

9 Design Guidelines



Photo-simulation of trail in sewer easement behind Weaver's Pond

Overview

The Design Guidelines provides information for the following greenway trail design issues:

- Design considerations and regulations
- Greenway Trail features
- Signage and Pavement Markings
- Amenities

Design Considerations

Greenways are developed in multiple area types and can play a part to protect certain aspects of the community and the environment. These trails can also be used to connect neighborhoods, community buildings, schools, and waterways. The function of greenway design is predicated on the area where it is located.

Greenway trails as Environmental Protection

Greenway trails are used in environmentally sensitive areas as a protection or buffer, while also not endangering those areas. New greenway trails should not impact streams, endangered species, water supplies, forested areas, steep slopes or unique ecological features. As part of the trail system, the buffer that will be created will vary in size, but will mostly be in the 30-50 foot range. This gives enough of an area for the protection while also providing enough space for the trail user.



Box Turtles along Trail in Cary, NC

Connections to Destinations

Greenway trails should be developed in locations where there may already be open space and cleared areas that connect destinations. This included existing sewer lines and easements and cleared areas around schools. Using existing sewer lines will reduce costs and increase visibility of both the utility and the trail while also providing more access. The Town must work closely with the utility companies to create shared corridors.

Using Low Impact Design and Stormwater Considerations

Stormwater management will be an essential part to any trail design with the increase in impervious surface. Since the greenway acts a linear park, it is important to try and keep the stormwater management within the greenway buffer zone. Therefore, green techniques such as bio-retention, vegetated swales, or underground infiltration systems may be used to increase environmental stability while also increasing stormwater management awareness.



Stormwater Device along a trail

Trail Facilities

Design practices for greenway trails include the type of surfacing for each project. Hard surfaces are used on trails to comply with the Americans Disabilities Act (ADA) guidelines for ease of access and use. Typically, greenway trails used asphalt surfacing. It is a smooth surface and easier on users than concrete, but also requires more upkeep and maintenance. The life span of an asphalt trail is about 15 years and works well on areas with high slopes (over 3%). Concrete may be a viable candidate in the more urban sections of the greenway system to keep the look and feel similar to other already established sidewalks. Concrete has a life span of almost 25 years, but is also more expensive than asphalt. Gravel fines can be used for trails with a more stable slope. Natural surface or mulched trails are applicable if the intended use is mostly for walking or hiking. Permeable paving is also an option, but does cost almost twice as much as asphalt and needs more maintenance (clean out trapped debris and erosion on a regular basis). On larger trail sections, a combination of materials can be used to provide both adequate facilities for bicyclists and walkers/runners.

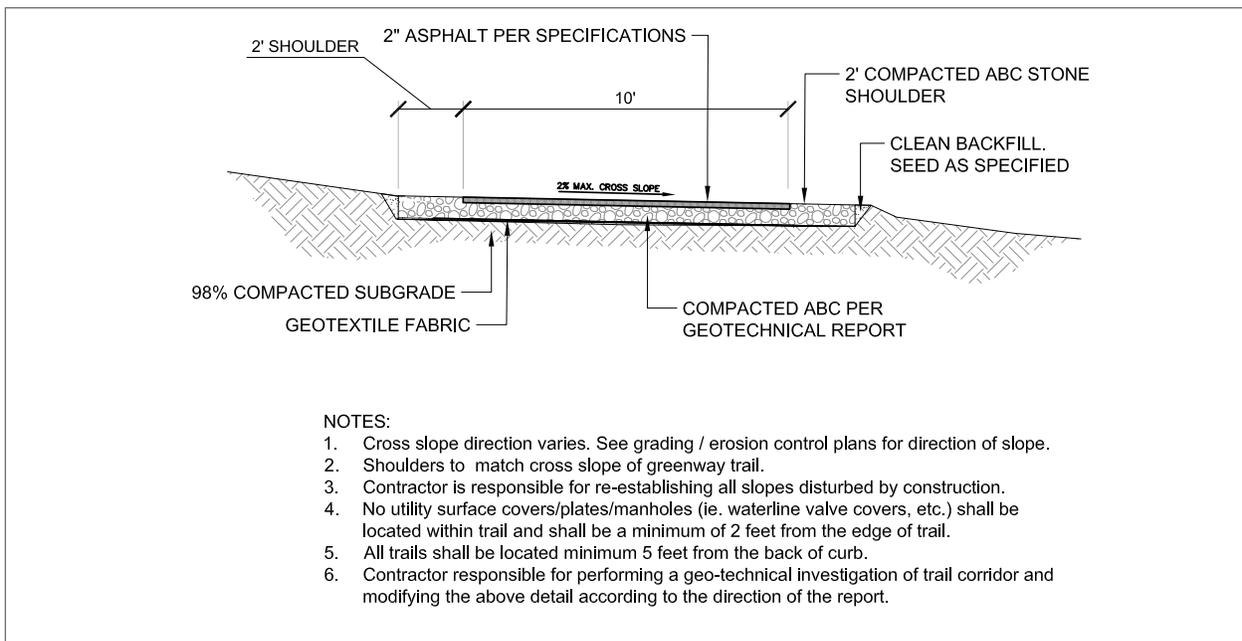


American Tobacco Trail - Chapel Hill, NC

Permitting

All greenway trails will require permitting from multiple agencies such as:

- Wake County Stormwater Management (National Pollutant Discharge Elimination System General Permit)
- Wake County Floodplain Development Permit
- NC Division of Land Quality Erosion Control Permit
- Town Building Permit (for structures)
- North Carolina Department of Transportation Encroachment Permit (other agency encroachment agreement permit may be required)
- FEMA Conditional Letter of Map Revision (CLOMR)/FEMA Letter of Map Revision (LOMR)
- U.S. Army Corps of Engineers Section 401/404 Permit, Pre-Construction Notification (PCN) Permit
- NEPA Environmental Documentation (if federally funded project)



Typical Trail Section

Trail Design

Width

The width for any greenway trail should have a minimum of eight (8) feet and a maximum of twelve (12) feet depending on proposed traffic on the facility. Eight feet is typically used for smaller, neighborhood connections that are less in overall length, or to create a smaller section to use in an environmentally sensitive area. Ten (10) feet is recommended for most situations and is adequate for most trails and ADA compliant, as ADA would like to see at least five (5) feet in each direction.

Shoulders and Clearances

A minimum of two (2) foot shoulders should be provided on each side of the trail. There should also be at least four (4) feet of clearance to any sign or obstruction. Clearance to overhead obstructions should be at least eight (8) feet while ten (10) feet is recommended.

Grades

Greenway trails should adhere to ADAAG standards when possible. The longitudinal slope should be a maximum of ten (10) percent. Cross slopes should be two (2) percent to provide positive drainage. Safety railing of 48 inches should be provided where there are slopes of 3:1 or greater within 6 feet of the edge of pavement. On natural or mulched trails, the maximum slope shall be five (5) percent and the minimum slope shall be two (2) percent to allow for drainage.

Typical section

Trail foundation should be stable with a minimum of six (6) inches of stone base and two (2) inches of surface material. If vehicles may be used on the trail section, a stronger section will be expected.

ADA Compliance

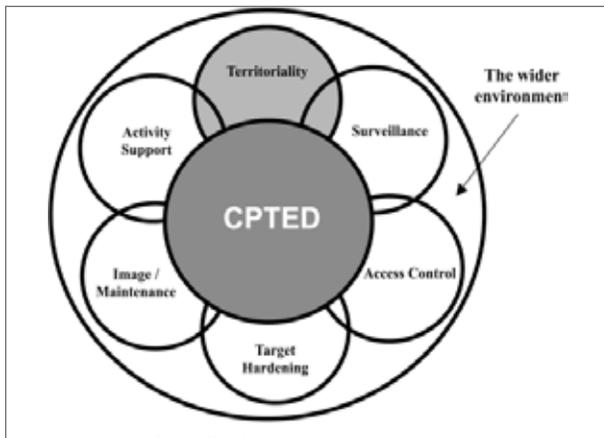
It can be difficult sometimes to meet ADA requirements while designing and constructing greenway trails. The United State Access Board has approved ADA guidelines for greenways and outdoor routes. Prohibitive impacts include topography and slopes, environmental features, and local regulations. ADA compliance includes: hardened surface, clear tread width of 36 inches, cross slope of 2%, longitudinal slope of 5% (could be higher with resting areas), passing space every 1,000 feet where trail is less than eight (8) feet, pavement changes near curb ramps, accessible signage, and accessible facilities and amenities.



Grit Trail - Cary, NC

Crime Prevention through Environmental Design (CPTED)

It is the design intent to incorporate Crime Prevention Through Environmental Design (CPTED) principles into the design of any greenway trail. The design guide will be used where appropriate in this setting to further enhance the user experience and create a more safe condition. The four design strategies of CPTED, Natural Surveillance, Territorial Enforcement, Natural Access control, and Target Hardening, will be evaluated by our design staff for applicability on any project. Recommendations from staff, along with local citizens, law enforcement, and other relevant City departments will be considered and incorporated into the design.



CPTED logo

Design Considerations in Special areas

Stream buffers

The trails inside stream buffers are located within hyper-sensitive environmental areas. Positive drainage must be kept and special NCDENR permits will be needed while meeting Neuse River buffer rules. The trail should try to follow contours as best as possible and vegetation removal should be minimized.



Trail within Power Easement

Trails within utility corridors

All trails located within utility easements must follow the utility's specific rules. These trails should be at least ten (10) feet to accommodate utility maintenance vehicles. Within sewer easements, the trail should be located at least ten (10) feet from any sewer manhole or equipment. Within power transmission line corridors, the trail must not be closer than 25 feet from any towers, poles, or guy wires.



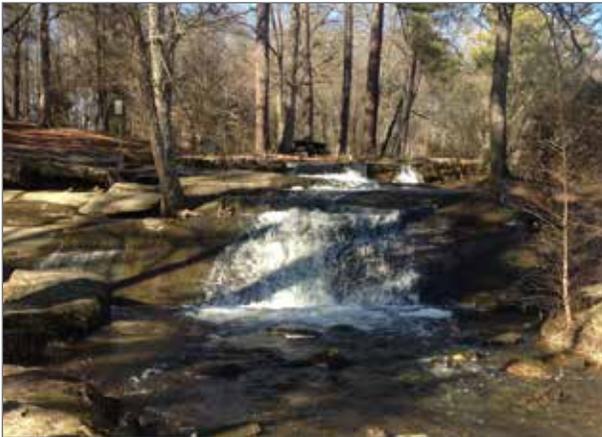
Trail within Power Easement



NC55 Streetside Trail - Cary, NC

Trails within Roadway Corridors

Trails will work best along roadways that have limited driveways. Should have a minimum width of ten (10) feet with at least six (6) feet between the trail and roadway. Any trail within NCDOT ROW will require an encroachment agreement. Location of the trail must follow the AASHTO Green Book requirements for roadside recovery.



Little River Park

Access points

The greenway trail system should provide adequate access from close-by neighborhoods, businesses, and industry. It is also important to include parking or congregation areas where users can enter the greenway trail system with ease. Trailheads and parking lots are good examples of well used access points. PIC: Little River Park All access areas must follow Town of Zebulon standard planning and zoning guidelines.



Spur Trail along Speight Branch Greenway - Cary, NC

Parking areas

On shorter trails and ones that are not located near existing public facilities (such as the Community Center), parking areas will be needed for users that don't live near the trails. Parking areas can be a multitude of surfaces with asphalt being the preferred standard. Gravel or other non-hard surfaces can be used in locations with more environmental sensibility or lower expected use. These minor parking areas should have 5-10 parking spaces, with at least one (1) paved accessible space. The lots must meet ADA slope standards. Emergency access must be able to be maintained while vehicles are parked.



Lassiter Mill Historic Park Parking lot - Raleigh, NC

Trailheads

Trailheads are used for greenway trails that may have a larger population using the trail or are located in a dense area of use. Trailheads may include amenities such as bathrooms, bicycle parking spaces, trash receptacles, water fountains, dog waste stations, bicycle repair stations, and major greenway trail wayfinding signage. It will be typical for trailheads to have 10-30 parking spaces with at least two (2) accessible spaces. Sidewalks should be provided from the edge of the lots to the greenway trail entrance.



Speight Branch Greenway - Cary, NC



American Tobacco Trail - Durham, NC

Neighborhood Access

Some of the accesses to the trail system will be directly from neighborhoods or business areas. These points must be clearly signed as entrances to the trails. Width of the trail will be at least six (6) feet and eight (8) to ten (10) feet is preferred. If the intent is to pull nearby citizens, “No Parking” signs may be installed to keep the entrance limited.



White Oak Creek Spur Trail - Cary, NC

Vegetation and landscaping considerations

The removal of native vegetation should be limited within the greenway corridors as nature is an important aspect of any greenway system. In highly forested areas, existing vegetation creates a balance to the corridor as well as keep natural habitats, privacy screening, and stabilize slopes and soils. Tree canopies can be kept to provide shade in warmer times of the year. Other vegetation can supplement the trail, but safety of the user must be a component of the design. Vegetation location must also meet all AASHTO sight distance requirements for trail usage and therefore ground shrubs, bushes, and plantings should be avoided.



White Oak Creek Spur Trail - Cary, NC

Shared Access

The trails access points should be located in areas where shared uses can occur, such as schools and existing parks and Town facilities. Where this shared access occurs, time and day usage must be balanced between the existing use and the trail. The shared use also allows for more parking and shared amenities and will act as de facto trailheads. Signage will be important as greenway trail access should be clearly identified and not interfere with existing use signage.



White Deer Park Greenway - Garner, NC



Speight Branch Greenway - Cary, NC

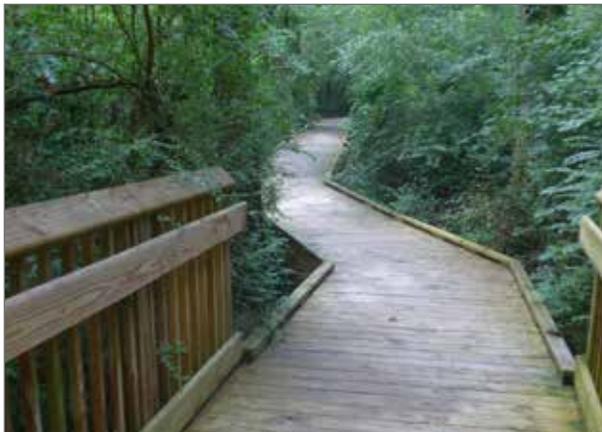
Boardwalks

Boardwalks are raised structures that should be used over environmentally sensitive or natural areas. These are typical for crossing smaller streams and wetland areas where the trail does not need to cross a floodway perpendicularly. The object is reduce or keep flood elevations the same as before the trail was located there to create a no-rise situation. Boardwalks can be made of materials including wood, composite decking, or concrete. The material of used depends on the up-front costs verses long term maintenance costs. Wood will be the lowest cost option at construction but highest cost to maintain, while concrete will be high cost at construction and virtually no cost to maintain.

Boardwalks should be at least 10 feet in width (where no railings are used) and up to 14 feet. Railings are encouraged to be used on all boardwalk locations and should be 42 inches in height.



Batchelor Branch Greenway - Cary, NC



Bolin Creek Greenway Boardwalk - Chapel Hill, NC

Bollards

Bollards can be used as physical barriers to restrict motor vehicle access to the trails. These are typically used near roadway access and intersection curb cuts. Bollard should be used at all major access points, trailheads, parking areas, and shared use areas. Bollard should be a minimum of 40 inches tall and four (4) inches wide. Setback from any roadway be at least 20 feet and they should be at least 6 feet apart when more than one is used. Bollards should be a bright color such as yellow or bright orange. Locks should be used on bollards and only can be opened by authorized users, Town staff, and emergency staff. Signage can be used to supplement the message.



Speight Branch Greenway - Cary, NC

Bridges

Bridges are used to traverse natural, wetland, and floodway areas where a culvert is not an option. They are also used to cross major highways.

The length and size of the bridges will depend on local conditions, such as FEMA floodway locations and elevations, environmental features, habitats, needed vehicles access, nearby connections, and highway width. There should be a smooth transition from the trail to the bridge, which may include the use of steel plates or a concrete approach.

Railing heights should be a minimum of 42 inches with a preference of 48 inches. Minimum overhead clearance is 10 feet and the opening between railing posts is 4 inches. All abutment and foundation designs should be completed and sealed by a licensed structural engineer. Bridges must be all local and state permitting regulations, as well as FEMA where necessary.



American Tobacco Trail Bridge - Durham, NC



Hinshaw Greenway Bridge over US1/64 - Cary, NC



Morgan Creek Greenway Bridge - Chapel Hill, NC



Underpass - Chapel Hill, NC

Underpasses



Underpass on Black Creek Greenway - Cary, NC

Signage



Town of Chapel Hill Rules Signage



Town of Cary Wayfinding Signage



Town of Cary Educational Signage



City of Raleigh Wayfinding Signage