University of Cincinnati - Student Team D7

Finding Common Ground

UC Medical Campus

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Table of Contents

ABSTRACT

University Commons is a 3.5 acre greenspace on the University of Cincinnati Medical Campus. At first glance, it looks like an engaging and eco-friendly space, with a large water feature and rolling hills. However, the site faces a number of problems. Local residents and employees rarely interact with the space. A nearby parking garage experiences regular flooding due to the site's inadequate drainage system. Additionally, the site is located in the corner of campus with the highest urban heat island effect. To address these challenges, the team proposes a green infrastructure redesign. Relevant elements include an extended detention wetland, bioswales, tree plantings, and additional native vegetation. They also include a new trail to lead visitors into the space from the adjacent sidewalk, and educational components like signage and a small amphitheater. Working with local partners, in addition to University of Cincinnati Planning, Design, and Construction staff, this proposal outlines benefits of the proposed green infrastructure, expected time frames for implementation, and projected costs. "Finding Common Ground" is ultimately a vision of a multi-functional space, where needs like stormwater management and community education are mutually supported, and inspire people throughout the city to explore how they can use green infrastructure in their own communities.

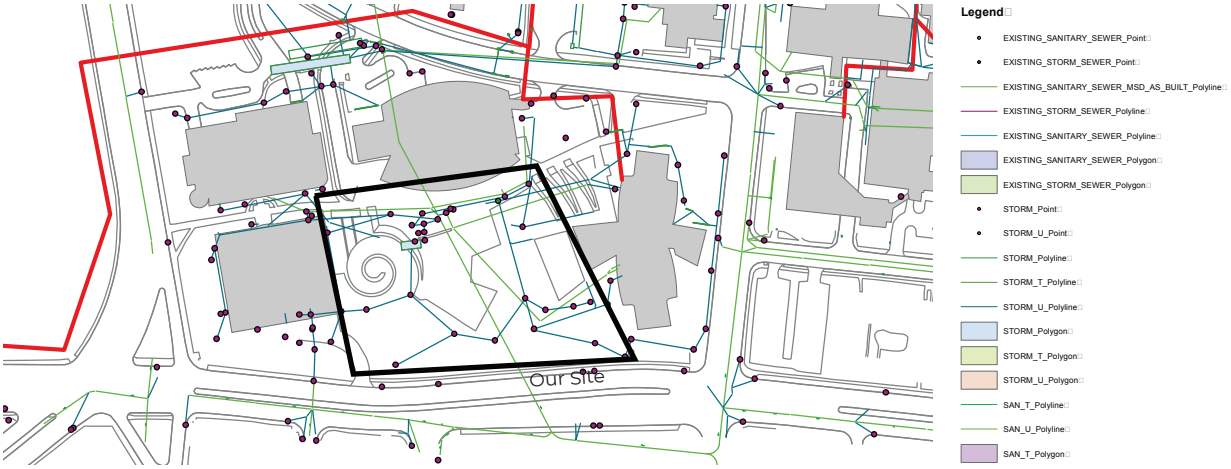
INTRODUCTION

The University of Cincinnati first moved to its Uptown location in 1882 with a few buildings off Clifton Avenue. The following 150 years saw its inexorable growth spread throughout large sections of the budding CUF and Corryville communities, and even taking up half of adjacent Burnet Woods in large expansions. The University is now inextricably linked with the fabric of these surrounding communities and acts as both an asset and burden for those who call them home. In the past 20 years the University has recognized its role in this network and attempted to act as a force for positive change and support. As such, the Rain Works competition offers a perfect opportunity for building upon this culture of support through the lens of green infrastructure.

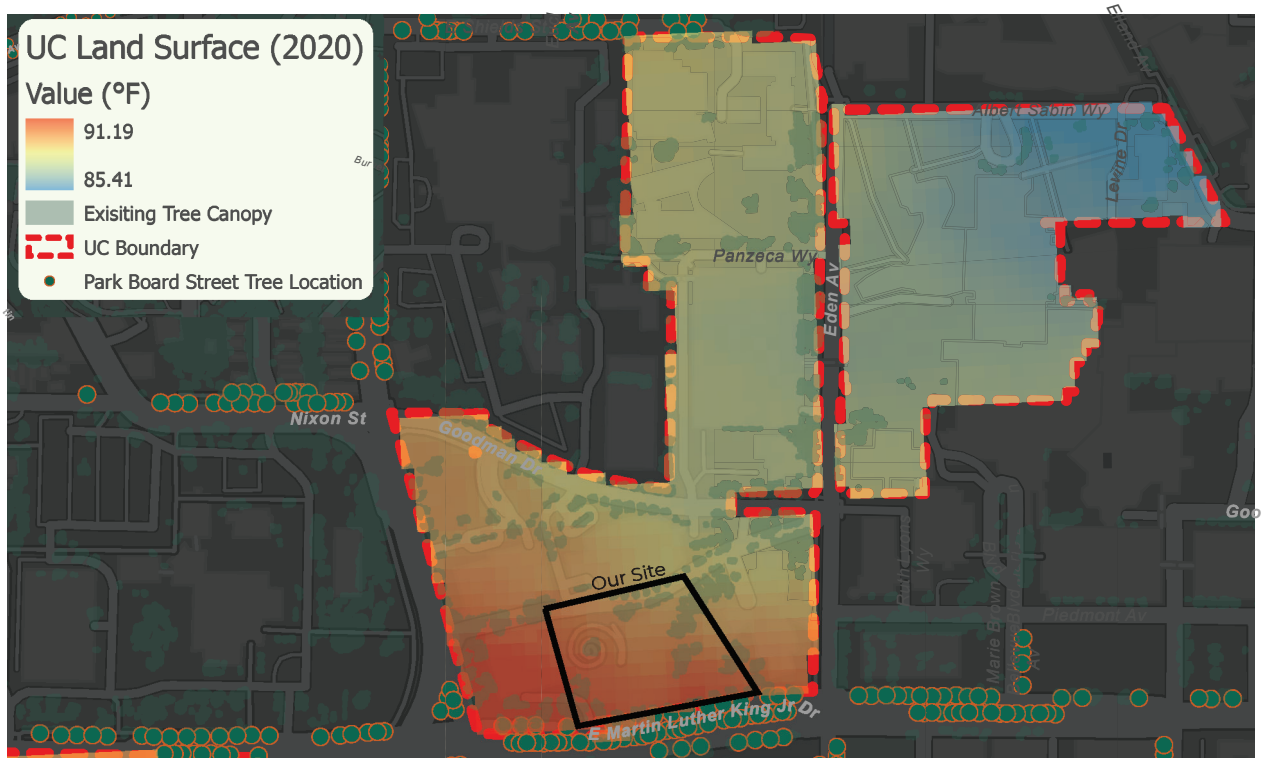
The residents of Cincinnati, like many others around the United States, are learning more about the importance of green infrastructure and the variety of benefits it can provide. Momentum for green initiatives is growing. The city recently published the 2018 Green Cincinnati Plan. There are also a variety of organizations throughout the city working in different ways to construct green infrastructure, and the University of Cincinnati is no exception. The Medical Campus in particular offers opportunities for building and improving green infrastructure capabilities, to meet such needs as handling stormwater infiltration on-site and creating space for its many visitors and nearby residents to engage outdoors. In particular, the green space on the Medical Campus, University Commons, offers such a possibility.

LOCAL CONTEXT, LOCAL PRIORITIES

University Commons sits on the edge of three Cincinnati neighborhoods, Avondale, Corryville, and Clifton. It is located along a busy thoroughfare, Martin Luther King Drive, and serves as a gateway for the many medical facilities around it, including the VA Hospital, Cincinnati Children's Hospital, and Shriners Hospital for Children. University Commons is roughly 3.5 acres and rarely used, though it features a fountain and seating. Despite a complex drainage system, the low-lying site contributes to persistent flooding within the adjacent parking garage.[1]

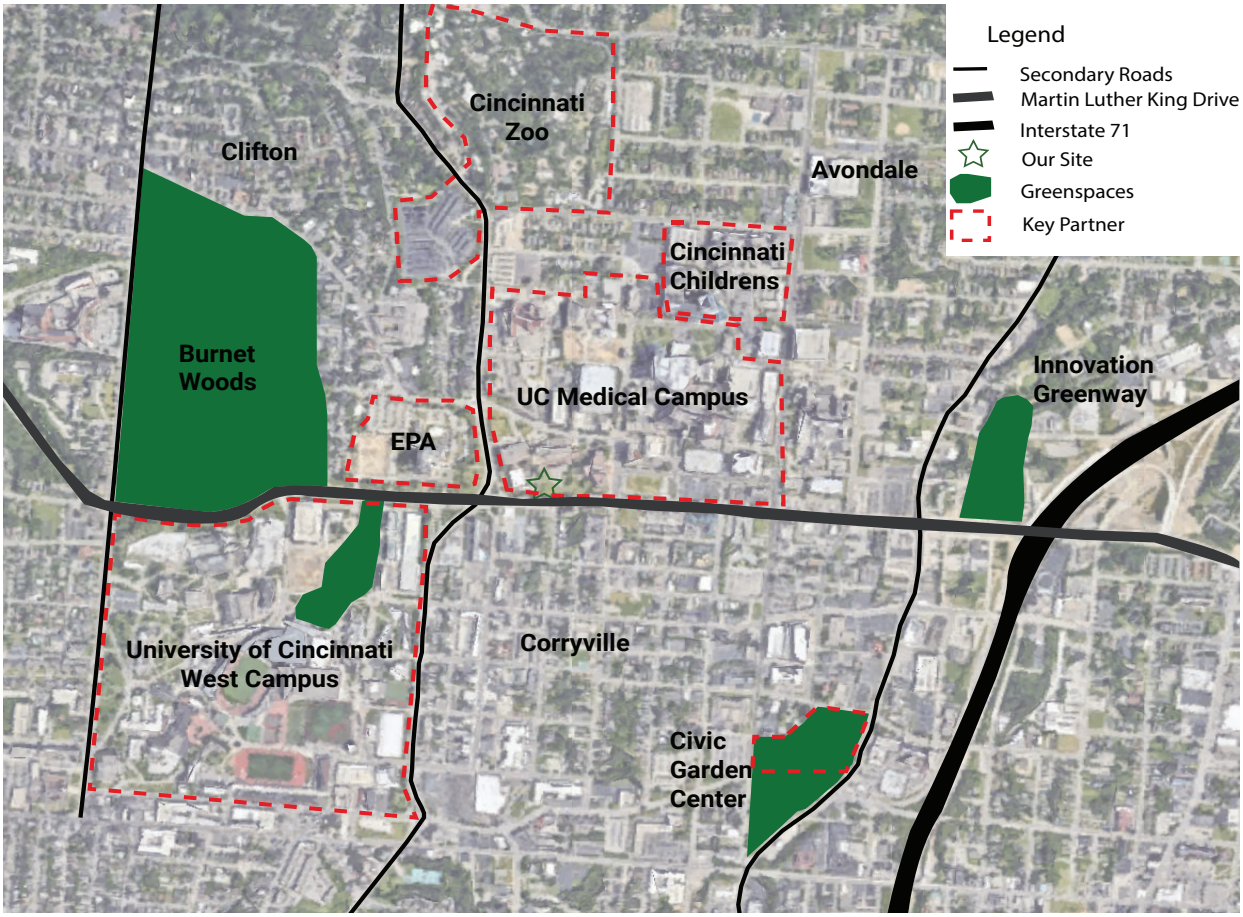


The space is also at the corner of the campus that experienced the highest on-campus land surface temperatures in the summer of 2020.[2]



LOCAL CONTEXT, LOCAL PRIORITIES, CONT.

A collaborative redesign of this space maximizing nearby partnerships and combatting environmental concerns will result in a functional and attractive gathering space better suited for the needs of the community. The site's location behind a prominent hotel within the uptown community situates it as a gateway to Cincinnati as a whole. The surrounding hospitals would benefit greatly from enhanced greenspace access, as many studies link visible and accessible gardens and nature areas with quicker healing speeds. This access has also been proven to improve the mental health of surrounding users as well, a benefit for the surrounding office buildings and classrooms as well as the hotel and hospital visitors. University Commons is in a prime location along Martin Luther King Drive, a main east-west thoroughfare through Cincinnati's uptown. This road has the capacity to connect more than vehicular traffic, with several green initiatives along its stretch. Innovation Greenway is a green infrastructure effort currently under consideration in the Uptown Innovation Corridor, half a mile east of University Commons. Burnet Woods, a Cincinnati park, is located half a mile west of University Commons. A more accessible University Commons helps link these greenspaces together, fostering a deeper sense of community while improving its ecological service value.[3]



SITE DESCRIPTION

The chosen site is confusing and not very accessible from a pedestrian scale. It looks like a community space, but the trees along the sidewalk, and grassy slopes that lead down to the fountain, may give the impression that the space is private, perhaps for use by the science center or hotel along its periphery. There is currently no clear access point from the sidewalk, other than walking on the grass. Additionally, there are two large mounds along the west side of the site, both made from fill that needed to be moved when other construction occurred on the campus. These mounds further shield the site and create an impression of separation.[4]

LOOKING S.E. TOWARDS MLK DR.

EXISTING FOUNTAIN & POOR DRAINAGE

POOR INLET PLACEMENT

PROJECT GOALS AND INDICATORS

1. Stormwater Management

   -Reduce stormwater runoff by **1.8** MILLION GALLONS / YEAR

2. Urban Heat Island Mitigation

   -Lower the site's average land surface temperature **8** °F by 2025

3. Community Space

   -Increase public use of space by **2000** PEOPLE / YEAR

4. Public Outreach and Education

   -Strategically install **10** educational components to increase community understanding of green infrastructure

DESIGN SOLUTION

The design team communicated with a number of local stakeholders, including the University of Cincinnati Planning, Design, and Construction Office, Innovation Greenway, and the Cincinnati Zoo to explore feasibility and constraints during proposal development. The proposed solution is a compilation of these conversations. Additionally, while there are no local or state design standards to adhere to, the 2018 Green Cincinnati Plan outlines several resilience priorities. Many of them are incorporated in this design.

Extended Detention Wetland

Wetlands provide on-site water storage for heavy rainfalls, as well as natural filtration for cleaning pollutants out of the water before it eventually percolates into the ground. This design proposes a extended detention wetland in place of the impervious pad that currently houses the fountain on University Commons. As it includes the lowest point on the site, the design seeks to manage the water that would otherwise be diverted through the drains located at the low point and mitigates the flooding risk faced by the nearby garage as a result. Discussions with the University Director of Utility Services found that flood mitigation and cleanup costs their department nearly $20,000 per year in relation to this site. The 2018 Green Cincinnati Plan identified the importance of creating and expanding wetlands to handle the projected increase in rainfall and reduce the combined sewer overflows the city faces.[5]

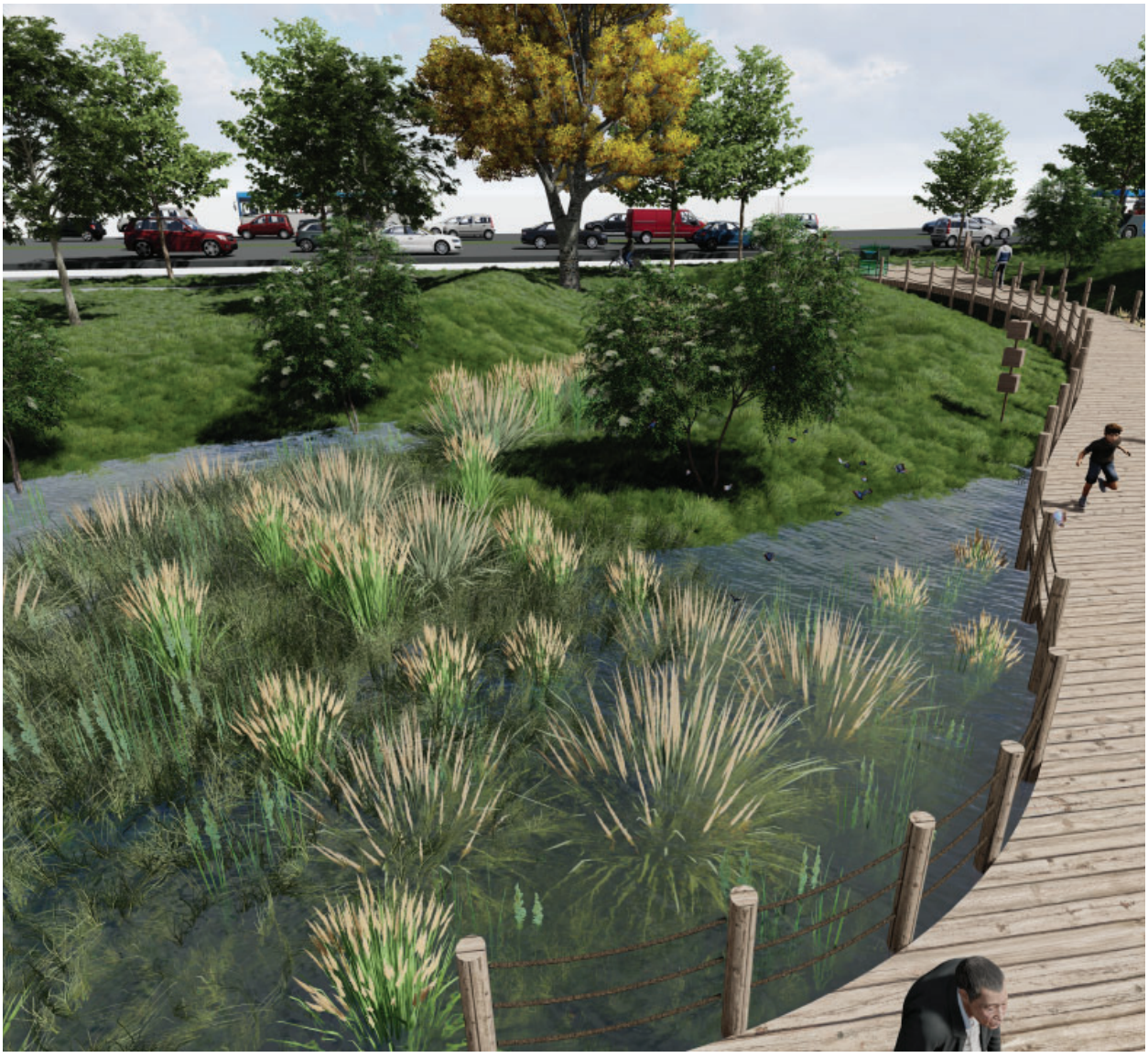
Developing a wetland also opens the opportunity to incorporate native plant species, contributing to the biodiversity of the site. Precedents considered as examples of successful wetland creation include Atlanta's 4th Ward Park in Georgia, and Tanner Springs Park in Portland, Oregon.[6,7]

Operations and Maintenance: Conducted by UC Facilities Management
Cost: $23k per acre [8]
Schedule: 2-3 years

Bioretention Areas/Bioswales

Bioretention areas and bioswales function to reduce stormwater damage, and consequently decrease spending on stormwater infrastructure. They also filter pollutants out of water. The slope of the mounds in the southeast quadrant of the site varies between 8-12%. This design proposes 8-inch deep bioswales to accommodate the runoff of these steeper mounds.[9]

Operations and Maintenance: Conducted by UC Facilities Management
Cost: $230,000/million gallons retained [10]
Schedule: 6 months



Tree Planting

The City of Cincinnati identified rising temperatures as a concern in its 2018 Green Cincinnati Plan, and included the objective of "No increase in…heat related fatalities" through 2023 as a resilience goal.[11] Part of meeting that objective is implementing goals like "increase city-wide tree canopy coverage to at least 40%."[12] University Commons is a natural space to consider additional tree coverage, both because of trees' role in reducing urban heat island effect, and their ability to reduce rainwater runoff.

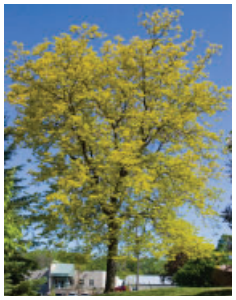
The design is cognizant of the impact invasive species have in southwest Ohio and is careful to select native tree species for planting, such as Red Maple, Honey locust and Cumulus Serviceberry.[13] A full list of native wetland plantings that may be included in the site can be found in Figure 1.

Operations and Maintenance: Conducted by UC Facilities Management
Cost: $31k per 100 trees, plus $20 per tree per year.[14]
Schedule: 1-2 years

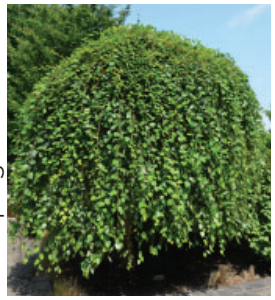
PLANT NAME	TYPE	SOIL CONDITIONS
Red Maple	Canopy Tree	Wet Soil Tolerant
Sunburst Honey Locust	Canopy Tree	Wet Soil Tolerant
Heritage River Birch	Medium-Large Tree	Thrives In Wet Conditions
Cumulus Serviceberry	Small Tree	Wet Soil Tolerant
Summer Cascade Weeping River Birch	Small Tree	Moisture-Retentive/Wetland
Bottlebrush Buckeye	Large Shrub	Wet Soil Tolerant
Indigobush Amorpha	Large Shrub	Moisture-Retentive/Wetland
Midwinter Fire Dogwood	Medium Shrub	Wet Soil Tolerant
Goatsbeard	Medium Shrub	Moisture-Retentive/Wetland
Giant Reed Grass	Native Prairie Grass	Moisture-Retentive/Wetland
Overdam Feather Reed Grass	Native Prairie Grass	Moisture-Retentive/Wetland
Common Cattail	Wetland Grass	Wetland
Paper Reed	Wetland Grass	Wetland
Swamp Milkweed	Flowing Ornamental	Moisture-Retentive/Wetland
Pickerelweed	Flowering Ornamental	Wetland
Water Lilies	Flowering Water-Cover	Wetland
Japanese Painted Fern	Ground-Cover	Moisture-Retentive/Wetland
Siberian Bugloss	Ground-Cover	Wet Soil Tolerant

Figure 1

Sunburst Honey Locust



Summer Cascade Weeping River Birch



Goatsbeard

Common Cattail

Walk-through Trail

One of the most important functions of the redesigned University Commons site is to bring more people into the space to both enjoy the wetland environment and learn more about its function at the same time. Thus, this design proposes a trail from an entrance at the sidewalk on Martin Luther King Boulevard, meandering through the bioswales and bringing people to a boardwalk over the wetland area.

Operations and Maintenance: Conducted by UC Facilities Management
Cost: as high as $100/lineal foot, depending on the materials used.[15]
Schedule: 2-3 years

Signage

Green infrastructure should not be kept a secret. Signage is therefore an important component of the proposed site redesign. By including signs at each feature's location, like on the trail over the wetland, and at the bioswales, people will learn about the ecological services such features provide, like reducing stormwater runoff, promoting habitats, and lowering urban heat island effects. By helping people learn about green infrastructure, these signs promote shared understandings that can influence the sustainability of the city at a larger scale.

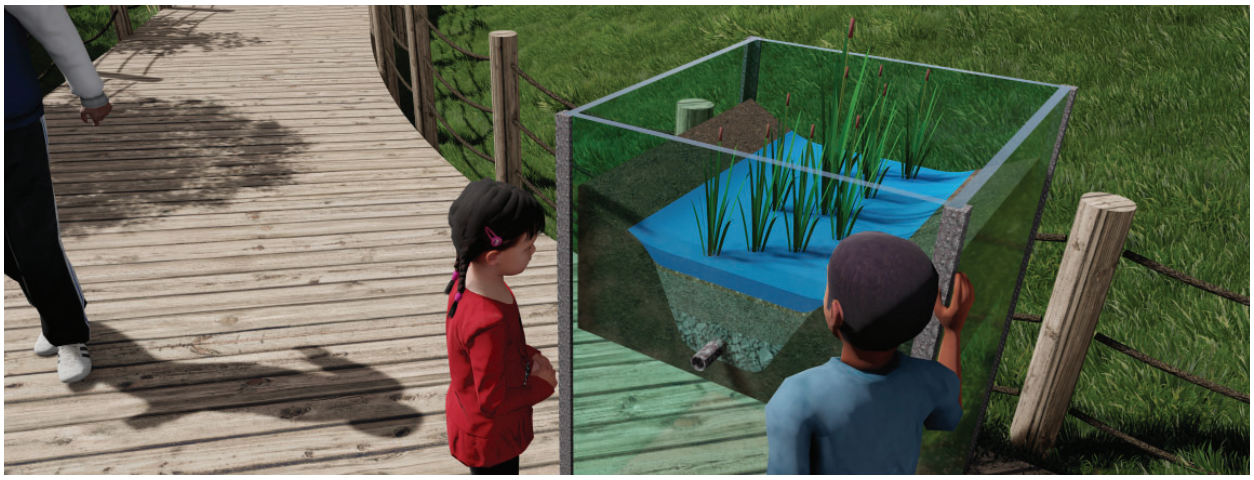
A number of organizations, like Rails to Trails, and the USDA Forest Service, publish design guidelines and suggest funding strategies for signage.[16,17] Signage sponsorships are a great opportunity to promote local businesses. Short Vine, a small business district directly south of University Commons, serves many residents and community members, and its proximity to University Commons suggests possibilities for directing people to the green space. Partnership opportunities should be explored to the benefit of both members of the Short Vine Business Association and University Commons.

Operations and Maintenance: Conducted by UC Facilities Management
Cost: $500 [18]
Schedule: Ongoing, as green infrastructure elements are added to the University Commons site

Bioswale Display

The more ways provided for people to engage with green infrastructure and learn about it, the better. This design program includes a plexiglass element, cutting below grade in a bioswale, so visitors are able to physically see what happens below the ground surface, for example, after a heavy rain or snow.

Operations and Maintenance: Conducted by UC Facilities Management
Cost: $1000
Schedule: placed at the end of bioswale construction



Small Amphitheater

A main feature of the current University Commons site is the fountain in the middle of the space. Water is sprayed at an angle onto a marble base, and then drains back to its origin point. This is the lowest section of the site and is where the proposed wetland should be located. Rather than look for means to dispose of the marble, the plan redesign includes a small amphitheater to the south of the wetland, with the terraced decks and stage made from the reused marble. The amphitheater provides another means for visitors to engage with the space, as well as a space for community events. The amphitheater may also be used for clases coming to learn more about the benefits and diversity of the site, or just needing an outdoor class setting in general. Overtime, the space could potentially be upgraded with a solar canopy allowing for students and other visitors to charge their laptops and devices while providing shade on warmer days. Having a multi-functional space will improve visitor numbers and increase awareness of overarching goals of green infrastructure, as well as its functional operations.

A team of University of Cincinnati engineering and construction management students completed an amphitheater development proposal for the nearby park Burnet Woods in 2015.[19] The project has not been implemented, but the proposal provides a precedent that there is an interest in such a facility in the area. The proposed amphitheater for University Commons is smaller and uses materials already on-site. As such, the cost estimates for this amphitheater are significantly smaller than those from the Burnet Woods proposal.

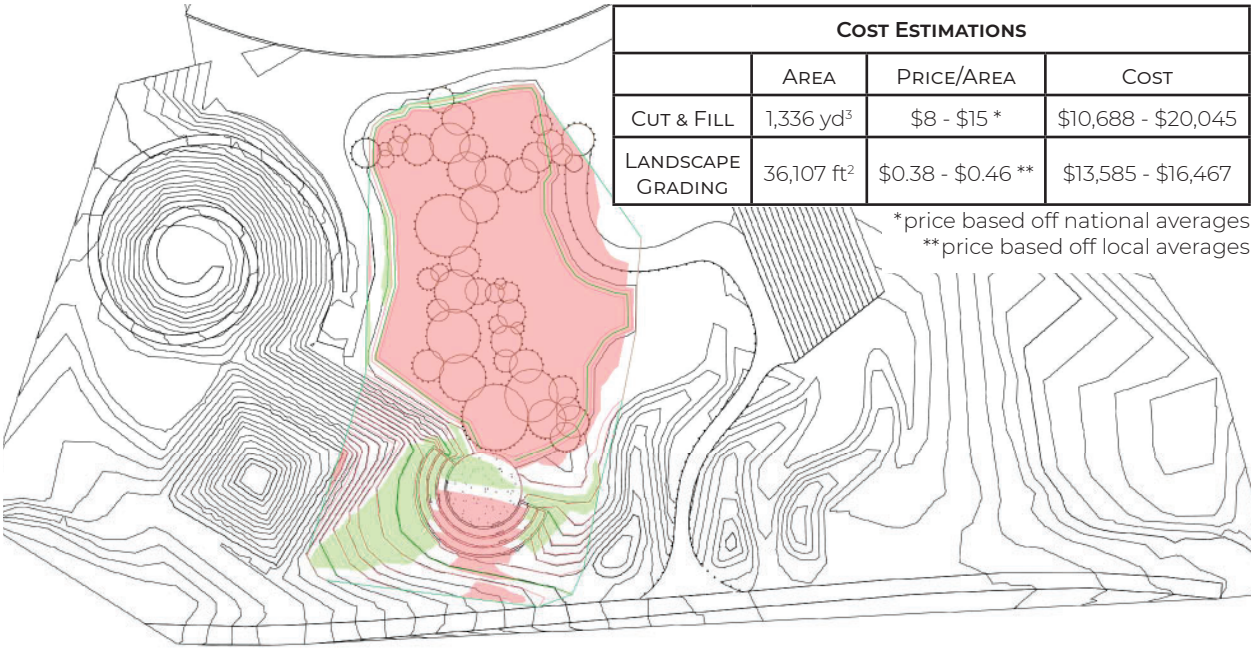
Operations and Maintenance: Conducted by UC Facilities Management
Cost: $200,000
Schedule: 2 -3 years

LOCAL STORMWATER MANAGEMENT REQUIREMENTS

Although University Commons is located outdoors and the goal is to attract members of the public to the space, it is managed by the University of Cincinnati. Thus, the design follows guidelines for stormwater management as outlined in the City of Cincinnati Stormwater Management Code.[20]

CALCULATIONS

Cut & Fill



Cost Estimations			
	Area	Price/Area	Cost
Cut & Fill	1,336 yd^3	$8 - $15 *	$10,688 - $20,045
Landscape Grading	36,107 ft^2	$0.38 - $0.46 **	$13,585 - $16,467

*price based off national averages
**price based off local averages

Stormwater

Statistic	Proposed	Baseline
Avg. Annual Rainfall (in)	41.98	41.98
Avg. Annual Runoff (in)	3.37	22.21
Days/Year w/ Rainfall	77.85	77.85
Days/year w/ Runoff	6.10	38.27
% of Wet Days Retained	92.17	50.83
Smallest Rainfall w/ Runoff (in)	0.35	0.10
Largest Rainfall w/o Runoff (in)	2.18	0.50
Max. Rainfall Retained (in)	2.18	0.69

FINANCING

Some elements of this redesign are more costly than others. While the signage, tree plantings, and bioswales may find funding through partnerships with businesses, the city of Cincinnati, and local greening organizations, the wetland and amphitheater projects may need more resources than what the local community alone is able to provide. Wetland restoration and conservation is a priority recognized at the national level in the United States and supported through a number of grant opportunities. For this element, small grant opportunities like Small Grants Program through North American Wetlands Conservation Act, or the Five Star and Urban Waters Restoration Program, might be appropriate, in collaboration with matching funds.[21,22] The amphitheater proposal may require partnerships, sponsorship opportunities, grants, and donations from some of the larger businesses in the surrounding community. The space is perfectly suited for outdoor classes which makes for a good argument in support of University funding as well. The multi-functionality and location of the space should serve as useful tools to bring the business community together in funding the project.

CONCLUSION

Finding Common Ground imagines a future for University Commons where college students, hotel guests, medical center patients and community residents may all come together to learn more about green infrastructure and benefit from its ecological services. The proposed site will be able to divert all runoff from 92% of rainy days and will provide a wetland habitat for migratory birds and small animal species. The extended detention wetland will not only be aesthetically pleasing, but an educational experience to all who travel along the wetland path and interact with its signage and active demonstrations. These renovations will be an exciting display of the transformative power of innovative green infrastructure for its public health and ecological benefits as well as potential for fostering new community connections. Finding Common Ground builds upon the University of Cincinnati's vision of Next Lives Here and its mission to be a driver of community growth, and is the perfect site to inspire parallel change throughout the rest of the city of Cincinnati and beyond.

REFERENCES

1) Drainage Map provided by UC Planning + Design + Construction staff via personal communication, October 2020.

2) Heat Island Map provided by UC Planning + Design + Construction staff via personal communication, October 2020.

3) Map by authors

4) Images by authors.

5) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018: 167.

6) "Historic Fourth Ward Park." The Trust For Public Land, 2016.

7) Pfeil, John. "Tanner Springs Park." GreenWorks. GreenWorks, March 1, 2019. https://greenworkspc.com/ourwork/tanner-springs-park.

8) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018. 168.

9) "Plan a Rain Garden." Civic Garden Center, August 10, 2015. https://www.civicgardencenter.org/green-learning-station/your-home/catching-rain-where-it-falls/plan-a-rain-garden/.

10) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018: 173-175.

11) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018: 40.

12) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018: 160.

13) "Results of Your Plant Search." Plantplaces.com. Accessed November 29, 2020. http://www.plantplaces.com/perl/viewplants.pl?Genus=.

14) "2018 Green Cincinnati Plan." Cincinnati: City of Cincinnati, May 2018: 166.

15) Kusler, Jon. "Common Questions: Constructing Wetland Boardwalks and Trails." Berne: Association of State Wetland Managers, 1993.

16) "Signage and Surface Markings: Rails-to-Trails Conservancy." Rails to Trails Conservancy. Accessed November 27, 2020. https://www.railstotrails.org/build-trails/trail-building-toolbox/design/signage-and-surface-markings/.

17) "Interpretative Planning - Tool #4." Golden: USDA Forest Service, n.d.

18) Megaprint, Inc. "Trail Signs & Kiosks: MegaPrint." Megaprint, Inc. Accessed November 27, 2020. https://www.megaprint.com/trail-signs.php?area=sSigns.

19) Beerck, Connor, Chris Mullins, Mitchell Neufarth, Karee Utterback, Woong Soo Yong, and Jeffrey Gould. "Amphitheater at Burnet Woods." Cincinnati, April 27, 2015.

20) "Excerpt from Cincinnati Stormwater Management Code." AQUALIS, June 23, 2020. https://www.aqualisco.com/compliance_item/city-of-cincinnati/.

21) "Small Grants." U.S. Fish & Wildlife Service - Department of the Interior. Accessed November 27, 2020. https://www.fws.gov/birds/grants/north-american-wetland-conservation-act/small-grants.php.

22) "Five Star and Urban Waters Restoration Grant Program." NFWF, September 17, 2020. https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program.