TWIN LAKES PARK REVITALIZATION

GREENSBORO, NC

GREENSBORO Parks & Recreation

PREPARED BY

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McAdams

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PROJECT OVERVIEW

INTRODUCTION

The study area for this project is located along the Twin Lakes Tributary drains to South Buffalo Creek. It extends from Glen Hallow Road and Wintergarden Lane intersection, past Holden Road, to Pinecroft Road and Cypress Park Road intersection. Overall stretch of the study area is approximately 5,000 linear feet. It encompasses total six parcels owned by the City of Greensboro, totaling 29.16 acres. The largest parcel (11.99 acres) south of the Cypress Park Road retains a conservation easement in perpetuity granted by Piedmont Land Conservancy. The conservation easement reservations restrict the use of the property to be retained for its natural, scenic, aesthetic, environmental, open space, educational, and recreational values.[1]

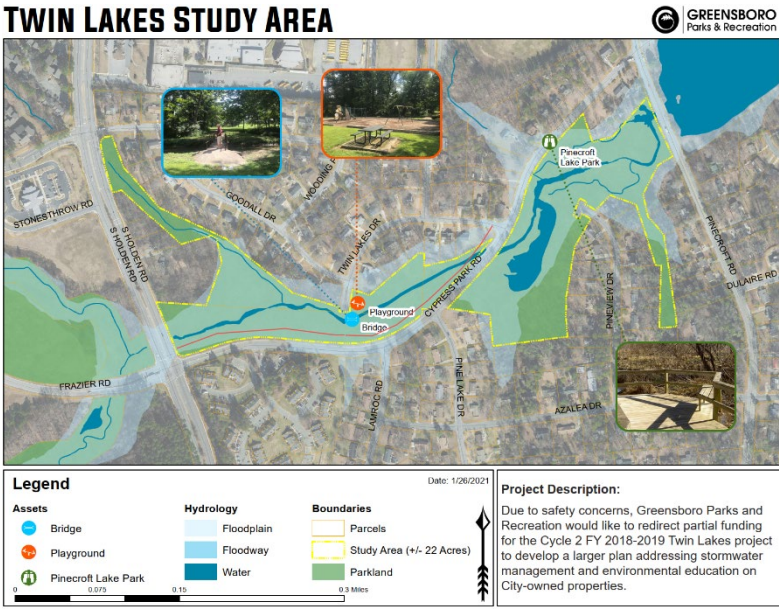


Figure 1 Twin Lakes Park + Greenway Feasibility Study Area (Image Source: City of Greensboro)

The Twin Lakes Tributary is an asset to this community and provides multiple benefits – large green space in the urbanized area to observe urban wildlife, passive recreational opportunities along the corridor, and it helps with water quality downstream.

These benefits don't come without challenges and this project focuses to address multiple issues and concerns while creating a positive impact on surrounding properties and contribute to the quality of life for longtime residents of this area.

The project recommendations will include the buffer areas of the upper end of the tributary for greenway feasibility study, Twin Lakes Park renovations, Pinecroft Lake Park renovations, and greenway connectivity to Pineview Drive across the wetland area. The recommendations will also encompass the floodwater management challenges this area is facing for many years. This will include incorporating Green Infrastructure Strategies (GSI) to mitigate the effects of floodwater levels and the landscape enhancement strategies to allow frequent stormwater inundations. Additionally, vegetation management recommendations will be included to enhance the overall aesthetic appeal of the area and create spaces for users to enjoy the scenic views of the wetlands and urban wildlife habitats.

PROJECT HISTORY

According to the Pinecroft Lake Park Management Plan report[2] provided by the City, the area that is now Pinecroft Lake Park was originally part of 100 acres of land purchased by Eugene Foushee in 1925. Mr. Foushee cleared much of the land in the following two decades and built three lakes. He started selling off lots in the

[1] Deed document from Piedmont Land Conservancy as Grantor to City of Greensboro as Grantee
[2] Dr. Bridle Kenneth; Pinecroft Lake Management Plan; July 2011

1930's and built three log cabins along Pincroft Road. Upstream residential and especially commercial construction of Four Seasons Town Centre resulted in significant siltation that essentially filled two of the three lakes. Aerial photographs from 1957, 1966, 1985 and 1990 document this development and the conversion of the upstream lakes from open water to shallow wetlands. After Mr. Foushee's demise, the S Corp formed by his heirs donated the Pinecroft Lake Park parcel to Piedmont Land Conservancy which ultimately passed over the land to City of Greensboro. The conservation easement on this parcel seeks to preserve the land in its natural state. The conservation easement reservation outlines the statutory authority for the easement, conservation values, prohibited and allowed activities, rights of the grantor, enforcement, and other details of legal contractual agreement. The other parcels included in the study are within the floodplain areas and buffers on stream corridors that are owned by the City.

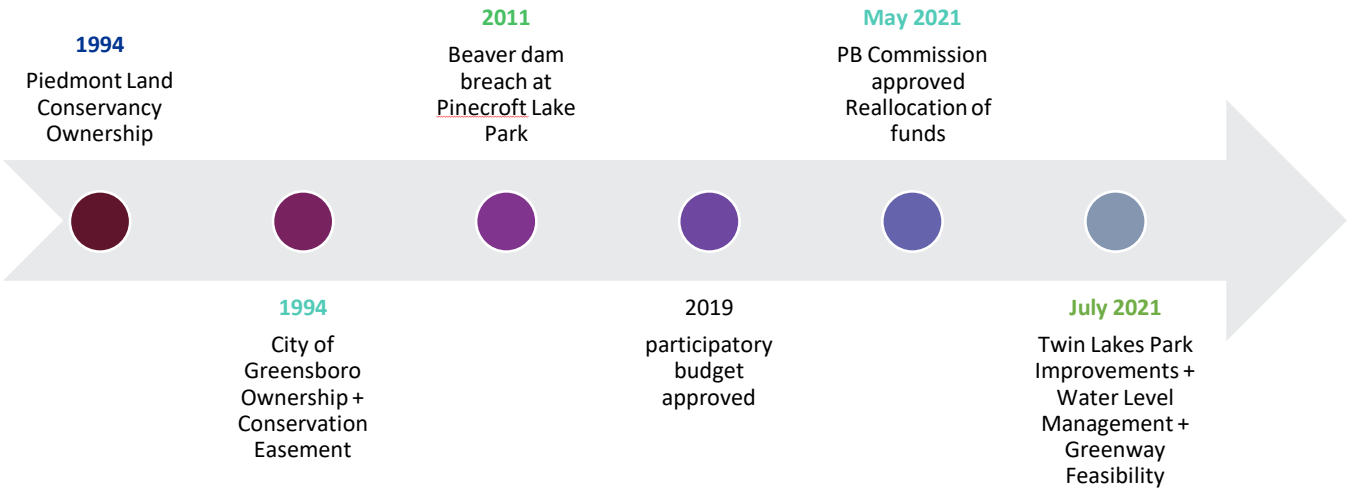


Figure 2 Project Timeline

The Over the years, as the development continued upstream of the South Buffalo Creek, the residential area started to get impacted during major storm events. The whole study area is within the 100 year floodplain with at least three private properties that have residential structures within the floodplain area (Parcel ID: 40524, 59638, 40064). The City recognized the value of this natural resource in the increasingly urbanizing area. Addition of park amenities along the corridor involved development of amenities such as play area, connectivity from Twin Lakes neighborhood to Cypress Park Road via bridge, seating opportunities, boardwalk and wetland overlook as well as educational signage at Pinecroft Park. These amenities however are in despair and at the end of their lifecycles. Similarly, the vegetation in the park areas has overgrown, creating spaces that are hard to supervise, thus becoming grounds for illicit activities. Additionally, the

Project Needs

- Water Level Management
- Community Concerns
  - Safety
  - Vandalism
  - Landscape management
  - Parking at Twin Lakes Drive and Goodall Drive
  - Beaver Management
  - Trash Management

increasing urbanization of the area and lack of public awareness are the cause of litter that ends up in the stream thereby resulting in more maintenance and management burden on the City staff and deterioration of the value of natural resources. Finally, as with any natural areas, this corridor provides refuge to a variety of urban wildlife habitat, including beavers. City's stream corridors have always been the home for beavers which provide tremendous value to other wildlife and water quality. For Twin Lakes stream corridor, the beaver activity has become a nuisance resulting in property damage and flooding problems. They have contributed to trees damage, culvert obstructions, and storm drain blockage. The City has finally established the USDA approved beaver management program and trapping strategies.

The City of Greensboro Parks and Recreation Department received the reallocated participatory budget funding in 2021 to address the concerns and issues along the Twin Lakes Tributary corridor. In collaboration with the City's Water Resources Department and Piedmont Land Conservancy, the Parks and Recreation Department and McAdams team investigated the concerns from residents and provided recommendations to establish the corridor's potential to be a community asset with a greenway trail connection that enables users to enjoy the water features, wetlands, and wildlife encounters while providing daily contact with nature.

PLANNING CONTEXT

Over the years, City of Greensboro undertook several studies and planning efforts to address the continued concerns from residents in the surrounding area.

Twin Lakes area hydraulic and hydrologic assessment report: In 2008, the City's stormwater management division developed Twin Lakes area hydraulic and hydrologic assessment report with another consulting firm. The report included flood modelling results, conclusions, and recommendations to limit the flooding impacts to private properties upstream of Pinecroft Lake. This report also recommends reviewing the upstream development to reduce the stormwater discharge downstream.

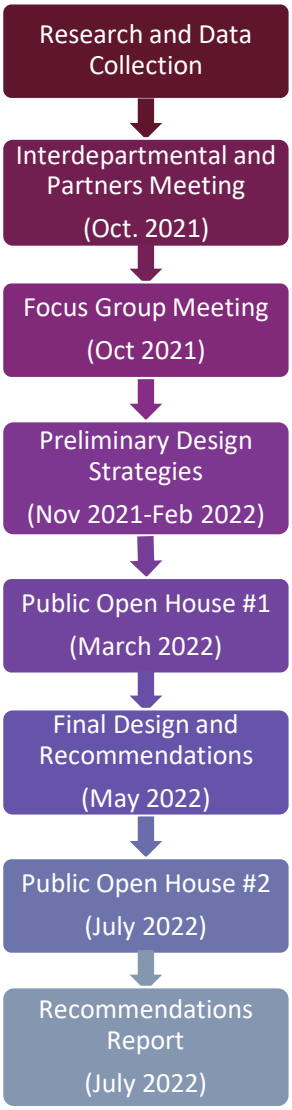
Pinecroft Lake Park Management Plan: Piedmont Land Conservancy developed a management plan in 2011 to provide guidance on maintaining and managing the eleven-acre parcel with conservation easement. This report includes the history of the park acquisition by the City, limitations on development because of the conservation restrictions, potential threats, and management goals.

Addendum to Pinecroft Natural Area Management Plan: This draft document was made available by the City to the project team. The document authors mentioned include Annette Liggett-Lineberger and Danny Lineberger. The document does not include a publication date. The purpose of the document is to help the residents regain the use of the park, natural areas, and personal property. The document lists multiple challenges in great detail such as upstream development, beaver activity, flooding, changes in the floodplain, trash, siltation, and security concerns as well as the recommendations and strategies that have been implemented till date to resolve these issues.

Beaver Management Memo: Water Resources Department submitted a memo to the City to adopt beaver management strategy in 2010. It is not clear, if this memo was formally adopted. The memo provides background on the beaver activity nuisance and provides an escalating management strategy that includes regular monitoring, evaluation of property damage, evaluation of obstructed stormwater inlets and culverts, and installation of water level control device if deemed appropriate. An agreement between USDA and City of Greensboro also includes trapping as the absolute sustainable solution.

PROJECT PROCESS

The overall project process followed eleven-month timeline. The project was kicked off with a site visit with City of Greensboro Parks and Recreation and Water Resources staff. The team walked the corridor to assess existing site conditions, location of recreation amenities, greenway connectivity, and floodwater challenges. Additionally, the project team reviewed all previous planning efforts and reports provided by the City. The stormwater engineers on the team performed preliminary floodwater modelling scenarios to understand the flood water impacts to surrounding properties. An initial meeting was held with Parks and Recreation and Water Resources staff and Piedmont Land Conversancy staff to establish the project framework. A focus group consisting of members from the surrounding community provided detail feedback at a virtual meeting and though an online survey questionnaire. The feedback from these entities was incorporated to develop preliminary design strategies which were presented to the public at an open house. Feedback from the residents was incorporated to develop final recommendations and implementation strategies. The final recommendations were presented to the public for any additional feedback and incorporated in the final report for the City.



TWIN LAKES PARK REVITALIZATION

EXISTING CONDITIONS

PROJECT CONTEXT

According to North Carolina Flood Risk Insurance Maps, the study area including the two pocket parks (Twin Lakes Park and Pinecroft Lake Park) is located along the Twin Lakes Tributary. Several secondary tributaries join the Twin Lakes Tributary from the northern and southern residential areas. This tributary flows under S Holden Road and Cypress Park Road through culverts before draining to larger wetland areas which were once part of the three lakes constructed by damming the stream. Water from the wetland further flows under Pinecroft Road to the large waterbody of Pinecroft Lake before it becomes part of the South Buffalo Creek. South Buffalo Creek becomes Buffalo Creek after joining the North Buffalo Creek and get renamed Reedy Fork before draining to Haw River.

The project area is within a few minutes of Interstate 40 and Interstate 85. S Holden Road connects to Gate City Boulevard providing an easy connectivity to Downtown Greensboro. Surrounding the project area is predominantly typical suburban residential development. Four Seasons Town Center is the closest commercial area just north of the site along the Pinecroft Road and Smith High School is within walking distance of the Twin Lakes Park accessible by Veasley Street.

PROJECT AREA

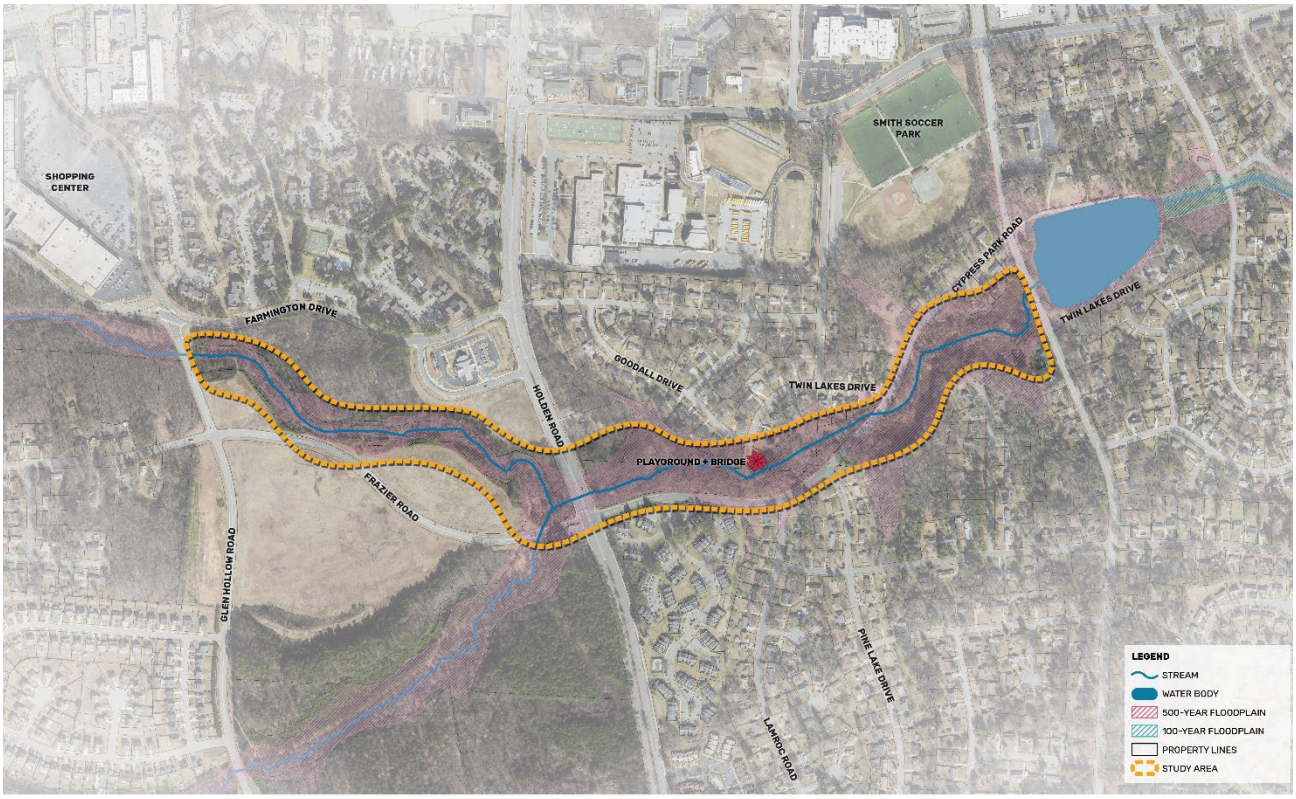


Figure 1 Project Study Area Extents

ECOLOGY

According to the 2015 update to N.C. Wildlife Action Plan, City of Greensboro is located within the Piedmont Ecoregion boundary. North Carolina's classic Piedmont habitats include old fields, rock outcrops, streams and woodlands, where species diversity for some animal groups, such as amphibians, reptiles and birds, is relatively high. The earliest available aerial images show relatively undisturbed floodplain along the Twin Lakes Tributary, the development surrounding the corridor has resulted in the habitat fragmentation, siltation from upstream development, and alterations to natural hydrology earlier with damming the creek to construct lakes and later the lake draining resulting in floodplain pools and emergent wetlands. The creek corridor has shallower slopes along most of the length. The corridor contains the typical headwater forest vegetation types such as swamp chestnut oak, willow oak, and American elm. The floodplain pools and intermittently wet and drying pools create habitat for a variety of fish and amphibians.

EXISTING CONDITIONS

Glen Hollow Road to Holden Road

The Glen Hollow Road to Holden Road stretch of the corridor is buffer area along the Twin Lakes Tributary. The parcel is zoned commercial and most of the developable land is along Frazier Farm Road. There is a bank property on the north side. There is a potential to provide a greenway trail along this buffer and provide a spur connection to Farmington Drive. The City is interested in exploring the feasibility of providing a "dirtway" or a natural surface trail as part of the phase one of the project. The understory vegetation along the buffer could be thinned to provide creek views and easy supervision from the streets. Pedestrian crossing is in place at Holden Road and Cypress Park intersection, however rapid flashing beacons for pedestrian crossing will be needed at Glen Hollow Road and Holden Road intersection.

Figure 2 Holden Road and Cypress Park Road Intersection

Holden Road to Pinecroft Road

The tributary corridor along Holden Road to Pinecroft Road passes through four city-owned parcels. The stream flows under Holden Road and drains towards east. The parcel at the intersection of Holden and Cypress Park is used for the regular trash clean up that collects in the stream. Further eastward, the city has constructed a small pocket park known as the Twin Lakes Park. The park area, accessible from Twin Lakes Drive, has a playground structure, swing set, few picnic benches and large boulders. All the amenities are in the floodplain area. Currently there are two parking spaces at the end of Twin Lakes Drive. A bridge across the stream connects Cypress Park Road, however there is no paved or natural


Figure 3 Twin Lakes Park

surface trail that provides connection to the bridge. Overgrown vegetation has made it harder to have "eyes" on this pocket park which has encouraged vandalism, illicit activities, and concerns from neighbors. There is a four-foot-wide sidewalk along Cypress Park Road that terminates at eastern end of Twin Lakes Drive. There is no sidewalk on either side of the road till Pinecroft Drive. Permanent floodwater inundation has resulted in trees mortality in this part of the study area. Beaver activity has also contributed to fallen trees. The stream crosses under Cypress Park Lake through a large culvert and drains to the parcel with conservation easement restrictions on development. This parcel used to be part of one of the three lakes which drained and created smaller floodplain pools and wetlands. The City constructed a small pocket park area known as the Pinecroft Lake Park with educational signage and a boardwalk and overlook platform over the wetlands. These amenities are at the end of their lifecycle. The water level changes in the wetland area deteriorated the boardwalk and taken over by vegetation. The boardwalk view from the street is also obstructed by vegetation making it hard to supervise the area as well as enjoy the flora and fauna of this wetland.

Figure 4 Overgrown vegetation on deteriorated overlook platform at Pinecroft Lake Park

STORMWATER

Urban development upstream of Glen Hollow Road, siltation in the creek bed, trash collection, and beaver activities within stream corridor have been cited as several reasons for the stormwater management challenges in the Twin Lakes tributary corridor. Water level fluctuations and wetlands formation because of the lake breach has resulted in vegetation mortality in certain areas. Additionally, limited flood water storage area within the floodplain results in floodwater impact on private properties.

Figure 5 Trash collection within stream corridor

NEEDS AND OPPORTUNITIES

The Twin Lakes Tributary corridor has the potential to regain its status as the community asset by design intervention and regular upkeep of the area to preserve the natural resources existing along the corridor. These needs and opportunities are listed below:

- Greenway trails provide an opportunity for residents to engage in physical activity such as walking, running, biking, connect with nature, and as an alternative mode of transportation that connect local destinations. Twin Lakes corridor greenway trails provide an opportunity to connect the surrounding neighborhoods to the two parks,

Figure 6 Lack of vegetation management results in unsupervised areas

commercial area on the northern side, the bank, and other neighborhoods within walkable distance. The long-term goal from the city could be further extend the greenway trail eastward to Rolling Park and northward to Gate City Boulevard which will connect the neighborhoods to Downtown Greenway.

Figure 7 Play area within floodplain

- Citizen awareness and education is another important element to keep civic spaces safe and enjoyable for all. The city has litter management plan in place to collect the trash that accumulates in the water way and compromises the water quality of the stream. There is an opportunity for the city to develop an outreach component to educate not only neighbors but also businesses and students at Smith High school about litter management and water quality. Greensboro Parks and Recreation Department can partner with neighbors to develop a litter sweep event annually. Similarly, Smith High school can develop extracurricular STEAM (Science, Technology, Engineering, Arts, and Math Curriculum) programs or environmental clubs to educate students about the importance of healthy watersheds. Additionally, environmental education signage could be installed in strategic places where users learn about the functions of watershed, ecological importance, and protection of urban wildlife habitat.

Figure 9 Aging infrastructure at Twin Lakes Park

- The existing amenities and furnishings along the corridor are aging and deteriorating. There is a need for replacement and maintenance for the same so residents can continue to enjoy the corridor. The playground structure is in the floodplain area and frequently gets inundated with water, compromising its structural integrity. The play area also poses the challenge because of vandalism thereby not being used by families with children. This play area could be relocated to another more accessible and visible location and the area could be restored as floodplain to support the much-needed flood water management.

Figure 8 Deteriorated boardwalk at Pinecroft Lake Park

- The lack of consistent maintenance and management of the area has resulted in pockets of areas that residents consider unsafe. Landscape maintenance is critical for natural areas that are close to residential developments to discourage undesired activities and vandalism.

TWIN LAKES PARK REVITALIZATION

COMMUNITY ENGAGEMENT

MCADAMS

INTRODUCTION

Community insight is an essential part of any planning process and the most effective plans are firmly rooted in the realities and visions of the community that created them. This report is based on the combination of feedback from the community, focus groups and the city staff to inform the community engagement portion of the information-gathering process.

METHODOLOGY

The Department and project team designed the public engagement process to maximize the amount of input and feedback from community members and Department staff. The process was intended to be equitable and inclusive, offering a variety of input opportunities and methods for all community members to have a comfortable platform for expressing their concerns and feedback. The public engagement process included the following elements:

Focus Group Meeting and Online Questionnaire

(2) Public Open House meetings

The initial focus group meeting and the first public open house had a broader approach with the Department and project team intending to inform participants about the planning process and solicit input regarding the opportuntieis and challenges of Twin Lakes corridor. The second public open house meeting took focused approach, seeking feedback on proposed recommendations. The findings from the meetings are described below.

Focus Group Meeting

Purpose

To solicit feedback from the focus group regarding the current use of the corridor, challenges experienced by users, and opportunities that exist to enhance the user experience.

Methodology

The focus group comprised of selected group of residents that are currently involved in some way with the project such as residents whose properties are impacted by the flood water levels and HOA members of the subdivisions in the area. Project team conducted an hour-long virtual meeting with this group followed by an online questionnaire to provide additional feedback. For the members who could not attend the meeting, presentation recording was made available.

Key Findings

Several themes emerged from the discussion with focus group that shed light on the needs and opportunitis that exist along this corridor. Residents value this natural resource right in their backyard for the many benefits it provides in terms of recreation opportunities, contact with nature, and connectivity to neighborhoods. However, they expressed property damage during larger storm events as one of the leading causes of concern and would like to see incoporating innovative stormwater management strategies to manage water levels in this area. They mentioned beaver activity as a cause of concern for water level management as they take down healthy trees for building dams creating debris and blocking the water flow. They also expressed concerns over safety and security of amenties, unwanted activities taking place in the hard to supervise areas, vandalism, and lack of trash management. One of the member suggested partnering with the school and local businesses to educate them

about importance of healthy watersheds and ecological functions. Overall, participants would like to see design interventions implemented to enhance the corridor, provide connectivity and opportuniteis for people to enjoy the views of the wetlands and the habitat it supports, and develop management strategies to avoid the safety and security issues recurring in the future.

Public Open House #1 (In-person + Virtual)

Date: March , 2022

Purpose

To solicit feedback from the surrounding community regarding the current use of the corridor, challenges experienced by users, and opportunities that exist to enhance the user experience.

Methodology

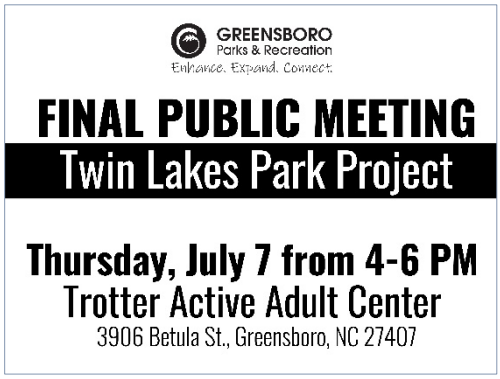
The City staff organized public open house at the SECU Bank where community members could drop in to provide comments on the assessment findings and preliminary recommendations for Twin Lakes corridor enhancements. Additionally, the project team provided pre-recorded presentation and an online questionnaire survey for residents who could not participate during the in-person open house hours.

Key Findings

Over thirteen people participated at the in-person open house meeting and four responded to the online questionnaire. Respondents asked several questions during the open house meeting regarding the proposed improvements and were supportive of the proposed recommendations. The online questionnaire survey reflected feedback from some long time residents of the area concerned about vegetation management, impact on residents' privacy, and increased greenway trail use resulting in more vandalism and trash contamination in the stream corridor and wetlands. Overall, people value this ecological corridor for its value as natural resource and wildlife habitat and want to see it preserved and protected in the future.

Public Open House #2 (In-person + Virtual)

Date: July 7th, 2022



Purpose

To solicit feedback from the surrounding community regarding the final recommendations for Twin Lakes Park revitalization and greenway connections.

Methodology

The City staff organized public open house at the Trotter Active Adult Center where community members could drop in to provide comments on the recommendations for Twin Lakes corridor enhancements. Additionally, the project team provided a one-question online questionnaire survey for residents who live in proximity of Pineview Drive to provide feedback on the proposed boardwalk connection from Cypress Park Road.

Key Findings

Over ten people participated at the in-person open house meeting. In general, participants were supportive of the recommendations proposed and the programming component associated with environmental education and outreach. The questions and concerned expressed during the meeting were consistent with previous input received, including impact of development on conservation area and wildlife, beaver activities and fallen trees in floodplain, and issues with trash accumulation in the ecologically sensitive areas. Residents along Cypress Park Road would like to see the multi-use trail continued within the existing right-of-way using road width reduction strategy. Regarding the boardwalk connection from Pineview Drive to Cypress Park Road, participants are not very supportive of the connectivity given their past experience with crime incidents and vandalism when this connection was a vehicular bridge connection. Participants also shared that river otters have been sighted in the area recently for the first time, indicating the important of this corridor as wildlife habitat.

Conclusion

The results of the community engagement process are consistent with information shared by the City staff as well as project team's site observations. Following priority themes emerged through this process:

- Floodwater level management is the highest priority for this area to protect the surrounding residential properties from damage during large storm events.
- Twin Lakes Park is in major need of renovations. Concerns regarding safety, crime, illicit activities, and vandalism need to be addressed along with removal of the unsafe play structure within the floodplain.
- Vegetation management is needed to address issues related to supervision of the area and also to enhance the function of wetlands by removal of invasive species and provision of native vegetation.
- Community awareness regarding proper trash disposal is needed to reduce trash accumulation and pollution downstream.
- Finally, the City needs to be proactive in managing the beaver population in the stream corridor to ensure the balance of benefits provided by beavers and limit their impact on trees for dam creation.

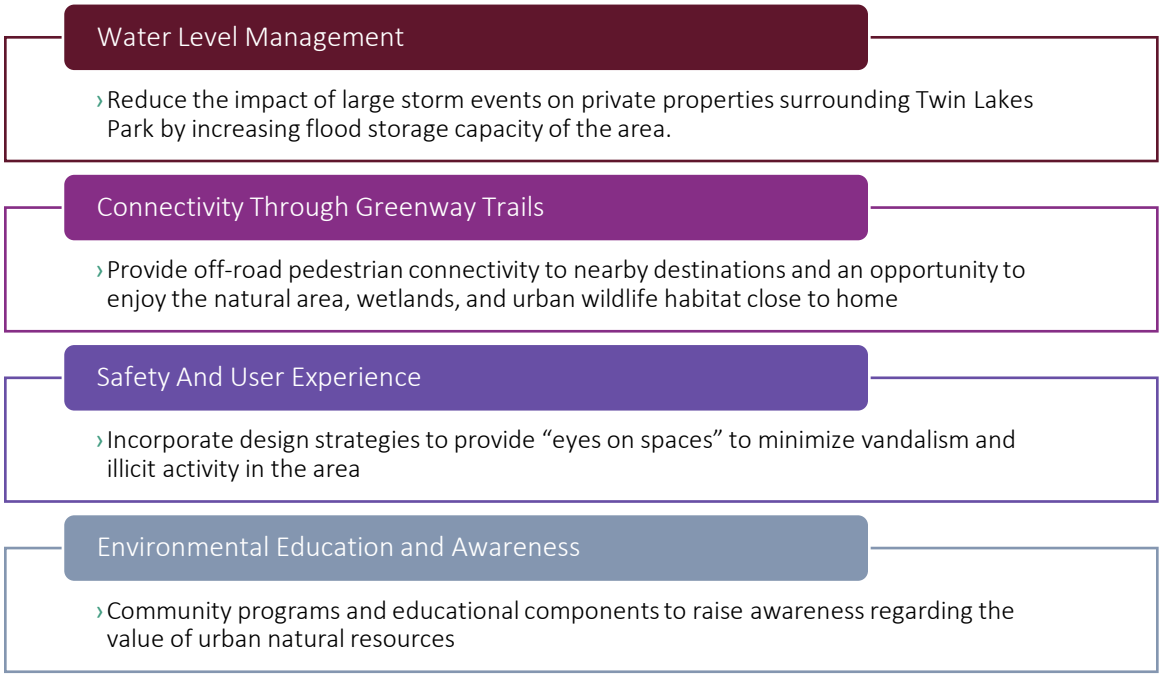
TWIN LAKES PARK REVITALIZATION

RECOMMENDATIONS

McAdams

RECOMMENDATIONS

Community insight, site assessment, and staff input provided foundation to develop the recommendations for this feasibility study. These recommendations stand on the following planning components:



Recommendations

Playground and Pedestrian Bridge Removal

The playground structure at Twin Lakes Park sits within the floodplain. Its location and aging nature compromise structural integrity. The secluded nature of the play area poses challenges with vandalism and illicit activity, making it even harder to use the play area by families and children. For these reasons, this plan recommends removing the play area as well as removal of the aging pedestrian bridge from this park.

With the removal of the playground, a significant area is available for adaptive re-use within the floodplain. Restoring this area to a naturalized floodplain adds additional floodwater storage and natural habitat, both of which are created through grading and vegetation establishment. This restored area may also contain floodplain pools or similar low-lying areas to provide additional opportunities to create wetland areas, further diversifying the plant palette in the project area. These will increase habitat for urban wildlife and waterfowl.

Twin Lakes Drive & Goodall Drive

The potential reconfiguration of this intersection there is an opportunity to add a green stormwater infrastructure device to improve water quality in the area where pavement may be removed, or barriers placed to remove the parking area which often becomes residents’ concern for loitering. The removal of pavement is a direct benefit to water quality and will lower peak flow rates and runoff volume. This will also lower expected pollutant loads in the Twin Lake Tributary assuming the new area is converted to open space. With this location’s proximity

to the roadways and stormwater flow patterns, a rain garden installation has the most direct benefit to the watershed by controlling and treating the runoff from the roadway surface which is likely to be high in nitrogen, phosphorous, and metals. Sequestering and removing these pollutants is highly beneficial to water quality. No additional drainage infrastructure is needed aside from curb cuts and flumes in the proposed curb line to allow the surface runoff to freely flow into the rain garden. The planting media would be designed to allow for quick infiltration of the runoff, minimizing the potential for long term shallow water ponding in this location. The treated runoff would be discharged to the floodplain via a perforated underdrain pipe. We examined the potential for treating the flow in the existing storm drainage system, but this proved infeasible due to the profile of the existing pipe network.

Road Diet along Cypress Park Road

In terms of water quality and water level management, the primary benefit of the road diet is the reduction of impervious surface. This reduction in impervious surface area lowers the overall volume of runoff and the peak rate of flow from the associated drainage system. For this plan, narrowing the road width will provide space within the existing right-of-way to build a new greenway trail in lieu of existing sidewalk. This multi-use path will provide the most community benefit by connecting local destinations and providing opportunity for users to enjoy the natural beauty of the Twin Lakes area. Additional green stormwater infrastructure measures may be considered as the design is more fully developed. At the very least, environmental sustainability benefits are still realized by reducing the overall impervious area.

Floodplain Vegetation

For the entire study corridor, the goal is to preserve existing native vegetation that provides essential ecological value to this urban natural resource. However, a section on the southern overbank of the stream contains numerous deceased trees, which we propose to remove and regrade the area to enhance ecological functions. The tree limbs may be reused to create ground level habitat areas. The re-established floodplain area would use floodplain pools and varying topography to increase the overall floodplain storage volume, further reducing the impact of flood waters within the study corridor. The new grading plan is envisioned not only to include floodplain pools and channels, but also some high ground resulting in a range of habitat and vegetation options. The area would be replanted with native species selected for low maintenance needs and their growth patterns to maintain clear sight lines.

Vegetation Management

There was a consensus throughout the community engagement process that the surrounding residents value the proximity of this natural environment. This plan recommends establishing procedures for regular vegetation management in the area where new social areas such as the greenway trails and overlook platforms are proposed. Keeping the canopy trees limbed up and shrubs and small trees lower than three feet tall will help ensure clear sightlines into these social areas for easy access and supervision. Any fallen trees or diseased trees that presents challenges to surrounding private properties should be promptly removed. However, the vegetation away from human use areas should be protected and kept undisturbed to continue the natural processes within the forested areas.

Connectivity

This plan proposes a combination of natural surface trails and asphalt multi use paths within the study area to enhance pedestrian connectivity to nearby destinations such as the shopping area, SECU Bank, and Smith High School. The natural surface trail, also termed as "dirtway" will be implemented between Glen Hollow Road and Holden Road. This will be a temporary facility implemented by clearing the vegetation within the creek buffer area and if the trail count numbers over the years seem to trend upwards, the City will consider paving the ditway as a permanent greenway trail as a long-term goal. A sidewalk spur will be proposed from the dirtway to connect SECU Bank and Farmington Drive. The multi-use path from Holden Road to Pinecroft Road will use the expanded right-of-way through road diet strategy as mentioned above. This multi- use path will eventually provide connectivity to future sidewalk along Pinecroft Road. This plan also recommends sidewalk improvements along Veasly Street and Twin Lakes Drive since the pedestrian bridge connection at Twin Lakes Park will be removed.

Pinecroft Lake Park Removal

Pinecroft Lake Park is an underutilized deteriorating amenity located within the conservation land. Overgrown vegetation makes it hard to locate and supervise. The environmental education signs are faded and in need of repair. Additionally, the boardwalk which once provided views into the lake and wetlands is deteriorated and structurally unsafe. This plan proposes to remove this amenity from the conservation land and to be replaced by an overlook platform directly off the greenway trail, the details of which are described below.

User Experience

While this plan proposes removal of aging and deteriorating amenities in the Twin Lakes and Pinecroft Lake Parks, two brand new overlooks are being proposed in their location to provide opportunities for greenways users to still enjoy the natural beauty of this stream corridor and wetlands. Birdwatching and urban wildlife viewing will be possible from these overlook platforms while also ensuring that easy supervision to these spaces is provided because of their strategic locations, thus avoiding vandalism and other undesired activities that are currently the concerns of residents. These areas also provide spaces for benches and trash receptacles for easy access. Additionally, environmental signage will be located here, the details of which are described below.

Environmental Education and Outreach Programming

Environmental education and outreach are important components of this plan's recommendations. The two themes that consistently emerged throughout the process were litter management and beaver management concerns. Long-time residents of the area have been vocal about the trash accumulation issues as areas upstream of the corridor developed and started to impact the downstream water quality by trash accumulation. While the City has implemented a regular schedule for trash collection within the stream bed, it is also essential educate public about proper disposal of trash through reuse-reduce-recycle philosophy. Similarly, there is a clear divide in residents' opinion about the impact of beaver population in managing stormwater levels within the creek corridor. While some people value the ecological benefits of beaver population and their habitat, others consider them nuisance and reason for flooding. City of Greensboro has developed an agreement with USDA to control urban beaver population, however, there is a need for public awareness about the benefits of beavers for other wildlife species. Finally, interpretive signage regarding the piedmont flora and fauna will also help greenway users

understand the value of Twin Lakes tributary and stream corridor as part of the larger urban ecological context. The specific programs and signage components are described below and graphically illustrated in the appendices.

"Trash To Treasure" Public Art Program

Twin Lakes Creek and the associated wetlands area are regularly impacted by litter and trash from upstream developments. Though the City has developed a maintenance and management program focused on trash pick up from the stream, additional community awareness through participation is suggested as part of this partnership program. The City can partner with the Smith High School's science and art teachers to develop an annual program where environmental education students will develop "trash to treasure" sculptures and display them at the trail head as part of graduation commencement celebrations. This program will also give students an opportunity to interact with greenway trail users and neighborhood residents to raise awareness about proper disposal of trash items through the concept of reduce / reuse /recycle, and the impact of non-biodegradable materials on wildlife and local ecology.

Beaver Family: Opportunity for Public Art

There is an opportunity to create a small interactive public art at the Holden Road and Cypress Park Road intersection to show beaver family in action building the dam and lodge! It creates the perfect area for greenway users to pause and learn about beavers. The public art concept will incorporate a sculpture of beaver family and their lodge and dam structure. This sculpture will be interactive so public can peek through to see what the inside of a beaver dam looks like or even scoot inside to pretend play beaver pup. Additionally, an interpretive signage will accompany the public art to provide more information on beavers, the details of which are included on the exhibit board in the appendices.

Interpretive Signage: Twin Lakes Wetlands

An interpretive sign regarding Twin Lakes Wetlands will be provided at the overlook platform. The information on the sign will include value of urban wetlands as natural resource and specifically the function of Twin Lakes wetlands' role in floodwater storage to mitigate the property damages caused by flood water during large storm events. Additionally, the societal benefits of health and wellbeing achieved through daily contact with nature will be included on the signage as well.

Interpretive Signage: Piedmont Flora and Fauna

An interpretive sign regarding Piedmont Flora and Fauna will be located at the Pinecroft Lake Park overlook area. A local artist can be commissioned by the City to provide unique hand painted scenery showing native flora and fauna and the signage can incorporate a "game theme" where readers are asked to locate the species in the wetlands.

Next Steps

Prioritization

Several recommendations and design strategies have been suggested in this plan and prioritization is key for successful implementation, typical of any plan. The recommendations related to life safety should be prioritized as funding becomes available. These recommendations would include Twin Lakes Park area renovations to remove the play area and develop additional flood water storage capacity. Secondly, the deteriorated boardwalk and overlook area at the Pinecroft Lake Park should be removed. Thirdly, community outreach and education recommendations should be prioritized to mitigate litter and water quality impact. Finally, other recommendations such as connectivity through greenway trail development, new wetland overlook platforms, and public art commissioning should be considered as part of placemaking and enhanced user experience. It should be also noted that these priorities can be shifted if appropriate funding sources are available that are better suited for certain areas within the project study area.

Funding

The City should continue to pursue funding opportunities through interdepartmental collaborative approach for the detail design, construction documents, and ultimately the implementation of the recommendations. Several funding sources for floodwater mitigation, stormwater management, and environmental education are available through State and Federal Grants that could be pursued to implement the recommendations in this plan. The Greensboro Parks and Recreation Department has been proactive in these efforts and have already applied for NC State Attorney General's Environmental Enhancement Grant.

TWIN LAKES PARK REVITALIZATION

APPENDICES

McAdams

Sidewalk along Farmington Drive to Gate City Boulevard slated to be constructed in 2023

SHOPPING CENTER

Intersection improvements to include trailhead and dedicated pedestrian crossing. Traffic study needed to determine crossing type.

Potential for partnership with developer to construct greenway spur directly connecting to Farmington Drive

FARMINGTON DRIVE

HOLDEN ROAD

VANSTORY STREET

SMITH HIGH SCHOOL

VEASLEY STREET

SMITH SOCCER PARK

Right-of-way acquisition required for greenway construction

Renovate Pinecroft Lake Park by constructing new observation area and trailhead

Future sidewalk along Pinecroft Road

Sidewalk Improvements:
Improve pedestrian connection to Smith High School from Cypress Park Drive along Twin Lakes Drive and Veasley Street by removing gaps and repairing pavement.

Vegetation management

Realign Twin Lakes Drive and remove parking area, playground, and pedestrian bridge to increase floodwater storage

TWIN LAKES DRIVE

PINECROFT ROAD

YOW ROAD

Increase sidewidth if culvert is replaced in the future

PINEVIEW DRIVE

Potential boardwalk connection to Pineview Drive

DULAIRE ROAD

Dedicate pedestrian crossing. Traffic study needed to determine crossing type.

GLEN HOLLOW ROAD

FRAZIER ROAD

CYPRESS PARK ROAD

Construct creek and floodplain restoration observation area

AZALEA DRIVE

Proposed 10' wide "dirtway" (natural surface trail)

Create small stormwater wetland habitat

Remove dead trees and plant floodplain vegetation in constructed floodplain pools to increase floodwater storage

KILBOURNE DRIVE

PINE LAKE DRIVE

Existing pedestrian crossing at intersection

Cypress Park Road Improvements:
Reduce lane widths and construct sidepath and/or bike lanes.

LEGEND

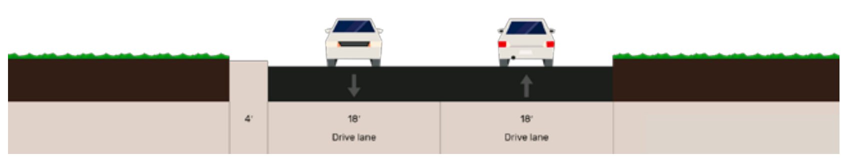
- Creek
- Water Body
- 500-year Floodplain
- Property Lines
- Study Area
- Proposed Road / Sidewalk Improvement
- Proposed Greenway (Paved)
- Proposed Greenway Natural Surface Trail
- Potential Greenway Boardwalk
- Proposed Trailhead
- Proposed Overlook
- Greenway Right-of-Way Acquisition Required

PROPOSED GREENWAYS

McADAMS
PREPARED FOR:
City of Greensboro
Greensboro

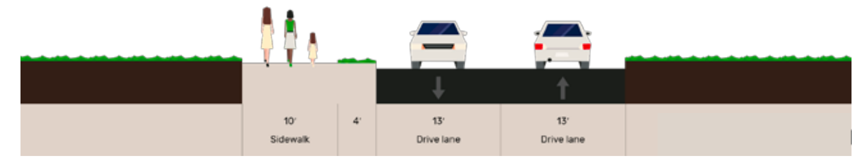
CYPRESS PARK ROAD EXISTING CONDITIONS

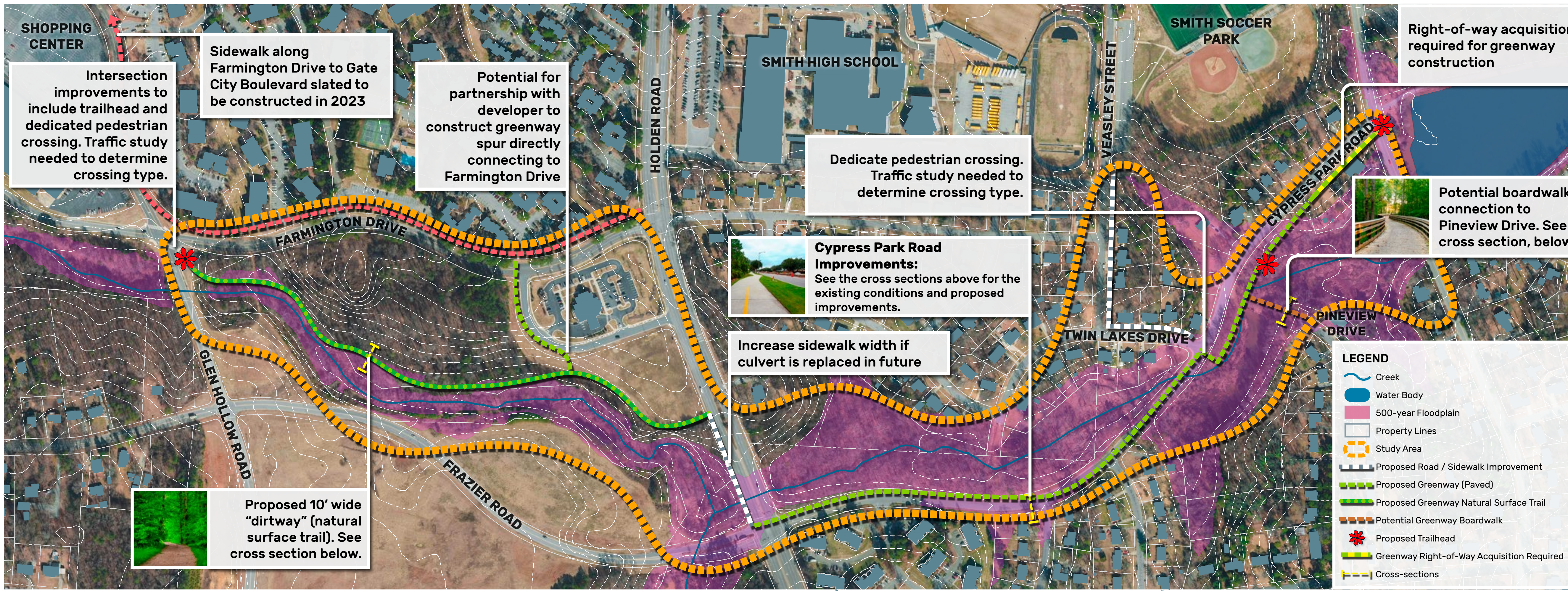
Cypress Park Road currently contains a 5’ sidewalk and two 18’ drive lanes bound by curbs.



CYPRESS PARK ROAD PROPOSED CONDITIONS

Option 2 removes the existing curbs and sidewalk on one side. Drive lanes are slightly reduced to 13’ wide to accommodate a new 10’ sidewalk while maintaining existing overall road and sidewalk width.

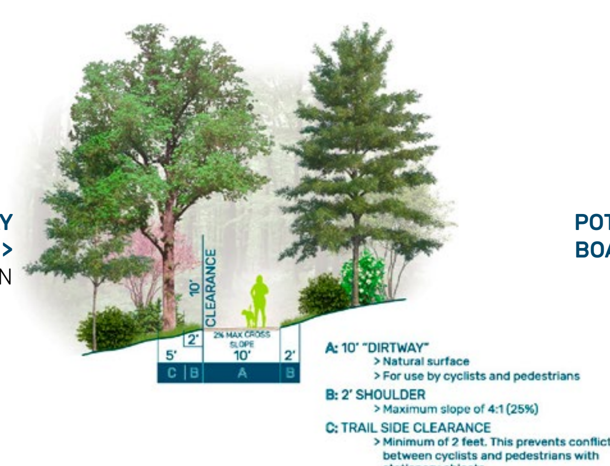




How strongly do you feel there should be a boardwalk connecion to Pineview Drive from Cypress Park Road? Place a dot on the scale below.

AGREE ▮ **DISAGREE**

DIRTWAY (NATURAL SURFACE TRAIL) > CROSS SECTION



POTENTIAL PINEVIEW DRIVE BOARDWALK CONNECTION > CROSS SECTION

TWIN LAKES REVITALIZATION
GREENWAYS + CROSS SECTIONS
GREENSBORO, NORTH CAROLINA

0' 150'
SCALE: 1" = 150'

GBO-2101
2022-07-07

VANSTORY STREET

SMITH SOCCER PARK

VEASLEY STREET

SMITH HIGH SCHOOL

PHASE 1

Realign Twin Lakes Drive and remove parking area, playground, and pedestrian bridge to increase floodwater storage

TWIN LAKES DRIVE

HOLDEN ROAD

CYPRESS PARK ROAD

PHASE 1

Remove dead trees and plant floodplain vegetation in constructed floodplain pools to increase floodwater storage

PINE LAKE DRIVE

LEGEND

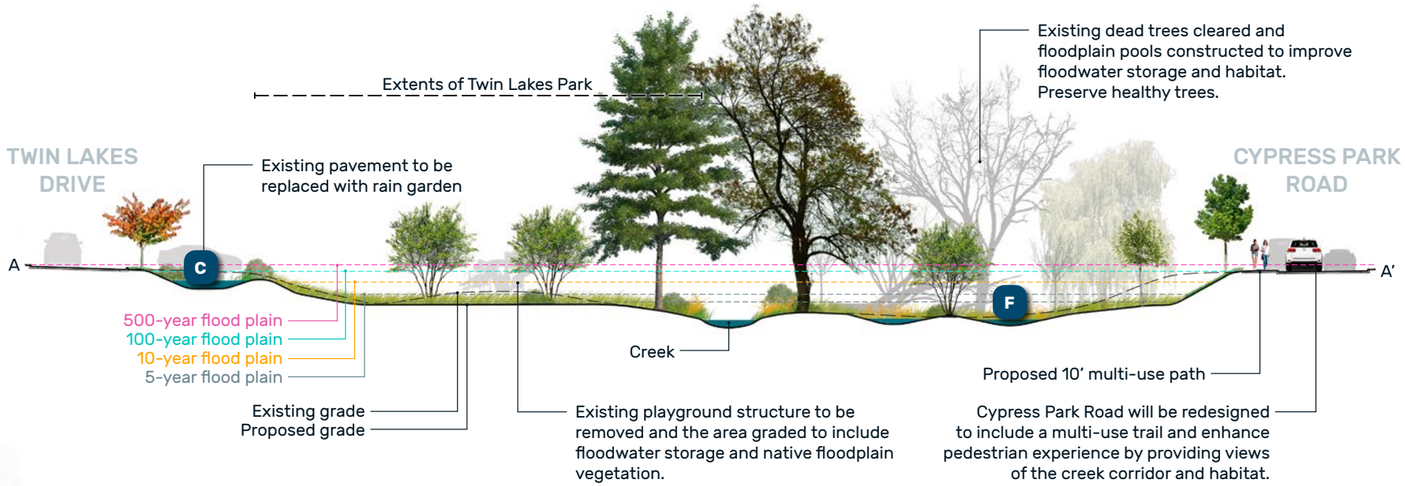
- Creek
- Water Body
- 500-year Floodplain
- Property Lines
- Study Area
- Proposed Road / Sidewalk Improvement
- Proposed Greenway (Paved)
- Proposed Greenway Natural Surface Trail
- Potential Greenway Boardwalk
- Proposed Trailhead
- Proposed Overlook
- Greenway Right-of-Way Acquisition Required

PROPOSED DESIGN STRATEGIES

TWIN LAKES DRIVE REALIGNMENT AND TWIN LAKES PARK RENOVATION
HAMMERHEAD RENOVATION AND STORMWATER MANAGEMENT AREA

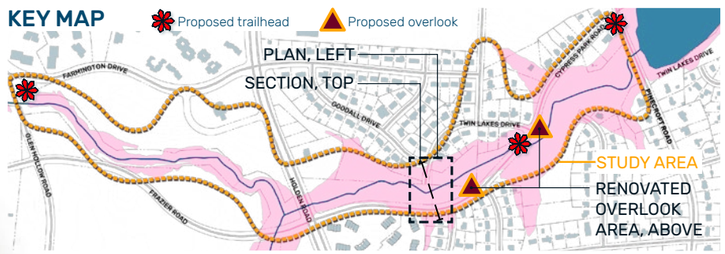
- **A** Proposed pavement removal and new curb
- **B** Proposed flume to transport road runoff in to the proposed rain garden
- **C** Proposed rain garden
- **D** Existing drainage swale to be realigned to slow down the water velocity
- **E** Existing playground structure to be removed and the area graded to increase floodwater storage and restore floodplain vegetation.
- **F** Proposed floodplain pool
- **G** Bridge to be demolished

TWIN LAKES DRIVE TO CYPRESS PARK DRIVE
ROAD AND FLOODPLAIN CROSS SECTION (LOOKING NORTH)

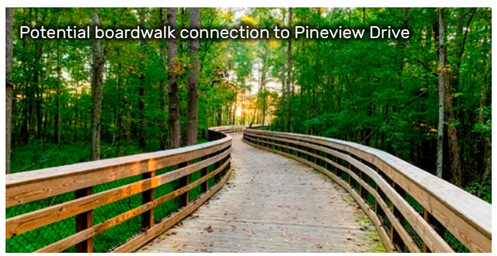


PROPOSED OVERLOOKS FOR TWIN LAKES PARK AND PINECROFT LAKE PARK

KEY MAP



PRECEDENT IMAGERY



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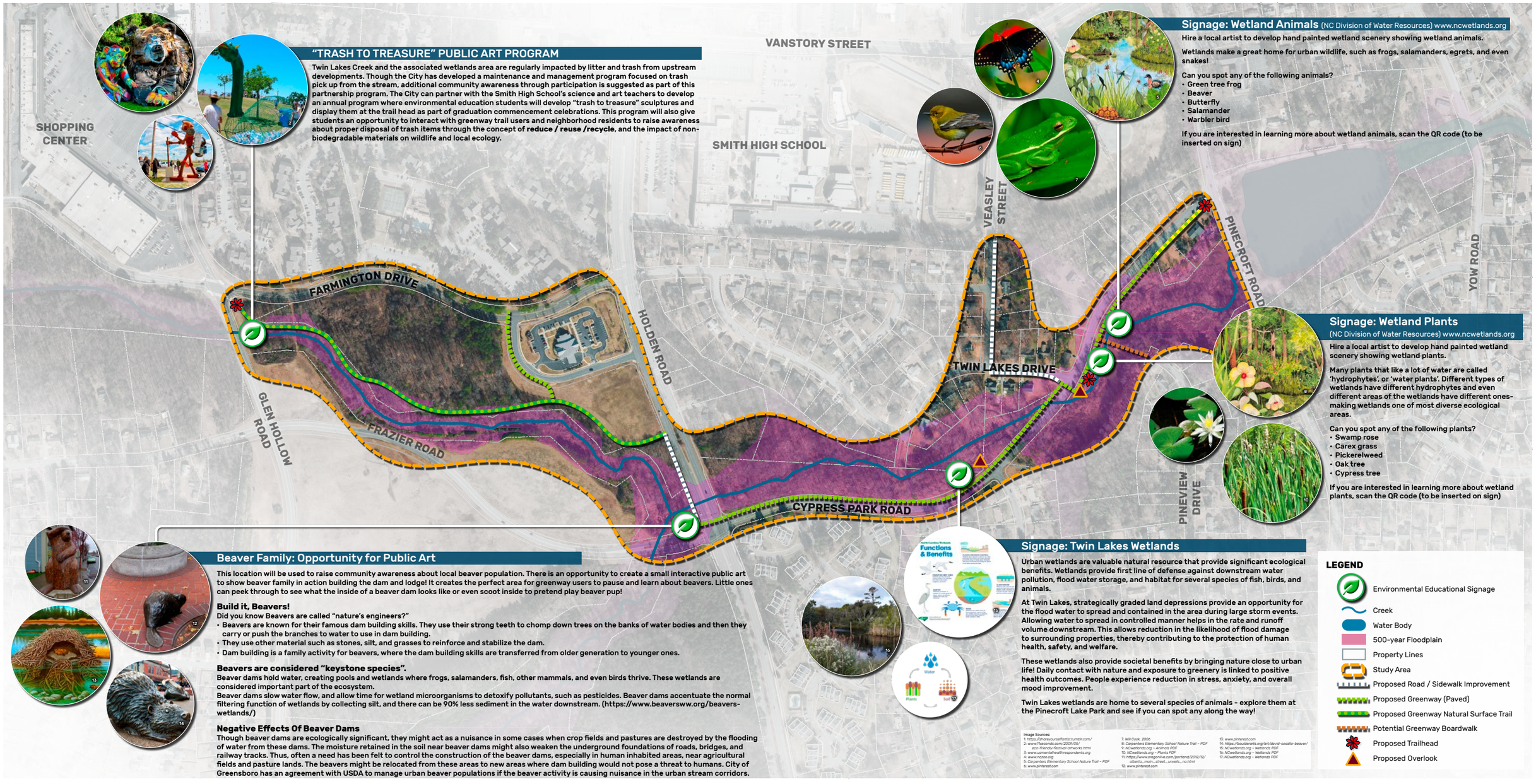
PREPARED FOR: City of Greensboro
Greensboro

TWIN LAKES REVITALIZATION
PROPOSED DESIGN STRATEGIES
GREENSBORO, NORTH CAROLINA

SCALE: 1" = 10'

GBO-2101
2022-07-07



"TRASH TO TREASURE" PUBLIC ART PROGRAM

Twin Lakes Creek and the associated wetlands area are regularly impacted by litter and trash from upstream developments. Though the City has developed a maintenance and management program focused on trash pick up from the stream, additional community awareness through participation is suggested as part of this partnership program. The City can partner with the Smith High School's science and art teachers to develop an annual program where environmental education students will develop "trash to treasure" sculptures and display them at the trail head as part of graduation commencement celebrations. This program will also give students an opportunity to interact with greenway trail users and neighborhood residents to raise awareness about proper disposal of trash items through the concept of **reduce / reuse /recycle**, and the impact of non-biodegradable materials on wildlife and local ecology.

Signage: Wetland Animals (NC Division of Water Resources) www.ncwetlands.org

Hire a local artist to develop hand painted wetland scenery showing wetland animals.

Wetlands make a great home for urban wildlife, such as frogs, salamanders, egrets, and even snakes!

Can you spot any of the following animals?
- Green tree frog
- Beaver
- Butterfly
- Salamander
- Warbler bird

If you are interested in learning more about wetland animals, scan the QR code (to be inserted on sign)

Signage: Wetland Plants (NC Division of Water Resources) www.ncwetlands.org

Hire a local artist to develop hand painted wetland scenery showing wetland plants.

Many plants that like a lot of water are called 'hydrophytes', or 'water plants'. Different types of wetlands have different hydrophytes and even different areas of the wetlands have different ones- making wetlands one of most diverse ecological areas.

Can you spot any of the following plants?
- Swamp rose
- Carex grass
- Pickerelweed
- Oak tree
- Cypress tree

If you are interested in learning more about wetland plants, scan the QR code (to be inserted on sign)

Beaver Family: Opportunity for Public Art

This location will be used to raise community awareness about local beaver population. There is an opportunity to create a small interactive public art to show beaver family in action building the dam and lodge! It creates the perfect area for greenway users to pause and learn about beavers. Little ones can peek through to see what the inside of a beaver dam looks like or even scoot inside to pretend play beaver pup!

Build it, Beavers!

Did you know Beavers are called "nature's engineers?"
- Beavers are known for their famous dam building skills. They use their strong teeth to chomp down trees on the banks of water bodies and then they carry or push the branches to water to use in dam building.
- They use other material such as stones, silt, and grasses to reinforce and stabilize the dam.
- Dam building is a family activity for beavers, where the dam building skills are transferred from older generation to younger ones.

Beavers are considered "keystone species".

Beaver dams hold water, creating pools and wetlands where frogs, salamanders, fish, other mammals, and even birds thrive. These wetlands are considered important part of the ecosystem.
Beaver dams slow water flow, and allow time for wetland microorganisms to detoxify pollutants, such as pesticides. Beaver dams accentuate the normal filtering function of wetlands by collecting silt, and there can be 90% less sediment in the water downstream. (https://www.beaversww.org/beavers-wetlands/)

Negative Effects Of Beaver Dams

Though beaver dams are ecologically significant, they might act as a nuisance in some cases when crop fields and pastures are destroyed by the flooding of water from these dams. The moisture retained in the soil near beaver dams might also weaken the underground foundations of roads, bridges, and railway tracks. Thus, often a need has been felt to control the construction of the beaver dams, especially in human inhabited areas, near agricultural fields and pasture lands. The beavers might be relocated from these areas to new areas where dam building would not pose a threat to humans. City of Greensboro has an agreement with USDA to manage urban beaver populations if the beaver activity is causing nuisance in the urban stream corridors.

Signage: Twin Lakes Wetlands

Urban wetlands are valuable natural resource that provide significant ecological benefits. Wetlands provide first line of defense against downstream water pollution, flood water storage, and habitat for several species of fish, birds, and animals.

At Twin Lakes, strategically graded land depressions provide an opportunity for the flood water to spread and contained in the area during large storm events. Allowing water to spread in controlled manner helps in the rate and runoff volume downstream. This allows reduction in the likelihood of flood damage to surrounding properties, thereby contributing to the protection of human health, safety, and welfare.

These wetlands also provide societal benefits by bringing nature close to urban life! Daily contact with nature and exposure to greenery is linked to positive health outcomes. People experience reduction in stress, anxiety, and overall mood improvement.

Twin Lakes wetlands are home to several species of animals - explore them at the Pinecroft Lake Park and see if you can spot any along the way!

Image Sources:
1. https://shoreyourselfartist.tumblr.com/
2. www.11seconds.com/2009/05/eco-friendly-festival-artworks.html
3. www.usmentalhealthrespondents.org
4. www.nczoo.org
5. Carpenters Elementary School Nature Trail - PDF
6. www.pinterest.com
7. Will Cook, 2006
8. Carpenters Elementary School Nature Trail - PDF
9. NCwetlands.org - Animals PDF
10. NCwetlands.org - Plants PDF
11. https://www.oregonlive.com/portland/2012/12/alberta_main_street_unveils_no.html
12. www.pinterest.com
13. www.pinterest.com
14. https://boulderarts.org/art/david-sasaki-beaver/
15. NCwetlands.org - Wetlands PDF
16. NCwetlands.org - Wetlands PDF
17. NCwetlands.org - Wetlands PDF

LEGEND

- Environmental Educational Signage
- Creek
- Water Body
- 500-year Floodplain
- Property Lines
- Study Area
- Proposed Road / Sidewalk Improvement
- Proposed Greenway (Paved)
- Proposed Greenway Natural Surface Trail
- Potential Greenway Boardwalk
- Proposed Trailhead
- Proposed Overlook

McADAMS
PREPARED FOR: City of Greensboro
Greensboro
TWIN LAKES REVITALIZATION
EDUCATIONAL SIGNAGE PLAN
GREENSBORO, NORTH CAROLINA
SCALE: 1" = 100'
080-2101
2022-07-07

TWIN LAKES

REVITALIZATION

COMMUNITY ENGAGEMENT SUMMARY

DATE	REVIEWED BY	COMMENTS

FOCUS GROUP MEETING

The project team facilitated a focus group meeting with the Twin Lakes Park stakeholders. This group involved City staff, Piedmont Land Conservancy staff, and a group of interested residents. During the virtual meeting, the project team shared a slide presentation with the group and facilitated an interactive discussion. The group agreed with the team's observations and provided feedback on their experiences till date. In addition to the flood water impacts, they expressed concerns about upstream pollutants, litter, beaver activity, loss of tree canopy, and increased illicit activities in the Twin Lakes Park area. There was also overall consensus about preserving the natural environment and the urban forest canopy.

OPEN HOUSE # 1

The project team conducted a drop-in community input session at the State Employees Credit Union Bank on March 3rd, 2022. About ten people participated in this drop-in session to ask questions about the schematic design and preliminary recommendations. In addition, a virtual recording of the presentation was shared with the residents to provide feedback.

PARTICIPANT INPUT

Below is the summary of discussion from participants:

- Residents asked questions about safe crossings from Cypress Park Road to Twin Lakes Drive and the trail connection through the Piedmont Conservancy Land.
- Resident and former owner of the conservation land expressed concerns about the trail development and location of the overlook area. There was also concern regarding vegetation management and beaver activity.
- Another resident expressed concern about litter impact on wetlands and loss of wildlife habitat.
- Participants who attended the in-person open house, asked several questions about the design and were in support of the overall recommendations.

OPEN HOUSE # 2

On Thursday, July 7th, a drop-in public input meeting was conducted at the Trotter Active Adult Center. This location was selected due to its proximity 1.25 miles from the project site. The purpose of this meeting was to allow citizens to view the proposed conditions ranging from greenways to Twin Lakes Park renovations and environmental signage. Prior to the meeting, signs were posted along the streets in the project area, as well as posted on social media. 12 participants were counted at the meeting, although 11 signed in. Participants ranged from citizens living in the immediate project area, as well as a member of Piedmont Land Conservancy. The individuals listed below facilitated the meeting.

- Garrett Jenkins, McAdams
- Vonda Martin, City of Greensboro
- Shawna Tillery, City of Greensboro
- Jennifer Hance, City of Greensboro

PARTICIPANT ACTIVITY + INPUT

Participants at the meeting were encouraged to express their question and concerns. Below is a comprehensive list of verbal and written communications by attendees.

- River otters have been sighted in the area for the first time in a long time.
- There use to be a vehicular bridge at the end of Pineview Drive until about 15 years ago.
  - When there was a connection, crime occurrence was higher. House break-in and suspicious activity behind the homes in the woods
- 8 out of 9 participants do not want a pedestrian connection via boardwalk from Cypress Park Road to Pineview Drive.
- The public's opinion on beavers is dramatically split. Approximately half of the participants believe beavers should be allowed to continue living in the area as-is. A quarter of participants believe the beaver population should be strictly managed, while the remaining quarter of participants believe the beavers are a nuisance contributing to flooding.
- Residents on Cypress Park Road are concerned about the sidepath encroaching into their yard. They ask if it is possible for the path to fall within the existing ROW and taking up the footprint of the existing road, similar to what is being proposed along the rest of Cypress Road Park.
- Nearly every participant expressed littering is a major concern and large contributing factor for the low quality of the stream and wetlands.
- Those who spoke to the renovations at Twin Lakes Park spoke positively about the proposed conditions.
- Some participants, especially those who live nearest the stream and Twin Lakes Park, are concerned about the number of fallen trees in the floodway.
- The area has a rich history based on nature. Descendants from the family who developed the land still live in the area and attended the meeting. Log cabins found in the area were part of the original development.
- Those who reviewed the environmental signage board did not have any suggestions. The concept of litter sculptures received the most positive feedback.

July 20, 2022

Greensboro Parks and Recreation
City of Greensboro
300 W Washington Street
Greensboro, North Carolina 27401

RE: Twin Lakes Revitalization and Flood Mitigation
Flood Modeling Summary

Dear Shawna,

The McAdams team has continued to refine the water level modeling for the Twin Lakes Tributary based on the master plan and its alternatives. This memo provides a summary of the results of flood modeling for multiple scenarios

Water Level Modeling Technical Update

McAdams received current riverine models (HEC-RAS v. 3.1.1) from McKim & Creed and analyzed these models in HEC-RAS version 6.0. The area upstream of Holden Road was also modeled using PondPack to analyze the effect of detention and ponding upstream of the roadway culvert on expected peak flow rates in the downstream channel. The PondPack model watershed data was calibrated to closely match the HEC-RAS 100-yr flow rate to facilitate comparisons between the two models. Adding the influence of the culvert and detention upstream of Holden Rd, the culvert constriction was estimated to result in a flow rate reduction between 3% (1-year storm) and 12% (100-year storm) when compared to the existing HEC-RAS model.

The McAdams team analyzed alternative culvert inlets which utilized a baffle on the upstream face of the culvert with the intent of using the available detention storage upstream of Holden Road to reduce water levels in the portion of the tributary between Holden Road and Cypress Park Road. After multiple iterations, McAdams selected a 6” diameter low flow orifice and a 30” tall weir across the upstream face of the culvert. Table 1 below summarizes the peak flow anticipated downstream of Holden Road in each of the 3 modeling scenarios.

2905 Meridian Parkway, Durham, NC 27713 / 919. 361. 5000

Profile	HEC-RAS Model	PondPack Corrected Existing Conditions	PondPack Proposed Conditions with Baffle
1yr*EST*	505	499	438
2yr	743	680	602
10yr	1222	1119	957
25yr	1477	1330	1094
50yr	1634	1459	1300
100yr	1777	1571	1562

*All flow rates in cubic feet per second

The flow reductions are achieved by ponding and detaining water upstream of Holden Road. Comparing the existing and proposed PondPack models, the 100-year storm ponding depth upstream of Holden Road is expected to increase by 1.64 feet after installation of the baffle The combination of the revised modeling methodology and the proposed baffle. However, due to these updates to the modeling technique, we do not anticipate any change to the base flood elevation (BFE) compared to the effective FEMA model at this location. This is due to the impact of detention upstream the existing culvert under Frazier Road, which was not studied in the existing model.

The goal of this study was to determine whether the proposed improvements to the Holden Road culvert entrance would benefit the property owners downstream. The additional detention of floodwaters upstream of Holden Road reduces the peak flow rates in all storm event, but the greatest reduction is expected during the small storm events. For the purposes of this summary memo, we have included the analysis of the 2-year storm (3.38” of rainfall in 24 hours) and 100-year storm (7.15” of rainfall in 24 hours). The modeling of the 2-year and 100-year storms indicates that the flood level would drop by 4” immediately downstream of Holden Road, and 2” at the existing playground in both scenarios.

It should be noted that the upstream detention provides additional benefits including increased habitat upstream, lower flow velocities in the channel downstream of Holden Road, and less flashy flow during small storm events. Permitting approvals from FEMA, the US Army Corps of Engineers, and NCDEQ should be expected prior to final approval for construction of any alternative.

See the attached exhibit for mapping and additional information.

Greenway Flood Model

As second scenario was also added to the previous scenario to study the potential impact of the proposed greenway trail along the stream corridor. This model included the combined impact of the greenway trail, modifications to the culvert entrance upstream of Holden Rd (described above), and removal of woody vegetation in portions of the floodplain between Holden Rd and Cypress Park Rd. With the additional potential for fill and obstructions caused by the additional of the greenway, the model indicates that rises in the 100-yr WSEL are anticipated. While allowed by City and FEMA regulations, the project is likely to require a Conditional Letter of Map Revision (CLOMR) prior to

construction. There are existing structures within a portion of the floodplain but the rise in 100-yr WSEL does not appear to impact those structures.

If you have any additional comments or questions regarding this flood study of the scenarios included in this report, please do not hesitate to contact me at freeman@mcadamsco.com or 919-264-7613.

Sincerely,

Hunter C. Freeman, PE LEED AP
Green Stormwater Infrastructure Practice Lead

SEGMENT 1 | GLEN HOLLOW ROAD TO HOLDEN ROAD

The Glen Hollow Road to Holden Road stretch of the corridor is buffer area along the Twin Lakes Tributary. The proposed greenway trail along this buffer will be initially constructed as natural surface trail or "dirtway". An existing sidewalk along Holden Road would provide connectivity to Cypress Park intersection. At the culvert under Holden Road, a storm drainage modification will help reduce downstream flooding.

Project Snapshot

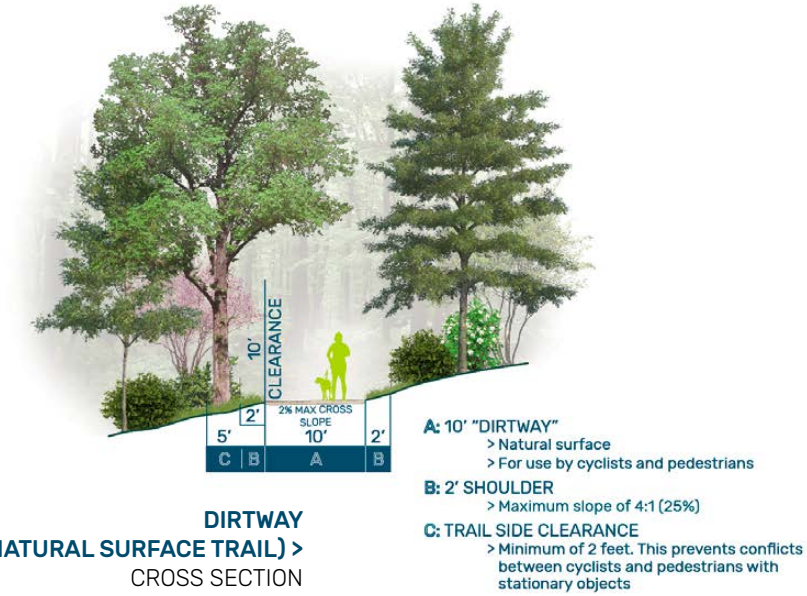
- Location: Creekside, Holden Road
- Project Type: Dirtway
- Project: 0.49 miles
- Connections: Farmington Drive (0.12 miles)

Potential Permitting Needs

- Erosion Control
- 401/404 permitting
- NCDOT Encroachments
- CLOMR/LOMR flood modeling permits
- FEMA Floodplain Development Permits

Potential Right-of-Way Needs

- Number of impacted parcels (not City or County owned): 1
- Number of impacted property owners:1



DIRTWAY (NATURAL SURFACE TRAIL) > CROSS SECTION

Estimated Project Cost

2022 Base Construction Cost Estimate: $ 291,320

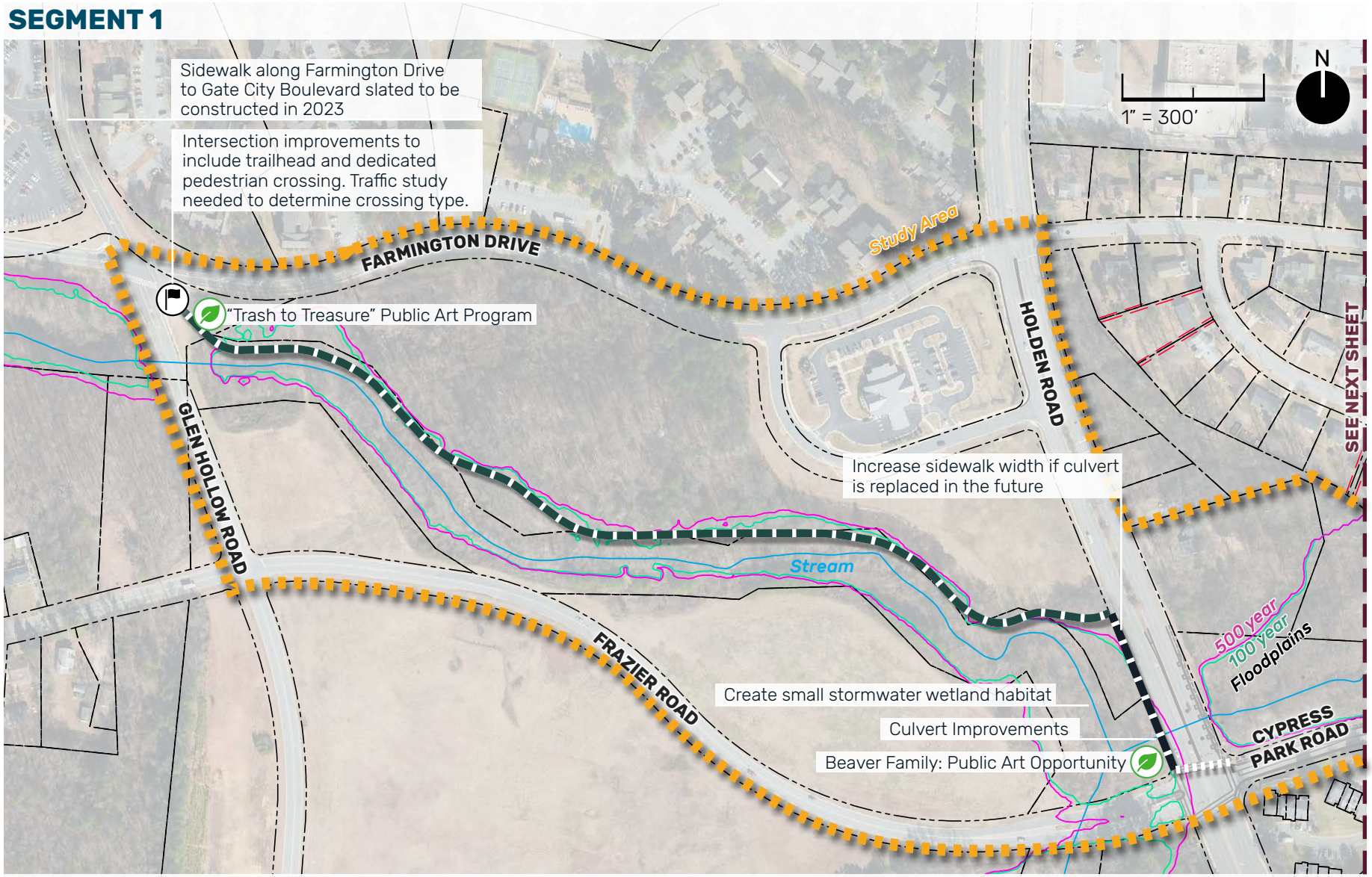
Estimated Design Services (13% conctruction cost): $ 40,000

Build Year	2025
Escalated Construction Cost Estimate Escalated:	$ 340,000
Contingency (30% construction cost):	$ 102,000
Estimated CEI Services (12% construction cost)	$ 40,800
TOTAL CONSTRUCTION COST ESTIMATE:	**$ 482,800**

**Cost associated with right-of-way acqusition to be determined during design process and are not included in this estimate*

*** Detailed cost information in Appendix C*

SEGMENT 1



LEGEND

- 10' Wide "Dirtway"
- 10' Wide Paved Path
- Sidewalk Renovation
- Proposed Sidewalk
- Existing Crosswalk
- Proposed Pedestrian Crossing
- Proposed Trailhead
- Environmental Signage

SEGMENT 2 | HOLDEN ROAD TO PINECROFT ROAD

The tributary corridor along Holden Road to Pinecroft Road passes through four city-owned parcels. There is a four-foot-wide sidewalk along Cypress Park Road that terminates at eastern end of Twin Lakes Drive. There is no sidewalk on either side of the road until Pinecroft Drive. The proposed 10' wide greenway trail will replace the existing sidewalk. The road width will be reduced to accommodate additional trail width. Overlook platforms and educational signage program will be incorporated along this corridor to enhance user experience. Additional details regarding the Twin Lakes Park and Pinecroft Lake Park improvements are included elsewhere in this report.

Project Snapshot

- Location: Cypress Park Road
- Project Type: Multi-use path
- Length of Project: 0.53 miles

Potential Permitting Needs

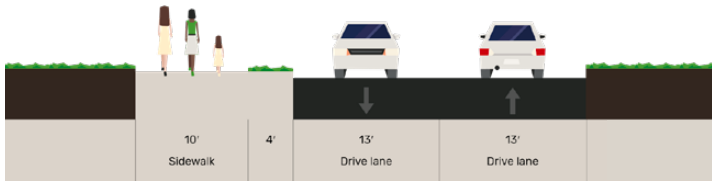
- Erosion Control
- 401/404 permitting
- NCDOT Encroachments
- CLOMR/LOMR flood modeling permits
- FEMA Floodplain Development Permits

Potential Right-of-Way Needs

- Number of impacted parcels (not City or County owned): 2
- Number of impacted property owners:1

Habitat Improvements

Enhancement of the existing floodplain will reduce flood risks to residents and add valuable natural wetland habitat for flora and fauna.



MULTI-USE PATH
CROSS SECTION

Estimated Project Cost

2022 Base Construction Cost Estimate: $ 924,875

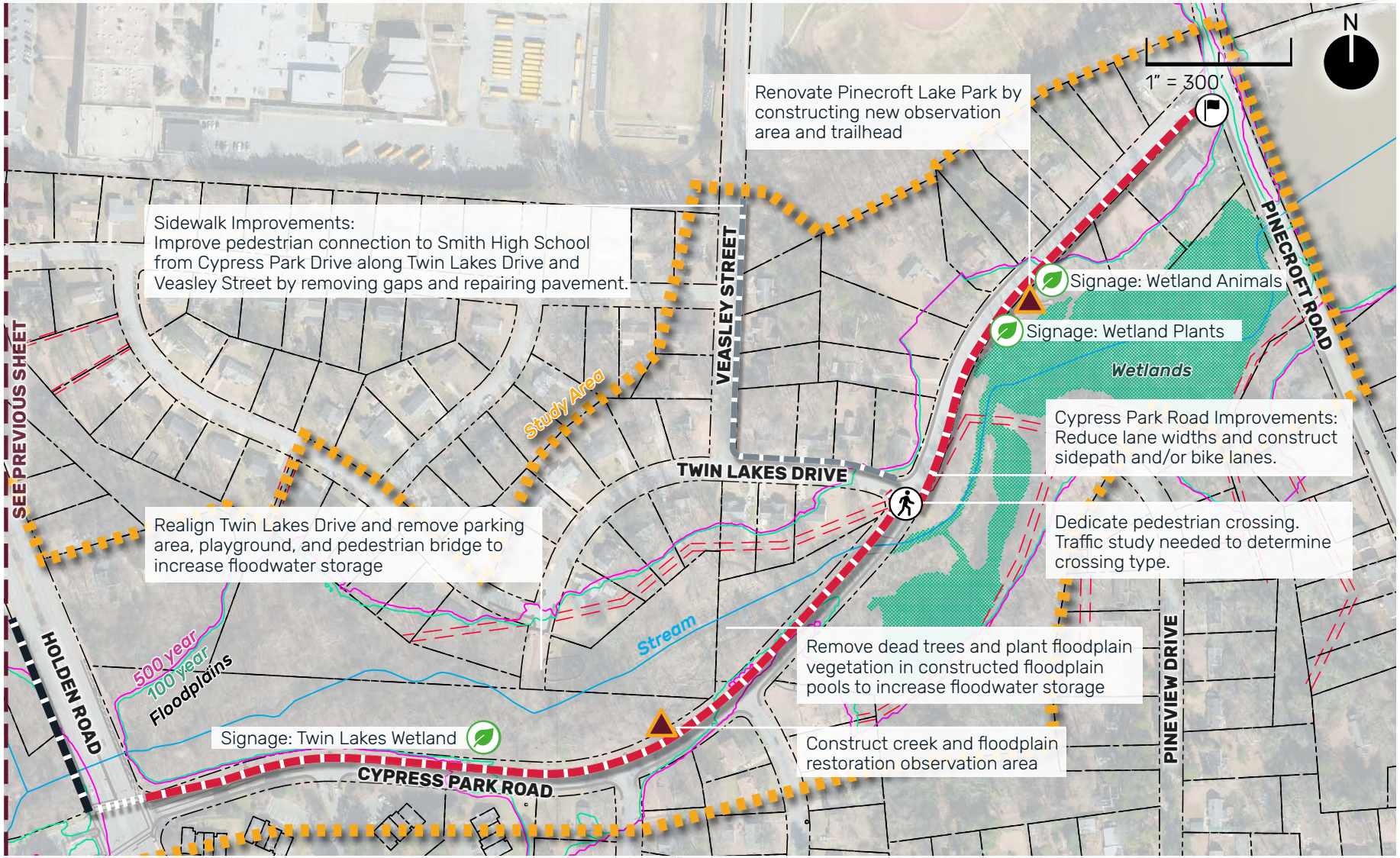
Estimated Design Services (13% conctruction cost): $ 120,000

Build Year	2025
Escalated Construction Cost Estimate Escalated:	$ 1,080,000
Contingency (30% construction cost):	$ 324,000
Estimated CEI Services (12% construction cost)	$ 129,000
TOTAL CONSTRUCTION COST ESTIMATE:	**$ 1,533,600**

**Cost associated with right-of-way acqusition to be determined during design process and are not included in this estimate*

*** Detailed cost information in Appendix C*

SEGMENT 2



LEGEND

- 10' Wide "Dirtway"
- 10' Wide Paved Path
- Sidewalk Renovation
- Proposed Sidewalk
- Existing Crosswalk
- Proposed Pedestrian Crossing
- Proposed Trailhead
- Environmental Signage

McAdams

Prepared By: JAP Date: 7/12/2022
Checked By: GDB Date: 7/12/2022
McAdams Project No: 000GBO2101.00

Twin Lakes Revitalization

Project Location: Greensboro, NC
Project Description: Natural Surface Trails and 10' Multi-Use Path
Client: City of Greensboro
Client Project No. 000GBO2101

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

OVERALL SUMMARY

Segment	Segment Length (mi.)	Cost
1 (GLEN HOLLOW TO HOLDEN)	0.49	$379,000
2 (HOLDEN TO PINECROFT)	0.55	$1,203,000
SECU CONNECTION	0.12	$111,000
PINEVIEW DR CONNECTION	0.05	$138,000
TOTAL	1.22	$1,831,000

Twin Lakes Revitalization

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ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 1 - Glen Hollow to Holden						
Section	**Item Code**	**Item Description**	**Quantity**	**Unit**	**Unit Price**	**Cost**
800	0000100000-N	MOBILIZATION	1	LS	$ 13,400.00	$ 13,400.00
801	0000400000-N	CONSTRUCTION SURVEYING	1	LS	$ 10,000.00	$ 10,000.00
SP	1115000000-E	GEOTEXTILE FOR PAVEMENT STABILIZATION	2730	SY	$ 4.00	$ 10,920.00
520	1121000000-E	AGGREGATE BASE COURSE	1060	TON	$ 50.00	$ 53,000.00
SP		COMPREHENSIVE GRADING, SEGMENT 1	1	LS	$ 100,000.00	$ 100,000.00
SP		DRAINAGE	1	LS	$ 25,000.00	$ 25,000.00
SP		EROSION CONTROL	1	LS	$ 53,000.00	$ 53,000.00
SP		TRAFFIC CONTROL	1	LS	$ 10,000.00	$ 10,000.00
SP		ENVIRONMENTAL EDUCATION COMPONENT #1	1	LS	$ 6,000.00	$ 6,000.00
SP		ENVIRONMENTAL EDUCATION COMPONENT #2	1	LS	$ 10,000.00	$ 10,000.00

SUBTOTAL **$291,320.00**

CONTINGENCY @ 30% **$87,396.00**

CONSTRUCTION COST SAY **$379,000**

Notes:
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7. Road diet does not include modifications to existing curb line, drainage, or utilities.

McAdams

Prepared By: JAP Date: 7/12/2022
Checked By: GDB Date: 7/12/2022
McAdams Project No: 000GBO2101.00

Twin Lakes Revitalization

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ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 2 - Holden to Pinecroft						
Section	**Item Code**	**Item Description**	**Quantity**	**Unit**	**Unit Price**	**Cost**
800	0000100000-N	MOBILIZATION	1	LS	$ 43,600.00	$ 43,600.00
801	0000400000-N	CONSTRUCTION SURVEYING	1	LS	$ 10,000.00	$ 10,000.00
SP		COMPREHENSIVE GRADING, SEGMENT 2	1	LS	$ 40,000.00	$ 40,000.00
SP		DEMOLITION	4000	SF	$ 0.50	$ 2,000.00
SP		DRAINAGE	1	LS	$ 25,000.00	$ 25,000.00
SP		EROSION CONTROL	1	LS	$ 53,000.00	$ 53,000.00
SP		TRAFFIC CONTROL	1	LS	$ 25,000.00	$ 25,000.00
SP		6" CLASS B CONCRETE	1230	SY	$ 80.00	$ 98,400.00
SP		MID-BLOCK ROADWAY CROSSING	1	EA	$ 5,000.00	$ 5,000.00
SP		ROAD DIET	1805	LF	$ 175.00	$ 315,875.00
SP		ENVIRONMENTAL EDUCATION COMPONENT #3	1	LS	$ 17,000.00	$ 17,000.00
SP		STORMWATER MANAGEMENT (REVISION TO TWIN LAKES DR INTERSECTION)	1	LS	$ 75,000.00	$ 75,000.00
SP		STORMWATER MANAGEMENT (WETLAND FLOODPLAIN GRADING & PLANTING)	1	LS	$ 30,000.00	$ 30,000.00
SP		STORMWATER MANAGEMENT (ROAD DIET STORMWATER)	1	LS	$ 40,000.00	$ 40,000.00
SP		STORMWATER MANAGEMENT (BAFFLE IN CULVERT)	1	LS	$ 25,000.00	$ 25,000.00
SP		OVERLOOK	2	EA	$ 60,000.00	$ 120,000.00

SUBTOTAL **$924,875.00**

CONTINGENCY @ 30% **$277,462.50**

CONSTRUCTION COST SAY **$1,203,000**

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McAdams

Prepared By: JAP Date: 7/12/2022
Checked By: GDB Date: 7/12/2022
McAdams Project No: 000GBO2101.00

Twin Lakes Revitalization

Project Location: Greensboro, NC
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ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

SECU Connection						
Section	**Item Code**	**Item Description**	**Quantity**	**Unit**	**Unit Price**	**Cost**
800	0000100000-N	MOBILIZATION	1	LS	$ 4,000.00	$ 4,000.00
801	0000400000-N	CONSTRUCTION SURVEYING	1	LS	$ 3,000.00	$ 3,000.00
SP		COMPREHENSIVE GRADING, CONNECTION 1	1	LS	$ 25,000.00	$ 25,000.00
SP		DRAINAGE	1	LS	$ 5,000.00	$ 5,000.00
SP		EROSION CONTROL	1	LS	$ 13,000.00	$ 13,000.00
SP		6" CLASS B CONCRETE	440	SY	$ 80.00	$ 35,200.00

SUBTOTAL **$85,200.00**

CONTINGENCY @ **30%** **$25,560.00**

CONSTRUCTION COST **SAY** **$111,000**

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Twin Lakes Revitalization

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ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Pineview Dr Connection (Add Alt)						
Section	**Item Code**	**Item Description**	**Quantity**	**Unit**	**Unit Price**	**Cost**
800	0000100000-N	MOBILIZATION	1	LS	$ 5,000.00	$ 5,000.00
801	0000400000-N	CONSTRUCTION SURVEYING	1	LS	$ 2,000.00	$ 2,000.00
SP		COMPREHENSIVE GRADING, CONNECTION 2	1	LS	$ 10,000.00	$ 10,000.00
SP		DRAINAGE	1	LS	$ 5,000.00	$ 5,000.00
SP		EROSION CONTROL	1	LS	$ 6,000.00	$ 6,000.00
SP		TIMBER PILE CONCRETE BOARDWALK	40	LF	$ 1,500.00	$ 60,000.00
SP		6" CLASS B CONCRETE	220	SY	$ 80.00	$ 17,600.00

SUBTOTAL **$105,600.00**

CONTINGENCY @ **30%** **$31,680.00**

CONSTRUCTION COST **SAY** **$138,000**

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