Concept Plan for the Dry Creek Greenway Trail

Town of Chapel Hill, North Carolina

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PROJECT OVERVIEW AND PROCESS FOR DEVELOPMENT

This Concept Plan is the first step toward the realization of the extension of the Dry Creek Greenway Trail from Perry Creek Drive to Providence Road. The Concept Plan analyzes issues relating to constructability, cost, environmental impact, land ownership, and experiential value of the trail, and presents route alternatives. The Concept Plan is intended to be a tool to help public officials make fully informed decisions for establishing project budgets and schedules, acquiring land and/or easements, and coordinating with other planned infrastructure improvements.

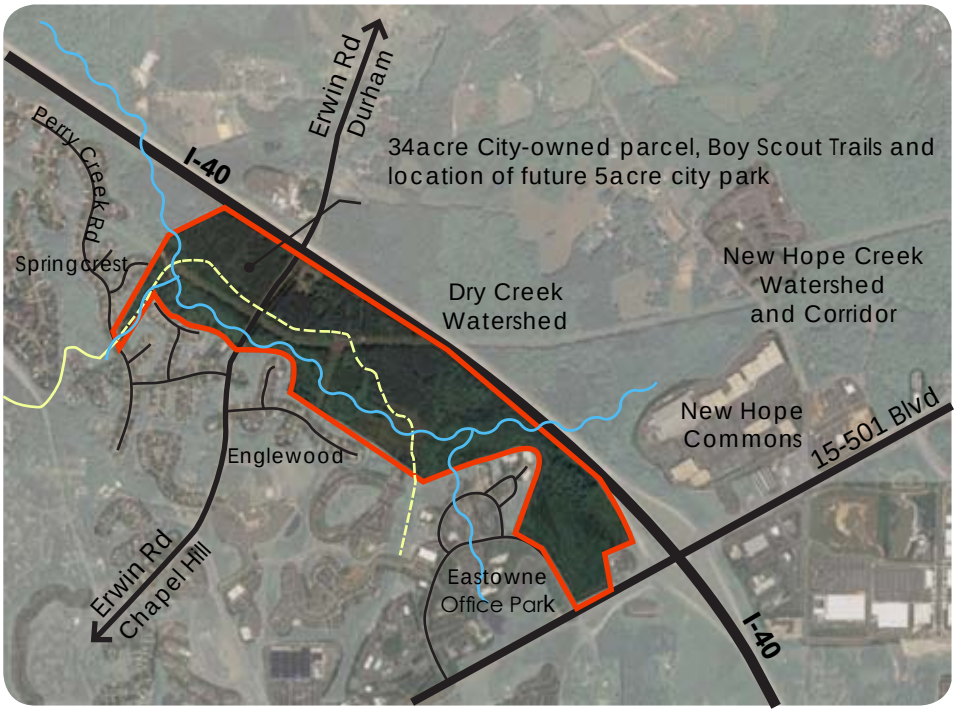


Figure 1: Context Map

The Dry Creek Greenway is located in northeast Chapel Hill within the Dry Creek watershed. Dry Creek is a major tributary of New Hope Creek (Figure 1). The existing portion of the Dry Creek Trail is a natural surface trail that runs 1.2 miles along the southern branch of Dry Creek and links East Chapel Hill High School to the Silver Creek and Springcrest neighborhoods at Perry Creek Drive (Figure 2). From Perry Creek Drive, the trail continues as a natural surface trail, over an existing bridge and then connects to a series of loop trails within a 34-acre parcel bought by the Town of Chapel Hill in 2000. This portion of the trail is approximately 2,100 feet long. Phase I of the greenway project would include surfacing a portion of the existing natural surface trail in asphalt and developing a new portion of the trail between the existing bridge and Erwin Road. Phase II would continue the trail from Erwin Road to Providence Road at the Eastowne Office Park. The current length of Dry Creek trail is 1.2 miles. The proposed length of Phase I would be approximately 0.5 miles, and Phase II would be approximately 0.7 miles. At total build-out, the project would extend the

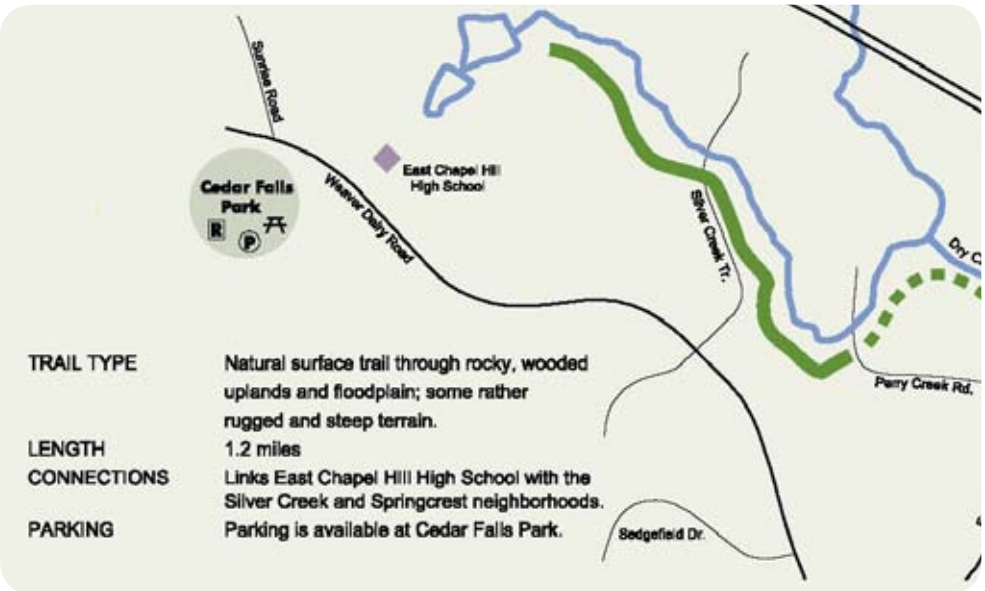


Figure 2: Portion of Dry Creek Trail Map shwoing Existing Section of Trail: Chapel Hill Greenway Trail Map

trail approximately 1.2 miles (Exhibit D). Though relatively short in length, Phase I of the Dry Creek Greenway would be a major step toward linking the Chapel Hill greenway system with Durham County and the future New Hope Creek Corridor Trail, (see Figure 10), as well as connecting the Greenways system to major shopping centers along Highway 15-501. Phase II, from Erwin Road to Providence Road would provide low-impact access to one of Orange County's most important ecological habitats.

The alternatives discussed in this Concept Plan are consistent with the Chapel Hill Greenways Comprehensive Master Plan, adopted by the Town Council in January 2006 (Figure 3). The Concept Plan also provides specific recommendations for the construction of a pedestrian crossing at Erwin Road, a small, low-impact parking area on the west side of Erwin Road, two minor stream crossings, and a boardwalk/bridge across the wetlands located between Erwin Road and Providence Road.

The process used to develop the Dry Creek Greenway concept plan relied on a number of steps. Initially, goals were developed based on master plan initiatives, site constraints, and conversations with Town of Chapel Hill Parks and Recreation Department. The next step involved analysis of the site including the impact the greenway may have on its immediate neighbors; traffic demands and safety concerns for pedestrians, bicyclists, and motorists; location of existing utilities; jurisdictional requirements and environmental impacts relating to sensitive areas such as the floodplain, wetlands, habitat, mature vegetation and slopes; and views and features that would be enjoyable to the user.

After the site analysis was completed, a technical feasibility study delineated more precise wetland boundaries in order to determine areas for resource protection and to measure environmental and construction costs.

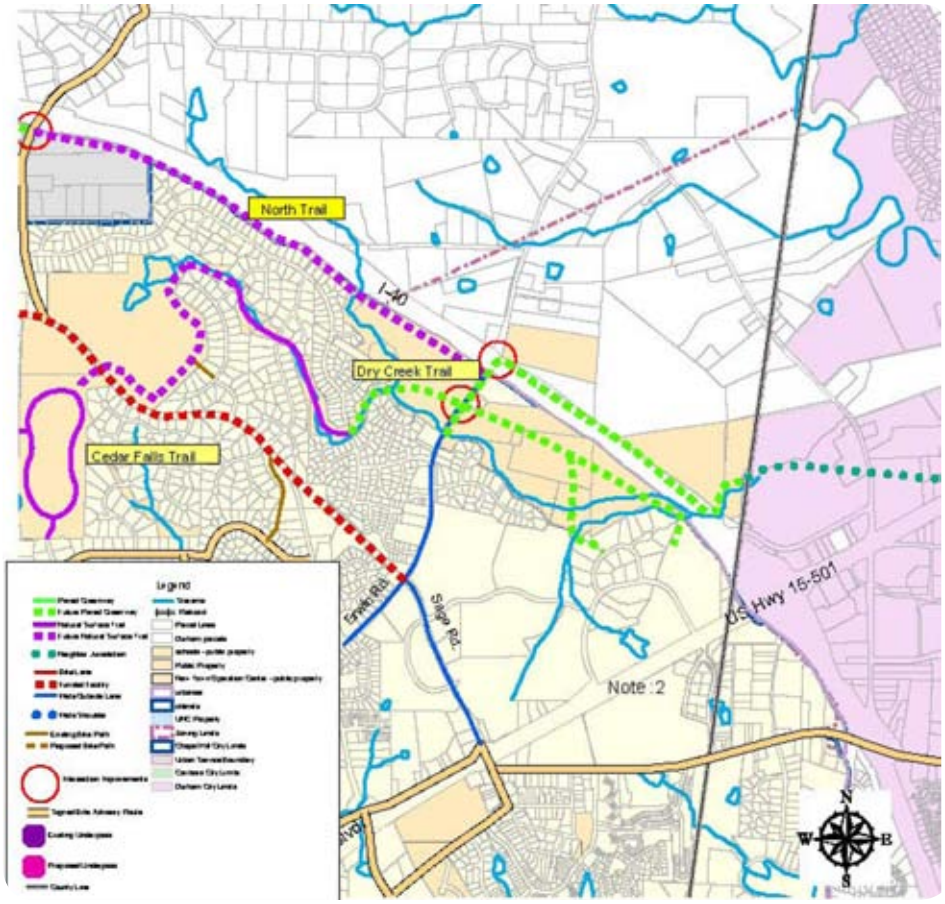


Figure 3: Dry Creek Trail: Chapel Hill Greenways Master Plan (1998)

The Concept Plan was developed using this data. The preliminary draft goals and technical report were then evaluated and commented upon by the Greenway Commission at a public forum in September of 2007. The final stage in the process is to seek approval of the Concept Plan by the Town Council. Upon Council approval, the Final Design phase of the Greenway can begin.

Wetland Edge

PROJECT GOALS

In order to best serve the community, the following goals were established to guide the implementation for the Dry Creek Greenway Concept Plan:

1. **Design a trail that would have as little disturbance to adjacent wetlands as possible.**
   The Dry Creek wetlands east of Erwin Road have been identified in *The Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina* as one of Orange County's most significant natural areas. The trail will remain outside of jurisdictional wetlands except for one perpendicular crossing to access Providence Road.

2. **Design a trail that will not result in an increase in flood elevations and will produce no rise in regulatory flood flows in Dry Creek.** Ideally the design would avoid the necessity of submitting a Letter of Map Revision (LOMR) for any impacts to Dry Creek and its tributaries.
   Flood modeling and a further study of stream channelization during the detailed design phase would determine more precisely the location of the boardwalk/bridge crossing.

3. **Provide a 10 foot wide pedestrian and bicycle trail with a maximum 5% slope to the greatest extent possible, between Perry Creek Drive and Providence Road.**
   This criterion, which is intended to meet the needs of disabled users, would be met throughout the length of the trail wherever possible.

4. **Utilize existing trails and disturbed areas where feasible to protect existing trees and minimize the impact to the environment, including rare species identified in the Triangle Land Conservancy Report.**
   A significant part of the proposed trail utilizes existing trails, sewer easements, and power easements. In forested areas, routes were located to avoid the majority of existing trees. Access to the wetland edge was determined to be the point where the least amount of grading would be necessary. Trails within the Chapel Hill greenway system are always, to some extent, field-located in order to avoid notable trees.

5. **Design an attractive, pedestrian-friendly and safe crossing of Erwin Road.**
   A preliminary study of road crossing options was analyzed with traffic engineers at NCDOT. This plan recommends a trail crossing that includes a pedestrian refuge, traffic control signs, adequate sight distances, and proper speed controls. The plan would be dependent upon final NCDOT approval.

6. **Minimize the impact of the Greenway to surrounding neighbors while providing connectivity to the neighborhoods.**
   Fortunately, the majority of the proposed trail corridor has few close neighbors. The trailhead entrance at Perry Creek Drive has the most and closest neighbors. The trailhead at Providence Road would be near an apartment complex and adjacent to offices. In both locations appropriate buffer plantings and sensitive entrance plantings would minimize the impact of the trail.

7. **Avoid the need to relocate existing utilities.**
   The trail would avoid existing utilities such as sewer outlets, the OWASA substation, and transmission lines.

8. **Plan for a future link to the New Hope Creek Corridor and the Durham County Greenway System by coordinating the Dry Creek plans with the New Hope Corridor Open Space Master Plan.**
   The extension of Dry Creek Trail to Erwin Road would be a major step toward future connections to the New Hope Creek corridor and the Durham County greenway system. A bridge widening at Erwin Road would be necessary for the safest crossing over I-40. In addition, a future bridge crossing of I-40 near Eastowne may be possible.

DESIGN ISSUES

Trail Alignment

The recommended alignment utilizes existing trails, easements, and older logging roads to minimize impacts to existing trees and sensitive areas. Because of the equipment needed to construct the boardwalk, the creek banks and wetland areas will be disturbed. However, siting the crossing in a narrower section of the wetland that has access via either Providence Road or along the proposed trail, will encourage a construction process that will require less grading and disturbance to vegetation. Also, the use of helical piers - which are installed with hand-held equipment and require no excavation - and building a low boardwalk ensures a low-impact alternative to more traditional boardwalk construction.

The recommended trail alignment leaves existing bridges, culverts, and water and sewer lines in place, with the exception of one narrow pedestrian bridge near the OWASA substation, which would be replaced to provide a safe crossing for non-motorized transportation use.

Erwin Road

Widening Erwin Road where the trail would cross is recommended in order to provide a pedestrian refuge island across this busy street. Potential addition of a bike lanes along Erwin Road right of ways could be a first step towards connecting the Town of Chapel Hill greenway system to the Durham County Trailway System and the future New Hope Creek Trail.

The recommended realignment of Erwin Road would shift either one or both edges of the roadway five to ten feet within the existing right-of-way. This measure could potentially affect the appearance of the right-of-way in front of one property on Erwin Road. The improvement of drainage features and slope conditions along these frontages would be part of the realignment project and could allow for the addition of bike lanes or wide shoulders along Erwin Road. Early notification of all properties affected by this realignment is recommended.

Neighbor Issues

Aside from the two trailheads on Perry Creek Drive and Providence Road, the trail is sited away from existing residential areas. North of Perry Creek Drive, the alignment runs sixty to eighty feet behind existing houses. In addition to this horizontal separation, the trail would be approximately ten to twenty feet below these houses in elevation. The final design would provide screening of the trail from adjacent properties where necessary.

Landscape Treatment

In open areas, the greenway should receive a uniform cover of grass to stabilize its shoulders. Ground or shredded wood mulch may also be used in particularly shady areas not suited to lawn establishment. Natural regeneration of woodland vegetation should be encouraged along the trail shoulders in areas outside utility easements. Plantings should also be designed at trailheads to enhance and identify the areas where the greenway interfaces with public roads. Appropriate landscape buffers should be provided where needed to protect the privacy of adjacent homeowners. A mix of low-maintenance native evergreen and deciduous shrubs and trees should be used in order to visually blend with the surrounding vegetation and to better tolerate periods of both drought and inundation. Suggested plant materials to be used for screening purposes could include American holly, inkberry, witch hazel, and wax myrtle.

Trail Amenities

Directional and regulatory signage should be provided throughout the length of the trail, conforming to the current edition of the *Manual of Uniform Traffic Control Devices (MUTCD)*. Trailheads should also include standardized signs to identify the trail and to outline Town greenway regulations and hours of use, as well as benches, bike racks, and trash receptacles (where they can be readily accessed by Solid Waste vehicles for collection.) Proposed site furnishings should incorporate recycled materials wherever practical. Bollards should be used to restrict vehicular traffic at appropriate locations, including street crossings and trailheads. Where appropriate, bollards should be hinged or collapsible to allow emergency and maintenance vehicles access to the trail.

Preliminary Trail Markings

Perry Creek Rd Trailhead and Play Area

Existing Bridge to Boy Scout Trails

PROJECT INVENTORY AND ANALYSIS

Natural History of Site

Between June 1987 and October 1988, Orange County contracted with the Triangle Land Conservancy to conduct an inventory of the "principal natural areas and wildlife habitats of Orange County." The result of which was the document, *The Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina* (Appendix E). The study identified a total of 64 significant natural sites in Orange County. In summary, the paper identified the Dry Creek area as one of only three significant Piedmont Swamp Forest sites in the County. The Piedmont Swamp Forest is unusual in Orange County and can only be found within the Triassic Basin area.

The site contains a relatively large swath of mature bottomland swamp forest. Significant tree species include: red maple (Acer rubrum), white ash (Fraxinus americanus), sweet gum (Liquidambar styraciflua), willow oak (Quercus phellos), Shumard's oak (Quercus shummardii), overcup oak (Q. lyrata), sycamore (Platanus occidentalis), and tulip poplar (Liriodendron tulipifera), with hop hornbeam (Ostrya virginiana) and ironwood (Carpinus caroliniana) occurring in the subcanopy. Water hemlock, lizard's tail, false nettle, aneilema, lycopus, and jewelweed are the main herbaceous species.

The site is also host to a number of rare animal species. Marbled salamanders and other amphibians frequent the large pools for breeding. Thorey's grayback dragonflys (Tachopteryx thoreyi), which is the most significant rare species identified on the site, "breed in the shallow seeps located where the crystalline rock of the Piedmont meets the flat sediments of the Triassic Basin" (See Appendix 6). Other common visitors to area include deer, raccoon, red fox, and groundhog.

Environmental Impact

Much of the proposed trail would lie within 100-year flood limits and the Town's Resource Conservation District (RCD). However, the trail alignment should minimize the impact upon the storage capacity of the floodplain. Preliminary flood modeling confirming the general feasibility of the alternatives outlined in the Concept Plan is presented later in the Concept Plan. However, a more detailed analysis of the final alignments, cross-sections, and bridge structures would be required as part of the eventual design review and permitting process.

Although localized clearing of vegetation, including some larger trees, would be required, impacts to higher quality stands of mature trees can be largely avoided, particularly where existing utility corridors and existing trails can be utilized. The trail would travel through jurisdictional wetlands in at least one location. Any proposed impacts or disturbance to the stream channel of Dry Creek would fall within the review authority of the US Army Corps of Engineers. Construction would be required to utilize Best Management Practices for minimizing erosion and controlling sediment-laden runoff during construction in accordance with North Carolina Department of Environment and Natural Resources regulations.

Design Criteria

Guidelines used to assess the technical feasibility of the Dry Creek Greenway include the *1994 North Carolina Bicycle Facilities Planning and Design Guidelines* by the North Carolina Department of Transportation (NCDOT) and the 1999 third edition of the *Guide for the Development of Bicycle Facilities*, published by the American Association of State Highway and Transportation Officials (AASHTO).

Final design, including exact route selection, horizontal and vertical alignment, trail cross-sections, pavement markings, signage and signalization should adhere to the most current applicable NCDOT and AASHTO guidelines in place at the time of design. Trail access points and the Erwin Road street crossing should be located and designed to ensure adequate site distances and to minimize conflicts with vehicular traffic.

Connections to existing public sidewalks and rights-of-way should be made at Perry Creek Drive and at Providence Road. The at-grade street crossing occurring at Erwin Road should not have longitudinal slopes in excess of 1:20 (5%) and should in no case exceed the maximum gradient of 8%. Cross-slope or pavement crown should not exceed 1/4" per foot (2%). Bridge footings, abutments and pavement sections should be designed by a North Carolina licensed Geotechnical or Structural Engineer in consideration of localized soil conditions, potential for frequent inundation, and to withstand heavy vehicular traffic in instances where the trail could be used by OWASA or other utility providers.

Construction Issues

The primary challenge would involve constructing a low-impact boardwalk/ bridge that would traverse approximately 500 feet of sensitive wetlands. We believe that the boardwalk might contain a bridge segment to alleviate the problem of debris gathering along the up-stream side of the boardwalk. The size and location of any such bridge span should be carefully evaluated by considering the economic and environmental costs.

Exhibits A, B, and C contain further analysis.

GREENWAY ALTERNATIVES AND RECOMMENDATIONS: PHASE I

The Dry Creek Greenway is currently planned to be built in two phases for budgetary reasons. Phase I would be constructed from Perry Creek Drive to Erwin Road. Phase II would be constructed from Erwin Road to Providence Road (Exhibit D).

Phase I: Perry Creek Drive to Erwin Road

Description

Phase I of the Dry Creek Greenway (Exhibit E) would begin on the north side of Perry Creek Drive. It would continue to the north along an existing gravel trail on the OWASA sewer easement. It would then cross a Duke Energy transmission line that runs adjacent to the creek. From there the trail would cross over a tributary of Dry Creek on an existing 5-ton rated corten steel bridge. Poorly drained soils and consistently wet conditions found on either side of the trail may require further grading near the entrance and bridge.

After crossing the bridge, the trail would turn to the northeast of the transmission easement and cross an ephemeral stream. Though dry most of the time, the steep slopes edging this ephemeral stream (see Appendix A1) and the occasional rise in water level may require a culvert to maintain the trail. Minimal grading in this area is proposed to ensure a slope of 5% or less.

After crossing the ephemeral stream, the trail would continue to the north of the Dry Creek wetland area, avoiding close proximity to the Duke Energy power easement. This portion of the trail would be tree-covered and gently rolling as it runs along the side-slopes of a ridge. Though loblolly pines dominate this area, a mix of tree species, including red cedar, American beech, red oak, holly, tulip poplar, and sweet gum would provide shade, buffering from the easement, and interest along the trail. The proposed trail is aligned to avoid disturbance of mature trees. Where tree damage may occur, understory and canopy trees would be planted to encourage appropriate forest regeneration.

Phase I of the Dry Creek Greenway Trail would terminate at Erwin Road. A proposed parking lot with space for 8-10 vehicles would be located approximately two hundred feet north of the proposed crossing of Erwin Road. The parking lot is intended to serve visitors to the greenway trail, existing nature trails, and a future 5-acre park. The park is identified in the Town's 2002 Parks *and Recreation Master Plan*.

Perry Creek Drive Trailhead

The proposed trailhead at Perry Creek Drive would be located in the heart of the Springcrest neighborhood. It would include a crosswalk that would connect the existing natural-surface Dry Creek Trail to the proposed paved trail. The entry along both sides of Perry Creek Drive would include Town of Chapel Hill greenway trail signage. Low maintenance, attractive, native plantings would line the entrance and direct the traveler towards a grassy area that will provide an enlarged play space. Chapel Hill boulders and/or modest stone columns, consistent with those proposed along Erwin Road, would subtley demarcate the entrance to both sides of the trial.

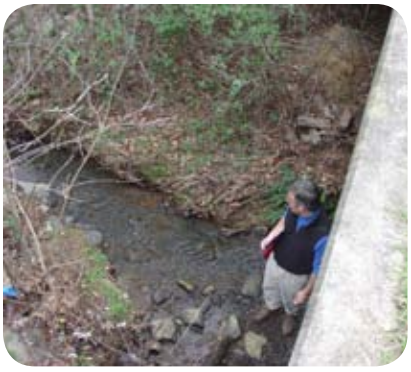
The existing culvert under Perry Creek Drive creates a steep enough slope that some grading along the first 500 feet of the trail would be required to maintain less than a 5% slope as the trail slopes down to run along Dry Creek. Poorly drained soils and low-lying wet areas to either side of the trail may require further grading and/or additional drainage options.

Sewer outlets line the eastern side of the trail for the first 800 feet along Dry Creek. Steep slopes with larger boulder outcroppings are located on the opposite side of Dry Creek and are of visual interest. Revegetation along portions of this stretch would help detract from the sewer outlets, provide additional drainage benefits, and buffer surrounding residential properties.

Grass Area at Perry Creek Road Trailhead

Adjacent neighbors have recommended that the existing, small grass area be graded at a 2% slope to provide a play area for the neighborhood. The trail would hug the steeper slopes along the creek to provide as much open green space as possible.

Perry Creek Rd Trailhead and Play Area



Culvert under Perry Creek Rd

Existing Grassy Area

Figure 4: Trailhead and Grass Area at Perry Creek Road

Buffer plantings of evergreens and native shrubs along the edge of the grass area would provide adequate screening along residential property to the north. The exact configuration of the grass area would be determined during the detailed design phase with the help of adjacent neighbors. The goal would be to create an area for neighborhood play while maintaining trail grades suitable for use by all visitors.

An 18"- 24" high stone retaining wall along the Perry Creek Drive side of the grass area would provide a place for visitors to sit and relax. Planting along the steep shoulder of the road which leads down to the grass area would provide seasonal interest, slope stabilization and protection from views of the road. (Figure 4).

Proposed Route beyond the Perry Creek Road Trailhead

The trail would use the existing bridge over Dry Creek to reach Town property on the north side of the creek. This bridge was designed and located with the intention to continue the trail along the north side of the creek and avoid disturbing several thousand feet of wetlands surrounding Dry Creek. Furthermore, locating the trail on the north side of the creek would allow direct access from the Springcrest neighborhood to a proposed neighborhood park site, the proposed parking lot, and the preferred location of a pedestrian crossing at Erwin Road.

Parking Area and Trailheads at Erwin Road

Because the Erwin Road is an important gateway into Chapel Hill the parking lot, trailheads, phase II pedestrian crossing, and road widening should be designed with a level of detail that enhances ones sense of arrival into Town. The experience should add to the aesthetics of the trail. The design development phase of the project would include exploration of the use of public art, stone, and native plantings typical to Chapel Hill. The project should add to the beauty and aesthetics of the entranceway, while creating a place of interest that motorists would slow down to see as they pass through that location.

Three alternatives for the proposed parking lot were studied during the initial process for the Concept Plan:

- The west side of Erwin Road, 200 feet north of the proposed location of the Erwin Road crossing.
- The east side of Erwin Road near the Duke Energy access drive.
- Along the Duke Energy easement on the west side of Erwin Road

The first of these options is the preferred location for various reasons. This parking area could best serve visitors to the greenway, the existing Eagle Scout trails, and the future proposed 5-acre park. The proposed site for the parking lot is situated in close proximity to the existing trail entrance sign off of Erwin Road and is also within 100 feet from the proposed location of the paved trail. This distance provides adequate buffering from the trail but is close enough to the main trail to minimize the amount of grading and tree damage potentially required.

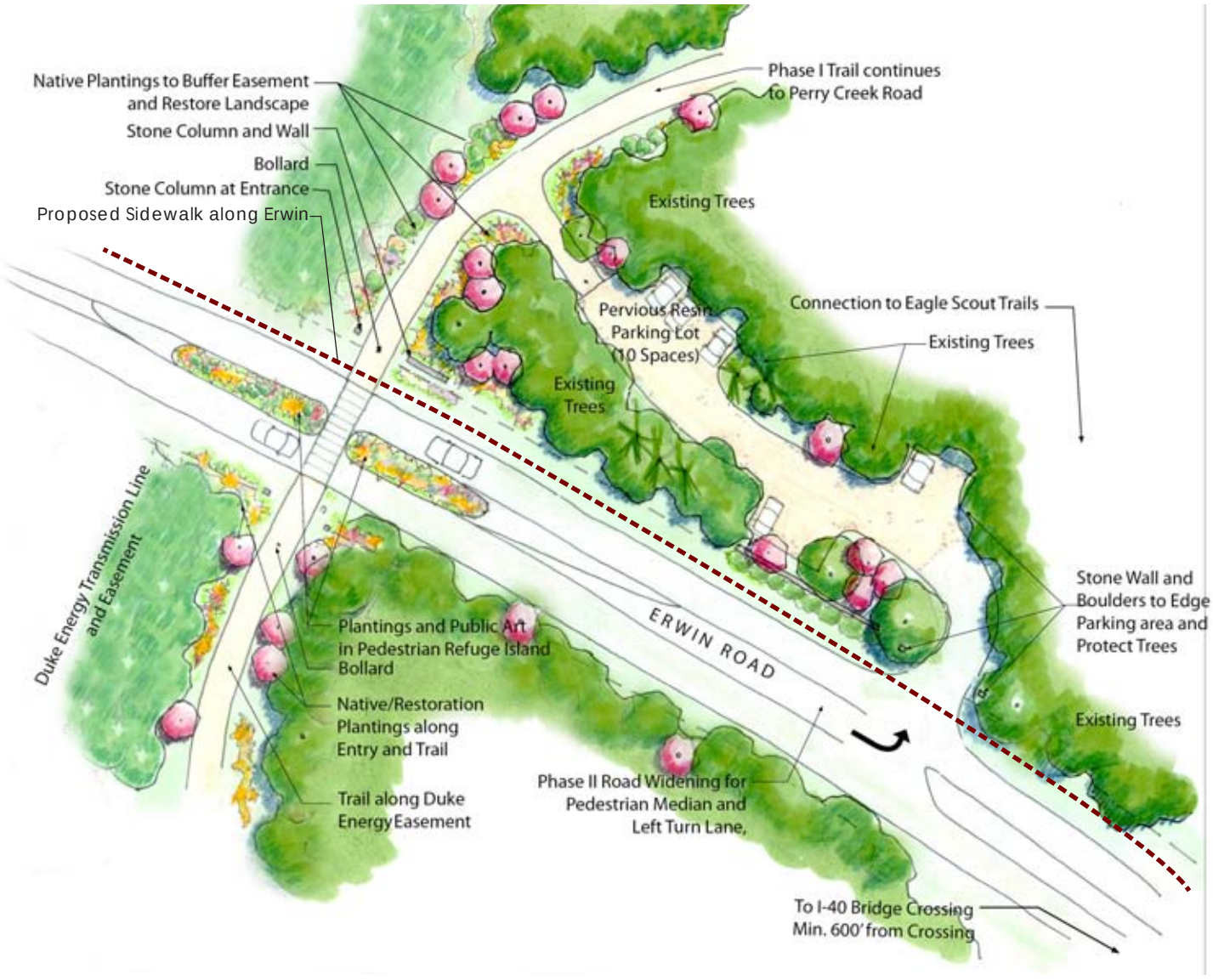


Figure 5: Parking Lot, Trailheads, and Pedestrian Crossing at Erwin Road

GREENWAY ALTERNATIVES AND RECOMMENDATIONS: PHASE II

Phase II of Dry Creek Greenway would include widening a portion of Erwin Road to allow for a pedestrian refuge median and a left turn lane into the parking lot. Considerations of proper sight distances and deceleration requirements from both the bridge over I-40 and the pedestrian crossing determined that the best location for the parking is along the west side of Erwin Road (Appendix B). The required deceleration distance for the left turn from Erwin Road will determine where the drive into the parking lot should be located.

The parking lot is set back an additional 10 feet from the 60 foot right-of-way of Erwin Road. This additional ten-foot set back would allow for adequate space for additional buffering from the road. The buffer could include items such as a low stone retaining wall and additional native shrub plantings. Modest stone columns at the parking lot and additional native plantings would tastefully indicate the entrance to the parking lot. The design of the parking lot should provide pockets for parking spaces among existing trees. Boulders, stones and/or timber edging, plus native shrubs and groundcover planting used to indicate parking space locations could help protect existing trees from vehicular use.

Because of the expressed concerns of citizens and the stated project goal of minimizing the trail's impact to natural areas, various paving options for the parking lot were considered. Aggregate binders-made of non-toxic, natural plant byproducts including plantago (Indian wheat) - are porous, lighter in color and thus reflect light and reduce heat re-radiation. Aggregate binders act and look like compacted gravel, but allow better percolation. Unlike asphalt, aggregate binders do not contain petrochemicals, making them a preferred substitute around environmentally sensitive riparian corridors like Dry Creek and its surrounding wetlands. Using aggregate binders generally costs less than asphalt paving.

Resin Pavement, at approximately the same cost as asphalt paving, is also a binder emulsion that contains no petroleum ingredients but acts similarly to asphalt. The high stability and flexibility of this product is preferred over other aggregate binders because it offers the same environmentally sensitive ingredients and benefits, but is less likely to require as much maintenance and potential for loose, migrating gravel (Figure 5).

Erwin Road Sidewalks

In an effort to provide safe connections from neighborhoods to the entrance of the trailheads on Erwin Road and safer access across Interstate 40 to New Hope Creek Greenway Corridor and New Hope Creek Commons, a sidewalk extending from the Spring Crest Neighborhood on the west side of Erwin is proposed for Phase I of the project. Phase II of the project will include a side walk along the east side of Erwin extending from Englewood to the bridge across Erwin Road.

Phase II: Erwin Road to Providence Road

Description

Phase II of Dry Creek Greenway would begin on the east side of Erwin Road at or near the current location of an existing gravel road used by Duke Energy. This road is used to access the Eastgate tap station, which lies 900 feet east of Erwin Road. This Concept Plan proposes that the greenway utilize this existing road for up to 800 feet of its length. This portion of the plan is dependent upon Duke Energy allowing access on the road. A representative of Duke Energy has indicated that approval may be feasible if the Town is willing to make certain improvements to control access.

About 800 feet east of Erwin Road, the trail would leave the Duke Energy access road and pass to the north of the tap station. It would then traverse the Duke Energy utility easement at a 90-degree angle before entering the wooded area between the easement and Dry Creek. Here, the proposed trail would cross a small drainage swale and pass through a mixed hardwood and pine forest before arriving at the edge of the wetland area. From this point, a low boardwalk/bridge would convey the trail across the wetlands and braided channel of Dry Creek to the south edge of the wetlands.

From its landing point on the south side of the Dry Creek wetlands, the trail would run along an existing sanitary sewer easement toward an existing OWASA pump station. This segment could afford the opportunity to connect the trail to a nearby apartment complex.

Fifty feet from the pump station fence, the trail would cross a small tributary on a bridge. It would then continue parallel to the pump station fence and then up the hill toward Providence Road. The final stretch would partially use the existing gravel pump station access drive and an easement on the south side of the drive. The trailhead on Providence Road would mark the end of the Dry Creek Trail, Phase II.

The total length of Dry Creek Greenway Phase II would be about 3,420 lineal feet, not including a possible side trail to the apartment complex. Roughly half the length of the alignment would occur on land that is already cleared for access roads or easements. The remaining length would include 1,100 lineal feet of trail sited in and among upland forest, and a boardwalk/bridge structure of approximately 460 lineal feet. The intensity of construction required for the boardwalk wetland crossing would mean that the construction cost per lineal foot for Phase II would likely exceed that of Phase I by a significant margin (see Appendix C: Cost Estimate).

Erwin Road Crossing

In order to connect the Phase I greenway with Phase II, a crossing of Erwin Road would be necessary. The speed limit on this portion of Erwin Road is 35 MPH,

Existing conditions of proposed location of Erwin Rd crossing and Duke Power access drive

Existing conditions of Duke Power access drive

Eastgate Tap Station

which is reduced from a speed limit of 45 MPH just to the north of the project area. Cars are frequently observed at speeds of 55 mph and higher on this stretch of road, and the route is regularly used by motorists traveling between Chapel Hill and Durham. A safe crossing of this road is essential to the viability of the Greenway as a Town transportation and recreation facility.

The Concept Plan proposes a location for an at-grade crossing of Erwin Road that provides a 400 foot minimum sight distance from the crossing to approaching cars in either direction. It also recommends that the speed limit transition from 45 to 35 MPH be moved northward on Erwin Road to encourage slower speeds at the crossing location. In addition, the plan proposes the construction of a median island in Erwin Road to both alert drivers to the presence of a crosswalk and to serve as a "pedestrian refuge" for trail users (Figure 5). As shown, the pedestrian refuge can be combined with a left-turn lane for vehicles accessing the parking area from the south. The crosswalk location could be supplemented by flashing warning signs to the north and south and high-visibility pavement marking (see Figure 5).

Given an unlimited budget, it is conceivable that the greenway could be conveyed above the road on a bridge or beneath the road in a tunnel. Neither of these options was pursued for the following reasons. A bridge would require significant viaducts east and west of the road to gain the required clearance. The resulting structure would certainly be prohibitively expensive and would likely be an unacceptable intrusion into the very environment that the concept plan seeks to preserve. A tunnel, on the other hand, would require a detour to the north in order to keep the tunnel above the water table elevation, and significant grading and retaining walls on either side of the road to pass the trail beneath the fill slope of Erwin Road. A tunnel would also have a significant financial impact.

NCDOT funding will be needed for the road widening and crosswalk.

Duke Energy Access Road and Easement

The proposed location of the Erwin Road crossing has the added advantage of being in roughly the same location as an existing one-lane gravel road used by Duke Energy for access to and maintenance of their transmission facilities in the area. It lies within an easement for that purpose. This concept plan recommends that the Town of Chapel Hill and Duke Energy negotiate an agreement for the improvement and shared use of this road as a joint access road and greenway trail. At this writing, a Draft of the Concept Plan has been sent to Duke Energy's Asset Protection Division for their information and feedback. The Plan proposes that the shared road would be a 12 foot wide asphalt road with HS-20 loading capacity and that a removable or collapsible bollard would be used at the Erwin Road entrance to allow only Duke Energy or Town vehicles to use the access road. If Duke Energy does not allow shared use of this road it would be necessary to align the greenway north of, and parallel to, the gravel road. This route would require substantial grading and clearing of existing trees.

The trail would leave the shared segment of road near the Eastgate Tap Station, cross the Duke Energy Easement at a right angle, and enter the wooded area to the south (see Appendix D).

Upland Forest Area

This segment of the greenway between the tap station and the Dry Creek floodplain would be a winding trail through a forest of mature pines and large hardwoods. In order to site the trail without unnecessarily removing existing trees, a tree survey encompassing a wide swath of this area would be undertaken as part of the final design phase. Members of the public and the Greenways Commission voiced a strong preference for felling as few trees as possible in this area; therefore, the following measures should be employed in constructing the trail in this area.

- During the design phase the trail should be located, to a great extent, based on the results of the tree survey.
- During the construction phase the trail should be field located to some extent to save trees that do

not appear on the tree survey.
- The trail should be installed with minimum excavation in the root zones of existing trees.
- In certain locations a minimum horizontal clearance of 2 feet between the edge of the trail and obstructions should be considered instead of the typical 3 foot clearance.

Wetland Crossing Alternatives

In order for the greenway to connect to Providence Road from the forested area north of Dry Creek, a crossing of Dry Creek and the wetlands around it is necessary. The only alternative to this crossing, and the northerly alignment of the trail in general, would be to align the trail along the OWASA sanitary sewer easement south of Dry Creek. This alternative was not pursued for several reasons:

- Sight distance requirements would place the Erwin Road crossing well north of the OWASA easement (see above).
- This alignment would place the trail within 100 feet of five houses and within 150 feet of nine others in the Englewood neighborhood.
- The trail would have to be built in a low-lying, flood-prone area for about 2,400 feet. Most of this area is wetlands.

The concept plan proposes to span the Dry Creek wetlands with a boardwalk/bridge structure of approximately 460 feet in length. It would be located at the narrowest point possible between uplands to the north and the OWASA pump station access road off Providence Road to the south. A narrower crossing of the wetlands further west would be possible. This option, however, is not recommended because it would result in a greater overall impact to wetlands, and because the trail would be within 100 feet of at least two houses in the Englewood neighborhood (Figure 6).

At the recommended crossing location, the concept plan team performed field mapping of the actual extent of wetlands, which shows them to be somewhat narrower than shown in National Wetlands Inventory (NWI) maps (see Appendix A1). At this location, an elevated boardwalk is proposed, possibly incorporating a bridge span. Depending on its height, the boardwalk could be designed with or without railings. According to the North Carolina Building Code (NCBC), a guardrail is required if a walking surface, i.e. the boardwalk deck, is thirty inches or higher above the ground surface below. The *North Carolina Bicycle Facilities Planning and Design Guidelines*, however, recommend a 54 inch-high safety rail for bicycle paths that are a foot or more higher than an adjacent surface, whether separated vertically or by a steep slope. The NCBC rule is legally binding on all projects in the state, whereas the NC Bicycle Guidelines are recommendations used by NCDOT's Office of Bicycle and Pedestrian Transportation to evaluate NCDOT-funded projects.

A primary consideration in designing the boardwalk is that the proposed boardwalk crosses the floodway of Dry Creek and thus presents a potential obstacle to floods and debris flow. In order to obtain a permit for the construction of this structure, the Town

Wetland

would have to demonstrate (in the final design phase) that the introduction of the boardwalk would result in no increase, in the elevation of the 100-year flood event. This "no-rise" certification would be carried out by a qualified engineering firm and approved by FEMA and the U.S. Army Corps of Engineers. It appears that a railing on the boardwalk would not make it more difficult for the project to obtain a "no-rise" certification.

Another consideration in the design of the boardwalk is the possibility of debris, carried by the stream, accumulating against the boardwalk structure. According to guidelines published by the Federal Highway Administration, a relative lack of debris upstream, combined with low flow velocity and the presence of trees in the floodplain, argue against the possibility of significant debris accumulation (see References, No. 2). However, experience has shown that this can be a persistent and expensive maintenance problem. This issue should be addressed by a qualified hydrologist in the final design phase. Options for the crossing currently being considered include:

1. A low boardwalk without railings whose deck elevation is no more than 28 inches from the surrounding grade;

2. A boardwalk that is low on both ends and raised in the middle, having railings in the middle third of its length;

3. A boardwalk that is raised three or more feet above the surrounding grade, having railings along its whole length, with a bridge section that provides a clear span at the area of greatest flow.

4. A boardwalk that is low on both ends, with a central bridge section that provides a clear span at the area of greatest flow.

Members of the Greenways Commission at the Public Forum on September 26, 2007, expressed a strong preference for omitting railings from the boardwalk and keeping the deck height as low as possible, in order to minimize the visual impact of the structure and allow users close observation of the wetlands environment.

Depending on what is learned from the flood model (see Appendix A2) and further site investigation, it may be necessary to provide at least one area where the boardwalk would be split by a bridge structure. The main purpose would be to allow debris to flow under the structure during high water events. We have observed problems in other locations when structures have been built without any provision for allowing debris to move downstream. The final determination for the need for railings or a bridge component will be made in the detailed design phase of development.

The final location and design of the boardwalk will be determined in Phase II after thorough environmental assessments are complete and the design team has determined the best method approach to the construction.

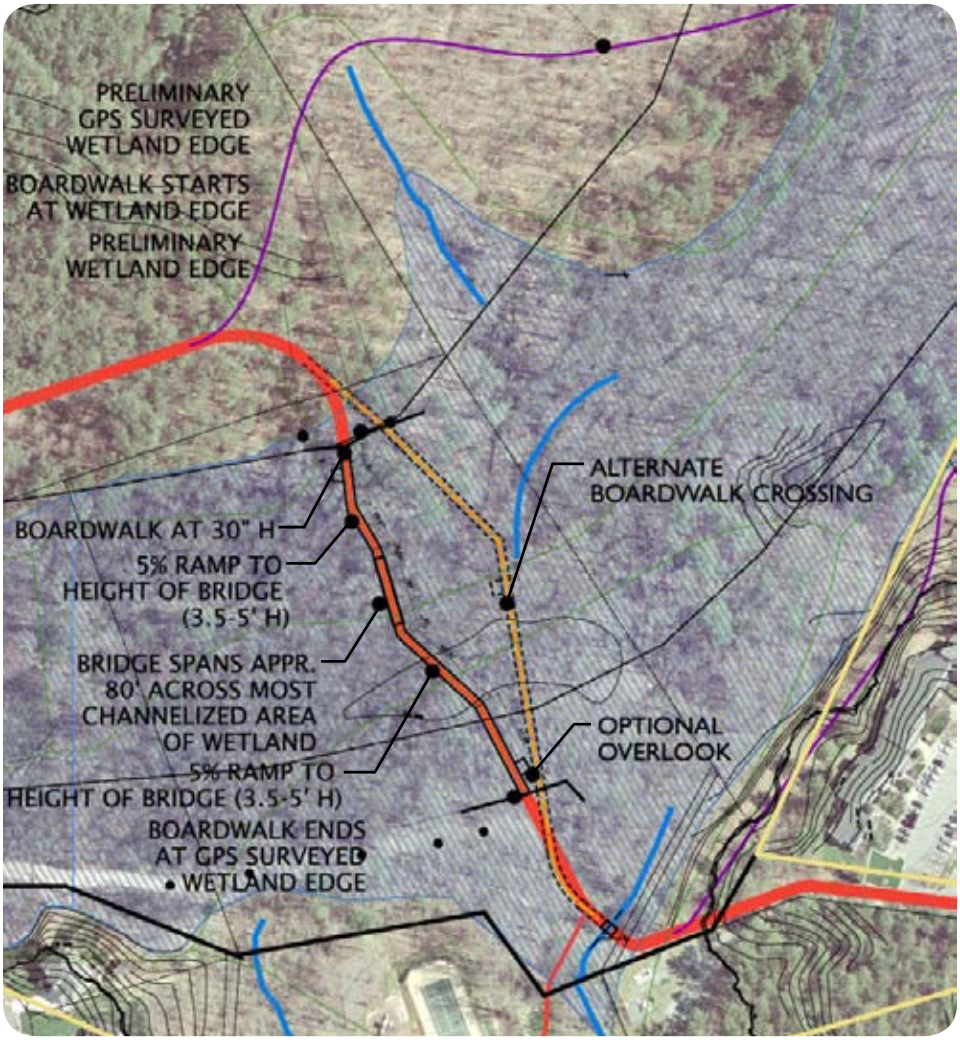


Figure 6: Proposed location of Boardwalk through wetland

Boardwalk Structure

The Concept Plan team explored several construction alternatives for the boardwalk, primarily focused on differing methods of supporting and anchoring the structure. A design load of five tons was assumed for the boardwalk. For the boardwalk deck, joists, and beams, wood construction is the most economical choice. Substituting steel members for some of the larger wood members should be considered in the final design phase, however. A structural engineer should be consulted to determine whether using steel beams between posts, or example, would allow the structure to accommodate greater loads with a reduced profile.

Two types of post with differing installation methods were considered for the boardwalk: steel helical piers (sometimes called screw shaft foundations) and timber piles. A third option, known by the trade name Pin Foundations, was considered but rejected because it is currently only used for light applications and would not accommodate 5-ton loading.

For the wetlands area at Dry Creek, helical piers are the recommended support method for the following reasons: First, like driven piles, helical piers require no soil excavation. Second, helical piers resist upward movement resulting from the possible buoyancy of the boardwalk structure in a flood event. Third, galvanized steel piers would be durable in the wetlands environment and, if required, are removable and reusable. Fourth, for a boardwalk lower than three feet, the required post size is only 1-1/2" square, which presents a very minor impediment to flood flows. Finally, helical piers can be installed with portable, hand held equipment (Figure 8).

The second-best option for post construction is to drive wood piles into the wetland soil until they reach a "point of refusal," then install the beams, joists and decking on the driven posts. York Bridge Concepts is one company that has developed a system for installing posts and constructing boardwalk ahead of the pile driving machinery, so that the installation machinery never needs to be in contact with the wetland surface.

The cost estimate (Appendix C) shows a slightly lower cost for the driven timber pile option compared with the helical piles. These costs should be reviewed in the final design phase to reflect current prices for steel and equipment. In our opinion, the reduced impact, narrower profile, and durability of the steel helical piers makes them a better choice for this location and justifies a modest added expense.

Figure 7: Helical Piers

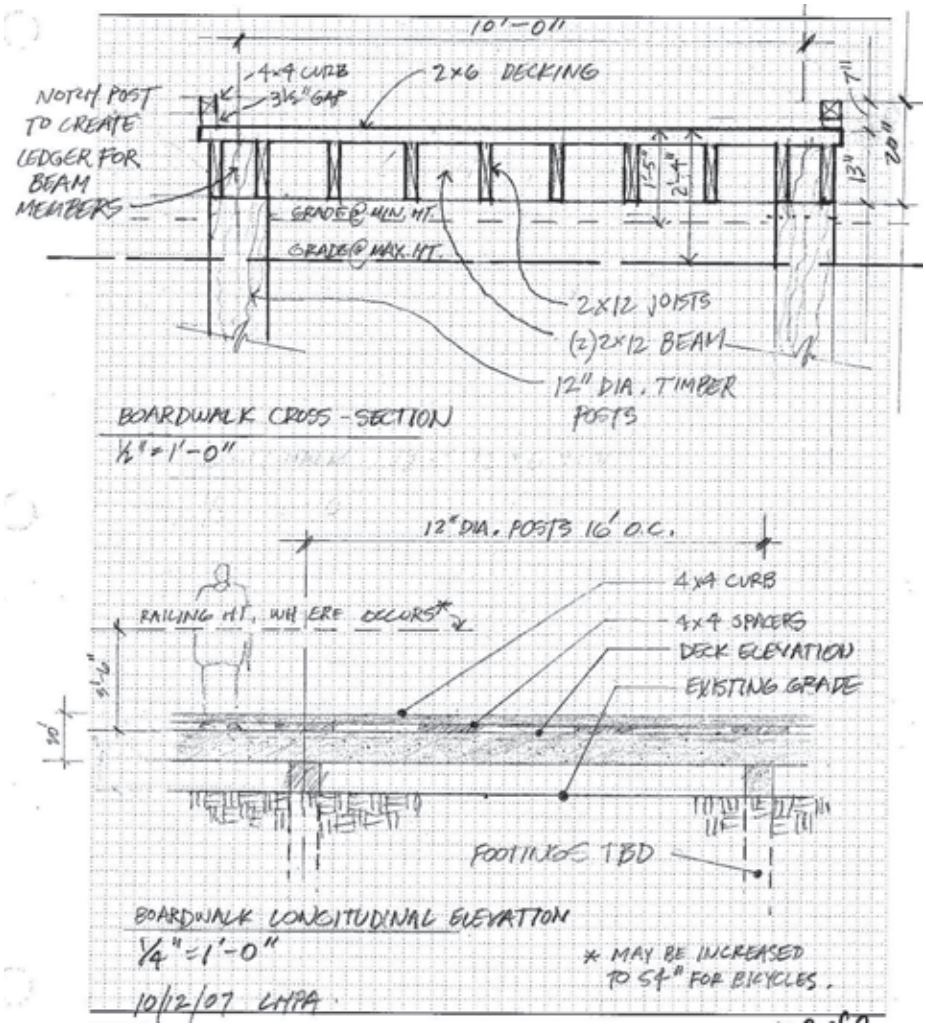


Figure 8: Section and Elevation of Boardwalk

Trailhead at Bridge at Tributary and OWASA Pump Station Area

South of Dry Creek, the greenway leaves the wetlands and runs along the OWASA sewer easement toward the pump station west of Providence Road, where it must cross a small incised stream. This stream appears as a "blueline" stream on USGS maps. This means that culvert across this stream would count as an "impact" for purposes of permitting by the US Army Corps of Engineers. In general, a project whose cumulative impacts to stream channels total 150 feet or more would trigger the need for an Individual permit from the USACE rather than a Nationwide permit. It is unlikely that cumulative impacts from the Dry Creek Greenway project would approach 150 feet even if a culvert were used here. However, given the stated goal of this project to reduce impacts where feasible, a 16-foot bridge with concrete abutments should be employed at this location rather than a culvert.

From this small bridge, the greenway would run past the OWASA pump station and then up to Providence Road on the existing access road alignment and an easement to the south. The trail installation would require some fill to the north of the pump station to overcome a steep side slope there. The trail gradient should be kept to 1:12 or less in this area, and would match the existing slope of the gravel access road to Providence Road.

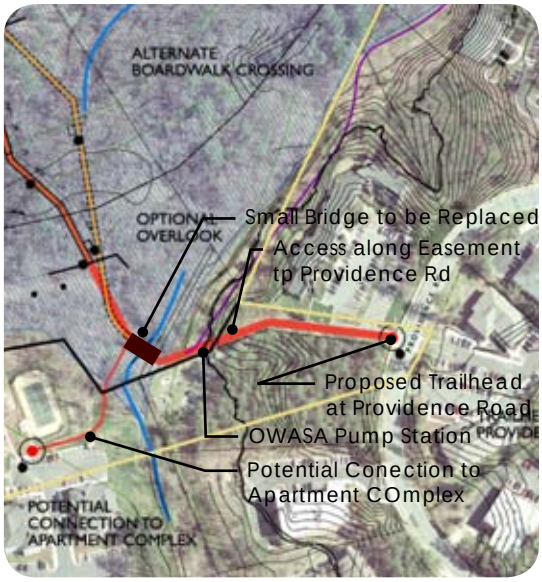


Figure 9: Providence Road Trailhead

Small Existing Bridge over Tributary

OWASA Pump Station

Wetland

FUTURE CONNECTIONS

The New Hope Corridor Open Space Master Plan, 1991 (Fig. X), and the Chapel Hill Greenways Master Plan, 2007 (Fig. X) both describe potential connections to future greenways along Dry Creek and New Hope Creek on North East side of Interstate 40. These recommendations include:

Durham/New Hope Connection at Erwin Road – This would involve extending a trail connection to the north along Erwin Road and across I-40 at the existing overpass. The trail would then run parallel to the NCDOT right-of-way of I-40 eastward to connect again with Dry Creek on the north side of I-40. From there the trail would continue into Durham County as part of the future New Hope Creek trail network. This option would require improvement of the existing bridge over I-40, possibly as part of future widening of Erwin Road. Such widening is not part of any Transportation Improvement Plan at this time. The town currently owns all of the land necessary except for one tract to the north of I-40.

Durham/New Hope Connection at New Bridge/Tunnel Location – A continuation of Dry Creek Greenway to some point south of I-40, where a bridge or tunnel would be needed to convey the trail over or under I-40, making a connection to Dry Creek on the north side of the freeway. It appears technically possible to build a tunnel beneath I-40 for this purpose at the existing Dry Creek culvert. However, the expense of such a project would be significant. A better option for a proposed crossing of I-40 might be a pedestrian bridge that takes advantage of high cut slopes further east, at the west end of the off-ramp to 15-501. Though also expensive, this option would provide a high-profile feature that could serve to "advertise" Chapel Hill's greenways system and would be more likely to be used than a tunnel.

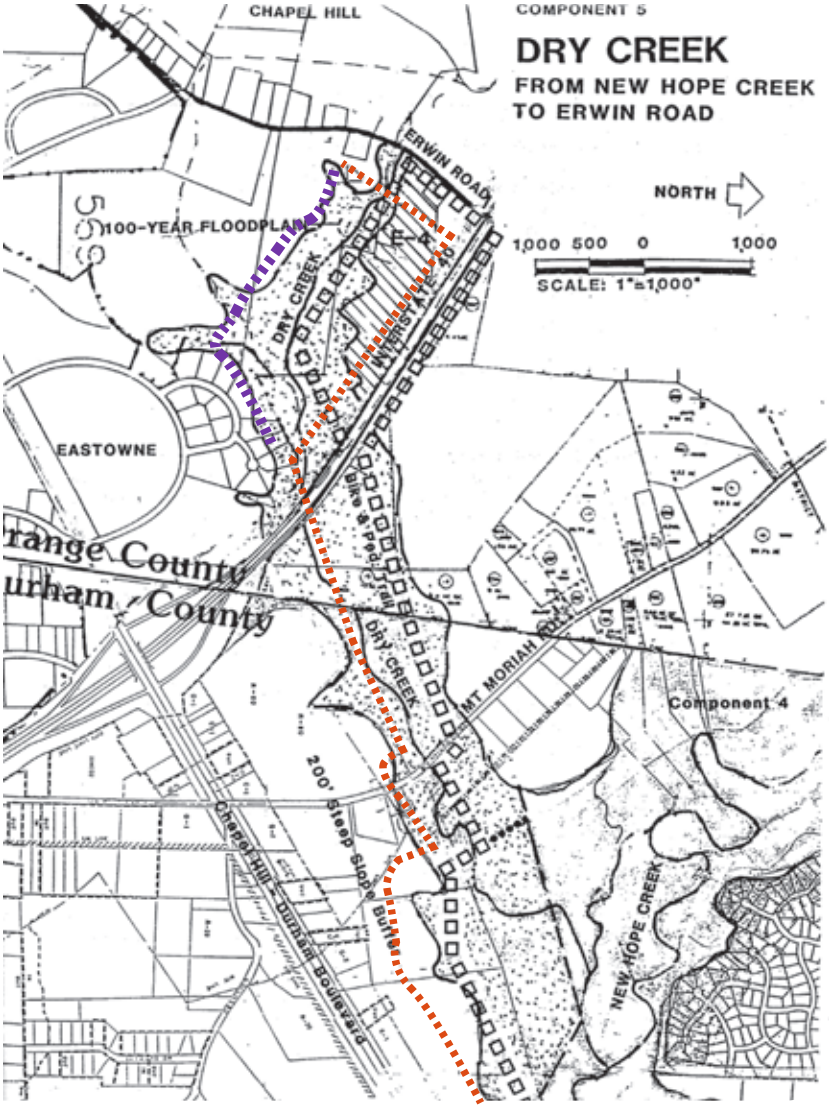


Figure 10: Proposed Connections over Erwin Road and over I-40 as shown on map "Component 6: Dry Creek from New Hope Creek to Erwin Road" from the *New Hope Corridor Open Space Master Plan*, April, 1991.

To reach the southern landing of this bridge, the Dry Creek Greenway would follow the existing sewer easement behind the Eastowne office buildings as far as possible. The trail would then have to be "benched in" to the slope for about 200 feet before climbing the hill to the new bridge.

Connection to Future Development Site – Another possible option for a future connection is the probable future development site along 15-501 between Eastowne and I-40. The most economical way for the Dry Creek Greenway to reach this site would be for the trail to merge with Providence Road at the proposed Phase II trailhead. The road would be signed eastward toward Eastowne Drive. From that point a separate trail would run north of and parallel to Eastowne Drive. Such a connection would serve to link this future commercial area to the residential neighborhoods further west along Dry Creek.

NEXT STEPS

NEXT STEPS

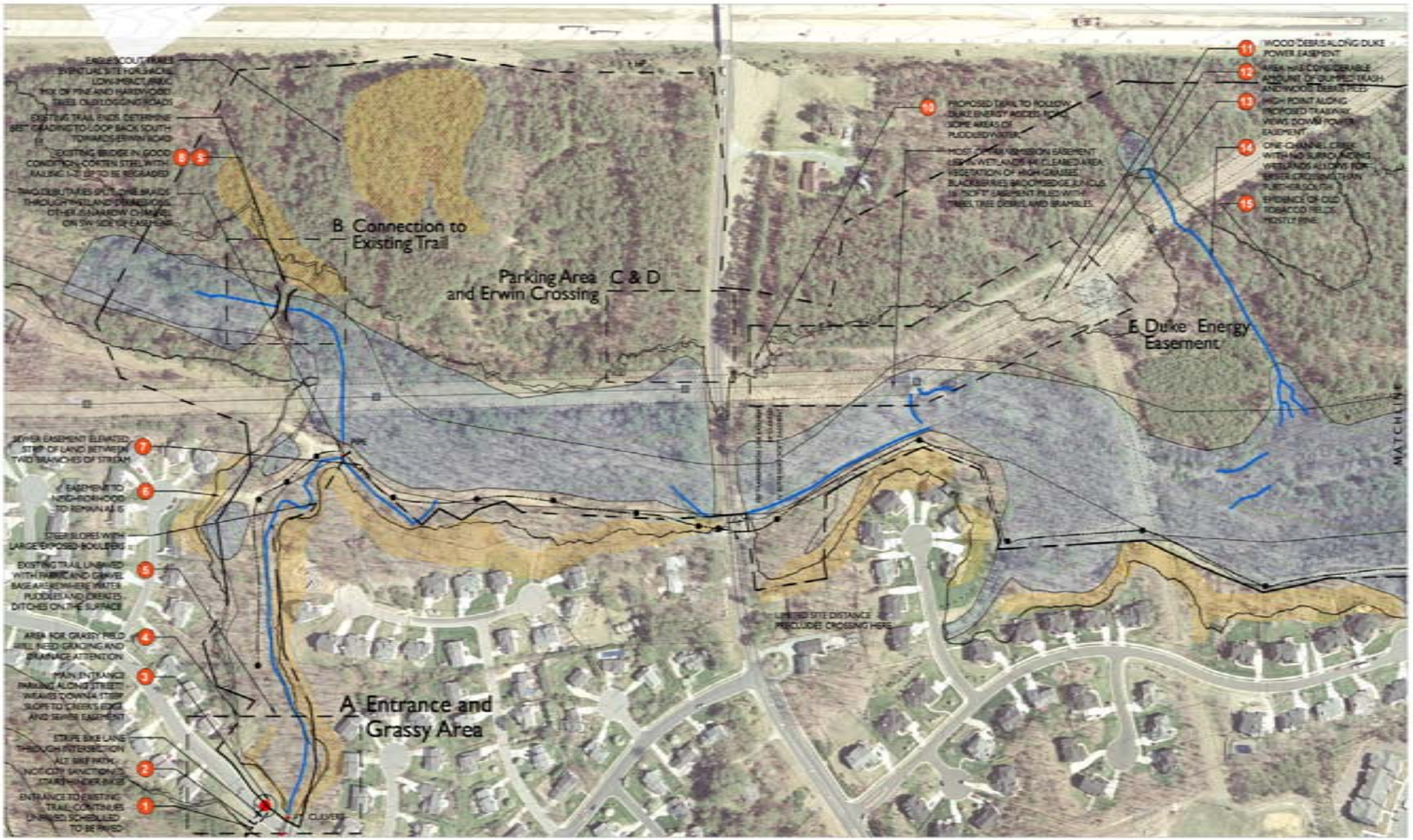
Once the Council adopts the Concept Plan, detailed design and documentation would begin, including design development drawings, detailed cost etimates and bids, construction documentation, all required permitting and documentation for flood modeling and natural resource protection, formalized agreements with Duke Power and OWASA, and approvals by the Town and public. Permits required include NCDOT Right-of-Way Encroachment on Erwin Road, DWQ Stream Channel and Streambank Impacts, 404 and 401 Water Quality Permits, USACE Wetland Permit, and NCDENR Erosion Control, and Town Engineering approval.

Upon completion of detailed design documentation, Phase I construction of the trail from Perry Creek Drive to Erwin Road would begin. This phase of construction would include a small parking lot. Conditioned upon review of updated costs and a review of available revenues, the design of the Erwin Road Crossing may be included in Phase I.

DRY CREEK GREENWAY
Existing Conditions Images

LHPA

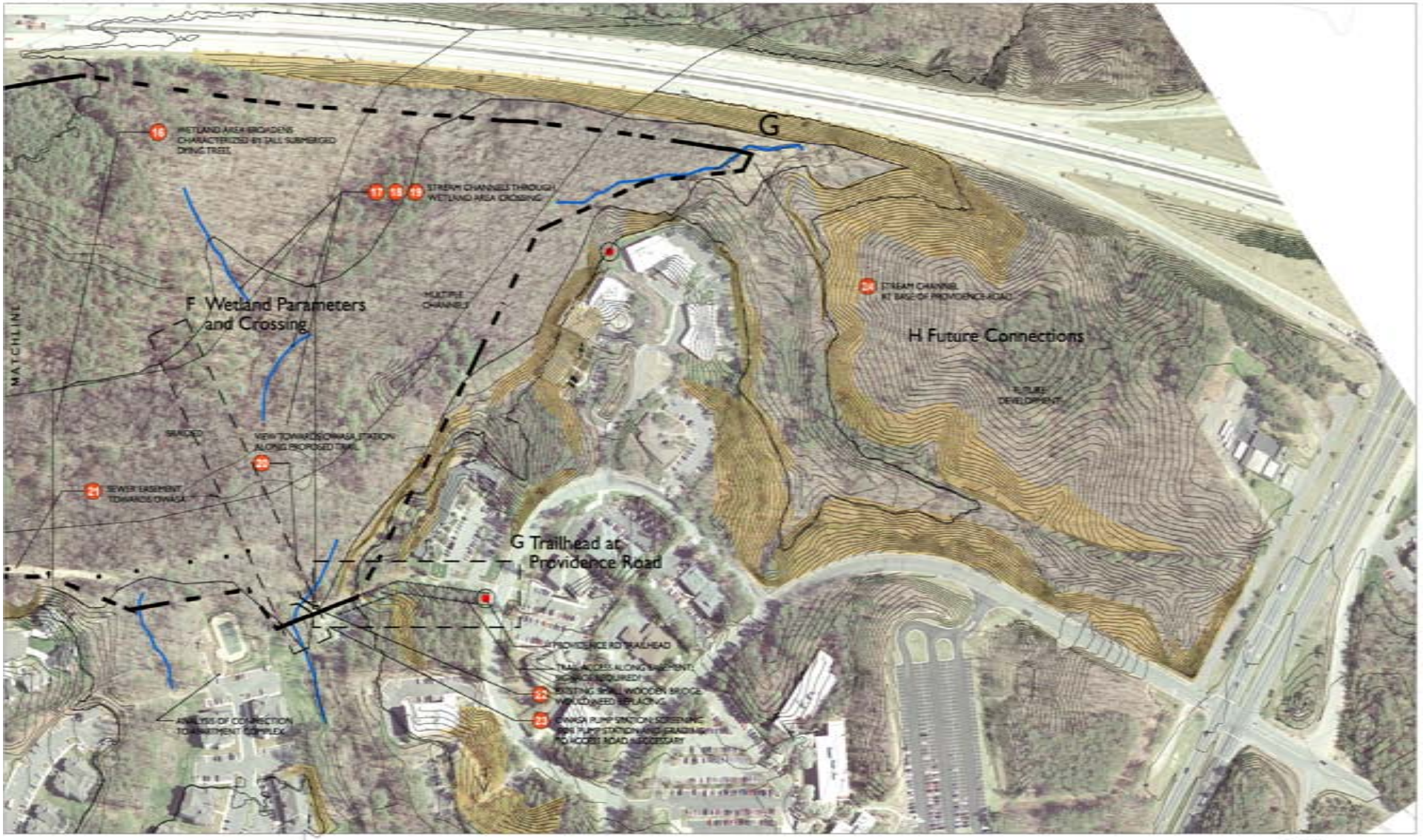
Concept Plan for the Dry Creek Greenway Trail: Chapel Hill, NC



DRY CREEK GREENWAY

Existing Conditions and Analysis

Sheet 1



DRY CREEK GREENWAY

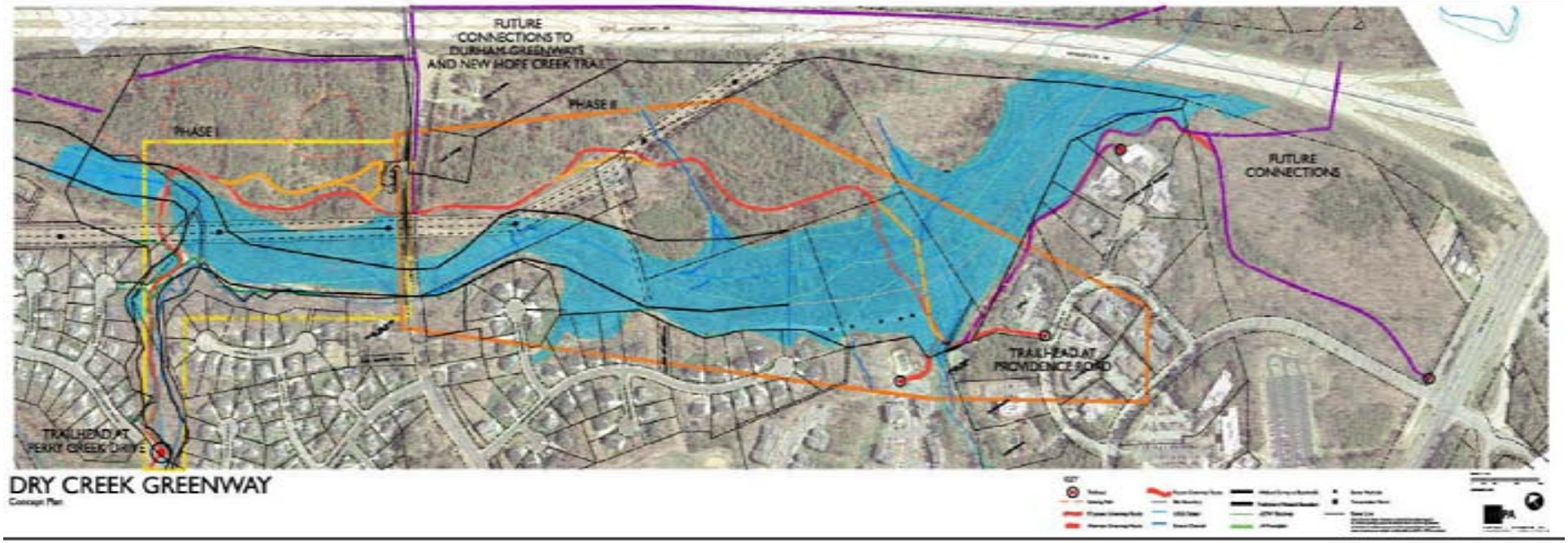
Existing Conditions and Analysis
Sheet 2

KEY

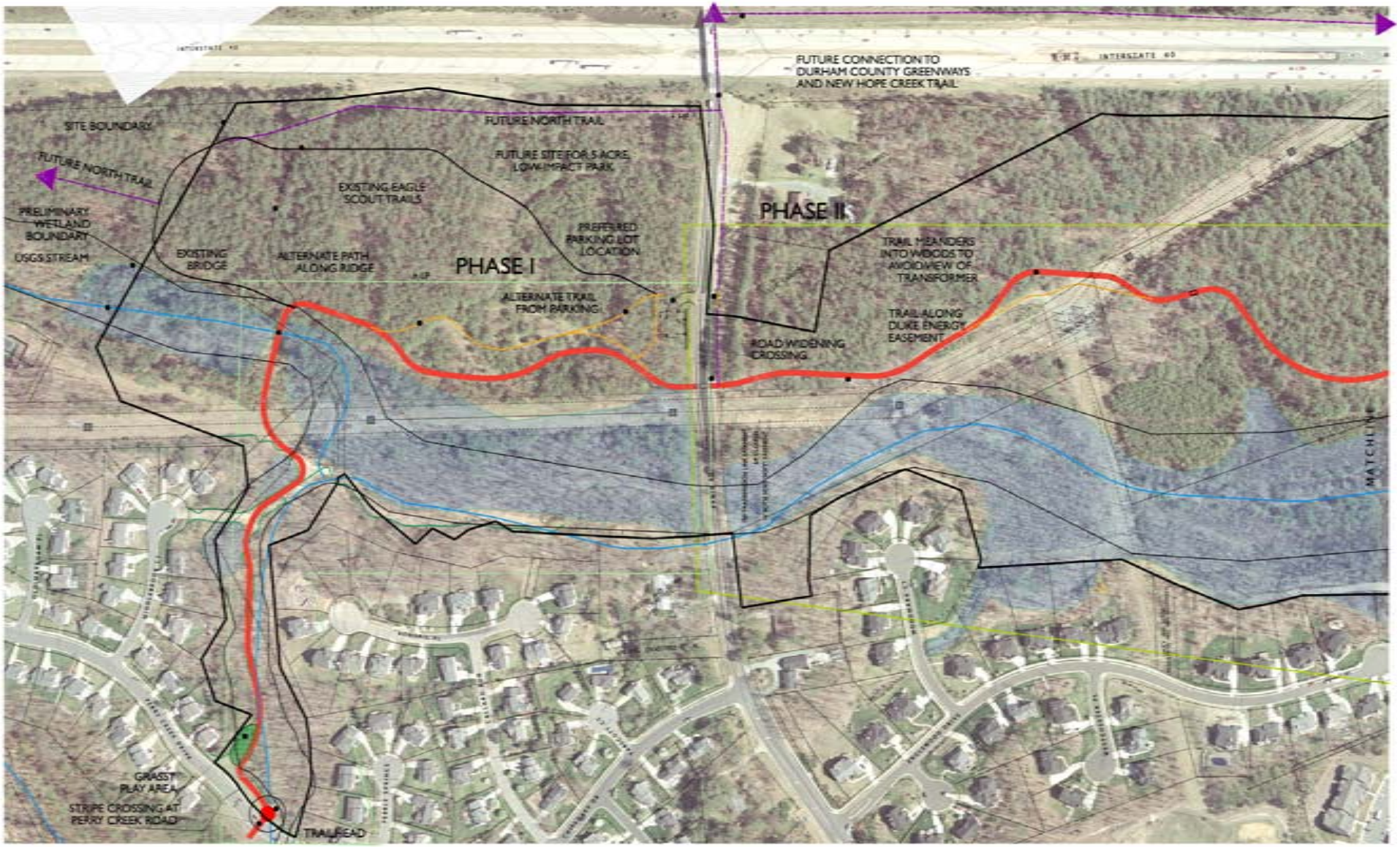
- Site Boundary
- USGS Stream
- Stream Channel
- Dashed Stream
- Steep Slope
- Wetland Survey
- AEFW Floodway
- AE Floodplain
- Sewer Manhole
- Underground Sewer Line
- Transmission Tower
- Power Line
- Trailhead
- Easement Connection
- Existing Bridge

LHPA

Concept Plan for the Dry Creek Greenway Trail: Chapel Hill, NC



Concept Plan for the Dry Creek Greenway Trail: Chapel Hill, NC



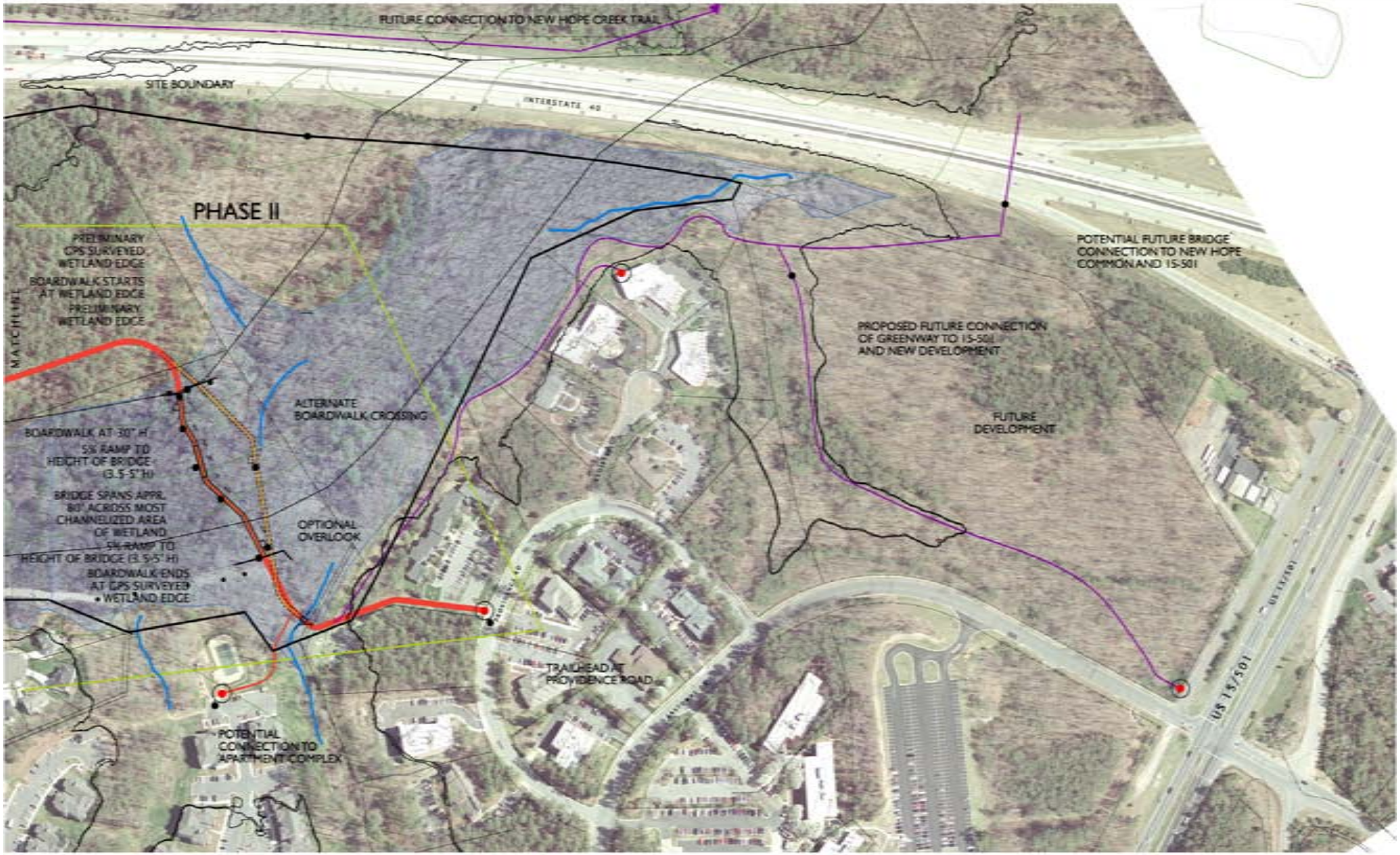
DRY CREEK GREENWAY

Concept Plan
Sheet 1

KEY

- Trailhead
- Existing Path
- Proposed Greenway Route
- Alternate Greenway Route
- Future Greenway Route
- Site Boundary
- USGS Stream
- Stream Channel
- Wetland Survey as Boardwalk
- Preliminary Wetland Boundary
- ABFW Floodway
- AE Floodplain
- Sewer Manhole
- Transmission Tower
- Power Line

LHPA


FUTURE CONNECTION TO NEW HOPE CREEK TRAIL
SITE BOUNDARY
INTERSTATE 40
PHASE II
PRELIMINARY GPS SURVEYED WETLAND EDGE
BOARDWALK STARTS AT WETLAND EDGE
PRELIMINARY WETLAND EDGE
MATCHLINE
ALTERNATE BOARDWALK CROSSING
BOARDWALK AT 30" H
5% RAMP TO HEIGHT OF BRIDGE (3.5-5" H)
BRIDGE SPANS APPR. 80' ACROSS MOST CHANNELIZED AREA OF WETLAND
5% RAMP TO HEIGHT OF BRIDGE (3.5-5" H)
BOARDWALK ENDS AT GPS SURVEYED WETLAND EDGE
OPTIONAL OVERLOOK
TRAILHEAD AT PROVIDENCE ROAD
POTENTIAL CONNECTION TO APARTMENT COMPLEX
POTENTIAL FUTURE BRIDGE CONNECTION TO NEW HOPE COMMON AND 15-501
PROPOSED FUTURE CONNECTION OF GREENWAY TO 15-501 AND NEW DEVELOPMENT
FUTURE DEVELOPMENT
US 15/501
DRY CREEK GREENWAY
Concept Plan
Sheet 2
KEY
Trailhead
Existing Path
Proposed Greenway Route
Alternate Greenway Route
Future Greenway Route
Site Boundary
USGS Stream
Stream Channel
Wetland Survey at Boardwalk
Preliminary Wetland Boundary
AEFW Floodway
AE Floodplain
Sewer Manhole
Transmission Tower
Power Line
LHPA

Baker

Baker Engineering NY, Inc.
8000 Regency Parkway
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Cary, North Carolina 27518

919-463-5488
FAX 919-463-5490

April 11, 2007

Lappas and Havener, P.A.
The Imperial Building
215 Morris Street, Suite 150
Durham, NC 27715

Attention: Mr. Grayson Baur

Subject: **Preliminary Wetland Determination**
Dry Creek Greenway
BAKER Project 110706

Dear Mr. Baur:

Baker Engineering NY, Inc. (BAKER) is pleased to submit this preliminary determination of jurisdictional waters of the U.S., including wetlands, at the approximately one-mile long subject corridor, located along the south side of Interstate Highway 40 (I-40) between Erwin Road and U.S. Highway 15/501 (US-15/501) in Chapel Hill, Orange County, North Carolina. This report documents the methodology used to assess approximate boundaries of jurisdictional waters of the U.S., the results of map and field review, and recommendations concerning potential permitting requirements under Section 404 of the Clean Water Act (33 U.S.C. 1344).

Background and Methodology

BAKER was contracted, in accordance with your authorization dated January 12, 2007, to conduct preliminary wetland mapping for planning purposes followed by wetland boundary approximation within 25 feet of one trail alignment, at the proposed location of the Dry Creek trail in Chapel Hill (Figure 1).

Jurisdictional wetlands are defined by 33 CFR 328.3(b) and are protected by Section 404 of the Clean Water Act (CWA), which is administered and enforced in North Carolina by the U.S. Army Corps of Engineers (USACE), Wilmington District. Jurisdictional wetlands are defined as areas that have positive evidence in the field of the following three environmental parameters:

- Hydrophytic vegetation (vegetation typically adapted for life in saturated soil conditions);
- Wetland hydrology (substrate that is inundated or saturated to the surface at some time during the growing season); and
- Hydric soils (soils that possess characteristics that are associated with reducing/anaerobic soil conditions).

Wetlands on the subject property were determined using the Routine On-Site Determination Method as defined in the 1987 Corps of Engineers Wetlands Delineation Manual. BAKER's Richard Darling reviewed the site on January 12, 2007 during preliminary corridor assessment with Mr. Grayson Baur and Ms. Katherine Gill of Lappas and Havener, P.A. (LHPA). Observations of the soil, vegetation, and hydrology were made on selected portions of the study area in order to make appropriate wetland/upland determinations. However, jurisdictional waters/upland boundaries were not flagged in

the field or surveyed at that time. The following references were reviewed to identify possible wetland areas, streams, and open water (collectively referred to as "waters of the U.S."):

- U.S. Geological Survey (USGS) 7.5-minute Topographic Quadrangle (Chapel Hill, NC);
- U.S. Department of Agriculture (USDA) Natural resources Conservation Service (NRCS) Soil Survey of Orange County;
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), Chapel Hill quadrangle;
- Town of Chapel Hill color aerial photography and topographic survey provided by LHPA.

On February 23, 2007, BAKER's Dwayne Huneycutt and Chris Arrington surveyed potential trail centerline locations and the wetland/upland boundary at locations where the LHPA-identified trail was proposed to traverse potential jurisdictional wetlands and/or streams. Hand-held global positioning system (GPS) equipment was used to survey the trail centerline as identified by LHPA. The approximate boundaries of potential jurisdictional wetlands were delineated in the field and recorded with GPS within 25 feet of the trail centerline. Routine Wetland Determination Data Forms were completed at the proposed trail crossing locations consistent with the 1987 USACE Wetlands Delineation Manual. Perennial and intermittent stream channels traversed by the proposed trail were identified within 25 feet of the trail centerline. North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) Stream Determination Forms were completed to document channel status as intermittent or perennial at proposed crossing locations.

Map Review

The USGS topographic quadrangle depicts Dry Branch as perennial with adjacent swamp east and west of Erwin Road (Figure 2, enclosed). Intermittent tributaries are indicated both sides of Erwin Road. The NRCS soils survey depicts numerous intermittent and perennial tributaries to Dry Branch on the site, with potential hydric soils (Chewacla loam) mapped throughout the Dry Branch floodplain (see Figure 2). The NWI identifies the immediate floodplain of Dry Branch as palustrine, forested, broad-leaved deciduous, seasonally flooded (PFO1C) wetlands with adjacent peripheral, temporarily flooded (PFO1A) and emergent, persistent (PEM1A) wetlands where stream tributaries join the floodplain (see Figure 2).

Field Observations

The subject property includes approximately 100 acres traversed by maintained cleared overhead power and buried sewer line easements. The field and map review indicated the presence of contiguous bottomland floodplain wetlands associated with the Dry Branch stream channel along the length of the southern portion of the project study area. The stream channels (intermittent and perennial tributaries to Dry Branch) as well as the adjacent riparian wetlands may be considered jurisdictional waters of the U.S. (see Figure 2).

The proposed trail preferred alignment as identified in the field by LHPA on February 23, 2007 begins at the existing trailhead at Perry Creek Drive and progresses northeast along the existing gravel

footpath to an existing footbridge over Dry Branch. From there, the proposed alignment progresses southeast along the north side of the Dry Branch wetland area to Erwin Road, where there is a planned parking lot on the west side of the road. From Erwin Road, the trail parallels the existing power line easement along its north side, skirts the substation and crosses an unnamed tributary to Dry Branch (Channel #2). The trail continues along the north side of the wetlands and turns south to cross the wetland area in a direct (shortest distance) or winding route to the sewer pump station at which location this section of the trail terminates (Figure 3, enclosed). The trail crosses another unnamed tributary to Dry Branch just north of its terminus at the pump station. An additional approximately 1,000 feet of proposed trail was included running along the north side of the Eastowne Drive business park.

Field determination of wetland and stream locations and status within 25 feet of the proposed trail centerline completed on February 23, 2007 was consistent with the preliminary review completed on January 12, 2007 (see Figure 3). Dominant plant species in the wetland at the proposed trail crossing location included sweet gum (*Liquidambar styraciflua*), soft rush (*juncus* sp.), dog fennel (*Eupatorium capillifolium*) and a variety of grasses and sedges. Soils in this wetland area were of low chroma color with concretions and showed strong evidence of aquic moisture regime. Obvious indicators of wetland hydrology included saturation within the top 12 inches, water marks, drainage patterns, and large areas of inundation. Completed USACE Routine Wetland Determination Data Forms (enclosed) document potentially jurisdictional wetland and adjacent upland areas where the preferred trail alignment is proposed to cross. The potential wetland boundary in the proposed crossing vicinity, as flagged and GPS-located in the field, is depicted on Figure 3.

The preferred trail alignment contemplates two stream crossings in addition to the proposed crossing of the wetland area (which may be inclusive of one or more channels). The trail crossing of Channel #2 (see Figure 3) is located at an intermittent reach of an unnamed tributary to Dry Branch, flowing to the wetland area from the north. This channel rated 26.5 using the DWQ classification method (completed DWQ Stream Classification Forms enclosed). The proposed crossing of Channel #3 is located at a perennial reach of an unnamed tributary to Dry Branch flowing to the wetland from the south. This channel rated 32 using the DWQ classification method.

The approximate boundaries of jurisdictional waters of the U.S., including wetlands, are subject to change following verification by the USACE and DWQ. The wetland and stream estimates and the approximate location information are intended for preliminary planning purposes only.

Wetland Jurisdiction

On January 9, 2001, the U.S. Supreme Court ruled that the USACE exceeded its authority by asserting jurisdiction over abandoned, isolated gravel pits in Northern Illinois, which provided habitat to migratory birds (Solid Waste Agency of Northern Cook County v. USACE, commonly referred to as the SWANCC decision). In doing so, the Supreme Court rejected the "Migratory Bird Rule", adopted by the USACE in 1986, which the USACE had used to regulate isolated (intrastate) wetlands. In light of this ruling, the USACE Wilmington District has informally decided to make decisions on isolated

wetlands on an individual basis. Essentially, if a wetland has any drainage connectivity (any type of surface water feature) or any potential interstate commerce use (hunting, fishing, etc.) the USACE may consider it jurisdictional. In addition, the DWQ, under direction from the North Carolina Environmental Management Commission (EMC), has instituted "Temporary Isolated Wetland/Waters Permitting Rules" to regulate impacts to isolated wetlands. Therefore, if a wetland/water is not considered jurisdictional by the USACE, the DWQ will most likely assert jurisdiction over the wetland/water.

As a result of the Supreme Court decisions in United States v. Rapanos and United States v. Carabell, USACE and EPA are developing a policy that will clarify the methods that describe and document jurisdictional determinations. This policy may impact jurisdictional determinations, in cases where there are intermittent or ephemeral streams or wetlands adjacent to intermittent, ephemeral or perennial streams. In light of the pending release of formal guidance on this issue, when there are these types of waters present on a site, the Wilmington District will not issue a final determination until the final or additional interim guidance is issued by USACE headquarters. USACE has not been given a timeframe for the issuance of any formal guidance. The Wilmington District will continue to make jurisdictional calls, based on existing procedures, for waters not affected by the rulings. These include:

- Traditional navigable waters (Section 10);
- Isolated, non-navigable, intrastate (SWANCC);
- Wetlands or waters abutting Section 10 waters; and
- Natural tributaries that are relatively permanent, standing or continuously flowing, bodies of water such as streams and rivers.

The pending guidance affects procedures for processing stand-alone jurisdictional determinations. The Wilmington District is continuing to process and issue permits without delay. If forthcoming guidance should change USACE jurisdiction, then permit holders can request a revised jurisdictional determination; and corresponding permit requirements, such as mitigation, may be re-visited.

Wetland Permitting

Depending on the project and the type and extent of waters of the U.S., including streams and wetlands, to be impacted by a project, Section 404 CWA permitting requirements can range from activities that are considered exempt or preauthorized, to those requiring Pre-Construction Notification (PCN) for a Nationwide Permit (NWP) or requiring a Section 404 Individual Permit (IP) from the USACE, and Section 401 Water Quality Certification (WQC) from DWQ. Wetland permitting requirements are generally based on the linear footage of intermittent and perennial stream channel and the acreage of wetland impact, however, adjacent streams that directly influence the wetlands in question are also considered.

Limited impacts to waters of the U.S., associated with the construction or expansion of recreational facilities may be authorized under NWP 42 (and WQC 3402). Examples of recreational facilities that

may be authorized by this NWP include playing fields (e.g., football fields, baseball fields), basketball courts, tennis courts, hiking trails, bike paths, golf courses, ski areas, horse paths, nature centers, and campgrounds (excluding recreational vehicle parks). This NWP also authorizes the construction or expansion of small support facilities, such as maintenance and storage buildings and stables that are directly related to the recreational activity, but it does not authorize the construction of hotels, restaurants, racetracks, stadiums, arenas, or similar facilities. The discharge must not cause the loss of greater than ½-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds this 300 linear foot limit is waived in writing by the district engineer. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters. The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. Additional conditions of NWP 42 include:

1. Discharges of dredged or fill material into waters of the U.S., including wetlands, within the floodway, resulting in permanent above-grade fills are not authorized by this NWP.
2. Discharges of dredged or fill material into waters of the U.S., including wetlands, within the mapped FEMA 100-year floodplain, below headwaters (i.e. <five cfs) resulting in permanent above-grade fills are not authorized by this NWP.
3. This NWP may not be used to authorize the discharges of dredged or fill material into waters of the United States that have been identified or designated by the State of North Carolina as:
   a. Outstanding Resource Waters
   b. High Quality Waters
   c. Coastal Wetlands as defined by North Carolina's Coastal Area Management Act
   d. Wetlands adjacent to these waters

Impacts allowable under NWP 42 involving greater than 1/3 acre of waters of the U.S., including wetlands, and/or greater than 150 linear feet of jurisdictional stream channel will also require notification to DWQ. In addition, where notification is required, mitigation will be required by DWQ for impacts to perennial[1] streams and/or greater than one-acre of wetlands.

All activities conducted under the NWP program must comply with the NP General Conditions. Permitting under Section 404 of the Clean Water Act may require coordination with interested agencies including, but not limited to USFWS, the North Carolina Wildlife Resources Commission, the State Historic Preservation Office, NCDENR, and the U.S. Environmental Protection Agency.

If jurisdictional areas to be impacted exceed ½ acre of wetlands and/or 300 linear feet of stream providing important aquatic function, then a Section 404 Individual Permit (IP) would likely be required for the proposed impacts. The IP process involves rigorous documentation and will require addressing protected species and cultural resources issues, an alternatives analysis, impact avoidance and minimization strategies, and compensatory wetland and/or stream mitigation. The IP process

[1] DWQ defines perennial stream channels as those that rate 30 or more using the latest version of the Stream Identification Method.

typically includes a 30-day public notice period with additional extended review by the regulatory agencies.

Recommendations

BAKER recommends that the jurisdictional boundaries of waters of the U.S., including wetlands, be verified by the USACE and DWQ prior to mechanized land clearing or impacts. The USACE and DWQ verification will provide appropriate documentation concerning the potential permitting of proposed site impacts. These recommendations do not consider floodway or floodplain fill restrictions or any other restrictions as mandated by local ordinance, State, or Federal regulation. The findings of our study are only applicable to the dates of our field review.

We appreciate the opportunity to conduct these environmental services for LHPA. Please contact Richard Darling at 919-459-9009, if you have any questions regarding this review.

Sincerely,

BAKER ENGINEERING NY, INC.

Richard B. Darling, C.E.
Environmental Manager

JCA/DH/RBD:rbd

Enclosure(s) Figure 1 Location Map
Figure 2 Preliminary Wetland Map
Figure 3 Preliminary Trail Map
Completed USACE Routine Wetland Determination Data Forms
Completed DWQ Stream Classification Forms (Version 3.1)

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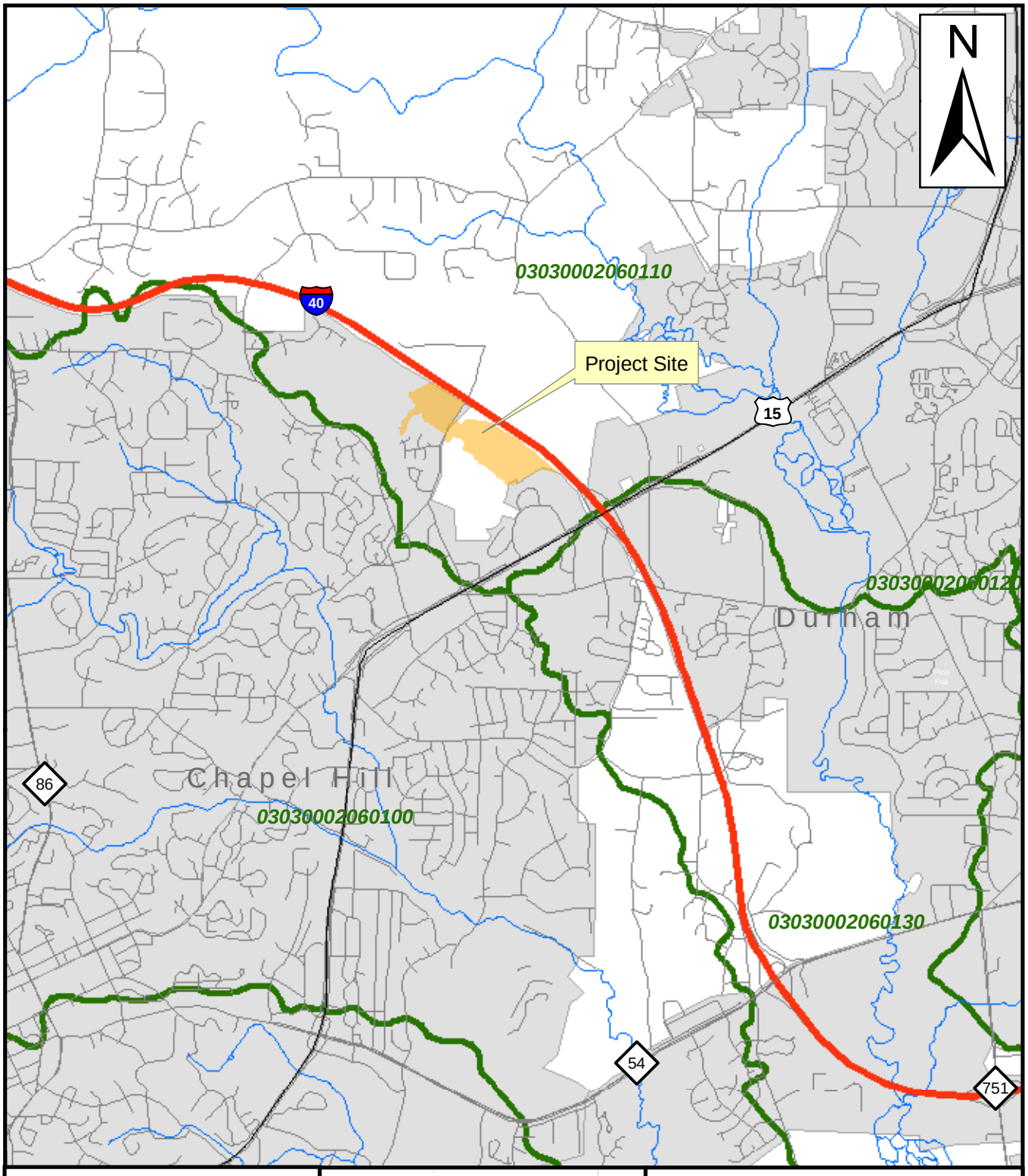

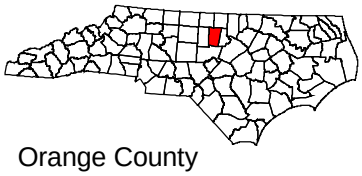

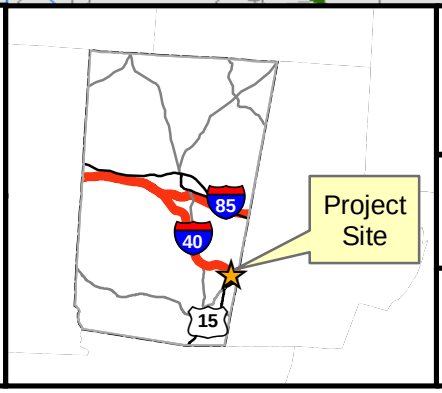

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Figure 1. Project Vicinity Map
Dry Creek Site

0 0.25 0.5 1 1.5 Miles

N

Legend

- Stream Channel (Preliminary Estimate)
- Ch - Chewacla loam (NRCS)
- Study Area
- Streams (USGS)
- Wetlands (NWI)
- Wetlands (Preliminary Estimate)
- 2 ft Contours

This Map is for preliminary planning purposes only. Potential wetland areas were approximated by Buck based on existing map sources and field review. Jurisdictional boundaries or stream channels were not marked in the field, verified by USACE or DWQ, or surveyed.

BRAIDED CHANNELS

PONDED, STRAIGHTED REACH

BEAVER ACTIVITY

BRAIDED CHANNELS

MULTIPLE CHANNELS

BRAIDED

MULTIPLE CHANNELS

Erwin Rd

I-40

40

Pebble Springs Rd

Callard Run

Tabscott Ln

Chippoaks Dr

Green Willow Ct

Big Meadows Pl

Big Meadows Pl

Green Willow Ct

Orchard Ln

Orchard Ln

Orchard Ln

Carriage Cir

Covington Dr

Erwin Rd

I-40

0 250 500 1,000 Feet

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Figure 2
Preliminary Wetland Map
Dry Creek Site

N

EXISTING FOOTBRIDGE

Channel #1 Ephemeral

PIPE

CULVERT

CULVERT

Channel #2 Intermittent

Channel #3 Perennial

Legend

- Trees
- Delineated Wetland Boundary
- Wetland Datapoint
- Trail (Proposed Alignment)
- Potenetial Trail Extension
- Stream Channel (Preliminary Estimate)
- Parking Lot (Proposed)
- Study Area
- Wetlands (Preliminary Estimate)

Jurisdictional boundaries or stream channels were not verified by USACE or DWQ.

0 250 500 1,000 Feet

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Figure 3
Preliminary Trail Map
Dry Creek Site

Appendix A

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Dry Creek
Applicant / Owner:
Investigator: Arrington / Honeycutt

Date: 2/23/07
County: Orange
State: NC

Do normal circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No X
Is the area a potential problem area? Yes ___ No X
(explain on reverse if needed)

Community ID: ___
Transect ID: ___
Plot ID: Wetland #1

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	Tree	FAC+
2. Typha (sp)	Tree	FACW
3. Dry Broom		FAC+
4. Juncus (sp)		FACW
5. Typha angustifolia		OBL
6. Sedges		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 100%

Remarks: Wetland Vegetation Present Based Upon Greater than 50% of the Plant Species are/are not Classified as FAC-OBL in the National List of Plant Species that Occur in Wetlands. Sample plot was taken...

>50% of plant species FAC or wetter Wetland veg present.

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 3 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ✓ Inundated
- ✓ Saturated in Upper 12"
- ✓ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ✓ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Wetland hydrology present

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes___ No___

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	O	organic mulch			
1-6		6/2 7.5Y	6/8 7.5Y	20%	loamy clay
6+		6/2 7.5Y	6/8 7.5Y	5%	loamy clay

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- X Aquic Moisture Regime
- X Reducing Conditions
- X Gleyed or Low-Chroma Colors
- X Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed On Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Hydric soils present

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___
Hydric Soils Present? Yes X No ___

Is the Sampling Point Within a Wetland? Yes X No ___

Remarks: Location (describe) is/is not classified as a wetland based upon the criteria set forth in the 1987 Army Corps of Engineers Wetlands Delineation Manual.

All 3 criteria met. Area is a wetland.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Dry Creek
Applicant / Owner:
Investigator: Arrington / Honeycutt

Date: 2/23/07
County: Orange
State: NC

Do normal circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No X
Is the area a potential problem area? Yes ___ No X
(explain on reverse if needed)

Community ID: ___
Transect ID: ___
Plot ID: Upland #1

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Pinus (loblolly)	Trees	FAC
2. American Beech	Trees	FACW
3. Oak (Red)	Trees	FACW-
4.		
5. Vine (Sp)	Vine	FAC
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 50%

Remarks: Wetland Vegetation Present Based Upon Greater than 50% of the Plant Species are/are not Classified as FAC-OBL in the National List of Plant Species that Occur in Wetlands. Sample plot was taken...

Based on vegetation Criteria for wetland not met

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

Depth to Free Water in Pit: ___ (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

No hydrology present

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes___ No___

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		4/4 7.5 yr			Sandy Clay
5-12		5/4 7.5 yr	4/3 7.5 yr	4 by < 5%	Sandy clay
12+		5/6 7.5 yr			clay

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed On Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
no hydric indicators or soil stress

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X
Hydric Soils Present? Yes ___ No X

Is the Sampling Point Within a Wetland? Yes___ No X

Remarks: Location (describe) is/is not classified as a wetland based upon the criteria set forth in the 1987 Army Corps of Engineers Wetlands Delineation Manual.

Area not a wetland. Upland to wetland along toe.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Dry Creek
Applicant / Owner:
Investigator: Arrington / Hunsucker

Date: 2/23/07
County: Orange
State: NC

Do normal circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No X
Is the area a potential problem area? Yes ___ No X
(explain on reverse if needed)

Community ID: ___
Transect ID: ___
Plot ID: Wetland #2

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	Tree	FAC
2. Box Elder		FAC
3. Sumac		FACW
4. Tall grasses/sedges		-
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). >75%

Remarks: Wetland Vegetation Present Based Upon Greater than 50% of the Plant Species are/are not Classified as FAC-OBL in the National List of Plant Species that Occur in Wetlands. Sample plot was taken...

>50% of plants are FAC or better. Wetland vegetation is present.

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 4-5 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12"
- X Water Marks
- X Drift Lines
- X Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

Wetland hydrology is present!

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes___ No___

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		4/4 7.5yr	4/2 7.5yr	15%	clay
2-8		4/2 7.5yr	4/1&5/6 7.5yr	10/2	Clay
8+		4/4 7.5yr	4/6 7.5yr	>5%	Sandy clay

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- X Sulfidic Odor
- X Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- X Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- X Organic Streaking in Sandy Soils
- ___ Listed On Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

Wetland soils are present

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___
Hydric Soils Present? Yes X No ___

Is the Sampling Point Within a Wetland? Yes X No ___

Remarks: Location (describe) is/is not classified as a wetland based upon the criteria set forth in the 1987 Army Corps of Engineers Wetlands Delineation Manual.

All necessary requirements met for point to be considered a wetland.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Dry Creek Applicant / Owner: Investigator: Arrington / Honeycutt	Date: 2/23/07 County: Orange State: NC
Do normal circumstances exist on the site? Yes X No ___ Is the site significantly disturbed (Atypical situation)? Yes ___ No X Is the area a potential problem area? Yes ___ No X (explain on reverse if needed)	Community ID: ___ Transect ID: ___ Plot ID: Upland #2

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	Tree	Fac +
2. Red maple	Tree	Fac
3. Pine sp.	Tree	Fac
4. ground moss	Groundcover	
5.		
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 75%

Remarks: Wetland Vegetation Present Based Upon Greater than 50% of the Plant Species are/are not Classified as FAC-OBL in the National List of Plant Species that Occur in Wetlands. Sample plot was taken...

75% of plants are FAC or wetter. Wetland plant vegetation is present.

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

Depth to Free Water in Pit: ___ (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: No hydrology present to indicate a wetland

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes___ No___

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4		C/4/ 2.5y			Sandy clay
4-8		4/6 7.5yr			Sandy clay
8+		3/4 7.5yr		>5% 5/6 7.5yr	Clay Concretion at this depth

Hydric Soil Indicators:

___ Histosol	_x_ Concretions (at depth)
___ Histic Epipedon	___ High Organic Content in Surface Layer in Sandy Soils
___ Sulfidic Odor	___ Organic Streaking in Sandy Soils
___ Aquic Moisture Regime	___ Listed On Local Hydric Soils List
___ Reducing Conditions	___ Listed on National Hydric Soils List
___ Gleyed or Low-Chroma Colors	___ Other (Explain in Remarks)

Remarks: Soil is non hydric

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes x No ___
Wetland Hydrology Present? Yes ___ No x
Hydric Soils Present? Yes ___ No x

Is the Sampling Point Within a Wetland? Yes___ No x

Remarks: Location (describe) is/is not classified as a wetland based upon the criteria set forth in the 1987 Army Corps of Engineers Wetlands Delineation Manual.

Area is not a wetland

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 2-23-07	**Project:** Dev. Creek	**Latitude:**
Evaluator: D. Hungerford	**Site:** Stream 1	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 8.5	**County:** Orange	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 3.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	(0)	1	2	3
2. Sinuosity	0	(1)	2	3
3. In-channel structure: riffle-pool sequence	(0)	1	2	3
4. Soil texture or stream substrate sorting	(0)	1	2	3
5. Active/relic floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Braided channel	0	1	(2)	3
8. Recent alluvial deposits	(0)	1	2	3
9[a] Natural levees	(0)	1	2	3
10. Headcuts	(0)	1	2	3
11. Grade controls	(0)	0.5	1	1.5
12. Natural valley or drainageway	0	(0.5)	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = (0)		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 1)				
14. Groundwater flow/discharge	(0)	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	(1)	2	3
16. Leaflitter	1.5	1	0.5	(0)
17. Sediment on plants or debris	(0)	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	(0)	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = (0)		Yes = 1.5	

C. Biology (Subtotal = 4)				
20[b]. Fibrous roots in channel	3	(2)	1	0
21[b]. Rooted plants in channel	3	(2)	1	0
22. Crayfish	(0)	0.5	1	1.5
23. Bivalves	(0)	1	2	3
24. Fish	(0)	0.5	1	1.5
25. Amphibians	(0)	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	(0)	0.5	1	1.5
27. Filamentous algae; periphyton	(0)	1	2	3
28. Iron oxidizing bacteria/fungus.	(0)	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = (0)			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 2-23-07	**Project:** Dry Creek	**Latitude:**
Evaluator: D. Hungerford	**Site:** Stream 2	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 26.5	**County:** Orange	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	(2)	3
2. Sinuosity	0	(1)	2	3
3. In-channel structure: riffle-pool sequence	0	1	(2)	3
4. Soil texture or stream substrate sorting	0	(1)	2	3
5. Active/relic floodplain	0	1	(2)	3
6. Depositional bars or benches	(0)	1	2	3
7. Braided channel	(0)	1	2	3
8. Recent alluvial deposits	0	1	(2)	3
9[a] Natural levees	(0)	1	2	3
10. Headcuts	(0)	1	2	3
11. Grade controls	0	0.5	(1)	1.5
12. Natural valley or drainageway	0	(0.5)	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = (0)		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)				
14. Groundwater flow/discharge	0	1	2	(3)
15. Water in channel and > 48 hrs since rain, or Water in channel – dry or growing season	0	1	(2)	3
16. Leaflitter	1.5	(1)	0.5	0
17. Sediment on plants or debris	(0)	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	(1.5)
19. Hydric soils (redoximorphic features) present?	No = (0)		Yes = 1.5	

C. Biology (Subtotal = 7.5)				
20[b]. Fibrous roots in channel	3	(2)	1	0
21[b]. Rooted plants in channel	3	(2)	1	0
22. Crayfish	0	(0.5)	1	1.5
23. Bivalves	(0)	1	2	3
24. Fish	(0)	0.5	1	1.5
25. Amphibians	0	0.5	(1)	1.5
26. Macrobenthos (note diversity and abundance)	(0)	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	(2)	3
28. Iron oxidizing bacteria/fungus.	0	(0.5)	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = (0)			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 2-23-07	**Project:** Dry Creek		**Latitude:**
Evaluator: D. Huneycutt	**Site:** Stream 3		**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 32	**County:** Orange		**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	(3)
2. Sinuosity	0	(1)	2	3
3. In-channel structure: riffle-pool sequence	0	(1)	2	3
4. Soil texture or stream substrate sorting	0	(1)	2	3
5. Active/relic floodplain	0	1	2	(3)
6. Depositional bars or benches	0	(1)	2	3
7. Braided channel	(0)	1	2	3
8. Recent alluvial deposits	0	1	(2)	3
9[a] Natural levees	(0)	1	2	3
10. Headcuts	(0)	1	2	3
11. Grade controls	0	0.5	(1)	1.5
12. Natural valley or drainageway	0	(0.5)	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = (0)		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
14. Groundwater flow/discharge	0	1	(2)	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	(3)
16. Leaflitter	(1.5)	1	0.5	0
17. Sediment on plants or debris	0	(0.5)	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	(1.5)
19. Hydric soils (redoximorphic features) present?	No = (0)		Yes = 1.5	

C. Biology (Subtotal = 10)				
20[b]. Fibrous roots in channel	(3)	2	1	0
21[b]. Rooted plants in channel	(3)	2	1	0
22. Crayfish	0	(0.5)	1	1.5
23. Bivalves	(0)	1	2	3
24. Fish	(0)	0.5	1	1.5
25. Amphibians	(0)	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	(0.5)	1	1.5
27. Filamentous algae; periphyton	0	1	2	(3)
28. Iron oxidizing bacteria/fungus.	(0)	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = (0)			

[b] Items 20 and 21 focus on the presence of upland plants, item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

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November 6, 2007

Grayson Baur
Lappas + Havener, PA
The Imperial Building
215 Morris Street
Durham, NC 27701

RE: Hydraulic Modeling Results for Dry Creek Project

Mr Grayson Baur:

Baker Engineering has constructed a representative hydraulic model for the Dry Creek project. This model simulates the portion of the creek where the greenway boardwalk crossing is proposed and its immediate vicinity upstream and downstream. The hydraulic model that has been prepared is a preliminary model and does not constitute the final hydraulic analysis for this project. Although the results obtained from this model are not final hydraulics results, they provide a general idea of how each of the three simulated bridge crossing scenarios can be expected to affect flood levels through the area. This letter summarizes the results obtained from the preliminary hydraulic model for the Dry Creek project.

BRIDGE SCENARIO No. 1

The first bridge scenario studied in this analysis included a 410 foot long boardwalk bridge crossing the span of the Dry Creek channel and floodplain. This boardwalk bridge was simulated without any railing, and included a side curb along the entire length of the bridge. The top elevation of the curb was set seven inches above the elevation of the surface deck. Under this bridge scenario, the following results were obtained:

Results For 2-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.29	273.29	0
Just upstream of bridge	8712	270.4	270.52	0.12
Just downstream of bridge	8542	270.32	270.32	0
530 ft downstream of bridge	8139	269.75	269.75	0
765 ft downstream of bridge (downstream limit of model)	7904	268.24	268.24	0

Results For 5-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.66	273.66	0
Just upstream of bridge	8712	270.96	271.06	0.1
Just downstream of bridge	8542	270.85	270.85	0
530 ft downstream of bridge	8139	270.06	270.06	0
765 ft downstream of bridge (downstream limit of model)	7904	269.45	269.45	0

Results For 10-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	275.43	275.44	0.01
Just upstream of bridge	8712	275.41	275.41	0
Just downstream of bridge	8542	275.4	275.4	0
530 ft downstream of bridge	8139	275.38	275.38	0
765 ft downstream of bridge (downstream limit of model)	7904	275.37	275.37	0

Results For 25-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	277.27	277.27	0
Just upstream of bridge	8712	277.26	277.26	0
Just downstream of bridge	8542	277.26	277.26	0
530 ft downstream of bridge	8139	277.25	277.25	0
765 ft downstream of bridge (downstream limit of model)	7904	277.24	277.24	0

Results For 50-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.48	282.48	0
Just upstream of bridge	8712	282.48	282.48	0
Just downstream of bridge	8542	282.47	282.47	0
530 ft downstream of bridge	8139	282.47	282.47	0
765 ft downstream of bridge (downstream limit of model)	7904	282.47	282.47	0

Results For 100-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.55	282.55	0
Just upstream of bridge	8712	282.55	282.55	0
Just downstream of bridge	8542	282.55	282.55	0
530 ft downstream of bridge	8139	282.54	282.54	0
765 ft downstream of bridge (downstream limit of model)	7904	282.54	282.54	0

The results from the preliminary hydraulic simulation for Bridge Scenario No. 1 show that construction of this bridge alternative would not affect the regulatory base flood levels (100-year levels) throughout the area, in compliance with Sections 5-60 and 5-61 of the Town of Chapel Hill Flood Damage Prevention Ordinance.

BRIDGE SCENARIO No. 2

This bridge scenario also included a 410 foot long boardwalk bridge crossing the span of the Dry Creek channel and floodplain. This boardwalk bridge was simulated with railing along a 160 ft center section of the boardwalk bridge, and the remaining portions of the bridge were kept without railing but with side curb as in Scenario No. 1. The top of the railing was set at an elevation three and a half feet above the elevation of the deck surface. Under this bridge scenario, the following results were obtained:

Results For 2-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.29	273.29	0
Just upstream of bridge	8712	270.4	270.52	0.12
Just downstream of bridge	8542	270.32	270.32	0
530 ft downstream of bridge	8139	269.75	269.75	0
765 ft downstream of bridge (downstream limit of model)	7904	268.24	268.24	0

Results For 5-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.66	273.66	0
Just upstream of bridge	8712	270.96	271.06	0.1
Just downstream of bridge	8542	270.85	270.85	0
530 ft downstream of bridge	8139	270.06	270.06	0
765 ft downstream of bridge (downstream limit of model)	7904	269.45	269.45	0

Results For 10-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	275.43	275.44	0.01
Just upstream of bridge	8712	275.41	275.41	0
Just downstream of bridge	8542	275.4	275.4	0
530 ft downstream of bridge	8139	275.38	275.38	0
765 ft downstream of bridge (downstream limit of model)	7904	275.37	275.37	0

Results For 25-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	277.27	277.27	0
Just upstream of bridge	8712	277.26	277.26	0
Just downstream of bridge	8542	277.26	277.26	0
530 ft downstream of bridge	8139	277.25	277.25	0
765 ft downstream of bridge (downstream limit of model)	7904	277.24	277.24	0

Results For 50-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.48	282.48	0
Just upstream of bridge	8712	282.48	282.48	0
Just downstream of bridge	8542	282.47	282.47	0
530 ft downstream of bridge	8139	282.47	282.47	0
765 ft downstream of bridge (downstream limit of model)	7904	282.47	282.47	0

Results For 100-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.55	282.55	0
Just upstream of bridge	8712	282.55	282.55	0
Just downstream of bridge	8542	282.55	282.55	0
530 ft downstream of bridge	8139	282.54	282.54	0
765 ft downstream of bridge (downstream limit of model)	7904	282.54	282.54	0

The results from the preliminary hydraulic simulation for Bridge Scenario No. 2 show that construction of this bridge alternative would not affect the regulatory base flood levels (100-year levels) throughout the area, in compliance with Sections 5-60 and 5-61 of the Town of Chapel Hill Flood Damage Prevention Ordinance.

BRIDGE SCENARIO No. 3

This bridge scenario also included a 410 foot long boardwalk bridge crossing the span of the Dry Creek channel and floodplain. This boardwalk bridge was simulated with railing along the entire span of the bridge. The top of the railing was set at an elevation three and a half feet above the elevation of the deck surface. Under this bridge scenario, the following results were obtained:

Results For 2-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.29	273.29	0
Just upstream of bridge	8712	270.4	270.63	0.23
Just downstream of bridge	8542	270.32	270.32	0
530 ft downstream of bridge	8139	269.75	269.75	0
765 ft downstream of bridge (downstream limit of model)	7904	268.24	268.24	0

Results For 5-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	273.66	273.66	0
Just upstream of bridge	8712	270.96	271.18	0.22
Just downstream of bridge	8542	270.85	270.85	0
530 ft downstream of bridge	8139	270.06	270.06	0
765 ft downstream of bridge (downstream limit of model)	7904	269.45	269.45	0

Results For 10-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	275.43	275.44	0.01
Just upstream of bridge	8712	275.41	275.41	0
Just downstream of bridge	8542	275.4	275.4	0
530 ft downstream of bridge	8139	275.38	275.38	0
765 ft downstream of bridge (downstream limit of model)	7904	275.37	275.37	0

Results For 25-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	277.27	277.28	0.01
Just upstream of bridge	8712	277.26	277.26	0
Just downstream of bridge	8542	277.26	277.26	0
530 ft downstream of bridge	8139	277.25	277.25	0
765 ft downstream of bridge (downstream limit of model)	7904	277.24	277.24	0

Results For 50-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.48	282.48	0
Just upstream of bridge	8712	282.48	282.48	0
Just downstream of bridge	8542	282.47	282.47	0
530 ft downstream of bridge	8139	282.47	282.47	0
765 ft downstream of bridge (downstream limit of model)	7904	282.47	282.47	0

Results For 100-Year Storm:

Location	River Station	Water Surface Elevation (ft)		Difference (ft)
		Existing	Proposed	
650 ft upstream of bridge	9332	282.55	282.55	0
Just upstream of bridge	8712	282.55	282.55	0
Just downstream of bridge	8542	282.55	282.55	0
530 ft downstream of bridge	8139	282.54	282.54	0
765 ft downstream of bridge (downstream limit of model)	7904	282.54	282.54	0

The results from the preliminary hydraulic simulation for Bridge Scenario No. 3 show that construction of this bridge alternative would not affect the regulatory base flood levels (100-year levels) throughout the area, in compliance with Sections 5-60 and 5-61 of the Town of Chapel Hill Flood Damage Prevention Ordinance.

CONCLUSIONS

The results show that for all bridge alternatives, the proposed boardwalk bridge would affect flood levels along the area during small flow events such as the 2-year and 5-year floods, but would not affect flood levels under larger storm events such as the 50-year and 100-year floods.

This is due to the backwater effect from the larger stream (New Hope Creek) which Dry Creek discharges into at a location approximately one mile downstream from the proposed bridge location. During larger storm events such as the 50-year and 100-year floods, flood levels along New Hope Creek are substantially higher than those corresponding to the 50-year and 100-year floods discharge along Dry Creek. The higher flood levels along New Hope Creek will act as a control for flood levels along Dry Creek, raising flood levels along Dry Creek to an elevation at least 11 feet above the top of the boardwalk bridge. With such a large hydraulic influence from downstream backwater levels under large flow events, the hydraulic influence of the boardwalk bridge on Dry Creek flood levels becomes insignificant, and no change is observed between existing and proposed Dry Creek water levels for large storms.

If you have any additional questions regarding this matter, please feel free to contact me at 703-317-3070, or by email at eparrilla@mbakercorp.com. Thank you.

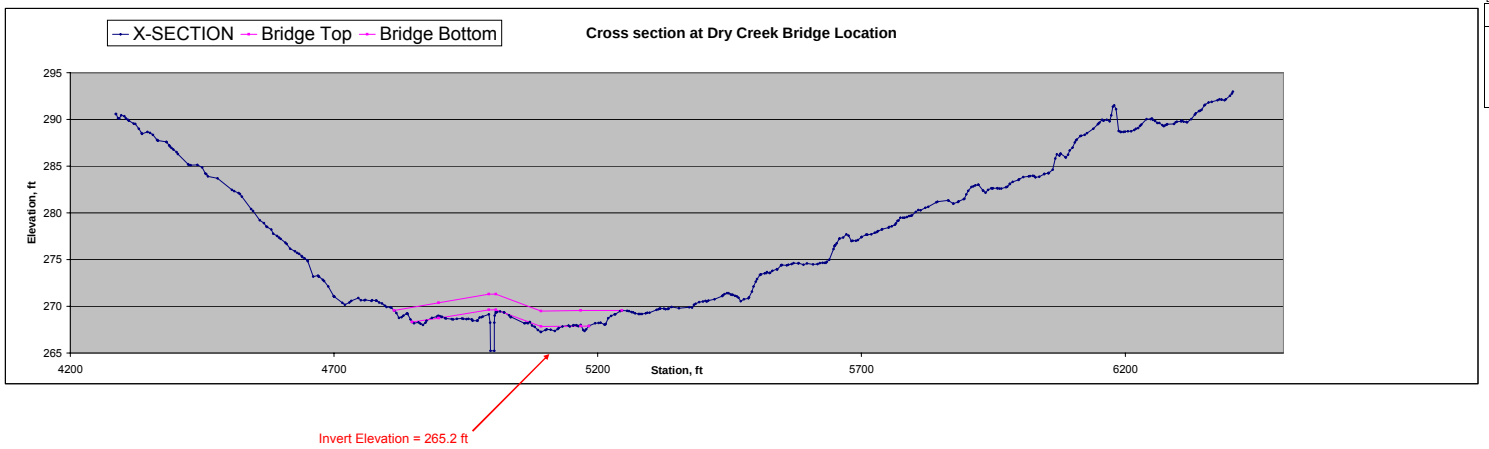
Cordially,

Elsie Parrilla Castellar, P.E.

CROSS-SECTION AT DRY CREEK BRIDGE LOCATION:

Data Points:

Station	Elevation
4286.1	290.58
4286.5	290.57
4290.6	290.12
4293	290.1
4296.4	290.43
4302.5	290.34
4305.4	290.1
4309.2	289.98
4311.2	289.85
4320.4	289.54
4323.4	289.52
4329.9	289
4335	288.53
4336	288.45
4346.1	288.66
4350.8	288.57
4356.4	288.34
4364.6	287.8
4365.9	287.75
4366.4	287.73
4381.9	287.61
4382.8	287.58
4387.5	287.22
4388.8	287.11
4391.7	286.95
4395.5	286.77
4401.7	286.52
4403.6	286.31
4423.1	285.2
4424.4	285.15
4428.1	285.1
4440.9	285.15
4450.2	284.86
4456.1	284.2
4457.6	284.14
4460.9	283.91
4479	283.71
4506.5	282.48
4510.8	282.33
4518.9	282.11
4521.4	282.01
4525.1	281.76
4543	280.4
4546.7	280.2
4558.9	279.22
4567.3	278.89
4571.8	278.52
4573	278.51
4580.9	278.23
4584.8	277.77
4592	277.55
4595.6	277.38
4598.4	277.22
4607.7	276.83
4610.3	276.68
4616.9	276.16
4626.2	275.88
4630.1	275.71
4634	275.6
4638.9	275.37
4640	275.28
4644	275.15
4649.3	274.92
4650.2	274.82
4660.3	273.18
4669.5	273.3
4670.7	273.2
4671.3	273.18
4678.9	272.83
4680.9	272.69
4688.8	272.11
4699.5	271.09
4700.1	271.05
4700.2	271.05
4700.3	271.04
4715.4	270.36
4720.5	270.18
4729	270.41
4732.7	270.57
4745.8	270.9
4750.8	270.66
4757.8	270.65
4759.2	270.67
4771.1	270.57
4772	270.65
4779.6	270.62
4780.9	270.61
4785.2	270.41
4791.1	270.32
4796.6	270.07
4799.6	269.94
4806.8	269.91
4808.8	269.85
4813.7	269.55
4818	269.29
4822.9	268.78
4828.2	268.82
4831.4	269.02
4837.5	269.22
4839.1	269.26
4839.7	269.18
4845	268.6
4847.9	268.33
4851.4	268.18



Bridge Deck + Curb Data Points:

Top Station	Top Elevation	Bottom Station	Bottom Elevation
4813.7	269.55	4847.9	268.33
4898.1	270.3867	4898.1	268.72
4993.5	271.3	4993.5	269.63
5007.1	271.3	5007.1	269.63
5092.6	269.5	5092.6	267.83
5167.9	269.55	5167.9	267.88
5246.1	269.55	5183.7	267.88

4860.3	268.29
4863.6	268.14
4868.5	268
4873.4	268.27
4875.5	268.47
4885.7	268.78
4895.5	268.92
4897.1	268.96
4898.1	268.97
4900.8	268.95
4903.5	268.88
4904.9	268.86
4910.6	268.74
4912.3	268.7
4923.4	268.62
4925.7	268.58
4932.9	268.67
4942.6	268.69
4945.3	268.65
4951.1	268.63
4954.6	268.67
4960.9	268.58
4961.8	268.57
4962.6	268.47
4971.5	268.45
4971.7	268.47
4971.9	268.48
4976	268.8
4979.4	268.85
4982.1	268.92
4993.5	269.13
4996	268.25
4996.4	265.25
5003.6	265.25
5004	268.25
5004.2	268.99
5006.6	269.29
5007.1	269.45
5008.8	269.38
5015.1	269.44
5021.9	269.35
5022.5	269.35
5031.7	269.05
5034.6	268.85
5035.6	268.86
5061	268.17
5063.4	268.23
5067.7	268.2
5071	268.33
5075.6	267.96
5080.2	267.82
5086.1	267.47
5091.8	267.25
5092.6	267.25
5101	267.45
5103.4	267.55
5110.9	267.49
5118.6	267.35
5124	267.58
5125.6	267.67
5133	267.84
5144.6	267.95
5147.1	267.85
5152.9	267.93
5154.4	267.98
5159.1	267.97
5161.8	267.91
5163.6	267.88
5167.9	268
5172.3	267.46
5175	267.35
5178.2	267.52
5183.7	267.91
5194.7	268.17
5201.5	268.22
5205	268.27
5212.5	268.05
5213.6	268.04
5215.1	268.11
5219.6	268.72
5225.3	268.96
5231.8	269.15
5233	269.16
5242.5	269.47
5246.1	269.55
5255.9	269.52
5259	269.48
5264.2	269.38
5267.2	269.36
5271.1	269.26
5277.7	269.18
5279.9	269.19
5283.5	269.17
5290.9	269.24
5294.1	269.3
5298.2	269.31
5311.2	269.62
5314.9	269.68
5317.5	269.75
5318.5	269.75
5325.6	269.76
5328.2	269.7
5332.9	269.72
5333.6	269.73
5334.6	269.75
5340	269.93
5354	269.81
5373.3	269.89

5378.7	269.85
5382.6	270.17
5385.6	270.28
5391.9	270.45
5399.6	270.5
5404.4	270.58
5406.7	270.52
5409.5	270.63
5421.5	270.74
5435.9	271.11
5437.2	271.18
5440.1	271.3
5445	271.41
5447.8	271.41
5452.2	271.27
5454.5	271.23
5456	271.24
5460.1	271.12
5463.8	271.06
5466.8	270.91
5471.1	270.56
5476.9	270.77
5485.6	270.84
5487.1	270.96
5492.1	271.59
5495.4	272.11
5499.8	272.63
5501.9	272.91
5507.4	273.34
5508.5	273.38
5509.5	273.44
5516.6	273.52
5519.6	273.57
5520.8	273.65
5525.8	273.55
5526.8	273.61
5530.9	273.79
5539.7	273.96
5539.9	273.95
5547.5	274.4
5548.1	274.41
5549.3	274.42
5558.4	274.4
5561.2	274.46
5567.3	274.52
5571	274.61
5580.4	274.6
5580.7	274.63
5589.9	274.45
5596.8	274.59
5608.1	274.49
5616.8	274.52
5620.8	274.63
5626.1	274.67
5630.9	274.65
5632.5	274.66
5634.4	274.75
5639	275.01
5646.9	276.14
5649.1	276.44
5649.6	276.52
5650.4	276.57
5652.9	276.76
5658.1	277.23
5658.8	277.26
5664.9	277.36
5671.2	277.71
5675.4	277.58
5680.8	276.98
5683.4	277.03
5689.3	277.03
5693.1	277.08
5700	277.4
5700.6	277.42
5708.7	277.66
5709.2	277.67
5711.1	277.67
5718.3	277.7
5725.4	277.87
5728.7	277.93
5731.5	278.05
5738.3	278.23
5739	278.25
5751.2	278.44
5752.8	278.49
5757.4	278.57
5763.6	278.74
5765.5	278.87
5768.5	279.13
5770.3	279.18
5773.5	279.47
5778.8	279.5
5781.6	279.48
5786	279.55
5790.2	279.67
5793.7	279.69
5795.4	279.74
5803	280.11
5808	280.3
5811.9	280.29
5821.3	280.56
5826.6	280.64
5841.7	281.13
5844.2	281.2
5864.2	281.32
5865.3	281.31
5874	281.01
5874.4	281

5882.8	281.16
5883.9	281.22
5894.2	281.47
5895	281.52
5899	281.98
5902.7	282.37
5908.4	282.77
5912.4	282.84
5915.7	282.96
5921.5	283.03
5921.7	283.03
5930.2	282.4
5931.1	282.37
5935.1	282.16
5940	282.48
5945.8	282.64
5948.2	282.61
5949.2	282.63
5957.4	282.64
5957.5	282.64
5961.1	282.6
5964.7	282.61
5973.9	282.75
5976.3	282.81
5981.1	283.09
5981.3	283.1
5986.9	283.31
5997.9	283.54
5999	283.6
6006.9	283.82
6017.3	283.9
6019.5	283.95
6024.8	283.97
6027.3	283.95
6030	283.8
6037.2	283.86
6045.9	284.13
6047	284.18
6054.3	284.24
6054.7	284.25
6055.3	284.29
6062.5	284.62
6067.7	285.82
6070.5	286.27
6075.4	286.14
6076.9	286.32
6077.7	286.32
6086.6	285.95
6087.3	285.94
6091.8	286.23
6094.8	286.68
6099.9	287
6104.4	287.53
6106.7	287.77
6108.3	287.85
6114.8	288.21
6116.3	288.26
6123.3	288.34
6127.6	288.54
6139.8	289.02
6148.4	289.48
6149.3	289.54
6151.3	289.66
6155.7	289.95
6157.2	289.94
6159	289.87
6165.3	289.98
6170.4	289.81
6173.5	290.43
6176.7	291.36
6178.9	291.52
6182.6	291.1
6187.5	288.78
6191.3	288.68
6191.7	288.68
6196.9	288.66
6199.4	288.69
6205.4	288.72
6211	288.72
6217.2	288.87
6220.3	288.99
6224.7	289.09
6228.3	289.33
6230.6	289.45
6240.1	290.04
6248.4	290.02
6250.6	290.1
6252.6	289.98
6256.8	289.82
6260.7	289.64
6264.8	289.61
6270.7	289.39
6273.1	289.27
6276.3	289.4
6278.4	289.45
6280	289.47
6292.8	289.53
6295.4	289.7
6297.9	289.75
6305.7	289.8
6306.3	289.84
6306.8	289.86
6310.5	289.76
6316.1	289.73
6317.1	289.69
6325.1	290.03
6332.2	290.52
6333.7	290.66

6339.6	290.88
6341.9	290.92
6344.6	291.04
6349.9	291.5
6351.3	291.57
6358.2	291.82
6364.2	291.88
6375	292.04
6378.6	292.16
6382.6	292.13
6383	292.13
6388.1	292.07
6390.8	292.16
6398.4	292.53
6402.2	292.79
6403.9	292.97

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
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Dry Creek Trail
Town of Chapel Hill

Erwin Road Crossing
November 14, 2007

See attached sketch for the recommended crossing layout of Dry Creek Trail and Erwin Road .

Roadway Widening

Erwin Road is recommended to be widened so that a refuge island at the trail crossing and, if desired, a left turn lane into the trail parking lot can be constructed. The roadway shall be widened according to "Recommended Treatment for Turn Lanes", Figure 4A, Chapter 9-1 of the *North Carolina Department of Transportation's Roadway Design Manual.* The attached sketch assumes symmetrical widening. It is recommended that the roadway be widened from two to three 12' lanes. This would provide a 12' wide refuge island and allow for construction of the left turn lane.

A median with a raised island is recommended because it would provide a refuge for the elderly and children to cross Erwin Road. The island also helps in traffic calming by increasing the awareness of the crossing by the vehicular traffic and providing a location for signing. However, having an island would increase the overall time required to cross Erwin Road.

Refuge Island

The recommended refuge island is a 5'' monolithic concrete island according to the North Carolina Department of Transportation (NCDOT), Standard Drawing 852.01. The monolithic island is recommended because of less maintenance requirements and it is easier to see at night.

An alternative to the 5" monolithic concrete island would be a raised landscaped island with a 1'-6" curb and gutter according to the NCDOT, Standard Drawing 846.01. The 12 foot median should allow adequate room to provide maintenance. Discussions would need to be held with NCDOT to determine if they would maintain the island or if an agreement could be reached that the Town would be responsible for the maintenance.

A raised planter is not recommended because of the introduction of a hazard to the vehicular traffic. Impact attenuators would be needed at both ends of the planter.

Signing and Pavement Marking

The signing and pavement markings for the Erwin Road/Dry Creek Trail crossing shall be according to the latest edition of the *Manual on Uniform Traffic Control Devices* and *North Carolina Bicyle Facilities Planning and Design Guidelines.*

Pedestrian Signal

For a pedestrian signal to considered by NCDOT, they normally would require that the warrants from MUTCD, Section 4C.05 be met. The warrant is as follows:

"The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that both of the following criteria are met:

A. The pedestrian volume crossing the major street at an intersection or midblock location during an average day is 100 or more for each of any 4 hours or 190 or more during any 1 hour; and

B. There are fewer that 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic."

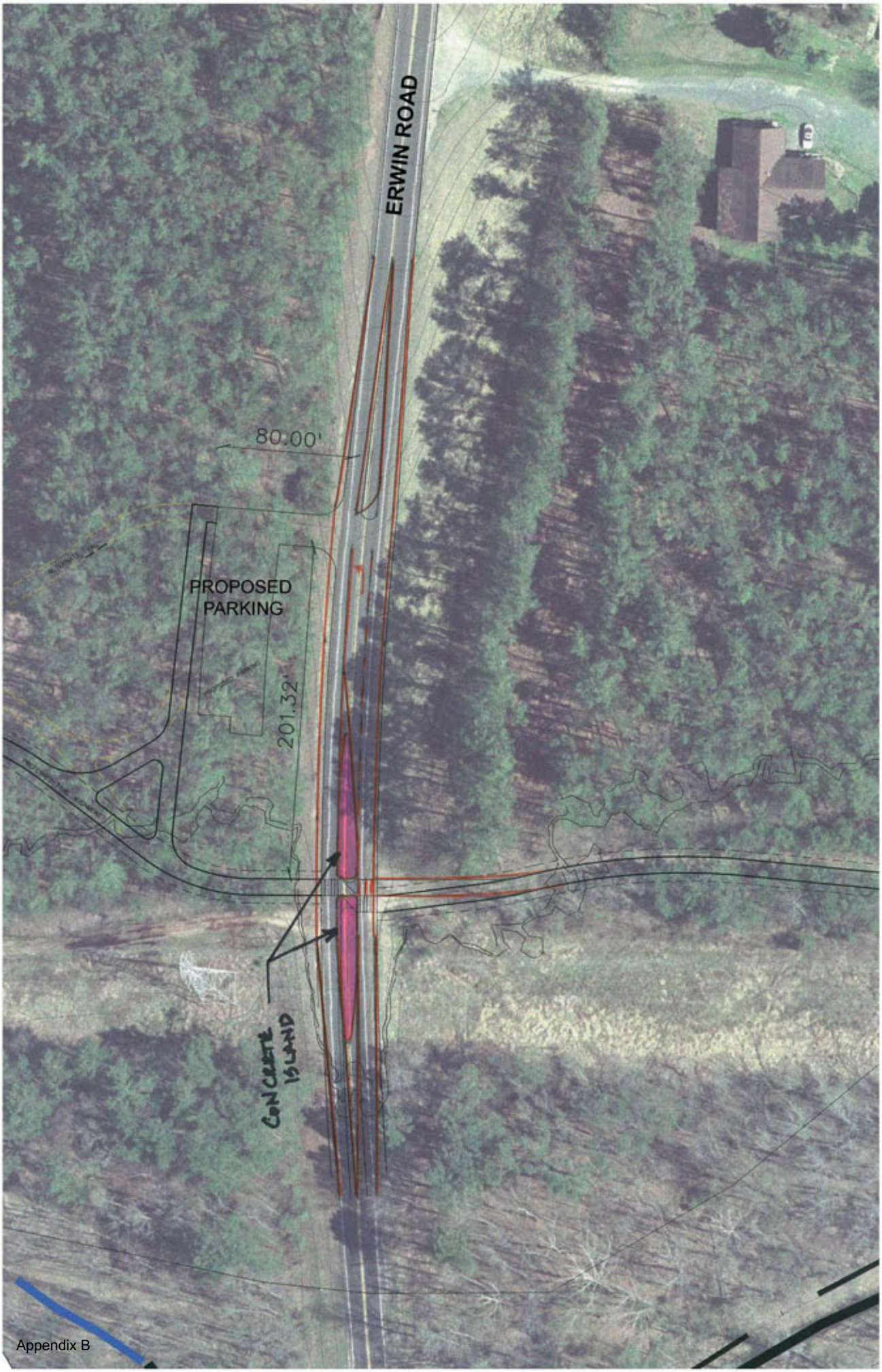
In lieu of the pedestrian signal or until the warrant is met, it is recommended to provide advance warning signs with warning flashers on Erwin Road that can be manually or automatic sensor activated.

Posted Speed Limit

Request that NCDOT move the posted speed limit transition from 45 mph to 35 mph that is occurring just south of the bridge over I-40 be moved so that it occurs entirely north of I-40. The speed of the traffic should be monitored and enforcement measures should be used if needed.

Additional Measures to be considered

1. Consider the use of in-roadway lighting in conjunction with the advance warning signs with warning flashers at the trail crossing.
2. Discuss with NCDOT about the possibility of striping Erwin Road for 11' lane widths as a traffic calming measure.
3. Other traffic calming devices such as a speed hump with crosswalk, woonerf configuration, etc. are not recommended because of the classification and amount of traffic on Erwin Road. Rumble strips are not recommended because of there not being a fixed condition that you are trying to warn motorists.


ERWIN ROAD
80.00'
PROPOSED
PARKING
201.32'
CONCRETE
ISLAND

SUMMARY OF PRELIMINARY CONSTRUTION COST ESTIMATE

See following pages for detailed estimate

PHASE I: PERRY CREEK DRIVE TO ERWIN ROAD

Phase I Greenway length:	2430	LF
Phase I Graded Area:	60700	SF
Phase I Total Cost Estimate	**$261,351**	
Cost per Square Foot	$4.31	

PHASE II: ERWIN ROAD TO PROVIDENCE ROAD

Phase II Greenway length:	3,420	LF
Phase II Graded Area :	86,000	SF
Phase II Total Cost Estimate	**$843,017**	
Cost per Square Foot	$9.80	

COMBINED TOTAL, PHASES I AND II:	**$1,104,368**
Cost per Square Foot	$7.53

PHASE I:PERRY CREEK DRIVE TO ERWIN ROAD

Phase I Greenway length = 2430 LF
Phase I Graded Area = 60,700 SF or 1.4 ac

Item	Qty.	Cost/ unit		Subtotal	
DEMOLITION					
Site					
Clearing and Demolition	38000	0.30	sf	$11,400	
			Sub-Total	$11,400	
		ADD 6% FOR DUMPING FEES		$684	
		TOTAL FOR DEMOLITION		$12,084	
* Perry Creek to bridge (OWASA easement) not included in clearing and demo cost					
GENERAL CONSTRUCTION					
Site work					
Mobilization: 5%				$44,000	
Surveying	1	$8,000	ls	$8,000	
Grading	810	$9.50	cy	$7,695	
S 9.5 A Asphalt Trail	2700	$20.00	sy	$54,000	
Stabilized Chapel Hill Gravel Parking Lot	6108	$8.00	sf	$48,866	
Timber Retaining Wall	35	$46.00	ff	$1,610	
Furnishings - Benches	4	$1,200.00	ea	$4,800	
Furnishings - Litter	2	$500.00	ea	$1,000	$169,971
Storm Drainage					
Culvert: 12" RCP	90	$40.00	lf	$3,600	
Erosion Control					
Allow	1	$5,000.00	ls	$5,000	
Planting					
Allow	1	$8,000.00	ls	$8,000	
	SITE CONSTRUCTION TOTAL			$186,571	
	DEMOLITION			$12,084	
		Subtotal		$198,655	
Contractor Overhead and Profit		$198,655	0.1	$19,866	
Contractor Mobilization and bonds		$218,520.85	0.04	$8,741	
15% Contingency		$227,261.69	0.15	$34,089	
Total Estimate				**$261,351**	

Alternate Items:

No.	Item	Qty.	Cost/ unit		Subtotal	Add/Deduct
1	Asphalt Parking Lot and Drive	678	$20.00	sy	$13,560	-$35,306
2	Chapel Hill Gravel lot without stabilizer	6108	$5.00	sf	$30,541	-$18,325

PHASE II: ERWIN ROAD TO PROVIDENCE ROAD

Phase II Greenway length = 3420 LF
Phase II Graded Area = 86,000 SF or 2.0 ac

Item	Qty.	Cost/ unit		Subtotal	
DEMOLITION					
Site					
Clearing and Demolition	60000	0.30	sf	$18,000	
			Sub-Total	$18,000	
		ADD 6% FOR DUMPING FEES		$1,080	
		TOTAL FOR DEMOLITION		$19,080	
Duke Power Easement not included in clearing and demo cost					
GENERAL CONSTRUCTION					
Roadway work with median pocket at xing					
Allow	1	$160,000.00	ls	$160,000	
Site work					
Mobilization: 5%				$44,000	
Surveying	1	$10,000	ls	$10,000	
Grading	990	$9.50	cy	$9,405	
12' wide Asphalt Road for shared use	1200	$25.00	sy	$30,000	
S 9.5 A Asphalt Trail	2300	$20.00	sy	$46,000	
12' Wood Bridge at tributaries	2	$10,000.00	ea	$20,000	
Timber Retaining Wall	30	$50.00	ff	$1,500	
Furnishings - Benches	4	$1,200.00	ea	$4,800	
Furnishings - Litter	2	$500.00	ea	$1,000	$166,705
Storm Drainage					
Culvert: 12" RCP	90	$40.00	lf	$3,600	
Boardwalk structure					
Abutments	2	$3,000.00	ea	$6,000	
Decking, joists, beams	2700	$12.00	sf	$32,400	
Railings: see breakdown below	1	$16,000.00	ls	$16,000	
Helical Piers - see alternates below	56	$1,000.00	ea	$56,000	$110,400
Pedestrian Bridge					
Weathering steel, 5-ton load rating	80	$2,000.00	lf	$160,000	
Abutments	2	$4,000.00	ea	$8,000	$168,000
Erosion Control					
Allow	1	$5,000.00	ls	$5,000	
Planting					
Allow	1	$8,000.00	ls	$8,000	
	SITE CONSTRUCTION TOTAL			$621,705	
	DEMOLITION			$19,080	
		Subtotal		$640,785	
Contractor Overhead and Profit		$640,785	0.1	$64,079	
Contractor Mobilization and bonds		$704,863.50	0.04	$28,195	
15% Contingency		$733,058.04	0.15	$109,959	
Total Estimate				**$843,017**	

Note: Estimate for this segment assumes utilizing the existing Duke Energy access road east of Erwin Road and one minor swale bridge crossing in addition to the boardwalk.

Alternate Items

No.	Item	Qty.	Cost/	unit	Subtotal	Add/Deduct
	Base price for boardwalk and bridge combination above				$278,400	
1	Estimate from York Bridge Concepts					
	for 465 LF bdwk with 40' span bridge portion	1	$260,000.00	ea	$260,000	-$18,400
2	"Pin Foundations" pier foundations*					
	in lieu of helical piers	60	$300.00	ea	$18,000	-$38,000

Item Breakdown: Railing Components**

Jakob Mesh wire	2070	$8.00	sf	$16,560
Jakob cable	5980	$1.00	lf	$5,980
Cable components: Internal thread	130	$6.56		$853
Cable components: Headless screw	130	$4.21	ea	$547
Cable components: Hex nuts	260	$0.32	ea	$83
Cable components: Dome nuts	130	$0.83	ea	$108
			Subtotal	$7,571

* Pin Foundations can only currently be utilized for non-vehicular loading. If vehicular loading is required on boardwalk structure, this method is not currently an option. Cost assumes (60) posts at approx. 16' on center.

** Does not include cost for shipping. Delivery from overseas is $25 per kg or 2.2 lbs.

End of Cost Estimate

Substation Access Road Specification

Revised 05/05/06

Width: **14 feet** (minimum) in straight sections
18 feet (minimum) in curved sections
28 feet (minimum) driveway entrance

Maximum Grade: **8% for Crusher Run Rock and 10% for Heavy Duty Asphalt**

Maximum Rate of Change in Slope: **3%**

Inside Turn Radius: **55 feet for inside wheels & 65 feet for outside wheels**
See attached drawing
Maximum Side Slope: **2%**

Road Load Bearing Capability:

Asphalt Drive	- **Heavy Duty Asphalt (NC DOT Standard)**
or	
ABC Crusher Run Rock (Un washed)	- **Sub Grade Compaction - 95%** **Stone Compaction - 98%** **Initial Stone Depth - 6 inch (Minimum)** **Stone Depth to be maintained at a 3 inch minimum level throughout the life of the Facility.**

Notes:

Any security fence sections that block the access drive will have a minimum gate width of 20 feet (desired 24 feet), must be installed to Duke's minimum guide lines, and located no closer than 80 feet to the Public Road. This will allow the truck operator to park the truck and trailer and un lock the security gate without the end of the trailer sticking out into the Public Road. Duke Energy employees must have 24-hour access to the property; appropriate accommodations must be made for securing the gate with a double lock.

Site Development Requirements;

Preparation of the project site shall include clearing and removing of all trees, stumps, and large rocks within the Road Bed construction area limits. Grubbing shall include the removal of any item that would interfere with the building of the access road. Stream crossing will be allowed only if proper permitting has been obtained and if they are constructed with appropriately sized and placed culverts. The minimum culvert size will be 18 inches and with an appropriate amount of compacted cover soil to handle axle loads listed below. Intake and discharge of culverts shall be armored with oversized washed stone, and streams are to be crossed at right angles. Access road connection to the Public Highway will be at a right angle for at least a minimum of 50 feet. For access roads connections to the Public Highway at less than a right angle, Duke will require review and approval of driveway entrance. During construction of the site the first 50 feet of the access road will be paved with 2"- 3" ballast rock until the soil and access road has been stabilized. Logs, trees tops, stumps, roots, brush, tree trimmings, large rocks, and other materials resulting from grubbing and clearing operations shall be properly disposed of. Permission and review of burial site by Duke is required if this material is to be disposed on the station property. Structures, buildings, mobile homes and trailers, satellite signal receiver systems and equipment, swimming pools and associated equipment, human graves, billboards, signs, wells, septic tanks or septic systems, absorption pits, storage tanks both above and below ground, garbage, trash, rubble, flammable material, building material, junk, and wrecked or disabled vehicles are not allowed within the road right-of-way limits. Other utilities R/W's, roads, driveways, sewer lines, water lines, vision cable or any other overhead or underground facilities shall not parallel the center line within the road R/W limits, but may cross at angle not less than 30 degrees with the center line and no closer than 20 feet to any Duke Structure. Access roads that cross Duke's transmission R/W's must adhere to all Transmission Line R/W restrictions (see Form 02191- R12-98) as it pertains to, angle of crossing, clearances to wire conductors, and permanents structures and fixtures. Manholes and underground vaults within the road R/W limits must be approved by Duke ET before installation. Fences shall not parallel the centerline within the road R/W but Duke reserves the right to grant or reject the property owner request to cross the access road with a fence. The fence may cross at any

angle not less than 45 degrees with the centerline of the road. If a fence crosses the road R/W, a gate shall be installed and maintained by the property owner per Duke's specifications to allow free access required by Duke's equipment, trucks, and personnel. Fences shall not be attached to any Duke pole or structure. Grading of the access road shall be at least 20 feet from any Duke pole, structure, or tower leg. No vehicles or equipment will be allowed to be parked within the road R/W limits.

Soil Compaction Requirements;

Roadway Road Bed construction Soil Material shall be compacted to a depth of at least 6 inches, using industry acceptable compacting techniques, to 95% of the maximum density in accordance with ASTM - D698 and at +2 percent of the optimum moisture content as determined by ASTM - D1557. Soil backfill shall be deposited in layers not to exceed 6 inches in uncomplicated thickness and shall be compacted to the same density of the graded substation yard. Material for backfield shall be composed of earth free of wood, grass, roots, broken concrete, large stones, trash, or debris of any kind. No tamped, rolled, or otherwise mechanically compacted soil backfield shall be deposited or compacted in water. All soil backfield material shall consists of loose earth having a moisture content such that the required density of the compacted soil will be obtained with the compacting method used. Moisture content shall be distributed uniformly and water for the correction of moisture content shall be added sufficiently in advance so as proper moisture distribution and compacting will be obtained. Final grade elevation shall be established to effectively handle storm water run-off. Run-off shall be directed from the crown of the road bed to the outside perimeter of the with a 1/2 % slope to a point off the road bed which would minimize erosion and sedimentation damage. The Access Road Bed shall be graded such that no depressions shall be left within the access road that will hold water or prevent the proper drainage of the site. No ponding or the flooding of water within the road bed area shall occur. After the Road Bed grade has been established, cover the length of the Road Bed area with 6 inches of un washed ABC Crusher Run Granite Aggregate compacted to 98% Mod Proctor except for during construction - the first 50 feet of Road Bed entrance which will be covered with 2"- 3" unwashed Coarse Granite Aggregate to a depth of 6" compacted to a 98% Mod Proctor. After construction is completed, this area will be covered with un washed ABC Crusher Run Granite Aggregate to a depth of 4" and compacted to a 98% Mod Proctor.

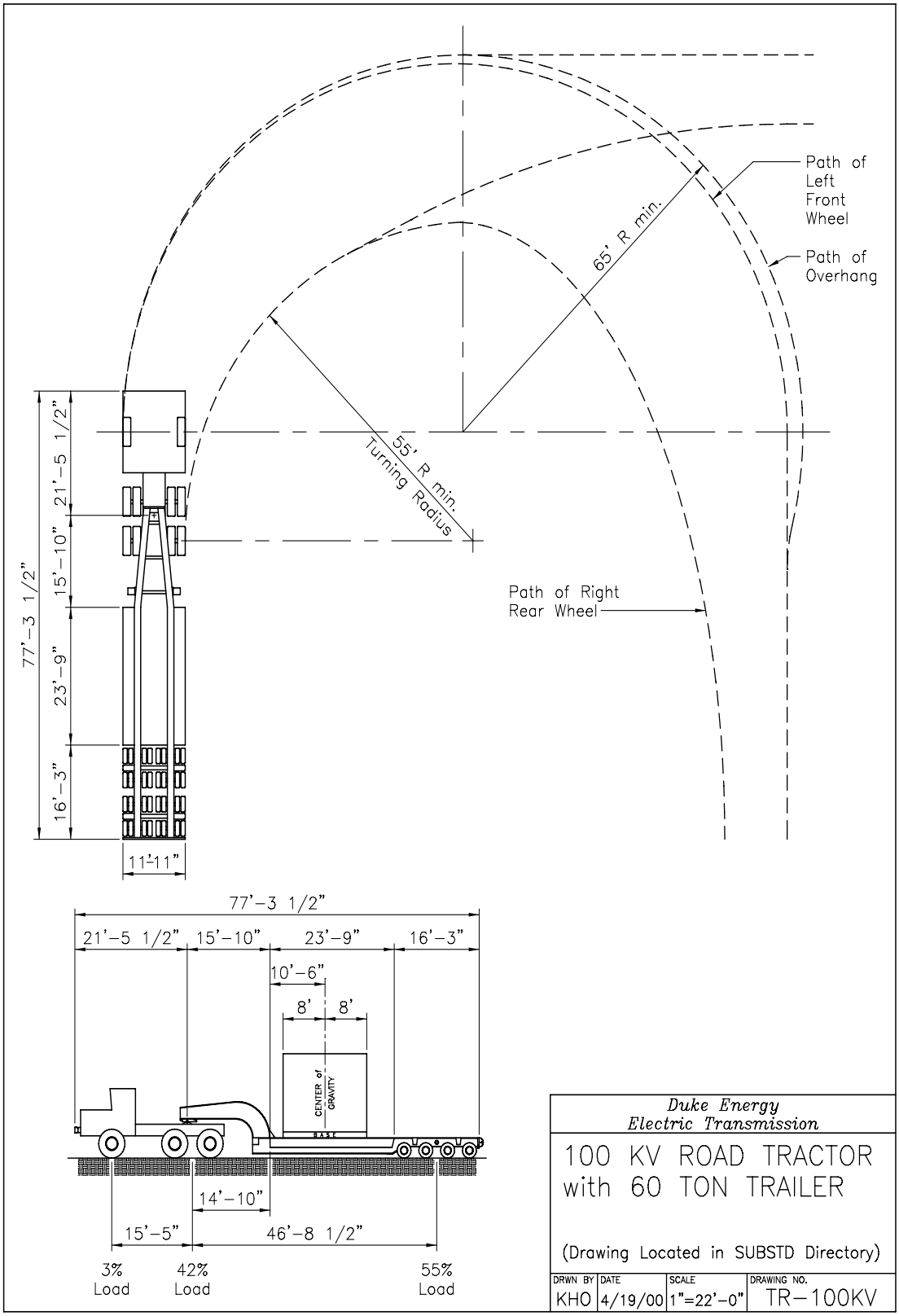
Soil Seeding Requirements;

Sedimentation control, including re-vegetation and permitting, will be covered and required as per Federal, State, County, or City regulations. Soil surface stabilization measures will be completed immediately following the establishment of the Road Bed. Seeding, mulching, matting,

or other soil surface stabilization measures will be placed on the road shoulders and other disturbed areas following initial soil disturbance. Prior to seeding, all disturbed surfaces shall be scarified to a depth of four to six inches to enhance seed germination and help impede storm water runoff. Seeding mixtures will be tailored to site-specific conditions, steepness of slopes, climate, location, time of year, and elevation. Mulch or matting shall be applied to all seeded areas to aid in the establishment of vegetation and help impede soil erosion. Vegetative mulch, typically wheat or oat straw, shall be applied at the rate of 3,000 to 4,000 LBS/ACRE. Ditches on either side of the Road Bed shall be designed and covered with matting and seeding so as to prevent any erosion of soil in the bottom of the ditches.

Axle Loading for Soil Compaction Design;

One	**axle loads**	**N.C.**	**25,000lb ,**	**S.C.**	**20,000lb**
Two	**axle loads**	**N.C.**	**50,000lb ,**	**S.C.**	**40,000lb**
Three	**axle loads**	**N.C.**	**60,000lb,**	**S.C.**	**60,000lb**
Four	**axle loads**	**N.C.**	**60,000lb,**	**S.C.**	**80,000lb**
Five	**axle loads**	**N.C.**	**94,500lb,**	**S.C.**	**90,000lb**
Six	**axle loads**	**N.C.**	**108,000lb,**	**S.C.**	**110,000lb**

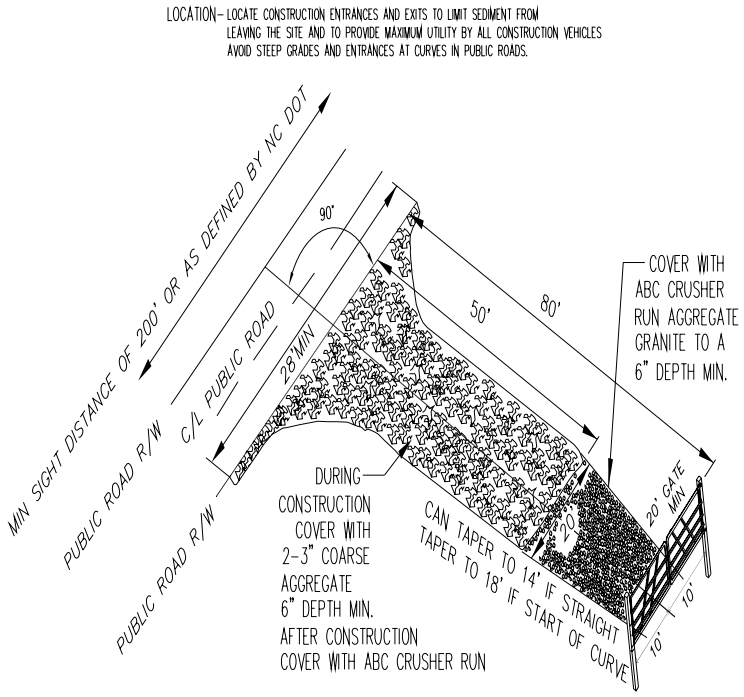


Duke Energy
Electric Transmission

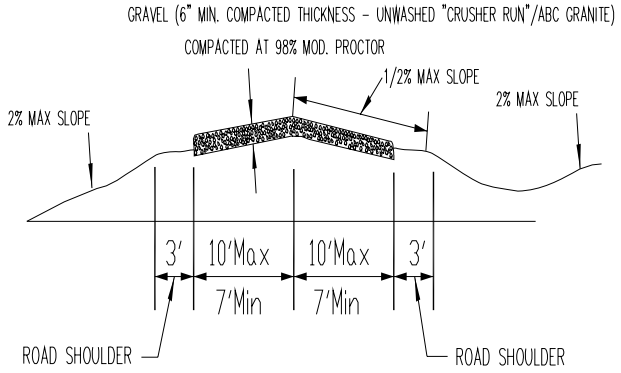
100 KV ROAD TRACTOR with 60 TON TRAILER

(Drawing Located in SUBSTD Directory)

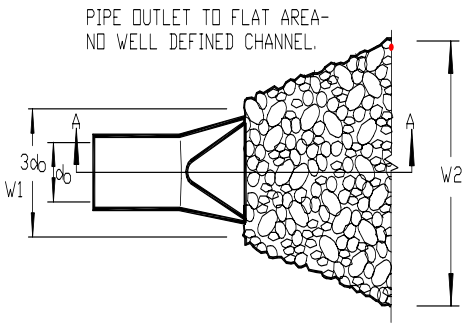
DRWN BY	DATE	SCALE	DRAWING NO.
KHO	4/19/00	1"=22'-0"	TR-100KV



DRIVEWAY ENTRANCE

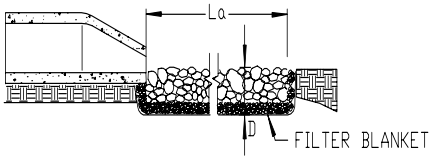


SIDE VIEW of ACCESS ROAD



NOTES:

1. La IS THE LENGTH OF THE RIP RAP APRON.
2. D=1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6".
3. IN A WELL DEFINED CHANNEL EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF THE BANK, WHICHEVER IS LESS.
4. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIP RAP AND SOIL FOUNDATION.

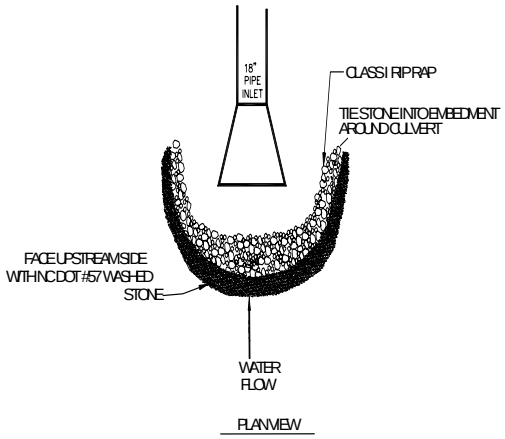


NOTE: ALL RIP RAP TO BE CLASS A

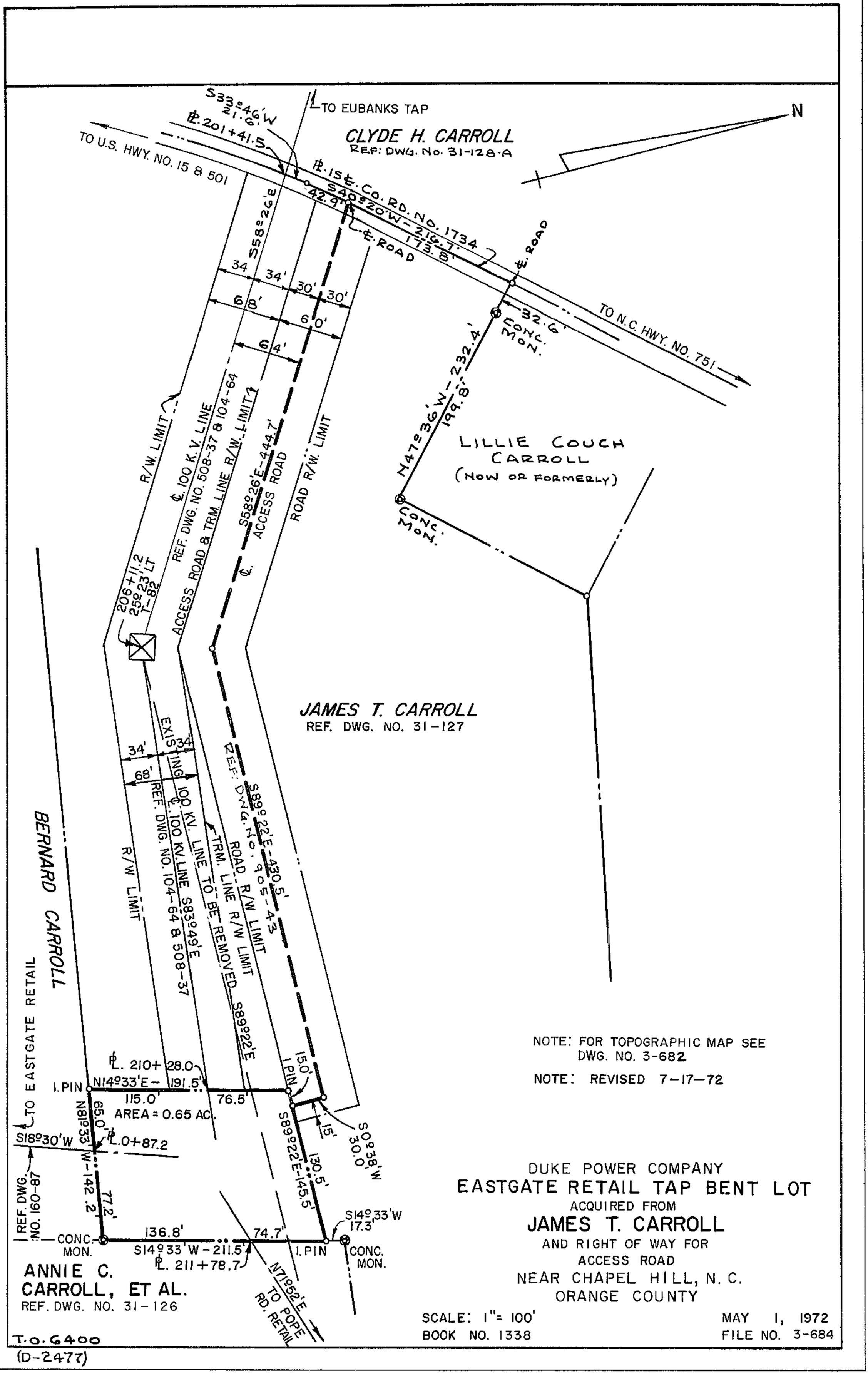
* PIPE TO BE REINFORCED CONCRETE PIPE (RCP)

CULVERT (#)	SIZE (DIA.)	La ft.	W1 ft.	W2 ft.	D in.	INLET ELEV.	OUTLET ELEV.
DISSIPATOR #1 18" RCP CULV.	18"	6'	4.5'	7.5'	12"	623.75'	623.25'

ENERGY DISSIPATOR PAD



CULVERT INLET PROTECTION

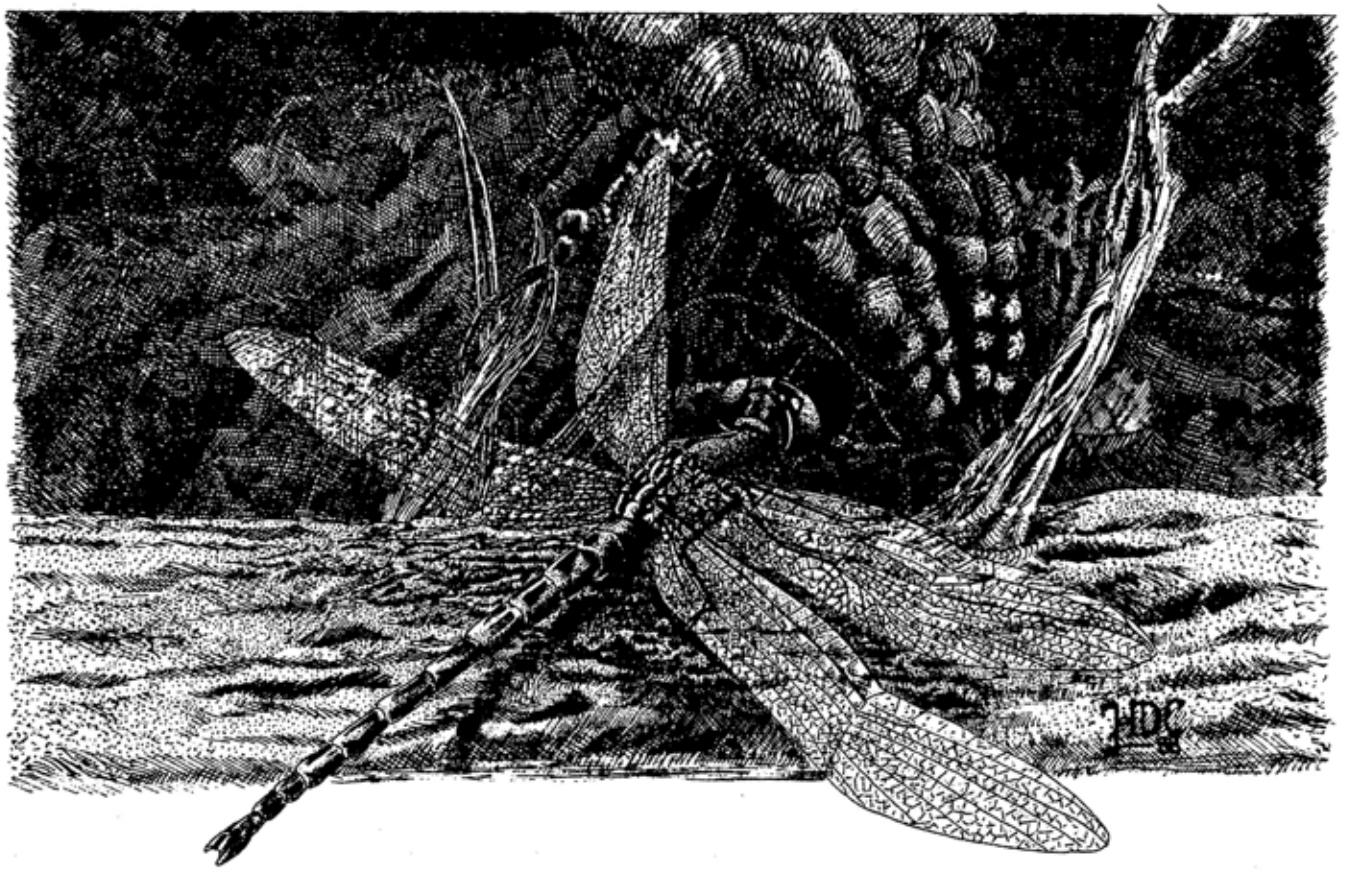


EUGENE DIETZGEN-135-A 1530

RGH

APPENDIX E

INVENTORY OF THE NATURAL AREAS AND WILDLIFE HABITATS OF ORANGE COUNTY, NORTH CAROLINA



GRAYBACK DRAGONFLY

Table 1. Natural Communities in Orange County and the Natural Areas in which they occur. Names of the communities from Schafale and Weakley (1985). Page 2 of 2.

PALUSTRINE COMMUNITIES	
Rocky Bar and Shore Uncommon in small streams; mainly in Eno River	E13
Piedmont Levee Forest Rare due to absence of large streams	C02
Piedmont Swamp Forest Rare; found here only in Triassic Basin areas	B03,M17,M18
Piedmont Bottomland Forest Common in broad stream valleys	E05,E08,M18,N16
Piedmont Alluvial Forest Commmon in stream valleys	C03,E07,E11,E13,E15, E16,M15,N16
Upland Depression Swamp Forest Uncommon; in flat, poorly drained upland areas	E10,N02,N03
Semipermanent Impoundment Uncommon; mostly beaver ponds	L01,L02,M05

Plant species characteristic of this unusual formation include Virginia pine (Pinus virginiana), mountain laurel (Kalmia latifolia), various heath species, and bracken fern (Pteridium aquilinum). In positions where steep, nutrient poor slopes are facing north and are thus relatively cool and moist, rhododendron slopes (part of the Acidic Cliff community) can occur. Rhododendron catawbiense, common in the mountains, is restricted in the Piedmont to these steep sites. There are nine such rhododendron slopes in Orange County, more than in any other of the Triangle counties surveyed to date.

Several other terrestrial forest communities are found on soils that are circumneutral in pH. Natural areas containing such forests are very rare in Orange County. The Basic Mesic Forest at Sevenmile Creek, with a large number of sugar maples and other woody species that thrive in circumneutral soils, is the only example of this forest type that we located in this survey. The Basic Oak--Hickory Forest is likewise rarely found in good condition in the county. The best examples are located on the few undisturbed large formations of diabase rock. A tree species found at these sites is the southern shagbark hickory (Carya carolinae-septentrionalis). Where circumneutral clay soils such as Enon or Iredell series develop an impermeable hardpan, the Montmorillonite Forest may develop. Quite rare and restricted to the Piedmont, these forests have a stunted canopy and are dominated by post oak (Quercus stellata) and blackjack oak (Quercus marilandica). The Montmorillonite Forest in the Blackwood Division of Duke Forest (N04) is one of the best examples of this natural community in the state.

There are several types of palustrine (wetland) communities in Orange County. The most common of these are the Piedmont Alluvial Forest and the Piedmont Bottomland Forest, which are common in stream valleys of various sizes. Standing water is absent most of the time, but regular seasonal inundation and deposition of sediments are characteristic. Many of the streamside natural areas we have identified in this report contain at least a small representative area of these natural communities.

Much more uncommon is the Piedmont Swamp Forest, which is restricted to the Triassic Basin areas found only on the easternmost edge of the county. A superlative example of this natural community, indeed one of the best remaining representatives in the eastern Piedmont, is the old growth swamp forest of the Big Oak Woods (M17).

Since Orange County is a headwater region, large streams are lacking. Only at the southwestern corner, where the Haw River forms several miles of the county border, is there a large enough river system to deposit the amount of sediments needed for the development of the Piedmont Levee Forest community. This community, dominated by river birch, box elder and ash, occurs only along a narrow portion of the Haw River that has been, until recently, protected as a part of the NC Wildlife Commission

ORANGE COUNTY NATURAL AREAS SURVEY. SITE DESCRIPTION.

Site name: Cedar Terrace Bottoms
Site number: B03

Significance: 4 - County Medium **Integrity:** 1 - Prime
Threat Status: 3 - Moderate

Location: South of I-40 and north of Providence Road.
USGS Quad: Chapel Hill
Approx. acreage: 85

Jurisdiction: Chapel Hill

Reasons for significance: This area includes a large tract of relatively mature bottomland swamp forest located on the westernmost limits of the Durham Triassic Basin. One state-listed animal of special concern, the Thorey's grayback dragonfly (Tachopteryx thoreyi), breeds in seepage areas at the margins of this forest.

General description: The wide and gentle bottoms of the Triassic Basin touch only the easternmost portion of Orange County. Except for the Big Oak Woods and Morgan Creek Swamp (M17 and M18), this is the best example of swamp forest in the county. Along the unnamed tributary of New Hope Creek which flows through this site, the forest cover is composed mostly of red maple (Acer rubrum), white ash (Fraxinus americanus), and sweet gum (Liquidambar styraciflua). Other important trees are willow oak (Quercus phellos), Shumard's oak (Q. shumardii), overcup oak (Q. lyrata), sycamore (Platanus occidentalis), and tulip poplar (Liriodendron tulipifera), with hop hornbeam (Ostrya virginiana) and ironwood (Carpinus caroliniana) occurring in the subcanopy. Many of the herbaceous species are those restricted to wet bottomlands, and include water hemlock (Cicuta maculata), lizard's tail (Saururus cernuus), false nettle (Boehmeria cylindrica), aneilema (Aneilema keisak), lycopus (Lycopus virginicus), and jewelweed (Impatiens capensis).

These bottomland forests are often prime nesting sites for birds, and 33 species were recorded here over only two brief visits in 1988. Some of the typical bottomland species include the green-backed heron (Butorides striatus), acadian flycatcher (Empidonax virescens), and parula warbler (Parula americana), while the hooded warbler (Wilsonia citrina) and scarlet tanager (Piranga olivacea) represent species that simply prefer extensive hardwood forests, especially where the cover is fairly dense. The tracks of deer (Odocoileus virginianus), racoon (Procyon lotor), red fox (Vulpes vulpes), and groundhog (Marmota monax) are also conspicuous, while large pools provide breeding habitat for marbled salamanders (Ambystoma opacum) and other amphibians. The most noteworthy animal is the rare Thorey's grayback dragonfly (Tachopteryx thoreyi), which breeds in the shallow seeps located where the crystalline rock of the Piedmont meets the flat sediments of the Triassic Basin.

Protection Status: None known.

Surrounding land use:

N: Powerline, forest
E: I-40
S: Business development
W: Residential

Threats:

Immediate: Construction of apartments and offices on adjacent uplands; timbering
Potential: Same

Recommendations for management or protection: These bottomlands should be protected from development under the Floodplain Protection Ordinance of the Town of Chapel Hill; care needs to be taken, however, that development on the adjoining slopes does not spill over, especially where the grayback seeps occur; a conservation easement should be negotiated with the landowners for the protection of the forest.

Ownership: See Appendix A

Documentation References: None

NATURAL AREA RECONNAISSANCE

County: Orange **Quad:** Chapel Hill
Elevation: 260'-290' **Physiographic province:** Piedmont

Surveyors: Dawson Sather
Biology Department
UNC-CH
Chapel Hill, NC
967-9306

Steve Hall
Biology Department
UNC-CH
Chapel Hill, NC
942-8451

Site name: Cedar Terrace Bottoms
Site number: B03

Significance: 4 - County Medium **Integrity:** 1 - Prime
Threat Status: 3 - Moderate

Date(s): 1/7/87; 2/3/88; 5/6/88, 7/7/88; 25/7/88, 15/9/88

Summary list of Special Status Plant Species: None

Summary list of Special Status Animal Species:
SC Tachopteryx thoreyi

Other significant features: None

Priority for further investigation: Low

Specific needs for further investigation: The area was examined for the presence of four-toed salamanders during March, 1988; although none were found, a more thorough search could still turn them up.

Discussion of natural area: See general description.

NATURAL COMMUNITIES

Name (by NCNHP system): Piedmont Swamp Forest
Nat. Area name: Cedar Terrace Bottoms
County: Orange **Quad:** Chapel Hill
Acreage: 85
General description of community: Same as for natural area.

Includes the following Plant Community types:

Natural Community quality and integrity: Prime

Topography
Slope: None
Steepness (in degrees): Flat
Topo position: Bottom along stream.

Hydrology: Intermittantly saturated

Watershed: New Hope Creek --> Haw River --> Cape Fear River

Natural Community significance and reasons: Same as for natural area.

PLANT SPECIES LIST

CANOPY:
- Acer floridanum
- Acer rubrum
- Fraxinus americana
- Liquidamabar styraciflua
- Liriodendron tulipifera
- Platanus occidentalis
- Quercus lyrata
- Quercus phellos
- Quercus rubra
- Quercus shumardii

SUBCANOPY:
- Carpinus caroliniana
- Ostrya virginiana

SHRUBS:
- Chionanthus virginicus
- Cornus florida
- Ilex decidua
- Itea virginica
- Prunus serotina
- Rubus argutus
- Viburnum rafinesquianum

HERBS:
- Aneilema keisak
- Aster paternus
- Boehmeria cylindrica
- Carex louisianica
- Cicuta maculata
- Eupatorium sp.
- Impatiens capensis
- Leersia virginica
- Lycopus virginicus
- Peltandra virginica
- Polygala senega
- Polystichum acrostichoides
- Rudbeckia laciniata
- Saururus cernuus
- Smilax rotundifolia

VINES:
- Campsis radicans
- Lonicera japonica
- Parthenocissus quinquefolia
- Rhus radicans
- Vitis rotundifolia

ANIMAL SPECIES LIST

Vertebrates:

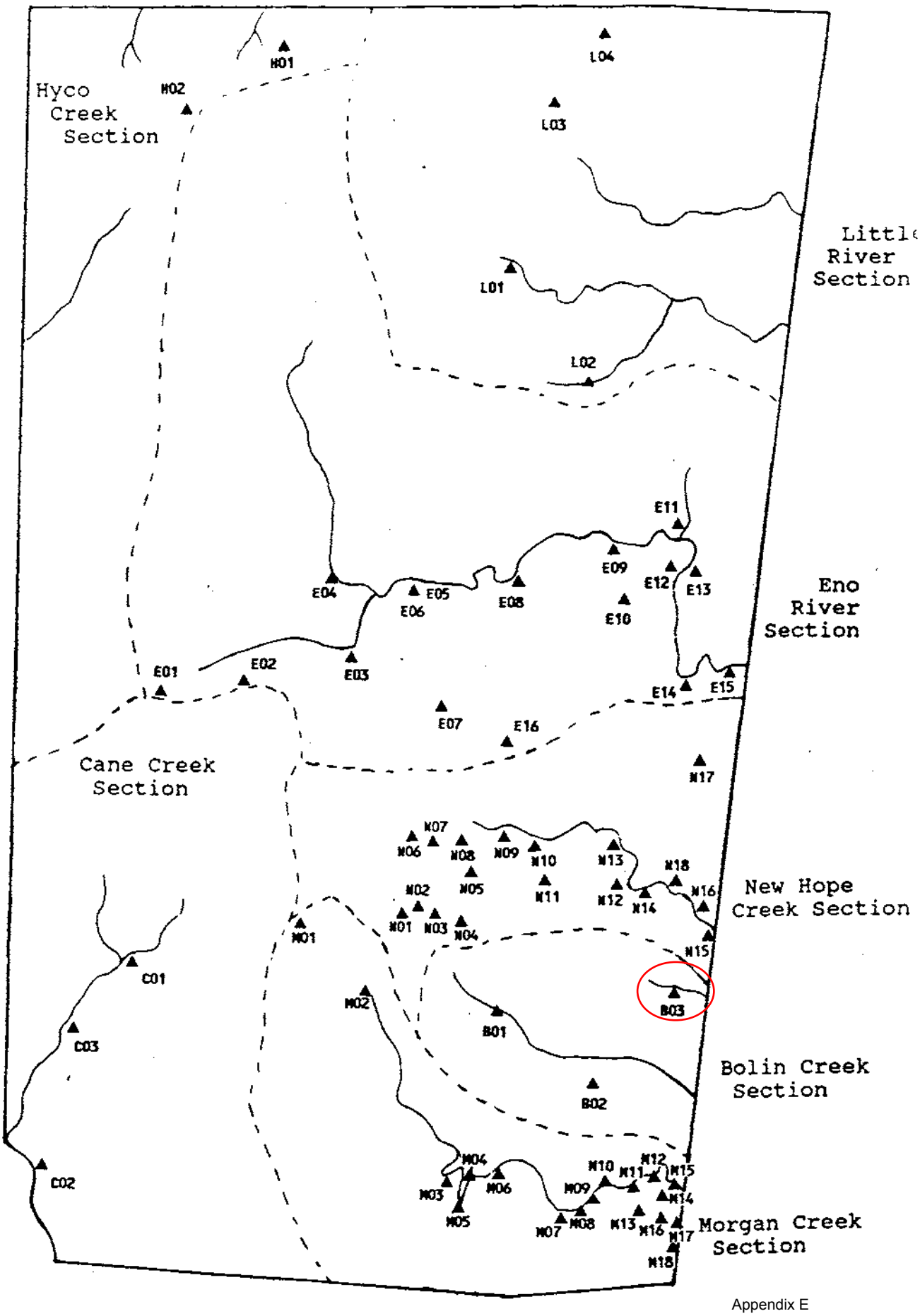
	Butorides	striatus
	Zenaida	macroura
i	Coccyzus	erythropthalmus
	Melanerpes	carolinus
	Picoides	pubescens
i	Picoides	villosus
	Colaptes	auratus
	Empidonax	virescens
	Cyanocitta	cristata
	Corvus	brachyrhynchos
	Parus	carolinensis
	Parus	bicolor
i	Sitta	carolinensis
	Sitta	pusilla
	Thryothurus	ludovicianus
	Polioptila	caerulea
	Sialia	sialis
	Hylocichla	mustelina
	Vireo	olivaceus
	Parula	americana
	Dendroica	pinus
i	Seiurus	aurocapillus
	Geothlypis	trichas
i	Wilsonia	citrina
	Icteria	virens
	Piranga	rubra
i	Piranga	olivacea
	Cardinalis	cardinalis
	Guiraca	caerulea
	Passerina	cyanea
	Pipilo	erythropthalamus
	Quiscalus	quiscala
	Carduelis	tristis
	Marmota	monax
	Sciurus	carolinensis
	Vulpes	vulpes
i	Urocyon	cinereoargenteus
	Procyon	lotor
	Odocoileus	virginianus
	Coluber	constrictor
	Ambystoma	opacum
	Bufo	americanus
	Bufo	woodhousei fowleri
	Hyla	chrysoscelis
	Pseudacris	triseriata
	Rana	clamitans

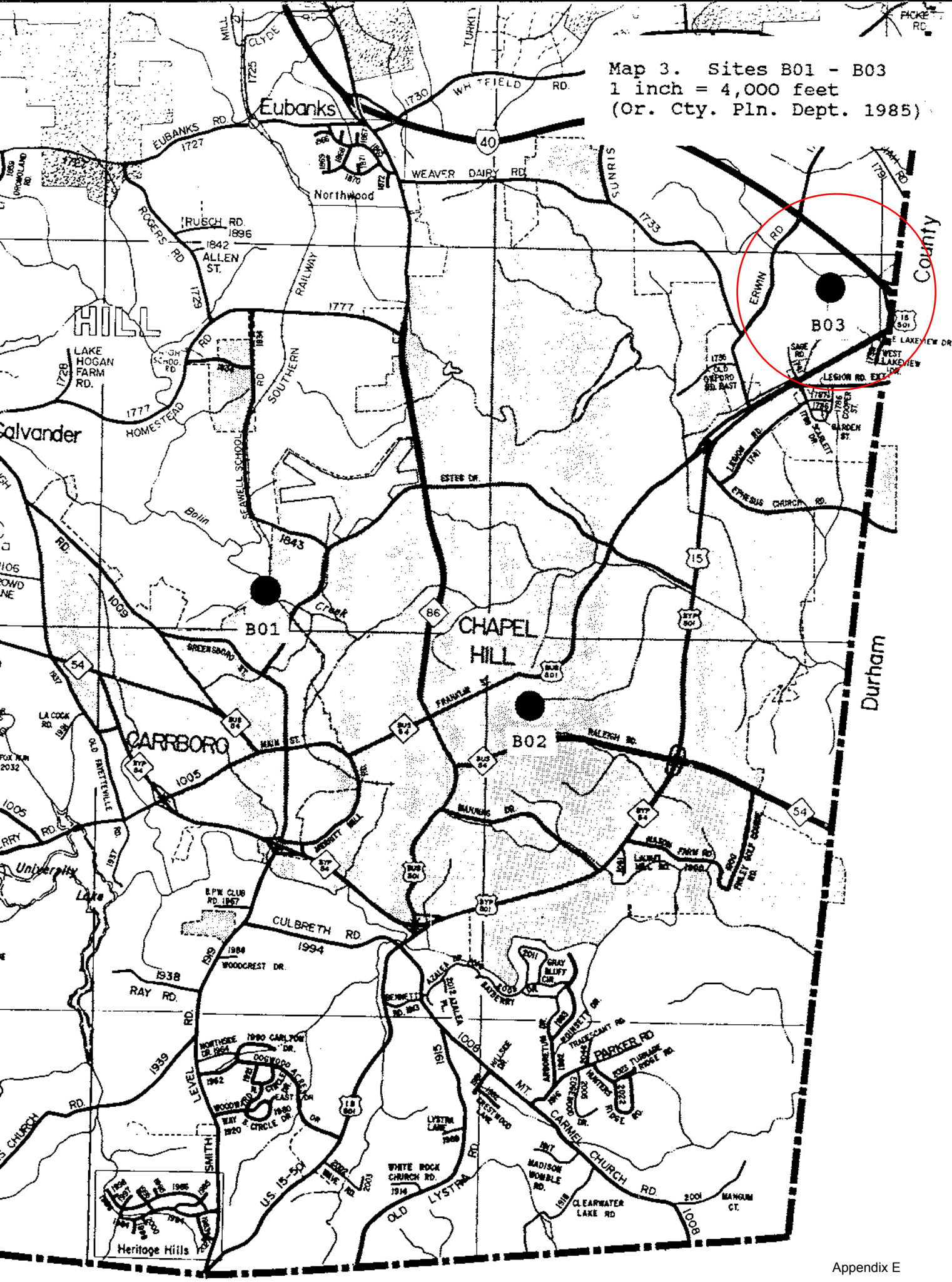
Invertebrates:

	Papilio	glaucus
	Satyrium	calanus

	Satyrium	liparops
	Everes	comyntas
	Polygonia	interrogationis
	Nymphalis	antiopa
	Limenitis	arthemis astyanax
i	Asterocampa	celtis
	Satyrodes	appalachia
	Megisto	cymela
	Epargyreus	clarus
	Thorybes	bathyllus
	Nastra	lherminier
	Poanes	zabulon
sc	Tachopteryx	thoreyi
	Antrodiaetus	unicolor

Overall Map of Natural Areas in Orange County




Map 3. Sites B01 - B03
1 inch = 4,000 feet
(Or. Cty. Pln. Dept. 1985)
B01
B02
B03
CHAPEL HILL
CARRBORO
Eubanks
Northwood
Calvander
HILL
Durham County
EUBANKS RD.
WEAVER DAIRY RD.
ROGERS RD.
RUSCH RD.
ALLEN ST.
SUNRIS
ERWIN RD.
LAKE HOGAN FARM RD.
HOMESTEAD
SEAWELL SCHOOL RD.
SOUTHERN RAILWAY
ESTES DR.
Bolin Creek
GREENSBORO ST.
FRANKLIN ST.
MAIN ST.
OLD FAYETTEVILLE RD.
BANKING DR.
RALEIGH RD.
CULBRETH RD.
RAY RD.
WOODCREST DR.
LEVEL CHURCH RD.
SMITH LEVEL RD.
AZALEA DR.
PARKER RD.
CARMEL CHURCH RD.
WHITE ROCK CHURCH RD.
OLD LYSTRA RD.
CLEARWATER LAKE RD.
MADISON WOMBLE RD.
MT. CARMEL CHURCH RD.
Heritage Hills
University Lake
B.P.W. CLUB RD. 1957
DOGWOOD ACRES DR.
GRAY BLUFF CIR.
TRADESCANT RD.
TURNBERRY RIDGE RD.
MANGUM CT.
LEGION RD.
SAGE RD.
WEST LAKEVIEW DR.
COOPER ST.
GARDEN ST.
PINEBUS CHURCH RD.
OLD OXFORD RD. EAST
PICKE RD.
WHITFIELD RD.
TURKEY
MILL
CLYDE

Substantive Comments received from the Greenway Commission in response to September 2007 Public Forum

Compiled by Bill Webster, Assistant Director, Parks and Recreation, Town of Chapel and Katherine Gill, LHPA

- Agree we should go ahead with the draft report
- Appreciate additional comments and think they are appropriate to include in the report -- In favor of moving forward with draft on expedited basis.
- Pronounce some of the nuances more. For example,
    - add examples about how the parking area could be more than a typical parking lot and why it is such an excellent opportunity to combine design elements with Master and Comprehensive plan objectives...an entranceway feature, a public art opportunity, a greenways trail/head, a micro-park (i.e., a table or a Chapel Hill-type stone wall/seat wall that buffers the parked cars from the road and/or "amenity" onsite. Combining these could add to the beauty and aesthetics of the entranceway, while creating a place of interest that motorists would slow down to see as they pass through that location. We get traffic calming effects and some context to tie the pedestrian refuge (vegetated or not) to a destination point. Consider how people are curious about the unofficial parking along Estes Drive Extension to the unofficial trails, and how some know that parked cars there are evidence that people have found an interesting place to walk in the woods. The Dry Creek 'car park' could be like that but better designed.
- Some of the participants were also interested in vegetation preservation as a means to habitat and wildlife preservation too.
- The low profile boardwalks were favored and the general sentiment was to go with the absolute minimal amount of railings.
- There was some discussion about making sure we graphically include the regional connections of the Dry Creek in future presentations.
- Add that the Commission appreciates the work of LHPA and complimented the aesthetic ideas of the trail entrance at Perry Creek Road, and looks forward to seeing new ideas about the "car park" and refuge. We should note that there was no neighborhood or residents who were not in favor of the Trail Concept.
- Comfortable with your preparing a draft and pursuing the 'month's jump on the process, but am open to any Commission member who would like to discuss it further next month. If none do, let's proceed per your speed.
- Participants agreed that it was their desire to make the parking area more than a typical parking lot. It should reflect the nature of the project and be a positive amenity on the site.
- Participants agreed that the crossing of Erwin Road would be a key component of the plan. The proposed solution is a pedestrian refuge. Participants agreed that if the refuge crossing is selected

it should be as aesthetically pleasing as possible. It was also agreed that NCDOT should be contacted to see if a pedestrian activated cross walk light might be installed.

- The question of additional clearing along the trail corridor was raised. Staff asked if participants felt that the remote nature of the trail might justify longer than usual visual openings for security reasons. Participants stated that vegetation preservation should be a higher priority.

- The question of the boardwalk/bridge crossing was discussed. It was agreed that the bridge structure must have the smallest possible footprint in the wetland area. It should also avoid any know locations of rare plants.

- A commission member asked that the project's impact on the New Hope Corridor Master Plan be emphasized.

- A gree that we should proceed with the draft.

- Comfortable proceeding with preparation of a draft report for Dry Creek . And don't see a need to further discuss it at next month's meeting.

Substantive Comments on the Dry Creek Report Draft of November 19, 2007

- Refer to the New Hope Corridor Plan in the introduction and how this corridor fits into that plan.

- Explain [flood modeling] in simple language.

- Explain that the trail is designed for bicycles also.

- Add language to emphasize minimizing impact on rare species and wildlife corridors as identified in the Triangle Land Conservancy Report. Also, to not impact wildlife corridors.

- Emphasize connectivity to neighborhoods.

- Recommend specifically saying that plans would be coordinated with the New Hope Corridor Open Space Master Plan.

- Provide more context in maps and especially to areas referred to in document

- Clarify commission's process.

- Include in appendix a complete list of citizen and Commission comments from the public forum

- Attach the relevant pages from the Inventory of Natural Areas in the appendix.

- Provide further text and map that shows proposed connections on the Durham side, and how the Chapel Hill trail fits into the plan.

- Include information about potential a sidewalk on Erwin Road in Phase I, as is referred to in CH Greenways Master Plan

- Explain appropriate location of boardwalk and its " impact to the creek banks and wetland areas," so additional discussion of how it meets the identified goals of minimizing impacts would be desirable.

- Add text that the final location and design of the boardwalk in Phase II would be determined in the detailed design phase after an environmental assessment.

- Move the parking lot closer to the Erwin Road crossing. The text should note that the illustration is one concept; there could be others that would emerge during detailed design.

- Include updates on Duke Power easement arrangements

- Give some explanation of funding for the project, and the sources.

- Label and key maps to page numbers

- Improve the readability of the maps, figures, and labels at the 8 ½ by 11 size format.

- A motion to review by the inter-jurisdictional New Hope Corridor Advisory Committee at its meeting on March 13, prior to the Council's public hearing.