

FURNEAUX CREEK 5 CHANNEL AND TRAIL IMPROVEMENTS

TEXAS CHAPTER AMERICAN PUBLIC WORKS ASSOCIATION

PROJECT OF THE YEAR



**CATEGORY: ENVIRONMENT PROJECT OF \$2 MILLION BUT LESS THAN \$5 MILLION
ENGINEERING DEPARTMENT, CARROLLTON TEXAS**

FURNEAUX CREEK 5 CHANNEL AND TRAIL IMPROVEMENTS

The City of Carrollton’s storm drainage system consists of approximately 42 miles of channels, 228 miles of storm water sewers and culverts and about 6,900 inlets. Extensive improvements have been made over the last 20 years to address flood control and property erosion as well as water quality associated with the Storm Water Management Plan/Permit Program. The results demonstrate great success and the storm drainage system was rated “B” in the City’s 2011 Infrastructure Report Card. As the Drainage Program matured, the aggressive efforts not only address environmental concerns but now include quality of life trail systems to promote vibrant communities and better sustain a healthy city.

The City of Carrollton has had an ongoing program to address channel erosion since a study was completed in 1988 identifying several streams that were unstable and unsafe to the public. While 30 years ago it was accepted practice to simply concrete line a channel section, the U.S. Army Corps of Engineers (COE), through its Section 404 Permitting Process now regulates the improvements that occur within Waters of the United States. Furneaux Creek falls into this category of water course.

Due to the location of the channel improvements, the city decided to include an extension to the city-wide trail system along the alignment. This 10-foot wide concrete trail included access across the creek through the use of both a new pedestrian bridge and low water crossings.

PROJECT DESCRIPTION

CHANNEL IMPROVEMENTS

Design of this channel began in 2007 with the execution of a contract with Nathan D. Maier Consulting Engineers (NDMCE). The lead engineer for the project, Bill Wallace, P.E., Executive Vice President, provided channel analysis, design and permitting services. As with other channel improvements, it



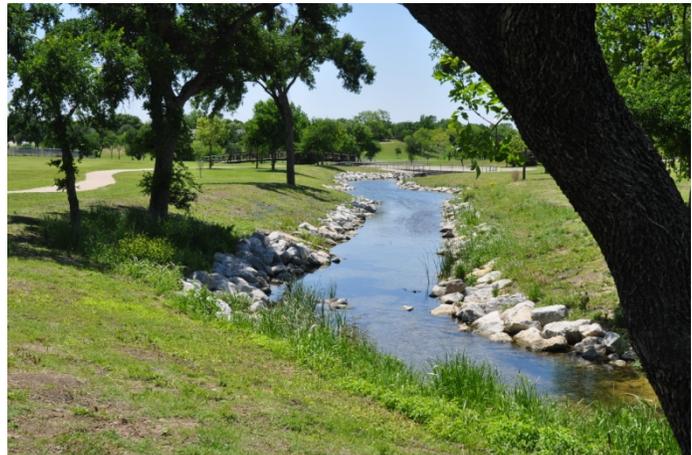
is critical that the improvements do not impact flood water elevations.

The channel consists of a trapezoidal section. Most of the channel has a bare earth bottom with large rock rip rap on the lower section of the channel slope. The large rip rap (36-inch) provides toe protection for the bottom of the slope. It extends about 3 feet



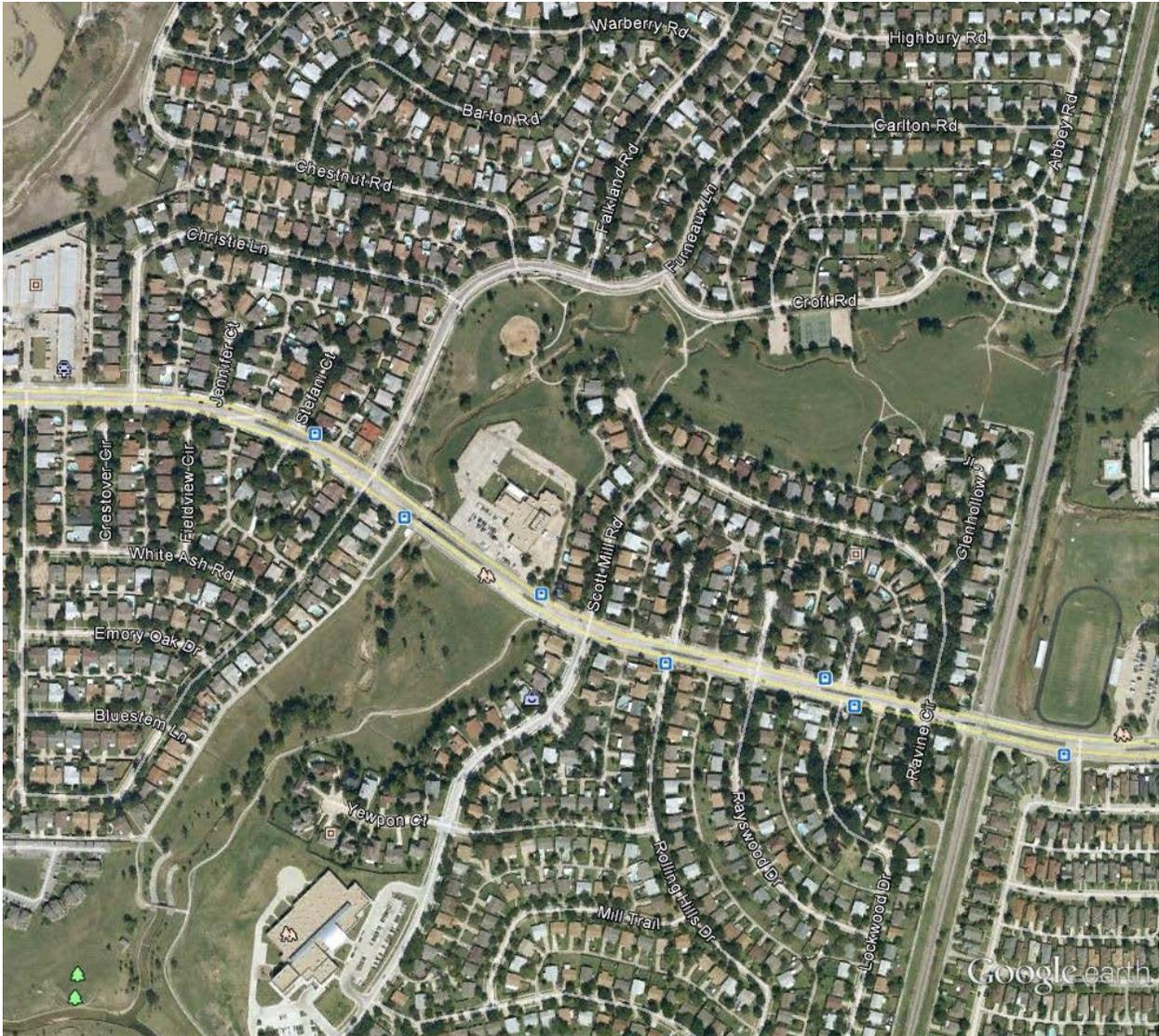
below the flowline of the channel. The bottom of the channel is typically about 10 to 15 feet wide and the depth varies from about 2 feet to over 7 feet. The channel includes six drop structures, each with a drop height of about 2 to 3 feet. These drop structures include vertical walls with milsap façade and gabions to protect the areas behind the walls. These drop structures reduce the channel grade which, in turn, reduces channel velocities to 6 feet per second or less.

The lower section of the channel meandered through a small grouping of older trees. The erosion was undermining the root system, but the trees were substantial and beneficial to a relatively bare greenbelt. The channel was realigned

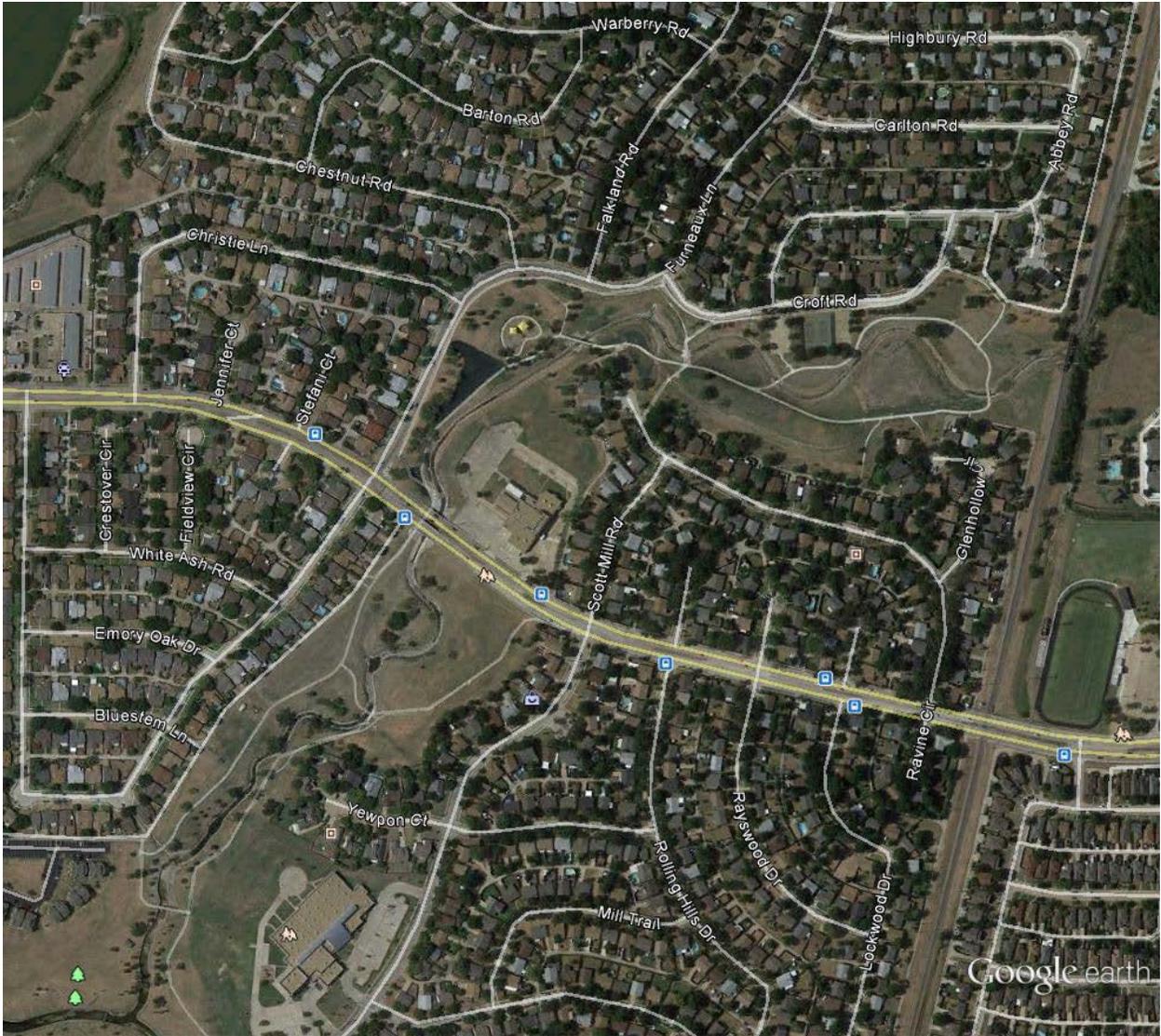


to avoid the trees as much as possible. This was complicated by the fact that the COE expects the length of creek to remain the same or increase as part of the 404 Permitting process. Ponding areas were developed, including a low area for water to back up into during a mild to severe rainfall event.

Geotextile fabric was used extensively on the upper bank and on the overbank areas that were disturbed during construction. While this has become a maintenance concern and probably hinders vegetation establishment, it is a necessary evil for establishing vegetation and protecting areas before vegetation is vigorous.



THE SITE IN 2007



THE PROJECT SITE IN 2012

TRAIL

The trail winds through the greenbelt, paralleling the trail in many areas, then loops on the upstream side of the site. The trail is designed as both a walking/jogging trail and a bicycle path. The 10-foot wide trail consists of a 6-inch thick fiber reinforced concrete



section on a compacted subgrade. We have found that the fiber reinforcement holds up well for this application and is cheaper and faster than traditional reinforcing steel.



The trail includes multiple crossings. Two are low water crossings, with small rectangular openings that provide for low flows to pass underneath and larger flows to overtop. One of the crossings is a steel and concrete pedestrian bridge which spans the entire channel. There is also a 'mid level' crossing that will be overtopped during severe events, but more frequently than the steel bridge (approximately 2% design storm).



CONSTRUCTION ISSUES

The original construction time for the project was 510 days. The Notice to Proceed on the project was issued on September 30, 2010, setting the project start date as November 1, 2010 which yielded a construction completion date of March 25, 2012. City contracts are based on contract days with no specific provisions for inclement weather.

COMPLETION TIME

The project was substantially complete in April of 2012. Vegetation establishment was a concern. There is no provision in our contracts for 'substantial completion' or any type of partial completion. The city typically releases most of the project funds earned to the contractor, withholding a portion of retainage awaiting vegetation to be established. The remaining portion of the retainage was released in November 2012.

SCHEDULE MANAGEMENT

Microsoft Project was used by City staff to monitor progress during construction. Staff also met with the contractor on a bi-weekly basis during construction to review work completed, problems encountered and review upcoming tasks.

City staff enforced the contractor's stormwater pollution prevention plan (SWPPP) by requiring that the upstream areas be somewhat stabilized before moving to the downstream section. This improved safety by not spreading the work force across the entire site and by reducing the amount of temporary diversion and stormwater drainage controls required.

SAFETY PROGRAM

Aside from typical safety measures, consideration was given to securing the site during high water events. With erosion control measures in place, water would back up more quickly than under normal conditions. Provisions were made to move some stormwater controls before a major rainfall event. Controls such as rock dams were sized small enough to not significantly impact upstream areas.

The contractor performed weekly safety meetings along with more detailed monthly meetings. There were no lost day injuries over the duration of the project.

ENVIRONMENTAL ISSUES

This project is primarily an environmental project. The goals of the project include reducing channel erosion, improving habitat in the creek and maintaining flood capacity through the greenbelt. The project was permitted utilizing the Section 404 Nationwide General Permit #27 – Aquatic Habitat Restoration, Establishment and Enhancement Activities. There are a number of requirements associated with this permit with the ultimate goal of returning an urban stream to a more natural, aquatically vibrant condition. This is balanced with providing controls for erosion by using hard surfaces at an absolute bare minimum. This is achieved through the use of the rock rip rap toe

protection along the sides of the channel and hard armoring transition points with gabions and/or concrete.

CONSTRUCTION RELATED ENVIRONMENTAL CONTROLS

The contractor prepared the Stormwater Pollution Prevention Plan for the project with some limited input from the project designer. In general, they utilized a phased approach to controlling the disturbed area. Construction was completed on the upstream section first with Frankford Road serving as the dividing line between phase 1 and phase 2. By phasing the project, fewer stormwater controls were required and sediment from disturbed areas was more easily controlled. By completing the upstream section first, the upstream sediment load was reduced in the Phase 2 construction area.

Dewatering and flow management is always a challenge in these types of project. The contractor constructed temporary channels to route flow around disturbed areas where possible. Preservation of aquatic species was a factor in determining controls.

LONG TERM ISSUES

As stated above, one of this project's goals is to improve wildlife habitat within and along the creek corridor. Vegetation is a key to this. Specific ponding areas are also critical to provide some safe areas for aquatic life during dry summer months.

Managing the vegetation is a difficult task. The public is split on their expectations of a greenbelt area such as this. Some like the groomed, manicured look along the bank and overbank areas while others prefer the 'natural' vegetated look. For the city to meet the intent of the 404 Permit, mowing must be kept to an absolute minimum. On the other hand, some vegetation control is required to maintain flood carrying capacity. It is a balance we continue to work with.

Establishing native vegetation is a major challenge. The plans call for multiple zones of vegetation, going from Buffalo Grasses to bunch grasses, shrubs and trees. A major rainfall event will typically wipe out a large percentage of the shrubs and trees during the first two or three years of establishment. Growing the bunch grasses through the erosion control mats is a very slow process. In some cases, a large rainfall event will get under the mat and roll it, taking the new bunch grass along with it. Proper anchoring of the mat will typically address this issue, but it still happens at times.

Flow into this channel comes from an unimproved channel outside of our city limits. Trash, gravel, tree limbs and other debris are introduced into this improved channel during any significant rainfall event. While this occurred before the improvements, now portions of the debris and sediment get caught at the first low water crossing and along the bends of the channel. This requires maintenance on a regular basis.

COMMUNITY RELATIONS

As with all change, the public was skeptical as construction began on the project. The project is bound on both sides by residential areas so people were very concerned. This

greenbelt includes a playground area, tennis courts and disk golf course. It was an inconvenience to the greenbelt users for a long period of time. However City staff and the contractor worked closely with homeowners in the area, explaining the purpose of the project and minimizing impacts to the amenities as much as possible. There have been a considerable number of positive comments at the conclusion of the project.

DESIGN CONSIDERATIONS

In general, the trail serves as the amenity for this project. In terms of trail design, accessibility and proximity to the creek are paramount. Accessibility is achieved through the multiple creek crossings, allowing a broader access to the overall greenbelt. The number of crossings was increased from 3 to 5 from the preconstruction conditions, with one being the large pedestrian bridge that is accessible in high flow conditions.

For the majority of the greenbelt, the trail follows the creek, just outside of the specially vegetated areas. At the upstream side of the trail, a large loop is provided to allow for a bicycle and pedestrian termination that is more interesting than a simple cul-de-sac bulb. As noted above, the end of this project is at the city limit line, so extension of the trail further east is very unlikely.

PUBLIC NOTIFICATION

Public notification was not a major factor in this project. City staff worked with residents as issues arose during construction. The disc golf club was notified when their course was impacted and also when the project was complete.

CONSTRUCTION PHASE CONCERNS

There were few construction phase concerns from the public during the construction of this project. Most of the calls received related to either dust on the site during the summer months or water pockets on the existing sidewalks in the greenbelt (which were to be removed).

Once the majority of the trail was in place, it was difficult to keep the public off the project site as the excitement to use it grew quickly. Cyclists and pedestrians would ignore the construction signage.

PROJECT CHALLENGES

As with any large scale project, there were challenges in the completion of the project. Several of these are mentioned above. The biggest challenge for this project included vegetation, managing rainfall events, and maintaining the site after completion.

VEGETATION

Getting native grasses established along a channel and watercourse is a challenge. To address this, we specified requirements for the landscape contractor as a condition of the project specifications. Staff had seen channel projects that took several years to get vegetation established – with fairly sparse coverage.

For this project, the amount of geotextile fabric required hindered grass establishment as well as high velocities on the overbanks. As the photos shows, even anchored geotextiles were damaged due to high flow conditions.

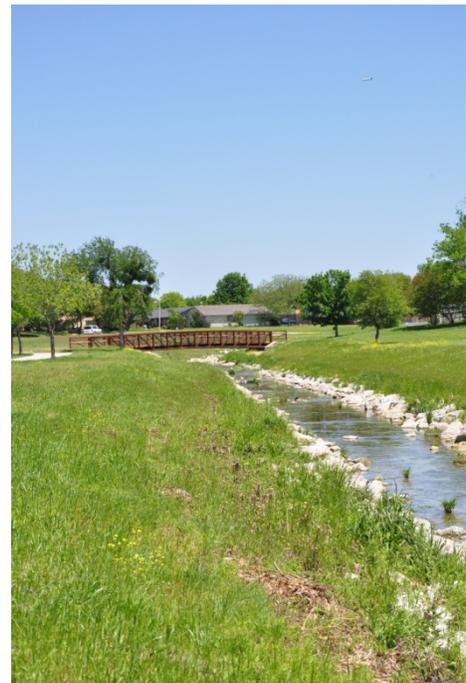
Even though the project has been accepted, we are still in touch with the landscape contractor to address some problem areas. Some of the large slope staging areas, which are outside of the high flow velocity areas, have less grass coverage than required. It is anticipated that this growing season will correct that.



RAINFALL EVENTS

It was a relatively dry period during construction. There were a few rainfall events that occurred, but through preparation and a well executed stormwater plan construction activities were not seriously impacted.

We have had a few rainfall events since completion of the project. We have had to add additional geotextile fabrics in areas subject to erosion. Currently the vegetation is nearing enough coverage and maturity to withstand mild rainfall events. This spring will likely put it to the test.



PROJECT GOALS

The goals of this project were to

- Reduce channel erosion
- Improve wildlife habitat / create an urban oasis
- Improve and encourage access to the greenbelt through the addition of a trail

- Expand the city trail system
- Meet federal requirements of the Clean Water Act
- Maintain flood carrying capacity

At a cost of nearly \$3 million in construction and \$400,000 in design, this project meets and exceeds these goals. The trails are being used extensively by the public. As grass and other vegetation become established, the creek is appearing more natural. The stability of the side slopes reduces silt loading in the creek and improves the safety of the greenbelt. The large stone is a deterrent to graffiti and vandalism, reducing maintenance. The project was walked by an inspector with the Corps of Engineers and passed with flying colors.

As time goes on and the shrubs and trees mature, this should create a wonderful area for nature walks and recreation. It will also provide a safe, stable channel with reduced maintenance requirements both along this segment and in water bodies downstream.

