Urban Stream Restoration Case Studies: *Lessons Learned*

Alabama Cooperative Extension System
ADEM
AL DOT
CAWACO RC&D
Cahaba River Society
Samford University
Goodwyn Mills & Cawood
LBYD
Volkert
Stantec
Thompson Engineering
North State Environmental
Southern Excavating
Cities of Auburn, Daphne, Jasper, Montgomery, Vestavia Hills, Spanish Fort

Stream Restoration

"activities that initiate or accelerate the recovery of ecosystem health, integrity, and sustainability" (*SER, 2004*)

Jasper Town Creek

Auburn UT Town Creek

Stream Restoration is a Systematic Process

1. Planning & Assessment
2. Engineering
3. Construction & Planting
4. Monitoring, Maintenance, Adjustments

Samford Univ Shades Creek

Daphne UT D'Olive Creek

Goals of Stream Restoration Projects

- Improve habitats & water quality
- Improve recreation & aesthetics
- Protect infrastructure & land value
- Educate citizens & decision-makers

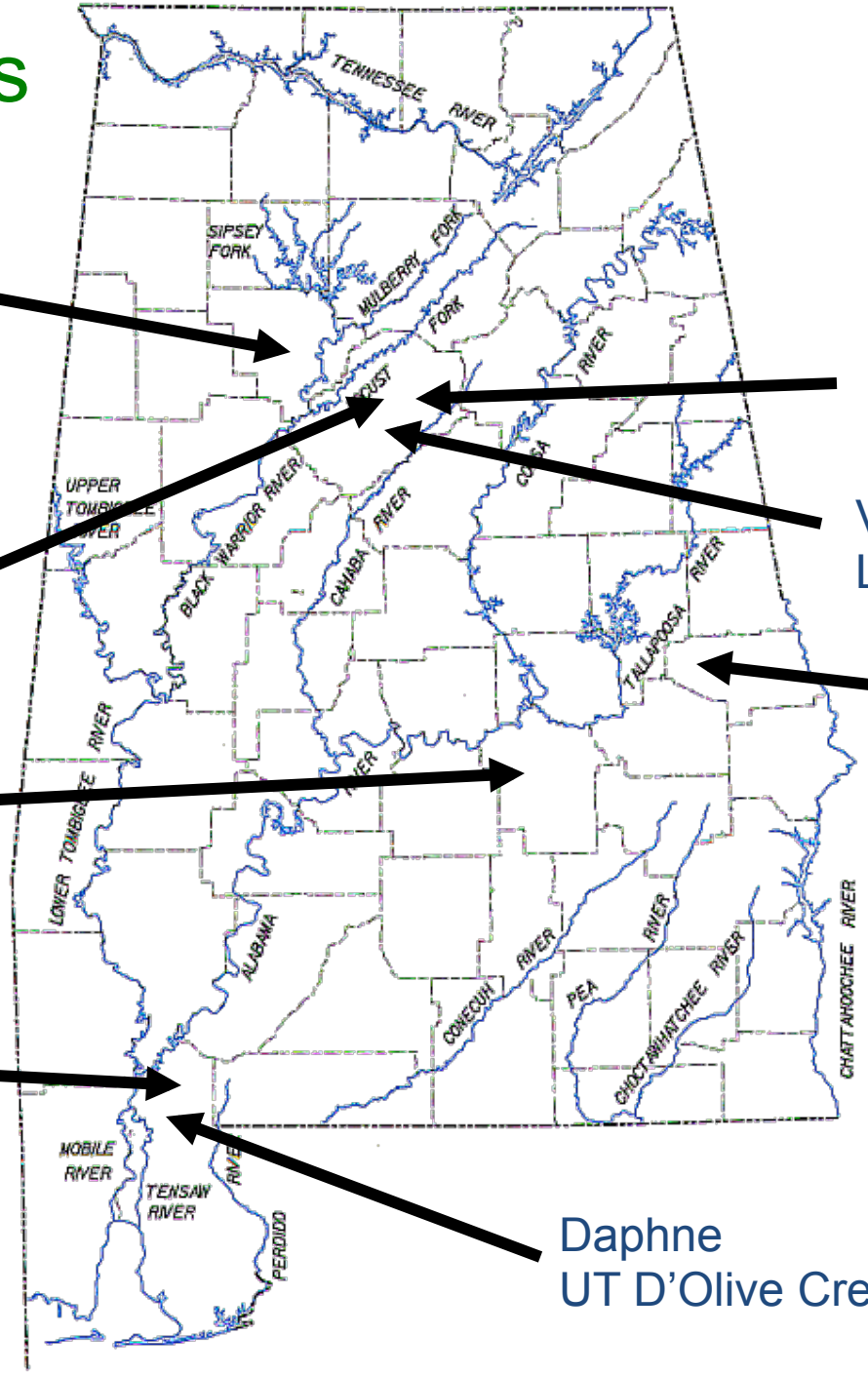
Daphne UT D'Olive Creek

Samford Univ Shades Creek

Stream Restoration as a BMP

- Sediment control
- Nutrient cycling (instream & floodplain)
- Peak discharge attenuation
- Habitats (aquatic & terrestrial)
- Infrastructure protection

Case Studies



Jasper
Town Creek

Samford University
Shades Creek

Montgomery
White Slough

Spanish Fort
Joes Branch

Trussville
Cahaba River (2013)

Vestavia Hills
Little Shades Creek

Auburn
UT Town Creek
UT Saugahatchee
Saugahatchee
Parkerson Mill Cr

Daphne
UT D'Olive Creek (2 sites)

Auburn Town Creek Trib (2008)

2007

Project Mgmt: Auburn Univ

Funding: ADEM EPA 319

Design: Stantec, Jennings

Construction: North State Environmental

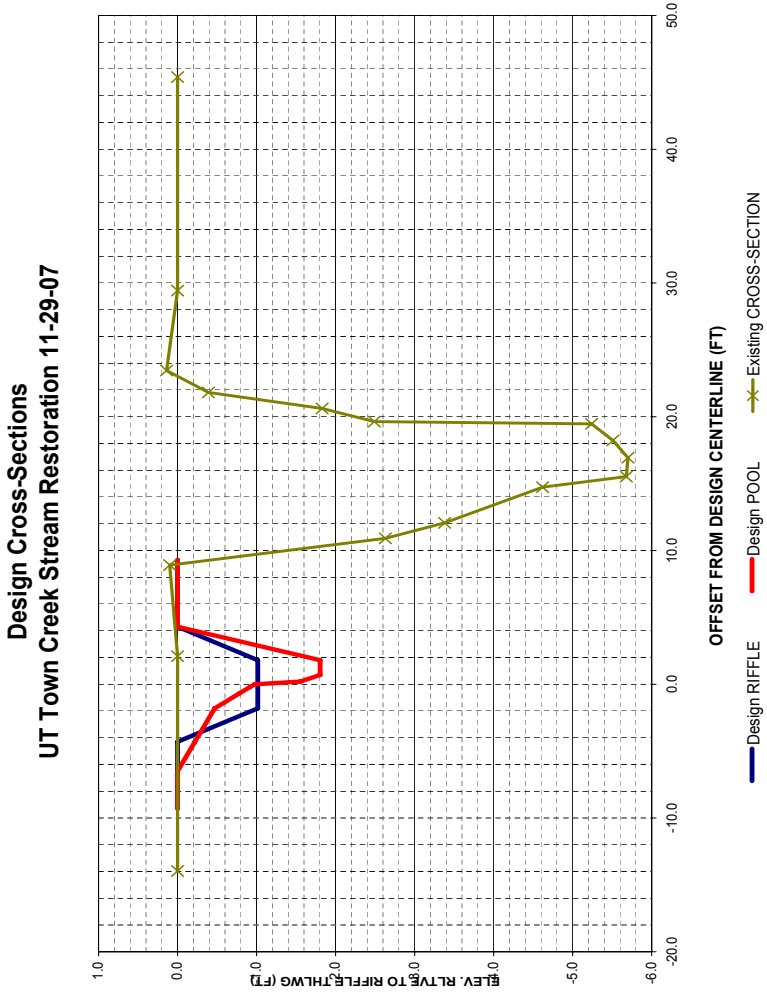
Vegetation: Auburn Univ

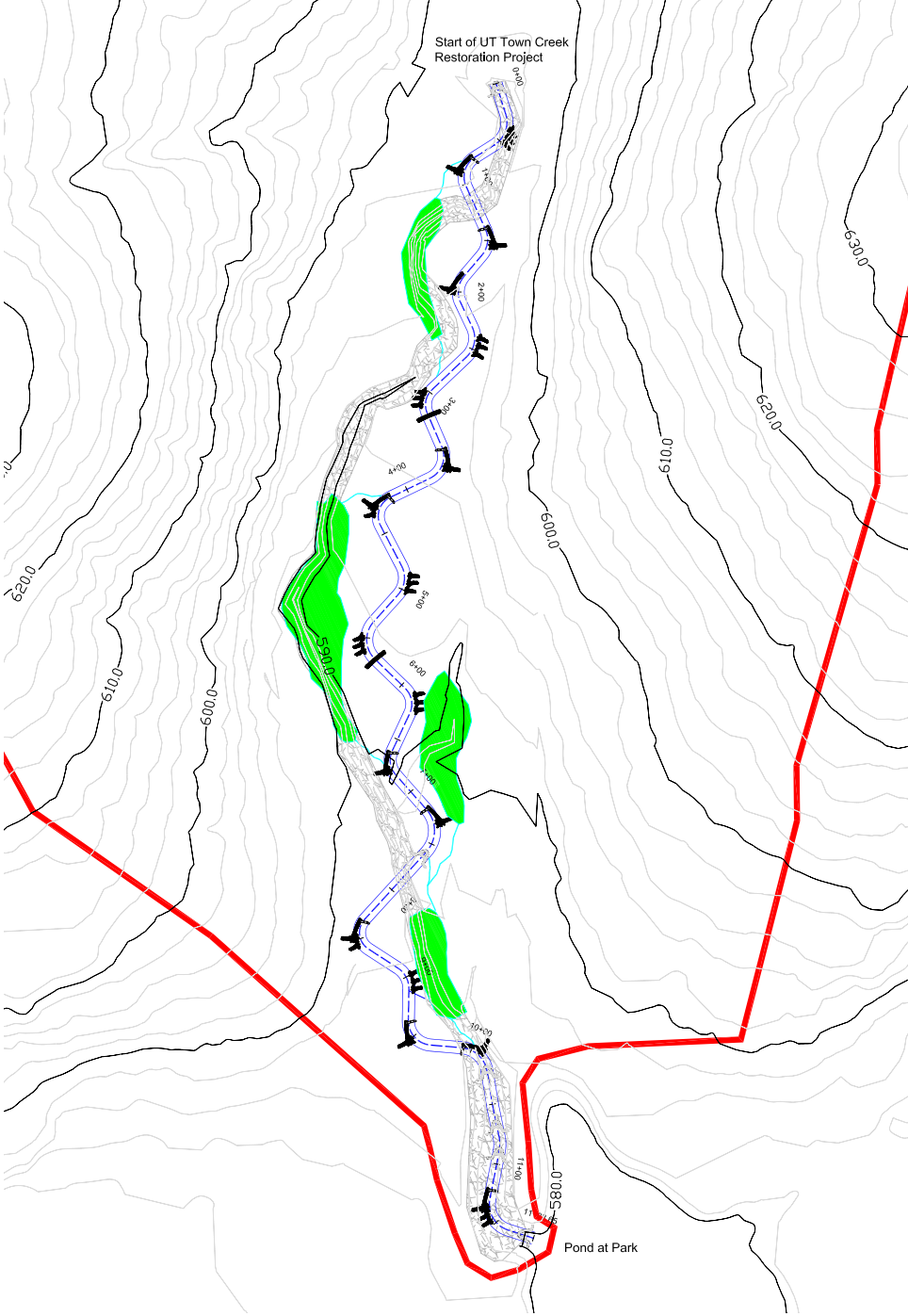
North State ENVIRONMENTAL

2009

Engineering Design:

David Bidelspach, PE, Stantec





Priority 1: Reconnect Floodplain

Replace incised channel with shallow channel raised to existing floodplain elevation

ER = 18 W/d = 12
K = 1.4 S = 0.008

2006 Town Creek Tributary 2007

Montgomery White Slough (2009)

Project Mgmt: Auburn Univ

Funding: ADEM, EPA 319

Design: GMC, Jennings

Construction: GMC

Vegetation: GMC, Auburn Univ

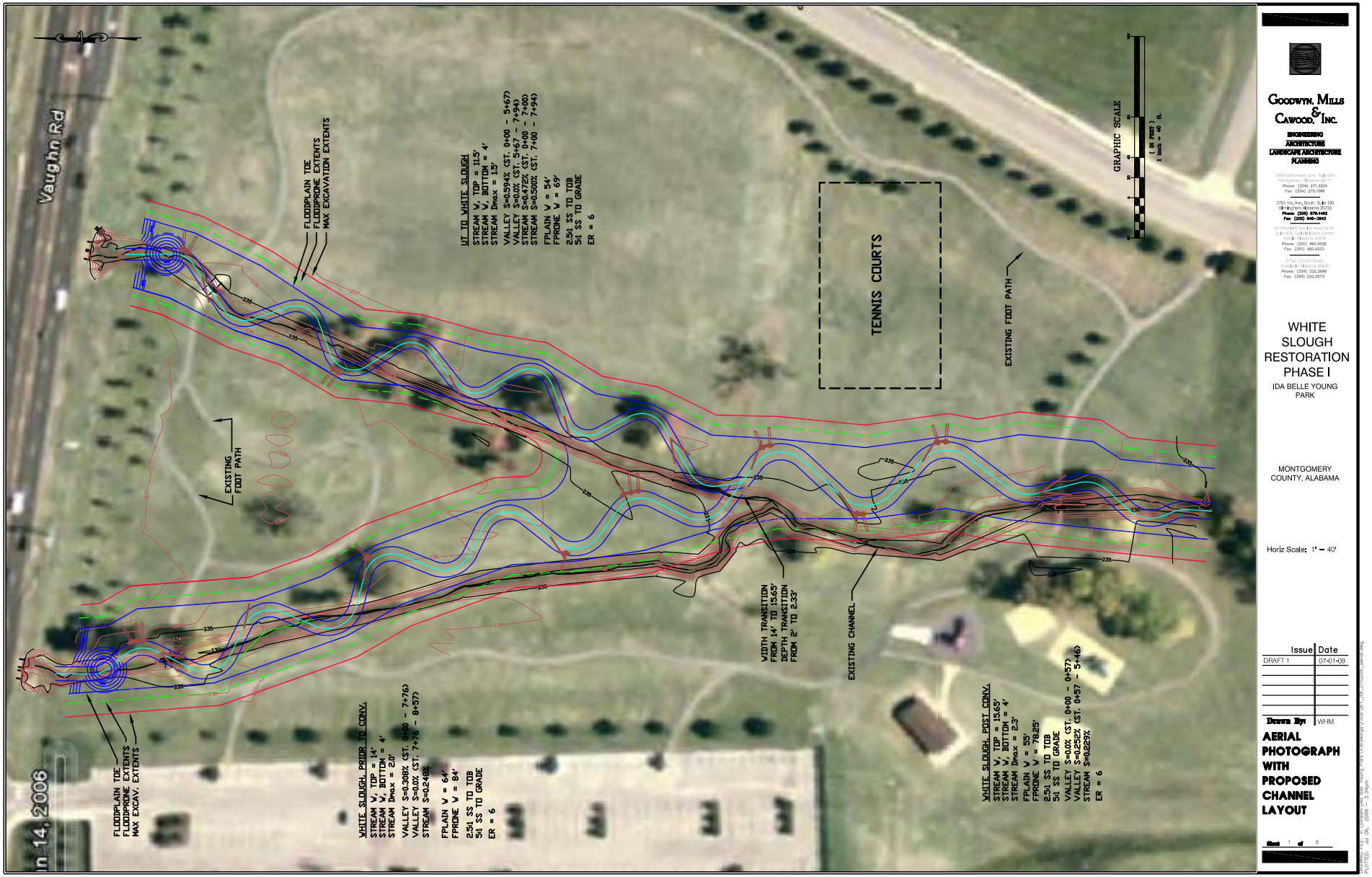
2008

2010

Montgomery White Slough (2009)

Objectives: Improve water quality and habitats

Engineering Design: William McLemore, PE, GMC



GOODWYN, MILLS & CAWOOD, INC.
ENGINEERING
ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING

WHITE SLOUGH RESTORATION PHASE I

IDA BELLE YOUNG PARK

MONTGOMERY COUNTY, ALABAMA

Horiz Scale: 1" = 40'

Issue	Date
DRAFT 1	07-01-09

Drawn By: WHM

AERIAL PHOTOGRAPH WITH PROPOSED CHANNEL LAYOUT

Sheet 1 of 9

Priority 2: Reconnect Floodplain

Excavate wide floodplain and meander channel at a lower elevation

ER = 6
W/d = 11
K = 1.4
S = 0.003

2008 White Slough 2010

Priority 2: Reconnect Floodplain

Priority 2: Reconnect Floodplain

Entrenchment Ratio = W_{fpa} / W_{bkf} = 84/14 = 6

Vegetation

Challenges:

Poor soil for plant establishment

Flashy urban flows

Geese and Beaver

Vestavia Hills Little Shades Creek (2010)

2009

Project Mgmt: CAWACO RC&D

Funding: ADEM, EPA 319

Design: GMC, Jennings

Construction: North State Environmental

Vegetation: Auburn Univ, NSE

2011

North State ENVIRONMENTAL

Little Shades Creek (2010)

Ashley Woods subdivision

City of Vestavia Hills, AL

Jefferson County

Tributary to Shades Creek

Cahaba River Basin

Drainage Area = 8 sq miles

Impervious Surface = 35%

Project Partners

- ADEM
- US Environmental Protection Agency
- City of Vestavia Hills
- Cawaco Resource Conservation & Development Council, Inc.
- Cahaba River Basin Clean Water Partnership
- Alabama Cooperative Extension System
- Ashley Woods Homeowner's Association
- The Nature Conservancy
- Alabama Department of Transportation
- North State Environmental
- North Carolina Cooperative Extension
- Goodwyn Mills & Cawood, Inc.
- Representatives Jabbo Waggoner
- Representative Greg Canfield
- Representative Jack Williams
- USDA/NRCS
- Morgan Properties

Grant Objectives

- Control erosion and reduce sedimentation utilizing natural channel design techniques
- Install BMPs to remediate runoff from urban sources.
- Provide education regarding nonpoint source pollution and effective stormwater management techniques.

Need: Protect water quality + infrastructure

Opportunity: Community Support + Technical Expertise + Administrative Persistence

Project Specs

1,900 feet stream length

30-60 feet riparian buffer

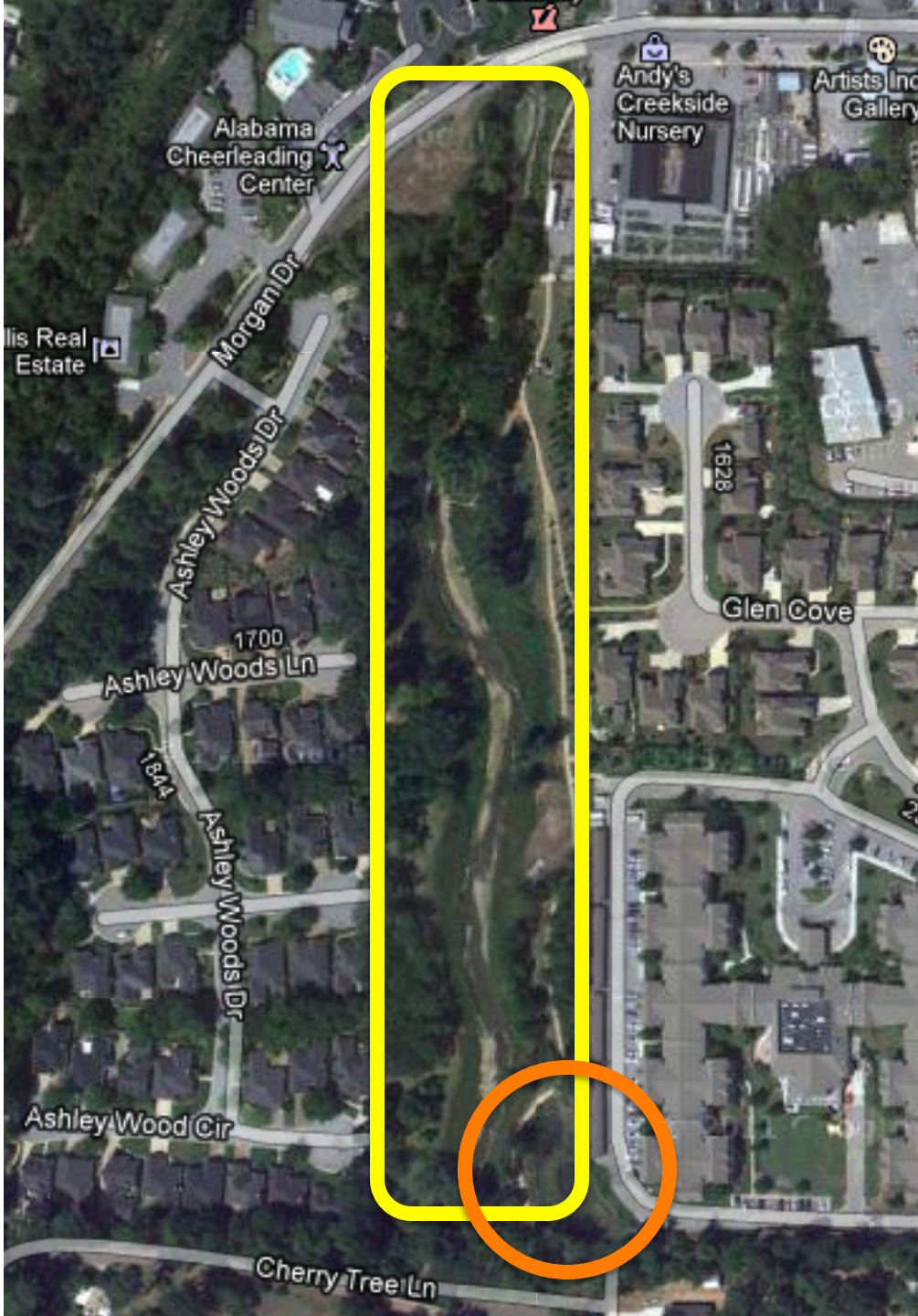
0.5 acre stormwater wetland

10 stormwater outfall channels

Sewer crossing

Greenway trail on East bank

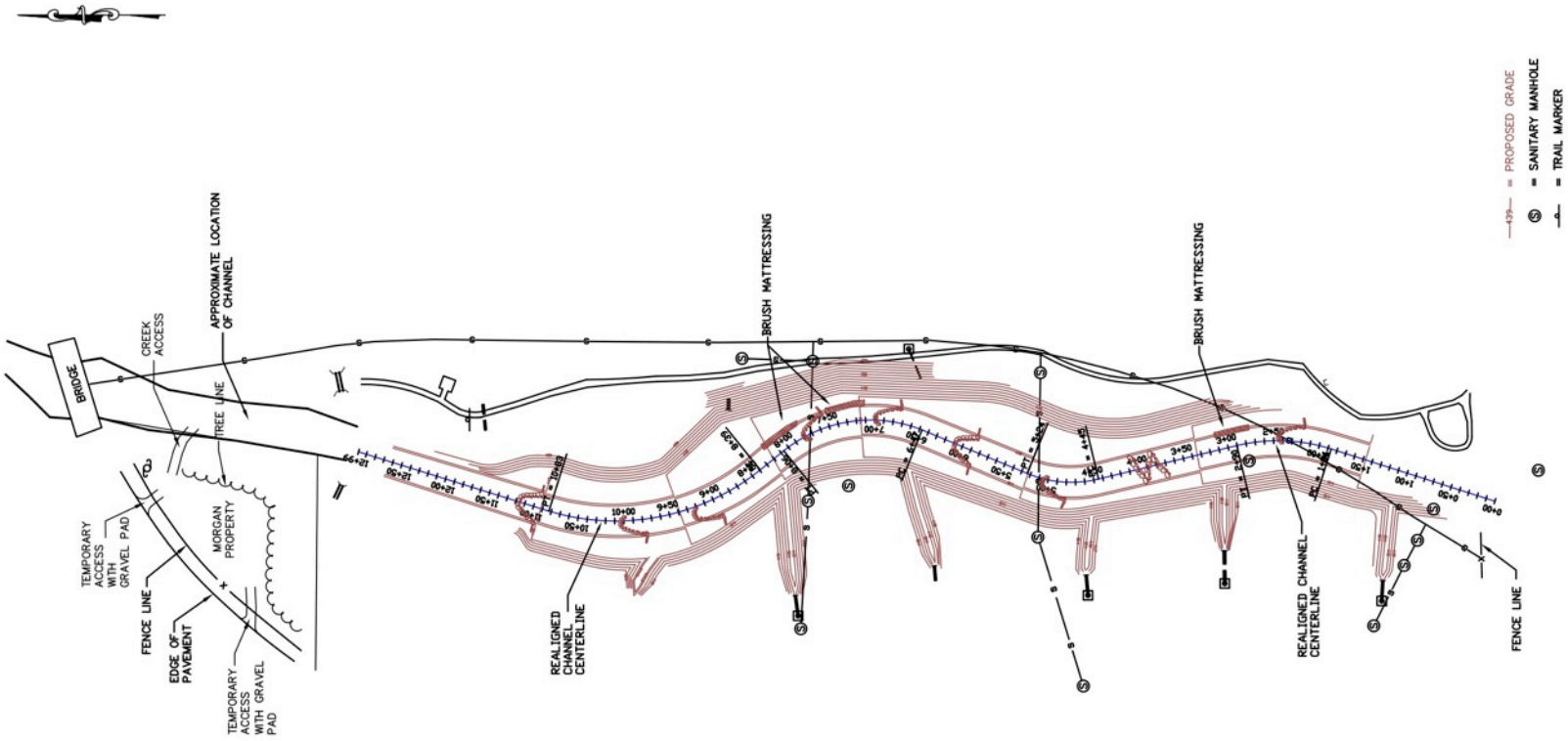
Gravel/cobble – high bedload



Project Components

1. Channel morphology
2. Floodplain structure
3. Hydrologic & hydraulic analysis
4. In-stream structures
5. Habitats & vegetation
6. Site & watershed conditions
7. Monitoring, maintenance, education

Engineering Design: William McLemore, PE



NOTES
1. BIORETENTION AREAS W/ ROCK SPILLWAY STRUCTURE TO BE FIELD DESIGNED TO MINIMIZE IMPACTS TO TREES.
2. LIGHT TRUCK ACCESS ONLY THROUGH THE CITY PARK VIA ANDY'S NURSERY AND ACROSS THE EXISTING CULVERT.
3. LIGHT TRUCK ACCESS ONLY THROUGH ASHLEY WOOD SUBDIVISION.
4. TRACK VEHICLES AND HEAVY EQUIPMENT ACCESS ONLY THROUGH MORGAN PROPERTY.
5. STORAGE AND STOCKPILING AREAS TP BE CHOSEN BY CONTRACTOR. AREAS MAY INCLUDE ASHLEY WOOD NEIGHBORHOOD COMMON AREAS, MORGAN PROPERTY, AND CITY OF VESTAVIA HILLS PARK. AREAS SHOULD BE CHOSEN TO MINIMIZE IMPACT TO TREES.
6. TAKE EFFORTS TO MINIMIZE IMPACTS TO EXISTING CONCRETE WALKWAY IN PARK.

GRAPHIC SCALE
(IN FEET)
1 inch = 120 ft.

Goodwyn, Mills & Cawood, Inc.
ENGINEERING
ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING

LITTLE SHADES CREEK ENHANCEMENT

ASHLEY WOOD NEIGHBORHOOD

VESTAVIA HILLS, JEFFERSON COUNTY, ALABAMA

Horiz Scale: 1" = 120'

Issue	Date
DRAFT 1	01-05-10

Drawn By: WHM

PROPOSED IN-STREAM ROCK AND BIOENGINEERING STRUCTURES

Sheet 8 of 13

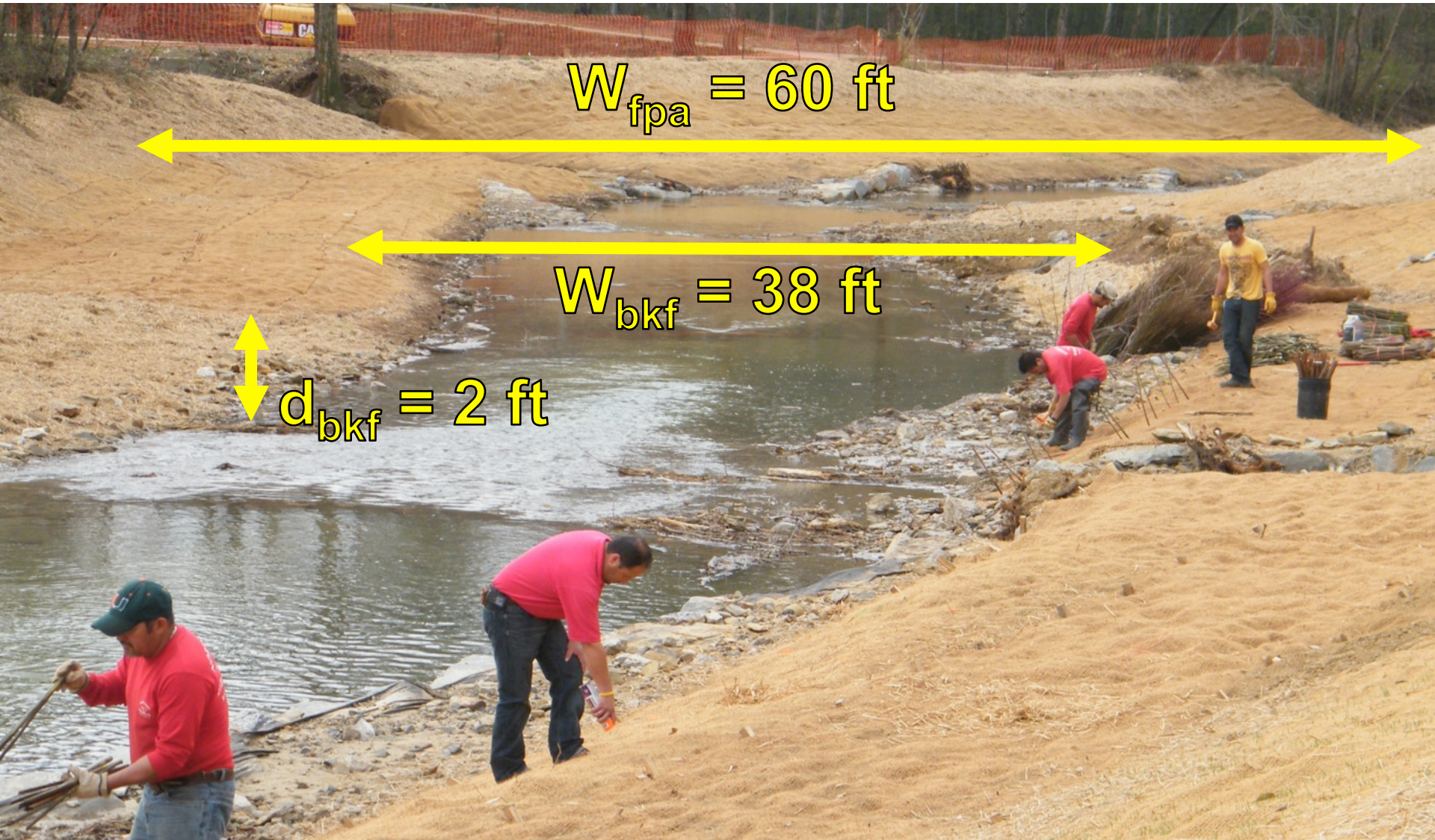
Priority 3: Excavate narrow floodplain benches in confined corridor

ER = 1.6
W/d = 19
K = 1.2
R_c/W = 2-3

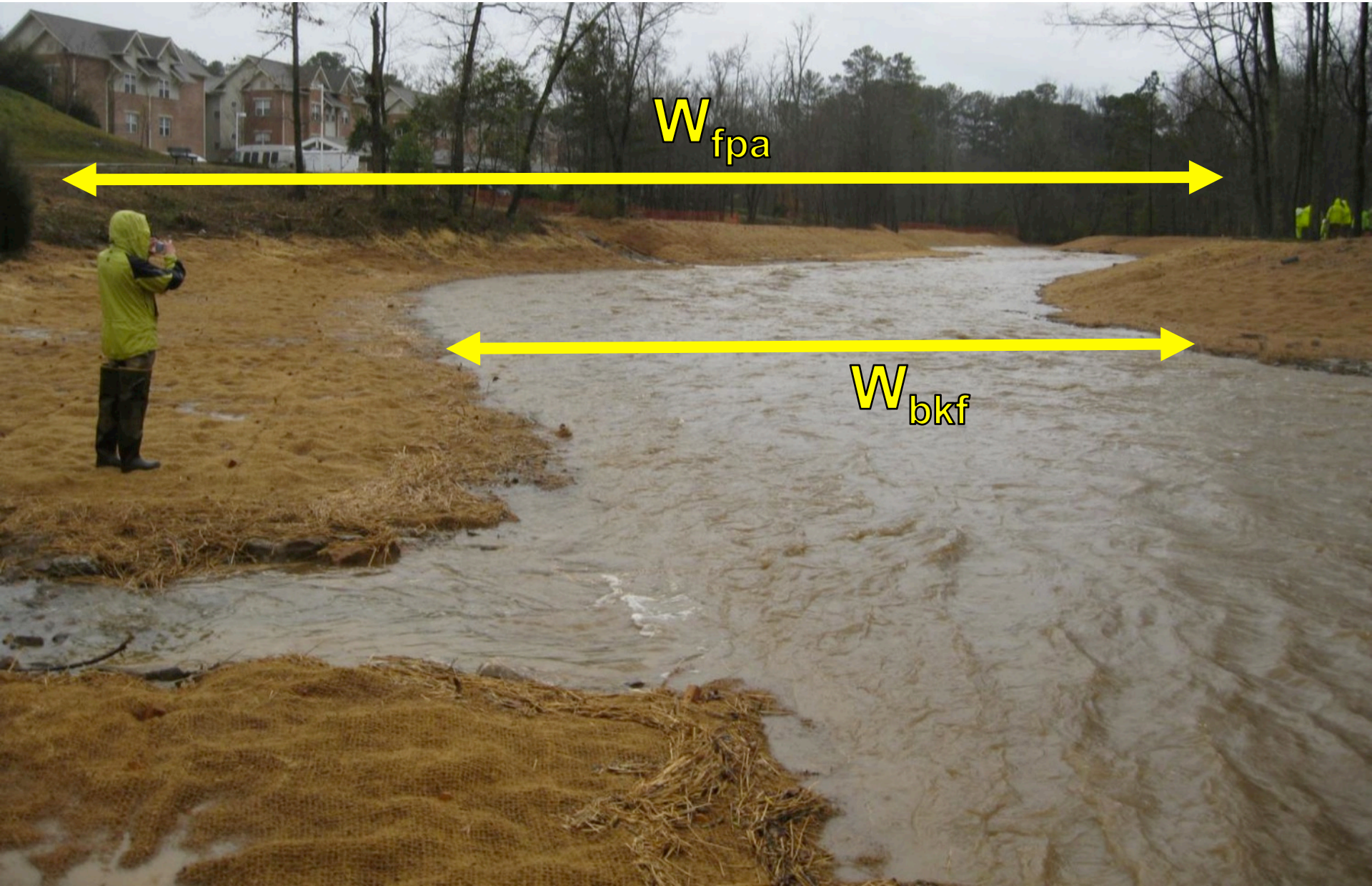
Construction: Jan-Mar, 2010

Entrenchment Ratio = W_{fpa} / W_{bkf} = 60/38 = 1.6

Width to depth Ratio = W_{bkf} / d_{bkf} = 38/2 = 19



Entrenchment Ratio = W_{fpa} / W_{bkf} = 60/38 = 1.6



In-Stream Structures (11): Boulder & Log

- Grade Control
- Bank Protection
- Sediment Transport
- Habitat Enhancement

Boulder Vanes (Grade Control J-hooks)

- 3-6 % arm slopes
- 20-25 degree arm angles
- Boulder footers & non-woven geotextile
- 0.5 ft drops over j-hook inverts

Log Vanes

- 2-4 % arm slopes
- 20 degree arm angles
- Sealed with woven geotextile & backer logs

Stormwater Outfall Channels (10)

- Vegetated bio-swales (low slope)
- Rock step-pools (high slope)

Construction Practices

- Track equipment
- Spill management plan
- Staged construction phases to limit exposure

Temporary Erosion Control

- Soil prep, seed, straw
- Biodegradable matting (coir, 700g)
- Wood stakes

Stormwater Wetland Enhancement

- Runoff from 90 acres
- Sediment retention (78% reduction)
- Native plants – nutrient cycling

Vegetation – Streamside Forest

- Native plants
- Grasses, shrubs, trees
- Live stakes, bare roots, containers

Education & Engagement

- Signs
- <u>Workshops:</u> Construction, Planting, Maintenance

Maintenance

- Planting
- Invasive plant removal
- Bank erosion – brush mattress, coir logs

High-stress bank after repair with coir logs

Natural Succession

Partridge Pea, *Chamaecrista fasciculata*

Is the Project Achieving Goals?

- Streambank erosion eliminated
- Floodplain & wetlands functioning
- Vegetation, water quality, & habitats improving
- Public understanding enhanced

Samford University Shades Creek (2011)

Project Mgmt: Samford Univ

Funding: Samford Univ

Design: LBYD, Jennings

Construction: North State Environmental

Vegetation: Auburn Univ, NSE

2010

2012

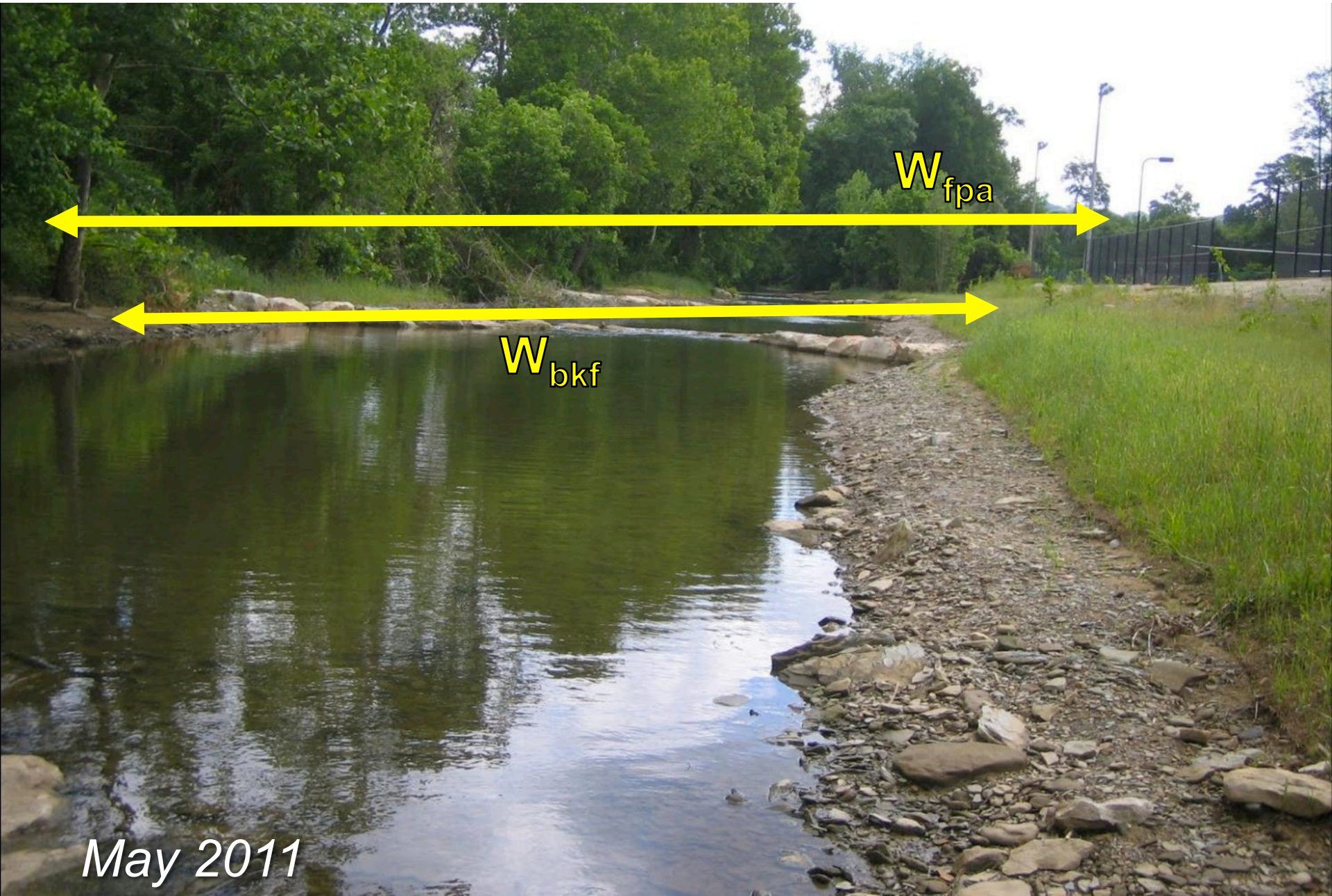
Priority 3: Excavate narrow floodplain benches in confined corridor

ER = 1.4
W/d = 15
K = 1.02
S = 0.005

Construction: Jan, 2011

North State ENVIRONMENTAL

Entrenchment Ratio = W_{fpa} / W_{bkf} = 55/40 = 1.4



Erosion Control: Seed, Straw, Matting, Wood Stakes

In-Stream Structures (10): Boulder & Log

- Grade Control
- Bank Protection
- Sediment Transport
- Habitat

Log Vane (Grade Control J-Hook)

- 70-ft long log; 30-inch diameter; root wad attached
- 3 % arm slope; 20 degree angle
- Sealed with woven geotextile & backer log
- Back filled with river cobble, gravel, sand

Log Vane (Grade Control J-Hook)

Boulder Cross-Vanes

- 1 to 2 ton boulders; 3 % arm slope; 20 degree angle
- Throat extends through center half of channel
- Boulder footers; Sealed with non-woven geotextile
- Back filled with river cobble, gravel, sand

Boulder Cross-Vanes

Shades Creek Flood, March 2011

Samford University, Shades Creek, Feb 2002

Samford University, Shades Creek, Aug 2011

Vegetation – Streamside Forest

Native plants

Grasses, shrubs, trees

Live stakes, bare roots, containers

Japanese Hops

Education & Engagement

Field days

Seminars

Student projects

Jasper Town Creek (2008): *Enhancement*

2007

Project Mgmt: CAWACO RC&D

Funding: ADEM, EPA 319

Design: Stantec, Jennings

Construction: North State Environmental

Vegetation: Auburn Univ, NSE

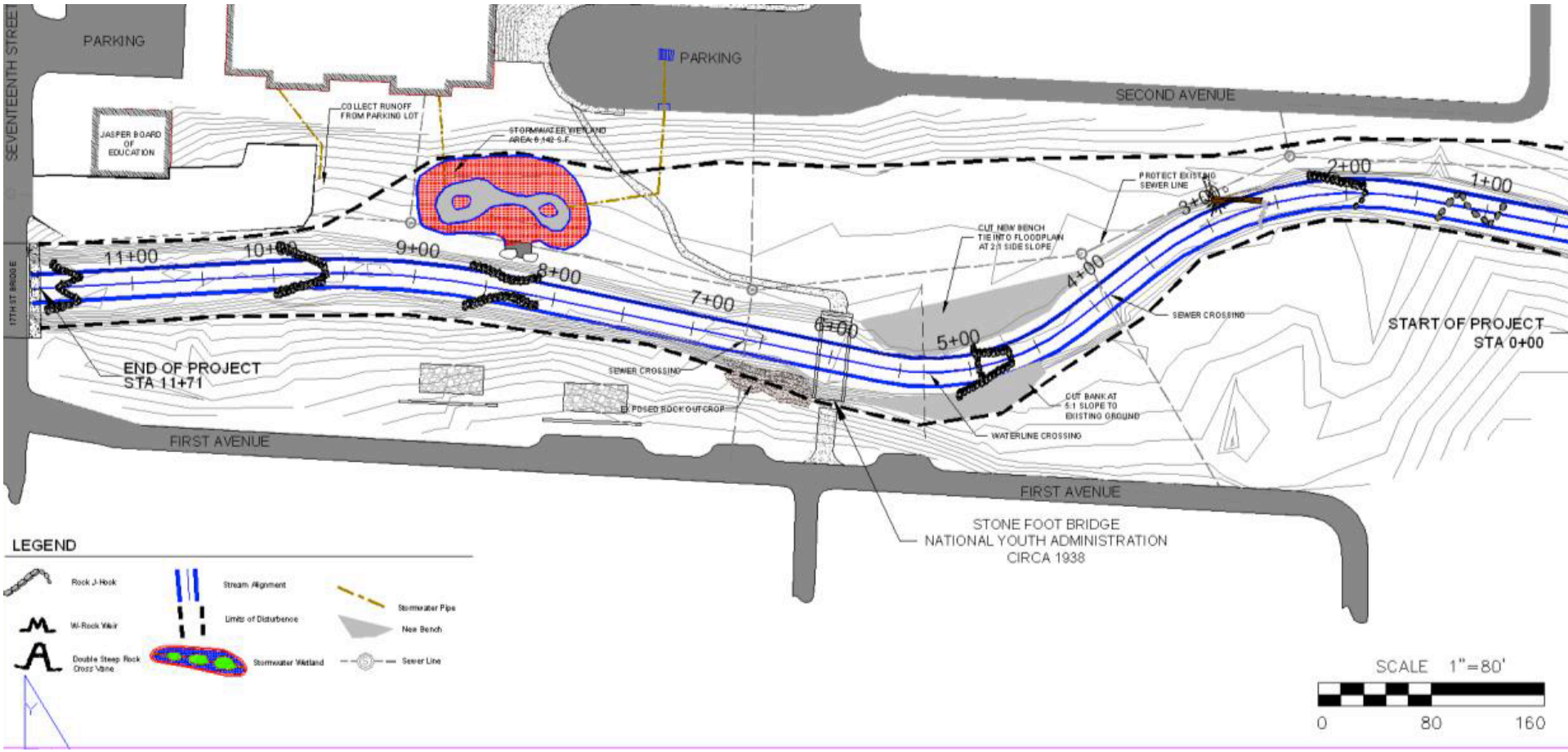
2012

North State ENVIRONMENTAL

Jasper Town Creek (2008): *Enhancement*

Objectives: Improve water quality and habitats

Engineering Design: David Bidelspach, PE, Stantec



In-Stream Structures (7): Boulder & Log

- Grade Control
- Bank Protection
- Sediment Transport
- Habitat

Vegetation

- Native riparian species
- Brushmattress, live stakes, native seeds

Stormwater Wetland Enhancement

- Runoff from 5 acres
- Native plants
- Education at Middle School

Stormwater Wetland Enhancement

Maintenance

Clear communication with City

Follow up for vegetation replacement


2009 12 3


2009 12 3

Lessons Learned - Summary

Set clear goals that everyone understands

Design and plan for big floods

Maintenance, maintenance, maintenance

Communication – everyone, all the time, constant