Low-Impact Development Strategies for Panther Island

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Agenda

• Trinity River Vision Overview
• Storm Drain Master Plan
• Water Quality Basics
• LID Strategies for Panther Island
• LID Business Case Evaluation
• Next Steps to LID Implementation
• Questions and Discussion

Trinity River Vision Overview
Trinity River Vision
PRIVATE DEVELOPMENT

Trinity River Vision
BYPASS CHANNEL DETAIL

East Side: “Hard edge” for development
West Side: “Soft edge” for recreation

Trinity River Vision
PROJECTS: TRINITY UPTOWN / CENTRAL CITY

How This Will Be Built
- Bridges
- Bypass Channel
- Storm Water Management
- Isolation Gates
- Dam & Channel Lock
- Interior Water Feature
- Panther Island
Storm Drain Master Plan

Background
- Multi-phased master planning study
- Storm drain infrastructure needed to support TRV project and ultimate development

Storm Drain Master Plan for Panther Island
- Based on mass grading plan
- Sliding scale of LID techniques
- Costs and benefits of implementations
- 50,000-foot view
Water Quality Basics

The “first flush”

• First 1 to 2 inches of rainfall
• Contains the most concentrated pollutants and is targeted for treatment
• Expressed as a volume of runoff to be treated – “Water quality volume” (WQV)
• Numerous LID strategies exist to capture and treat this volume

Water Quality Basics

Bioretention

• Water quality volume is retained on surface and in filter media
• Pollutants are removed through filtration and natural biological processes
Water Quality Basics

Why consider LID approaches?

• Higher treatment efficiencies than gray infrastructure
• Simulates natural processes
• Aesthetic benefits
• Promotes focus on water quality
• Cost savings

Examples

Seattle, Washington
Milwaukee, Wisconsin
Washington, D.C.
Austin, Texas
Portland, Oregon

LID Strategies for Panther Island
LID Strategies for Panther Island
Casts a vision for LID implementation on Panther Island

Incremental Levels of LID Implementation Evaluated

Traditional Design
- No green infrastructure
- Water Quality addressed structurally

Right-of-Way Response
- Bioretention to replace all street trees
LID Strategies for Panther Island

Incremental Levels of LID Implementation Evaluated

Open Space Response
• Bioretention along canals and open spaces
• Allows for drainage directly to canals

Right-of-Way Response

Traditional Design

LID Strategies for Panther Island

Incremental Levels of LID Implementation Evaluated

Architectural Response
• Private implementation of green roofs
• Assumes 25% green roof coverage

Right-of-Way Response

Traditional Design

Right-of-Way Response

Water Quality Volume Treated
23%
Open Space Response

50% Water Quality Volume Treated

Architectural Response

58% Water Quality Volume Treated

Technical Analysis

Water Quality Volume

- Calculated per NCTCOG iSWM Manual
  - \( WQ_0 = 1.37 \) inches
- Bioretention area delineation
- Concept bioretention section

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<thead>
<tr>
<th>Water Quality Volume Treated with Green Infrastructure</th>
<th>Volume Treated</th>
<th>Cumulative Pct. of WQ Volume Treated</th>
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<tbody>
<tr>
<td>Traditional Design</td>
<td>0.00 in</td>
<td>0%</td>
</tr>
<tr>
<td>Right-of-Way Response</td>
<td>0.32 in</td>
<td>32.4 %</td>
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<tr>
<td>Open Space Response</td>
<td>0.69 in</td>
<td>50.0 %</td>
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<tr>
<td>Architectural Response</td>
<td>0.79 in</td>
<td>57.5 %</td>
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Business Case Evaluation

Construction Costs

$6.0  $5.1  $4.5  $4.3 $2.2  $1.1  $1.1  $1.1 $1.8  $3.8  $3.8

Capital Cost in Millions of Dollars

Green Infrastructure
Stormceptors
Grey Infrastructure

Construction Costs

Traditional $8.2
ROW $8.0
Open Space $8.4
Architectural $8.2

Business Case Evaluation

What is the economic case for implementing a more expensive solution?
Business Case Evaluation

• Quantifies tangible and intangible economic, social and environmental benefits
• Utilizes model in development based on the Envision Rating System
• Panther Island is one of the early test cases nationally

Next Steps to LID Implementation
Review/Summary

50,000 foot view
Vision for Panther Island

Business Case Supports Moving Forward

We Are Here

Next Steps

Operations & Maintenance
Developer Resources
Funding
Engineering Planning

50,000 foot view
Vision for Panther Island

Questions/Discussion

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Storm Drain Sizing

- **Hydrology adjustments:**
  - Increased initial abstraction
  - Reduced sheet flow
  - Manning’s n value

- **Drainage area adjustments:**
  - With Open Space
  - Response, some runoff is treated on-site and does not drain to public ROW

Business Case Evaluation

**Economic Benefits:**

- **Sales Tax**
  - Estimated 2-4% Increase
  - Base values from Economic and Fiscal Impacts of the Corps of Engineers’ Trinity River Vision Project (UNT 2005)
  - Conservative estimate based on prior studies

Business Case Evaluation

**Costs Evaluated:**

- Probable Construction Cost Estimated by FNI
  - 8-year construction period
  - 50-year operational period

- Operations and Maintenance Cost
  - Typical costs from EPA
Business Case Evaluation

• Property Values
  – Estimated 3.36% increase based on 10,500 residential units with an average value of $150-160k

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<th>Property Value Worksheet</th>
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<thead>
<tr>
<th></th>
<th>Right-of-Way Response</th>
<th>Open Space Response</th>
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<tbody>
<tr>
<td>Total Residential Units</td>
<td>10,500</td>
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<td>Average Value of Residential Unit (USD per unit)</td>
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<td>Number of Units Affected</td>
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<td>Estimated Value Increase</td>
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<td>Total Value Increase</td>
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<td>Sale Price</td>
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<tr>
<td>Total Value Appraised</td>
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Business Case Evaluation

Environmental/Social Benefits:

• Water Quality Improvements
  – Based largely on Willingness-To-Pay studies conducted by USACE and others

• CO₂ and Air Pollution Reduction
  – Based on US Forest Service estimates for pollutant removal

Water Quality Ladder

- Diagram of water quality ladder

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<th>Table B.1 Water quality characteristics for purification of water</th>
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Engineering Planning

LID Master Plan
• Comprehensive LID concept layout
• Water Quality Modeling of BMPs
• Develop key schematic sections and details
  – Roadways, canal edge, open space corridors

Funding
• Public Funding Options
  – PID, Impact Fee, Grants
• Developer Partnerships
• Develop financial plan for implementation

Developer Resources
• Amend Trinity Uptown Development Standards and Guidelines
• Resources for voluntary LID implementation including standard details and specifications
Operations and Maintenance

- Determine maintenance entity
- Develop O&M standards
- Quantify O&M costs