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### Publication Date

2001-09-24

# MITIGATION OF LIGHT RAIL TRANSIT CONSTRUCTION ON JURISDICTIONAL AREAS IN THE WHITE ROCK CREEK FLOODPLAIN, DALLAS, TEXAS

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Abstract: In 1994, Dallas Area Rapid Transit (DART) began planning for an 11.8-mile extension of its light rail transit (LRT) system from Dallas to Garland, Texas. The proposed alignment of the LRT extension traversed approximately 1.2-miles of the White Rock Creek floodplain near the confluence of three creeks and adjacent to approximately eight acres of wetlands. Because of the extensive development that has occurred within the watersheds of these creeks over the last 50 years, the conveyance of flood waters within this urban floodplain has been severely constrained. In order to adequately protect the new rail bed from flooding, it needed to be elevated as much as 12 feet above the existing rail bed, nearly 20 feet above the natural surface.

This area also serves as part of the Olive Shapiro Nature Preserve and White Rock Park – one of the largest, intact natural areas in the City of Dallas. Thousands of park users cross the proposed alignment daily. In addition to protecting the jurisdictional areas found adjacent to the rail alignment and to preserving the park's existing flood water storage, project designers wanted to maintain park users' access to the bike paths and natural areas of the park. All of these concerns were taken into account when evaluating the project design alternatives.

The first alternative suggested placing the new alignment on fill with bridges located at the creek crossings. This alternative would restrict park users' access, destroy adjacent wetlands, and further restrict floodplain storage. The second design option recommended placing the rail line on an aerial structure through the length of the floodplain. This option would minimize permanent impacts to the adjacent jurisdictional areas, maintain the public's access to all areas of the park, and avoid impacts to floodplain storage within the park. Although the construction costs for this option were higher, DART selected this alternative.

The true success of this project, though, was found not in innovative engineering, but in the cooperative efforts between DART, USACE, USFWS and the City of Dallas Parks and Recreation Department. These groups collaborated to develop a mitigation plan that was acceptable to all interested parties, including the general public. The fact that this mitigation occurs within the same watershed and within one-mile of the original impact area is a significant accomplishment.

The final mitigation plan has four components:

- post-construction restoration of the wetland areas adjacent to the new alignment;
- construction of two "educational" wetlands next to the park's hike-and-bike trail;
- restoration of a ten-acre historical wetland within White Rock Creek Park; and
- creation of a mitigation monitoring plan to review construction activities.

It is our hope that this project will serve as a model for future cooperative work between DART, USACE, USFWS, and the City of Dallas.

## Problem Statement

In 1994, Dallas Area Rapid Transit (DART) began planning for a \$293 million, 11.8-mile extension of its light rail transit (LRT) system from Dallas to Garland, Texas – known as the Northeast Corridor – along the former MKT railroad. One of the more interesting issues that were addressed during project planning and design was the consideration of impacts to jurisdictional areas in the White Rock Creek floodplain. A portion of the proposed alignment of the LRT extension traversed approximately 1.2-miles of floodplain near the confluence of White Rock Creek, Jackson Branch and McCree Branch. This floodplain also serves as part of the Olive Shapiro Nature Preserve and White Rock Park – one of largest, intact natural areas in the City of Dallas.

Because of the extensive development that has occurred within the watersheds of these creeks over the last 50 years, the conveyance of floodwaters in these urban floodplains has been severely constrained. The creeks often flood their banks during storm events and overtop portions of the old rail line by as much as 10 feet. In order to maintain rail operations during these events, it is necessary to design a system where the track or low chord of structures is at least two feet above the 100-year floodplain. Critical to the planning and design of the system is the potential impacts to jurisdictional areas within the floodplain – bottomland, hardwood forests complete with a mosaic of wetlands.

Additionally, hundreds of park users cross this alignment daily at the White Rock Creek Hike-and Bike Trail and other equestrian trails. Maintaining these trails during construction and assuring openings for equestrian users became an important issue during the planning process.

### Project Objective

The primary objective of this project was to minimize LRT construction impacts on the surrounding floodplain.

### Methodology

During the planning phase of the Northeast Corridor, jurisdictional delineation identified ten wetland areas, totaling more than eight acres that could be impacted along the former freight line. The majority of these were located within the White Rock Creek floodplain. Isolated jurisdictional areas were also identified in areas where urban runoff was collected. Many of these areas were formed because the rail bed causes seasonal impoundments. These floodplain wetlands represent a diverse, mature closed-canopy of hard and soft mast-producing species. These bottomland hardwood forests tend to be rare in metropolitan areas and function as a refuge for urban wildlife and migrating birds and waterfowl.

Within the White Rock Creek floodplain, the top of rail was, on average, six feet above the natural grade of the floodplain. It was completely built on fill material with openings at White Rock Creek, the White Rock Creek Overflow Channel and Jackson Branch. Field investigations revealed that the existing track bed served an important function in influencing hydrologic conditions for the bottomland, hardwood forest. Overtime, low-lying areas developed near the rail bed due to scouring action during flooding. As a result, these areas experienced an enhanced hydroperiod.

In order to locate the LRT line two feet above the 100-year floodplain, as required by DART design standards, several options were considered. One design option would require placing the new alignment on fill with bridges located at each of the creek crossings. Nearly 48,000 cubic yards of fill would be required to raise the rail structure 12 feet above the existing rail bed (nearly 20 feet above the natural ground surface). At a 3:1 side slope, the new rail bed would be approximately 135 feet wide at its base.

There were several adverse impacts of this option. First, most of the available ROW would be impacted, permanently displacing adjacent jurisdictional areas and thousands of trees. Second, because of the flooding issues already associated with urban watersheds, City of Dallas policy limits the amount of development in the floodplain. Any DART development would not be allowed to raise the 100-year flood elevation. Mitigation for this amount of fill would be extremely costly. Third, to accomplish the construction of this option, construction roads would be required on both sides of the rail line, causing further impacts to the surrounding jurisdictional areas and limiting park users' access to the ROW.

Retaining walls, instead of sloped fill, were also considered; however, it was determined that the structural integrity could be in jeopardy due to the scouring action of the floodwaters.

A second design option recommended placing the LRT line on an aerial structure through the length of the floodplain. This option would limit the width of impact, requiring only a temporary construction road along one side of the embankment. Further analysis also determined that placing the support piers for this structure on the existing rail bed would minimize the hydraulic impact and maintain the existing 100-year flood elevation.

During the NEPA process, Wendy Lopez & Associates, Inc. (WLA) conducted an evaluation of these alternatives to determine their impact on the jurisdictional areas in the park and to compare the costs of mitigation and construction.

### Summary of Findings

Cost/benefit analyses revealed that the direct construction costs of placing the new rail on fill was less expensive, but the overall impacts and indirect costs of mitigation made it unfavorable. The direct construction costs of the structural alternative were much higher, but the mitigation costs were negligible relative to the fill option. Additionally, the direct impacts to the wetlands adjacent to the ROW were lessened and the hydrology of the area and the volume of the floodplain storage largely unchanged. Finally, the freedom of visitors to wander through the park would be unimpaired once the aerial structure was completed. DART concurred with

this finding and coordination with affected agencies was initiated to determine mitigation for the temporary impacts to the jurisdictional areas.

In addition to restoring the wetland areas along the temporary construction road, it was the desire of the USACE for DART to identify additional potential mitigation areas within the White Rock Creek watershed. The City of Dallas Parks and Recreation Department owns much of the surrounding land in the watershed including several thousand acres around White Rock Lake located approximately ½-mile south of the DART LRT line. DART approached the Parks and Recreation Department about identifying areas for potential mitigation. They agreed to let DART research parkland and make recommendations where potential mitigation could occur.

DART identified three areas for potential off-site mitigation: an area along the hike-and-bike trail; one along the White Rock Lake shoreline; and an isolated area that was historically an open-water wetland. The City of Dallas Parks Department suggested that the area along the hike-and-bike trail be developed as an educational wetland. Additionally, the hydroperiod of the isolated area would be enhanced to restore its historic function as a wetland.

As a result of field studies, the proposed mitigation plan included the following components:

- restoration and enhancement of the wetland areas adjacent to the new structure;
- construction of two “educational” wetlands located next to a heavily traveled hike-and-bike trail that will teach the public about the characteristics and benefits of wetlands;
- off-site restoration of a ten-acre wetland area located in White Rock Creek Park; and
- quarterly monitoring of construction activities to ensure protection of the surrounding environment from further degradation.

The mitigation plan was strengthened by the fact that the mitigation occurred in the same watershed. The USACE and USFWS concurred with the findings and approved the proposed mitigation measures.

#### Implications for Future Research/Policies

The true success of this project was found in the cooperative efforts between DART, USACE, USFWS and the City of Dallas Parks and Recreation Department to develop a plan that was acceptable to all interested parties, including the general public. DART received land for mitigation at no cost; the City of Dallas Parks Department received two educational wetlands for the general public; the USACE obtained mitigation within the same watershed; and the enhanced wetland areas met the USFWS desire for improved habitat. Additionally, this seven-year project was the impetus for DART to develop Mitigation Monitoring Policies for all projects where mitigation is required through the NEPA process.

Biographical Sketch: Ms. Schieffer has experience in a broad range of projects within the field of Conservation Biology. She has worked with state and federal agencies, non-profit organizations, community groups and private companies, both in the United States and abroad, on projects ranging from tracking endangered species occurrences, to maintaining trails and implementing erosion controls, to researching the effects of oak wilt. She has also designed, organized and led workshops for college and high school students, serving as both leader and team member, overseeing quality control and reviewing the success of each workshop. Ms. Schieffer spent 1½ years in Bolivia with the Peace Corps, working as an environmental educator, where she collaborated with community groups, non-governmental organizations and government officials on a variety of projects. Currently, she is working as an Environmental Scientist for Wendy Lopez & Associates, an engineering and consulting in Dallas, Texas. In this capacity, Ms. Schieffer has gathered data and prepared documents for NEPA compliance, completed Section 404 jurisdictional determinations (for wetlands/waters of the US), conducted noise surveys, and carried out mitigation monitoring for wetland restoration projects.