

Rail Solutions Case Studies



Long Island Rail Road - Colonial Road

Long Island, New York

Railway Underpass

Owner:

MTA Long Island Railroad

Engineer:

KS Engineers, PC

Contractor:

Railroad Construction Company

Installation:

2016



Chartered in 1834, the Long Island Rail Road Company (LIRR) is one of the few railroads that has survived from its conception to the present. Aging infrastructure is a constant issue for the company, so when a 115 year old structure in the Village of Thomaston just 19 miles from Times Square was deemed structurally deficient, a replacement was needed.

Since the bridge was not historically or architecturally notable, LIRR decided that replacement was a better option than rehabilitation so that improvements could be made to the area. The scope of the project included: 1. Replacement of the original, deteriorating structure, 2. construction of a new 12-car pocket track, and 3. improvement of the existing right-of-way to mitigate flooding and drainage issues.

During the planning phase, site challenges such as difficult soils for footings, a skewed roadway alignment, and the need to keep the trains running as much as possible for Long Island commuters were all considered. In the end, a 52' x 11'-2" [CON/SPAN® O-Series® Bridge System](#), 324' in length, was designated as the best bridge replacement option to meet the requirements. The precast system's ability to be installed quickly and efficiently was imperative since the railroad could be closed for a maximum of only three weekends. All but two of the 84 precast arches were subtly pie-shaped to span the track's radius, allowing no room for error. Utilizing pie-shaped pieces allowed for the use of 52' span arches, instead of 62' span arches, providing a considerable materials cost savings to LIRR.

Technical Description:

- CON/SPAN® O-Series® Bridge System
- Span: 52'
- Rise: 11'-2"
- Length: 324'



Long Island Rail Road - Colonial Road

Long Island, New York

The arches were produced 100 miles away and then delivered to the site on 42 flatbed trailers at night when traffic was light. Installation went smoothly with an arch set in place via crane approximately every 20 minutes. In fact, the project was completed within budget and ahead of schedule using only two of the three weekend closures.

"Contech Engineered Solutions went the extra mile at many points in this project and made it a successful project for everyone," stated Adam Schmitt, Project Manager with Railroad Construction Company, the project's contractor.

The project achieved several major benefits, including the ability to turn trains faster, run more trains during rush-hour allowing for a quicker commute, reduce flooding problems, provide a safer commute for vehicles, and reduce the noise for nearby residents.

The project was recognized with the following two awards: the "Metropolitan Section Design/Build Project of the Year" award by the American Society of Civil Engineers (ASCE) Metropolitan Section and the American Council of Engineering Companies (ACEC) Engineering Excellence Structural Systems award.

SEPTA R5 Commuter Rail

Doylestown, Pennsylvania

Owner:

SEPTA

Engineer:

SEPTA

Contractor:

Crossing Construction Company

Installation:

August 30, 2008



The South Eastern Pennsylvania Transportation Authority (SEPTA) provides commuter rail service throughout Philadelphia and suburban counties. As the result of the planned extension of the Doylestown Township shared use path, SEPTA was required to replace an existing 12' span bridge along an active commuter rail line.

Technical Description:

- Span: 32 ft
- Rise: 13 ft
- Length: 35 ft

The new alignment required SEPTA to replace the existing structure to accommodate both the private road for the college and the shared use path for the township. SEPTA could not afford extended down time to replace the structure. They researched several options and selected the CON/SPAN® precast bridge system.



Construction was scheduled for Labor Day weekend. Demolition commenced at 4 a.m. Friday and installation of the new bridge began at 6 a.m. Saturday, which included precast foundations, arch units, headwalls and wingwalls. Installation was completed in 14 hours. The contractor finished grouting and backfill and turned the structure back to SEPTA for final rail placement. Trains were back in service at 5 a.m. Tuesday, September 2.

“Using a CON/SPAN for this project was beneficial because we were able to start and finish the installation of a completely functional railroad bridge within four days” stated Edward LaGuardia, Assistant Chief Engineer of Bridges & Buildings for SEPTA. “The structure was well made and provided SEPTA with a very aesthetically pleasing and highly practical end product”

The project required close coordination between SEPTA, Doylestown Township, Delaware Valley College, Michael Baker Jr., Crossing Construction, Contech, PennDOT and Delaware Valley Regional Planning Commission.

U.S. 395 Railroad Tunnel

Spokane, Washington

Railway

Owner:

Washington State Department of Transportation

Engineer:

HDR Engineering

Contractor:

Scarsella Bros.

Installation:

August 2008



The US-395 Corridor Project is an effort to address increasing congestion and improve traffic movement through metropolitan Spokane. As part of the \$3.3 billion highway project, the Washington State Department of Transportation (WSDOT) needed a structure to span a Burlington Northern Santa Fe (BNSF) railroad track and support a new stretch of Highway 395 above.

Technical Description:

- Span: 54-ft.
- Rise: 25.5-ft.
- Length: 1,332-ft.

A conventional girder bridge was initially proposed for the project. Typically, when projects of this scope require BNSF involvement and approval, conventional beam bridges are often utilized due to ventilation concerns. BNSF requested a structure with a clearance large enough to accommodate a second railroad track in the future; however, several project factors led WSDOT and consulting engineer HDR to consider other alternatives.



The conventional bridge would have allowed for construction of just one lane of US 395 at a time over the structure. The second lane would have to be constructed at a later date, pushing back project completion time. Additionally, the curve of the railroad tracks and skew of the roadway above would have required a massivesized structure and a lengthy and complicated construction process.

WSDOT, working with Contech, began investigating prefabricated tunnel options using either a concrete or a steel plate arch system. Plans were submitted to BNSF Railway for each solution. BNSF accepted plans for a BEBO® Arch System, a buried concrete structure, which provided a number of solutions.

“BEBO offered the best crash worthiness of the tunnel options, a necessary consideration for potential train derailment inside the tunnel,” said Paul Weber with HDR, Inc. “The precast structure also allows the railroad tracks to remain in service

U.S. 395 Railroad Tunnel

Spokane, Washington

during construction. Installation of the precast units is flexible enough to allow crews to stop work while trains are passing through, then immediately resume work once the train is past.”

B & H Railroad over Hodgekins Creek

Painted Post, New York

Rail

Owner:

B & H Rail Corporation

Engineer:

Fraser-Wiley Associates

Contractor:

Silverline Construction

Installation:

September 8, 2003



An aging, turn-of-the-century, steel railway bridge over a stream adjacent to a levy was in need of replacement. The old structure did not provide sufficient hydraulic opening, since the stream was consistently rising above the rails, causing safety and maintenance concerns. Maintenance crews were required to remove debris collecting at the pier annually.

Technical Description:

- Span: 36 ft
- Rise: 11 ft
- Length: 16 ft

The solution was to install a 36-foot span x 11-foot rise CON/SPAN® structure. Because the rail line serves the community in the transporting of heating fuel to the local residents, construction time was limited to a seven day window. The contractor was able to demolish the old bridge; excavate and cast new footings; set the CON/SPAN® precast arch units, headwalls, and wingwalls; as well as backfill in the first three days of construction.

All of the CON/SPAN® components were designed in accordance with the structural requirements of the American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications. The finished structure was economical, met demands for quick installation, and provided a clear span, virtually eliminating future bridge maintenance.

MetroLink Cross County

St. Louis, Missouri

Rail

Owner:

Bi-State Development Agency (Metro)

Engineer:

STV, Inc.

Contractor:

McCarthy Building Companies, Inc.

Installation:

Summer 2005



McCarthy Building Companies installed the longest CON/SPAN® tunnel to date as part of the MetroLink Cross County Extension project in [St. Louis, Missouri](#).

The 8-mile, 9-station extension to the light transit line is one of the largest publicly funded projects ever undertaken in the city's history. This extension connects additional communities in the MetroLink system and plans to accommodate an additional 18,000 daily riders.

The precast tunnel portion of the project is designed with a custom shape and encompasses over 5,500 linear feet of CON/SPAN with a 31 ft - 6 in span and 10 ft - 10 in rise. The arch shape was designed to provide an economical solution that would meet the clearance diagram and load requirements of this site more efficiently.

Technical Description:

- Span: 31 ft - 6 in
- Rise: 10 ft - 10 in
- Length: 5,500 ft



Union Pacific Railroad Extension

Oxman, Oregon

Rail

Owner:

Union Pacific Railroad Company

Engineer:

HDR Engineering, Inc.

Contractor:

D.H. Blattner Sons Inc.

Installation:

November 19, 1993



Approximately 250 tons of **CON/SPAN**[®] precast units were shipped from Salem, Illinois, to **Oxman, Oregon**, for installation as an extension of an arch bridge built in 1902. Union Pacific Railroad Company needed to extend the bridge to accommodate double tracking. Following the one-day installation of the units, the structure was backfilled under 20 feet of cover and tracks were laid. The trains began running over the CON/SPAN extension in just one and one half weeks after the installation.

Technical Description:

- Span: 28 ft
- Rise: 11 ft
- Length: 42 ft

Toledo Zoo Pedestrian Tunnel

Toledo, Ohio

Railroad Underpass

Owner:

Toledo Zoo

Engineer:

SSOE

Contractor:

Rudolph Libbe Inc.

Installation:

June 1997



A CON/SPAN® Bridge System was installed as a railroad overpass/pedestrian underpass to enable the zoo to expand beyond the Norfolk and Southern Railway, which cut through the middle of the zoo's available land space. The contractor installed the eight-piece precast structure in two phases to maintain constant rail traffic.

The structure was designed for Cooper E-80 railroad loading to carry as many as four simultaneous 80-kip loads. In addition, the CON/SPAN precast solution served the railroad's desire for quick installation, a site-specific design and minimal disturbance to traffic.

The precast erection time for each stage was only five hours.

Technical Description:

- Span: 16 ft
- Rise: 9 ft
- Length: 60 ft



Jefferson St. over CSX Rail

LaGrange, Georgia

Rail

Owner:

City of LaGrange - Georgia DOT

Engineer:

Moreland Altobelli Associates, Inc.

Contractor:

Scott Bridge Company

Installation:

July 13, 2006



An existing timber bridge crossing a CSX railroad in [Troup County, GA](#), required replacement due to its deteriorated condition. A 50' span [CON/SPAN®](#) structure was designed to carry traffic on Jefferson Street over the tracks for this Georgia Department of Transportation bid project.

Technical Description:

- Span: 50 ft
- Rise: 11 ft
- Length: 64 ft - 4 in

“Both a PSC and steel bridge alternates were investigated, but that would have entailed raising the profile of Jefferson Street considerably, which would have impacted the rightof- way of adjacent properties,” said Hisham (Sam) Deeb, PE, Director of Structural Services for Moreland Altobelli Associates, Inc. “To minimize that impact, the 50' CON/SPAN® units provided a lower structure while still maintaining the stringent clearance requirements of CSX railway.”

“Moreover, the speed at which a CON/SPAN® is placed rendered that option more appealing since it eliminated prolonged construction closures of a track with considerable traffic,” said Deeb. As many as 14 trains passed through the site each day, which threatened to delay the installation. Crews, however, worked efficiently to accommodate the trains, and the CON/SPAN® installation was completed in just three days.



The 50' span structure allowed for a standard CSX horizontal clearance diagram complete with drainage ditches on both sides of the single rail line. 21'-1" tall cast-in-place retaining walls elevated the arch units to allow for 23' tall vertical clearance at the track level.

Route 302 Conway Railroad

Bartlett, New Hampshire

Rail

Owner:

New Hampshire Department of Transportation

Engineer:

New Hampshire Department of Transportation

Contractor:

RM Piper Inc.

Installation:

Summer 2008



The Conway Scenic Railroad (CSR) was completed in 1874 when rail travel was the preferred method of transportation over stagecoaches until the early 1950's when automobiles and improved highways caused a decline in passenger and freight service. In 1974, Dwight Smith established the CSR for seasonal excursion train rides in the Mount Washington Valley and it continues to offer scenic railroad tours today.

A bridge structure along the 21 mile, nearly 2 hour excursion to Bartlett, New Hampshire, was deteriorating and needed to be replaced. The new structure needed to provide enough clearance for the railroad below and also be able to accommodate a skew in the roadway above.

New Hampshire Department of Transportation chose a 36' x 10' CON/SPAN® Bridge System as its new railway underpass. The arches, with a combined length of 170, were placed on 14' tall cast-in-place pedestal walls. This structure was the best fit due to its low maintenance, ease of installation and a large enough clearance space for the trains to pass.

“The CON/SPAN system fit the parameters of this project seamlessly” stated Samantha Fifield, PE, Design Engineer for the New Hampshire Department of Transportation. “One benefit, especially given today’s economic challenges, is the reduction of long term maintenance costs. Contech’s engineering team was professional, efficient and very helpful which contributed to the effective application of this system”

In addition, CSR was able to maintain active train service while the structurally deficient structure was removed and replaced with a precast bridge.

Technical Description:

- Span: 36 ft
- Rise: 10 ft
- Length: 170 ft



Route 302 Conway Railroad

Bartlett, New Hampshire

“This was a perfect application of the CON/SPAN system” added John Bousquet, Vice President of RM Piper Inc. “The units were placed in just two days, all while maintaining train traffic. In addition, Conway preferred to utilize the final structure right away without having to pass under false, temporary structures that would have been required for a cast-in-place product”

BNSF Railway Culvert Extension

San Diego County, California

Owner:

North County Transit District/BNSF
Railway

Engineer:

RailPros, Inc.

Contractor:

Joshua Grading & Excavating

Installation:

August 2006



BNSF Railway wanted to expand their rail lines to accommodate three tracks in [Barstow, California](#). Contech MULTI-PLATE pipe arches were chosen to fit and extend existing MULTI-PLATE structures in place along the track.

Installation time became a challenge when they realized the railroad needed to remain open during construction. A 14-hour window was given to assembly crews for the multiple culvert extension before the tracks were opened to live freight.

Due to the shortened time frame, BNSF chose two MULTI-PLATE pipe arches with concrete paved inverters and two CSP round pipes. The structures were pre-assembled adjacent to the existing wood trestle bridge and positioned under the existing railroad tracks.

The construction process concluded with a slurry fill around the openings to secure them in place within the existing trestle structural members. Despite minimal cover over the culverts, the MULTIPLATE arches with slurry backfill supports the railroad loads required for this project.

Technical Description:

- Span: 20 ft - 7 in
- Rise: 13 ft - 2 in
- Length: 35 ft
- Product: MULTI-PLATE®



MV-25.13 over Wissahickon Creek

Flourtown, Pennsylvania

Reline / Rehabilitation

Owner:

Norfolk Southern Railway

Engineer:

Jacobs Engineering Group

Contractor:

WM Brode

Installation:

February 2015



Norfolk Southern (NS) Railway operates an east/west line through suburban Philadelphia, Pennsylvania. Bridge MV 25.13 is a seven-cell stone arch structure that has been in service for approximately 150 years. Several different rehabilitation efforts have been employed over the life of the bridge. The latest project, reline/reinforcement of the arches, resulted from field observations by the site contractor W.M. Brode Company of Newcomerstown, Ohio, who was employed to perform conventional repairs on the bridge. The contractor observed some severely deteriorated areas that included fractures in the load carrying stone. They advised NS that the conditions were beyond the scope of the proposed repair methods they were asked to use on the bridge.

NS retained Jacobs Engineer's Chicago, Illinois office to further investigate the conditions. Jacobs agreed with the contractor and recommended a more robust repair procedure be investigated. Jacobs then conducted a feasibility study. The challenge in this case, was to find a method and/or product that would be able to repair and reinforce the 50' span, single radius arches yet allow the rail line to remain in operation while the repairs were made.

Technical Description:

- Product: BridgeCor® Structural Plate Arch
- Length: 25 LF
- Dimensions: 48'-8" span x 24'-3" rise
(4 cells)



MV-25.13 over Wissahickon Creek

Flourtown, Pennsylvania

Jacobs concluded that 4 of the 7 cells would require the additional work to avoid further deterioration and possible track closure. The feasibility study found the most cost-effective method was to slip line the arches with corrugated structural plate.

Contech Engineered Solutions was approached by Jacobs, due to the success Contech has had with similar applications. After evaluating the existing conditions, Contech recommended its BridgeCor® structural plate product for the relining of the existing culvert arches. BridgeCor is a deep corrugation (15" x 5 1/2") high performance product that was developed to meet the requirements of this type of application (large span and heavy loading). The design method allows for the full transfer of the railroad live loads to the new arch and subsequently to the grouted annulus and the reinforced concrete footings.

Contech provided technical support to the NS/Jacobs design team, as well as field services including plate assembly. Each BridgeCor arch was assembled at the site. The base channel was placed in a C-channel that was mounted to new footing extensions with exterior anchors. Once each arch was completely assembled, a flowable cementitious grout mixture was pumped into the existing void between the two structures. After the curing process, the result was a completely rehabilitated structure. The relining of the four arches was completed in December 2014 without any interruption to rail operations. The entire project is scheduled to be completed by February 2015.

Chief Engineer of Norfolk Southern Corporation, James Carter, commented, "The BridgeCor structural plate was an excellent product that allowed the rehabilitation of this stone arch bridge without interruption to service."



SEPTA Structure Rehabilitation

Philadelphia, Pennsylvania

Reline

Owner:

SEPTA

Engineer:

Burns Engineering

Contractor:

IEW Construction

AP Construction

Installation:

2016



Several years ago, the federal government issued a policy requiring all railroad bridges to be load-rated. The Southeastern Pennsylvania Transportation Authority (SEPTA) evaluated all their structures and found that six of the stone arch bridges were too old to accurately rate.

After exploring options, SEPTA consulted with Contech Engineered Solutions for support, because of their past and positive experience using Contech's 2-Flange Tunnel Liner Plate for similar structures.

After preliminary design, cost and construction evaluations, SEPTA chose to specify 2-flange galvanized steel, Tunnel Liner Plate. Various radii, gages and lengths were utilized depending on the size of each of the six structures. In addition to being the most cost effective solution, the product was selected because the installation of the liner plate would not interrupt track operations.

During the design phase, Contech supported SEPTA's design consultant, Burns Engineering with preliminary sizing, product details and specifications, needed for the preparation of bid documents.

During the construction phase, the Tunnel Liner Plate was delivered to the jobsite, unassembled. The plates (18" long rings) were set on cast-in-place support (knee) abutment walls and bolted together down the length of each tunnel. The process, including post installation grouting, took approximately two weeks per structure.

Joe DeVito, Project Engineer for IEW Construction, Trenton, NJ, offered the following assessment of the project: "The projects went well and the customer was satisfied with the results. Contech provided the design support needed for final approvals



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Technical Description:

- Galvanized Steel Tunnel Liner Plate
- Length: 400 LF total barrel length for 6 structures. Shortest 24'; Longest 120'



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SEPTA Structure Rehabilitation

Philadelphia, Pennsylvania

and the field support during installation. These were key factors in the success of the project. We have used Contech's products on other projects and will consider them on future projects."

Murray Hill Station

Long Island, New York

Skywalk

Owner:

Roadway Contracting, Inc.

Engineer:

Jacobs Engineering Group, Inc.

Contractor:

Roadway Contracting, Inc.

Installation:

May 2005



The Long Island Rail Road (LIRR) system is comprised of over 700 miles of track on 11 different branches. More than 65 LIRR stations throughout the system have been rehabilitated in recent years. A [Continental](#)[®] bridge was designed for the MTA Long Island Railroad's [Murray Hill Station](#).

The new prefabricated pedestrian bridge replaces an existing structure. Space was limited, so the new bridge had to be designed to fit within the same footprint. The new bridge is 92' long by 10.5' wide and has some unusual characteristics. It is a thru truss design supported only on the ends of the bridge with the stairway exiting from the side of the bridge to the passenger platform below. The bridge features a truss roof to accept the onsite installation of the Kallwall brand roofing that also covers the Murray Hill Station entry canopies and stairways.

Full height mesh panels were installed on the sides of the bridge for pedestrian safety. The bridge was painted to match the MTA LIRR color scheme and a cast-in-place concrete floor was chosen for the decking. The bridge's unique features, along with the area lighting and landscaping, makes the Murray Hill Station a true showpiece.

Technical Description:

- Width: 10.5-ft.
- Span: 92-ft.
- Style: Gateway[®]
- Finish: Painted Steel
- Decking: Concrete



Sturtevant Passenger Rail Station

Sturtevant, Wisconsin

Skywalk

Owner:

City of Sturtevant

Engineer:

STS Consultants

Contractor:

Riley Construction Company, Inc.

Installation:

June 2006



In 1998 the Governor of Wisconsin made the decision to replace an old Amtrak station built in 1903. After many years of stalled demolition, the new construction began in September 2005.

The original design for the station included a tunnel to move pedestrians under the heavily traveled rails. When the costs for tunneling under active rail lines and utility relocation became too high the design team proposed a stair tower/pedestrian bridge over the rails. The concrete stair towers rise more than 40 feet above the tracks and are constructed of a combination of structural precast and cast-in-place concrete, which are clad in brick and stone. The towers are approximately 15 feet from an active rail line and support the steel truss bridge suspended 25 feet above the rail lines.

Twenty-six trains pass through the Sturtevant Railway Station during an eight-hour shift and Amtrak did not want to interrupt service while the new bridge was set in place. Riley Construction had only 90 minutes to install the span after one train passed through, and they were able to pick up the bridge and move it into place before the next train arrived.

The project has attracted much attention including winning a 2006 “Top Project Award” from Wisconsin Builder magazine. The architecture of the new pedestrian overpass compliments the historic character of the nearby depot. Together, the towers and bridge are the landmark the city had hoped for and a visible element of Sturtevant’s commitment to the Milwaukee/Chicago Amtrak corridor.

Technical Description:

- Width: 6 ft
- Span: 50 ft
- Style: Connector®
- Finish: Painted
- Decking: Concrete



South Florida Tri-Rail

Pompano Beach, Florida

Owner:

Tri County Commuter Rail Authority

Engineer:

Turner Associates

Contractor:

Tri-County Constructors

Installation:

March 2005



A Tri-County Constructors multi-bridge project in South Florida moved at full speed. Ten bridges were installed along the commuter rail corridor that serves Broward, Palm and Dade counties.

The Continental[®] overpass bridges vary in length from 35' to over 85'. Once the overpasses were completed, they allowed Tri-Rail[™] customers to safely crossover the northbound and southbound tracks to gain access to the train of their choice.

The pedestrian truss bridges were painted various custom colors to compliment the architecture at the stations. The prefabricated bridges are designed with cast-in-place concrete decking and powder coated mesh side panels are installed on each overpass to enhance pedestrian safety. Each of the prefabricated bridges were delivered to their respective sites in one piece and installed in a day or less.

Tri-Rail[™] is South Florida's premier commuter rail service. It provides a convenient, comfortable and affordable way to travel throughout South Florida. The service offers passengers air-conditioned service from Miami to West Palm Beach seven days a week.

Technical Description:

- Width: 13 ft
- Span: 68, 76 (7), 79 & 81 ft
- Style: Custom
- Finish: Painted Steel
- Decking: Concrete



Shiloh Road from IH635 to Kingsley Road

Garland, Texas

Storm Drain

Owner:

City of Garland

Engineer:

Nathan D. Maier Consulting Engineers

Contractor:

Ragle Inc. – Southern Division

Installation:

June 2019



The City of Garland launched efforts to improve Shiloh Road from IH-635 to Kingsley. The project included the widening of a four-lane divided thoroughfare to six lanes which required 53,000 SY of concrete pavement, 5,000 LF of storm sewer pipe, five intersections, landscaping and pavement markings. This project had been in the planning stages for over ten years awaiting funding.

Technical Description:

- Product: ULTRA FLO® polymer-coated CSP, 14 GA
- Diameter: 60-inch
- Length: 5,000+ LF

Nathan D. Maier Consulting Engineers was faced with significant hydraulic challenges on this project as they had to enclose an existing drainage channel running next to Shiloh Road with multi-barrel parallel pipes in order to expand the Lanes of traffic from four to six lanes. The expansion was to be constructed with limited elevation between the flow line of the existing channel and the proposed top of pavement. They had to account for a significant volume of water with limited height of cover, so the hydraulic efficiency of the pipe selected was critical.

There were four primary reasons Nathan Maier and the City of Garland selected the polymer-coated ULTRA FLO® spiral wound pipe:



Shiloh Road from IH635 to Kingsley Road

Garland, Texas

1. Polymer-coated ULTRA FLO has a Manning's n roughness coefficient = 0.012 compared to 0.013 for reinforced concrete pipe (RCP).
2. The City of Garland has had tremendous success with ULTRA FLO. This is the 10th Public Works project in Garland where ULTRA FLO was used in lieu of RCP.
3. Polymer coating was selected due to the potential of an abrasive bed load being dislodged in the drainage channel during significant rain events and carried through the multi-barrel pipes.
4. During the engineered cost analysis stage of design, polymer-coated ULTRA FLO was found to offer \$440,000 savings over RCP.



The awarded contractor, Ragle Inc., was impressed with the light weight and strength of the polymer-coated ULTRA FLO. They saved significant time over other storm drain pipes due to the 25' standard lengths and QUIK STAB bell and spigot joints.

BNSF Alliance IMF Expansion

Haslet, Texas

Storm Sewer

Owner:

BNSF Railway

Engineer:

HDR Engineering

Contractor:

SEMA Construction Inc.

Installation:

February 2017



Located in Haslet, Texas, the BNSF Railway Alliance Intermodal Facility (IMF) was in need of an expansion. With noticeably increasing demands on the facility as daily load intakes continued to rise, BNSF Railway knew an improvement was needed to address these concerns.

They put together a proposal that included additional lines and expansions to the existing tracklines. Not only would this proposal expand and improve the existing tracklines, but the additional lines would provide improved capabilities allowing the Alliance IMF to handle additional traffic through the facility. Once the proposal was finalized, it was released for bidding opportunities. Part of these plans also included several storm sewer systems to handle the increased surface storm drainage anticipated as a result of the facility improvements.

The engineer of record (EOR), HDR Engineering, worked directly with Contech Engineered Solutions to identify the best solution for the storm sewer systems that would be needed. Given the complexity of the site, two different systems were specified.

The winning bidder, SEMA Construction, then utilized the multi-product storm

Technical Description:

- Product(s): ULTRA FLO[®] CSP, 16 GA, ALT2 & Smooth Cor[™] double wall, 12 GA ALT shell with 18 GA polymer-coated liner
- Diameter: 30-in. to 60-in. (ULTRA FLO) & 108-in. (Smooth-Cor)
- Length: 7,000 LF (ULTRA FLO) & 350 LF (Smooth Cor)



BNSF Alliance IMF Expansion

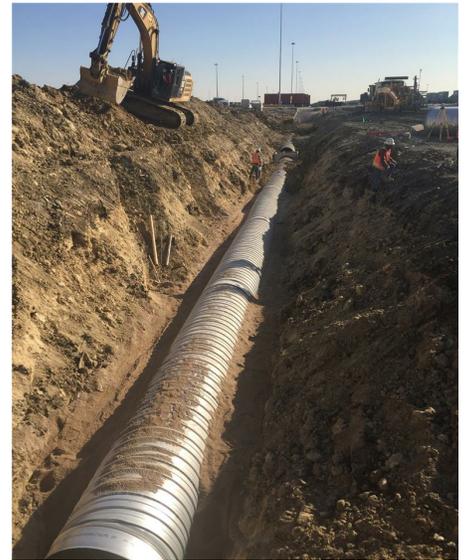
Haslet, Texas

sewer solution provided by Contech Engineered Solutions as specified on the original plans for the expansions to the facility. Fortunately, Contech offers a robust family of products and was able to help identify the right solutions to incorporate onto the site that were both efficient and cost-effective.

The first storm sewer system installed on site is one of the most hydraulically efficient storm sewer systems available – ALT2 **ULTRA FLO**[®], commonly known as Aluminized Type 2 Spiral Rib Pipe. The system included 30” to 60” diameter pipes and several multiple barrel systems and crossings. Its unique profile and smooth interior surface makes ULTRA FLO capable of a Manning’s “n” of 0.012 and is ideal for storm sewer applications.

Due to the high fill in one particular area, a secondary alternative was also needed. For this system, **Smooth Cor**[™] double wall corrugated steel pipe (CSP) was selected. Smooth Cor offers a hydraulically smooth steel liner coated with polymer coating. This combination makes Smooth Cor pipe the economical and performance alternative to reinforced concrete pipe in difficult situations such as weak soils, poor subsurface drainage conditions, steep slopes, and high fills.

Jeffrey Estes, Manager of Engineering at BNSF Railway, commented, “With Contech expertise and professionalism, we have successfully designed and built multiple systems on our Alliance Expansion projects.”



Florida East Coast Railway Culvert Reline

Jacksonville, Florida

Reline

Owner:

Florida East Coast Railroad

Engineer:

MG Underground LLC

Contractor:

MG Underground LLC

Installation:

September 2018



Founded in 1885 by Henry Flagler, the Florida East Coast Railway (FEC) is a Class II regional railroad that owns a 351-mile mainline track in Florida from Jacksonville down to Miami. The FEC Railway is the exclusive rail provider for Port Miami, Port Everglades and Port of Palm Beach.

The FEC connects to the national railway system in Jacksonville, allowing it to provide rail service in and out of Georgia, Tennessee, South Carolina, and North Carolina, into and out of Florida's east coast. Based in Jacksonville, FEC provides end-to-end intermodal and carload solutions to customers who demand cost-effective and premium quality transportation solutions. Every day, the railroad is moving commodities such as aggregate, automobiles, bulk liquids, building materials, orange juice, electronics and other items.

Given the high demand placed upon the FEC track, it was very important that the line remains fully functioning 24-hours a day, seven days a week. In order to maintain the track, FEC engineers will routinely inspect crossings and culverts to

Technical Description:

- Product: DuroMaxx® SRPE Liner Pipe, WC Joint (30 psi)
- Diameter: 42-inch
- Length: 220 LF



Florida East Coast Railway Culvert Reline

Jacksonville, Florida

ensure the line remains structurally intact. A 48-inch diameter, reinforced concrete pipe (RCP) drainage culvert was found to be structurally deficient with cracking and spalling occurring throughout the run combined with joint failures that were very concerning. FEC called on MG Underground LLC, a leader in installation and rehabilitation of buried infrastructure, to assess the condition and identify the best solutions for consideration.



Completing an infrastructure assessment and enacting a preventive maintenance plan to ensure that production is not hindered with aging or failing infrastructure is imperative. Deteriorated culverts not only pose potential production losses but can also be a health and environmental hazard if not identified and repaired or replaced in time.

To avoid any down time to the line above, which was an imperative aspect to the project, both the FEC and MG Underground determined that a relining solution was the best route to go. After some review of available solutions, MG Underground recommended sliplining with DuroMaxx® SRPE liner pipe with welded coupler (WC) joints, a steel reinforced polyethylene pipe manufactured by Contech Engineered Solutions LLC. Offering the strength of steel and the durability of pressure rated polyethylene resin (PE), DuroMaxx is a smooth inner wall pipe with a Manning's "n" value of 0.012 that provides superior durability with enhanced hydraulic capacity. Manufactured at their nearby plant in Montgomery, Alabama, the DuroMaxx liner pipe was shipped directly to the construction site.

For the installation process, MG Underground diverted the waterflow from the inside of the host pipe to expedite the sliplining process as well as the grout curing process. Using a hammer head and wedge system to pull the liner pipe in to the inlet of the culvert, MG lined the deteriorating host pipe with 42-inch diameter, DuroMaxx SRPE and then incorporated a backhoe on the outlet end of the pipe to pull the pipe into place throughout the 220 LF length of the original drainage culvert. Utilizing the push-pull method, they were able to lay and joint five sections per day. Once the liner pipe was in place, a lightweight, cellular grout was pumped through in a single-stage lift approach. This is done most efficiently by constructing a bulkhead at each end of the reline and allowing the new pipe to float to the crown of the existing pipe while grout is pumped into the annular space. The grout was pumped in a controlled manner to ensure balanced filling on all sides and cured. This allowed MG to employ only a small crew for the installation process, providing added savings and improving the efficiency of the installation and time needed to complete the project. The entire installation was completed in just one week.

The owner of MG Underground LLC, Donald Goff, P.E., commented, "DuroMaxx makes it easy to install, especially with its easy-to-use pressure rated 30 psi joints."

The end result to what could have been a time-consuming and costly replacement was a reline solution utilizing a steel, reinforced polyethylene liner pipe that provided both the strength and durability necessary to offer a permanent, structural solution that would extend the service life of the existing host pipe for over 100-years.

Covanta WTE Rail-to-Truck Intermodal Facility

Niagara Falls, New York

Waste-to-Energy Storage

Owner:

Covanta Energy

Engineer:

AECOM - Grand Rapids, MI

Contractor:

Kendey Company

Installation:

May 2015



In [Niagara Falls, New York](#), three engineering firms were involved in different phases of design for a new intermodal facility for Covanta – one of the world’s largest owners and operators of infrastructure for the conversion of waste-to-energy. Contech Engineered Solutions was very pleased to be able to provide assistance with the stormwater management system required in conjunction to this rail-to-truck intermodal facility being constructed as part of the expansion project for Covanta Niagara. This system was unique in that it would help to facilitate the handling of runoff from one of just under 100 waste-to-energy (WTE) facilities in use across the United States according to the Environmental Protection Agency (EPA) website and was the second in which Contech had been directly involved. Energy recovery from waste is the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes, included but not limited to combustion, gasification, pyrolyzation, anaerobic digestions and landfill gas (LFG) recovery. This process is known as waste-to-energy (WTE).

In addition to providing essential trash disposal services for cities and towns across the country, today’s WTE plants generate clean, renewable energy. Through the

Technical Description:

- Product: DuroMaxx® SRPE Storage System with 30 psi WC joints
- Diameter: 96-in.
- Length 383 LF
- Additional Product: CDS® 4040-8 Unit and 2020-5 Unit



Covanta WTE Rail-to-Truck Intermodal Facility

Niagara Falls, New York

combustion of everyday household trash in facility with state-of-the-art environmental controls, these WTE facilities play a key role in providing viable alternatives to communities that would otherwise have no option but to buy power from conventional power plants and dispose of their trash in landfills.

The engineering team at AECOM worked closely with the Covanta Niagara Resource Recovery Facility to design and implement this unique stormwater management system that would retain runoff from the WTE plant. The facility processes 2,250 tons of waste per day, selling the steam to adjacent chemical facilities and the electricity to the New York State power grid.

In preparation for the development of the intermodal facility's planned expansion project, AECOM teamed up with Contech to design a DuroMaxx® steel reinforced polyethylene (SRPE) storage tank and two CDS® pretreatment systems to handle much of the contaminated runoff associated with the plant's day-to-day activities. The 96-inch diameter DuroMaxx system runs 383 linear feet with bulkheads at either end and two access risers. The system was capable of 18,655 cf of storage (roughly 140,000 gallons) while pretreatment by a CDS 2020-5 unit and 4040-8 unit would provide 100% capture of trash and debris and ensures that all treated runoff meet New York State Department of Environmental Conservation water quality requirements and goals. As part of the design, the DuroMaxx storage system was required to maintain a low leakage rate of less than 100 gallons per day. With a 30 psi welded coupler (WC) joint, DuroMaxx provided an optimal solution. Both the DuroMaxx system and the CDS pretreatment units would need to meet a TS-9972 Reach Stacker load rating allowing for a 99,000-lbs. load. The runoff would be captured and retained in this unique system prior to being pumped to the local wastewater treatment plant (WWTP) for true treatment.

This expansion project is situated on approximately 15-acres along the railroad tracks on the eastern edge of a larger, former industrial complex located on 47th Street in the City of Niagara Falls, New York. It is a continued effort by Covanta as part of the Brownfield Cleanup Program which New York enacted to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and redeveloped. Covanta Niagara is just one of over 40 national Voluntary Protection Programs (VPP) star facilities operated by Covanta.



CSX Reline for Timber Beam Bridges

Homerville, Georgia

Reline / Rehabilitation

Owner:

CSX Corporation

Engineer:

STV Incorporated

Contractor:

CSX Corporation

Installation:

October 2015



CSX Corporation, together with its subsidiaries based in Jacksonville, Florida is one of the nation's leading transportation suppliers. For nearly 190 years, CSX has played a critical role in economic expansion and industrial development across the eastern United States and into parts of Canada.

With over 2,700 miles of track and more than 2 million carloads handled in the state of Georgia alone, CSX maintains a busy schedule not only transporting loads along those lines but also maintaining and inspecting the existing track areas to ensure deliveries, shipments, and schedules are consistently met.

Along the track from Valdosta Yard to Homerville, Georgia, CSX engineers noticed two timber beam bridges that had severely deteriorated to the point where they were in need of either replacement or repair. Upon identifying these two timber beam bridges, CSX turned to STV Incorporated to perform a hydraulics and hydrology capability assessment report to determine what options were available and what the best solution might be. The STV Jacksonville, Florida location worked closely with CSX to conduct the assessment report for the two timber beam bridges in need of repair. STV provided a report on the existing condition of the structures

Technical Description:

- Product: HEL-COR® 10 GA ALT2 CSP
- Diameter: 72" (3-barrel round) and 78" (6-barrel pipe-arch)
- Length: 120 LF ea. (1,080 total LF)



CSX Reline for Timber Beam Bridges

Homerville, Georgia

as well as a proposed condition and possible alternatives. The modeling and hydraulic analysis was performed to size the proposed structure and to determine any change in flow from the existing condition to the proposed condition.

In order not to delay the track schedule, CSX preferred a solution that would have as little negative impact as possible to the rail track. STV determined that sliplining the existing structures with a multi-barrel corrugated steel pipe (CSP) culvert would be the most efficient and cost-effective solution. Determining the proper material type, size and shape that should be used for a particular site is a bit of science mixed with art. The evaluation process should consider the usual items considered for new structures including loading requirements and other structural needs, hydraulics, velocities in the structure and at the outlet, material type and service life needs, site specific construction obstacles and accessibility limitations, contractor experience, grouting methods, etc.

In order to help with this process, STV reached out to Contech Engineered Solutions for assistance in identifying the right product and design solution. With over 70 years of experience, Contech provides permanent, fully structural solutions based on time-proven designs and suggested using aluminized type 2 (ALT2), 10 gage HEL-COR[®] corrugated steel pipe (CSP) to reline the existing bridge structures. Contech was able to manufacture the HEL-COR[®] CSP at their local manufacturing plant located in Conyers, Georgia, to provide a 72-inch diameter, triple-barrel culverts to slip line under one of the wooded beam bridges and another 78-inch diameter, 6-barrel, pipe-arch culvert under another wooden beam bridge just a few yards down the track.

Not only did the proximity of the Contech manufacturing facility help cut costs considerably, but CSX was able to use their own track workers to dewater the area and slide the culverts into place before grouting and backfilling the area which also severely reduced the cost of maintenance.

They laid a slurried concrete slab down for improved working conditions and, with minimal delays to the track above, were able to finish the installation for a completely structural solution that would extend the service year life expectancy substantially.



Alabama & Gulf Coast Railway Reline

Monroeville, Alabama

Reline/Sliplining

Owner:

Alabama & Gulf Coast Railway (AGR)

Engineer:

Alabama & Gulf Coast Railway (AGR)

Contractor:

Chase Plumbing & Mechanical, Inc.

Installation:

April 2015



Alabama & Gulf Coast Railway (AGR), a Genesee & Wyoming Company, began operations in Monroeville, AL in 1997 from Kimbrough, AL to Pensacola, FL. In 2003, AGR expanded from Kimbrough, AL to Columbus, MS with operations from Mobile, AL via BNSF Railway. They now operate a total of 442 miles of track through Mississippi, Alabama and Florida.

During a courtesy inspection along one of the tracks, AGR engineers noted that a 132-in. culvert running directly under the track had failed due to age, degradation, and poor installation methods used. The deteriorating culvert had experienced major encroachment along the toe of the slope after a major rain event and catastrophic washouts. Given this advanced degradation, AGR consulted three local contractors for proposed solutions and cost. AGR preferred a method that would allow the railroad to remain in operation while construction took place. Not only would this allow the line to continue unimpeded but would also provide substantial cost savings.

Ultimately, AGR accepted a proposal by Chase Plumbing to slipline the host culvert with 108-in. diameter **Smooth Cor™**, a double wall corrugated steel pipe with a polymer-coated liner and Aluminized Type 2 (ALT2) shell as well as 102-inch

Technical Description:

- Product: Smooth Cor™ double wall CSP, 14 GA ALT2 outer shell w/ 18 GA smooth, polymer-coated liner, 106 LF of 108-inch
- Additional Product: 2-Flange Tunnel Liner Plate, 10.5 LF of 102-inch



Alabama & Gulf Coast Railway Reline

Monroeville, Alabama

Tunnel Liner Plate both manufactured and supplied by Contech Engineered Solutions. The Smooth Cor was inserted on struts from the south end. During this process, a partial collapse occurred directly under the rail which required an emergency hand lining with Contech's 7 gage, 2-flange Tunnel Liner Plate for roughly 10.5 LF. The full length corrugations and lapped joints inherent with 2-flange Liner Plate provide more effective stiffness and ring compression and was ideal for relining this portion of the culvert. Smooth Cor was then used to line the rest of the length of the host pipe for a total of 117 LF installed.

Once the host was relined, the entire structure was grouted in multiple stages with a non-shrink grout while a low maximum grouting pressure of < 5 PSI was maintained. The end result was a fully structural repair with both significant time and money saved. The original pricing for open cut and replacement was upwards of \$500,000. AGR was extremely pleased with the outcome of relining the host pipe which cut the original estimated cost by roughly 40%.



Old Colony Railroad

Boston, Massachusetts

Rail

Owner:

Massachusetts Bay
Transportation Authority (MBTA)

Engineer:

Sverdrup Corporation

Installation:

Spring 1995



Thousands of people in and around Boston arrive at their jobs on a commuter rail system owned and operated by the MBTA (Massachusetts Bay Transportation Authority). To increase its service area, the MBTA decided to reopen the Plymouth and Middleboro lines—which had been closed since the 1930’s. The renovated lines will carry commuters to and from numerous communities on the South Shore. The driving time from many of these locations can be up to two hours or more, but the train ride is less than 30 minutes.

Technical Description:

- Product used:
- TRUSS Pipe® 132,000 lf of 12-in.

Before the new rail lines became operational, they had to be refurbished to meet current standards. This involved grade crossings over several heavily traveled secondary roads, new layover facilities and approximately 75 miles of new track construction.

Sverdrup Corporation, the consultant commissioned to design the project, saw its greatest challenge being the control of the ground and surface water along the rail lines. Many of the new lines crossed flat terrain, often through wet and unstable subgrade conditions. So, the water had to be constantly drained away in order to maintain a firm and stable subgrade and foundation under the heavy E-80 railroad and impact loadings. Sverdrup engineers determined that they needed a subdrain system that would meet the following requirements: flexibility, high pipe stiffness, nonmetallic, high joint pull-apart resistance, low Manning’s “n” and strip perforation.

Contech [PVC TRUSS Pipe](#) was chosen because it met all of Sverdrup’s requirements: TRUSS pipe is flexible enough to adjust to uneven loads, has a 200 psi pipe stiffness to resist E-80 live loads, can be solvent welded to eliminate joint separation, has a Manning’s “n” of 0.009 to maximize flow and has strip perforations.

Phase I of the project was built in the spring of 1995 and included 9000 LF of 12-in. perforated TRUSS Pipe. The Sverdrup engineers and MBTA were extremely pleased with the quality of Contech’s TRUSS Pipe and decided to make it the standard

Old Colony Railroad

Boston, Massachusetts

subdrain for all future construction. No other pipe products— including HDPE, SDR 35 PVC or RCP were accepted as an alternative. The project, now known as the Old Colony Railroad, included 6 other phases with over 132,000 -ft. of 12-in. perforated TRUSS Pipe.

CSX Fairburn Intermodal Expansion

Fairburn, Georgia

Surface Runoff

Owner:

CSX

Engineer:

AEC, Inc.

Contractor:

AMES Construction Inc.

Installation:

2018



CSX Transportation is a Class I freight railroad operating in the eastern United States and is a leading supplier of rail-based freight transportation in North America. In 1999, CSX completed an intermodal center in Fairburn, Georgia to help promote the city as a center for distribution and logistics industries. The facility has helped to attract several related logistics operations, aiding in the additional creation of jobs and investments in the area.

In 2018, CSX expanded the Fairburn CSX Intermodal Center to add capacity in an area due to the increased growth in available warehouses. The project included the extension of seven existing process tracks and one existing support track. Two crane rails were also installed to support a wide-span rail mounted crane parallel above the process and support tracks. The work resulted in increased facility capacity from 350,000 lifts a year to 750,000 lifts a year.

The expansion of the rail yard led to the need to handle large amounts of sheet flow from storm events. This was best achieved by utilizing **Slotted Drain™** pipe, a surface runoff system manufactured by Contech Engineered Solutions, connected with grated junction boxes. One section of Slotted Drain has the capacity to accept 50% more flow than a standard 2'x2' frame and grate thereby cutting down on the number of grate inlets needed and making grading more cost-effective. As an added benefit, Slotted Drain can be laid in 20-foot sections, compared to alternate products that are laid in 2-foot sections, thereby providing a greater advantage in decreasing installed costs.

Technical Description:

- Product: Slotted Drain™
- Diameter(s): 12-inch to 30-inch
- Length: 13,159 LF (2.5 miles)



CSX Fairburn Intermodal Expansion

Fairburn, Georgia

As with all railroad and intermodal facilities, the ability to handle heavy live loads of various types while meeting AREMA standards, was critical in the decision to use Contech Slotted Drain. Further, the ability to handle such live loads under minimum cover allowed the engineer to maximize the available grade for surface water collection across very long runs of drain, allowing the Contech Slotted Drain to capture large amounts of storm sheet flow within the limited site constraints of the rail yard.

Recognizing that the Contech Slotted Drain system met all the structural site requirements while increasing the flow capacity by replacing curbs and drain basins with continuous lengths of Slotted Drain to open up an obstruction-free single grade area to enhance effectiveness and improve safety, the engineer of record, AEC, Inc., incorporated a **13,159 LF Slotted Drain system (roughly 2.5 miles)** into the intermodal system expansion to address the increased sheet flow anticipated in the yard.

The entire Slotted Drain system was installed and completed on schedule.



BNSF Intermodal Facility Storm Sewer

Roanoke, Texas

Storm Sewer

Owner:

BNSF Railway (formerly ATSF Railway)

Engineer:

Jacobs Engineers (formerly Carter & Burgess - Dallas)

Contractor:

Wright Construction - Grapevine, Texas

Installation:

1994



Burlington Northern Santa Fe (BNSF) Railway is one of North America's leading freight transportation companies and has over 32,500 route miles in 28 states. Dating back more than 160 years ago to 1849, the railroad began with a 12-mile stretch of railroad in Illinois. Over the next several decades, many additional rail lines were built and eventually became part of what we know today as the BNSF Railway. In 1994, Atchison, Topeka and Santa Fe (ATSF) Railway, which eventually merged to become BNSF, was building an impressive intermodal facility in Roanoke, Texas. They required the installation of a storm sewer culvert constructed just under the rail. They selected one of the most hydraulically efficient storm sewer systems available – ALT2 ULTRA FLO®, commonly known as Aluminized Type 2 Spiral Rib Pipe, along with some an additional helically corrugated culvert pipe manufactured by Contech Engineered Solutions. The system included 18" to 60" diameter pipes and often involved multiple barrel systems and crossings. Due to its unique corrugation and smooth interior surface, ULTRA FLO provides a Manning's "n" of 0.012 and is ideal for storm sewer applications. The original construction involved approximately 13 rail lines in this large intermodal facility and switching yard. The ULTRA FLO and aluminized culvert pipe are running underneath the tracks and heavy intermodal container handling equipment which transfers containers on and off the container well cars. The pipes were backfilled with compacted sand and crushed stone.

As part of an in-ground performance study of aluminized type 2 (ALT2) steel, engineers from Contech revisited the site to assess the condition and performance of the systems after 20 years of service. Upon a visual and core sample inspection of

Technical Description:

- Product: ULTRA FLO® ALT2 10-16 gage
- Diameter: 18-in to 60-inch diameters
- Length: 26,000 LF (one barrel at 10,000 LF & another at 16,000 LF)



BNSF Intermodal Facility Storm Sewer

Roanoke, Texas

the storm sewer and culvert systems, they found that the system was excellent structural condition, the shape of the pipe was as round as the day it was installed and despite significant bed load, the ALT2 coating was performing extremely well with no indication of erosion or material degradation in the invert. The enhanced abrasion resistance and durability of ALT2 ULTRA FLO® is meeting expected service life requirements and giving every indication of exceeding a 75-year service life. A steel coupon was obtained from the invert, or 6 o'clock position of the pipe, and analyzed providing another occasion in which ALT2 ULTRA FLO has outperformed and out-serviced other similar alternatives.

[Click here to view on Google maps.](#)

Prairie Line Trail

Tacoma, Washington

Low Impact Development

Owner:

City of Tacoma

Engineer:

KPFF

Contractor:

Korsmo

Installation:

Summer, 2014



The City of [Tacoma](#) partnered with UW Tacoma and landscape architecture firm [PLACE Studio](#) to build a regional stormwater treatment facility along a beautiful bike and pedestrian trail beside a portion of the historic Prairie Line rail corridor. The rail corridor is historically significant as the first transcontinental railroad connection to the Puget Sound, which shaped the early development of the City.

The project area falls within the Thea Foss Watershed, which drains into the Thea Foss Waterway and Commencement Bay. The Thea Foss Waterway has been monitored for a wide range of parameters since 2001. Despite the City's intensive source control, maintenance, and education programs, data continues to show elevated levels of polyaromatic hydrocarbons (PAHs), phthalates, solids, and some metals. Therefore, this section of the City was targeted for treatment to further reduce contaminants to the Thea Foss Waterway.

The University wanted a stormwater facility that could provide an interactive learning experience for students and the general public. To accomplish this goal the new facility features six, 550 square foot minimum custom [Filtterra systems](#) with a specially designed flow distribution system to meet WA-Ecology design requirements. The Filtterra systems filter stormwater through Filtterra's engineered media to an underdrain system that discharges to the City's stormwater system, as infiltration is not feasible due to concerns about potentially contaminated soils.

Since the site was previously a rail line, underlying soil quality is unknown, but areas within this vicinity have been known to include contaminated soils. The Filtterra system was built within steel walls with a heavy membrane liner system with a heavy

Technical Description:

- CDS hydrodynamic separator
- Filtterra Bioscape



Prairie Line Trail

Tacoma, Washington

LLDPE liner adhered to the walls and lining the bottom. This prevents contamination from surrounding soils from migrating into the facility. The structural supports also support the railroad rails that were included as a visual reminder of the railroad that had once used the corridor.

The system was filled with underdrain rock, piping, Filterra media, plants that assist with absorption of pollutants biological uptake/ storage and microbially-mediated transformations.

A [CDS hydrodynamic separator](#) was also used to pre-treat a portion of the stormwater before entering the Filterra systems. CDS is a below-ground, flow-through treatment device that uses multiple treatment processes including swirl concentration and continuous deflective separation to screen, separate and trap debris, sediment and hydrocarbons from stormwater runoff.

The Prairie Line Trail at UW Tacoma Station opened in September, 2014. An informational sign that includes a cross section of the treatment process is located adjacent to the facility.