

BRIAR CHAPEL STORMWATER MANAGEMENT PLAN

The stormwater management plan for Briar Chapel will be accomplished by the limitation of impervious surface (and therefore runoff potential of the site after development is completed) and by systematically treating the stormwater runoff from the site by incorporating engineered stormwater management facilities to capture and treat virtually all of the stormwater runoff from site developed areas. This section is to discuss the stormwater management philosophy and management plan for Briar Chapel.

Minimization of Stormwater Impacts for Briar Chapel

One of the prime focus areas of the stormwater management plan for Briar Chapel is the minimization of impervious surfaces to be constructed and the minimization of disturbed areas required for development of the site. Both of these significantly impact the quality and quantity of stormwater runoff from a site. Impervious surfaces shed runoff from rainfall very quickly, with no absorption of water possible through the surface and little to no interception or depression storage of runoff available. The runoff flow rate from a paved surface can easily be 5X to 10X the runoff flow rate from an undeveloped area. There are two main sub-categories of impervious surface: transport-related (roads, parking, etc.) and rooftop-related (homes, commercial buildings, etc.). Of these two, transport related impervious surfaces generally exert a more significant impact. This is due to the fact that runoff from rooftop-related impervious surfaces in residential areas is usually spread out over pervious areas and is not always directly connected to the site storm drainage system. On the other hand, transport-related impervious surfaces are usually directly connected to the site storm drainage system, and carry a higher pollutant loading due to vehicle drippings and deposits from other vehicular systems (exhaust, brake linings, tire dust, etc.). In a typical development, these pollutants are collected along the street drainage system and discharged directly into the streams with little chance for filtering or infiltration through pervious areas. Briar Chapel limits the generation of these stormwater contaminants by reducing the amount of impervious surfaces through dense development and the preservation of large areas of open space. Where conditions allow, the Briar Chapel development will utilize street sections that do not have curb and gutter (with discrete drainage systems) to allow as much of the street runoff as possible to be filtered in swales before treatment or release.

Secondly, the type of pervious cover in a certain watershed influences the acuteness of stormwater impact due to development. As a site is developed and disturbance and compaction of the native soils is undertaken, the end result is often open areas with soil characteristics much different than that of the native soils. Disturbed areas transformed into open spaces are generally more compacted and lower in permeability when compared to their condition before disturbance. As a result, many "lawn" areas from residential lots will produce more runoff than in the pre-development condition, even though the area not covered by the home or driveway is considered to be green space. Residential lawn areas (and commercial and business lawn and landscaped areas) produce more water pollutants than native open areas due to the usage of fertilizers, pesticides, and insecticides. Therefore, the preservation of native open areas is paramount to the limitation of stormwater impacts resulting from development. Since Briar Chapel is to be developed as a compact community rather than a typical large-lot subdivision, the amount of land disturbance required will be minimized. Much more of the overall site will remain in a native, undisturbed open condition than would be possible with a typical large lot subdivision plan. This preservation of open space will

serve to reduce stormwater impacts resulting from the development and construction of Briar Chapel.

Management and Treatment of Stormwater Runoff from Briar Chapel

The Briar Chapel site will incorporate a plan for stormwater management that meets or exceeds all applicable ordinance requirements for compact community developments. The stormwater management plan incorporates biologically based and innovative stormwater management techniques to manage both water quantity and quality aspects of runoff. Wet detention ponds, extended detention stormwater wetlands, bioretention areas, grassed swales, stormwater filter systems, cisterns, and hydrodynamic separators are all under consideration for use at Briar Chapel, depending on the site characteristics at each stormwater management location. Low-impact development techniques have been employed where practical. Examples of low-impact development influence on the design of the stormwater management system at Briar Chapel include:

- Small, upland stormwater management basins to treat stormwater close to the source. All of the identified stormwater management areas on the site are located away from any environmentally sensitive areas (such as stream channels, stream buffers, and wetland areas).
- Each of the identified stormwater management areas is located where virtually all of the runoff to each basin area will be from disturbed areas of the site. We do not discharge stormwater runoff into a natural channel area to be treated further downstream. Therefore, the on-site channels are protected as well as off-site areas.
- Due to the development of the site, it is impossible to treat all of the stormwater immediately at the source (i.e. at each rooftop and at each low point along the roadway), however, we have broken the site up to drain to 37 identified stormwater management facilities. This number of facilities limits the size of the drainage area to each basin, and places the basin as close as possible to the source of the stormwater runoff. More facility locations may be identified in the future.
- Various areas of the site, including some roadways and residential lots, will not flow to the stormwater management basin areas. It is estimated that approximately $\frac{1}{4}$ of the built upon area of Briar Chapel will not flow to one of these basins. In these cases cisterns, bioretention areas, infiltration trenches, grassed swales, and hydrodynamic separators will be used as necessary and reasonable, to treat stormwater runoff.
- For those residential lots that bypass the main stormwater management basin areas, it is proposed that cisterns with infiltration capability be utilized to capture all rooftop drainage from the home or buildings. This cistern would be allowed to slowly discharge over a period of days and to infiltrate into the ground as much as is possible.

The stormwater management system for Briar Chapel will be designed to protect downstream environment. Both water quality and quantity are controlled before allowed to leave the site. The stormwater management plan for Briar Chapel is designed to meet

or exceed all of the new compact community ordinance requirements. The stormwater management plan will meet the ordinance requirements by:

- Detention will be provided such that peak flowrates in the one-year, 24-hour duration storm event after development do not exceed those computed for the pre-development condition.
- Stormwater discharge volume control is provided such that the first inch of **runoff** from the developed areas of the site is captured and released (or infiltrated) over a two to five day period.

The stormwater management plan for Briar Chapel will **exceed** the ordinance requirements by:

- Detention will be provided for all commercial areas draining directly to offsite residential areas such that peak flowrates in the one-, two-, five-, ten-, and twenty-five year, 24-hour duration storm events after development do not exceed those computed for the pre-development condition in the same return period storm events. This is in recognition that most of the concentrated impervious surface within the Briar Chapel development will be located in the commercial areas, and the residential areas immediately adjacent to those commercial areas are most at risk for flooding as a result of this project.
- All of the stormwater management basins identified as areas 1-37 on the stormwater management plan for the site will provide water quality controls such that at least 85% of the total suspended solids (TSS) and at least 25% of the nitrogen in incoming stormwater runoff will be removed prior to exiting the facility.

Specific stormwater treatment devices to be used for the 37 identified stormwater management areas will primarily consist of wet detention basins and extended detention stormwater wetlands. This is to serve the dual purpose of water quality and detention controls. The type of facility to be used at each location has not yet been determined, and will be based upon the characteristics of the drainage area to each of the basins, as well as the physical characteristics of the stormwater management area itself. In each of the facilities, wetland type plants will be specified in shallow areas. This will prevent “volunteer” wetland species from creating a homogeneous wetland plant population, it will promote biodiversity and more efficient uptake of nutrients from stormwater runoff, and it will prevent one species of plant from overtaking the entire basin, only to have disease or some other malady eliminate that species entirely from the basin.

Many of the proposed stormwater management areas will be located upstream of existing areas of development. For these areas, we will conduct breach analyses to determine the effect of a catastrophic failure of the stormwater facility on downstream property. This catastrophic failure will be based on a total and complete loss of water in the facility within a time frame of 30-minutes. The facility will be considered high hazard if the breach analysis indicates that there is the possibility of loss of human life, or if estimated property damage resulting from the breach is greater than \$200,000. If a high hazard classification is warranted, the dam will be designed to pass the $\frac{1}{3}$ PMP (probable maximum precipitation; 10 inches of rainfall within a 6-hour period, roughly equal to a 500-year storm) event with $\frac{1}{2}$ foot of freeboard (minimum) to the top of berm elevation.

Before the dam can be constructed, the State Dam Safety Engineer will be required to review and approved the plans for any such facility. Construction cannot commence on a high-hazard facility before an approval to construct is issued by the State. Facilities deemed high hazard would require a State-approved Emergency Action Plan, detailing the actions that must be taken in the event failure of the impoundment is imminent. If the facility is not deemed to be high hazard (there is to be concurrence by the NC Dam Safety Engineer for hazard classifications of jurisdictional facilities), then the dam and outlet structures will be designed to pass the 100-year storm event with one foot of freeboard (minimum) to the top of berm elevation. Several of the proposed facilities may be jurisdictional under the Dam Safety Law of 1967, and will be subject to review and approval by the North Carolina Dam Safety Engineer. Jurisdictional dams are not necessarily high-hazard dams, as all dams greater than 15-feet in height AND with an ultimate storage capacity of 10 acre-feet or more are considered jurisdictional and fall under the review of the NC Dam Safety Engineer. We will obtain all appropriate and necessary permits for construction of the stormwater management facilities at Briar Chapel.

For those areas of the site that do not drain directly to one of the stormwater management basins, direct “source” stormwater treatment will be applied. This will consist of infiltration trenches, vegetated swales and filter strips, cisterns (primarily for residential areas bypassing the stormwater management basins), bioretention areas, and possibly hydrodynamic separators if conditions are appropriate. Infiltration will be used to the extent possible when site conditions are conducive to that type of treatment. It is possible, however, that site conditions in some areas will not provide infiltration rates allowing infiltration to stand-alone. For these areas, it is proposed that the stormwater volume will be held until the storm has passed, then released in a slow fashion over a period of two to five days. All stored stormwater will be discharged from the system (either via infiltration or slow release) at the end of the five-day period, as this is the average return interval for rainfall events in North Carolina.

For each of the stormwater management facilities proposed within an identified stormwater management area, there will be an executed operation and maintenance agreement that will specify the minimum maintenance and minimum maintenance intervals required for each basin. Each of these operation and maintenance plans will be approved by Chatham County prior to the approval of a final subdivision plat. Each of these stormwater management facilities will have performed an annual inspection by a registered professional engineer. This inspection will document whether the facility is performing to design specifications and will recommend any repairs, maintenance, or modifications as may be necessary to assure continued operation of the facility. A copy of the maintenance and inspection report will be submitted to Chatham County within 30 days after the inspection is completed.