Each year in North Carolina 150,000 acres of new turf areas are developed including athletic fields, recreational areas, golf courses, home lawns, and other turf sites, and that development continues to grow. For example, golf course construction greatly increased during the 1980s and 1990s. According to the National Golf Foundation, 358 golf courses opened in the U.S. in 1993. Each turf site is an ecosystem whose grasses clean the environment by absorbing gaseous pollutants and intercept pesticides, fertilizers, dust and soil.

Wetland Disturbance
Erosion and Sediment Control
Zoning

The need to protect surface and groundwater quality is a serious environmental issue. Good design can prevent or minimize erosion and runoff. Good design provides for buffers and natural vegetated areas near streams, wetlands, and other fragile areas. It also minimizes the development of gullies, the redirection of streams, and the unnecessary disruption of the natural landscape, especially around drainage ditches, and stream banks.

Protecting the environment benefits everyone. Turfgrass sites can be constructed while protecting and preserving valuable natural resources if responsible design and construction practices and governmental regulations are followed. Mismanagement of turf area construction could have a major impact on the environment. The purpose of this publication is to provide a general guide to obtaining permits, following regulatory processes, and using good construction practices in building turfgrass areas in North Carolina.

There are three agencies which govern most turf area construction:

**Army Corps of Engineers (ACOE)** regulates any disturbance of surface waters or wetlands.

**North Carolina Department of Environment, Health, and Natural Resources** regulates sediment and erosion control on the construction site, pesticide or fertilizer contamination of surface or groundwater, and administers the endangered plant and animal regulations.

**County/City Zoning Board** regulates all matters of property zoning.

**Wetland Disturbance**

Potential sites for turf areas may have some wetlands. Any disturbance of these wetlands or land adjoining the wetlands will require a permit from the Army Corps of Engineers (ACOE). The ACOE defines a wetland as any area inundated or saturated by surface or groundwater and supporting vegetation adapted for saturated soils. Wetlands include swamps, marshes, bogs and similar areas (US ACOE Regulatory Program, 1985). The ACOE can advise you of the most recent legal rulings of wetlands in your county as it pertains to your site.
Regulations

The Army Corps of Engineers is given regulatory control over wetlands and surface waters under Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the amended Clean Water Act, and Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972. Other laws may be involved depending on specific circumstances such as the National Environmental Policy Act, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, the Deepwater Port Act, the Federal Power Act, the Marine Mammal Protection Act, the Wild and Scenic Rivers Act, and the National Fishing Enhancement Act of 1984.

The application form for the permit is Engineer Form 4345, Application for a Department of the Army Permit. In North Carolina, this application may be obtained from:

The District Engineer
US Army Engineer District
PO Box 1890
Wilmington, NC 28402-1890
Attention: SAWCO-E
Phone: (910) 251-4511

A 401 Water Quality Certification is also required from:

The Division of Environmental Management
P.O. Box 29535
Raleigh, NC 27626-0535
Phone: (919) 733-1786.

Depending on the level of wetland or surface water disturbance, the time to process the application can vary. Activities causing minimum levels of disturbance may be covered by nationwide or regional permits and no further ACOE approvals are required. For higher levels of disturbance, a Public Notice may be required. This serves to notify Federal, state, and local agencies, adjacent property owners, and the general public of the proposal in order to provide an opportunity for review or public hearing. This process can vary, depending on the complexity of the issue.

The ACOE will begin to process the application by performing a public interest review which balances the needs and expected benefits against the probable impacts of the work.

ACOE Review Considerations

What are the relative public and private needs?

Are there any alternative locations and methods.

What are the beneficial and detrimental effects on public and private uses (US ACOE Regulatory Program, 1985)?

Outlined below is the typical processing procedure for a standard individual permit as described by the ACOE.

ACOE Permit Procedure

1. Applicant requests an application consultation, if necessary.
2. Applicant submits ENG Form 4345 to the district regulatory office in Wilmington, North Carolina.
3. ACOE receives the application and assigns an identification number.
4. ACOE issues a public notice within 15 days of receiving all information.
5. ACOE provides a 15 to 30-day comment period depending upon the nature of the activity.
6. The proposal is reviewed by the ACOE, the public, special interest groups, and local, state, and federal agencies. The review period may be extended if the applicant fails to submit information or if required by certain laws (US ACOE Regulatory Program, 1985).

7. ACOE considers all comments and consults with other federal agencies, when appropriate.

8. District engineer may ask applicant to provide additional information.

9. ACOE holds a public hearing, if needed.

10. The district engineer makes a decision.

11. The permit is issued or denied and the applicant is advised of the reason.

Erosion and Sediment Control

Construction sites are particularly susceptible to high soil erosion rates, which can result in sedimentation that impacts on water quality. Sedimentation is the leading cause of stream impairment in North Carolina. Sediment is carried to streams by stormwater from land areas or paved areas where soil is exposed or deposited.

 Regulations

The North Carolina Sedimentation Pollution Control Act of 1973 established a statewide program to control soil erosion and sedimentation. The law covers all land-disturbing activities in North Carolina, regardless of the size of the disturbance, except those involving agriculture, forestry, and mining. The law and the rules do not specify a rigid set of practices. They require the land developer to prepare an erosion and sedimentation control plan and employ measures to meet the performance standards. Address specific questions regarding the interpretation of this law to your regional office of the Division of Land Resources of the Department of Environment, Health, and Natural Resources (DEHNR).

This law prohibits visible off-site sedimentation from construction sites but permits the owner and developer to determine the most economical, effective, temporary and permanent control measures for erosion and sedimentation control. This flexibility in the law allows for innovation and considers the uniqueness of each construction site. In addition to state regulations, some local governments have established local regulations on sedimentation control.

The law requires:

- that sufficient erosion control practices be installed and maintained to retain sediment within the boundaries of the site.
- that surfaces be made non-erosive and stable within 30 working days or 120 calendar days after completion of the activity, whichever period is shorter.
- that an erosion and sedimentation control plan be submitted at least 30 days before land disturbance begins for any site more than one acre in size. A preapproved plan is not required for sites of less than one acre, but the same regulations apply.

Erosion Control Plan

The erosion control plan requires an evaluation of the site and the proposed land-disturbing activities. The requirements of the plan include the following elements:

- a site location or vicinity map.
- a site development drawing including cut-and-fill slopes with angles no greater than that sufficient for proper stabilization.
- a site erosion and sedimentation control drawing which includes a sufficient buffer zone along any natural watercourse or lake.
- drawings and specifications of practices designated with supporting calculations and assumptions.
- vegetation specifications for temporary and permanent stabilization.
- a construction schedule.
- Graded slopes must be vegetated or otherwise stabilized within 30 working days.
- Offsite sedimentation must be prevented.
- Ground cover sufficient to prevent erosion must be provided within 30 working days or 120 calendar days, whichever is shorter.
- a brief narrative of the plan including the nature and purpose of the proposed development pertinent conditions of the site and adjacent areas proposed erosion and sedimentation control measures.
- a financial responsibility ownership form.

During construction, the person financially responsible for site development is responsible for maintenance of the erosion and sedimentation management practices. The landowner may also be held responsible. After construction is complete and the surface is permanently stabilized, responsibility passes to the landowner or the person managing the land.

The full details on sedimentation and erosion control plans can be found in the *Erosion and Sediment Control Planning and Design Manual*. This manual can be purchased for $30, or a more condensed field manual for $20, from:

Division of Land Resources
PO Box 27687
Raleigh, NC 27611-7687
Phone: (919) 733-4574

Detailed questions regarding the interpretation of the North Carolina Sedimentation Pollution Control Act of 1973 should be directed to the Department of Environment, Health, and Natural Resources, Division of Land Resources at the address above.

In addition, a National Pollutant Discharge Elimination System for land-disturbing activities greater than or equal to five acres must also have an NPDES permit for storm runoff during the construction phase. Contact:

DEM-Water Quality Permits and Engineering Branch
P.O. Box 29535
Raleigh, NC 27626-0535
Phone: (919) 733-5083.

**Management Practices**

Effective erosion and sedimentation control consists of minimizing erosion by protecting the soil surface and preventing eroded soil from moving offsite. The following practices should be employed to minimize erosion and sedimentation problems.

1. Schedule construction activities to minimize the exposed area and the duration of exposure, considering the season and the weather forecast.
2. Use dikes, diversions, and waterways to intercept runoff and divert it away from cut-and-fill slopes or other disturbed areas. To reduce on-site erosion, install these measures before clearing and grading.
3. Use temporary or permanent vegetation and mulches. Vegetative cover is relatively inexpensive to achieve and tends to be self-healing. It is often the only practical, long-term solution to stabilization and erosion control on most disturbed sites in North Carolina. Be aware that construction activities and erosion often expose infertile subsoil that requires fertilization. Planning from the start for vegetative stabilization reduces the cost, minimizes maintenance and repair, and makes structural erosion control measures more effective and less costly to maintain.
4. Unavoidable sediment eroded during rainstorms must be trapped on site. Construct sediment traps and basins before other land-disturbing activities occur. Consider the maintenance and repair costs of each practice. Erosion and sediment control structures should be inspected and maintained according to the plan.
Zoning

Generally, the construction of a turf area requires zoning changes. Zoning and any requests for zoning changes are handled by the county where the property is located. Frequently, the purchase of land for a turf area is contingent upon meeting the zoning requirements or securing the needed zoning changes.

For more information on golf course construction contact:

Golf Course Builders Association of America
Phil Arnold, Vice President
Chapel Hill, NC 27514
Phone: (919) 942-8922
Fax: (919) 942-6955

Environmental Impact Statements via private firms

American Society of Golf Course Architects
221 North LaSalle Street
Chicago, IL 60601
Phone: (312) 372-7090
Fax: (312) 372-6160

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