CONTECH®
ENGINEERED SOLUTIONS

Low Impact Development Application Guide

LID Solutions for Urban Environments

Urban stormwater management has two fundamental purposes: minimizing the impact of increased runoff quantity and preventing pollutants from migrating to our natural waterways through stormwater conveyance systems. Green or low impact urban stormwater systems are engineered to moderate impacts of land development by providing the same services as natural systems including infiltration, evapotranspiration, filtration, and detention of stormwater.

Implementing low impact development (LID) in urban environments is challenging. Many LID best management practices (BMPs) require a footprint larger than what is available on a highly developed site. That doesn't mean LID is not possible, it just means the solution may take a more engineered form. That's where Contech comes in.

Contech excels at providing expert advice & assistance to help engineers meet LID goals, especially in urban environments.

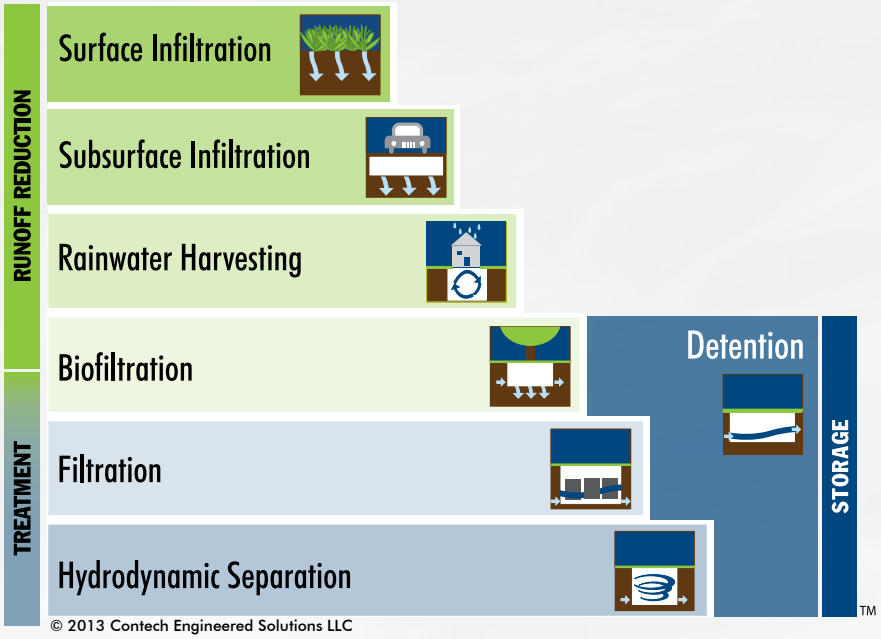
We do this by integrating the most appropriate stormwater management systems into the site design to restore predevelopment hydrology and to minimize pollutant discharge.

A Contech UrbanGreen Rainwater Harvesting System provides runoff reduction at the Oceano Warner Center in Woodland Hills, California

A Contech bioFiltration system provides treatment and partial runoff reduction at the Maverik Convenience Store in Mead, Washington.

UrbanGreen Solution Staircase

Low impact development regulations direct us to manage stormwater close to the source and mimic predevelopment hydrology to the maximum extent practicable. It is easy to meet those goals by taking a systematic approach to selecting which BMP is right for your site. First, select the runoff reduction practices that are most appropriate for your site, paying particular attention to pretreatment needs. If the entire design storm cannot be infiltrated on-site, select a treatment BMP for the balance. Finally, select a detention system to address any outstanding downstream erosion issues.

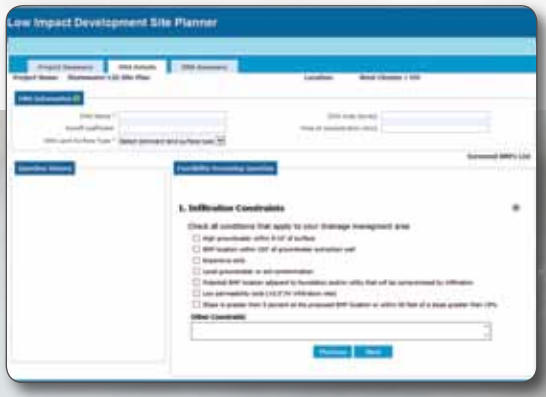


Low Impact Development Site Planner

The Low Impact Development (LID) Site Planner is a free, web based tool intended to guide you in preliminary selection of the most effective and likely to be approved stormwater control measures that are technically feasible given known site constraints.

Benefits of the tool include:

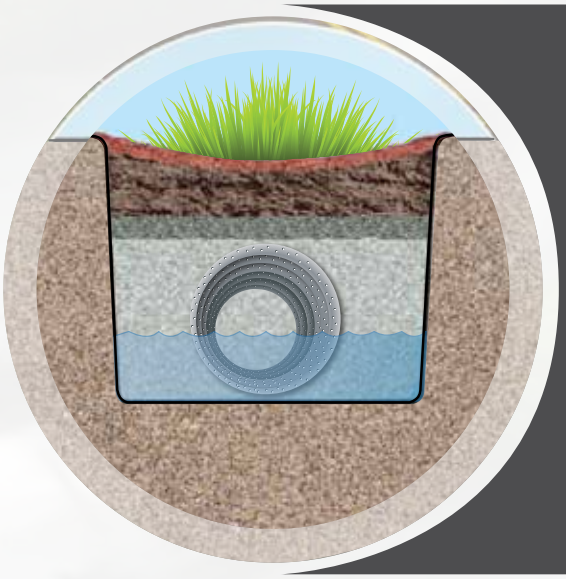
- A fast, easy-to-use tool that follows a Low Impact Development design approach consistent with regulations that prioritize Green Infrastructure
- Helps minimize the cost and delay of redesigns by prompting users to consider a wide range of common site constraints early in the design process
- Captures specific site conditions precluding the use of infeasible BMPs
- Allows flexibility to select flow through treatment controls where runoff reduction is not feasible
- **Provides a summary report with links to design guides, standard details, and specifications for stormwater management approaches that are likely to be feasible and approved on the project**



To use the LID Site Planner, visit www.ContechES.com/LIDSitePlanner

Surface Infiltration – Bioretention

Given its aesthetic appeal, bioretention is often the first choice for LID design. However, with limited footprints, buried utilities, and sometimes marginal soils, utilizing bioretention in urban environments may seem impractical. This doesn't have to be the case. By adding storage underneath a bioretention system by using perforated CMP or ChamberMaxx® chambers, you can shrink the footprint on the surface, maximizing annual infiltration and annual runoff reduction, design around existing utilities, and make bioinfiltration feasible for sites with marginal soils.



Bioretention with Perforated CMP

- Perforated CMP stores stormwater runoff exceeding a site's allowable discharge rate and releases it slowly over time.
- Wide range of shapes and sizes to meet site constraints
  - » Round and pipe-arch in diameters from 6 to 144 inches
  - » Rectangular, L-shaped, and staggered cells are frequently used

Bioretention with ChamberMaxx®

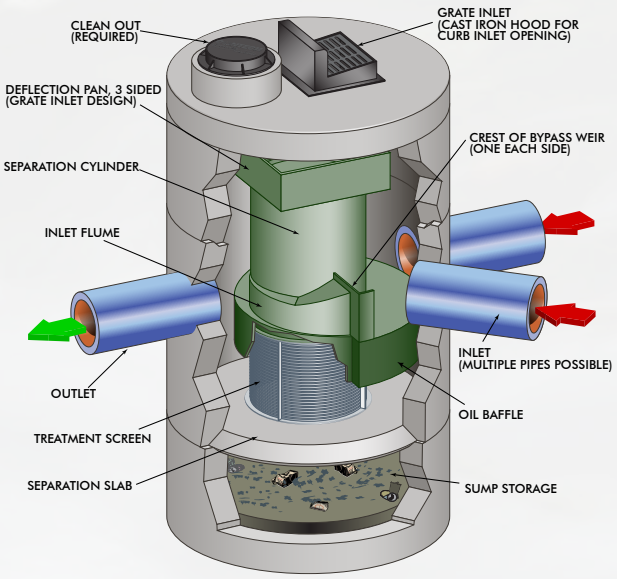
- The open-bottom plastic chamber allows infiltration into surrounding soil, effectively achieving runoff reduction objectives
- Ideal when you need to maximize storage capacity in a shallow footprint
- Reduces the footprint and depth of bioretention cells

LID Benefits:

- Aesthetic appeal
- Runoff volume reduction
- Peak flow control
- Ground water recharge
- Water quality improvement

Surface Infiltration – Bioretention Pretreatment

Trash, debris, sediment – not only does this material take away from the aesthetic appeal of a bioretention system, it also causes maintenance issues, increases surface loading, and reduces the effectiveness and life span of a biofiltration system. One way to avoid these issues is to pretreat your bioretention system with a Contech CDS® system. Capturing pollutants with a CDS will result in reduced maintenance, increased aesthetic appeal, and extended longevity of your biofiltration system.



Bioretention Pretreatment with CDS

- Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger
- Proven removal of solids, oil, and grease
- Patented indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Easy access to remove captured pollutants
- Performance verified by NJCAT and WA Ecology

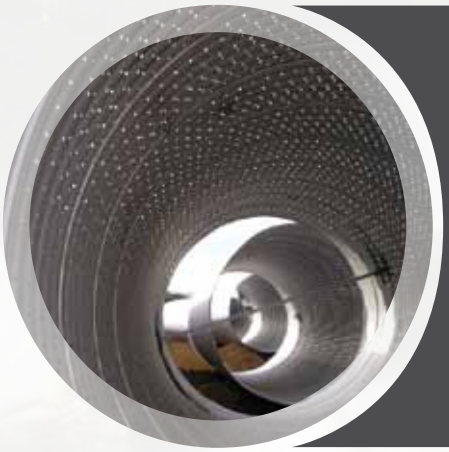
A CDS provides pretreatment for a bioswale in Newport Beach, California.

LID Benefits:

- Water quality improvement

Subsurface Infiltration

Many urban developments have limited space for bioretention facilities. For sites with limited area at the surface, subsurface infiltration may be the best option. By utilizing subsurface infiltration, space is preserved for development, runoff is reduced or eliminated, and groundwater recharge can occur. These systems commonly comprise a pretreatment component designed to remove sediment, trash, and oil and a high voids storage gallery surrounded by permeable stone. These systems are typically designed to support vehicular loading and to withstand lateral pressures from surrounding soil, which allows the overlying land to be used for virtually any non-building application



Subsurface Infiltration with Perforated CMP

- Runoff is stored in the pipe and surrounding stone until it can be slowly released into the surrounding native soil
- Available with various coatings to achieve 75-100 year design service life
- Diameters from 6 to 144 inches
- Variety of layouts – rectangular, L-shaped, and staggered cells are frequently used
- Optional CDS pretreatment device captures solids before they enter the CMP system for easy maintenance

Subsurface Infiltration with ChamberMaxx®

- Provides storage capacity in shallow footprint
- Open-bottom plastic chamber allows infiltration into surrounding soil
- Optional CDS® pretreatment captures solids before they enter the ChamberMaxx system for easy maintenance

CMP Infiltration is used at Pitzer College in Claremont, California

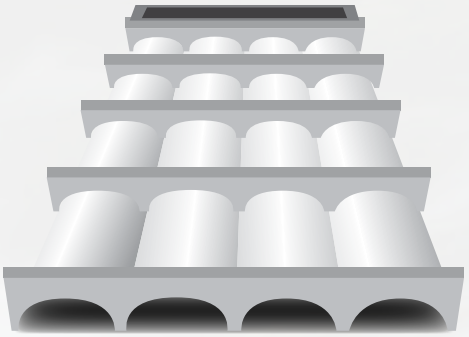
LID Benefits:

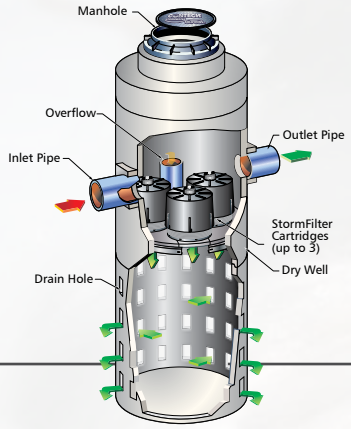
- Runoff volume reduction
- Peak flow control
- Ground water recharge
- Water quality improvement

Subsurface Infiltration

Subsurface Infiltration with Terre Arch™

- Modular, multi-chambered, precast concrete system for the detention and infiltration of stormwater
- 100+ year design life
- HS-25 load rating
- No foundation required
- Simple and fast installation; install 30,000 - 50,000 cubic feet of storage per day





Infiltrating with The Stormwater Management StormFilter®

- Provides treatment and infiltration in one structure
- Small footprint for tight sites or sites with crowded utilities
- Easily adapts to multiple drainages for a modular design

ChamberMaxx chambers and CMP infiltration are used on the Ocean Park Boulevard Green Streets project in Santa Monica, California

Rainwater Harvesting

Rainwater harvesting is fast becoming a leading tool for engineers to reduce runoff reduction and meet LID goals. In addition to irrigation, harvested water can be used for toilet flushing, process water, and cooling make-up. These systems require balancing supply, storage size, and reuse demand to maximize runoff reduction. With the UrbanGreen Rainwater Harvesting System, you have all the components to build an efficient and effective water re-use or runoff reduction integrated management practice.

UrbanGreen® Rainwater Harvesting System

- Turn-key system that include pretreatment, cistern, pumps, and controls
- DuroMaxx®steel reinforced PE cisterns can provide watertight storage to 15 psi
- Cisterns available up to 120" diameter – utilizing larger diameters whenever possible reduces storage cost per gallon
- Pretreatment devices can be added to improve water quality
- Disinfection systems available

Rainwater Harvesting with CDS Pretreatment is used at Yakult Manufacturing in Fountain Valley California

LID Benefits:

- Runoff volume reduction
- Peak flow control
- Water conservation and reuse

Biofiltration/Bioretention

Implementing low impact development and green infrastructure in urban environments is challenging, as they often require a large footprint. Contech has addressed this need by developing two unique biofiltration/bioretention solutions – Filterra® and Filterra Bioscape™.

Filterra

Filterra is an engineered biofiltration system that has been optimized for high volume/flow treatment and high pollutant removal. The combination of landscape vegetation and a specially designed filter media allows bacteria, metals, nutrients, and total suspended solids (TSS) to be removed naturally.

- Third party field testing confirmed that Filterra meets state regulatory requirements for pollutant removal under TAPE and TARP testing.
- Landscaping enhances the appearance of your site making it more attractive while removing pollutants.
- Multiple configurations and sizes available to meet site-specific needs.
- Filterra is ideal for both new construction and urban retrofits.
- Smaller bioretention footprint (up to 80% less) for more useable land.
- Save up to 20% on installed cost versus standard bioretention.

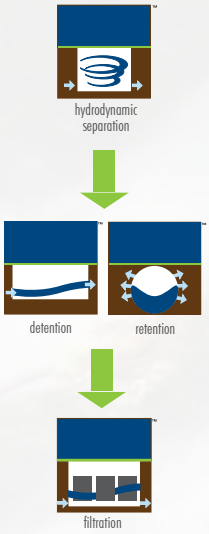
Biofiltration is used at Channel Islands Landing Marina and Boatyard In Ventura, California

LID Benefits:

- Aesthetic appeal
- Runoff volume reduction
- Peak flow control
- Water quality improvement

Treatment Train

Meeting certain stormwater quantity and/or quality objectives may require multiple BMPs integrated at the site, thus creating a "treatment train." A treatment train typically consists of pretreatment, detention, and filtration in an integrated system. The use of detention and treatment systems in a conventional design provides significant environmental benefits and is acceptable in many jurisdictions. This approach can meet TMDL requirements by providing a high level of pollutant removal and preventing erosion damage from peak flows.



Traditional Design

Pretreatment with HDS – Removes trash, debris and solids from runoff, and reduces the maintenance of downstream structures. **Contech HDS systems include CDS®, Vortechs® and VortSentry® HS**.

Detention – Reduces the quantity of stormwater runoff leaving a site by temporarily storing the runoff that exceeds a site's allowable discharge rate and releasing it slowly over time. **Contech offers a full line of corrugated metal pipe (CMP), concrete, and plastic detention solutions.**

Filtration – Improves water quality by filtering runoff to remove the most challenging pollutants including fine solids, heavy metals, and total nutrients. **Contech filtration systems include the Stormwater Management StormFilter® and the Jellyfish® filter**.

A Treatment Train is used at the Edie and Lew Wasserman Building in Westwood, California. The system uses CMP infiltration, CDS, and a Inifiltrating StormFilter to achieve LID goals

The Right Partner Can Make All the Difference

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

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

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

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

To get started, please visit www.conteches.com/localresources or call us at 800-338-1122.

Dig Deeper

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

Connect with Us

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

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

Start a Project

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

Links to Stormwater Tools:

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

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

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

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

To use the LID Site Planner , visit:
www.ContechES.com/LIDsiteplanner

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