

ecoStorm plus.

Technology that puts you clean ahead of the rest.



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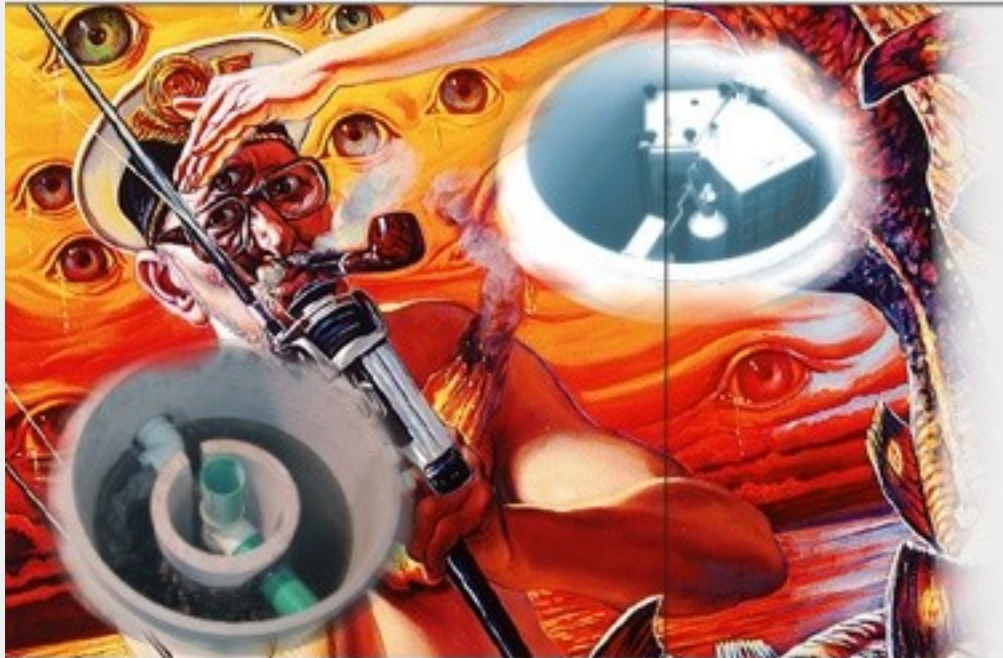
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ecoStorm
plus

stormwater
treatment

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80% of North America's stormwater pollution can be contributed to soluble pollutants like heavy metals, fertilizers, nutrients (phosphorous, nitrates, ...).

ecoStorm plus™ is our answer to a affordable hence effective management of soluble pollutants.



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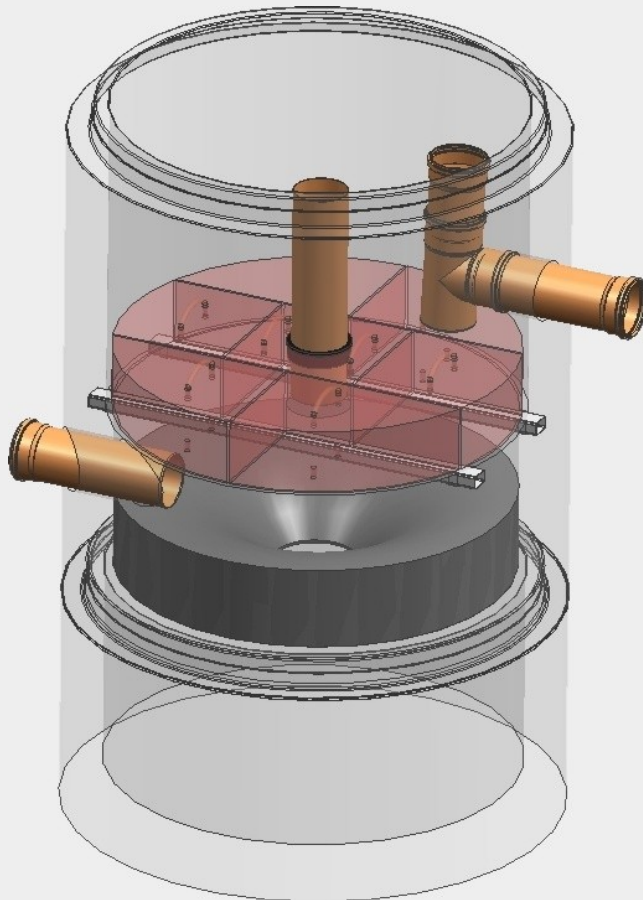
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The ecoStorm plus is an underground containment vessel designed to remove solids and targeted dissolved chemical elements that may be present in stormwater runoff.

The system has been designed with the precaster in mind. Standard concrete components, no elaborate inserts, even the filter is made out of concrete.

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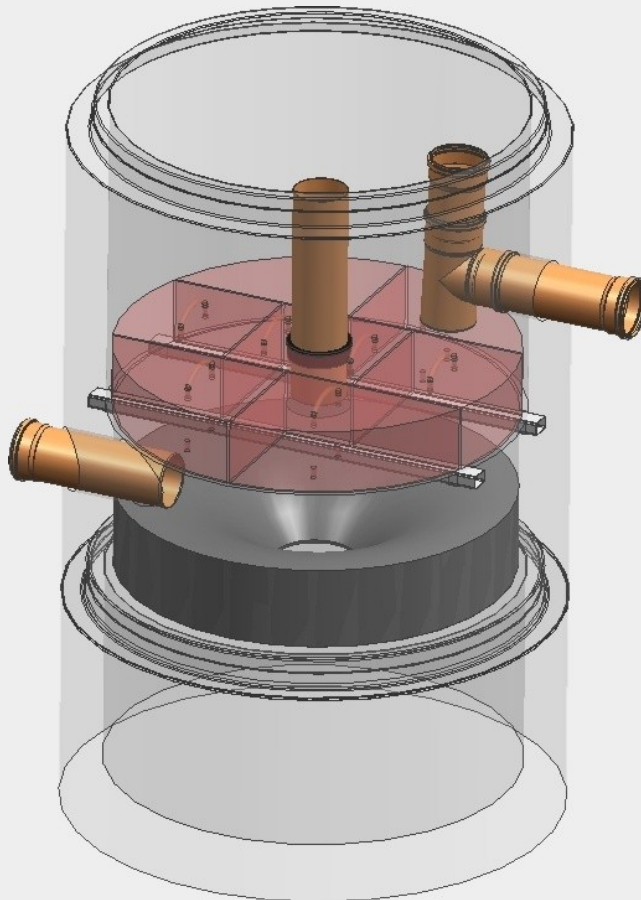
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The **ecoStorm plus** Stormwater Treatment System removes both solid particles and dissolved substances:

- Sediments
- Heavy metals (zinc, copper, lead, cadmium, chromium, nickel)
- Hydrocarbons (mineral oils, polycyclic aromatic hydrocarbons)
- Nutrients such as phosphates and nitrates.

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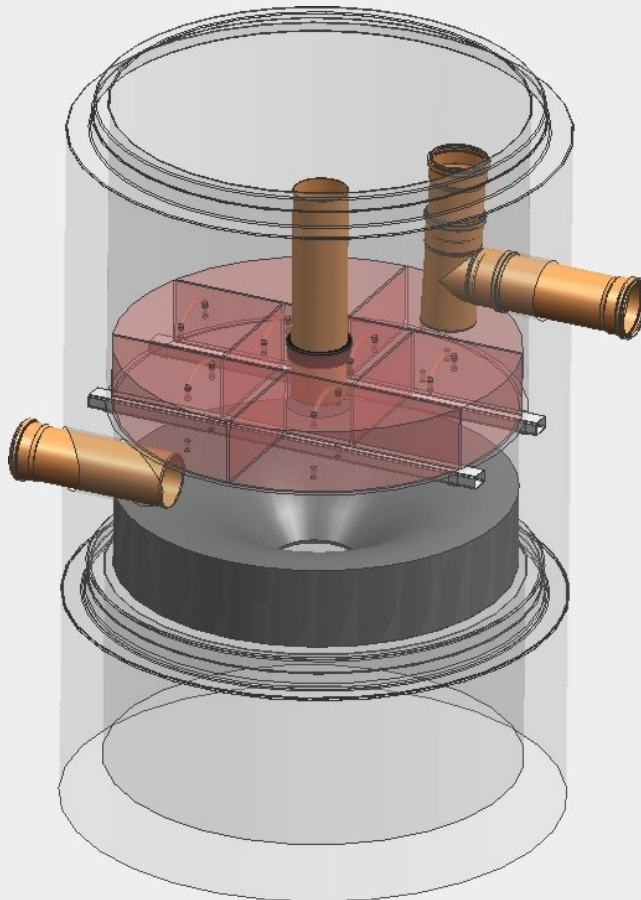
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Step 1: Removal of sediments, Hydrocyclon separator:

Sediments are removed from stormwater by gravitation and trapped in the base section of the Pollution Control Pit.

A hydrocyclone baffle with sludge trap below it can be arranged in a sedimentation space. In order to activate the action of the hydrocyclone, the water feed is made to flow into the lower compartment in a tangential manner.

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Step 2: Removal soluble pollutants, The ecoStorm plus filter:

The filter disk consists of porous or permeable concrete material. Depending on the blend, stone size and the thickness of the plates, the porous concrete filter media can pass 3-5gpm through its open cells for each square foot of surface area. Chemical additives are blended with the cement or resin used in forming the porous concrete to address selected target pollutants.

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Step 2: Removal soluble pollutants, The ecoStorm plus filter:

The alkaline nature of the porous concrete filter buffers the pH of the stormwater, which is typically acidic. Alkaline conditions promote precipitation and accumulation of dissolved substances. The fine pores of the filter allows water to seep slowly through the media providing greater opportunity for interaction between water and the alkaline composition of the filter.

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Step 2: Removal soluble pollutants: Chemical Additives:

Typically, Fe_2O_3 in powder form having a particle size less than 1 micron may be added to cement prior to its being mixed with aggregate and water to form the porous concrete. The presence of the Fe_2O_3 has been found to enhance the ability of the filter plate to adsorb phosphors and nitrates.

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Step 2:

Removal soluble pollutants: Chemical Additives:

Iron oxides and hydroxides promote the chemical precipitation of heavy metals as insoluble metal hydroxides and phosphates as iron-phosphates. Also, they enhance the ability of the filter to adsorb pollutants. Other additives may include limestone expanded clay and recycled concrete. Hydrocarbons tend to become entrained in the pores of the filter media.

ecoStorm plus. Dimensioning and Sizing.

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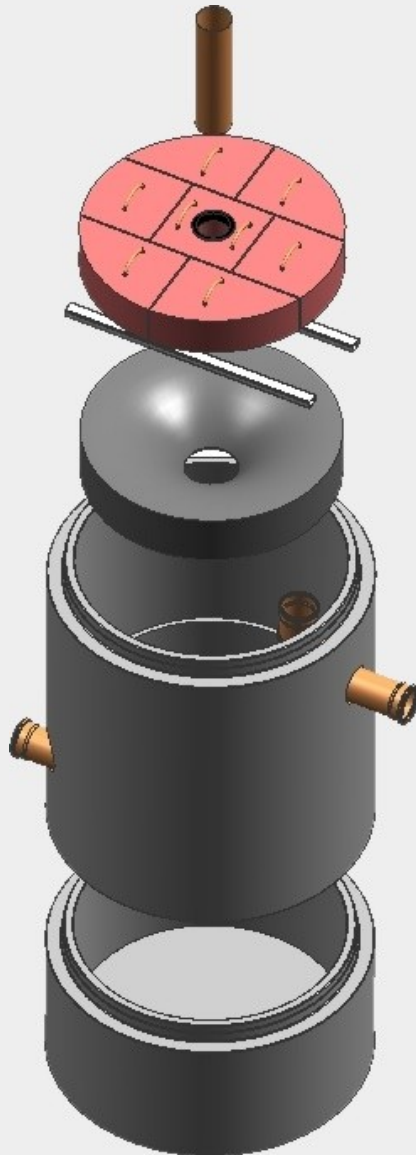
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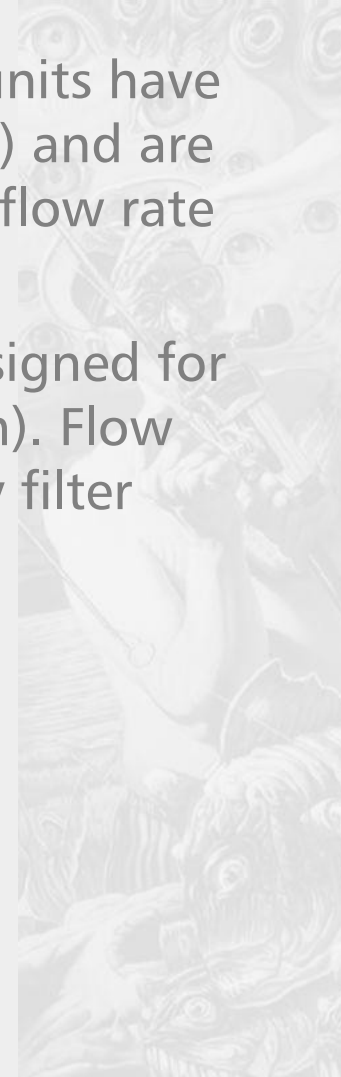
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Standard **ecoStorm plus** units have a diameter of 5 ft. (1,5m) and are designed for a maximum flow rate 390gpm (25l/s) .

All filters are normally designed for a head loss of 8" (200 mm). Flow rates can be controlled by filter porosity.



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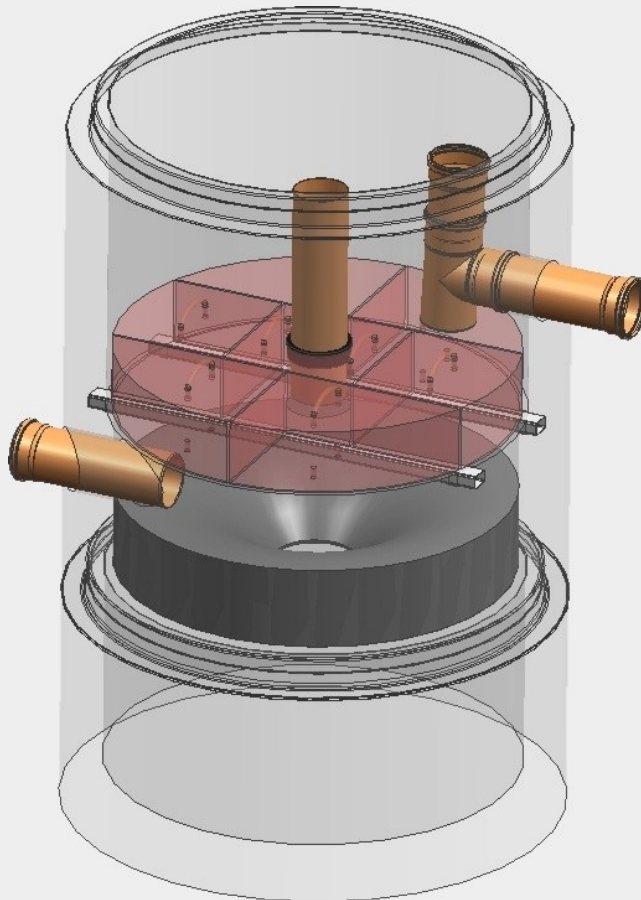
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ecoStorm is easy to install.

ecoStorm is delivered to the construction site in prefabricated concrete components.

Assembly and installation can be done by a local contractor.

ecoStorm comes with a standard HS-20 traffic loading hatches.

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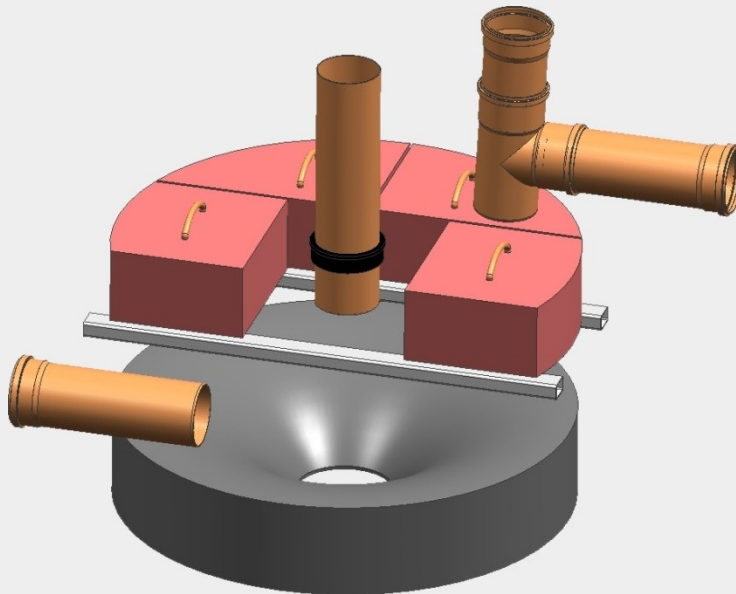
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ecoStorm is easy to maintain.

ecoStorm plus has been specially designed for low and easy maintenance. The main requirement of the system is that sediment be removed. The frequency of sediment removal will depend on site conditions.

Sediment deposited on the base of the Pollution Control Pit is removed either manually or by mechanical suction. Sediment may contain pollutants (heavy metals etc) removed in the Stage 1 cleaning process.

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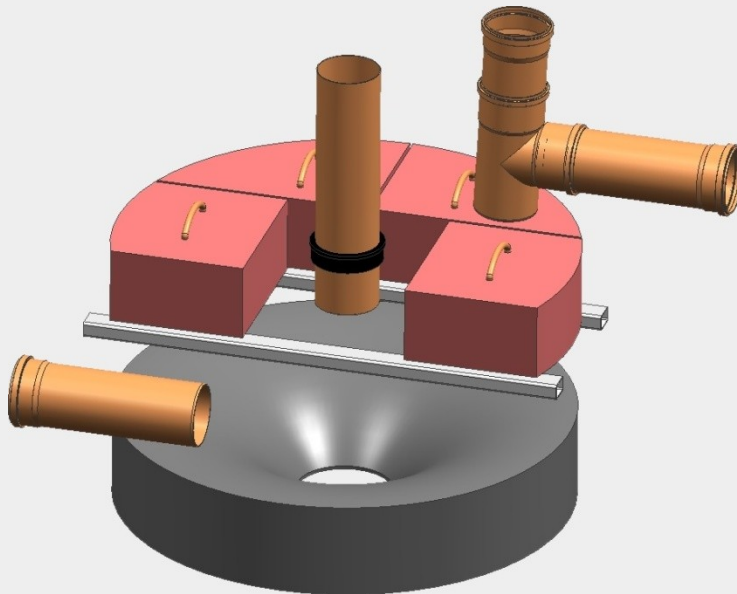
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ecoStorm is easy to maintain.

Permeable concrete filters in the system are self cleaning. Filters are expected to remain effective for long periods - possibly up to 2-3 years, without replacement. Since filters are relatively inexpensive, more frequent replacement could be considered, especially where pollution loads are likely to be heavy. Filters can be back-flushed to remove sediments.

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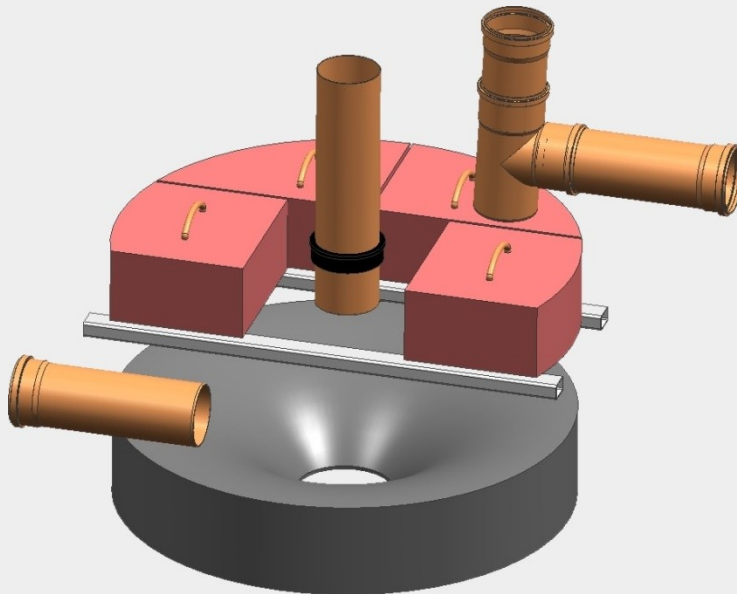
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ecoStorm is easy to maintain.

Sediment deposited on the base of the ecoStorm plus is removed by flushing and extracted via the Pollution Control Pit. Heavy metals and other pollutants remaining in the stormwater after the Stage 1 cleaning process combine with sediment in the pipes. HydroCon pipes themselves require no maintenance.

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| Parameter | Unit | Roof run-off general [range] | | Run-off from Cu Roof [range] | | Run-off from Zn Roof [range] | | Parking lot residential neighborhood [range] | | run-off from main street [range] | | ecoStorm plus effluent water quality | Limiting value |
|---------------------------|---------|------------------------------|-------|------------------------------|-------|------------------------------|--------|--|-------|----------------------------------|-------|--------------------------------------|-----------------|
| | | | | | | | | | | | | | |
| conductivity | [uS/cm] | 25 | 270 | 25 | 270 | 25 | 270 | 50 | 2400 | 110 | 2400 | <1500 7,0-9,5 | 2500 6,5-9,5 |
| pH | [-] | 4,7 | 6,8 | 4,7 | 6,8 | 4,7 | 6,8 | 6,4 | 7,9 | 6,4 | 7,9 | | |
| Nutrients | | | | | | | | | | | | | |
| P total | [mg/l] | 0,06 | 0,50 | 0,06 | 0,50 | 0,06 | 0,50 | 0,09 | 0,30 | 0,23 | 0,34 | - | - |
| NH ₄ | [mg/l] | 0,10 | 6,20 | 0,10 | 6,20 | 0,10 | 6,20 | 0,00 | 0,90 | 0,50 | 2,30 | - | - |
| NO ₃ | [mg/l] | 0,10 | 4,70 | 0,10 | 4,70 | 0,10 | 4,70 | 0,00 | 16,00 | 0,00 | 16,00 | - | - |
| Heavy metals | | | | | | | | | | | | | |
| Cd | [ug/l] | 0,2 | 2,5 | 0,2 | 1,0 | 0,5 | 2,0 | 0,2 | 1,7 | 0,3 | 13,0 | <5 | 5,0 |
| Zn | [ug/l] | 24 | 4.880 | 24 | 877 | 1.731 | 43.674 | 15 | 1.420 | 120 | 2.000 | <500 | 500,0 |
| Cu | [ug/l] | 6 | 3.416 | 2.200 | 8.500 | 11 | 950 | 21 | 140 | 97 | 104 | <50 | 50,0 |
| Pb | [ug/l] | 2 | 493 | 2 | 493 | 4 | 302 | 98 | 170 | 11 | 525 | <25 | 50,0 |
| Ni | [ug/l] | 2 | 7 | 2 | 7 | 2 | 7 | 4 | 70 | 4 | 70 | <50 | 50,0 |
| Cr | [ug/l] | 2 | 6 | 2 | 6 | 2 | 6 | 6 | 50 | 6 | 50 | <50 | 50,0 |
| Organic pollutants | | | | | | | | | | | | | |
| PAH* | [ug/l] | 0,4 | 0,6 | 0,4 | 0,6 | 0,4 | 0,6 | 0,2 | 17,1 | 0,2 | 17,1 | <0,2 | 0,2 |
| TH** | [mg/l] | 0,1 | 3,1 | 0,1 | 3,1 | 0,1 | 3,1 | 0,1 | 6,5 | 0,1 | 6,5 | <0,2 | 0,2 |

* polycyclic aromatic hydrocarbons

** total hydrocarbons

Laboratory and field test reports are available. ecoStorm plus shows excellent removal efficiencies for heavy metals, nutrients (phosphorous, nitrate) and hydrocarbons.

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ecoStorm plus may be used in a wide range of water-quality improvement applications including:

- Parking lots
- Commercial/Retail development
- Wetlands and Waterfront Protection
- Municipal/residential drainage improvements
- Industrial manufacturing facilities
- Transportation/maintenance facilities
- Groundwater remediation

ecoStorm plus.

All Clear. ecoStorm at a glance.



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>80% Net T.S.S. Removal Efficiencies.

Swirl-chamber technology combined with vortex design principles effectively treat the stormwater by removing and retaining sediments and floatables from site runoff.

**Superior Removal Efficiencies
for Soluble Pollutants**

including heavy metals, phosphorous, nitrates.

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ecoStorm plus™ is Easy to Install.

Sectional precast, concrete design limit maximum piece weights. Typically this allows a manufacturer or contractor to set the ecoStorm plus™ with a trailer boom or on-site excavation equipment.

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Single Structure Design.

Reduces footprint of excavation hence saving cost.

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Low Maintenance Costs.

ecoStorm plus™ systems provide access openings that allow for quick inspection and ample space for pumping truck wands.

Long Lifetime of Porous Concrete Filter.

Expected lifetime of ecoStorm plus™ filters is +2 years depending on the application.

Designed to meet discharge requirements.

ecoStorm filters can be modified to target specific pollutants.

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A) Literature:

- Report on investigations into retention of pollutants in rainfall runoff from a concrete plan

