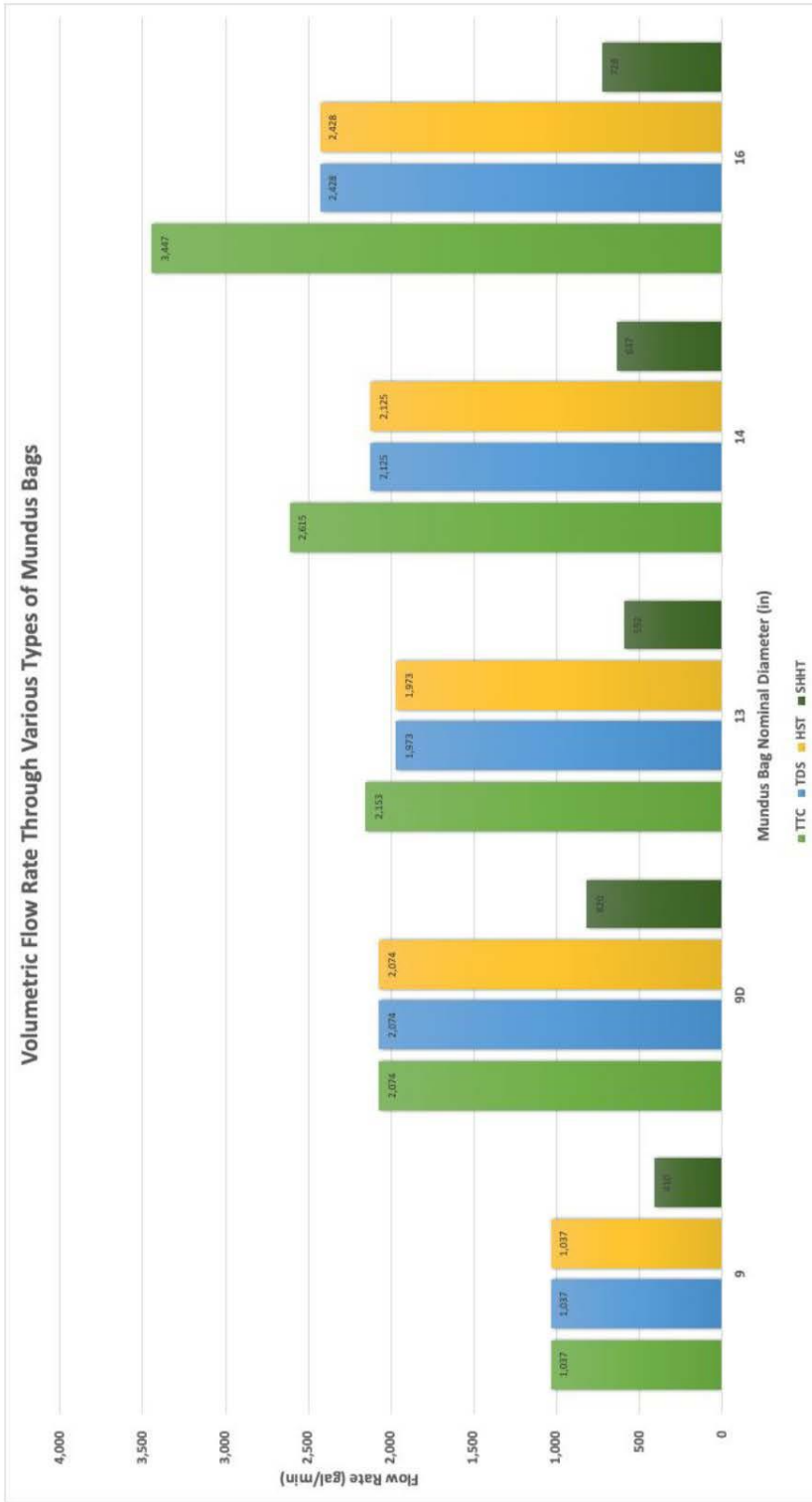


Targeted Pollution	Model	Filter Media
100% Total Trash Capture (Trash & debris > 4 mm)	TTC	polypropylene net
Trash, Debris & Sediment (80% TSS capture)	TDS	geofabric
Hydrocarbons, Sediment, & Trash	HST	Mycelk, geofabric
Sediment, Hydrocarbons, Heavy Metals, & Trash	SHHT	Granulated activated carbon, adsorbent, Mycelk, geofabric

Model	Bag dia (inches)	Max capacity (cu.ft)	Aperture size - particle retention (mm) (X 1000 for micron)	Min/Max length of filter (in)	Max capture load (lbs)	Max load rating of filter bag (lbs)	Empty bag flow rate (gpm)	Reusable	Est. useful life (months)
TTC-9	9	1.77	3.5	12/48	33	291	1,037	Yes	6-18
TTC-9D*	9D	1.77	3.5	12/48	33	291	2,074	Yes	6-18
TTC-13	13	3.14	3.5	12/48	59	517	2,153	Yes	6-18
TTC-14	14	4.27	3.5	12/48	80	704	2,615	Yes	6-18
TTC-16	16	5.58	3.5	12/48	104	920	3,447	Yes	6-18
TDS-9	9	1.77	0.21	12/48	242	291	1,037	No	3-12
TDS-9D*	9D	1.77	0.21	12/48	242	291	2,074	No	3-12
TDS-13	13	3.14	0.21	12/48	431	517	1,935	No	3-12
TDS-14	14	4.27	0.21	12/48	587	704	2,125	No	3-12
TDS-16	16	5.58	0.21	12/48	766	920	2,428	No	3-12
HST-9	9	1.77	0.21	12/48	242	291	1,037	Partial	3-12
HST-9D*	9D	1.77	0.21	12/48	242	291	2,074	Partial	3-12
HST-13	13	3.14	0.21	12/48	431	517	1,935	Partial	3-12
HST-14	14	4.27	0.21	12/48	587	704	2,125	Partial	3-12
HST-16	16	5.58	0.21	12/48	766	920	2,428	Partial	3-12
SHHT-9	9	1.41	0.10	24/72	194	233	410	Partial	3-12
SHHT-9D*	9D	1.41	0.10	24/72	194	233	820	Partial	3-12
SHHT-13	13	2.51	0.10	24/72	242	414	581	Partial	3-12
SHHT-14	14	3.42	0.10	24/72	431	563	637	Partial	3-12
SHHT-16	16	4.47	0.10	24/72	587	736	728	Partial	3-12

\* 9D: two 9 inch diameter Mundus Bags™ installed side by side in a single Gutter Bin

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**Notes:**

- Table data based on field trials, model data and vendor specifications
- Geofabric aperture size may be customized for customer requirements (i.e. 80% TSS removal)- may affect differential pressure
- Bags can be cut or secured to desired length for short install
- 9D: two 9" diameter Mundus Bags™ installed side by side in a single Gutter Bin
- Mundus Bag can be configured with an RFID for greater tracking abilities



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DUNS #080457762 | SAM: 080457762/7RLA3



## APPENDIX D - VECTOR CONTROL APPLICATIONS

The FCP CIF was submitted to the MVCAC on June 26, 2019. The application is included below:



### FROG CREEK PARTNERS

Mosquito Vector Control Accessibility Application for the Gutter Bin®  
Eco Curb Inlet Filter (CIF) and Mundus Bag® water filter

Seeking approval from the Mosquito Vector Control Association of California confirming the patent pending Gutter Bin® stormwater filtration system Eco Curb Inlet Filter and Mundus Bag® water filter are readily accessible for vector observation and treatment; or that the Devices do not require mosquito vector control accessibility



Frog Creek Partners, LLC  
800 W. Yellowstone Hwy  
Casper, WY 82601  
[brian@frogcreek.partners](mailto:brian@frogcreek.partners)  
307-439-9570  
<https://frogcreek.partners>

June 26, 2019

Dear Director Achermann and members of the Association:

Frog Creek Partners (FCP) respectfully submits this application for approval to the Mosquito Vector Control Association of California (MVCAC) for the Gutter Bin® Eco Curb Inlet Filter (CIF) and Mundus Bag® (MB) water filter. The patent pending CIF and MB are a stormwater filter system for curb inlet style storm drains that removes pollutants from stormwater and results in cleaner rivers and oceans. The system offers access to all corners of a catch basin for vector control observation and/or treatment.

The CIF is comprised of three (3) main parts:

- 1) a Gutter Bin funnel, frame, and overflow system that diverts water into a water filter. The system is designed for permanent or temporary use;
- 2) a customizable and removable Mundus Bag water filter that can remove trash, hydrocarbons, and sediment from flowing water. The MB drains between storms so as not to pool water; and
- 3) a reusable Mundus Hoop that connects the Gutter Bin to the Mundus Bag.



Figure 1 - CIF model & Mundus Bag®

The Mundus Bag is a removable and customizable water filter media with a backflow preventer that works in conjunction with the CIF to remove trash, debris, sediment, hydrocarbons, and heavy metals. The City of Santa Maria purchased multiple units with successful results since January of 2019. We can provide contact information if requested.

#### Access and Observation

The catch basin is easily accessed for maintenance and inspection due to the Device's design as the CIF's filter hanger and Mundus Bag are located directly under the curb inlet's manhole. The process for accessing the catch basin is as follows:

1. Remove the inlet manhole cover as prescribed by local regulations and safety protocol;
2. Observe all four (4) corners and bottom of the catch basin;
3. *(optional)* Remove the Mundus Bag by lifting the integrated handle to view the catch basin area directly below the CIF filter hanger;
4. Replace MB and manhole cover.

The corners and the bottom of the catch basin are visible by looking diagonally through the gap between the roof of the catch basin and the CIF's filter hanger. Additionally, the filter media may also be easily removed to provide direct and unimpeded access to inspect the catch basin bottom directly under the CIF. It may be recommended (but not required) that the mosquito vector control technician coordinate their inspection efforts with the entity responsible for maintaining the CIF. In doing so, the technician can perform his or her inspection and maintenance of the catch basin while using the services of the Gutter Bin maintenance staff to remove the manhole cover and MB.

It should be noted that some catch basins may be inadequately constructed and may be prone to retaining small amounts of water. This can cause proliferation of mosquito breeding. The preferred course of action is to repair any deficiencies in the catch basin construction that may cause standing water prior to installation of the CIF. It is important that the deficient areas be visible and accessible by the mosquito vector control personnel if repairs to the catch basin have not occurred prior to CIF installation.

#### Vector Control Treatment

Based upon the mosquito vector control technician's judgment, the vector control abatement may be placed in one of several locations related to the CIF:

- 1) attached to the surface of the CIF filter hanger;
- 2) inside the Mundus Bag;
- 3) on the gutter channel of the Gutter Bin CIF so the vector control material is washed into the catch basin during the next storm;
- 4) below the CIF in the catch basin; or
- 5) attached to the exterior of the Mundus Bag's tail to act as a wick during moisture events.

A hook may be required to remove the manhole cover and Mundus Bag. Other than that, no special tools or equipment are required.

**Please refer to the pictures in Appendix A for more information**

#### Optional Device Configurations

The Gutter Bin® CIF may include one or more of the following optional device configurations:

1. **Sampling/View Port** - The CIF can be equipped with an optional vector sampling/view port located on the CIF's filter hanger. The optional sampling/view port is hinged and can be opened by a magnet pulling on the open side or a hook. In most conditions, a technician can view all four corners of a catch basin with a CIF installed, but if a technician needs to view directly below the CIF, then this area can be observed through the optional hinged sampling/view port or by removing the Mundus Bag. The sampling/view port can be opened without entering the catch basin and allows a technician to view the bottom of the catch basin directly below the filter hanger.

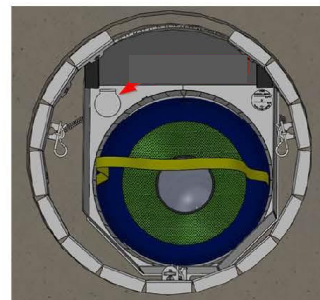


Figure 2 – Top View: Optional sampling/view port

2. **Rigid Basket** – A rigid metal perforated basket may be used in lieu of a flexible Mundus Bag. This rigid basket is removed the same way as the flexible MB.
3. **Interface Funnel Extender** - An optional inlet funnel slider may be used in some irregularly sized catch basins to extend the flared inlet funnel to reach the filter hanger.

**Please refer to the specification sheets in Appendix B for more information**

Please notify us at your earliest convenience if and when the device is approved by MVCAC. Frog Creek Partners is applying to the California State Water Resources Control Board to gain approval of the same device for 100% trash capture certification.

We thank you for your time and attention while reviewing this application. We also thank you for the work that you do for public health and safety. Please call or email if you have any questions or comment.

Respectfully submitted,



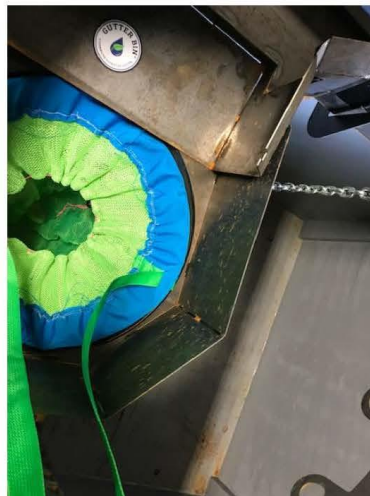
Brian Deurloo  
President  
Frog Creek Partners, LLC

## Appendix A – Photographs of Device

Note: all pictures in Appendix A were taken in and around the FCP curb inlet test platform. The test platform represents a typical curb inlet storm drain found in California (dimensions & scale may vary).



*Image 1 - top view of CIF with Mundus Bag®*



*Image 2 – perspective top view showing both right corners of catch basin*



*Image 3 – front view of CIF looking into curb inlet opening from street level*



*Image 4 – perspective top view showing left back corner of catch basin*



*Image 5 – perspective top view showing left front corner of catch basin*



*Image 6 - Mundus Bag® removal from CIF on curb inlet style catch basin test platform*



*Image 7 - top view through manhole opening of CIF with Mundus Bag® removed showing the bottom of catch basin*



*Image 8 - top view of CIF with Mundus Bag partially removed. Two left corners and area below MB is visible*



## Eco Curb Inlet Filter (CIF)

### Gutter Bin® Stormwater Filtration System



#### 100% TRASH CAPTURE RATED

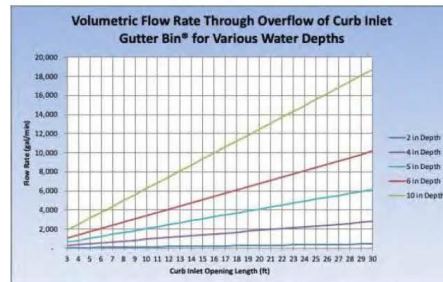
The patent pending Gutter Bin Eco Curb Inlet Filter provides unparalleled protection for curb inlet catch basins and accepts the full line of Mundus Bag™ filter media.

#### Product Highlights

- Flexible design fits most curb inlet basins
- Stainless steel, weathering steel and/or plastic construction to meet local & federal regulations
- Massive overflow meets or exceeds maximum hydraulic capacity of the catch basin
- Removable components for man or TV camera access
- Vector control & water sampling compatible
- Variable depth for deep or shallow catch basins
- Compatible with 14 and 16 inch Mundus Bags™
- Can be used in conjunction with automatic retractable screens (ARS) and connector pipe screens (CPS)
- Use as a pre-treatment solution for downstream filtration systems
- 7 year limited warranty

#### Installation and Servicing

- Installs in 30 minutes - confined space entry may be required
- Requires minimal drilling only
- Servicing performed in 2 minutes or less
- To service: remove cover, remove and replace soiled Mundus Bag™, replace cover



800 West Yellowstone Hwy  
Casper, Wyoming 82601 USA  
307.797.7720  
hey@frogcreekpartners  
[www.FrogCreekPartners](http://www.FrogCreekPartners)

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Copyright © 2019 Frog Creek Partners, LLC. All Rights Reserved. - The Gutter Bin® stormwater filtration system and the Mundus Bag™ are patent pending - May 19





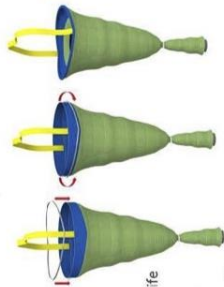
# Mundus Bag™

## Gutter Bin® Filtration Media

100% TRASH CAPTURE



The patent pending Mundus Bag™ water filter removes a broad spectrum of sediment, trash and hydrocarbons from stormwater. It integrates fully with the complete line of Gutter Bin stormwater filtration systems.



### Product Specifications

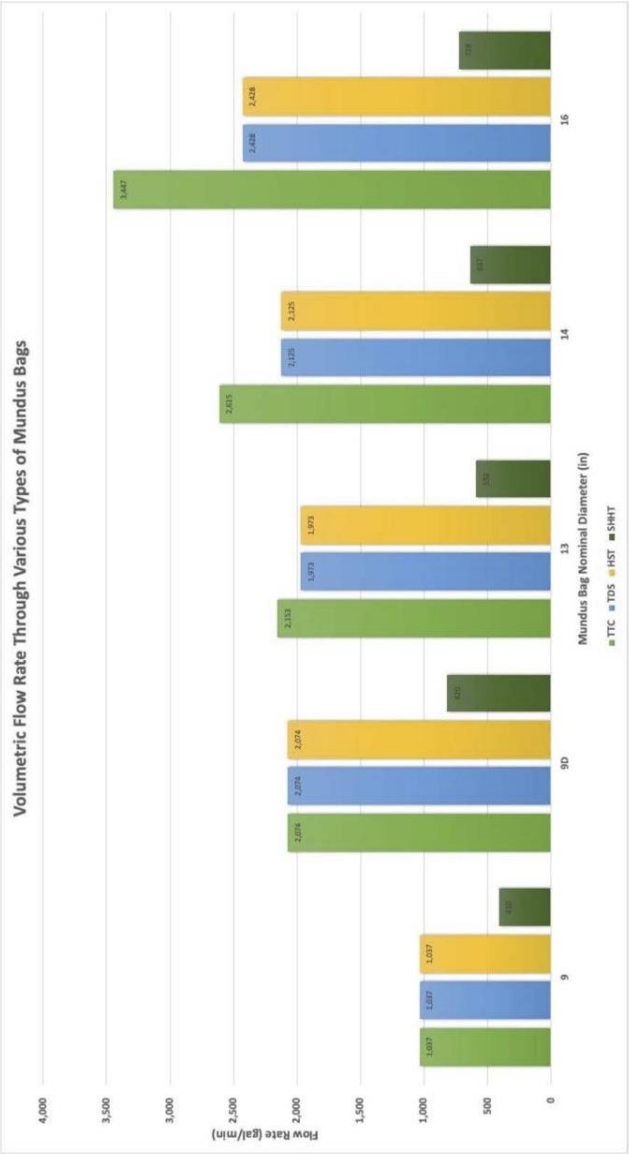
- Adjustable backflow preventer
- Variable depth for deep or shallow catch basins
- Integrated lifting straps for quick removal
- UV resistant durable construction for extended field life
- Single use and reusable models available
- Easily weighed for measurable & quantifiable results
- Cleaned by dumping, vac truck or bag replacement
- To service: load Mundus Hoop, wrap anchor, ready to filter

Targeted Pollution	Model	Filter Media
100% Total Trash Capture (Trash & debris > 4mm)	TTC	polypropylene net
Trash, Debris & Sediment (80% TSS capture)	TDS	geo/fabric
Hydrocarbons, Sediment, & Trash	HST	Myrcdx, geo/fabric
Sediment, Hydrocarbons, Heavy Metals, & Trash	SHHT	Granulated activated carbon, sediment, Myrcdx, geo/fabric

Model	Bag dia (inches)	Max capacity (cu.ft)	Aperture size - particle retention (mm) (X 1000 for micron)	Min/Max length of filter (in)	Max capture load (lbs)	Max load rating of filter bag (lbs)	Empty bag flow rate (gpm)	Reusable	Est. useful life (months)
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HST-16	16	5.58	0.21	12/48	766	920	2,428	Partial	3-12
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SHHT-9P*	90	1.41	0.10	24/72	194	223	820	Partial	3-12
SHHT-13	13	2.51	0.10	24/72	242	414	581	Partial	3-12
SHHT-14	14	3.42	0.10	24/72	431	563	637	Partial	3-12
SHHT-16	16	4.47	0.10	24/72	587	736	728	Partial	3-12

\* 90": two 9 inch diameter Mundus Bags™ installed side by side in a single Gutter Bin

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Notes:

- Table data based on field trials, model data and vendor specifications
- Geofabric aperture size may be customized for customer requirements (i.e. 80% TSS removal)- may affect differential pressure
- Bags can be cut or secured to desired length for short install
- 9D: two 9" diameter Mundus Bags™ installed side by side in a single Gutter Bin
- Mundus Bag can be configured with an RFID for greater tracking abilities



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www.FrogCreekPartners  
DUNS #088457762 | SAM: 080457762/7RLA3

## APPENDIX E – MOSQUITO AND VECTOR CONTROL ASSOCIATION OF CALIFORNIA APPROVAL OF CIF



**MVCAC**  
Mosquito and Vector Control Association of California

One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p: (916) 440-0826 • f: (916) 444-7462 • e: [mvcac@mvcac.org](mailto:mvcac@mvcac.org)

October 11, 2019

Frog Creek Partners, LLC  
800 West Yellowstone Hwy  
Casper, WY

Dear Mr. Deurloo,  
800

Thank you for the submission of the Frog Creek Partner CIF (FCP-CIF) for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has carefully reviewed the conceptual drawings for the FCP-CIF and verifies that although the device does not provide full visual access, curb inlet inspections from the curb are difficult regardless of the trash capture device installed. Therefore, inspection and treatment typically require the removal of the manhole cover.

Despite the issues and concern inspection curb inlet structures with trash capture devices installed, we verify that the FCP-CIF allows for access to inspect and treat standing water and immature mosquitoes.


While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the Frog Creek Partner CIF (FCP-CIF) as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water, that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,

A handwritten signature in black ink, appearing to read 'BA', with a long horizontal stroke extending to the right.

Bob Achermann,  
MVCAC Executive Director

## APPENDIX F - FCP FIELD APP & DATA TRACKING FOR MEASURABLE RESULTS

The FCP Field App is a mobile app for use with any iOS or Android device. At its core, the FCP Field App functions as a central data store for a surveyed inlet locations, installed Gutter Bins and MBs, and their related servicing visits. There are three (3) base data types: 1) Locations 2) Gutter Bins, and 3) Visits.

Locations are specific sites where a Gutter Bin is or will be installed. Key Location data points include: latitude/longitude, measurements/dimensions, observations/notes and photo uploads.

Gutter Bins are records regarding a specific Gutter Bin. Key Gutter Bin data points include: Location (tied back to a specific Location record), serial number, install date, MB (number, type and size), observations/notes and photo uploads.

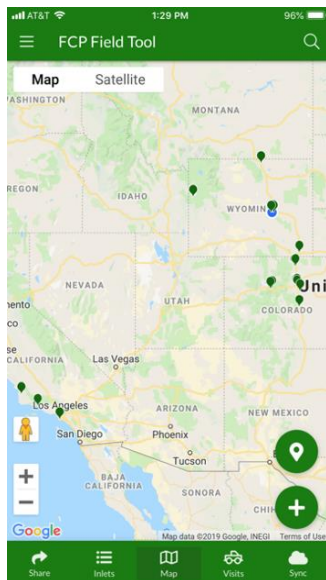
Visits are records regarding a specific visit to a Location. Key Visit data points include: Location (tied back to a specific Location record), Gutter Bin (tied back to a specific Gutter Bin record), visit date, visit type (installation, inspection, service), pollution recovered, MB type, personnel, observations/notes and photo uploads.

These three (3) base records allow FCP personnel equipped with the Field App to quickly access the data of any Gutter Bin (Device) and its accompanying service records.

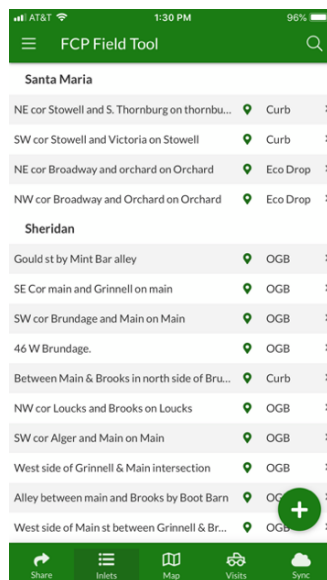
FCP installs an identification badge on each Gutter Bin and assigns a unique serial number to help facilitate the customer's asset management. The serial number and date of manufacturer is stamped into a stainless-steel badge for easy viewing by the service professional.

The CIF and MB can be fitted with a data transmission device (DTD) like a radio frequency identification device (RFID), barcode, QR code, etc. The mobile device can capture individual DTD information and enter it into the FCP field app for information transfer to the customer's asset tracking system.

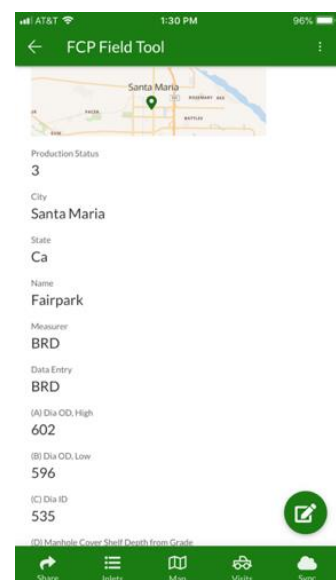
A customer version of the FCP Field App is available with the same functionality but limited only to customer-owned Gutter Bins (Devices).



*Image 24 -  
Geographic overview  
of locations*



*Image 25 - List of  
locations grouped by  
city*



*Image 26 - Specific  
location in Santa  
Maria, CA*

Thank you for taking the time to learn more about the Gutter Bin® stormwater filtration system and Mundus Bag® water filter.