LID STRATEGIES FOR
Panther Island

TRINITY RIVER VISION AUTHORITY

February 2014

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FREESE AND NICHOLS

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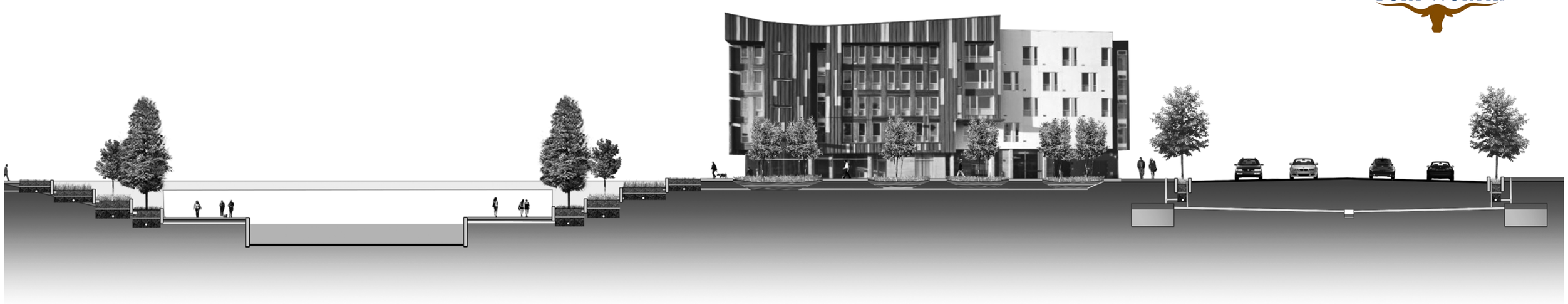



Open Space - Pedestrian areas
Bioswale basins /planters
Terraced Rain Gardens
Stormwater bio-filtration systems
The Rain harvesting / Bio filtration system,
provides treated water for the canals and lake

INTRODUCTION

Water Quality is a critical component to making the Panther Island project a success. The proposed development targets a pedestrian-focused lifestyle centered on interaction with the natural beauty of the river. A new reach of the Trinity River lined with multi-tiered walkways will be constructed along with an urban lake and a network of intertwining canals. Controlling pollutants in stormwater runoff will allow for an enhanced aesthetic for the Uptown residents and visitors. They will benefit not only by the cleanliness of the water but also by interaction with the natural elements inherent in green infrastructure.

Freese and Nichols has conducted a study and investigation into green infrastructure concepts that could be implemented in the future development of the Panther Island area. This portfolio provides a snapshot of the concepts envisioned for the area as well as their water quality benefits. An in-depth description of the methodology used in this study as well as a discussion of other infrastructure benefits from these concepts is presented in a separate technical report. This study is based on the mass grading plan and master plan for the future development prepared by Kimley-Horn and Associates for the Trinity River Vision Authority.

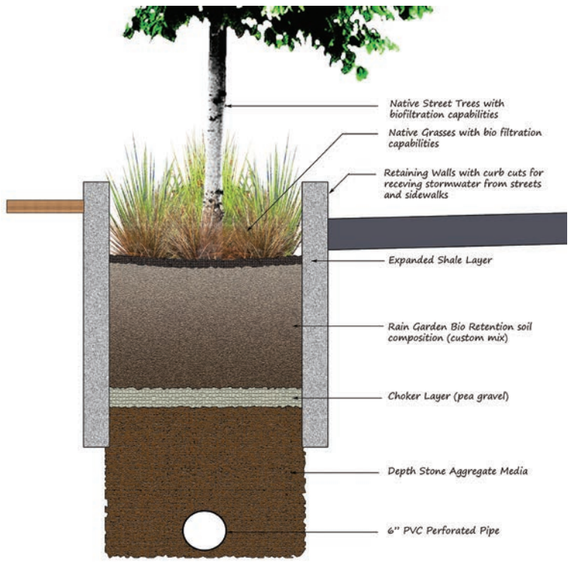
Three levels of implementation were evaluated and are presented graphically in this portfolio. The levels are titled: Right-of-Way Response, Open Space Response, and Architectural Response. Each response builds on the previous response by adding additional infrastructure and development standards. The first level of implementation includes a network of rain gardens located within the proposed right-of-way. The second level of implementation adds rain gardens within the open space areas, in the view corridors, and along the canal and lake areas. The final level of implementation, Architectural Response, considers the opportunities to treat the water quality volume within the building systems. This layered approach demonstrates to policy makers a sliding scale of Low Impact Development (LID) that can be considered for implementation.

An estimate of the total percentage of water quality volume treated with green infrastructure was calculated for each level of implementation within the Panther Island Development. The water quality volume refers to the “first flush” of rainfall, which contains the heaviest concentration of pollutants and is the target volume for treatment. This water quality volume was calculated using NCTCOG iSWM criteria. A stormwater management system designed for the first flush will treat all of the runoff from small storm events, as well as a portion of the runoff for all larger storm events.

FNI created conceptual rain garden and green roof sections consisting of layers of different media with varying depths, porosities, and maximum saturation percentages. When these typical sections were applied across the Panther Island area, a volume of treatment capacity was determined. This volume was then compared to the water quality volume to determine the percentage treated by the proposed LID implementation.

RIGHT-OF-WAY RESPONSE

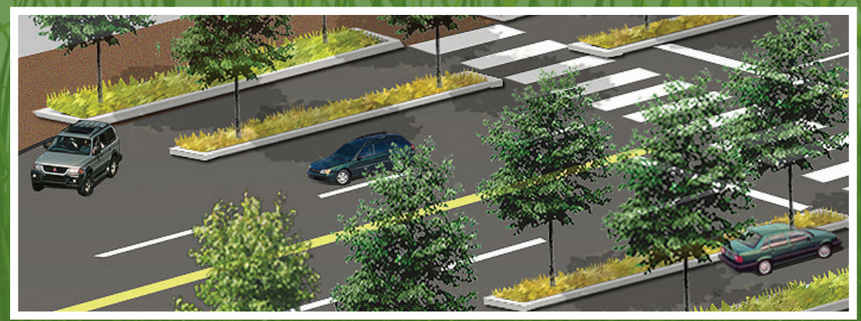
The first water quality implementation level evaluates opportunities to treat runoff within the proposed street sections and right-of-way. This implementation assumes that rain gardens are constructed wherever a street tree is shown in the master plan in place of traditional curb inlets. The results of the analysis indicate that this level of implementation could conceivably treat 23 percent of the water quality volume across the Panther Island development. It should also be noted that this concept is capable of treating 100 percent of the water quality volume running directly off of the right-of-way. Runoff to the remainder of the project area would require collection and transmission to other water quality structures to ensure treatment and cleanliness of the receiving water bodies. Due to the anticipated requirement that all surface runoff is to be treated for water quality, at this level it is assumed that all areas adjacent to the canals would be drained back toward the drainage systems in the street. This represents a significant cost to development versus discharging to the canals. There is a major opportunity to treat this runoff on the surface using green infrastructure in this configuration.



Conceptual Rain Garden Section

SUSTAINABLE ELEMENTS WITH THIS RESPONSE

Rain Gardens



Green Streets

23%

Water Quality Volume Treated

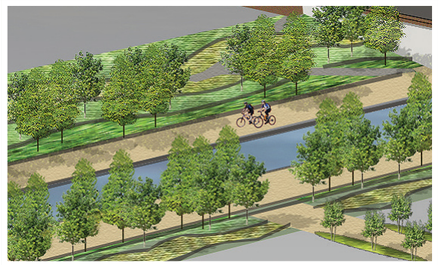
OPEN SPACE RESPONSE

The second level of implementation of water quality treatment measures expands the scope from the Right-of-Way Response to include the various open space areas located throughout the Panther Island development. The view corridors between the buildings and the areas adjacent to the canal were targeted as areas for additional rain garden placement. Terraced rain gardens were envisioned to treat runoff from development adjacent to the canals. By allowing this runoff to directly enter the canals instead of the street, significant cost savings for street drainage infrastructure can be realized.

The terrace rain gardens function as a series of biofiltration cells, accepting stormwater flow from other open spaces, along pedestrian walkways, bridge structures and private properties. Water from these sources flows from terrace to terrace providing irrigation before entering the canals. The upper level terrace could function as community gardens or as additional recreational space. Each rain garden terrace would be designed with a specific soil composition and vegetative system to provide optimal biofiltration prior to runoff entering the canals.

By taking advantage of the open spaces to treat runoff from the large building footprint areas there is a substantial increase in the water quality volume treated. The cumulative treatment volume at this level of implementation is calculated to be 50 percent of the water quality volume. Further increases in the performance of this response can be realized by increasing public open space. This calculation did not include any water quality treatment mechanisms within the individual development areas.

SUSTAINABLE ELEMENTS WITH THIS RESPONSE



Terraced Canal Rain Gardens

View Corridor Rain Gardens

Other Open Space Filtration

Eco Restorers

50%

Water Quality Volume Treated

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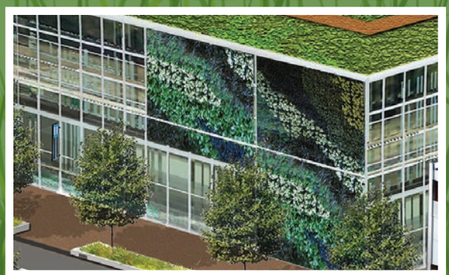
ARCHITECTURAL RESPONSE

The final level of response considers the opportunities to treat the water quality volume using building-attached systems, primarily green roofs. Rain barrels and increased harvesting and storage of rainfall at a private level could also be implemented to treat and use runoff on-site. Implementation of this response level would likely require enhanced development standards and restrictions. A full-scale implementation of green roofs is not anticipated given the up-front costs compared with the relatively small volume treated by the systems. However, it is important to note that these costs can be mitigated by the energy savings realized over time. At total build out, coverage of green roofs for this evaluation was estimated to be 25 percent. Based on this assumption, the cumulative water quality volume treated at this level was calculated to be 58 percent. Without additional site specific implementations of runoff capture and treatment, structural treatment systems for the private development will be required to provide complete treatment for the area.

Other sustainable building concepts can be considered at this response level. Green walls would provide increased energy savings and air quality enhancements. Energy savings could also be realized by utilizing roofs for energy harvesting. Solar or wind energy harvesting would be ideal for this purpose.

SUSTAINABLE ELEMENTS WITH THIS RESPONSE

Green Roofs and Rain Barrels



Green Walls

Energy Harvesting

Wind Energy Harvesting

58%

Water Quality Volume Treated

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CONCLUSION

Traditional development and drainage infrastructure centers around removing storm runoff from an area as quickly as possible. This development philosophy misses the beneficial interaction of stormwater with the surrounding environment through LID techniques. In addition, traditional development pushes the water quantity, as well as quality issues, downstream. This document explored the possibilities of implementing LID techniques in the Panther Island development to provide treatment of stormwater runoff.

Three levels of implementation were envisioned: Right-of-Way Response, Open Space Response, and Architectural Response. With each rising level of implementation, higher water quality goals can be achieved. Each level adds increased visual and public interaction that melds with the water-centric vision for the Trinity River.

The public is always drawn to water, and protecting the investment of the canals and lake features necessitates providing a framework for water quality. The biofiltration treatment system outlined here will serve not only a demonstrative purpose but also a long-term assurance of a legacy of water quality and a healthy environment.

Open Space - Pedestrian areas
Bioswale basins /planters

Rain Gardens / Green Streets
Bio-filtrated stormwater collected in underground storage tanks,
before overflowing into box culvert systems.

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