

DRAFT ENVIRONMENTAL ASSESSMENT

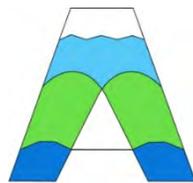
**TURNIPSEED NATURE PRESERVE
(PHASE II)
WAKE COUNTY, NORTH CAROLINA**

Prepared for:



WAKE COUNTY PARKS, RECREATION & OPEN SPACE

Prepared by:



Axiom Environmental, Inc.

Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603

March 2017

TABLE OF CONTENTS

1	INTRODUCTION	4
1.1	Proposed Project Description.....	4
1.2	Purpose and Need for Proposed Project.....	4
2	ALTERNATIVES ANALYSIS.....	5
3	EXISTING ENVIRONMENTAL CHARACTERISTICS OF PROJECT AREA.....	6
3.1	Topography.....	6
3.2	Soils	6
3.3	Land Use	7
3.4	Jurisdictional Areas.....	7
3.5	Prime or Unique Agricultural Lands.....	8
3.6	Public Lands and Scenic, Recreational, or State Natural Areas	8
3.7	Areas of Archaeological or Historical Value	8
3.8	Air Quality.....	8
3.9	Noise Levels	9
3.10	Water Resources.....	9
3.11	Forest Resources/Plant Communities	9
3.12	Shellfish or Fish and Their Habitats.....	9
3.13	Wildlife and Natural Vegetation.....	9
3.13.1	Protected Species.....	10
4	PREDICTED ENVIRONMENTAL CHARACTERISTICS OF PROJECT AREA	11
4.1	Topography.....	11
4.2	Soils	12
4.3	Land Use	12
4.4	Jurisdictional Areas.....	12
4.5	Prime or Unique Agricultural Lands.....	13
4.6	Public Lands and Scenic, Recreational, or State Natural Areas	13
4.7	Areas of Archaeological or Historical Value	13
4.8	Air Quality.....	13
4.9	Noise Levels	13
4.10	Water Resources.....	13
4.11	Forest Resources/Plant Communities	13
4.12	Shellfish or Fish and Their Habitats.....	14
4.13	Wildlife and Natural Vegetation.....	14
4.14	Introduction of Toxic Substances	14
5	MITIGATIVE MEASURES.....	14
6	REFERENCES	14
7	STATE AND FEDERAL PERMITS REQUIRED	15
	Conclusion Statement	16

Appendices

Appendix A. Figures and Site Plans

Figure 1. Site Location Map

Figure 2. Topography & Soils Map

Figure 3. Phase II Features Map

LWCF Site Plan Turnipseed Nature Preserve Phase II

Turnipseed Nature Preserve Rendering

Appendix B. Turnipseed Nature Preserve Engineered Drawings (Phase I & Phase II)

Appendix C. Clean Water Management Trust Fund Response Letter

1 INTRODUCTION

Wake County is pleased to provide this Environmental Assessment for Phase II of Turnipseed Nature Preserve (TNP). Development of the 249.81-acre TNP was divided into two phases. Phase I (135.04 acres) is currently under construction and is expected to be open to the public in the summer of 2017. Wake County is requesting Land and Water Conservation Fund (LWCF) funding to support development of Phase II (114.77 acres) of TNP. This document provides an environmental assessment for Phase II.

1.1 Proposed Project Description

TNP is located approximately 3.5 miles southwest of Wendell and 4 miles southeast of Knightdale in southeast Wake County near the Johnston County line (Figure 1, Appendix A). TNP is located in the Marks Creek watershed, a sub-basin of the larger Neuse River watershed.

Phase II of TNP is located north of an unnamed tributary to Mark's Creek (locally referred to as Gin Branch Creek). Wake County is requesting LWCF funds to build Phase II, which will expand the preserve to include one additional mile of accessible nature and hiking trails, a pedestrian bridge, boardwalks, a small pond with an accessible fishing area, open play areas, two picnic areas, interpretive signage, and a gravel parking lot for 35 cars, including Americans with Disabilities Act (ADA) parking. The trails in Phase II will connect with and expand upon the network of trails that will be completed in Phase I.

Part of the property is encumbered with an easement from the Clean Water Management Trust Fund (CWMTF), which helped fund the purchase of the property. As a result of the CWMTF easement, allowable uses on the property include passive recreational use, walking and hiking trails, pedestrian foot bridges, observation platforms, canoe/kayak access, parking, environmental learning kiosks, covered picnic shelters and tables, and convenience facilities (restrooms). Wake County, as the property owner, understands the Section 6(f) conversion rules. In a response letter from Will Summer, Executive Director of the CWMTF dated January 31, 2017, the CWMTF accepts the Phase II site plan as proposed (Appendix C).

1.2 Purpose and Need for Proposed Project

The mission of Wake County Parks, Recreation & Open Space is to provide outdoor recreation and educational opportunities while promoting environmental and cultural stewardship through a managed system of parks and open spaces. Development of Phase II of TNP is a key to this mission in order to expand recreational and learning opportunities for residents and visitors of the underserved and rapidly expanding eastern portion of Wake County, as well as the larger region.

Since 2010, Wake County has experienced the largest population growth of all 100 counties in North Carolina. The southeastern communities of Wendell and Knightdale are currently experiencing a surge in population growth with many large residential developments planned and under construction. As the result of this rapid growth, opportunities to experience natural environments and rural landscapes are becoming scarce. TNP addresses recreational needs in a particularly underserved section of Wake County, and its close proximity to Johnston County promises to increase the population it serves. Expanding TNP's recreational facilities and trails will increase the amount of land available for accessible exploration and passive recreation. The trails proposed in both Phase I and Phase II of TNP will serve as the starting point for a future, regional trail network.

Further, due to the significant and unique natural resources found on the property, the preserve will likely become a regional and even statewide destination for environmental education and research. WakeNature Preserves Partnership (WakeNature), a local collaboration dedicated to identifying and protecting ecologically significant public parcels, designated TNP as its first nature preserve in 2011. TNP boasts a number of exceptional and outstanding natural resources as defined by WakeNature; a variety of endangered, protected, and significant flora and fauna call the land home. These species and habitats provide residents, visitors, and students opportunities to observe, study, understand, and appreciate Wake County's natural heritage.

Phase II improvements include one additional mile of accessible nature and hiking trails, a pedestrian bridge, boardwalks, a small pond with an accessible fishing area, open play areas, two picnic areas, interpretive signage, and a gravel parking lot for 35 cars. These improvements will help address community demand for additional recreational opportunities. Based on a 2007 survey, 78 percent of Wake County respondents support Wake County's efforts to protect 30 percent of its land for large parks, trails, and environmental stewardship. That same survey revealed that 75 percent of respondent households desire additional walking and hiking trails. A 2013 survey of Wake County residents showed that they desire access to nature and wildlife viewing (95 percent), quiet parts of a park for relaxation (93 percent), and the opportunity to learn something new about nature (92 percent). At a public open house to discuss the project, one citizen mentioned that they specifically appreciated the consideration Wake County had given to accessibility and accessible trails, especially for elderly users. Collectively, the findings reinforce and support the mission of Wake County Parks, Recreation & Open Space and the need for planned improvements proposed in Phase II development of Turnipseed Nature Preserve.

2 ALTERNATIVES ANALYSIS

This Environmental Assessment covers Phase II of TNP; however, as shown in the attached rendering (Appendix A), Phase I and Phase II of this project are connected and will make it possible for Wake County citizens to enjoy the entire 249.81-acre

TNP property. By completing Phase I and Phase II, the project will provide a better experience for visitors, including more trail mileage, access to different amenities, an additional access point, increased educational opportunities, and TNP will serve as a hub for a future trail network. The project has been designed to maximize recreational and education opportunities while avoiding impacts to streams and minimizing impacts to wetlands and riparian buffers under jurisdiction of the U.S. Army Corps of Engineers and the N.C. Division of Water Resources.

The “no build” alternative fails to address the current deficit for recreational opportunities in eastern Wake County as well as the demands of Wake County residents. The “no build” alternative fails to meet the project purpose and need. In addition, the “no build” alternative contradicts the mission of Wake County Parks, Recreation & Open Space.

3 EXISTING ENVIRONMENTAL CHARACTERISTICS OF PROJECT AREA

3.1 Topography

TNP is located in the Northern Outer Piedmont ecoregion of the Piedmont physiographic region of North Carolina. Topography within the ecoregion is generally comprised of dissected irregular plains, some low rounded hills and ridges, and low- to moderate-gradient streams with mostly cobble, gravel, and sandy substrates. Topography within Phase II ranges from approximately 250 feet above sea level in the northern portion of the property to 190 feet at Mark’s Creek on the western property boundary.

Gin Branch Creek (FEMA Basin 14, Stream 2), a UT to Marks Creek on the south side of Phase II, is a FEMA-regulated stream. The proposed pedestrian bridge across Gin Branch Creek spans the floodway width and published water surface elevation. A flood study analysis and report has been submitted to Wake County.

3.2 Soils

The Web Soil Survey identifies five soil types in Wake County within Phase II of TNP (USDA 2016) (Table 1 and Figure 2, Appendix A).

Table 1. Phase II Soils

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Appling sandy loam	ApB2, ApC2, ApD	Well-drained	Nonhydric
Colfax sandy loam	CnA	Somewhat poorly drained	Nonhydric*
Durham loamy sand	DuB, DuB2	Well-drained	Nonhydric
Louisburg loamy sand	LoC, LoD	Well-drained	Nonhydric
Wehadkee and Bibb soils	WoA	Poorly drained	Hydric

* - Soils which are primarily non-hydric, but which may contain hydric inclusions

Primary project development constraints consist of hydric/drainageway soils (Wehadkee and Bibb soil complex) due to the presence of streams and wetlands, and the potential for flooding and a high water table.

3.3 Land Use

Surrounding land use consists primarily of forest land with scattered agricultural land and residential properties. Approximately two thirds of TNP supports forest, and approximately one third is comprised of fallow or active agricultural field.

3.4 Jurisdictional Areas

The entire TNP was not delineated for jurisdictional areas; however, Axiom Environmental, Inc. investigated and performed jurisdictional area delineations on four crossings with the potential for the presence of jurisdictional areas (Figure 3, Appendix A & Table 2). The U.S. Army Corps of Engineers (USACE) acknowledged the presence of wetlands within TNP on April 11, 2016. Trails, the access road, and parking lots were designed to remain outside of wetlands and riparian buffers to the maximum extent possible, and to avoid stream channels. More detailed descriptions of the two locations containing jurisdictional areas are included below.

Table 2. Phase II Jurisdictional Investigation Areas & Determinations (Figure 3, Appendix A)

Location	Description	Jurisdictional Areas Present	Subject to the Neuse River Riparian Buffer Rules
North Bend Crossing	Crossing marks the beginning of an ephemeral storm water channel.	No	No
Pond Spillway Crossing	A man-made, "v"-shaped ephemeral storm water ditch constructed on high-ground, well-above the groundwater elevation to allow overflow water to pass around the south side of the pond dam	No	No
Pond Outflow Channel Crossing	A perennial stream that receives pond overflow from a drop structure.	Jurisdictional stream	Yes
UT to Marks Creek (Gin Branch Creek) Crossing	A large, well-established beaver-impounded wetland containing short isolated reaches of low-flow, perennial stream that drown out into the impoundment.	Jurisdictional stream and wetland	Yes

Pond Outflow Channel Crossing

This crossing contains a stream that receives pond overflow from a drop structure through the dam groundwater and seepage. The stream drainage area is less than 0.1 square mile and primarily drains forest areas and smaller amounts of residential yards. The stream bed appears to be incised below the natural elevation; thereby, not allowing for overbank flooding following rain events. During the field visit, the channel bed was coated by iron-oxidizing bacteria indicating groundwater seepage as a primary source of water. In summary, the pond outflow channel crossing does include a jurisdictional perennial stream but no jurisdictional wetland.

UT to Marks Creek (Gin Branch Creek) Crossing

This stream has a fairly large drainage area (approximately 2.4 square miles) equally composed of forest and agricultural/pastoral areas. The stream has been subject to beaver activity for an extended period and is currently characterized by a

series of channel segments, each of which rises below a dam and drowns into the next impoundment. A perennial stream segment enters the upper end of the investigated reach and drowns into an impoundment after several hundred feet. The stream reach typically supports low flows and is characterized by a sand bed lacking riffles and pools. The impoundments extend across the floodplain and are characterized by a mix of open water, Non-tidal Freshwater Marsh, and relatively young Riverine Swamp Forest. Riverine Swamp Forest is the predominant wetland type within the investigated reach of this floodplain. In summary, the UT to Marks Creek (Gin Branch Creek) crossing includes both a jurisdictional perennial stream reach and extensive adjacent jurisdictional wetlands.

3.5 Prime or Unique Agricultural Lands

The following table summarizes farmland classification based on soil type and mapping units as identified by Web Soil Survey (USDA 2017) (Table 3 and Figure 2, Appendix A).

Table 3. Farmland Classifications-Summary by Mapping Unit

Soil Series	Mapping Unit	Rating
Appling sandy loam	ApB2	All areas are prime farmland
	ApC2, ApD	Farmland of statewide importance
Colfax sandy loam	CnA	Farmland of statewide importance
Durham loamy sand	DuB, DuB2	All areas are prime farmland
Louisburg loamy sand	LoC, LoD	Farmland of local importance
Wehadkee and Bibb soils	WoA	Not prime farmland

3.6 Public Lands and Scenic, Recreational, or State Natural Areas

The N.C. Natural Heritage Program (NCNHP) lists two unique terrestrial habitats adjacent to or within the park boundaries as follows:

1. Granitic Flatrock habitat (annual herb subtype) – located southwest of TNP
2. Piedmont/Mountain Semipermanent Impoundment (open water, marsh, and shrub communities) – located within the Marks Creek Floodplain area

3.7 Areas of Archaeological or Historical Value

No areas of archaeological significance or historic properties were identified within TNP. No buildings were present on the property.

3.8 Air Quality

Air quality at TNP is typical of rural areas within Wake County. Current sources of air emissions are from automobiles and farm machinery during the growing season. During dry periods, dust from fields, pastures, and unimproved roadways may also contribute to particulate matter in the air. The U.S. Environmental Protection Agency currently classifies Wake County as in attainment for all criteria pollutants (USEPA 2017). Proposed Phase II improvements will result in air emissions due to construction and automobile use within parking lots and for routine maintenance within the TNP.

3.9 Noise Levels

Current noise levels at TNP are minimal across the property. Proposed Phase II improvements will result in noise due to construction and automobile use within parking lots and for routine maintenance within TNP.

3.10 Water Resources

TNP is located within the Neuse River Basin in USGS 14-digit HUC 03020201100020 and NCDWR Subbasin 03-04-02. Phase II tributaries drain to Marks Creek (Stream Index Number 27-38), which has been assigned a Best Usage Classification of C, NSW (NCDWR 2013). Marks Creek is not listed on the NCDENR draft 2016 or final 2014 303(d) lists (NCDEQ 2014, NCDEQ 2016).

3.11 Forest Resources/Plant Communities

Approximately two thirds of TNP supports forest, and approximately one third is comprised of fallow or active agricultural field. The majority of the proposed parking area at the north end of the project off Pleasants Road is comprised of a stand of young loblolly pine (*Pinus taeda*) (less than 30 years old). Other forested areas within the property include mature loblolly pine (50-60 years old), upland hardwoods, bottomland hardwoods, and a well-established beaver impoundment comprised predominantly of herbaceous aquatic species with mature trees around the edges of the marsh. Species within hardwood forest areas include red maple (*Acer rubrum*), willow oak (*Quercus phellos*), river birch (*Betula nigra*), sweetgum (*Liquidambar styraciflua*), and tulip poplar (*Liriodendron tulipifera*). Dominant understory species include hazel alder (*Alnus serrulata*), ironwood (*Carpinus caroliniana*), American holly (*Ilex opaca*), American beech (*Fagus grandifolia*), microstegium (*Microstegium vimineum*), soft rush (*Juncus effusus*), black willow (*Salix nigra*), sedge (*Carex* spp.), reed (*Phragmites* sp.), and common greenbrier (*Smilax rotundifolia*).

3.12 Shellfish or Fish and Their Habitats

One NCNHP unique aquatic habitat, Marks Creek Floodplain, is located adjacent to TNP on Marks Creek and along a UT to Marks Creek (Gin Branch Creek) within the Site. However, the features that make the Marks Creek Floodplain habitat significant have been removed by long-term beaver activity within the TNP.

UT to Marks Creek (Gin Branch Creek) is the only stream within the investigation area large enough to potentially support shellfish or fish. This reach of stream has been subjected to beaver activity for an extended period that has resulted in the replacement of most of the stream with wetland/open water complexes. The one reach of stream remaining is characterized by sluggish flow and an unstable sand bed.

3.13 Wildlife and Natural Vegetation

TNP supports forest, fallow and active agricultural fields, and a large beaver impoundment that offer necessary components (food, water, cover) to support a number of animal species typical of the Piedmont region of the state such as white-

tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), eastern cottontail (*Sylvilagus floridanus*), gray fox (*Urocyon cinereoargenteus*), and Virginia opossum (*Didelphis virginiana*).

3.13.1 Protected Species

Based on the most recently updated county-by-county database of federally listed species in North Carolina as posted by the U.S. Fish and Wildlife Service (USFWS) (updated March 23, 2017), the bald eagle and four federally protected species are listed for Wake County. The following table lists these species and indicates if potential habitat exists within the property. A biological conclusion for each follows.

Table 4. Federally Protected Species Listed for Wake County, NC.

Common Name (Scientific Name)	*Federal Status	Habitat	Habitat Present in Property
Bald eagle (<i>Haliaeetus leucocephalus</i>)	BGPA	Mature forest with large, dominant trees or snags, typically within 1.0 mile of open water	Yes
Red-cockaded woodpecker (<i>Picoides borealis</i>)	Endangered	Roosting habitat consists of 60 years old and older living pine; foraging habitat consists of pine and pine-hardwood stands 30 years old or older	Yes
Dwarf wedgemussel (<i>Alasmidonta heterodon</i>)	Endangered	Small to large rivers on a variety of habitat types in hydrologically stable streams	No
Michaux's sumac (<i>Rhus michauxii</i>)	Endangered	Sandy or rocky open woods in association with basic soils	Yes
Northern long-eared bat (<i>Myotis septentrionalis</i>)	Threatened	Roosting habitat occurs under bark, in cavities, or in crevices of both live and dead trees. Farther west, winter roosting (hibernation) habitat consists of caves and mines. Foraging habitat consists of forested hillsides and ridges.	Yes

*Federal Status: BGPA=Protected by the Bald and Golden Eagle Protection Act

Bald eagle

Personal communication with an adjacent landowner confirmed that a bald eagle has recently been observed in the vicinity of the investigation area. Lake Myra is a large, open water providing eagle feeding and roosting habitat that is located approximately 0.5 mile northwest of TNP. TNP does support scattered large trees that could be used for eagle roosting. The proposed project **May Affect, but is Not Likely to Adversely Affect** bald eagle.

Red-cockaded woodpecker

The NCNHP has documented red-cockaded woodpeckers within a mile northwest of TNP in the vicinity of Lake Myra. The investigation area primarily winds through forests dominated by hardwood trees with scattered pines. The largest pines observed in and adjacent to the investigation area are less than 60 years of age; therefore, no nesting/roosting habitat occurs within the investigation area. One

pine stand occurs at the location of the proposed parking lot; however, these trees are less than 30 years old and do not provide foraging habitat. Several pine stands occur within 0.5 mile of the investigation area, but all are less than 30 years old. No evidence of red-cockaded woodpeckers was observed during field investigations completed October 7-8, 2014. The proposed project will have **No Effect** on red-cockaded woodpecker.

Dwarf wedgemussel

Habitat for dwarf wedgemussel consists of slow, well-oxygenated creeks and rivers with sand, gravel, or firm silt bottoms. The UT to Marks Creek (Gin Branch Creek) is the only stream within the investigation area large enough to potentially support dwarf wedgemussel. This reach of stream has been subjected to beaver activity for an extended period that has resulted in the replacement of most of the stream with wetland/open water complexes. The one reach of stream remaining is characterized by sluggish flow and an unstable sand bed. No mussel shells were observed during October 7-8, 2014 field investigations. Suitable habitat for dwarf wedgemussel does not occur within the investigation area; therefore, the proposed project will have **No Effect** on dwarf wedgemussel.

Michaux's sumac

The NCNHP has documented Michaux's sumac within the southwestern corner of Turnipseed Nature Preserve Phase I (along the utility line corridor adjacent to Marks Creek) outside of investigation areas. Suitable habitat occurs within the investigation area along the margins of agricultural fields and existing roads. No evidence of this species was found during field investigations on October 7-8, 2014; therefore, the proposed project will have **No Effect** on Michaux's sumac.

Northern long-eared bat

In this part of North Carolina, roosting habitat for northern long-eared bat is underneath bark, in cavities, or in crevices of both live and dead trees. Farther west, winter roosting (hibernation) habitat consists of caves and mines. Foraging habitat consists of forested hillsides and ridges. Suitable roosting habitat in the form of trees with crevices and/or peeling bark and moderate foraging habitat occurs within the site. As of March 8, 2016, neither the NCNHP nor the USFWS has any record of this species within 1.0 mile of the site. The site contains no documented hibernaculum or roosting tree and is not within 0.25 mile of a documented hibernaculum. Therefore, the proposed project **May Affect, but is Not Likely to Adversely Affect** the northern long-eared bat.

4 PREDICTED ENVIRONMENTAL CHARACTERISTICS OF PROJECT AREA

4.1 Topography

Minor topographic changes will be necessary for Phase II improvements including accessible nature and hiking trails, a pedestrian bridge, boardwalks, a small pond with an accessible fishing area, open play areas, two picnic areas, and a gravel

parking lot for 35 cars. Placement of these areas was designed to develop on level ground as possible, thereby minimize the need for grading. One trail crosses the UT to Marks Creek (Gin Branch Creek) floodplain area; however, the pedestrian bridge is designed to span the entire floodplain and impacts will be limited to piling insertions for the bridge. This project is not expected to have any significant impacts to project topography.

4.2 Soils

TNP site plans were created taking constraints due to hydric/drainageway soils (Wehadkee and Bibb soil complex) into consideration; therefore, in Phase II, the proposed pedestrian bridge crossing UT to Marks Creek (Gin Branch Creek) will span the floodplain and minimize any impacts due to construction within hydric/drainageway soils. All other areas containing these soils were avoided during development of the Phase II site plan. Grading of upland soils will be necessary as the result of construction of the parking lot, picnic shelter, and other Phase II improvements; however, the site plan was designed to develop these structures on level ground to keep grading to a minimum resulting only in minor soil impacts. This project will not result in any significant impacts to project soils.

4.3 Land Use

Proposed development of Phase II of TNP will result in minimal changes to vegetation communities and no significant impact to project land use.

4.4 Jurisdictional Areas

The USACE has issued a Section 404 Nationwide 42 Permit, with special conditions for the proposed project (April 11, 2016). In addition, the NCDWR has approved a Section 401 Water Quality Certification, with additional conditions, and has issued an authorization certificate per the Neuse River Basin Riparian Buffer Protection Rules, with additional conditions for the proposed project (April 8, 2016).

No jurisdictional streams will be directly impacted by this project.

Impacts to jurisdictional wetlands will result from the construction of the Marks Creek (Gin Branch Creek) crossing as follows.

- 0.08 acre of temporary wetland impacts due to the placement of bridge mats to support construction equipment
- 0.0002 acre of permanent impacts due to boardwalk piling insertion across the beaver impacted floodplain

Impacts to Neuse River Riparian Buffers will result from construction of two stream crossings at the pond outflow channel and Marks Creek (Gin Branch Creek), respectively, as follows.

- 0.01 acre of permanent riparian buffer impact
- 0.25 acre of temporary riparian buffer impact

Proposed project activities will require no stream, wetland, or riparian buffer mitigation due to no significant impacts to jurisdictional areas or Neuse River Riparian Buffers.

4.5 Prime or Unique Agricultural Lands

Grading of upland soils identified as prime farmlands and farmland of state or local importance will be necessary as the result of construction of the parking lot, picnic shelter, and other Phase II improvements; however, the site plan was designed to develop these structures on level ground to keep grading to a minimum resulting only in minor soil impacts. This project will not result in any significant impacts to project soils, or prime or unique agricultural lands.

4.6 Public Lands and Scenic, Recreational, or State Natural Areas

The proposed trail will cross the Piedmont/Mountain Semipermanent Impoundment community on the UT to Marks Creek (Gin Branch Creek); however, the bridge will cross the wetland and open water above the published water surface elevation. Therefore, this project is not expected to have any significant impact to these natural areas.

4.7 Areas of Archaeological or Historical Value

Not Applicable

4.8 Air Quality

Temporary, localized impacts to air quality are initially expected to be minimal due to construction. No significant long-term air-quality impacts are expected as the result of this project.

4.9 Noise Levels

Temporary, minor noise impacts are initially expected due to construction. No significant long-term noise level impacts are expected as the result of this project.

4.10 Water Resources

Project erosion control and stormwater management plans (incorporating a state-imposed diffuse flow requirement) have been generated and approved by the state and Wake County. Detention is required by Wake County at the parking lot. In addition, all pedestrian bridges will span the stream channel and floodplains. This project is not expected to result in additional development that could impact nearby downstream water quantity, and therefore will have no significant impact on water resources.

4.11 Forest Resources/Plant Communities

The project will result in limited changes in vegetation and plant community structure. Therefore, this project is not expected to have any significant impact on forest resources and plant communities.

4.12 Shellfish or Fish and Their Habitats

The features that make the NCNHP Marks Creek Floodplain natural area habitat significant have been removed by beaver activity within TNP. In addition, project activities will have no impacts within stream channels; all pedestrian bridges will span the stream channel as well as the floodplain. Therefore, this project is not expected to have any significant impacts on shellfish or fish, their habitats, or natural areas.

4.13 Wildlife and Natural Vegetation

Although the NCNHP documents the federally endangered plant, Michaux's sumac (*Rhus michauxii*) as occurring in the vicinity of the park, a systematic, on-site survey by an environmental consulting firm (Axiom Environmental, Inc.) found no evidence of this species, or any other federally or state protected species, within the footprint of proposed project development.

The project will result in limited changes in vegetation and plant community structure, and wildlife species diversity. Therefore, this project is not expected to have any significant impact on protected species.

4.14 Introduction of Toxic Substances

Not Applicable

5 MITIGATIVE MEASURES

Proposed project activities will require no stream, wetland, and riparian buffer mitigation due to avoidance of stream impacts and minimal impacts to wetlands and riparian buffers.

6 REFERENCES

Griffith, G.E., J.M. Omernik, J.A. Comstock, M.P. Schafale, W.H. McNab, D.R. Lenat, T.F. MacPherson, J.B. Glover, and V.B. Shelbourne. 2002. Ecoregions of North Carolina and South Carolina. U.S. Geological Survey, Reston, Virginia.

North Carolina Department of Environmental Quality (NCDEQ). 2014. 2014 Category 5 Water Quality Assessments-303(d) List (online). Available: https://ncdenr.s3.amazonaws.com/s3fs-public/Water%20Quality/Planning/TMDL/303d/2014/2014_303dlist.pdf (March 27, 2017).

North Carolina Department of Environmental Quality (NCDEQ). 2016. Draft 2016 Category 5 Assessments EPA Submittal -303(d) List (online). Available: https://ncdenr.s3.amazonaws.com/s3fs-public/Water%20Quality/Planning/TMDL/303d/2016/NC_2016_Category_5_2016_0606.pdf (March 27, 2017).

- North Carolina Division of Water Resources (NCDWR). 2013. River Basin Classification Schedule: Neuse (online). Available: https://ncdenr.s3.amazonaws.com/s3fs-public/Water%20Quality/Planning/CSU/Surface%20Water/River%20Basin%20Water%20Quality%20Classifications%20as%20of%20Dec%209%202013/Neuse_Hydro_order.pdf (March 27, 2017).
- Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.
- United States Department of Agriculture (USDA). 2017. Web Soil Survey (online). Available: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> [March 23, 2017].
- United States Environmental Protection Agency (USEPA). 2017. Counties Designated "Nonattainment" for Clean Air Act's National Ambient Air Quality Standards (online, updated February 13, 2017). Available: <https://www3.epa.gov/airquality/greenbook/map/mapnpoll.pdf> [March 23, 2017].
- United States Fish and Wildlife Service (USFWS). 2017. Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species, Wake County, North Carolina (online, updated March 23, 2017). Available: <https://www.fws.gov/raleigh/species/cntylist/wake.html> [March 23, 2017].

7 STATE AND FEDERAL PERMITS REQUIRED

- NCDOT Driveway Permit
- Flood Study Approval
- Erosion Control Permit
- Stormwater Permit
- Building Permit for bridges and boardwalks
- Section 401 Water Quality Certification
- Section 404 Nationwide Permit 42

Conclusion Statement

(Must be completed and signed by responsible state agency and submitted with the EA document to the State Clearinghouse.)

Select the appropriate statement below:

_____ After preparation/review of this EA, the responsible state agency has concluded there is a *Finding of No Significant Impact (FONSI)* and will not be preparing an *Environmental Impact Statement (EIS)*. (Attach any additional information regarding this conclusion that you deem important to this finding.)

_____ The agency has completed this EA and is hereby submitting it for review and comment. After a consideration of the comments received, the agency will proceed with a *FONSI* or prepare an *EIS*.

_____ **Signed**

_____ **Agency**

APPENDIX A

Figure 1. Site Location Map
Figure 2. Topography & Soils Map
Figure 3. Phase II Features Map
LWCF Site Plan Turnipseed Nature Preserve Phase II
Turnipseed Nature Preserve Rendering



Prepared for:



Project:

TURNIPSEED NATURE PARK

Wake County, NC

Title:

SITE LOCATION MAP

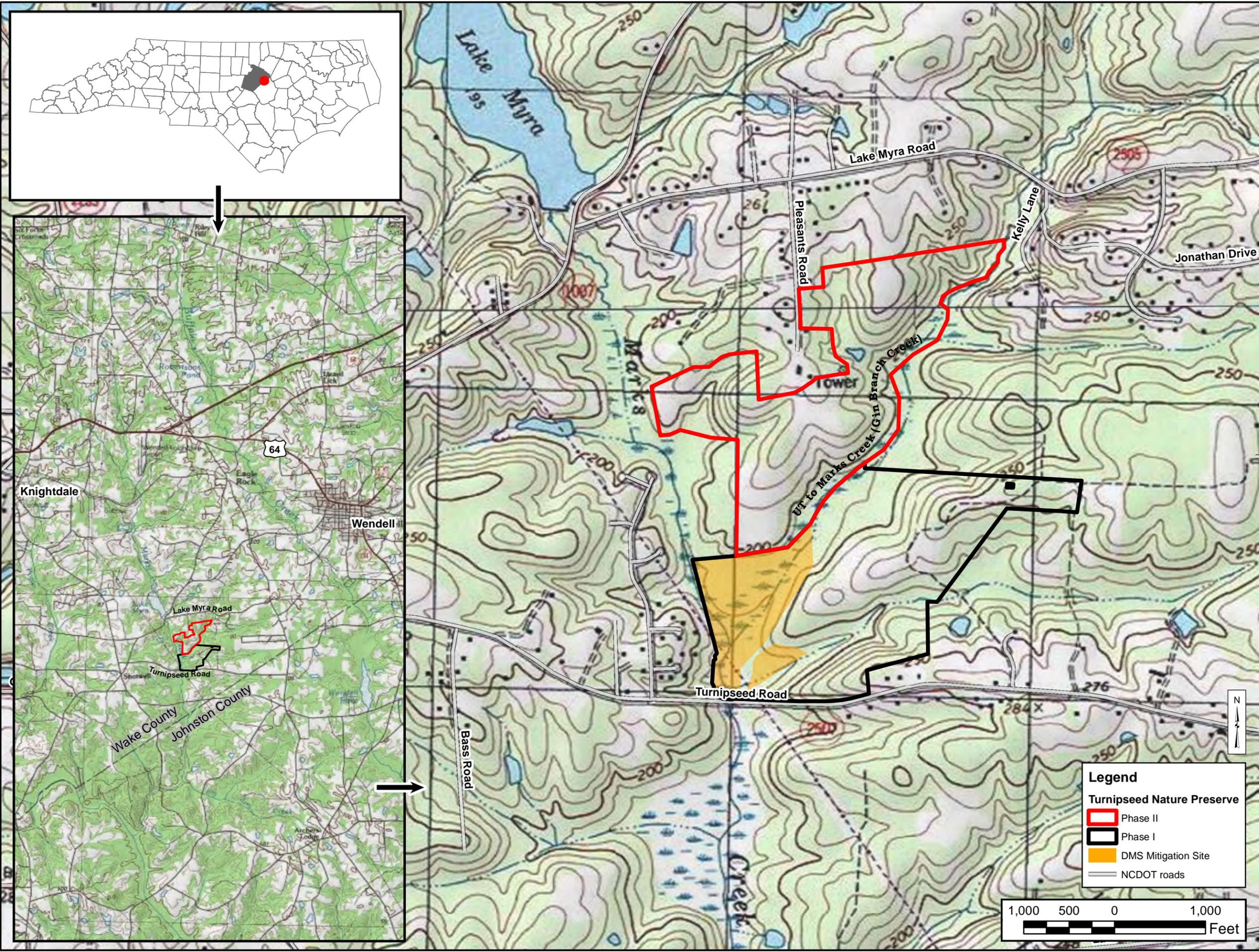
Notes:

Background imagery source:
Clayton, NC (1993) and Knightdale, NC (1993)
7-5-minute topographic quadrangles provided by the U.S. Geological Survey

Drawn by:	CLF
Date:	Mar 2017
Scale:	1:12,000
Project No.:	17-005

FIGURE

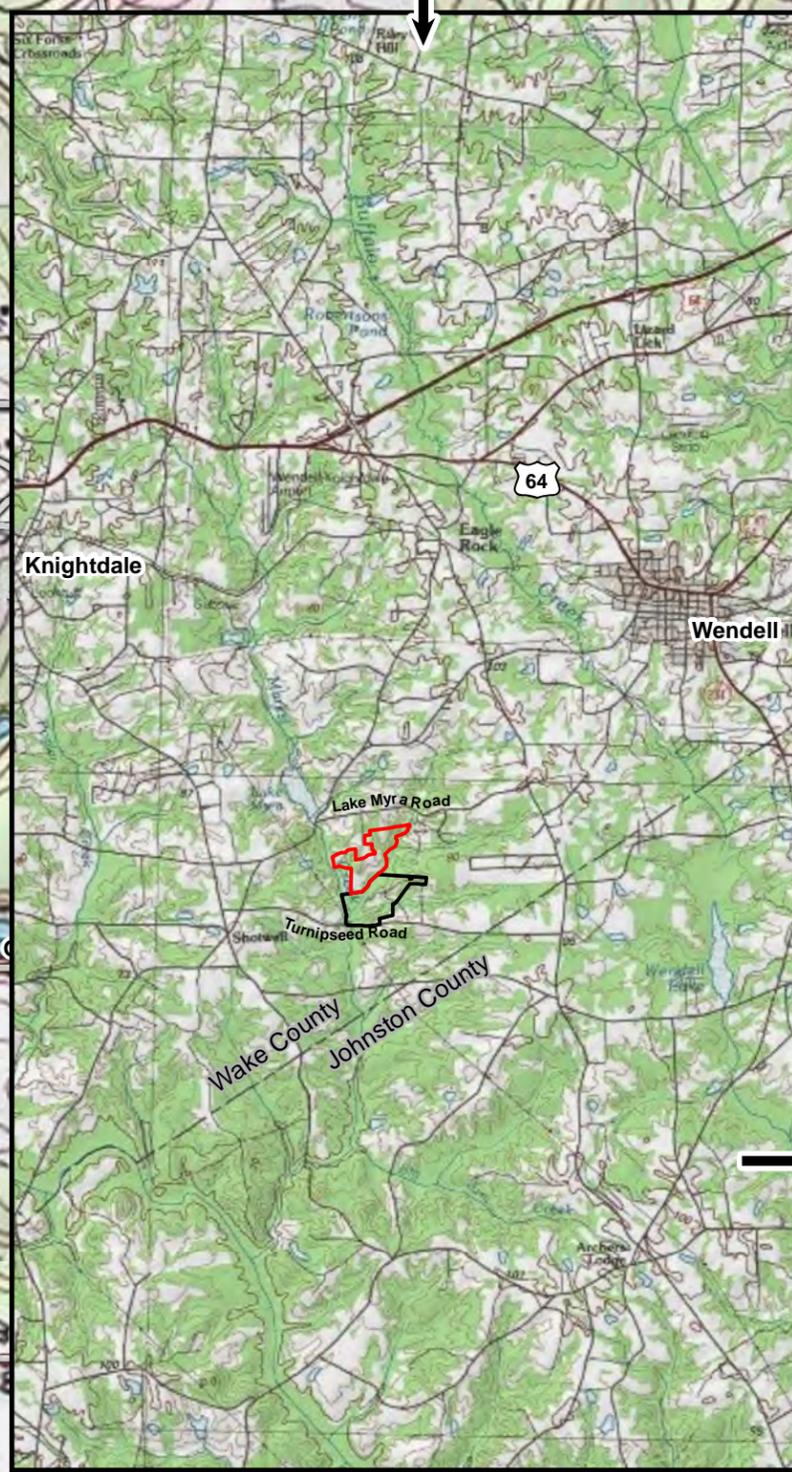
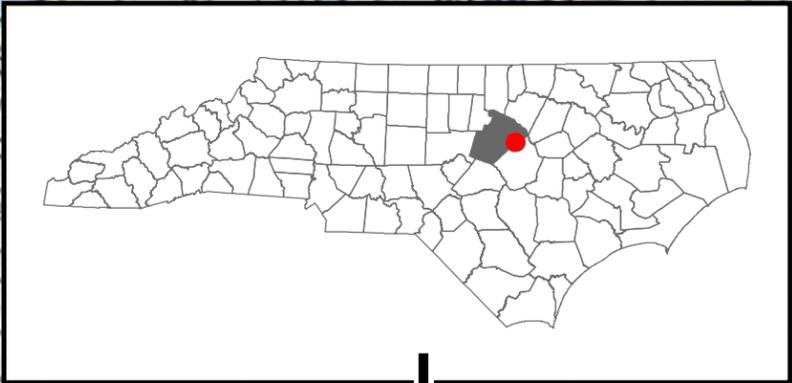
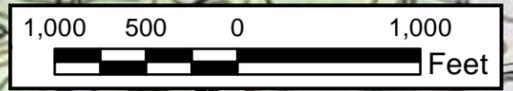
1

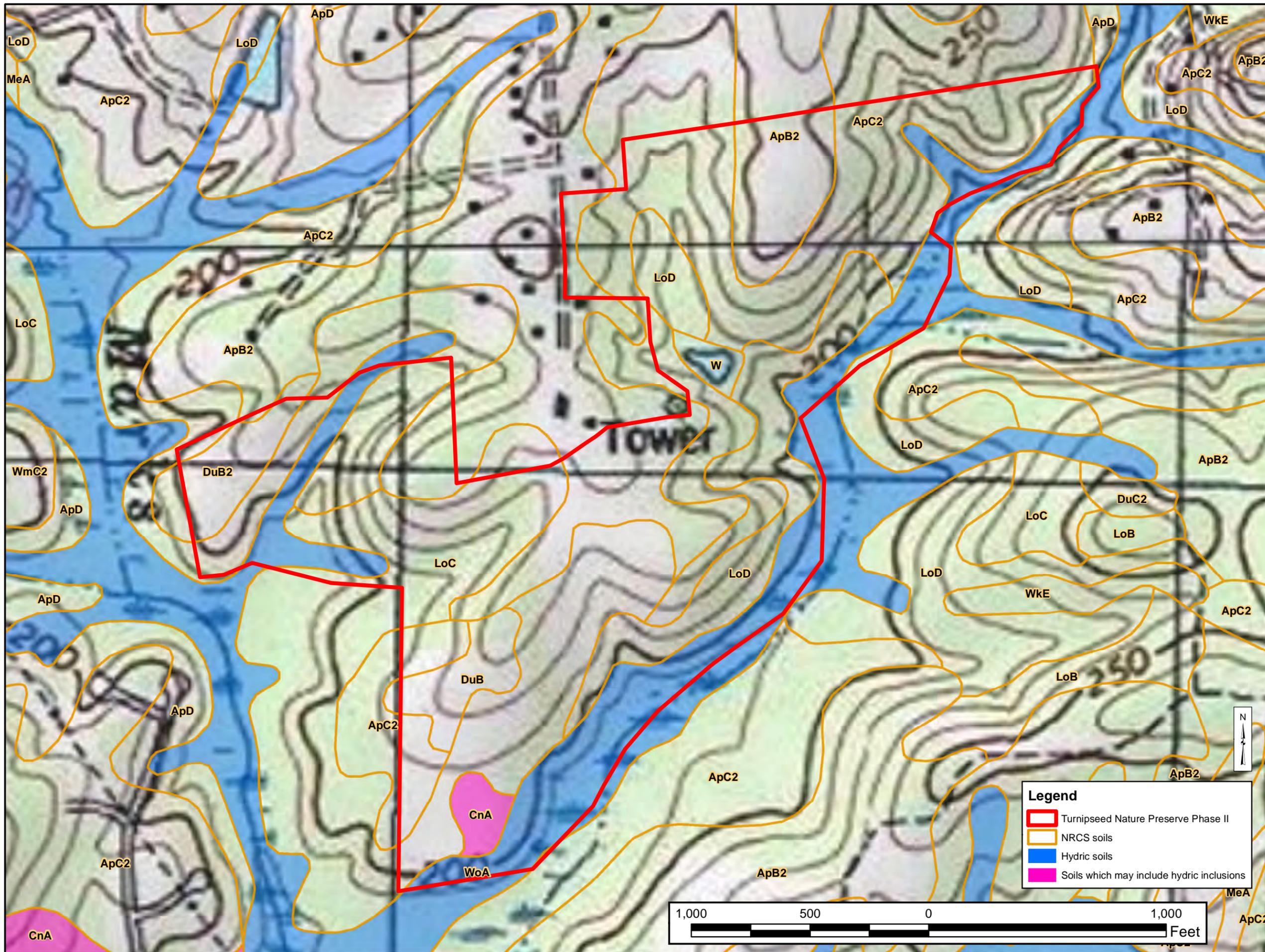


Legend

Turnipseed Nature Preserve

- Phase II
- Phase I
- DMS Mitigation Site
- NCDOT roads





Prepared for:



Project:

**TURNIPSEED
NATURE PARK**

Wake County, NC

Title:

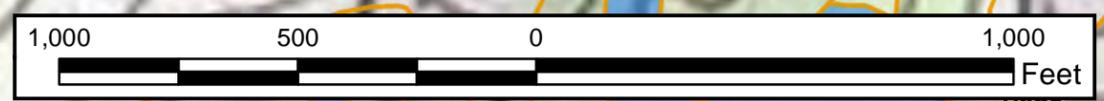
**TOPOGRAPHY &
SOILS
MAP**

Notes:

Background imagery source:
Clayton, NC (1993) and
Knightdale, NC (1993)
7-5-minute topographic
quadrangles provided by the
U.S. Geological Survey

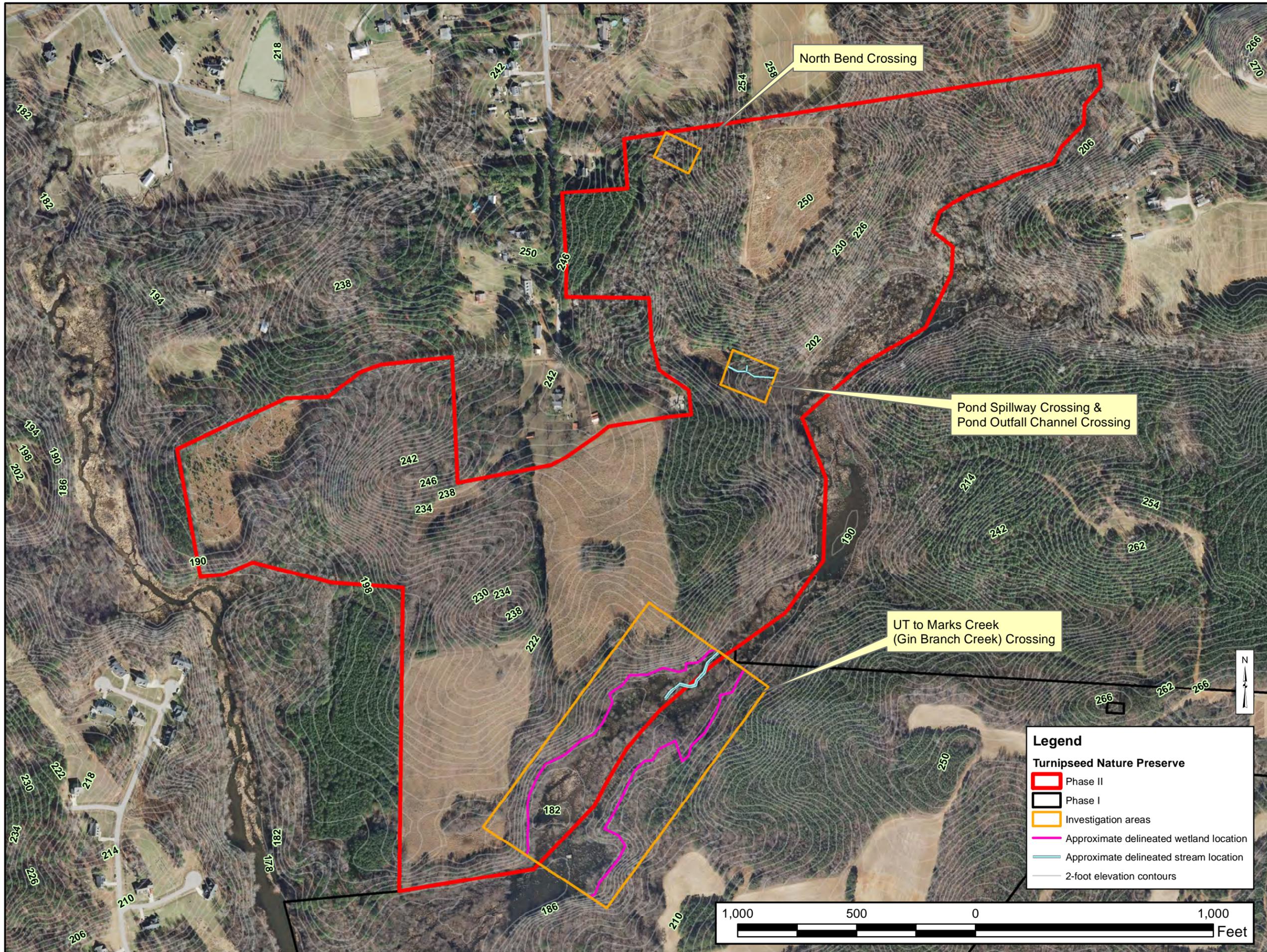
Legend

- Turnipseed Nature Preserve Phase II
- NRCS soils
- Hydric soils
- Soils which may include hydric inclusions



Drawn by:	CLF
Date:	Mar 2017
Scale:	1:4600
Project No.:	17-005

**FIGURE
2**



Prepared for:



Project:

TURNIPSEED NATURE PARK

Wake County, NC

Title:

PHASE II FEATURES MAP

Notes:

1. Background imagery source: 2013 color orthophotography provided by the NC OneMap Program (online, supported by the NC Geographic Information Coordination Council).
2. 2-foot elevation contours are generated from 2007 Light Distance and Ranging (LiDAR) data generated by the NC Floodplain Mapping Program and provided by the NC Department of Transportation.

Drawn by: CLF

Date: Mar 2017

Scale: 1:4600

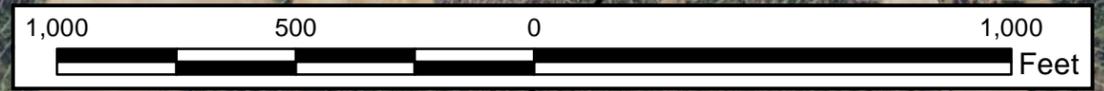
Project No.: 17-005

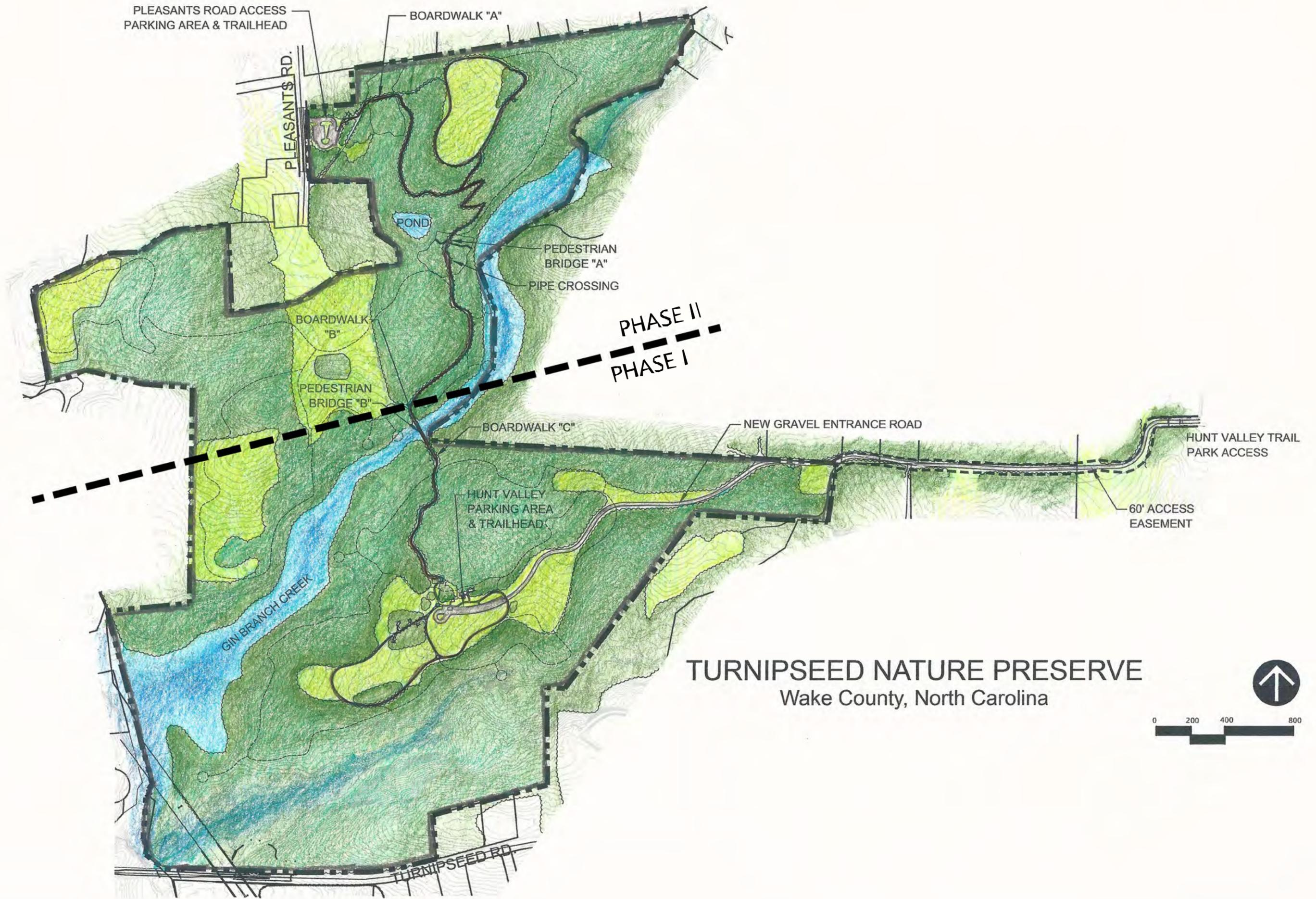
FIGURE 3

Legend

Turnipseed Nature Preserve

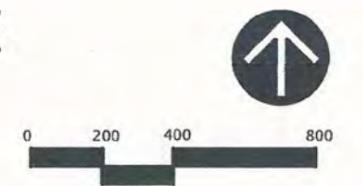
- Phase II
- Phase I
- Investigation areas
- Approximate delineated wetland location
- Approximate delineated stream location
- 2-foot elevation contours





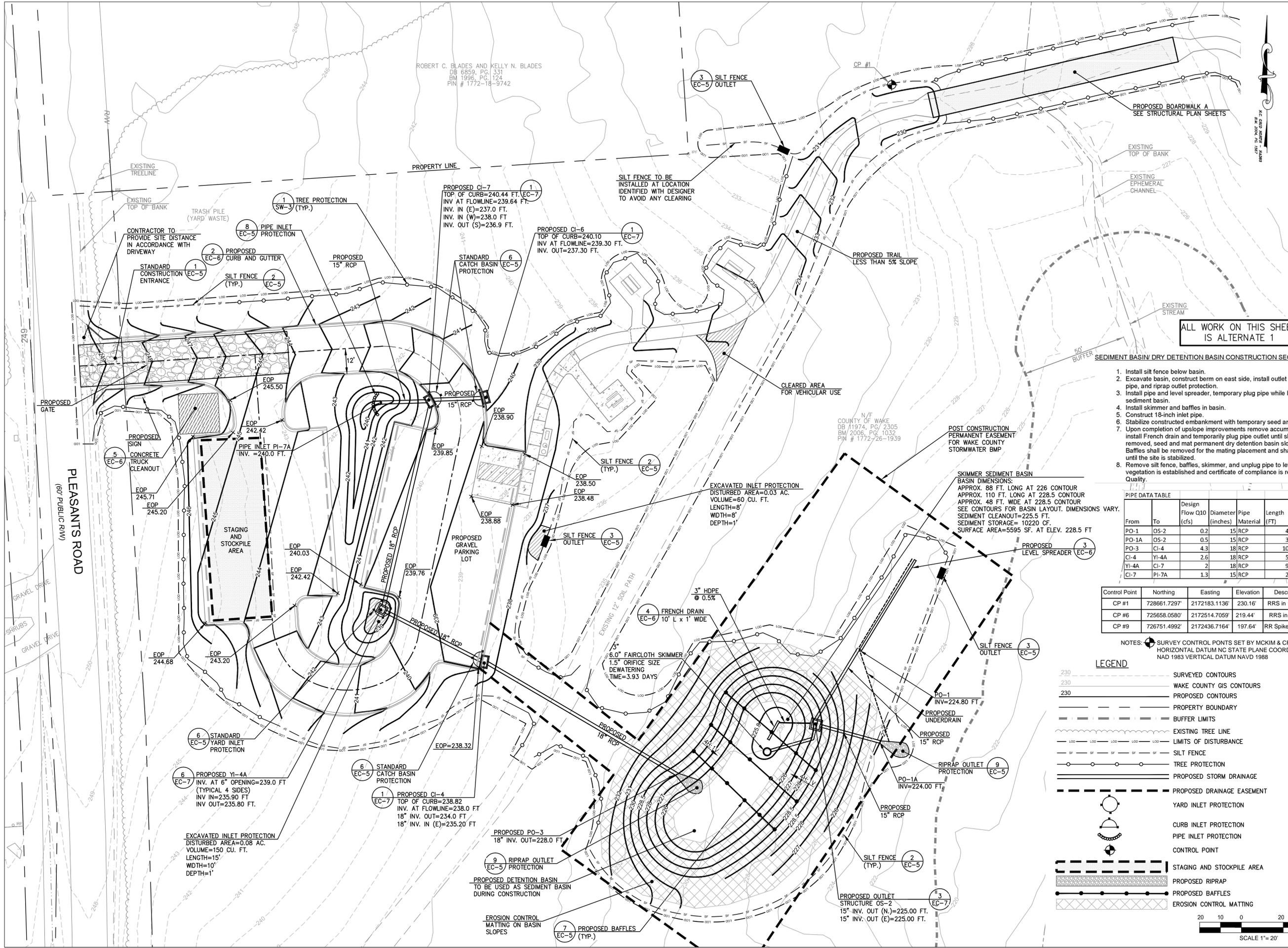
TURNIPSEED NATURE PRESERVE

Wake County, North Carolina



Appendix B

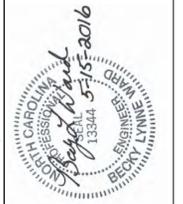
Turnipseed Nature Preserve Engineered Drawings (Phase I & Phase II)



WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2619
 4605 Green Rd, Suite 100
 Raleigh, NC 27616
 (919) 870-0626
 (919) 870-0626
 FAX (919) 870-0699

Susan Hatchell
 Landscape Architecture, PLLC
 711 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700

Pleasants Road
 Parking and
 Boardwalk Grading



Turnipseed Nature Preserve
 Wake County, NC

ALL WORK ON THIS SHEET IS ALTERNATE 1

- SEDIMENT BASIN/ DRY DETENTION BASIN CONSTRUCTION SEQUENCE
1. Install silt fence below basin.
 2. Excavate basin, construct berm on east side, install outlet structure, outlet pipe, and riprap outlet protection.
 3. Install pipe and level spreader, temporary plug pipe while basin is used as sediment basin.
 4. Install skimmer and baffles in basin.
 5. Construct 18-inch inlet pipe.
 6. Stabilize constructed embankment with temporary seed and mulch.
 7. Upon completion of upslope improvements remove accumulated sediment, install French drain and temporarily plug pipe outlet until skimmer is removed, seed and mat permanent dry detention basin slopes and bottom. Baffles shall be removed for the mating placement and shall be replaced until the site is stabilized.
 8. Remove silt fence, baffles, skimmer, and unplug pipe to level spreader when vegetation is established and certificate of compliance is received from Land Quality.

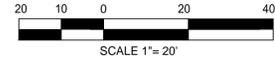
PIPE DATA TABLE

From	To	Design Flow Q10 (cfs)	Diameter (inches)	Pipe Material	Length (FT)	Slope (%)
PO-1	OS-2	0.2	15	RCP	42	0.5
PO-1A	OS-2	0.5	15	RCP	30	3.3
PO-3	CI-4	4.3	18	RCP	108	5.7
CI-4	YI-4A	2.6	18	RCP	52	1.2
YI-4A	CI-7	2	18	RCP	98	1
CI-7	PI-7A	1.3	15	RCP	24	9.1

Control Point	Northing	Easting	Elevation	Description
CP #1	728661.7297'	2172183.1136'	230.16'	RRS in 15' Pine
CP #6	725658.0580'	2172514.7059'	219.44'	RRS in Pine
CP #9	726751.4992'	2172436.7164'	197.64'	RR Spike in 24' Oak

NOTES: SURVEY CONTROL POINTS SET BY MCKIM & CREED
 HORIZONTAL DATUM NC STATE PLANE COORDINATES
 NAD 1983 VERTICAL DATUM NAVD 1988

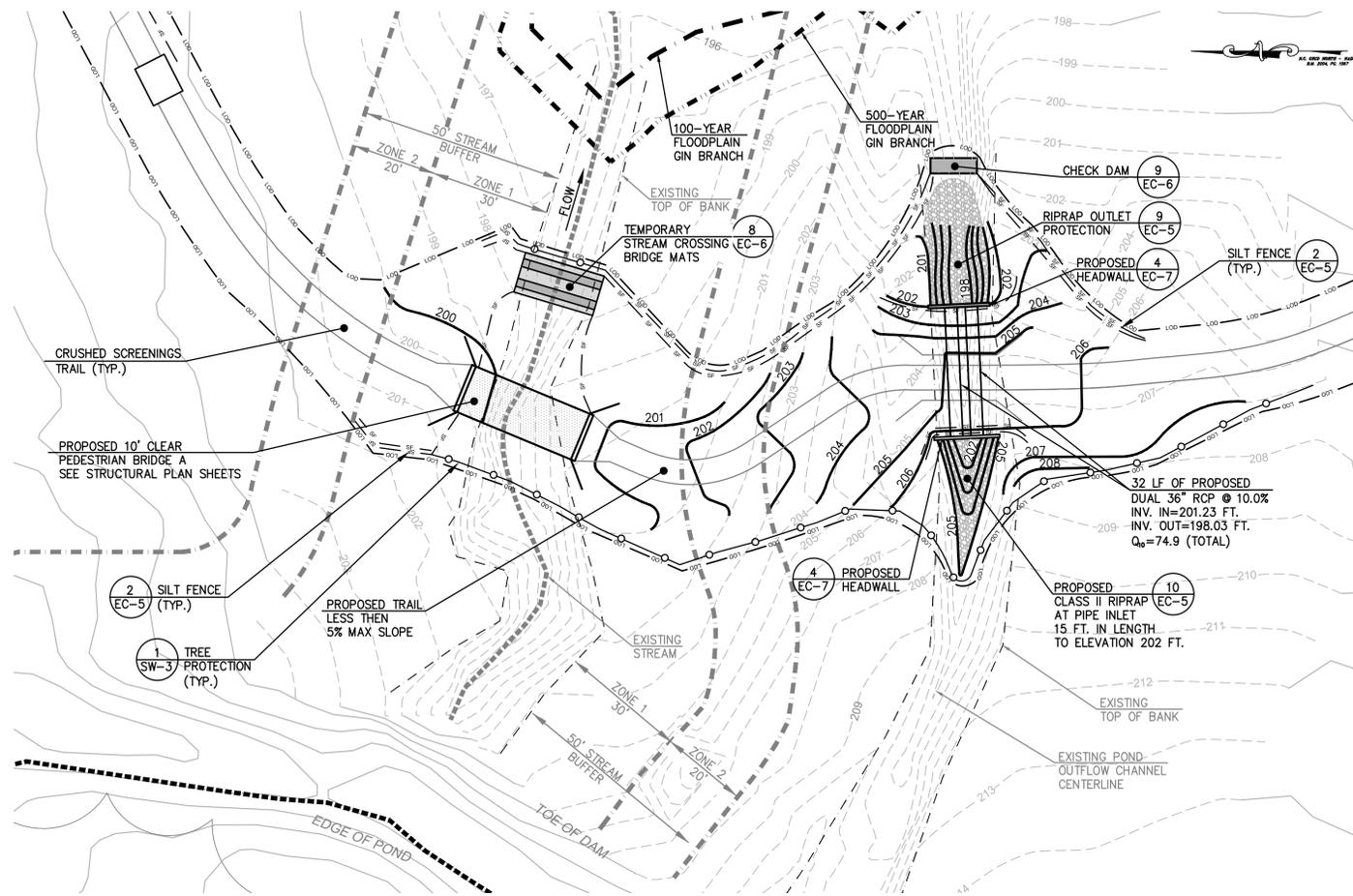
- LEGEND
- SURVEYED CONTOURS
 - WAKE COUNTY GIS CONTOURS
 - PROPOSED CONTOURS
 - PROPERTY BOUNDARY
 - BUFFER LIMITS
 - EXISTING TREE LINE
 - LIMITS OF DISTURBANCE
 - SILT FENCE
 - TREE PROTECTION
 - PROPOSED STORM DRAINAGE
 - PROPOSED DRAINAGE EASEMENT
 - YARD INLET PROTECTION
 - CURB INLET PROTECTION
 - PIPE INLET PROTECTION
 - CONTROL POINT
 - STAGING AND STOCKPILE AREA
 - PROPOSED RIPRAP
 - PROPOSED BAFFLES
 - EROSION CONTROL MATTING



REVISIONS

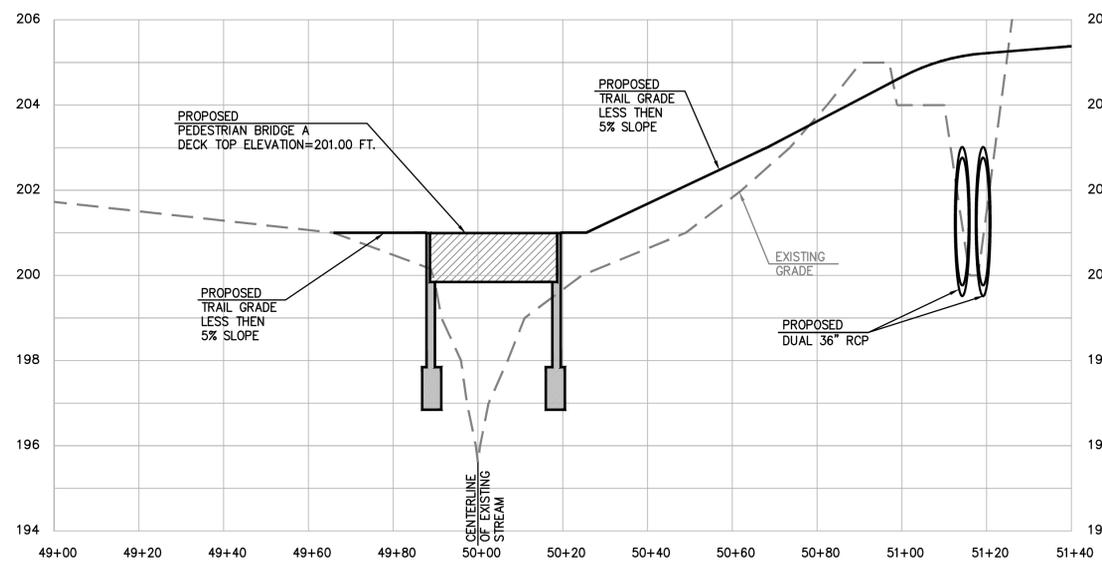
Date	Description
3-15-16	EROSION CONTROL COMMENTS
5-4-16	EROSION CONTROL COMMENTS

Date: 5-15-2016
 C-1



PLAN VIEW
1"=20'

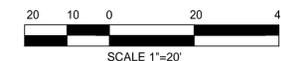
- NOTES:**
1. DEBRIS FOUND IN CHANNEL, UNKNOWN TO WHAT DEPTH. CONTRACTOR TO REMOVE ALL DEBRIS AND FILL WITH SUITABLE SOIL PRIOR TO CULVERT INSTALLATION.
 2. CONTRACTOR TO CROSS STREAM ONLY AT TEMPORARY BRIDGE MAT LOCATION.
 3. POND OUTLET CHANNEL NOT JURISDICTIONAL STREAM - WORK IN CHANNEL AND CROSSING AVAILABLE.
 4. DOUBLE SILT FENCE IN STREAM BUFFERS.



PROFILE VIEW
1"=20' HORIZONTAL
1"=2' VERTICAL

ALL WORK ON THIS SHEET IS ALTERNATE 1

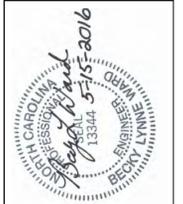
- LEGEND**
- 185 WAKE COUNTY GIS CONTOURS
 - 185 SURVEYED CONTOURS
 - PROPERTY BOUNDARY
 - USGS STREAM CENTERLINE
 - 100-YEAR FEMA FLOODPLAIN
 - 500-YEAR FEMA FLOODPLAIN
 - 50' STREAM BUFFER
 - 185 PROPOSED CONTOURS
 - FLOOD PRONE SOILS
 - LOD LIMITS OF DISTURBANCE
 - SF SILT FENCE
 - SURVEYED TREELINE
 - TEMPORARY STREAM CROSSING BRIDGE MATS
 - CHECK DAM
 - TREE PROTECTION



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4605 Green Rd, Suite 100
Raleigh, NC 27616
(919) 870-0526
(919) 870-0528
FAX (919) 870-0509

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Downstream Bridge and Pipe Crossing

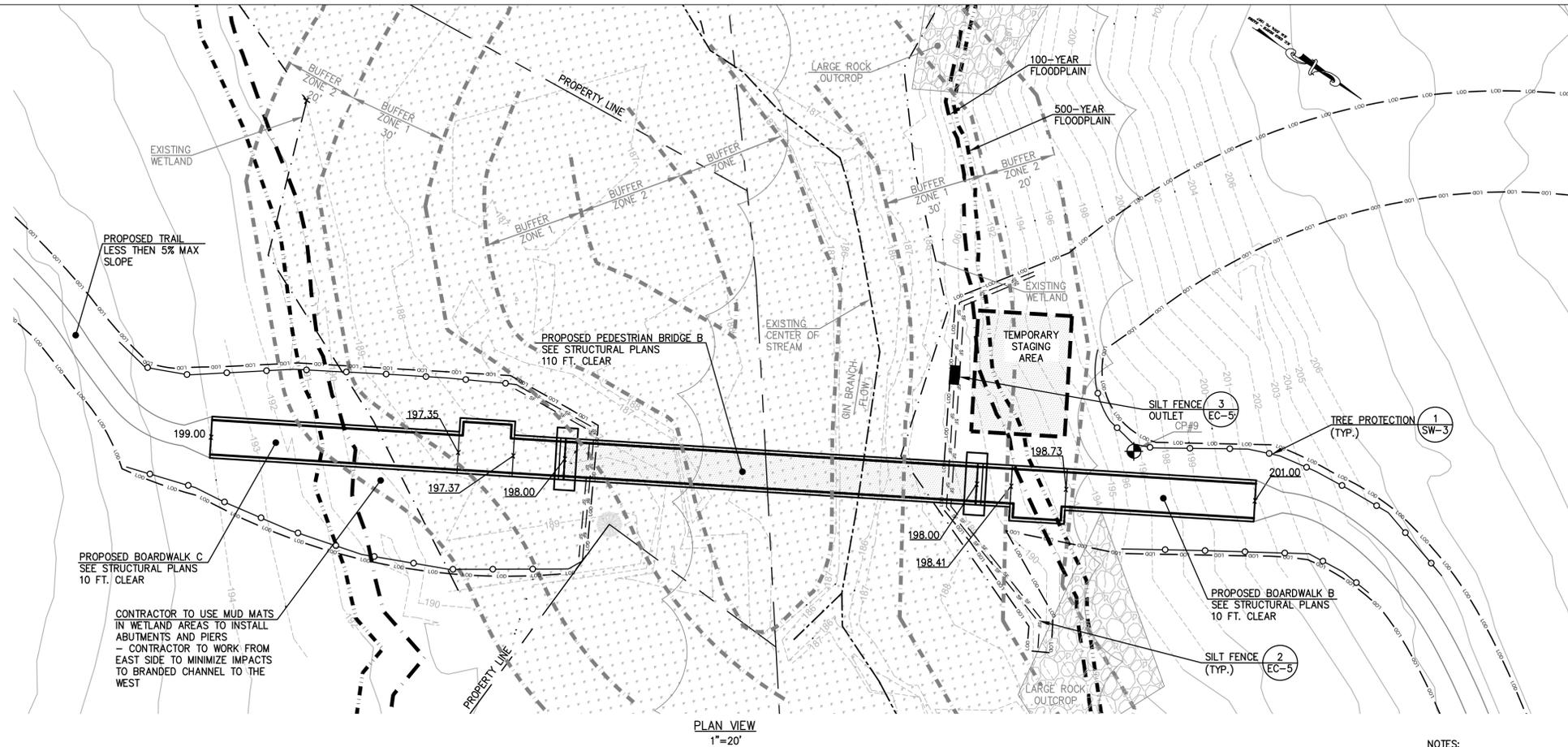


Turnipseed Nature Preserve Wake County, NC

REVISIONS	
3-15-16	EROSION CONTROL COMMENTS
5-4-16	EROSION CONTROL COMMENTS

Date: 5-15-2016

C-2



PLAN VIEW
1"=20'

CONTRACTOR TO USE MUD MATS IN WETLAND AREAS TO INSTALL ABUTMENTS AND PIERS - CONTRACTOR TO WORK FROM EAST SIDE TO MINIMIZE IMPACTS TO BRANDED CHANNEL TO THE WEST

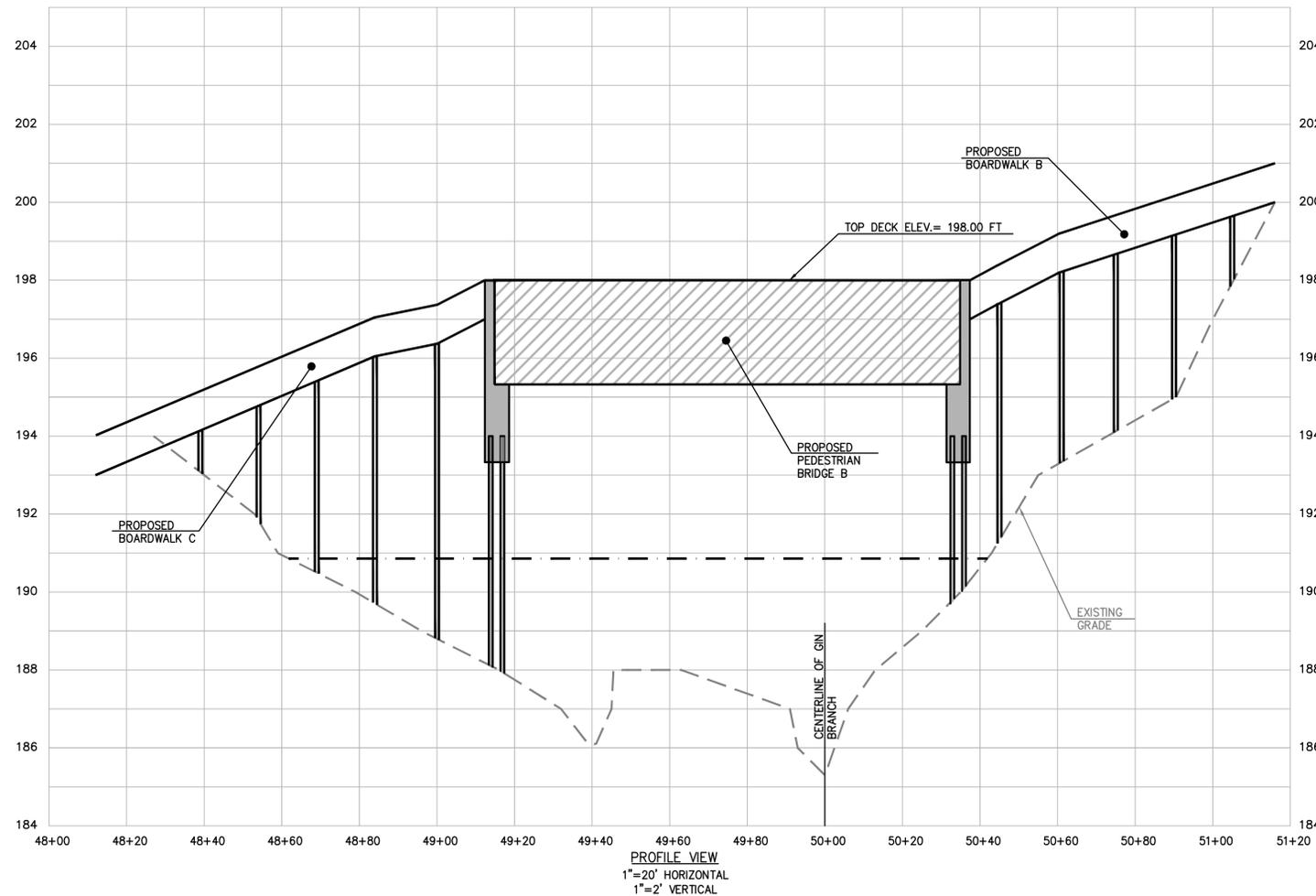
PROPOSED BOARDWALK C
SEE STRUCTURAL PLANS
10 FT. CLEAR

PROPOSED TRAIL
LESS THAN 5% MAX SLOPE

PROPOSED PEDESTRIAN BRIDGE B
SEE STRUCTURAL PLANS
110 FT. CLEAR

PROPOSED BOARDWALK B
SEE STRUCTURAL PLANS
10 FT. CLEAR

- NOTES:
- NO CONSTRUCTION EQUIPMENT WILL BE PERMITTED TO CROSS THE EXISTING CHANNEL OF GIN BRANCH. WORK IS TO BE COMPLETED FROM NORTH OR SOUTH BANKS.
 - SPOT ELEVATIONS SHOWN ON BRIDGE AND BOARDWALK ARE TOP OF DECK ELEVATIONS. SEE STRUCTURAL DRAWINGS.
 - DOUBLE SILT FENCE IN STREAM BUFFER.



PROFILE VIEW
1"=20' HORIZONTAL
1"=2' VERTICAL

ALL WORK ON THIS SHEET IS BASE BID

LEGEND	
185	WAKE COUNTY GIS CONTOURS
185	SURVEYED CONTOURS
---	PROPERTY BOUNDARY
---	USGS STREAM CENTERLINE
---	100-YEAR FEMA FLOODPLAIN
---	500-YEAR FEMA FLOODPLAIN
---	50' STREAM BUFFER
185	PROPOSED CONTOURS
---	FLOOD PRONE SOILS
---	EXISTING WETLANDS
---	LIMITS OF DISTURBANCE
---	SILT FENCE
---	SURVEYED TREE LINE
---	TEMPORARY STAGING AREA
---	PROPOSED BACKWATER EASEMENT
---	TREE PROTECTION



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4605 Green Rd, Suite 100
Raleigh, NC 27616

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Bridge Crossing at Gin Branch

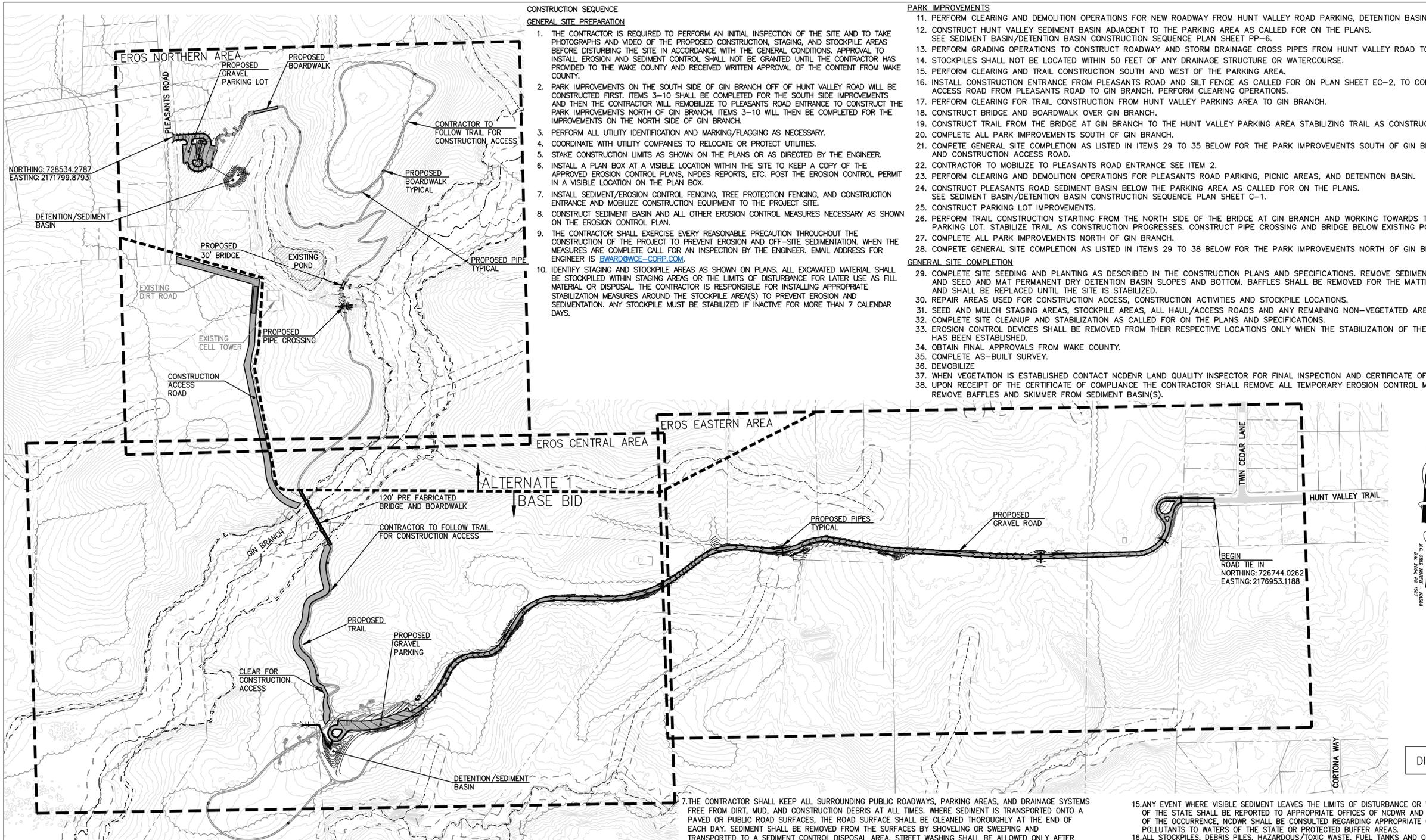


Turnipseed Nature Preserve

Wake County, NC

REVISIONS	
3-15-16	EROSION CONTROL COMMENTS
5-4-16	EROSION CONTROL COMMENTS

Date: 5-15-2016
C-3



- CONSTRUCTION SEQUENCE**
GENERAL SITE PREPARATION
1. THE CONTRACTOR IS REQUIRED TO PERFORM AN INITIAL INSPECTION OF THE SITE AND TO TAKE PHOTOGRAPHS AND VIDEO OF THE PROPOSED CONSTRUCTION, STAGING, AND STOCKPILE AREAS BEFORE DISTURBING THE SITE IN ACCORDANCE WITH THE GENERAL CONDITIONS. APPROVAL TO INSTALL EROSION AND SEDIMENT CONTROL SHALL NOT BE GRANTED UNTIL THE CONTRACTOR HAS PROVIDED TO THE WAKE COUNTY AND RECEIVED WRITTEN APPROVAL OF THE CONTENT FROM WAKE COUNTY.
 2. PARK IMPROVEMENTS ON THE SOUTH SIDE OF GIN BRANCH OFF OF HUNT VALLEY ROAD WILL BE CONSTRUCTED FIRST. ITEMS 3-10 SHALL BE COMPLETED FOR THE SOUTH SIDE IMPROVEMENTS AND THEN THE CONTRACTOR WILL REMOBILIZE TO PLEASANTS ROAD ENTRANCE TO CONSTRUCT THE PARK IMPROVEMENTS NORTH OF GIN BRANCH. ITEMS 3-10 WILL THEN BE COMPLETED FOR THE IMPROVEMENTS ON THE NORTH SIDE OF GIN BRANCH.
 3. PERFORM ALL UTILITY IDENTIFICATION AND MARKING/FLAGGING AS NECESSARY.
 4. COORDINATE WITH UTILITY COMPANIES TO RELOCATE OR PROTECT UTILITIES.
 5. STAKE CONSTRUCTION LIMITS AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
 6. INSTALL A PLAN BOX AT A VISIBLE LOCATION WITHIN THE SITE TO KEEP A COPY OF THE APPROVED EROSION CONTROL PLANS, NPDES REPORTS, ETC. POST THE EROSION CONTROL PERMIT IN A VISIBLE LOCATION ON THE PLAN BOX.
 7. INSTALL SEDIMENT/EROSION CONTROL FENCING, TREE PROTECTION FENCING, AND CONSTRUCTION ENTRANCE AND MOBILIZE CONSTRUCTION EQUIPMENT TO THE PROJECT SITE.
 8. CONSTRUCT SEDIMENT BASIN AND ALL OTHER EROSION CONTROL MEASURES NECESSARY AS SHOWN ON THE EROSION CONTROL PLAN.
 9. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION THROUGHOUT THE CONSTRUCTION OF THE PROJECT TO PREVENT EROSION AND OFF-SITE SEDIMENTATION. WHEN THE MEASURES ARE COMPLETE CALL FOR AN INSPECTION BY THE ENGINEER. EMAIL ADDRESS FOR ENGINEER IS RWARD@WCE-CON.COM.
 10. IDENTIFY STAGING AND STOCKPILE AREAS AS SHOWN ON PLANS. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED WITHIN STAGING AREAS OR THE LIMITS OF DISTURBANCE FOR LATER USE AS FILL MATERIAL OR DISPOSAL. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING APPROPRIATE STABILIZATION MEASURES AROUND THE STOCKPILE AREA(S) TO PREVENT EROSION AND SEDIMENTATION. ANY STOCKPILE MUST BE STABILIZED IF INACTIVE FOR MORE THAN 7 CALENDAR DAYS.

- PARK IMPROVEMENTS**
11. PERFORM CLEARING AND DEMOLITION OPERATIONS FOR NEW ROADWAY FROM HUNT VALLEY ROAD PARKING, DETENTION BASIN, PICNIC AREAS AND TRAIL.
 12. CONSTRUCT HUNT VALLEY SEDIMENT BASIN ADJACENT TO THE PARKING AREA AS CALLED FOR ON THE PLANS. SEE SEDIMENT BASIN/DETENTION BASIN CONSTRUCTION SEQUENCE PLAN SHEET PP-6.
 13. PERFORM GRADING OPERATIONS TO CONSTRUCT ROADWAY AND STORM DRAINAGE CROSS PIPES FROM HUNT VALLEY ROAD TO PARKING AREA.
 14. STOCKPILES SHALL NOT BE LOCATED WITHIN 50 FEET OF ANY DRAINAGE STRUCTURE OR WATERCOURSE.
 15. PERFORM CLEARING AND TRAIL CONSTRUCTION SOUTH AND WEST OF THE PARKING AREA.
 16. INSTALL CONSTRUCTION ENTRANCE FROM PLEASANTS ROAD AND SILT FENCE AS CALLED FOR ON PLAN SHEET EC-2, TO CONSTRUCT ACCESS ROAD FROM PLEASANTS ROAD TO GIN BRANCH. PERFORM CLEARING OPERATIONS.
 17. PERFORM CLEARING FOR TRAIL CONSTRUCTION FROM HUNT VALLEY PARKING AREA TO GIN BRANCH.
 18. CONSTRUCT BRIDGE AND BOARDWALK OVER GIN BRANCH.
 19. CONSTRUCT TRAIL FROM THE BRIDGE AT GIN BRANCH TO THE HUNT VALLEY PARKING AREA STABILIZING TRAIL AS CONSTRUCTION PROGRESSES.
 20. COMPLETE ALL PARK IMPROVEMENTS SOUTH OF GIN BRANCH.
 21. COMPLETE GENERAL SITE COMPLETION AS LISTED IN ITEMS 29 TO 35 BELOW FOR THE PARK IMPROVEMENTS SOUTH OF GIN BRANCH AND CONSTRUCTION ACCESS ROAD.
 22. CONTRACTOR TO MOBILIZE TO PLEASANTS ROAD ENTRANCE SEE ITEM 2.
 23. PERFORM CLEARING AND DEMOLITION OPERATIONS FOR PLEASANTS ROAD PARKING, PICNIC AREAS, AND DETENTION BASIN.
 24. CONSTRUCT PLEASANTS ROAD SEDIMENT BASIN BELOW THE PARKING AREA AS CALLED FOR ON THE PLANS. SEE SEDIMENT BASIN/DETENTION BASIN CONSTRUCTION SEQUENCE PLAN SHEET C-1.
 25. CONSTRUCT PARKING LOT IMPROVEMENTS.
 26. PERFORM TRAIL CONSTRUCTION STARTING FROM THE NORTH SIDE OF THE BRIDGE AT GIN BRANCH AND WORKING TOWARDS THE PLEASANTS ROAD PARKING LOT. STABILIZE TRAIL AS CONSTRUCTION PROGRESSES. CONSTRUCT PIPE CROSSING AND BRIDGE BELOW EXISTING POND.
 27. COMPLETE ALL PARK IMPROVEMENTS NORTH OF GIN BRANCH.
 28. COMPLETE GENERAL SITE COMPLETION AS LISTED IN ITEMS 29 TO 38 BELOW FOR THE PARK IMPROVEMENTS NORTH OF GIN BRANCH.

- GENERAL SITE COMPLETION**
29. COMPLETE SITE SEEDING AND PLANTING AS DESCRIBED IN THE CONSTRUCTION PLANS AND SPECIFICATIONS. REMOVE SEDIMENT FROM BASIN(S) AND SEED AND MAT PERMANENT DRY DETENTION BASIN SLOPES AND BOTTOM. BAFFLES SHALL BE REMOVED FOR THE MATTING PLACEMENT AND SHALL BE REPLACED UNTIL THE SITE IS STABILIZED.
 30. REPAIR AREAS USED FOR CONSTRUCTION ACCESS, CONSTRUCTION ACTIVITIES AND STOCKPILE LOCATIONS.
 31. SEED AND MULCH STAGING AREAS, STOCKPILE AREAS, ALL HAUL/ACCESS ROADS AND ANY REMAINING NON-VEGETATED AREAS.
 32. COMPLETE SITE CLEANUP AND STABILIZATION AS CALLED FOR ON THE PLANS AND SPECIFICATIONS.
 33. EROSION CONTROL DEVICES SHALL BE REMOVED FROM THEIR RESPECTIVE LOCATIONS ONLY WHEN THE STABILIZATION OF THE ADJACENT GROUND HAS BEEN ESTABLISHED.
 34. OBTAIN FINAL APPROVALS FROM WAKE COUNTY.
 35. COMPLETE AS-BUILT SURVEY.
 36. DEMOBILIZE
 37. WHEN VEGETATION IS ESTABLISHED CONTACT NCDENR LAND QUALITY INSPECTOR FOR FINAL INSPECTION AND CERTIFICATE OF COMPLIANCE.
 38. UPON RECEIPT OF THE CERTIFICATE OF COMPLIANCE THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION CONTROL MEASURES. REMOVE BAFFLES AND SKIMMER FROM SEDIMENT BASIN(S).

EROSION CONTROL NOTES:

1. THE CONTRACTOR SHALL EXERCISE PRECAUTIONS THROUGHOUT THE CONSTRUCTION SEQUENCE TO PREVENT EROSION AND OFF-SITE SEDIMENT. EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROJECT PLANS, WAKE COUNTY GUIDELINES, AND AS DIRECTED BY THE DESIGNER. ALL SEDIMENTATION AND EROSION CONTROLS ARE TO BE BUILT TO WAKE COUNTY AND NCDENR STANDARDS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL EROSION CONTROL MEASURES DURING CONSTRUCTION. THE MEASURES SHALL BE MAINTAINED CONTINUOUSLY, RELOCATED WHEN AND AS NECESSARY, AND SHALL BE CHECKED FOR MAINTENANCE ISSUES AFTER EVERY RAINFALL AT A MINIMUM.
3. ALL DISTURBED AREAS TO BE SEEDED TO SPECIFICATIONS UNLESS OTHERWISE NOTED ON THE PLANS. SEEDED AREAS SHALL BE CHECKED REGULARLY AND SHALL BE WATERED, FERTILIZED, RESEEDED AND MULCHED AS NECESSARY TO OBTAIN A DENSE STAND OF GRASS. ALL DISTURBED AREAS THAT ARE NOT OTHERWISE STABILIZED SHALL BE TOP SOILED AND SEEDED, TEMPORARILY OR PERMANENTLY, IN ACCORDANCE WITH THE WAKE COUNTY STANDARDS. PERMANENT SEEDING AND GRASS ESTABLISHMENT IS REQUIRED PRIOR TO PROJECT COMPLETION AND ACCEPTANCE.
4. THE CONTRACTOR SHALL PROVIDE GROUND COVER AS SOON AS POSSIBLE BUT IN ANY EVENT WITHIN 14 DAYS ON DISTURBED FLAT AREAS AND 7 DAYS ON ALL PERIMETER DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND SLOPES STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL. SEE GROUND STABILIZATION CHART.

GROUND STABILIZATION CHART		
SITE AREA DESCRIPTION	STABILIZATION	TIMEFRAME EXCEPTIONS
DIKES, SWALES, DITCHES, AND SLOPES	7 DAYS	NONE
HIGH QUALITY WATER (HQW) ZONES	7 DAYS	NONE
SLOPES STEEPER THAN 3:1	7 DAYS	IF SLOPES ARE 10' OR LESS IN LENGTH AND ARE NOT STEEPER THAN 2:1, 14 DAYS ARE ALLOWED.
SLOPES 3:1 OR FLATTER	14 DAYS	7 DAYS FOR SLOPES GREATER THAN 50' IN LENGTH.
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	NONE, EXCEPT FOR PERIMETERS AND HQW ZONES.

5. ALL DISTURBED AREAS TO BE PERMANENTLY GRASSED SHALL BE SEEDED WITH PERMANENT SEED MIX.
6. THIS SITE IS LOCATED WITHIN THE NEUSE WATERSHED. THE RECEIVING WATERCOURSE IS MARILS CREEK, A CLASS A STREAM

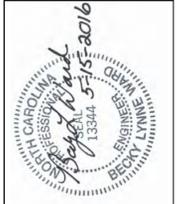
7. THE CONTRACTOR SHALL KEEP ALL SURROUNDING PUBLIC ROADWAYS, PARKING AREAS, AND DRAINAGE SYSTEMS FREE FROM DIRT, MUD, AND CONSTRUCTION DEBRIS AT ALL TIMES. WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACES, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE SURFACES BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER EXCESS SEDIMENT IS REMOVED.
8. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL EROSION CONTROL MEASURES NOT SHOWN ON THE PLANS BUT NECESSARY TO CONTROL EXCESS SEDIMENT, IF DETERMINED TO BE NECESSARY BY THE ENGINEER.
9. PROVIDE SILT FENCE OUTLETS AS NEEDED. ADDITIONAL OUTLETS WILL HELP TO DISSIPATE THE RUNOFF AND HELP PREVENT SCOURING ALONG THE SILT FENCES. WATTLE INLET PROTECTION FOR SILT FENCE OUTLETS IS A RECOMMENDED MEASURE TO REDUCE OUTLET MAINTENANCE. ADDITIONALLY, COMPOST SOCK OUTLETS ARE AN ACCEPTABLE OPTION INSTEAD OF GRAVEL.
10. SILT FENCE AROUND STOCKPILES - SILT FENCE SHALL ENCOMPASS, WITH THE EXCEPTION OF THE INGRESS/EGRESS AREA, THE ENTIRE STAGING, STOCKPILE, AND/OR SPOIL AREA TO PREVENT ANY SEDIMENT FROM LEAVING THE LIMITS OF DISTURBANCE.
11. PROTECT STREAM CROSSINGS - ADEQUATE TEMPORARY SEDIMENT CONTROLS SHALL BE PROVIDED AT THE END OF EACH WORK DAY AT ALL STREAM CROSSINGS UNTIL ADEQUATE PERMANENT GROUND COVER IS PROVIDED.
12. MINIMIZE BUFFER DISTURBANCE - THE PROJECT MUST MINIMIZE THE DURATION AND EXTENT OF DISTURBANCE WITHIN THE STREAM BUFFER ZONE. STAGING AREAS AND STOCKPILES MUST BE LOCATED OUTSIDE OF THE BUFFER ZONE WHENEVER POSSIBLE. WORK WITHIN THE BUFFER ZONE SHOULD BE SEQUENCED TO MINIMIZE THE LENGTH OF TIME THAT DISTURBED AREAS ARE EXPOSED. ALL MATERIALS SHOULD BE ON HAND BEFORE WORK IS COMMENCED. STREAM BANK STABILIZATION, WHICH INCLUDES THE AREA FROM THE EDGE OF WATER TO THE TOP OF BANK, SHOULD BE PHASED SO THAT EACH DAY'S WORK IS COMPLETED AND ADEQUATELY STABILIZED AT THE END OF EACH WORK DAY.
13. CONCRETE DUST/WASTE/WASTEWATER MUST NOT BE RELEASED TO THE STORM DRAIN OR OFF-SITE. ALL SEDIMENT MUST BE CLEANED OFF THE ROADWAY BY DRY SWEEPING METHODS ONLY. WATER MUST NOT BE USED TO WASH SEDIMENT OFF OF ROADS, DRIVEWAYS, OR PARKING LOTS.
14. THE FOLLOWING MUST BE KEPT ON SITE UNTIL THE E&S PLAN HAS BEEN CLOSED OUT BY THE DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES: PREVIOUS 30 DAYS OF SELF INSPECTION RECORDS, RAIN GAUGE, APPROVAL CERTIFICATE/LETTER, APPROVED PLAN, AND NPDES PERMIT. THESE ITEMS SHOULD BE LOCATED NEAR THE MAIN CONSTRUCTION ENTRANCE. COORDINATE WITH THE INSPECTOR IF AN ALTERNATIVE LOCATION IS PREFERRED. ADDITIONAL INFORMATION AND A LINK TO THE NCGO1 COMBINED SELF-MONITORING FORM CAN BE FOUND AT: [HTTPS://DEQ.NC.GOV/ABOUT/DIVISIONS/ENERGY-MINERAL-LAND-RESOURCES/ENERGY-MINERAL-LAND-PERMITS/STORMWATER-PERMITS/CONSTRUCTION-SW](https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/stormwater-permits/construction-sw)

15. ANY EVENT WHERE VISIBLE SEDIMENT LEAVES THE LIMITS OF DISTURBANCE OR WHERE POLLUTANTS ARE DISCHARGED TO WATERS OF THE STATE SHALL BE REPORTED TO APPROPRIATE OFFICES OF NCDWR AND NCDENR WITHIN 24 HOURS OF FIRST KNOWLEDGE OF THE OCCURRENCE. NCDWR SHALL BE CONSULTED REGARDING APPROPRIATE CLEAN-UP TECHNIQUES FOR ANY LOSS OF POLLUTANTS TO WATERS OF THE STATE OR PROTECTED BUFFER AREAS.
16. ALL STOCKPILES, DEBRIS PILES, HAZARDOUS/TOXIC WASTE, FUEL TANKS AND CONCRETE WASHOUT AREAS SHOULD BE NO LESS THAN 50' AWAY FROM ALL INLETS AND WATER BODIES (UNLESS IT CAN BE SHOWN THAT NO OTHER ALTERNATIVES ARE REASONABLY AVAILABLE).
17. SILT FENCE SHOULD BE INSTALLED ON ALL DOWNSLOPE PORTIONS OF THE DISTURBED AREA. SILT FENCES SHOULD NOT BE INSTALLED ON THE HIGH SIDE OF THE DISTURBANCE AREA (TREE PROTECTION FENCINGS IS AN ACCEPTABLE ALTERNATIVE IF DESIRED). SILT FENCE OUTLETS SHOULD BE INSTALLED AT ALL LOW SPOTS AND ANYWHERE WATER IS POOLING. SILT FENCE AND OUTLET LOCATIONS MAY VARY FROM THE APPROVED PLANS PER SITE CONDITIONS. IF THERE ARE QUESTIONS OR CONCERNS REGARDING SILT FENCE PLACEMENT, CONTACT THE DEMLR INSPECTOR FOR ASSISTANCE.
18. COMPOST SOCK MAY BE SUBSTITUTED FOR SILT FENCE OUTLET GRAVEL, SLOPE BREAKS, CHECK DAMS, AND INLET PROTECTION. FOR SILT FENCE OUTLETS, THE INSTALLED HEIGHT CAN BE NO LESS THAN 16 INCHES. WATTLES, COIR LOGS, FILTER LOGS, ETC. ARE NOT ACCEPTABLE FOR THESE USES.
19. NOTIFICATION OF LAND RESOURCES SEDIMENT AND EROSION CONTROL SELF-INSPECTION PROGRAM: THE SEDIMENTATION POLLUTION CONTROL ACT WAS AMENDED IN 2006 TO REQUIRE THAT PERSONS RESPONSIBLE FOR LAND-DISTURBING ACTIVITIES INSPECT A PROJECT AFTER EACH PHASE OF THE PROJECT TO MAKE SURE THAT THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN IS BEING FOLLOWED. RULES DETAILING THE DOCUMENTATION OF THESE INSPECTIONS TOOK EFFECT OCTOBER 1, 2010. THE SELF-INSPECTION PROGRAM IS SEPARATE FROM THE WEEKLY SELF-MONITORING PROGRAM OF THE NPDES STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES. THE FOCUS OF THE SELF-INSPECTION REPORT IS THE INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES ACCORDING TO THE APPROVED PLAN. THE INSPECTION MUST BE CONDUCTED AFTER EACH PHASE OF THE PROJECT, AND CONTINUED UNTIL PERMANENT GROUND COVER IS ESTABLISHED IN ACCORDANCE WITH NCGS 113A-54.1 AND 15A NCA4 48.0131. THE SELF-INSPECTION REPORT FORM IS AVAILABLE AS AN EXCEL SPREADSHEET FROM [HTTP://PORTAL.NCDENR.ORG/WEB/LR/EROSION](http://portal.ncdenr.org/web/lr/erosion) IF YOU HAVE QUESTIONS OR CANNOT ACCESS THE FORM, PLEASE CONTACT THIS OFFICE AT (919)791-4200.
20. THE PERSON RESPONSIBLE FOR MAINTENANCE: ERIC STAEHLE, WAKE COUNTY FACILITIES DESIGN AND CONSTRUCTION (919) 856-6369.

WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4805 Green Rd, Suite 100
Raleigh, NC 27616
TEL: (919) 870-0626
FAX: (919) 870-5589

Susan Hatchell
Landscape Architecture, PLLC
7111 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Erosion Control Sheet Key

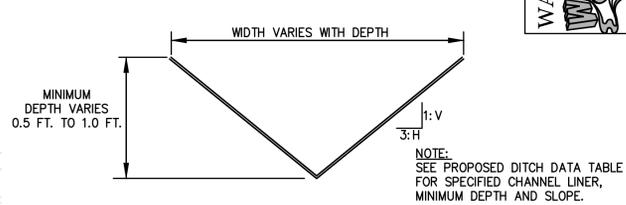
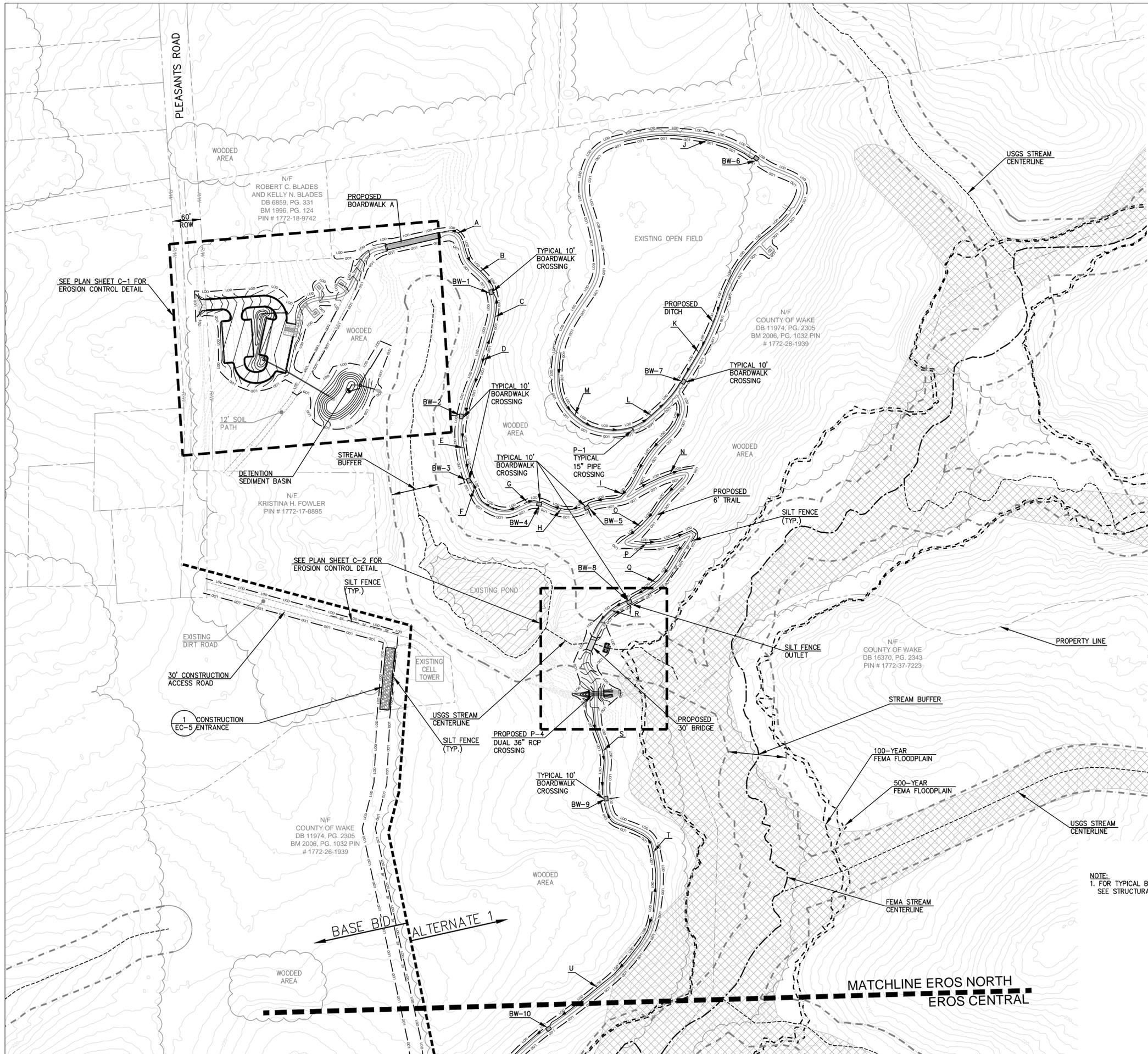


Turnipseed Nature Preserve
Wake County, NC

REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016
EC-1



TYPICAL DRAINAGE DITCH DETAIL
NOT TO SCALE

Pipe Label	Pipe Diameter (in)	Pipe Material	Number of Pipes	Minimum Slope (%)	Pipe Length (ft)	10-year Design Flow (cfs)	Full Flow Velocity (fps)
P-1	15	RCP	1	1.0%	8	1	3.81
P-4	36	RCP	2	10.0%	32	37.5	29.82

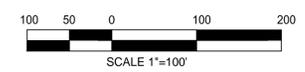
Boardwalk Label	10-year Design Flow (cfs)	Minimum Clearance Between Ground and Bottom Chord (in)	Natural Draw Slope (%)	Channel Type (A or B)	Velocity (fps)	Shear Stress (lb/sf)	Channel Liner Required Under Boardwalk
BW-1	4.0	18	0.12	A	8.21	1.35	Class B Stone
BW-2	1.2	18	0.087	A	5.2	0.65	Class B Stone
BW-3	1.2	18	0.105	A	5.57	0.72	Class B Stone
BW-4	1.3	18	0.16	B	6.49	1.40	Class B Stone
BW-5	2.3	18	0.182	B	9.4	1.82	Class B Stone
BW-6	2.0	18	0.038	A	4.47	0.40	Class B Stone
BW-7	5.6	18	0.051	A	6.57	0.80	Class B Stone
BW-8	0.6	18	0.091	A	4.29	0.45	Class B Stone
BW-9	15.9	18	0.054	B	10.42	1.58	Class B Stone

NATURAL CHANNEL TYPE A: 10 FT. TOP WIDTH, 1 FT. BOTTOM WIDTH, 18 IN. DEEP
NATURAL CHANNEL TYPE B: 3 FT. TOP WIDTH, 1 FT. BOTTOM WIDTH, 18 IN. DEEP

Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/sf)	Channel Liner
A	12%	0.5	3	3H:1V	0.29	1.7	0.8	Class B Stone
B	2%	1	6	3H:1V	2.57	4.2	0.3	Curlex Matting
C	2%	0.5	3	3H:1V	1.46	3.6	0.3	Curlex Matting
D	2%	0.5	3	3H:1V	1.22	3.3	0.2	Curlex Matting
E	3%	0.5	3	3H:1V	0.84	3.6	0.3	Curlex Matting
F	2%	0.5	3	3H:1V	0.41	2.6	0.1	Curlex Matting
G	3%	0.5	3	3H:1V	0.62	3.3	0.3	Curlex Matting
H	5%	0.5	3	3H:1V	0.66	3.8	0.3	Curlex Matting
I	2%	1	6	3H:1V	2.26	3.9	0.3	Curlex Matting
J	2%	1	6	3H:1V	1.96	3.7	0.3	Curlex Matting
K	2%	1	6	3H:1V	4.63	4.2	0.3	Curlex Matting
L	3%	0.5	3	3H:1V	0.92	3.4	0.2	Curlex Matting
M	3%	0.5	3	3H:1V	0.97	3.6	0.3	Curlex Matting
N	4%	0.5	3	3H:1V	0.37	3.1	0.2	Curlex Matting
O	5%	0.5	3	3H:1V	0.50	3.5	0.3	Curlex Matting
P	5%	0.5	3	3H:1V	0.37	3.4	0.3	Curlex Matting
Q	6%	0.5	3	3H:1V	0.60	4.2	0.4	Curlex Matting
R	3%	1	6	3H:1V	2.92	4.6	0.4	Curlex Matting
S	2%	1	6	3H:1V	8.90	5.4	0.6	Curlex Matting
T	2%	1	6	3H:1V	5.12	4.9	0.4	Curlex Matting
U	1%	1	6	3H:1V	3.19	3.1	0.2	Curlex Matting

- LEGEND**
- WAKE COUNTY GIS CONTOURS
 - SURVEYED CONTOURS
 - PROPOSED CONTOURS
 - PROPERTY BOUNDARY
 - EXISTING WOODED AREA
 - FEMA STREAM CENTERLINE
 - USGS STREAM CENTERLINE
 - FEMA 100-YEAR FLOODPLAIN
 - FEMA 500-YEAR FLOODPLAIN
 - 50' STREAM BUFFER
 - PROPOSED ACCESS AND UTILITY
 - FLOOD PRONE SOILS
 - LIMITS OF DISTURBANCE
 - SILT FENCE
 - PROPOSED DITCH
 - BW-1 □ PROPOSED BOARDWALK CROSSING

NOTE:
1. FOR TYPICAL BOARDWALK CROSSING SEE STRUCTURAL PLAN SHEETS.



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4805 Green Rd., Suite 100
Raleigh, NC 27616
(919) 870-0826
(919) 870-0828
FAX (919) 870-0859

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Erosion Control
Northern Area



Turnipseed Nature Preserve
Wake County, NC

NO.	DATE	DESCRIPTION
3-15-16		EROSION CONTROL COMMENTS
5-4-16		EROSION CONTROL COMMENTS

Date: 5-15-2016
EC-2

Proposed Boardwalk Data Table

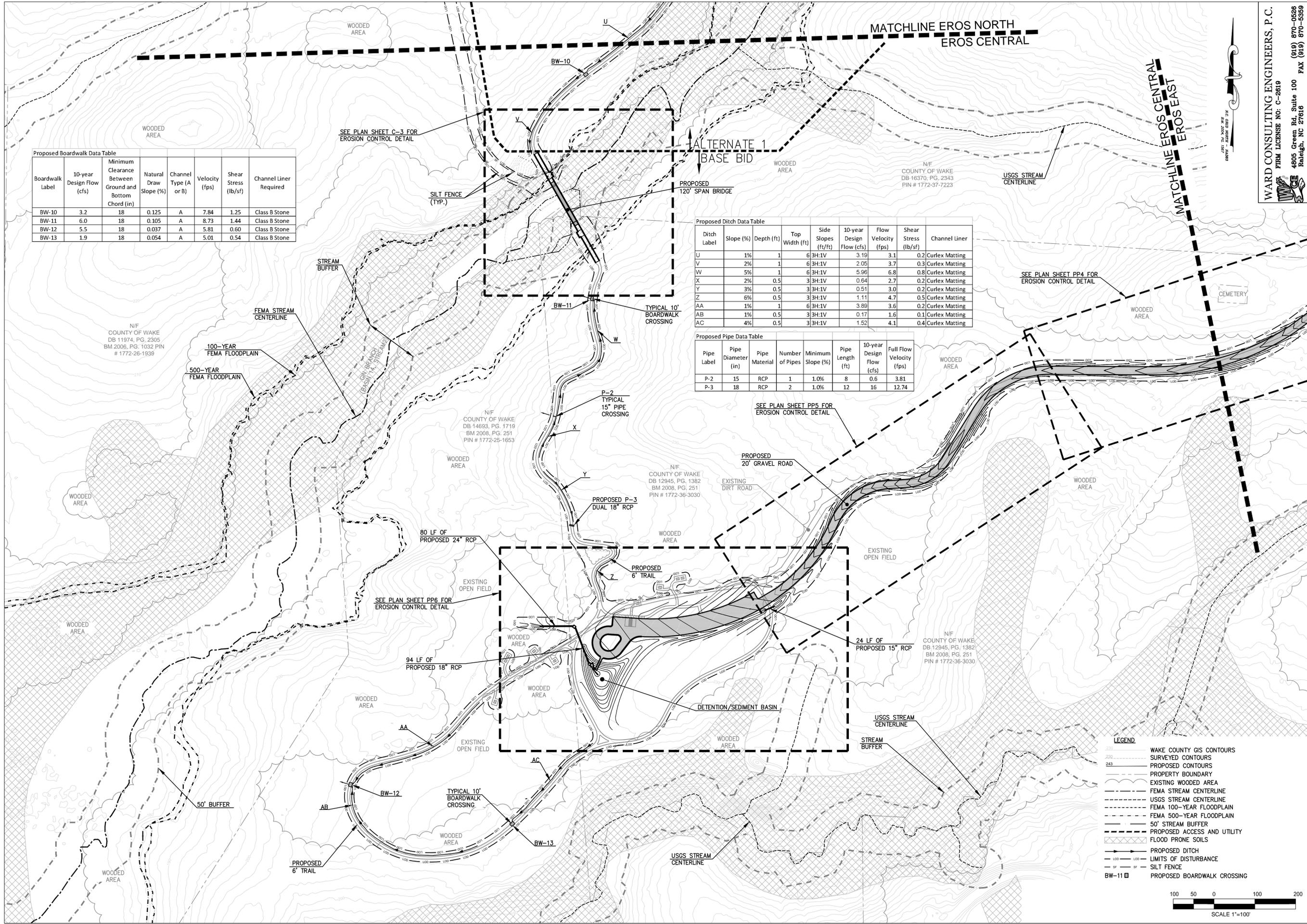
Boardwalk Label	10-year Design Flow (cfs)	Minimum Clearance Between Ground and Bottom Chord (in)	Natural Draw Slope (%)	Channel Type (A or B)	Velocity (fps)	Shear Stress (lb/sf)	Channel Liner Required
BW-10	3.2	18	0.125	A	7.84	1.25	Class B Stone
BW-11	6.0	18	0.105	A	8.73	1.44	Class B Stone
BW-12	5.5	18	0.037	A	5.81	0.60	Class B Stone
BW-13	1.9	18	0.054	A	5.01	0.54	Class B Stone

Proposed Ditch Data Table

Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/sf)	Channel Liner
U	1%	1	6	3H:1V	3.19	3.1	0.2	Curlex Matting
V	2%	1	6	3H:1V	2.05	3.7	0.3	Curlex Matting
W	5%	1	6	3H:1V	5.96	6.8	0.8	Curlex Matting
X	2%	0.5	3	3H:1V	0.64	2.7	0.2	Curlex Matting
Y	3%	0.5	3	3H:1V	0.51	3.0	0.2	Curlex Matting
Z	6%	0.5	3	3H:1V	1.11	4.7	0.5	Curlex Matting
AA	1%	1	6	3H:1V	3.89	3.6	0.2	Curlex Matting
AB	1%	0.5	3	3H:1V	0.17	1.6	0.1	Curlex Matting
AC	4%	0.5	3	3H:1V	1.52	4.1	0.4	Curlex Matting

Proposed Pipe Data Table

Pipe Label	Pipe Diameter (in)	Pipe Material	Number of Pipes	Minimum Slope (%)	Pipe Length (ft)	10-year Design Flow (cfs)	Full Flow Velocity (fps)
P-2	15	RCP	1	1.0%	8	0.6	3.81
P-3	18	RCP	2	1.0%	12	16	12.74



WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2619
 4605 Green Rd, Suite 100
 Raleigh, NC 27616
 (919) 870-0626
 (919) 870-5559
 FAX (919) 870-5559

Susan Hatchell
 Landscape Architecture, PLLC
 711 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700

Erosion Control
 Central Area



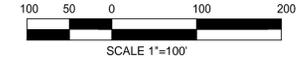
Turnipseed Nature Preserve
 Wake County, NC

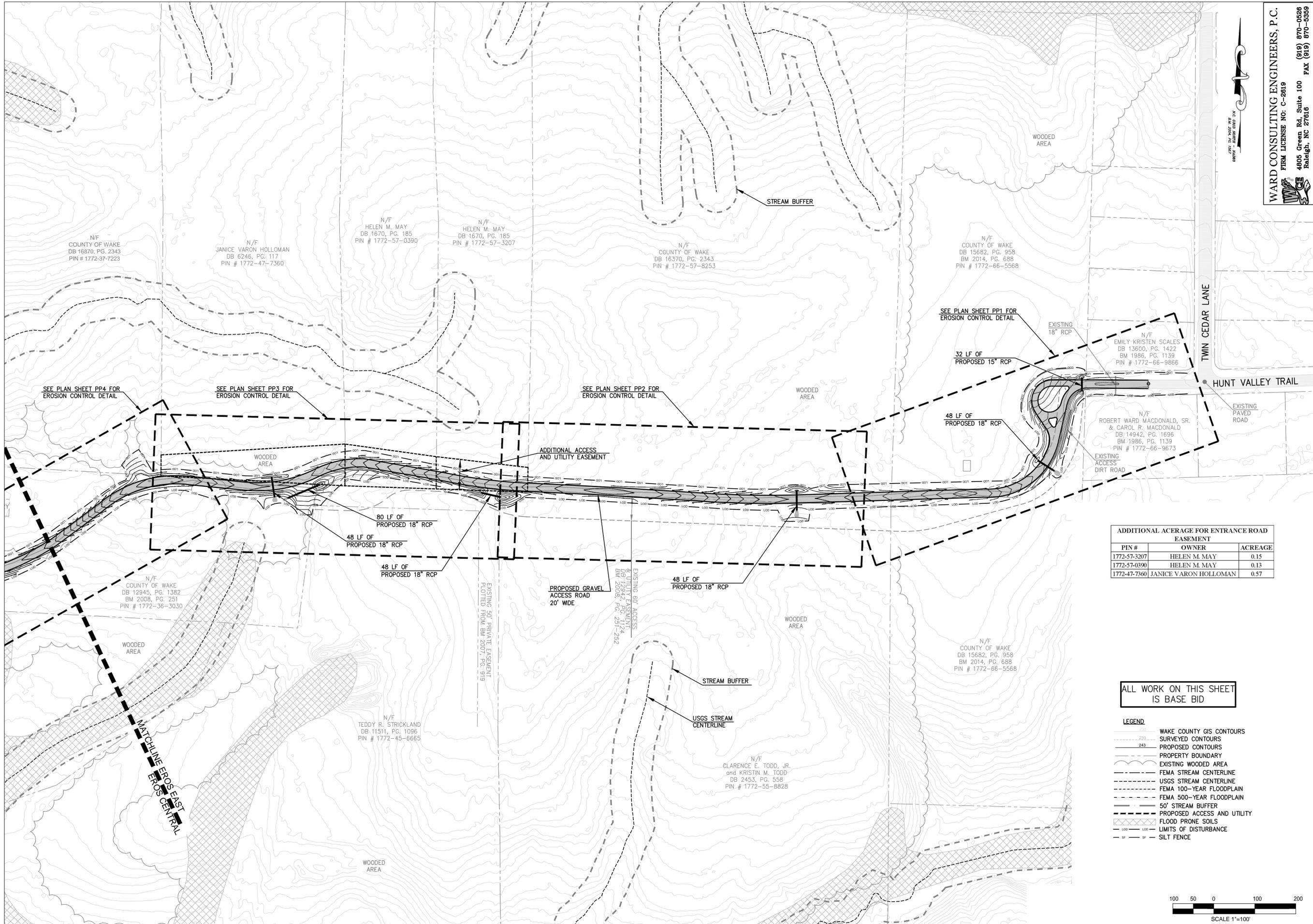
REVISIONS

5-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016
 EC-3

- LEGEND
- WAKE COUNTY GIS CONTOURS
 - SURVEYED CONTOURS
 - PROPOSED CONTOURS
 - PROPERTY BOUNDARY
 - EXISTING WOODED AREA
 - FEMA STREAM CENTERLINE
 - USGS STREAM CENTERLINE
 - FEMA 100-YEAR FLOODPLAIN
 - FEMA 500-YEAR FLOODPLAIN
 - 50' STREAM BUFFER
 - PROPOSED ACCESS AND UTILITY
 - FLOOD PRONE SOILS
 - PROPOSED DITCH
 - LIMITS OF DISTURBANCE
 - SILT FENCE
 - PROPOSED BOARDWALK CROSSING





WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2619
 (919) 870-0526
 4805 Creast Rd, Suite 100
 Raleigh, NC 27616 FAX (919) 870-5559

Susan Hatchell
 Landscape Architecture, PLLC
 711 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700

Erosion Control Eastern Area



Turnipseed Nature Preserve
 Wake County, NC

REVISIONS

5-15-16	▲	EROSION CONTROL COMMENTS
5-4-16	▲	EROSION CONTROL COMMENTS

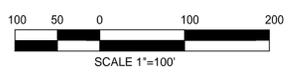
Date: 5-15-2016
 EC-4

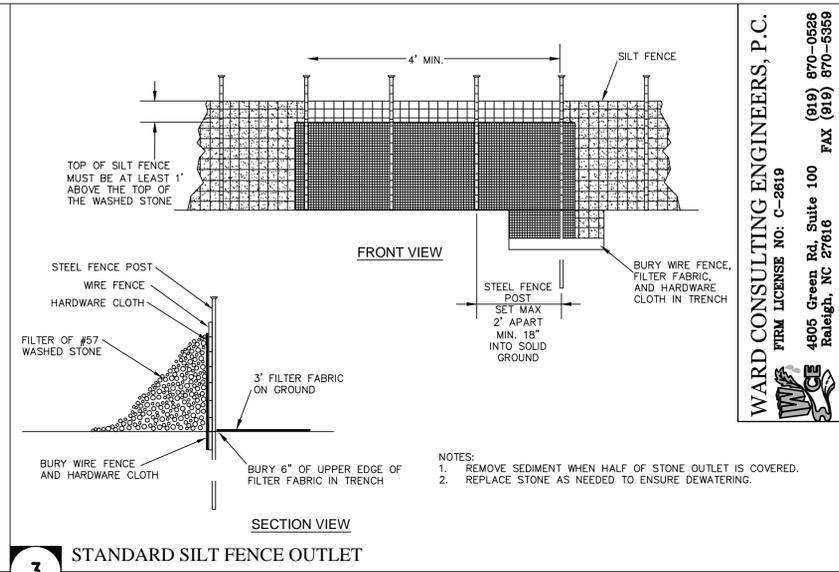
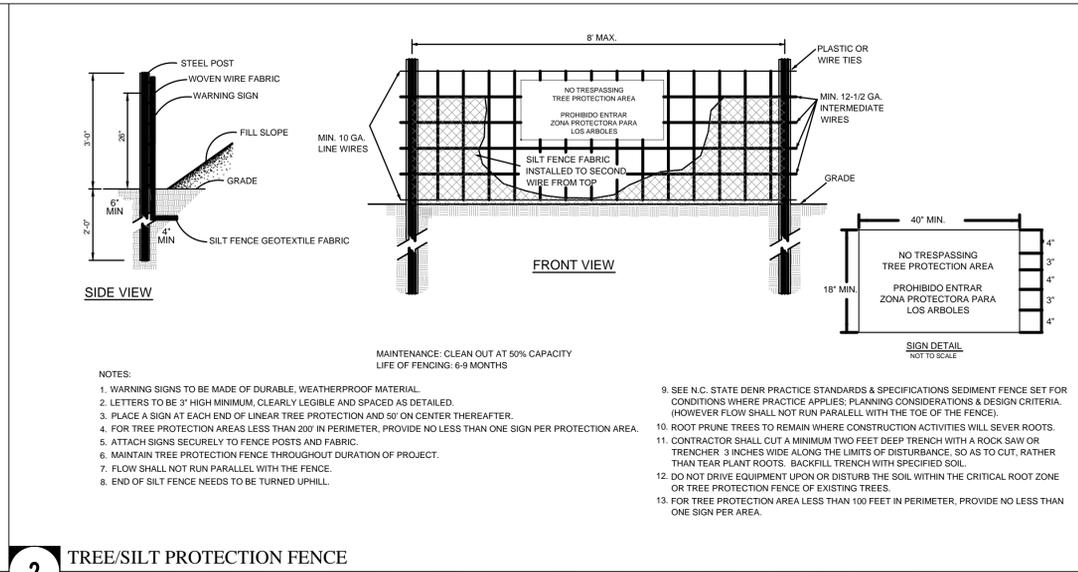
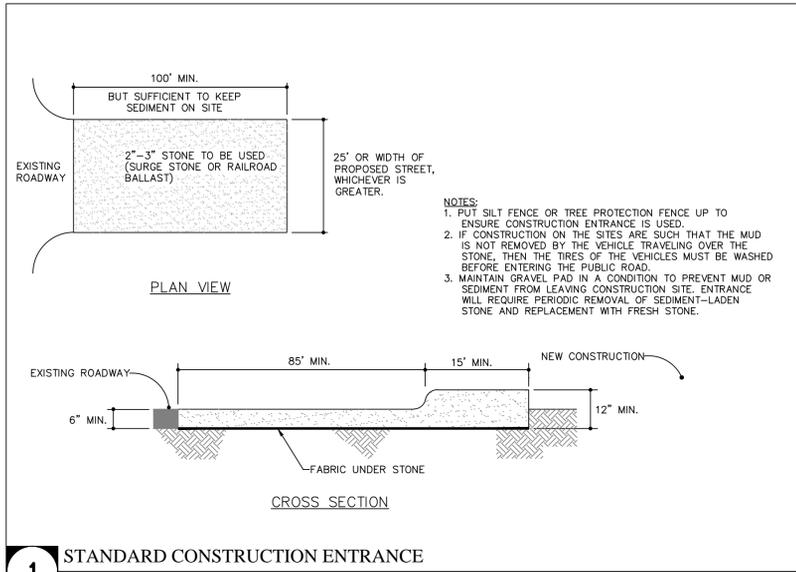
ADDITIONAL ACERAGE FOR ENTRANCE ROAD EASEMENT

PIN #	OWNER	ACREAGE
1772-57-3207	HELEN M. MAY	0.15
1772-57-0390	HELEN M. MAY	0.13
1772-47-7360	JANICE VARON HOLLOWMAN	0.57

ALL WORK ON THIS SHEET IS BASE BID

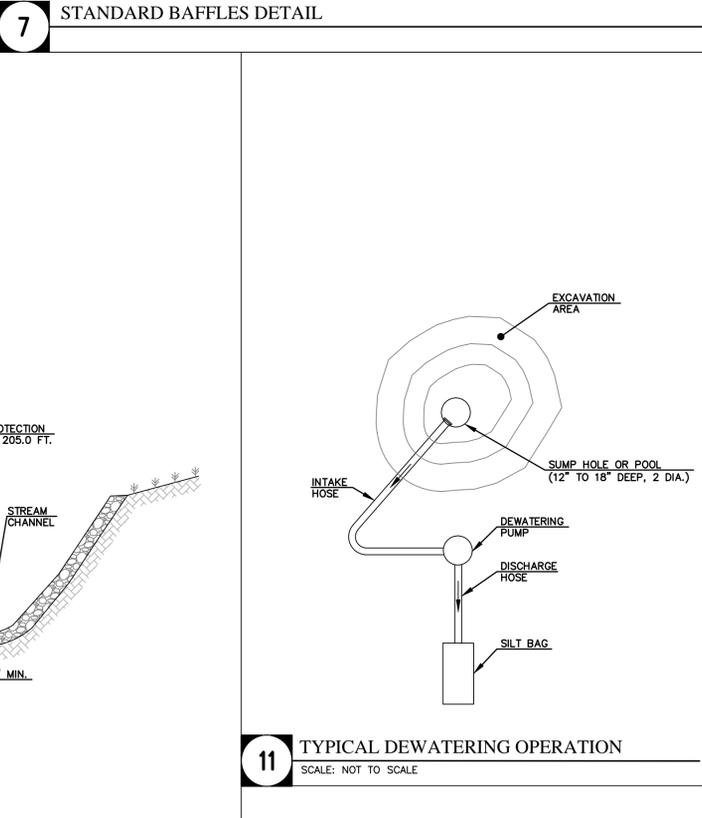
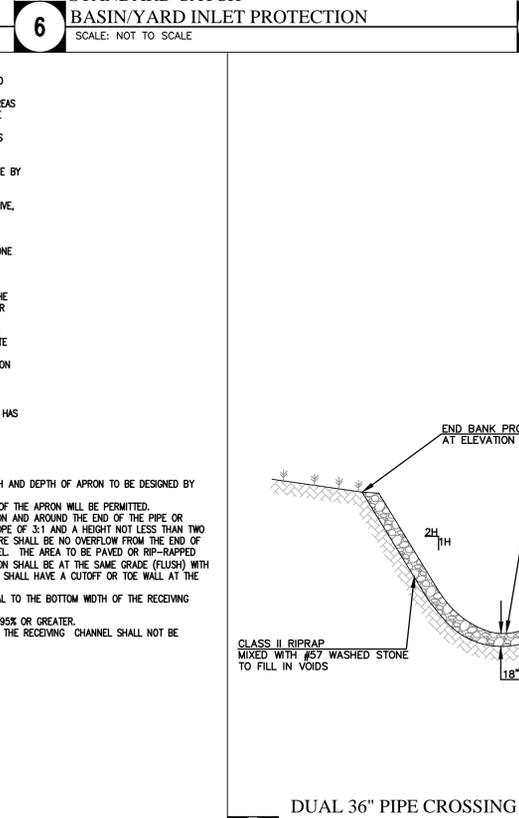
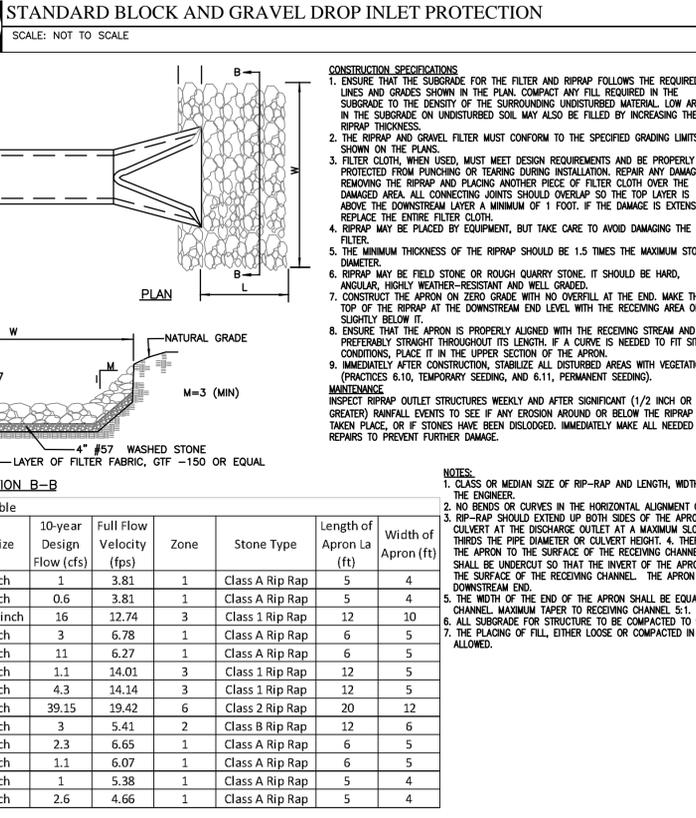
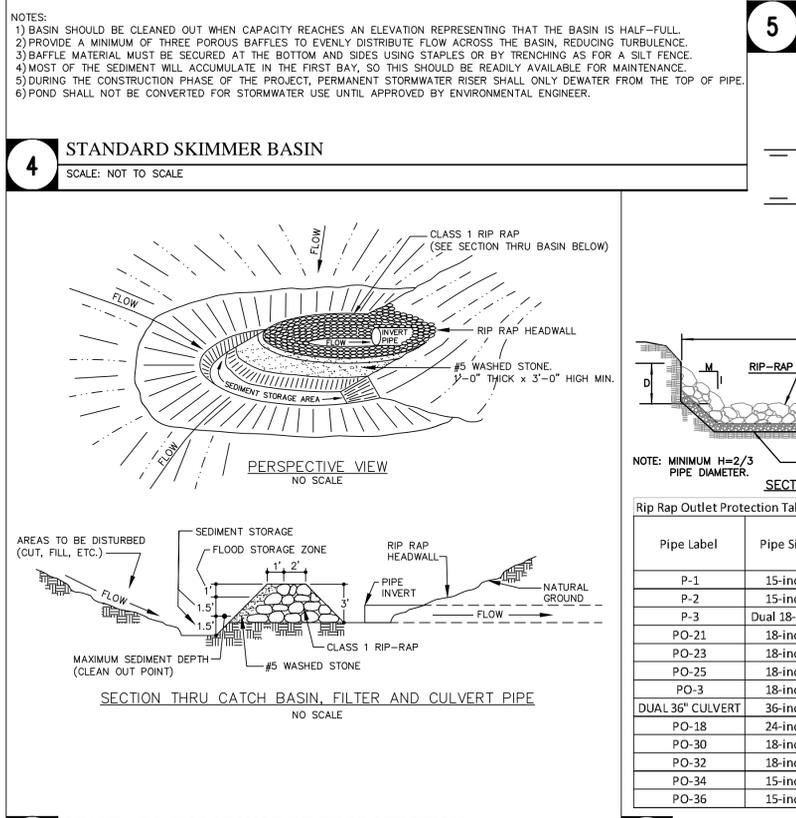
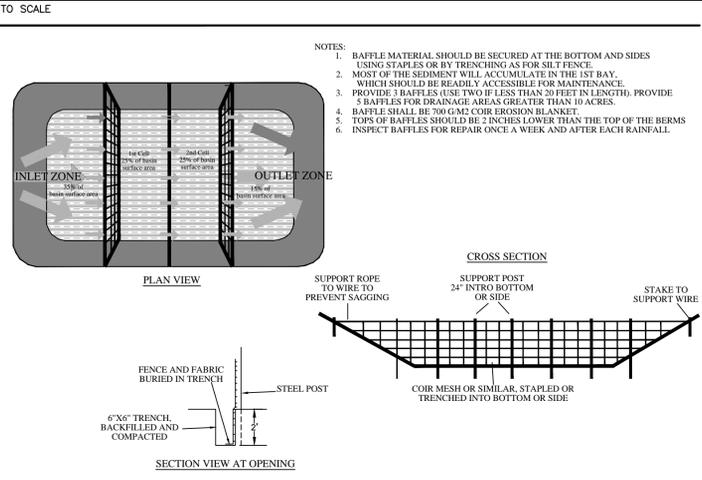
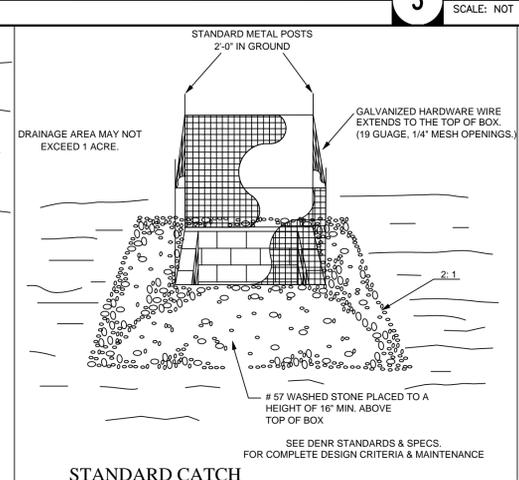
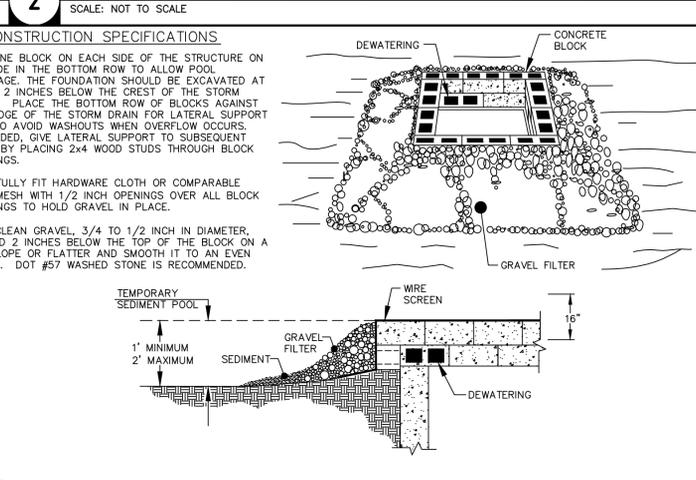
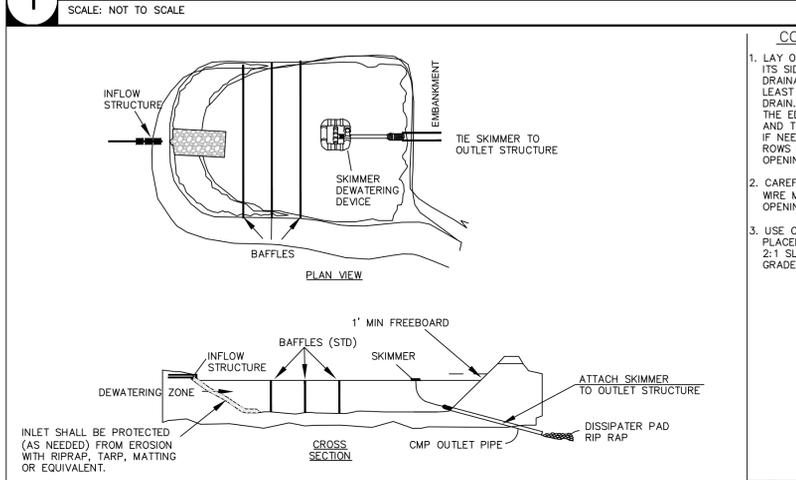
- LEGEND
- 250 WAKE COUNTY GIS CONTOURS
 - 230 SURVEYED CONTOURS
 - 243 PROPOSED CONTOURS
 - PROPERTY BOUNDARY
 - EXISTING WOODED AREA
 - FEMA STREAM CENTERLINE
 - USGS STREAM CENTERLINE
 - FEMA 100-YEAR FLOODPLAIN
 - FEMA 500-YEAR FLOODPLAIN
 - 50' STREAM BUFFER
 - PROPOSED ACCESS AND UTILITY
 - FLOOD PRONE SOILS
 - LIMITS OF DISTURBANCE
 - SILT FENCE





WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2819
 4805 Green Rd, Suite 100
 Raleigh, NC 27616
 (919) 870-0526
 (919) 870-0528
 FAX (919) 870-0509

Susan Hatchell
 Landscape Architecture, PLLC
 7111 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700



8 STANDARD HORSESHOE INLET PROTECTION
 SCALE: NOT TO SCALE

9 RIPRAP OUTLET PROTECTION
 SCALE: NOT TO SCALE

10 DUAL 36" PIPE CROSSING RIPRAP BANK PROTECTION
 SCALE: NOT TO SCALE

11 TYPICAL DEWATERING OPERATION
 SCALE: NOT TO SCALE

Erosion Control Details

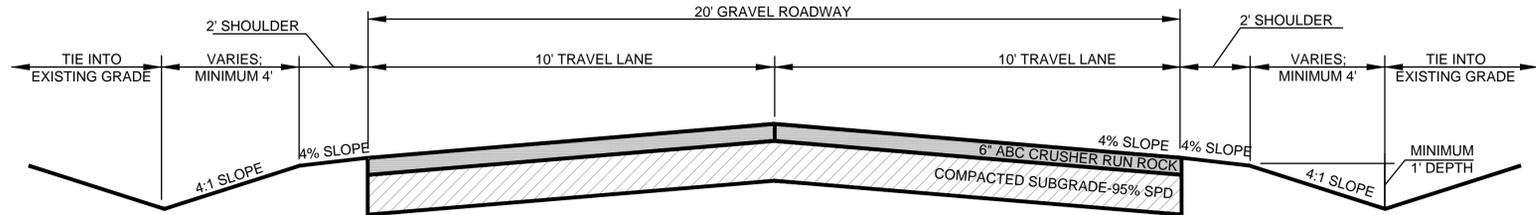


Turnipseed Nature Preserve
 Wake County, NC

REVISIONS

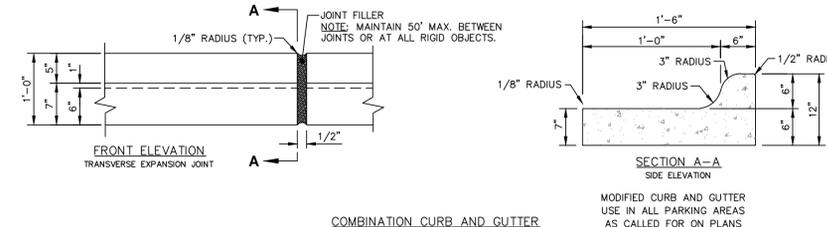
3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016
 EC-5



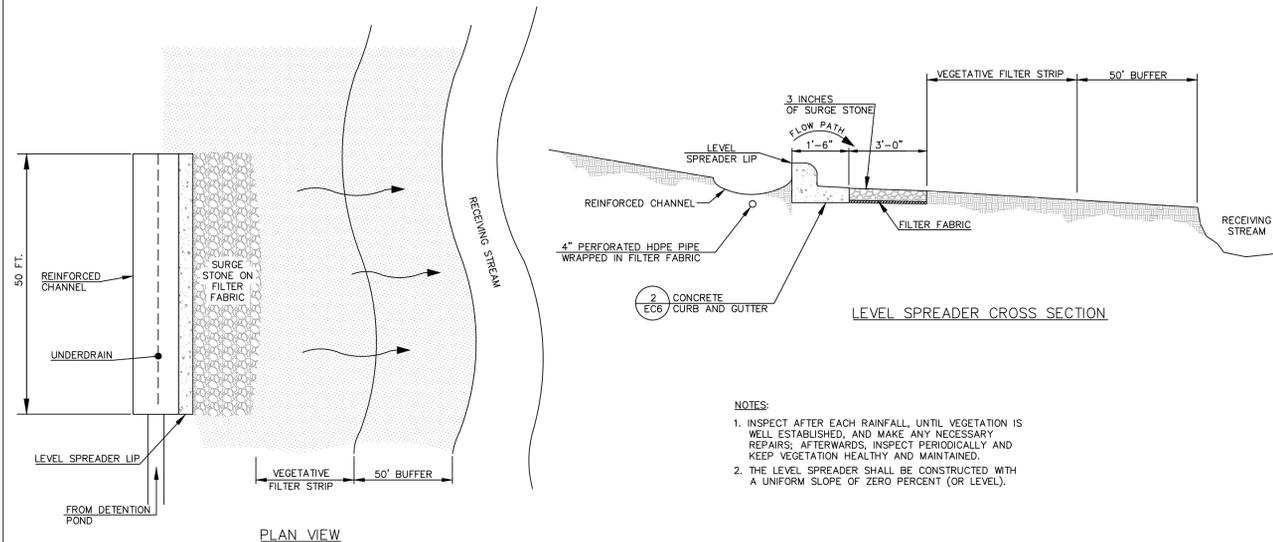
1 PROPOSED GRAVEL ROAD

SCALE: NOT TO SCALE

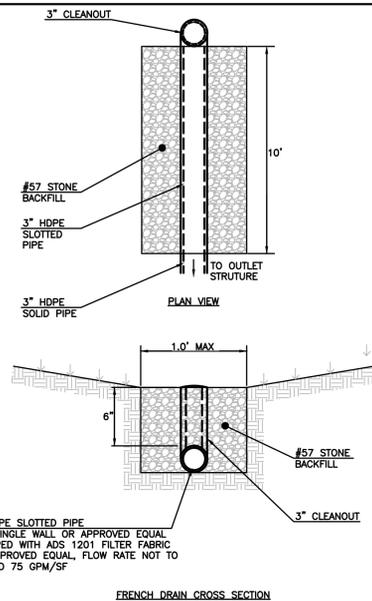


2 CONCRETE CURB AND GUTTER

SCALE: NOT TO SCALE

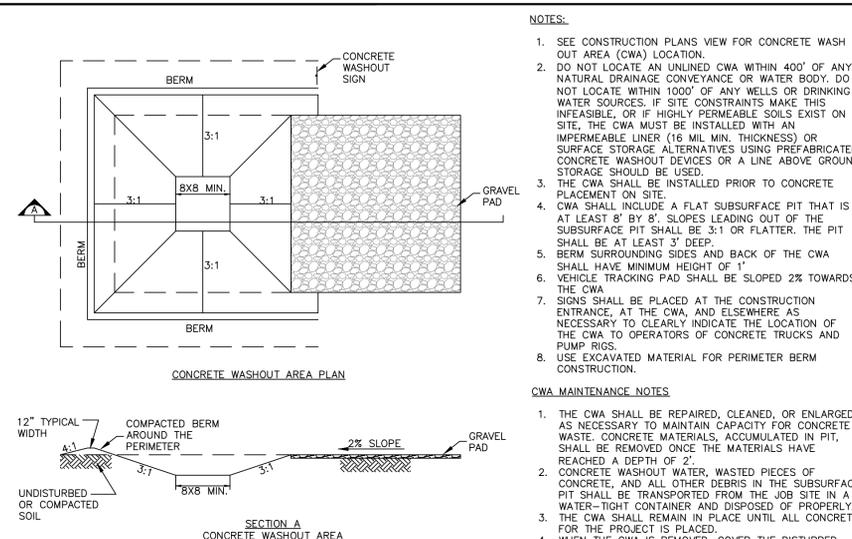


- NOTES:**
- INSPECT AFTER EACH RAINFALL, UNTIL VEGETATION IS WELL ESTABLISHED, AND MAKE ANY NECESSARY REPAIRS; AFTERWARDS, INSPECT PERIODICALLY AND KEEP VEGETATION HEALTHY AND MAINTAINED.
 - THE LEVEL SPREADER SHALL BE CONSTRUCTED WITH A UNIFORM SLOPE OF ZERO PERCENT (OR LEVEL).



4 TYPICAL FRENCH DRAIN DETAIL

SCALE: NOT TO SCALE

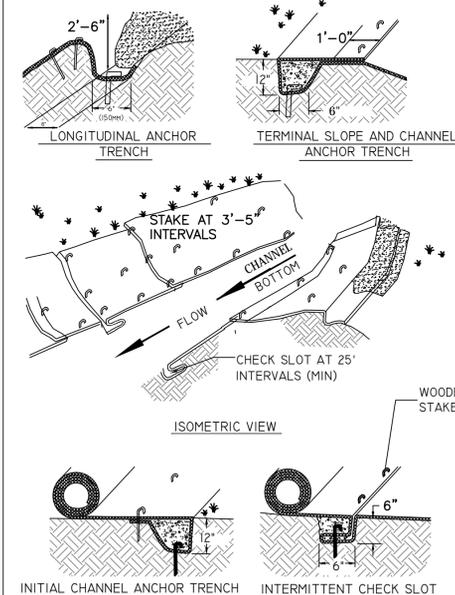


5 CONCRETE TRUCK CLEAN OUT PIT

SCALE: NOT TO SCALE

3 STANDARD LEVEL SPREADER

SCALE: NOT TO SCALE



- NOTES:**
- CHECK SLOTS TO BE CONSTRUCTED AT 25' INTERVALS.
 - ALL MATTING TO BE SECURED WITH WOODEN STAKES ACCORDING TO THE SPECIFICATIONS AT 5' INTERVALS.
 - FABRIC OVERLAP WHEN 2 ROWS OF MATERIAL ARE USED SHALL BE PLACED WITH THE UPPER ROW OF MATERIAL PLACED OVER THE LOWER ROW OF MATERIAL.
 - TRENCH MATTING AT TOP AND BOTTOM OF MAT AS SHOWN IN DETAIL.
 - OVERLAP FABRIC IN DIRECTION OF FLOW WITH MATTING UPSTREAM ON TOP OF DOWNSTREAM MAT.
 - MATTING WILL BE INSTALLED ACCORDING TO THE SPECIFICATIONS.

Table 6.10a Temporary Seeding Specifications for Winter and Early Spring

Seeding mixture Species	Rate (lb/acre)
Rye (grain)	120

Seeding dates	15 Feb to 15 May	15 May to 15 Aug
Mountains	<2500 ft	1-Feb to 3-May
Piedmont	1-Jan to 3-May	15-Apr to 15-Aug
Coastal Plain	1-Dec to 15-Apr	

Soil amendments
Apply one ton of lime per acre with two tons of lime per acre in clay soils or per soils test.

Mulch
Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting or a mulch anchoring tool. Use 400 gallons of tack per acre or straw covered with pinned netting.

Maintenance
Refer to Table 6.10b for growth not fully adequate. Re-seed, refer to Table 6.10b for growth not fully adequate. Re-seed, refer to Table 6.10b for growth not fully adequate.

Table 6.10b Temporary Seeding Specifications for Summer

Seeding mixture Species	Rate (lb/acre)
German millet	40

Seeding dates	15 May to 15 Aug	15 Aug to 15-Nov
Mountains	1-May to 15-Aug	15-Aug to 15-Nov
Piedmont	1-May to 15-Aug	15-Aug to 15-Nov
Coastal Plain	15-Apr to 15-Aug	

Soil amendments
Apply one ton of lime per acre with two tons of lime per acre in clay soils or per soils test.

Mulch
Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting or a mulch anchoring tool. Use 400 gallons of tack per acre or straw covered with pinned netting.

Maintenance
Refer to Table 6.10b for growth not fully adequate. Re-seed, refer to Table 6.10b for growth not fully adequate.

Table 6.10c Temporary Seeding Specifications for Fall

Seeding mixture Species	Rate (lb/acre)
Rye (grain)	120

In the Piedmont and Mountains, a small stemmed Sudangrass may be substituted at a rate of 500 lb/acre.

Seeding dates
Mountains: 15-Aug to 15-Dec
Coastal Plain and Piedmont: 15-Aug to 30-Dec

Soil amendments
Apply one ton of lime per acre with two tons of lime per acre in clay soils or per soils test.

Mulch
Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting or a mulch anchoring tool. Use 400 gallons of tack per acre or straw covered with pinned netting.

Maintenance
Repair and re-fertilize damaged areas immediately. Topdress with 50 lb/acre of nitrogen in March. If it is necessary to extend temporary cover beyond June 15, overseed with 50 lb/acre Kober (Piedmont and Coastal Plain). Use February or early March.

Permanent seeding see specifications. Use this table if not otherwise specified.

Permanent Seeding Mixture
Seed Mixtures
Blend of 50% KY-31 Tall fescue and 50% mixture of two or more turf-type tall fescues

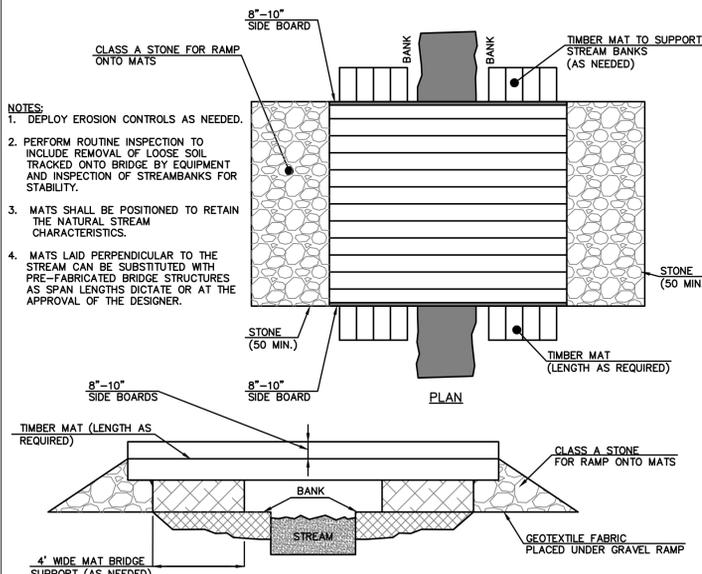
Planting Rates
200-250 lbs/acre

Blend of three or more turf-type tall fescues

200-250 lbs/acre

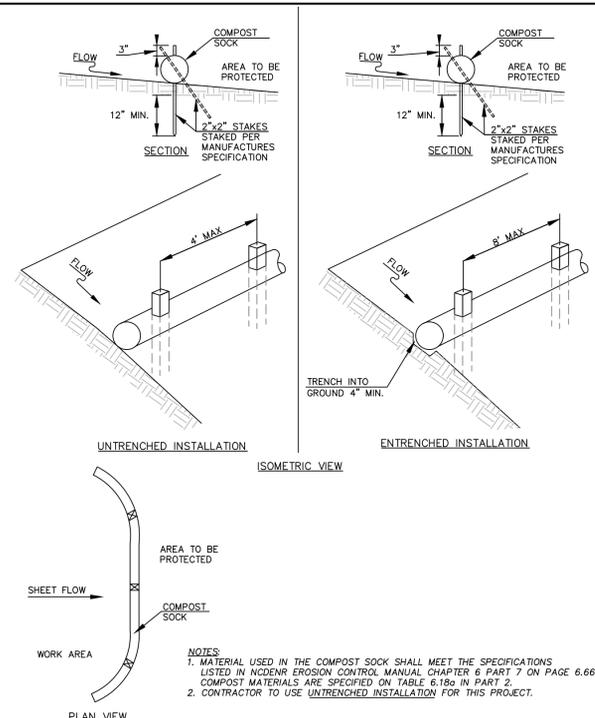
Seeding Dates Best: Aug. 25 - Sept. 15
Possible: Aug. 20 - Oct. 25
Feb 1 - March 31

The above vegetation are those which do well under local conditions; other seeding rate combinations are possible. Seeding mix shall be approved by the engineer before seeding of the project starts.



8 TEMPORARY STREAM CROSSING BRIDGE MATS

SCALE: NOT TO SCALE



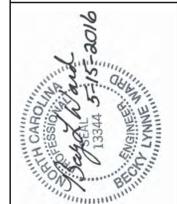
9 COMPOST SOCK INSTALLATION

SCALE: NOT TO SCALE

WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2819
4805 Green Rd., Suite 100
Raleigh, NC 27616
(919) 870-0826
(919) 870-0826
FAX (919) 870-0826

Susan Hatchell
Landscape Architecture, PLLC
7111 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Erosion Control and Miscellaneous Details



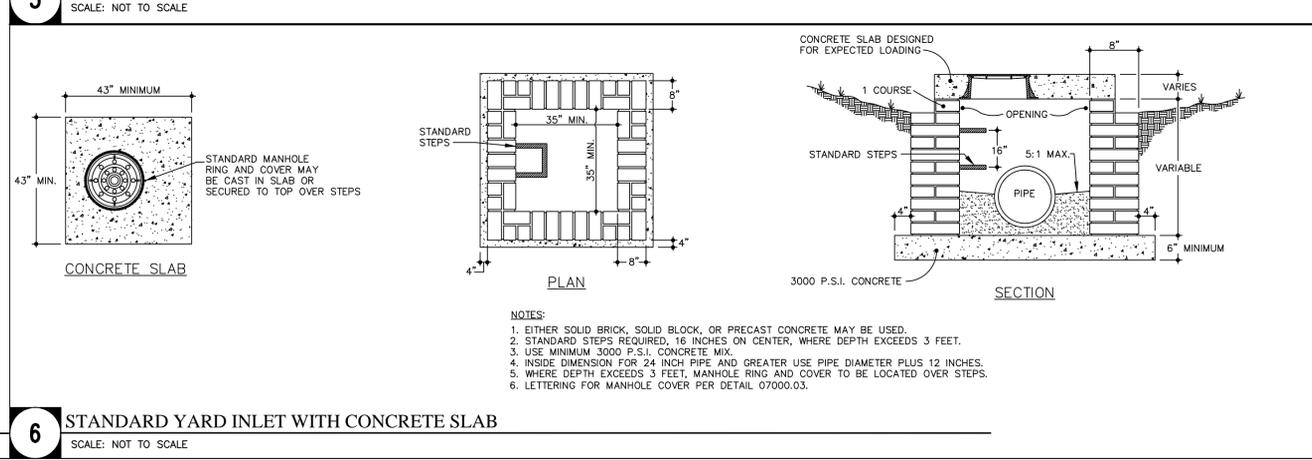
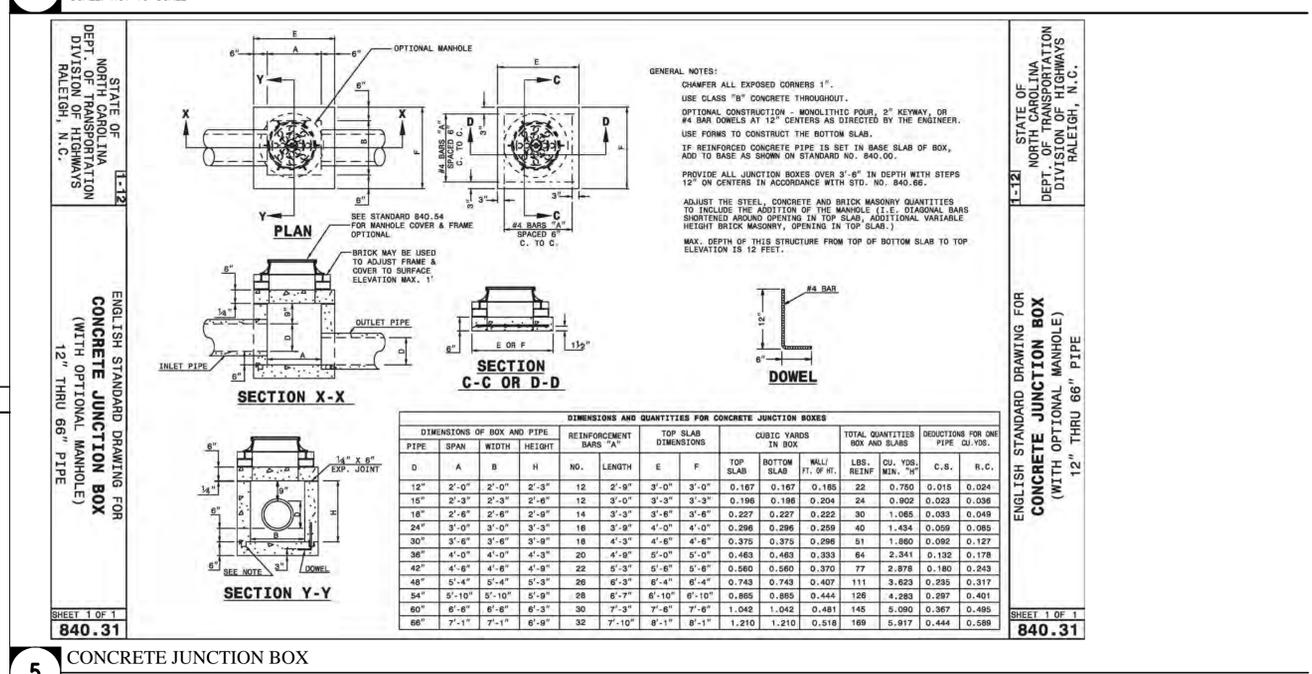
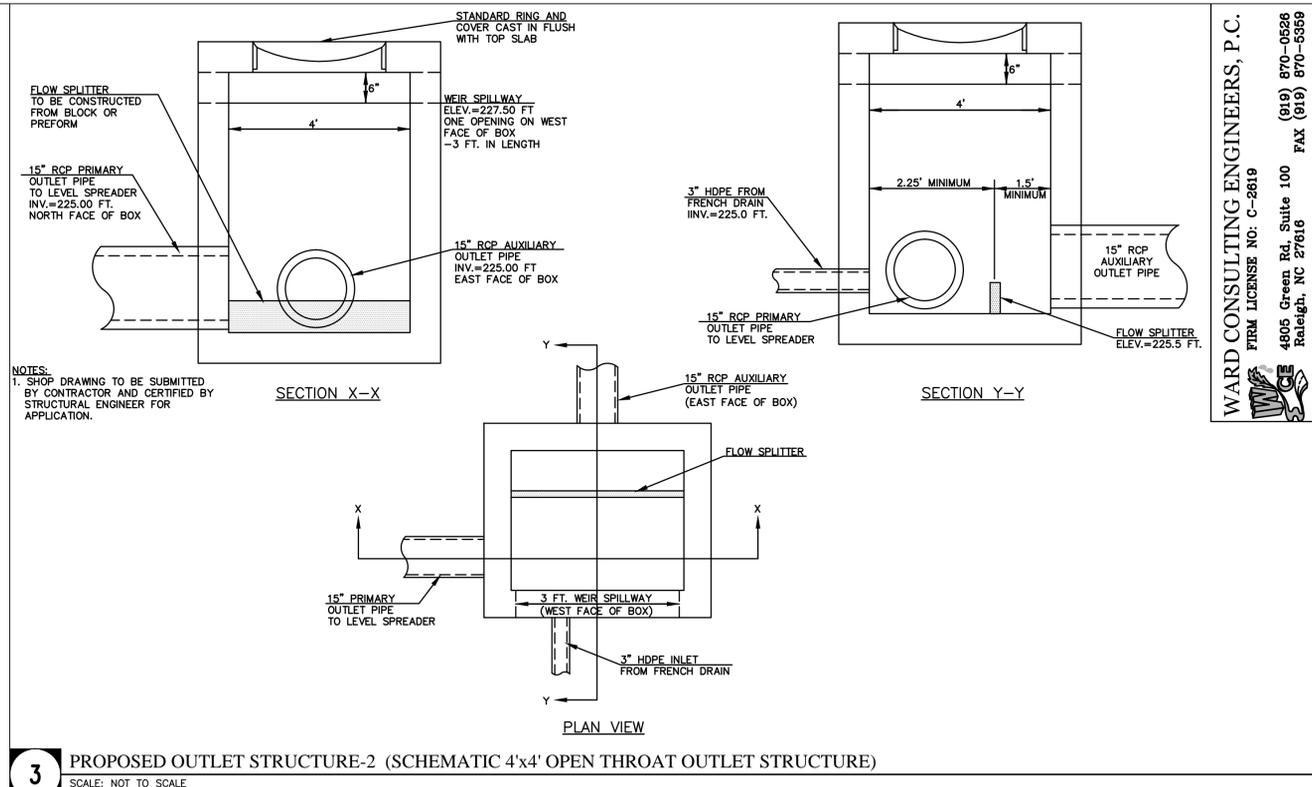
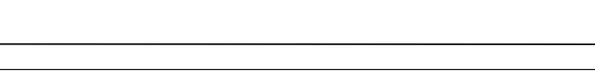
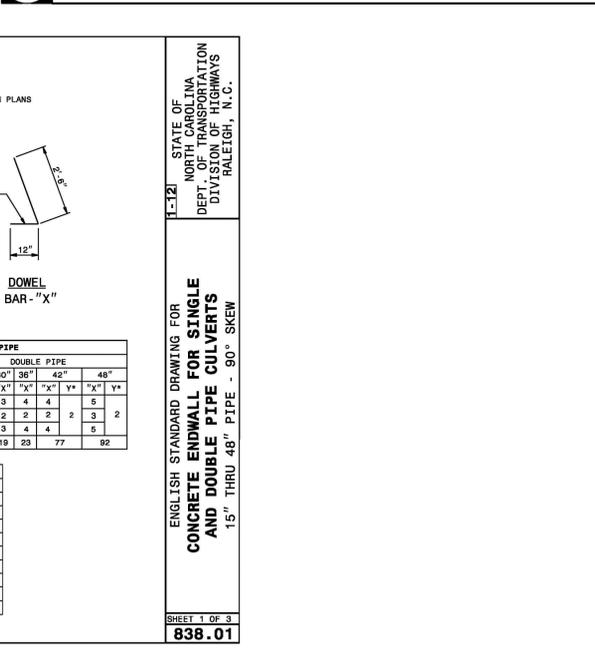
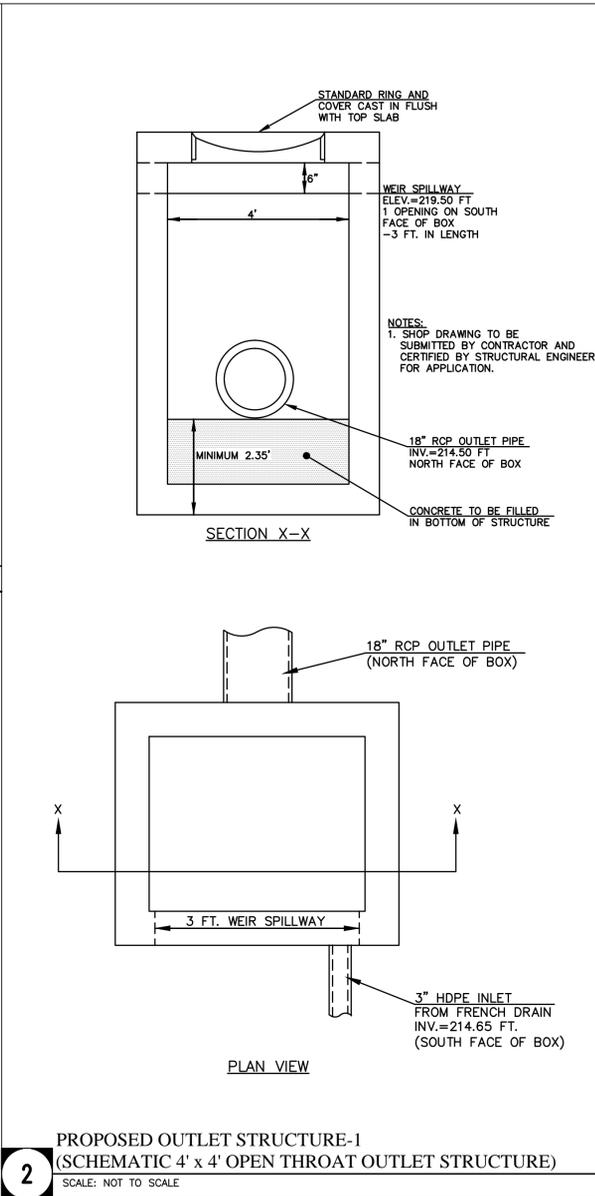
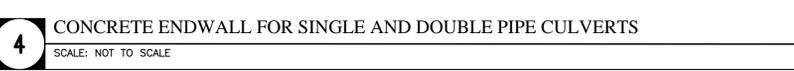
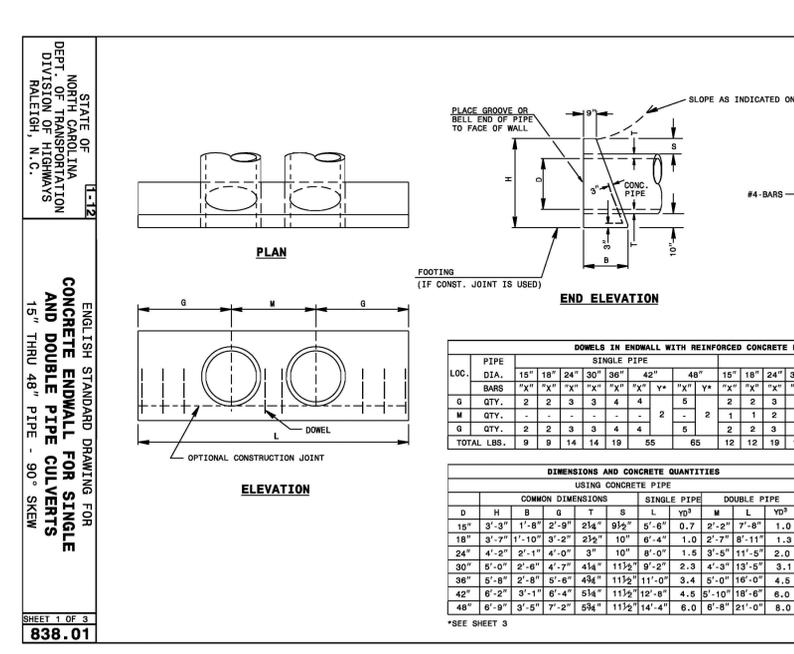
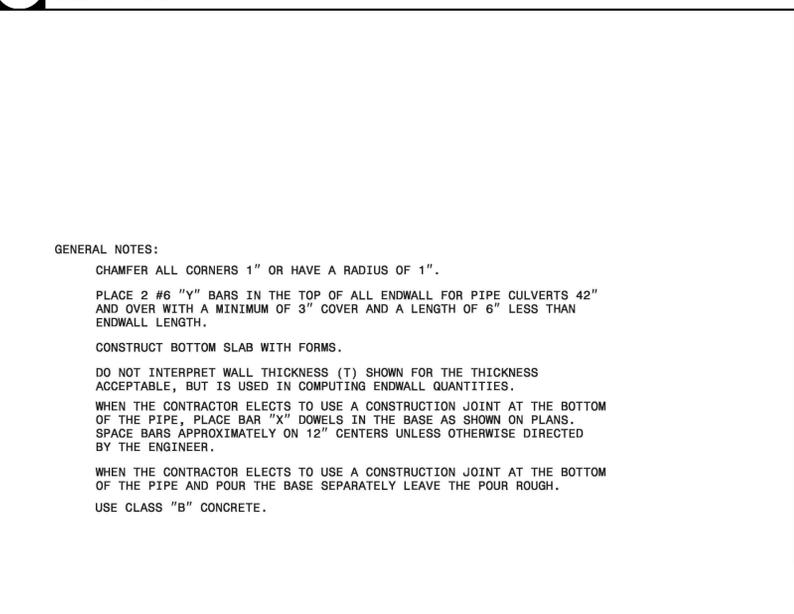
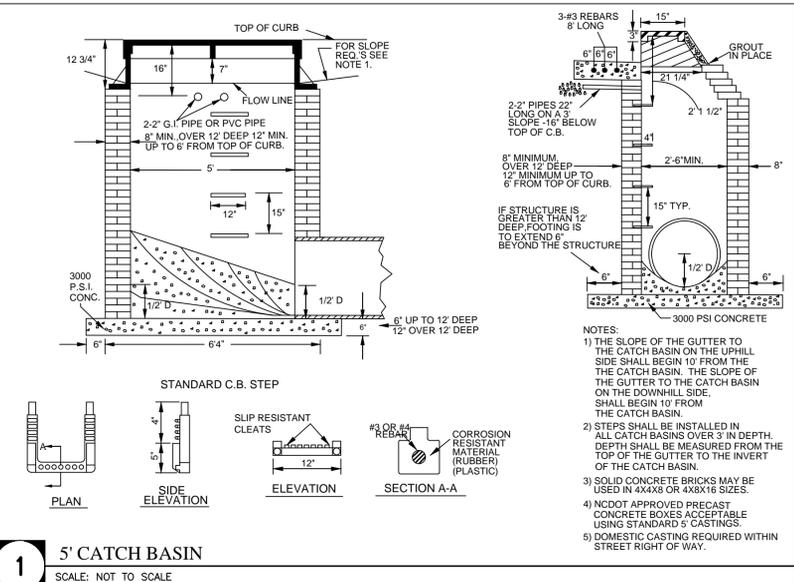
Turnipseed Nature Preserve
Wake County, NC

REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016

EC-6



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4605 Green Rd., Suite 100
Raleigh, NC 27616
(919) 870-0526
(919) 870-0528
FAX (919) 870-0509

Susan Hatchell
Hatchell Landscape Architecture, PLLC
7111 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Storm Drainage Structures

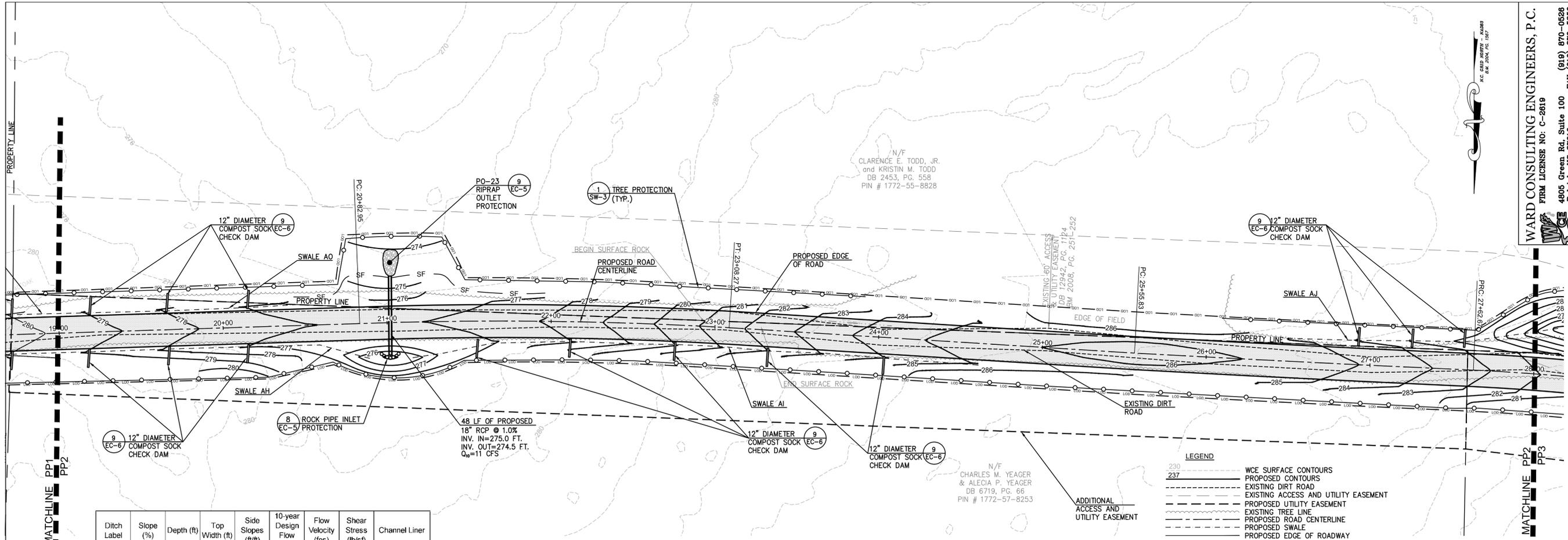
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR CONCRETE JUNCTION BOX (WITH OPTIONAL MANHOLE)
12" THRU 66" PIPE

REVISIONS

3-15-16	EROSION CONTROL COMMENTS
5-4-16	EROSION CONTROL COMMENTS

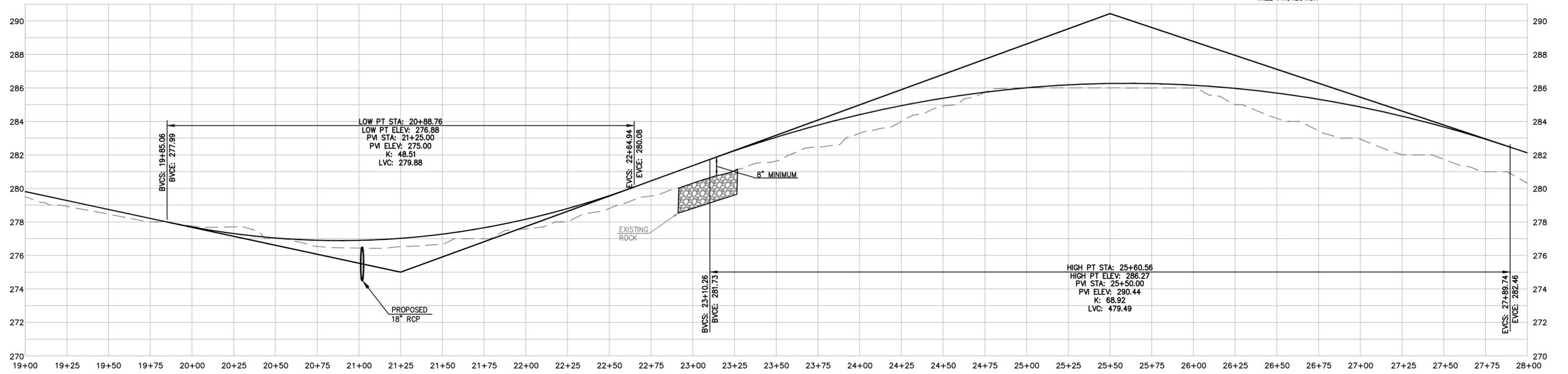
Date: 5-15-2016
EC-7



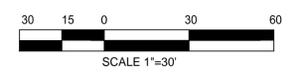
Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/ft ²)	Channel Liner
AH	3%	1	8	4H:1V	0.55	2.9	0.2	Curlex Matting
AI	3%	1	8	4H:1V	0.55	2.9	0.2	Curlex Matting
AJ	3%	1	8	4H:1V	1.10	3.4	0.3	Curlex Matting
AO	3%	1	8	4H:1V	0.60	2.9	0.2	Curlex Matting

- LEGEND**
- 230 --- WCE SURFACE CONTOURS
 - 237 --- PROPOSED CONTOURS
 - --- EXISTING DIRT ROAD
 - --- EXISTING ACCESS AND UTILITY EASEMENT
 - --- PROPOSED UTILITY EASEMENT
 - --- EXISTING TREE LINE
 - --- PROPOSED ROAD CENTERLINE
 - --- PROPOSED SWALE
 - --- PROPOSED EDGE OF ROADWAY
 - SF --- SILT FENCE
 - --- LIMITS OF DISTURBANCE
 - --- ROCK PIPE INLET PROTECTION
 - --- RIPRAP OUTLET PROTECTION
 - --- 12" DIAMETER COMPOST SOCK CHECK DAM
 - --- TREE PROTECTION

ALL WORK ON THIS SHEET IS BASE BID



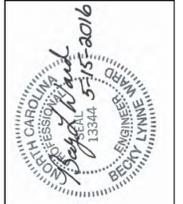
SCALE 1"=30' HORIZONTAL
1"=3' VERTICAL



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4905 Green Rd., Suite 100 (919) 870-0628
Raleigh, NC 27616 FAX (919) 870-5559

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Plan and Profile
19+00 to 28+00



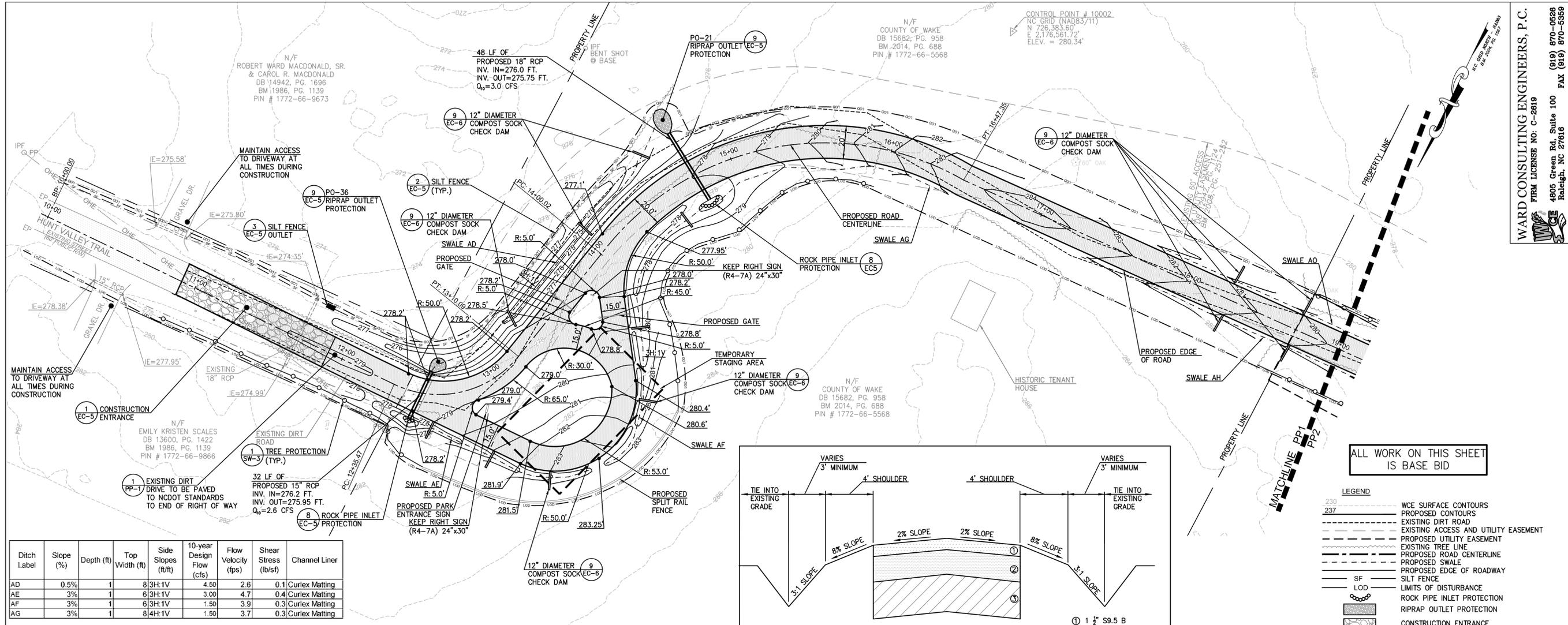
Turnipseed Nature Preserve
Wake County, NC

REVISIONS

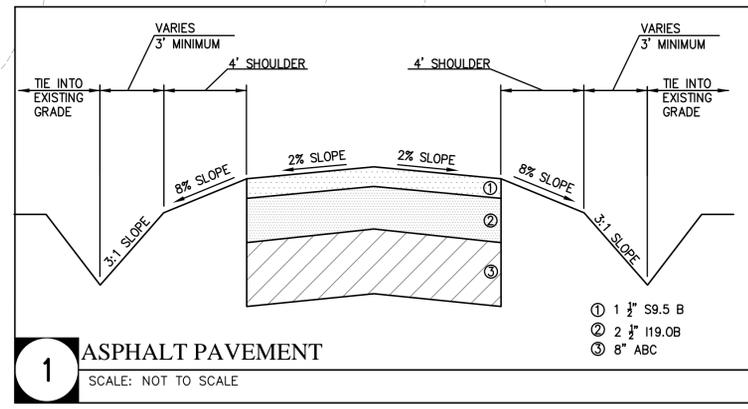
3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016

PP-2



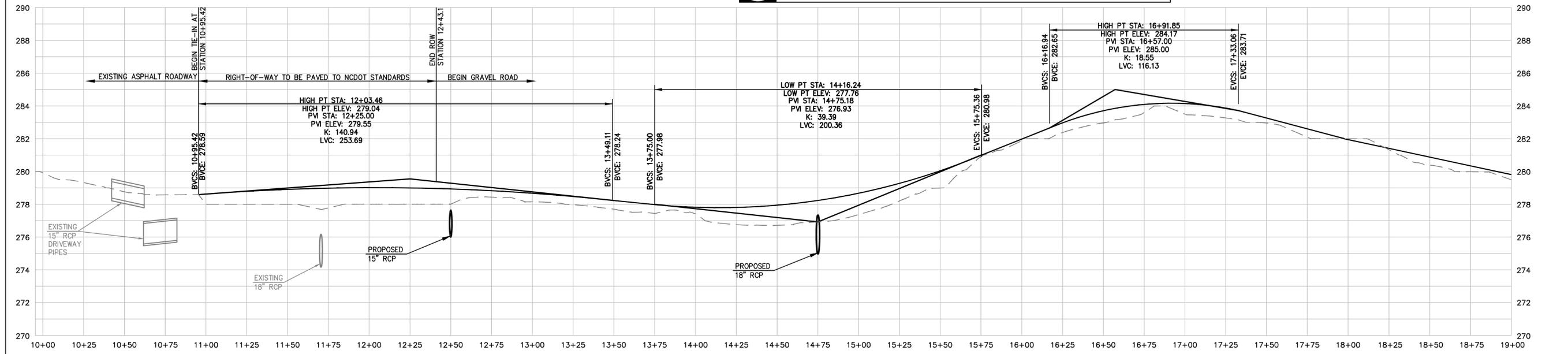
Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/ft ²)	Channel Liner
AD	0.5%	1	8	3H:1V	4.50	2.6	0.1	Curlex Matting
AE	3%	1	6	3H:1V	3.00	4.7	0.4	Curlex Matting
AF	3%	1	6	3H:1V	1.50	3.9	0.3	Curlex Matting
AG	3%	1	8	4H:1V	1.50	3.7	0.3	Curlex Matting



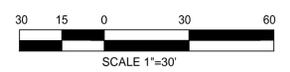
1 ASPHALT PAVEMENT
SCALE: NOT TO SCALE

ALL WORK ON THIS SHEET IS BASE BID

- LEGEND**
- WCE SURFACE CONTOURS
 - PROPOSED CONTOURS
 - EXISTING DIRT ROAD
 - EXISTING ACCESS AND UTILITY EASEMENT
 - PROPOSED UTILITY EASEMENT
 - EXISTING TREE LINE
 - PROPOSED ROAD CENTERLINE
 - PROPOSED SWALE
 - PROPOSED EDGE OF ROADWAY
 - SF SILT FENCE
 - LOD LIMITS OF DISTURBANCE
 - ROCK PIPE INLET PROTECTION
 - RIPPRAP OUTLET PROTECTION
 - CONSTRUCTION ENTRANCE
 - TREE PROTECTION
 - CHECK DAM
 - 12" DIAMETER COMPOST SOCK CHECK DAM



SCALE 1"=30' HORIZONTAL
1"=3' VERTICAL



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4805 Green Rd, Suite 100
Raleigh, NC 27616
(919) 870-0628
(919) 870-0559

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Plan and Profile
10+00 to 19+00

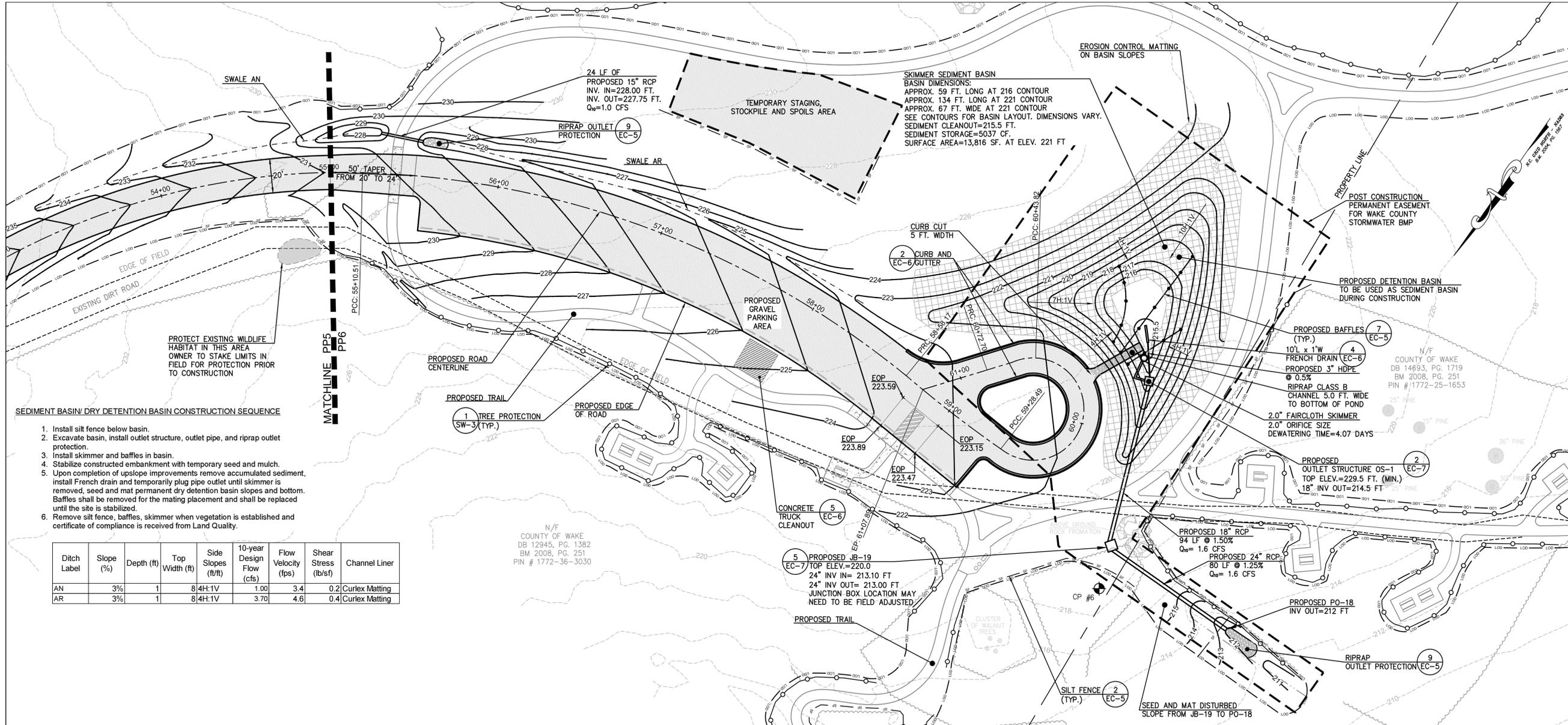


Turnipseed Nature Preserve
Wake County, NC

REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016
PP-1



WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2619
 4805 Green Rd., Suite 100 (819) 870-0628
 Raleigh, NC 27616 FAX (819) 870-0589

Susan Hatchell
 Landscape Architecture, PLLC
 711 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700

Plan and Profile
55+00 TO 61+00 & Hunt Valley Parking Area Grading



Turnipseed Nature Preserve
 Wake County, NC

REVISIONS

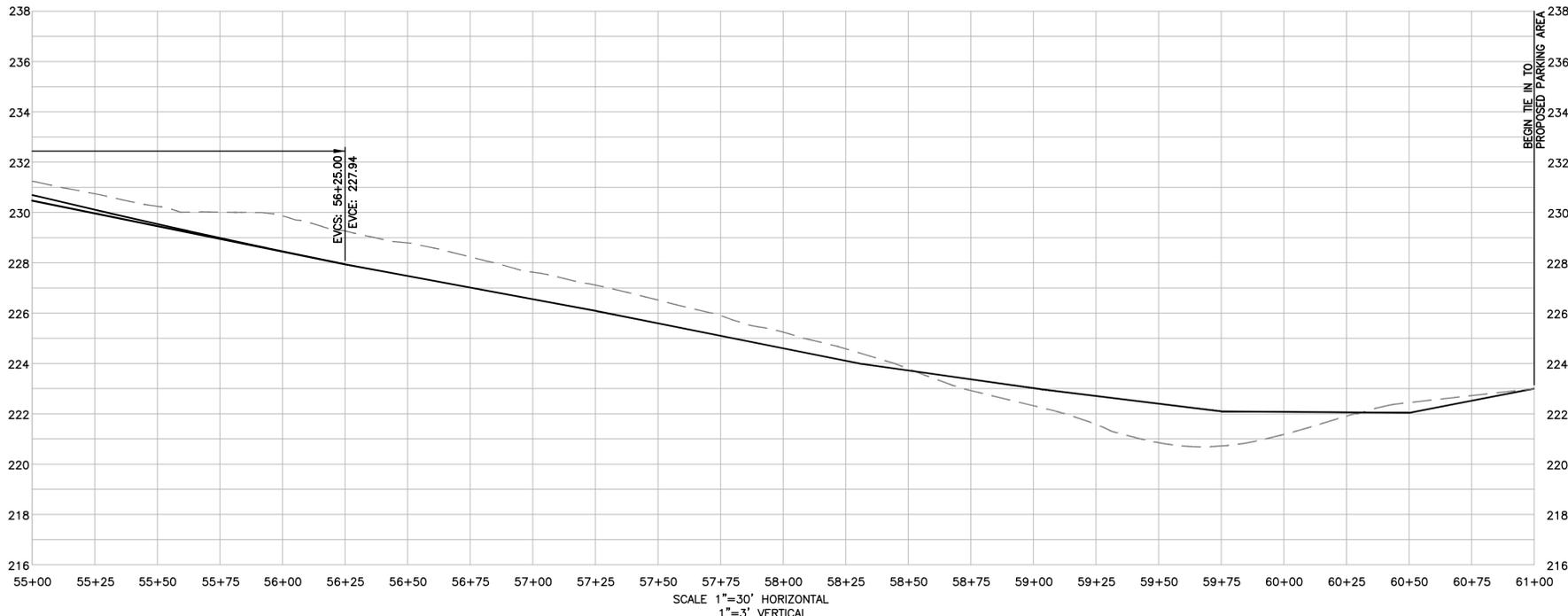
3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016
 PP-6

SEDIMENT BASIN DRY DETENTION BASIN CONSTRUCTION SEQUENCE

1. Install silt fence below basin.
2. Excavate basin, install outlet structure, outlet pipe, and riprap outlet protection.
3. Install skimmer and baffles in basin.
4. Stabilize constructed embankment with temporary seed and mulch.
5. Upon completion of upslope improvements remove accumulated sediment, install French drain and temporarily plug pipe outlet until skimmer is removed, seed and mat permanent dry detention basin slopes and bottom. Baffles shall be removed for the matting placement and shall be replaced until the site is stabilized.
6. Remove silt fence, baffles, skimmer when vegetation is established and certificate of compliance is received from Land Quality.

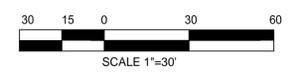
Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/ft ²)	Channel Liner
AN	3%	1	8	4H:1V	1.00	3.4	0.2	Curlex Matting
AR	3%	1	8	4H:1V	3.70	4.6	0.4	Curlex Matting

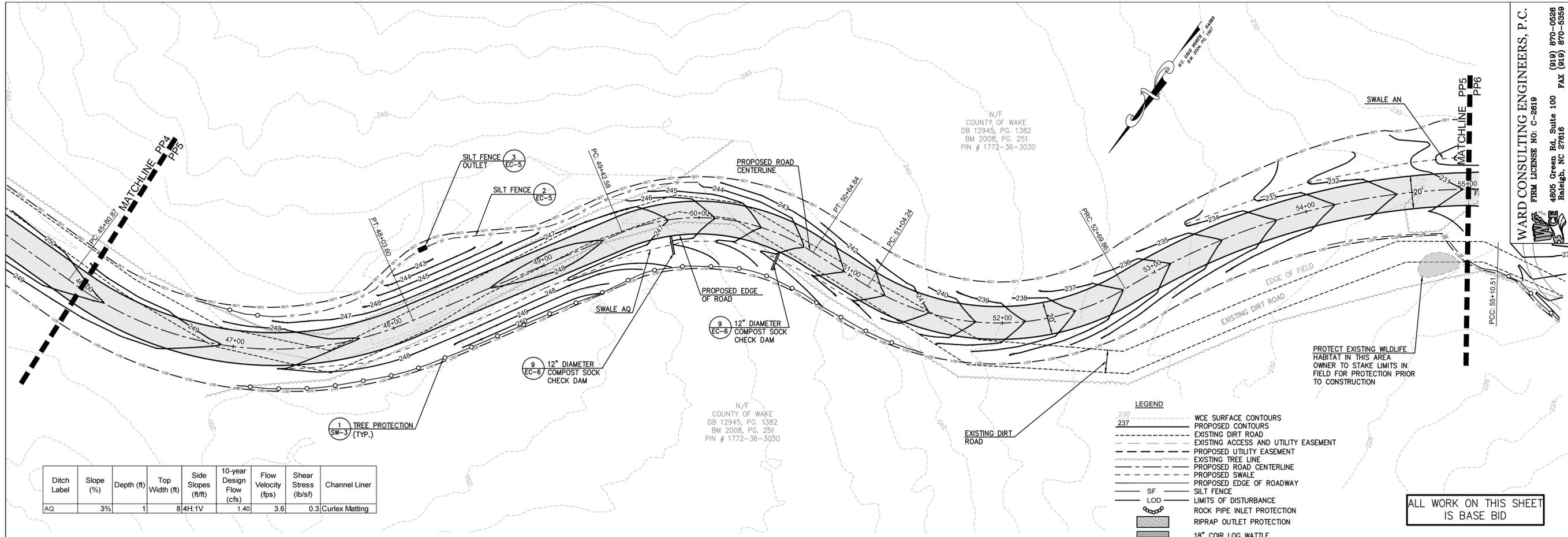


ALL WORK ON THIS SHEET IS BASE BID

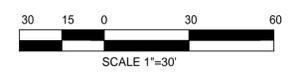
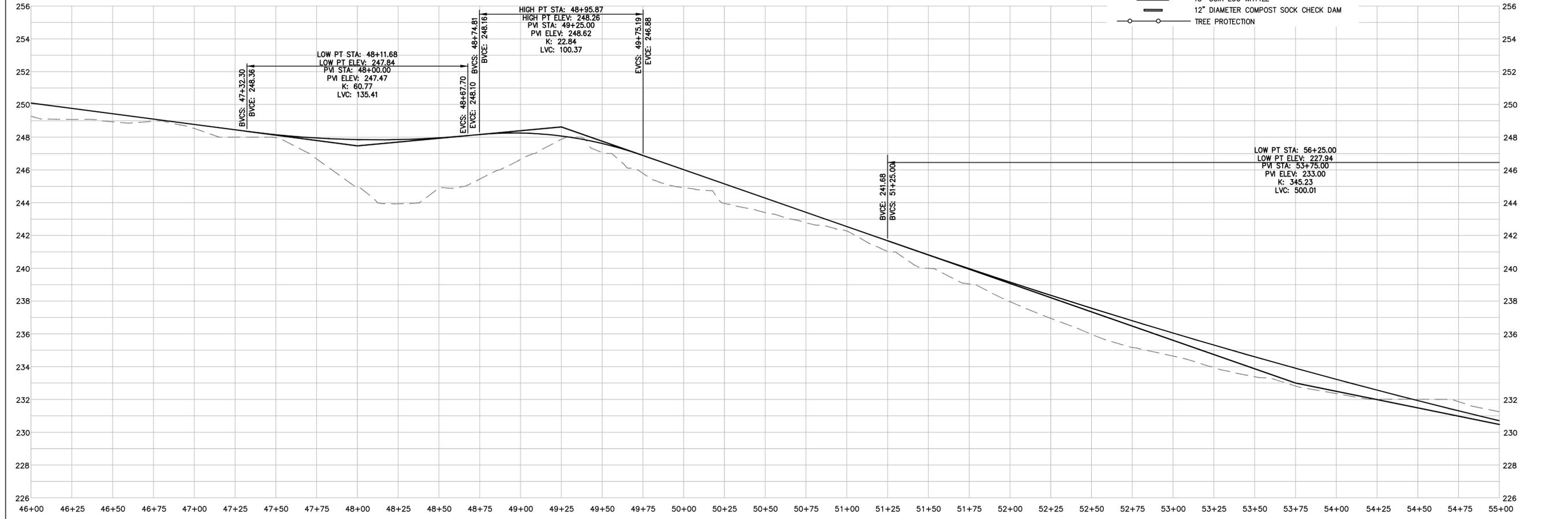
LEGEND

- 230 WCE SURFACE CONTOURS
- 237 PROPOSED CONTOURS
- EXISTING ACCESS AND UTILITY EASEMENT
- EXISTING TREE LINE
- PROPOSED ROAD CENTERLINE
- PROPOSED SWALE
- PROPOSED EDGE OF ROADWAY
- SF SILT FENCE
- LOD LIMITS OF DISTURBANCE
- PROPOSED EASEMENT
- TEMPORARY STAGING AREA
- RIPRAP OUTLET PROTECTION
- TREE PROTECTION
- 12" DIAMETER COMPOST SOCK CHECK DAM
- EROSION CONTROL MATTING





Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/ft ²)	Channel Liner
AQ	3%	1	8	4H:1V	1.40	3.6	0.3	Curlex Matting



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2819
4805 Green Rd, Suite 100
Raleigh, NC 27616
(919) 870-0628
(919) 870-5559
FAX (919) 870-5559

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Plan and Profile
46+00 to 55+00



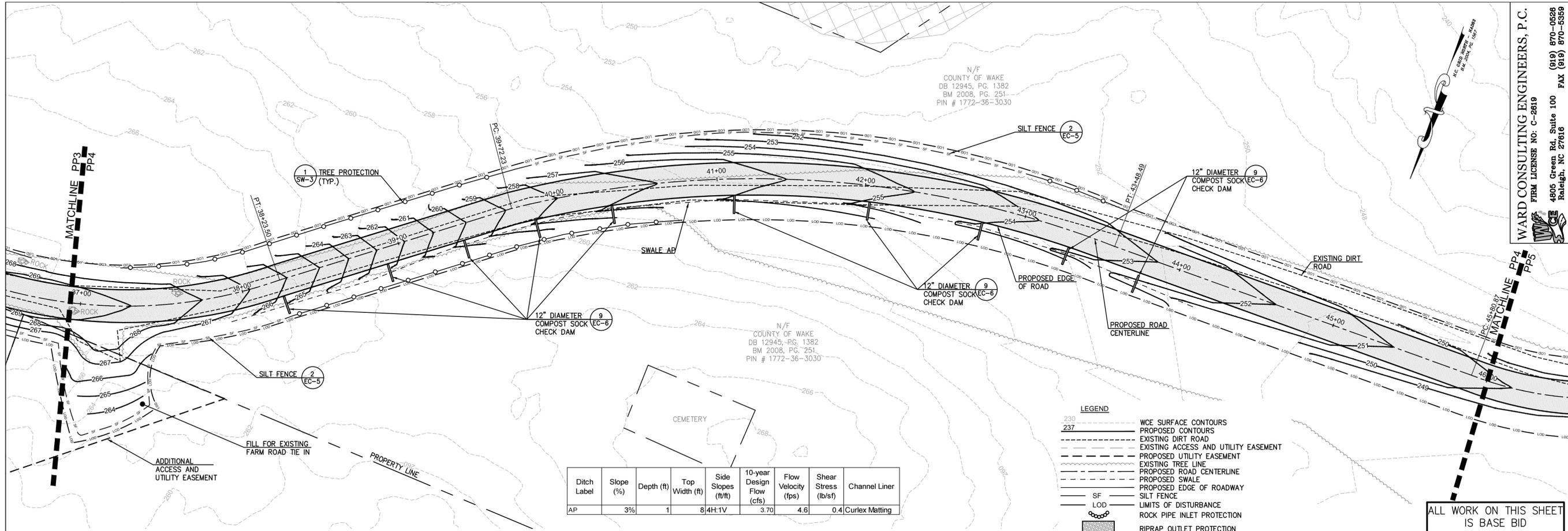
Turnipseed Nature Preserve
Wake County, NC

REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016

PP-5



WARD CONSULTING ENGINEERS, P.C.
 FIRM LICENSE NO. C-2619
 4805 Green Rd, Suite 100
 Raleigh, NC 27616
 (919) 870-0528
 (919) 870-5559
 FAX (919) 870-5559

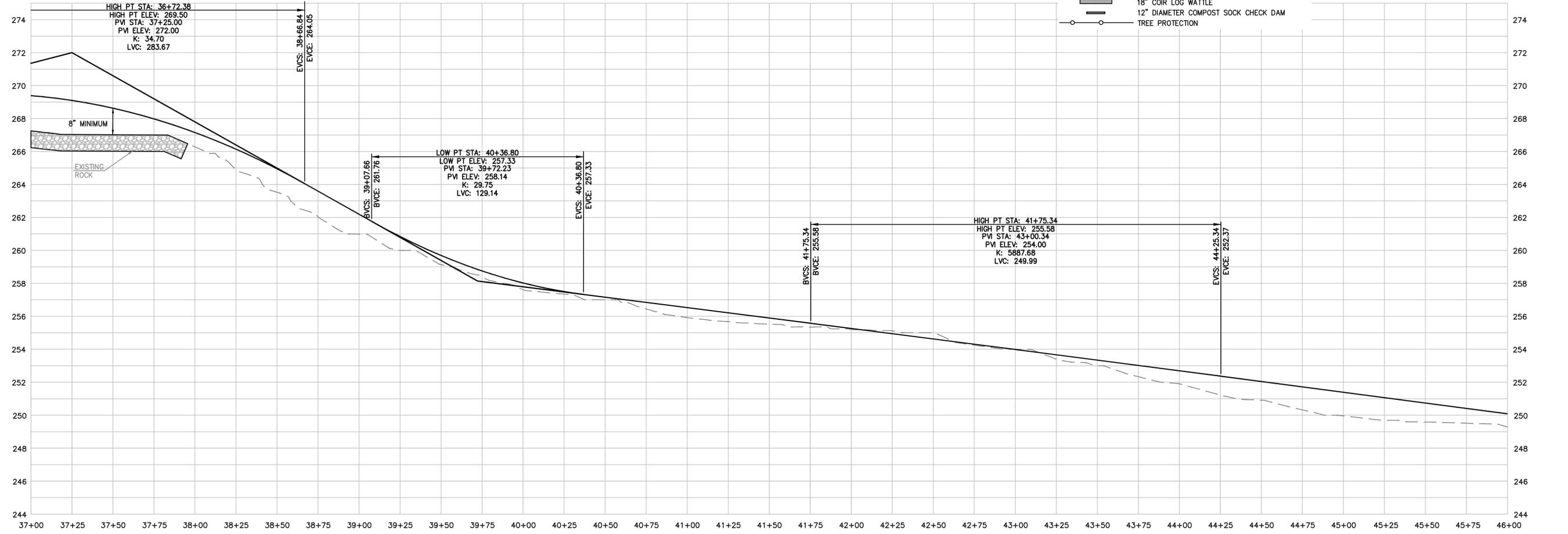
Susan Hatchell
 Landscape Architecture, PLLC
 711 W. North Street, Raleigh, NC 27603
 p. 919-838-9600 f. 919-838-9700

Plan and Profile
 37+00 to 46+00

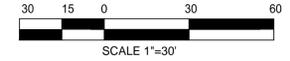
Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/sf)	Channel Liner
AP	3%	1	8	4H:1V	3.70	4.6	0.4	Curlex Matting

- LEGEND
- 230 WCE SURFACE CONTOURS
 - 237 PROPOSED CONTOURS
 - EXISTING DIRT ROAD
 - EXISTING ACCESS AND UTILITY EASEMENT
 - PROPOSED UTILITY EASEMENT
 - EXISTING TREE LINE
 - PROPOSED ROAD CENTERLINE
 - PROPOSED SWALE
 - PROPOSED EDGE OF ROADWAY
 - SILT FENCE
 - LOD LIMITS OF DISTURBANCE
 - SF ROCK PIPE INLET PROTECTION
 - RIPRAP OUTLET PROTECTION
 - 18" COIR LOG WATTLE
 - 12" DIAMETER COMPOST SOCK CHECK DAM
 - TREE PROTECTION

ALL WORK ON THIS SHEET IS BASE BID



SCALE 1"=30' HORIZONTAL
 1"=3' VERTICAL



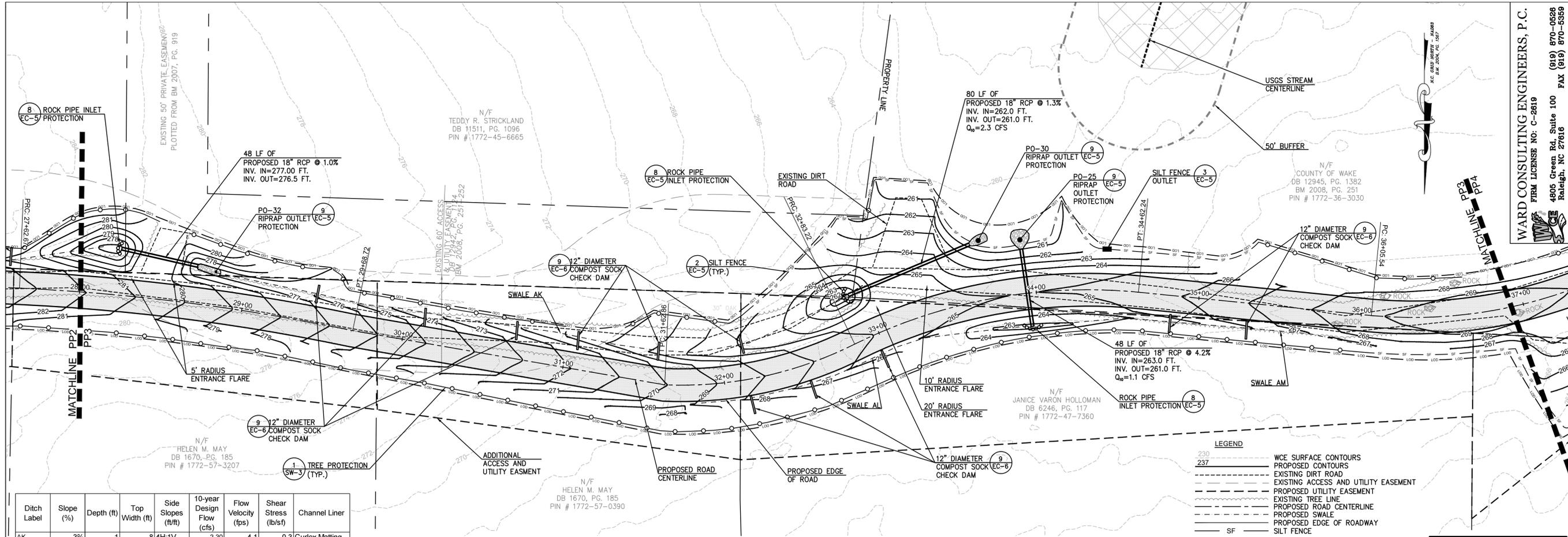
REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016

PP-4

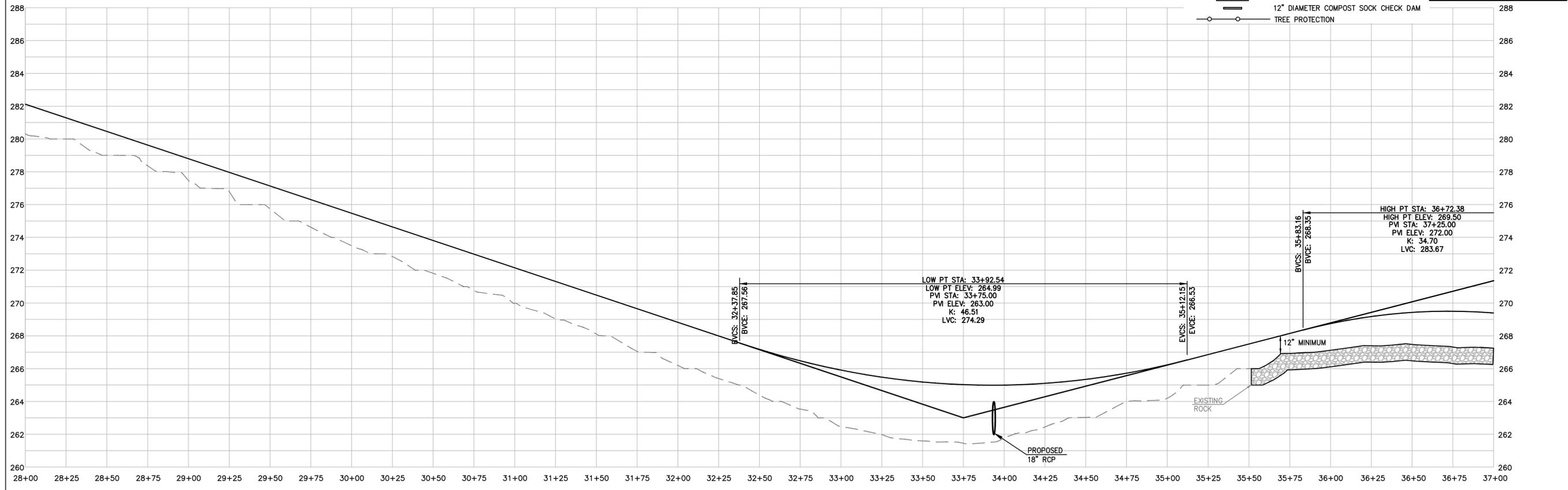
Turnipseed Nature Preserve
 Wake County, NC



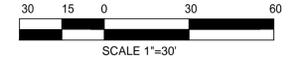
Ditch Label	Slope (%)	Depth (ft)	Top Width (ft)	Side Slopes (ft/ft)	10-year Design Flow (cfs)	Flow Velocity (fps)	Shear Stress (lb/ft ²)	Channel Liner
AK	3%	1	8	4H:1V	2.30	4.1	0.3	Curlex Matting
AL	3%	1	8	4H:1V	0.55	2.8	0.2	Curlex Matting
AM	3%	1	8	4H:1V	0.55	2.9	0.2	Curlex Matting

- LEGEND**
- WCE SURFACE CONTOURS
 - PROPOSED CONTOURS
 - - - EXISTING DIRT ROAD
 - - - EXISTING ACCESS AND UTILITY EASEMENT
 - - - PROPOSED UTILITY EASEMENT
 - - - EXISTING TREE LINE
 - - - PROPOSED ROAD CENTERLINE
 - - - PROPOSED SWALE
 - - - PROPOSED EDGE OF ROADWAY
 - SF
 - LOD
 - LIMITS OF DISTURBANCE
 - ROCK PIPE INLET PROTECTION
 - RIPRAP OUTLET PROTECTION
 - 12" DIAMETER COMPOST SOCK CHECK DAM
 - TREE PROTECTION

ALL WORK ON THIS SHEET IS BASE BID



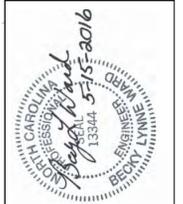
SCALE 1"=30' HORIZONTAL
1"=3' VERTICAL



WARD CONSULTING ENGINEERS, P.C.
FIRM LICENSE NO. C-2619
4605 Green Rd., Suite 100 (819) 870-0628
Raleigh, NC 27616 FAX (819) 870-5599

Susan Hatchell
Landscape Architecture, PLLC
711 W. North Street, Raleigh, NC 27603
p. 919-838-9600 f. 919-838-9700

Plan and Profile
28+00 to 37+00



Turnipseed Nature Preserve
Wake County, NC

REVISIONS

3-15-16	△	EROSION CONTROL COMMENTS
5-4-16	△	EROSION CONTROL COMMENTS

Date: 5-15-2016

PP-3

Appendix C

Clean Water Management Trust Fund Response Letter



Land and Water
Stewardship
NATURAL AND
CULTURAL RESOURCES

ROY COOPER
Governor

SUSI H. HAMILTON
Secretary

WILL SUMMER
*Executive Director (Acting),
Clean Water Management Trust Fund*

January 31, 2017

Mark Edmondson
Wake County Facilities Design & Construction
P.O. Box 550
Raleigh, NC 27602

RE: Turnipseed Park – Phase II (CWMTF #2003A-040)

Mr. Edmondson,

After reviewing the Phase II Site Plan you sent to me on January 17th and reviewing the reserved rights in the easement language (Wake Book 12504, Page 2316), nearly all of the amenities you have proposed are explicitly covered in the reserved rights. One exception is the “open play / nature study area” which will be maintained as mowed turf at the northern end of the park. Generally, this is not a feature allowed within our easements. However, I am taking several things into consideration in my approval of this area of the site plan: 1) that area has been continuously mowed and maintained as open since before the recording of the easement, 2) it is located more than 300 feet away from the streams, which was the primary focus of CWMTF at the time of this recording, and 3) this is a common and reasonable feature of passive parks. It is my understanding that the area will not need any grading or major alteration in order to achieve the desired condition. I will draw a distinction between this area and a level, graded recreational field, which would not be permitted. I will also note that the southern-most open area does have areas that are closer to the stream and per my conversation with your project manager, this area would simply be infrequently mowed in order to maintain an open area. No new open areas will be created as a result of these site plans. If any of this is incorrect or changes as the project progresses, we will need to discuss further before construction.

Please feel free to contact me if you have any questions.

Respectfully,

Will Summer



State of North Carolina | Department of Natural and Cultural Resources
109 East Jones Street | Raleigh, NC 27601
919-807-7300