

# Stormwater Management Infrastructure Solutions

A Collection Of Case Studies That Show  
How to Manage Costs and Keep Your Project  
On Schedule and Under Budget



# I-4 Ultimate Reconstruction

Orlando, Florida

**Owner:**

FDOT

**Engineer:**

Jacobs

**Contractor:**

SGL Constructors

**Installation:**

2018



The I-4 Ultimate reconstruction project is the largest transportation project in Florida history. The \$2.3-billion public-private partnership consists of the reconstruction of 21 miles of highway that runs through the heart of downtown Orlando.

Engineers designed nine underground stormwater storage systems to prevent flooding and control water quality. Underground storage was chosen because of a lack of land space and because the FDOT was working to build a functional Interstate and an aesthetically pleasing corridor for Central Florida.

Three of the underground stormwater detention systems are located where I-4 crosses Lake Ivanhoe, a popular lake just north of downtown. In addition to providing the proper storage volume, the stormwater solution also needed to meet the St. Johns River Water Management District (SJRWMD) regulations that call for nutrient filtration removal rates of 80%+ phosphorous and 50%+ for nitrogen for all runoff entering the lake.

Two of these detention systems are located in areas with a high water table, so a watertight system was needed to ensure groundwater did not infiltrate and displace the design storage volume. These sites utilized DuroMaxx Steel Reinforced Polyethylene (SRPE).

The stored stormwater is treated before discharge into Lake Ivanhoe using the Stormwater Management StormFilter equipped with cartridges filled with PhosphoSorb®, a media that removes total phosphorus. The use of PhosphoSorb enabled the engineers to meet the SJRWMD removal rates for phosphorous and nitrogen of all runoff enter the lake.

**Technical Description:**

- 2,372' of 96" DuroMaxx® Steel Reinforced Polyethylene
- 6,411' of 48", 60", and 72" perforated Aluminized Steel Type 2
- Stormwater Management StormFilter®



# I-4 Ultimate Reconstruction

Orlando, Florida

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In addition to the three sites near Ivanhoe Lake, six other detention systems were constructed to prevent flooding along the reconstructed roadway. These detention systems use a combined 6,411 LF of 48", 60", and 72" perforated, ALT2 corrugated metal pipe providing 1,077,636 gallons of storage in the pipe. Additional storage was achieved by using perforated CMP and limestone backfill. With the proximity to I-4, accessibility and speed of construction were very important for the contractor. The inherent nature of CMP's longer lengths (24' lengths) and lighter aluminized steel pieces allowed for fewer delivery trucks, smaller installation equipment, and fast installation.

A well-graded granular limestone was used for the backfill of the system. The limestone allowed for easy compaction, as well as good drainage throughout the entire system.

# San Jose Trash Capture

San Jose, California

## Stormwater Treatment

**Owner:**

City of San Jose

**Engineer:**

BKF

**Installation:**

Spring, 2017



California is widely known for its waterways. Millions of tourists and locals flock to these waters every year to swim, play, fish and relax in the sun, resulting in an economic boon for California. Unfortunately, trash generated by human activity on land is washed by rain into gutters and storm drains and makes its way into streams, creeks, rivers and, eventually, the ocean. Cigarette butts, paper, plastic bags, plastic food containers, cans and bottles have all been found in California waters and on beaches following stormwater runoff.

In 2015, the California State Water Board addressed the issue by adopting amendments to their Ocean and Inland Water Plans, commonly known as the “Trash Amendments,” which mandate that trash discharged from every city, county and CalTrans stormwater system is significantly reduced to protect local waterways.

The Bay Area has had trash capture regulations (C10) since 2009. Under C10, San Jose and other Bay Area cities must reduce certain percentages of trash by milestone dates in 2015, 2017, 2018, and 2022. The Trash Amendments require cities to install devices or other measures over a 10-year period beginning in 2019, with 2018 intended to be a year for planning and design.

To tackle the issue of trash, the city of San Jose has implemented a series of initiatives, including cracking down on illegal dumping, shore cleanups, ordinances for single use plastic bags and foam food containers, installing new public litter cans, and additional street sweeping.

### Technical Description:

- (7) CDS<sup>®</sup> hydrodynamic separators





# San Jose Trash Capture

San Jose, California

In the spring of 2017, the City installed nine CDS<sup>®</sup> hydrodynamic separators from Contech to meet their latest deadline for trash capture. The CDS is a hydrodynamic separator that uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment and hydrocarbons from stormwater runoff. CDS captures and retains 100% of floatables and neutrally buoyant debris, effectively removes sediment, and uses a non-blocking screening technology that facilitates easier maintenance.

The city had experience with CDS, having previously installed systems in 15 key locations. After installing the first two CDS units specifically for trash capture in 2010, the City examined the long-term lifecycle costs for using numerous individual catch basin screens compared to a small number of large devices like the CDS. While the CDS units were found to be more expensive initially, their significantly lower maintenance costs and long history of reliability made them the choice for the city's ongoing trash control efforts.

The city had less than a year to identify installation sites, perform hydraulic analysis, size and design the CDS units, prepare specifications for bid, sign contracts, retrofit their drainage system with the CDS units, and restore the city streets. Contech worked closely with City Public Works engineers and consulting firm BKF throughout the process, and provided hydraulic analysis for multiple scenarios before final designs were agreed upon.

The CDS units included four 12-foot-diameter units with diversion vaults, two twin 12-foot diameter units with diversion vaults, and one 18-foot-diameter unit with a segmented diversion vault. Existing drainage pipes required special designs to prevent upstream flooding. Box culverts were used at two sites instead of standard rectangular diversion vaults to fit within a limited footprint. Total combined flow treated by the nine CDS units is over 550 cfs. Over 5,000 acres of high-density urban San Jose is now protected by CDS units, and trash within these drainage areas will no longer make it into San Francisco Bay.

Most installation activities occurred within a six-week period in April and May of 2017, with two contractors, each working on three sites performing the installations. All installations were retrofits within a crowded urban area. Large trucks, overhead clearance for the cranes, and neighborhood access all had to be managed. One site required partial installation until the electric utility could relocate buried high voltage lines. Following the relocation, the site was re-excavated, and the remaining components were installed.

A Contech Project Coordinator worked to manage all delivery schedules, while a Contech Field Representative was on site providing the contractors support during the installations. The installations required over 60 trucks scheduled across a dozen installation dates, and each installation date changed multiple times. Most loads were oversize with a flag car, which meant they weren't allowed on the highway in the morning and required six different staging areas throughout the congested city so the trucks could arrive overnight.

Before the trucks could even be loaded, the 38 screen sections had to be fabricated, the 54 fiberglass pieces had to be built, and over 90 concrete pieces had to be poured. Complicating all of this were design changes made during construction, with

# San Jose Trash Capture

San Jose, California

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three of the sites having changes close to the day of installation. Two contractors worked through conflicting schedules to handle the installations. Despite all these challenges, the team met the June 30 deadline, surprising many city officials who thought the goal was not achievable.



# City of Yakima - North 1st Street Revitalization

Yakima, Washington

## Bioretention

### Owner:

City of Yakima, Washington

### Engineer:

HLA Engineering and Land Surveying,  
Inc HBB Landscape Architecture

### Contractor:

Total Site Services

### Installation:

November 2021



The North 1st Street Revitalization Project comprises three phases spread out over several years. The project is intended to improve safety for drivers and pedestrians and increase the economic development potential of the North 1st Street corridor, one of the main entrances to the City of Yakima. The project will also improve the underground infrastructure, which is over 100 years old.

Phase 1 of the North 1st Street Revitalization Project was completed in December 2019. Construction of Phase two started in April 2021 and included new stormwater treatment BMPs to meet most current Washington Department Ecology Stormwater Regulations.

With City's stormwater regulations restricting any increase in offsite flows from site-related drainage, planners had to review options carefully to ensure compliance with requirements on water quality treatment. The limited footprint was also a concern. To meet these needs, engineers specified eight, 6' x 4' Filterra Internal Bypass Curb, Street Tree configuration, the first of its kind installed on the West Coast. The Internal Bypass Curb configuration incorporates a curb inlet treatment chamber and internal high flow bypass in a single structure, eliminating the need for a separate bypass structure.

### Technical Description:

(8) Filterra® - Internal Bypass  
Curb, Street Tree configuration.



# City of Yakima - North 1st Street Revitalization

Yakima, Washington

The Street Tree configuration incorporates knockouts in the containment structure to allow for the planting of trees with more extensive root systems. The Filterra's were planted with Ruby Sunset Acer's, a tree with a mature height of 25' and a spread of 20'.

Filterra provided everything the City needed; regulatory compliance, a 100"/hr treatment rate, a small footprint, and the ability to blend in with the overall project.

"The Contech Filterra biofiltration unit was the perfect solution to the City of Yakima's stormwater problem of needing stormwater treatment with a small footprint that provided a large treatment capacity," said Terry Alapeteri, Principal of HLA Engineering. "It was a bonus for the City to choose a street tree with the Filterra unit that fit in seamlessly with the other amenities included in the downtown revitalization project."

Total Site Services installed the Filterra systems. When the sites were stabilized, a Contech Certified Maintenance Provider activated the systems by installing the trees and conducting a final inspection. Contech also provided the City's operations staff inspection and maintenance training of the Filterra systems to ensure they function as designed for years to come.

"It was important to the design team to maintain the street tree aesthetic along North 1<sup>st</sup> Street, using the same size of trees there were specified for typical tree grate planters," said Aaron Luoma, Principal of HBB Landscape Architecture. "The Street Tree Filterra unit worked well to maintain a consistent appearance along the corridor, utilizing the openings for future root growth and unique underground straps within the units."





# I-70/I-71 Columbus Crossroads

Columbus, Ohio

## Stormwater Treatment

**Owner:**

Ohio Department of Transportation

**Engineer:**

ms consultants, inc.

**Contractor:**

Shelly & Sands, Inc.

**Installation:**

November 2016



Running through a central business district of Ohio's largest city, the I-70/I-71 Interchange is a two-mile stretch of highway that has been going through a \$1.5 billion, multi-year modernization that will reduce congestion, reduce crashes, increase aesthetics, and reduce the environmental impact of the interchange. Phase 2B of the project was to improve the quality of stormwater runoff coming from the interchange and separate the runoff from the City's combined sewer.

Phase 2B required treatment of 75 cfs of runoff. Treatment was to be provided by a manufacturer approved on ODOT's Qualified Products List for Manufactured Water Quality Structures. Contech is one of four approved manufacturers. This phase was treated similar to a design-build project, so no design pre-approvals were given by

### Technical Description:

- (4) CDS<sup>®</sup> Hydrodynamic Separators



# I-70/I-71 Columbus Crossroads

Columbus, Ohio

the design engineer or ODOT; it was up to the contractor and manufacturer to supply a solution that met project specifications. Challenges associated with the project included designing a system to fit within a predetermined footprint as well as determining the most cost-effective way to provide treatment in accordance with scaling for ODOT's treatment performance criteria.

To meet all of these requirements Contech proposed a system consisting of four, 10-ft diameter CDS hydrodynamic separators. The CDS uses continuous deflective separation – a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff. Each unit was approximately 25 feet deep. The flow was split to each unit by a precast diversion box. Treated flow from each unit discharges to a precast vault before being discharged to the storm conveyance system.



Installation occurred in two phases: the CDS manhole sections and the internals. First, the CDS manholes were installed; each consisted of a base slab, three barrel/riser sections, and a top slab. The fiberglass internals and screen were then installed by a Contech representative. Contech provided installation oversight and guidance to the contractor throughout the entire installation process of the CDS units.

Contech worked with all parties to meet financial requirements, provided a reliable system with ease of installation, and supported the contractors throughout the entire installation process.



# Windsor-Detroit Bridge Authority - Perimeter Access Road

Windsor,

## Stormwater Treatment

**Owner:**

Windsor-Detroit Bridge Authority

**Engineer:**

Armtec (distributor)

**Contractor:**

AMICO

**Installation:**

January 2016



The Gordie Howe International Bridge, a bi-national border infrastructure project, will be one of the longest bridges in North America. The new bridge will connect Canada with the U.S., ensuring the effective flow of commerce between the two countries.

Early works activities will prepare the Canadian Port of Entry (POE) for the new bridge. This includes the construction of a new, four-kilometer, two-lane perimeter access road. The new road will surround the Canadian POE and provide employees and customers with access to local businesses, and provide access for emergency services such as fire and police.

Before the perimeter access road could be built, a stormwater management system designed to collect rain runoff from the road needed to be installed. The PAR stormwater management system includes a Vortechs hydrodynamic separator from Contech. Vortechs combines swirl concentration and flow controls into a shallow treatment unit that traps and retains trash, debris, sediment, and hydrocarbons from stormwater runoff.

The Vortechs was chosen for this application because it can handle flows from a 100-year storm as well as act as an oil/grit separator for the access road, treating the water before it is eventually discharged into the Detroit River.

Contech had to provide a design that would not only be able to capture the oil and grit from the runoff, but also be able to

### Technical Description:

- Vortechs® hydrodynamic separator



# Windsor-Detroit Bridge Authority - Perimeter Access Road

Windsor,

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handle the potential for higher flows, all while being cost effective. Contech provided design calculations and installation estimates to help the engineers better analyze the benefits of the Vortechs unit.

Because of the use of only one unit, installation was quick and easy. The crew was able to lower the precast vault into place, install the internals, install the top slab, and make the connections to the inlet and outlet pipes in just a few hours.



# Ocean Park Boulevard Green Streets Project

Santa Monica, California

## Stormwater LID Solution

### Owner:

City of Santa Monica

### Engineer:

Kimley-Horn and Associates, Inc.

### Contractor:

Excel Paving Company , Arcadis

### Installation:

April to June 2012



In 2008, at the request of the Santa Monica community, a project was initiated to examine the portion of [Ocean Park Boulevard](#) west of Lincoln Boulevard to Neilson Way. The community requested solutions to issues based on scale, character, health, safety, sustainability, landscaping, accessibility and circulation. After several years of planning and collaboration between community members, the City of Santa Monica and other local stakeholders construction for the Ocean Park Boulevard project began in December 2011 with a groundbreaking ceremony. From Neilson Way to Lincoln Boulevard, Ocean Park Boulevard will be turned into a “Complete Green Street,” resulting in a better performing, enhanced streetscape that is pedestrian and bicycle oriented, attractive and reduces urban runoff discharges into the Santa Monica Bay.

Key elements of the project included: wider sidewalks, over 100 trees, improved landscaping, a drip irrigation system, crosswalks, traffic signal improvements, parkway/stormwater biofilter swales and infiltration areas, storm improvements and more. While searching for a stormwater solution, the City and Kimley-Horn and Associates, Inc, the engineer on the project, turned to Contech Engineered Solutions for help. Both longterm clients, they knew Contech would provide a strong level of expertise in stormwater and low impact development (LID) engineering.

### Technical Description:

- 4 Basins of ChamberMaxx®
- 3 Basins of Corrugated Metal Pipe



# Ocean Park Boulevard Green Streets Project

Santa Monica, California

As a solution, Kimley-Horn chose to utilize four basins of ChamberMaxx<sup>®</sup> ranging from 945 CF to 4,590 CF of storage, two basins of 84” perforated corrugated metal pipe (CMP) with approximately 4,000 and 10,000 CF of storage and one basin of 24” perforated CMP with approximately 250 CF of storage. Ideal in a shallow footprint, the open-bottom plastic ChamberMaxx allows infiltration into surrounding soil, effectively achieving runoff reduction requirements. By utilizing subsurface infiltration, space is preserved for development or green spaces above, runoff is reduced or eliminated and groundwater recharge can occur. Furthermore, ChamberMaxx’s light weight allows for installation by hand, rather than by heavy equipment, providing a green and economical solution.



“The CMP installed very smoothly,” stated Randy Slane, Construction Manager with Arcadis, the construction manager on the project. “Excel Paving Company is a great contractor and installed the large, 7’ diameter pipe and connected it with an excavator in less than an hour, like clockwork.”

Throughout the project, a few challenges were encountered, such as installation of the pipe in tight spaces, utility conflicts and grade issues. Due to utilities buried in the area, it was imperative that the pipe size varied throughout the project in order to meet the depth requirements. In addition, the footprint was extremely restricted so the width and length of each pipe section was carefully considered. There were also concerns about corrosive soils in the area so, as a solution, the CMP was coated with polymer.

At completion, the project included improvements to over a half mile of vehicular right of way, more than 6,000 linear feet of sidewalks and the 4th Street overpass. The end result has benefited the Ocean Park neighborhood and the entire Santa Monica community by providing a working model of sustainability, multimodality and low-impact street design.

# Lake Street in Whitehall

Whitehall, Michigan

## Low Impact Development

**Owner:**

City of Whitehall

**Engineer:**

Prein & Newhof

**Contractor:**

Thompson Brothers

**Installation:**

August 2012



[White Lake](#) is a major tributary to Lake Michigan and an EPA Area of Concern (AOC). Historic industrial pollution contaminated lake bottom sediments, tainted fish and harmed water. Government officials are now working to reduce the volume of polluted stormwater that drains off the land and into White Lake.

The City of Whitehall recently completed Michigan’s first “Green Road.” The city transformed a 2,800 linear feet of Lake Street from a traditional paved roadway into a state-of-the-art stormwater collection system. The system uses pervious pavers, a Contech [CDS hydrodynamic separator](#), rain gardens and bioswales to capture and repeatedly filter stormwater runoff from 60 acres of streets and industrial land near White Lake. The Contech CDS unit plays a critical role in this unique stormwater system. Runoff on Lake Street is diverted into a series of bioswales along both sides of the road. These direct runoff into several detention zones lined with native trees and plants.

Runoff on Lake Street is diverted into a series of bioswales along both sides of the road. These direct runoff into several detention zones lined with native trees and plants. Runoff then flows into the new wetland areas. Each of these steps is designed to filter the runoff and encourage it to soak into the soil. Prior to the retrofit, runoff collected at industrial facilities east of Lake Street drained to the street without treatment. A CDS system was installed to remove trash, debris and sediment from the industrial area flows prior to treatment by BMPs within the green street. This greatly improves the longevity of those systems and retains pollutants where they will not come into contact with groundwater, soil or wildlife.

“The City of Whitehall is committed to being a leader in stormwater treatment,” says Jason Washler, Civil Engineer with Prein & Newhof. “With the new system, stormwater is treated multiple times prior to its eventual discharge into White Lake. The

### Technical Description:

- CDS<sup>®</sup> Hydrodynamic Separator





# Lake Street in Whitehall

Whitehall, Michigan

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treatment methods include naturalized wetlands, bioretention, pervious pavers, and a hydrodynamic separator from Contech. White Lake is expected to be delisted as an EPA Area of Concern in 2014 as a result of the efforts of many local stakeholders, including the City of Whitehall.”

Because the road’s stormwater system is so environmentally friendly, this project will further the EPA’s goals to reduce the quantity and improve the quality of stormwater entering White Lake.

# Granary and Laurel Street Revitalization

Bellingham, Washington

**Owner:**

City of Bellingham, WA

**Engineer:**

KPFF Consultants - Seattle

**Contractor:**

Ram Construction

**Installation:**

Spring 2018



The Granary Avenue and Laurel Street project involved building a new roadway through a site formerly occupied by a pulp and tissue mill on the waterfront of the City of Bellingham.

The 74 acre, heavily polluted site had sat idle for nearly 20 years. Extensive cleanup was needed to remove 500,000 cubic yards of contaminated soils and building materials from the site. In addition, \$35 million was spent on the cleanup of Whatcom Waterway. All this was done to reestablish the economic viability of Bellingham's downtown waterfront.

The redevelopment continued with Granary Avenue and Laurel Street, which provides access to the historic Granary Building and Waypoint Park. The Granary Building includes shops, restaurants and upper-story offices. The one-acre Waypoint Park consists of a new beach, playground, waterfront trail, industrial art and nearshore habitat. The project also included Bellingham's first cycle track, a protected bike lane physically separated from the street, allowing bicycle movement in both directions on one side of the road.

In continuing the theme of protecting the environment, the Granary Avenue and Laurel Street design included stormwater treatment measures to protect the bay from total suspended solids (TSS) as required by the Washington State Department of Ecology.

Several years ago, the City of Bellingham selected the Contech StormFilter as the media cartridge product of choice based on its ability to meet treatment requirements and ease of maintenance. For this reason, nine Catch Basin StormFilters were

**Technical Description:**

- (9) Catch Basin Stormwater Management StormFilters®



# Granary and Laurel Street Revitalization

Bellingham, Washington

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installed using ZPG™ media, a proprietary blend of zeolite, perlite, and granularly activated carbon that improves the performance of perlite and target organics, soluble metals, and other pollutants.

Installation of the StormFilters went as planned and without issue. The StormFilters are online and providing treatment from the roadway runoff before it is discharges into the bay.



# Ohio River Bridges Crossing

Louisville, Kentucky

## Stormwater Treatment

**Owner:**

Kentucky Transportation Cabinet

**Engineer:**

Parsons Brinckerhoff

**Contractor:**

Walsh Construction

**Installation:**

June 2016



The Ohio River Bridges Project was created to increase cross-river mobility by improving safety by alleviating traffic congestion in connecting highways. The East End Project will connect the end of Louisville to southern Indiana. The Kentucky approach to the new bridge will extend to KY 841 from its current end at US 42, adding a 1.4 mile long four-lane crossing.

Because this project will be expanding KY 841 into a four-lane crossing, the amount of impervious area will increase immensely. The increase in the impervious area combined with the increase in traffic meant that a new stormwater treatment system that could treat a large volume of runoff was needed.

Engineers at Parsons Brinckerhoff selected the Vortechs stormwater treatment system from Contech. Vortechs is a hydrodynamic separator that combines swirl concentration and flow controls into a shallow treatment unit that traps and retains trash, debris, sediment, and hydrocarbons from stormwater runoff.

The Vortechs was designed to treat a large flow - 34 cfs. The inflow pipe was made from RCP, while the outlet pipe was made from PVC. Both of the connecting pipes needed to be taken into consideration during the design and construction of the unit to ensure proper alignment to the precast vault of the Vortechs unit.

The Vortechs was delivered to the site with its externals already in place within the precast unit. This allowed for a quick and easy installation, with a crane lowering the unit into place, followed by the top slab. In addition to design support, a Contech Field Consultant was on site for the entire installation of the Vortechs unit.

### Technical Description:

Vortechs® Hydrodynamic Separator



# CONTECH<sup>®</sup>

## ENGINEERED SOLUTIONS

### Large-Scale Stormwater Management eBook

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