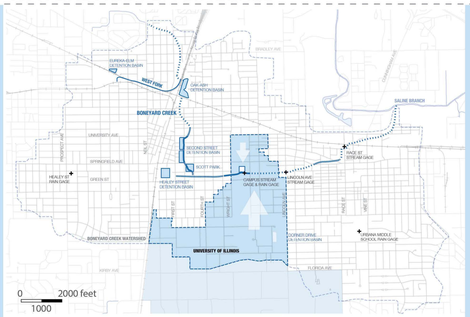
REVERSE ENGINEERING

RECONFIGURING THE CREEK-CAMPUS INTERFACE

The Boneyard Creek surfaces from a buried culvert into the Engineering Campus, its steep edges reinforced by rockery, concrete, and steel. Its floodplains, parking lots and back alleys. Once a series of loosely linked wet prairies and marshes seeping into each other, it has been transformed through a history of control; channelized, widened, deepened, straightened, buried, and dammed. As the fields of design and engineering evolve and overlap, an opportunity arises for interdisciplinary collaboration on a project in Reverse Engineering on the Engineering Campus of the University of Illinois Urbana-Champaign. Operating at multiple site and time scales, this proposal explores both systemic and structural approaches to green infrastructural design on the UIUC Campus that not only improves the performance of flood and water quality control, but builds a highly productive, social, ecological, and hydrological Interface between the Campus and Creek.

WATERSHED ANALYSIS

WATERSHED: ENGINEERED



ENGINEERED WATERSHED

- Detention Basin for Flood Control
- Buried Creek
- Decorative Creek
- Channelized Creek

FLOOD CONTROL WATER QUALITY CONTROL

Boneyard Creek drains an urbanized watershed of approximately 7.45 sq. miles that flows, in up-stream to downstream order, through the city of Champaign, the campus of the University of Illinois at Urbana-Champaign, and the city of Urbana, Illinois. Over the past several decades, several detention ponds have been constructed upstream of Campus Town and the UIUC Campus. Despite effectively eliminating recurrent flooding along the banks of the creek, the problem of poor water quality persists. The Boneyard Creek listed on the EPA's 303d list of impaired waterways, receives much of its base flow from urban runoff laden with nutrients, sediment, heavy metals, hydrocarbons and other pollutants.

CAMPUS SURFACE ANALYSIS AND DESIGN STRATEGY

CAMPUS AS LIVING LAB: AN EXPANDING SURFACE NETWORK OF GREEN STORMWATER INFRASTRUCTURE

SURFACE NETWORKS: LANDSCAPE INFRASTRUCTURES

A network of green infrastructure would mimic presettlement hydrological conditions, providing eco-system services of groundwater recharge through infiltration, water quality control through biofiltration. Benefits would be pronounced in the Boneyard Creek, where infiltration would stablilize base flow, biofiltration would reduce BOD, and a reduction in runoff volume would reduce peak flows.

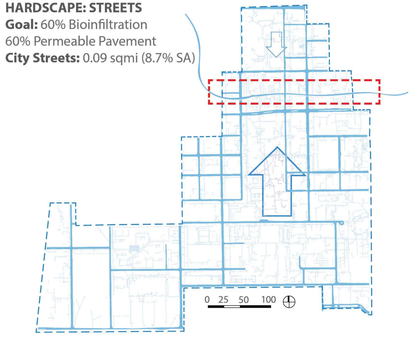
FILTERED FLOWS: CAMPUS TO CREEK

1. Stormwater Runoff
2. Bioinfiltration via Native Planting
3. Overflow into Storm Sewer
4. Filtered Water into Creek

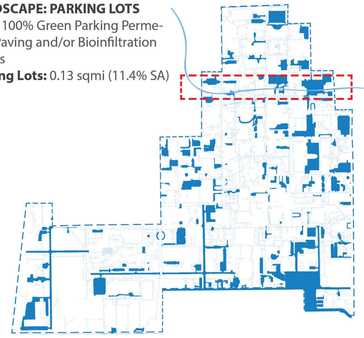
HYBRID SYSTEMS: SURFACE-SUBSURFACE

Designed for a 2-year 24hr storm, the network of green infrastructure will intercept the 'first flush', or the first inch of rainfall which typically carries the most concentrated urban runoff, laden with sediments, nutrients, heavy metals, organic particles and other pollutants. Storms greater than 2-year will overflow into the subsurface stormsewer network.

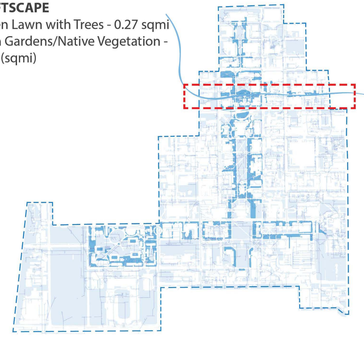
HARDSCAPE: STREETS
Goal: 60% Bioinfiltration
60% Permeable Pavement
City Streets: 0.09 sqmi (8.7% SA)



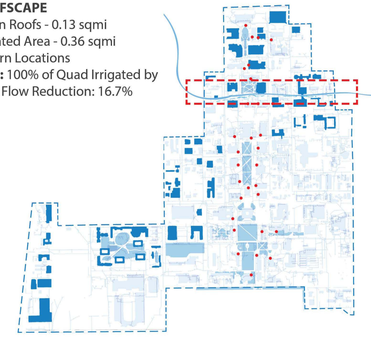
HARDSCAPE: PARKING LOTS
Goal: 100% Green Parking Permeable Paving and/or Bioinfiltration Swales
Parking Lots: 0.13 sqmi (11.4% SA)



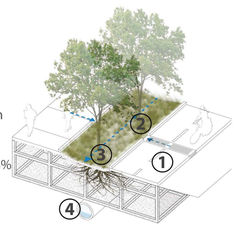
SOFTSCAPE
Open Lawn with Trees - 0.27 sqmi
Rain Gardens/Native Vegetation - 0.21(sqmi)



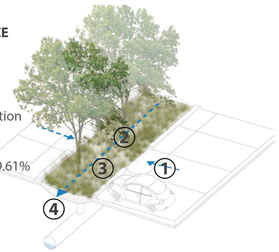
ROOFSCAPE
Green Roofs - 0.13 sqmi
Irrigated Area - 0.36 sqmi
Cistern Locations
Goal: 100% of Quad Irrigated by Peak Flow Reduction: 16.7%



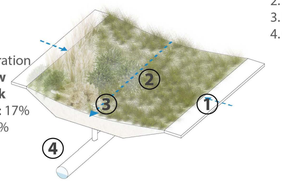
PROCESS & PERFORMANCE
1. Stormwater Runoff
2. Bioinfiltraiton:
TN Removal 20.7%
TSS Removal: 22.95%
<2-Year Storm 100% Infiltration
3. 2-Year Storm Overflow
4. Filtered Water to Creek
Runoff Volume Reduction: 14.4%
Peak Flow Reduction: 28.59%



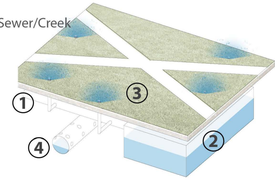
PROCESS & PERFORMANCE
1. Stormwater Runoff
2. Bioinfiltration
TN Removal: 2%
TSS Removal: 7.5%
<2-Year Storm 100% Infiltration
3. 2-Year Storm Overflow
4. Filtered Water to Creek
Runoff Volume Reduction: 9.61%
Peak Flow Reduction 7.95%

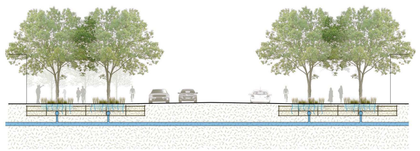


PROCESS & PERFORMANCE
1. Stormwater Runoff
2.Bioinfiltration
TN Removal: 8%
TSS Removal: 2.5%
<2-Year Storm 100% Infiltration
3. 2-Year Storm Overflow
4. Filtered Water to Creek
Runoff Volume Reduction: 17%
Peak Flow Reduction 36.0%

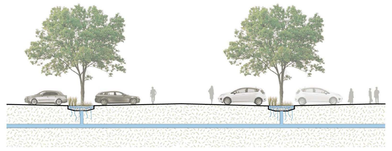


PROCESS & PERFORMANCE
1. Stormwater Runoff from Roof
2. Storage in Cistern
3. Irrigation
4. Overflow into Storm Sewer/Creek

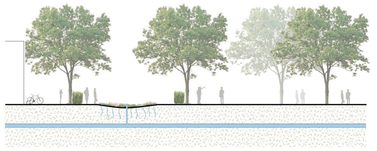




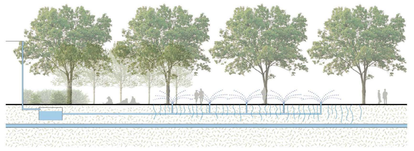
CAMPUS STREET AS BIOINFILTRATION INFRASTRUCTURE



CAMPUS PARKING LOT AS BIOINFILTRATION INFRASTRUCTURE



THE QUAD AS BIOINFILTRATION INFRASTRUCTURE



RAINWATER HARVESTING FOR IRRIGATION OF QUAD