

## Description

Water quality inlets (WQIs), also commonly called trapping catch basins, oil/grit separators, or oil/water separators, are devices that consist of one or more chambers that settle out coarse materials and separate free oil from stormwater. Some WQIs also contain screens to help trap trash as well. A typical WQI consists of a sedimentation chamber, an oil separation chamber, and a discharge chamber. WQIs typically capture only the first portion of runoff for treatment and are generally used for pretreatment before discharging to other best management practices (BMPs).

## California Experience

Experience in California and throughout the country indicates these devices are appropriate for capturing hydrocarbons spills, but provide very marginal sediment removal and are not very effective for treatment of stormwater runoff.

## Advantages

- Can provide spill control, and water quality treatment.

## Limitations

- WQIs generally provide limited hydraulic and residuals storage, therefore, WQIs do not provide substantial stormwater improvement.
- Standing water in the devices can provide a breeding ground for mosquitoes.

## Suitability and Design

- Water quality inlets are most effective for spill control and should be sized accordingly.
- Designs that utilize covered sedimentation and filtration basins should be accessible to vector control personnel via access doors to facilitate vector surveillance and controlling the basins if needed.
- Can be fitted with diffusion baffles at the inlets to prevent turbulent flow from entering the unit and resuspending settled pollutants.
- Generally, off-line units are designed to handle the first 1.3 centimeters (0.5 inches) of runoff from the drainage areas. Upstream isolation/diversion structures can be used to divert the water to the off-line structure (Schueler, 1992). On-line units receive higher flows that will likely cause increased turbulence and resuspension of settled material, thereby reducing WQI performance.

## Construction Considerations

- Any construction activities within the drainage area should be completed before installation of the WQI, and the drainage area should be revegetated so that the sediment loading to the WQI is minimized.

## Design Considerations

- Area Required

Targeted Constituent	Removal
----------------------	---------

Sediment	Med
Nutrients	Low
Trash	High
Metals	Low
Bacteria	Low
Oil and Grease	Med
Organics	Low



- WQIs are available as pre-manufactured units or can be cast in place. Reinforced concrete should be used to construct below-grade WQIs. The WQIs should be water tight to prevent possible ground water contamination.

## Performance

WQIs are primarily utilized to remove sediment from stormwater runoff. Grit and sediment are partially removed by gravity settling within the first two chambers. A WQI with a detention time of one hour may expect to have 20 to 40 percent removal of sediments.

To better understand the performance of water quality inlet (and other proprietary BMPs), many states such as New Jersey, Virginia and Washington State have created specific field and laboratory testing procedures for manufactured BMPs. The State-developed procedures allow for all BMP types be rated on the same criteria and better rate relative pollutant removal. See References for links to some State program websites.

Pollutant removal in stormwater inlets can be somewhat improved using inserts, which are promoted for removal of oil and grease, trash, debris, and sediment. Some inserts are designed to drop directly into existing catch basins, while others may require extensive retrofit construction.

## Siting Criteria

Prior to WQI design, the site should be evaluated to determine if another BMP would be more cost-effective in removing the pollutants of concern. WQIs should be used when no other BMP is feasible. The WQI should be constructed near a storm drain network so that flow can be easily diverted to the WQI for treatment (NVPDC, 1992).

WQIs are most effective for small drainage areas. Drainage areas of 0.4 hectares (1 acre) or less are often recommended. WQIs are typically used in an off-line configuration (i.e., portions of runoff are diverted to the WQI), but they can be used as on-line units (i.e., receive all runoff).

## Maintenance

Typical maintenance of WQIs includes trash removal if a screen or other debris capturing device is used, and removal of sediment using a vactor truck. Operators need to be properly trained in WQI maintenance. Maintenance should include keeping a log of the amount of sediment collected and the date of removal. Some cities have incorporated the use of GIS systems to track sediment collection and to optimize future catch basin cleaning efforts.

When sediment fills greater than 60 percent of their volume, catch basins can reach steady state. Storm flows can then resuspend sediments trapped in the catch basin, and will bypass treatment. Frequent clean-out can retain the volume in the catch basin sump available for treatment of stormwater flows.

Depending on frequency and severity of events WQIs should be cleaned regularly. Two studies suggest that increasing the frequency of maintenance can improve the performance of catch basins, particularly in industrial or commercial areas. One study of 60 catch basins in Alameda

County, California, found that increasing the maintenance frequency from once per year to twice per year could increase the total sediment removed by catch basins on an annual basis (Mineart and Singh, 1994). Annual sediment removed per inlet was 54 pounds for annual cleaning, 70 pounds for semi-annual and quarterly cleaning, and 160 pounds for monthly cleaning. For catch basins draining industrial uses, monthly cleaning increased total annual sediment collected to six times the amount collected by annual cleaning (180 pounds versus 30 pounds). These results suggest that, at least for industrial uses, more frequent cleaning of catch basins may improve efficiency.

BMPs designed with permanent water sumps, vaults, and/or catch basins (frequently installed below-ground) can become a nuisance due to mosquito and other vector breeding. Preventing mosquito access to standing water sources in BMPs (particularly below-ground) is the best prevention plan, but can prove challenging due to multiple entrances and the need to maintain the hydraulic integrity of the system. BMPs that maintain permanent standing water may require routine inspections and treatments by local mosquito and vector control agencies to suppress mosquito production.

## Cost

A typical pre-cast catch basin costs between \$2,000 and \$3,000; however, WQIs can be much more expensive. The true pollutant removal cost associated with WQIs, however, is the long-term maintenance cost which will require appropriate equipment, i.e., vector trucks, and the staff to conduct the maintenance.

## References and Sources of Additional Information

American Petroleum Institute (API), 1990. *Monographs on Refinery Environmental Control - Management of Water Discharges (Design and Operation of Oil-Water Separators)*. Publication 421, First Edition.

Aronson, G., D. Watson, and W. Pisaro. *Evaluation of Catch Basin Performance for Urban Stormwater Pollution Control*. U.S. Environmental Protection Agency, Washington, DC.

Berg, V.H, 1991. *Water Quality Inlets (Oil/Grit Separators)*. Maryland Department of the Environment, Sediment and Stormwater Administration.

Lager, J., W. Smith, R. Finn, and E. Finnemore. 1977. *Urban Stormwater Management and Technology: Update and Users' Guide*. Prepared for U.S. Environmental Protection Agency. EPA-600/8-77-014. 313 pp.

Metropolitan Washington Council of Governments (MWCOG), 1993. *The Quality of Trapped Sediments and Pool Water Within Oil Grit Separators in Suburban Maryland*. Interim Report.

Metzger, M. E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. 2002. The Dark Side Of Stormwater Runoff Management: Disease Vectors Associated With Structural Bmps. *Stormwater* 3(2): 24-39.

Metzger, M. E., and S. Kluh. 2003. Surface Hydrocarbons Vs. Mosquito Breeding. *Stormwater* 4(1): 10.

Mineart, P., and S. Singh. 1994. *Storm Inlet Pilot Study*. Alameda County Urban Runoff Clean Water Program, Oakland, CA.

New Jersey manufactured stormwater devices' performance verification:  
<http://www.njcat.org/verification-process/technology-verification-database.html>

Northern Virginia Planning District Commission (NVPDC) and Engineers and Surveyors Institute, 1992. *Northern Virginia BMP Handbook*.

Pitt, R., and P. Bissonnette. 1984. *Bellevue Urban Runoff Program Summary Report*. U.S. Environmental Protection Agency, Water Planning Division, Washington, DC.

Pitt, R., M. Lilburn, S. Nix, S.R. Durrans, S. Burian, J. Voorhees, and J. Martinson. 2000. *Guidance Manual for Integrated Wet Weather Flow (WWF) Collection and Treatment Systems for Newly Urbanized Areas (New WWF Systems)*. U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati, OH.

Schueler, T.R., 1992. *A Current Assessment of Urban Best Management Practices*. Metropolitan Washington Council of Governments.

U.S. EPA, 1999, Stormwater Technology Fact Sheet: Water Quality Inlets, EPA 832-F-99-029, Office of Water, Washington DC.

Washington State manufactured stormwater devices' performance verification:  
<http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html>