Case Study of Birkdale Village, NC: Comprehensive Report of the Impact of Urban Design on Water Resources

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BIRKDALE VILLAGE (HUNTERSVILLE, NC)

INTRODUCTION

Birkdale Village is a 52-acre New Urban development in the Town of Huntersville, a suburb of Charlotte in Mecklenburg County, North Carolina. Rapid urban growth in the Charlotte area prompted the Town of Huntersville to adopt a New Urban development ordinance to avert conventional, low-density sprawl in favor of a more sustainable urban form. The town justified its response, in part, due to the negative impacts of uncontrolled sprawl on Lake Norman – a highly-valued resource for drinking water, recreation, and natural beauty less than two miles from downtown Huntersville.

Three issues define how Birkdale Village impacted the Lake Norman watershed. These issues derive from four land use policies the town used to guide development, and the implementation of those policies through site design.

The first issue is Birkdale Village’s high level of imperviousness, but low level of stormwater management. Two of the town’s land use policies combined to create this outcome. First, the town adopted a New Urban development ordinance. New Urban developments are highly impervious due to their design: high densities of mixed urban land uses. Second, the town adopted a watershed overlay district ordinance intended to limit imperviousness and require developers to provide stormwater management. However, the ordinance did not provide clear standards for the maximum amount of imperviousness allowed, or the stormwater management techniques best suited to control and treat high volumes of urban runoff.

The second issue is Birkdale Village’s excess of poorly-designed parking. The town’s parking policy relied on its parking ordinance. However, this ordinance had three limitations. First, it did not specify a maximum limit on the total number of parking spaces, as prescribed by New Urbanism. Second, it did not require that all parking be hidden behind buildings, also prescribed by New Urbanism. Third, it did not require that all parking be built in multi-level decks, as opposed to surface parking lots. Parking built in decks generates less imperviousness and, therefore, less runoff than surface parking lots that accommodate the same number of parking spaces.

The third issue is Birkdale Village’s impact on the McDowell Creek floodplain. McDowell Creek flows along the site’s eastern boundary. When the town approved the Birkdale Village site plan, it allowed developers to drain runoff from the Birkdale Village site into a stormwater detention pond partially located in the McDowell Creek floodplain. Although Mecklenburg County had implemented a floodplain protection program to prevent this scenario, the town adopted the program’s regulations to protect the floodplain after it had approved the construction of the stormwater detention pond. Although the county exacted a stormwater utility fee on the Birkdale Village developers, they have not relocated the pond outside the floodplain, nor prevented Birkdale Village runoff from entering the pond.
**SETTING**

Birkdale Village is located in suburban Charlotte, North Carolina. The site is in a sub-watershed of Lake Norman called the Mountain Island Lake Watershed (see Figure 1). Within this sub-watershed, Birkdale Village drains to and borders the McDowell Creek floodplain. The site’s gently rolling terrain generally slopes less than 5%, typical of the Carolina Piedmont. The site also contains well drained sandy soils. The combination of gentle slopes and sandy soils minimized the volume and impact of site runoff.

![Figure 1. Protected Areas in the Mt. Island Lake Watershed](image)

The Town of Huntersville is one of the fastest growing communities in North Carolina. It has increased in population by over 18 times, from 1,294 in 1980 to 24,960 in 2000 (see Table 1). This growth is attributed to both annexation and in-migration. The larger political units that contain Birkdale Village (Mecklenburg County, Charlotte Metropolitan Area, and North Carolina) also experienced strong growth between 1980 and 2000.
Table 1. Population and Population Growth of Political Jurisdictions that Contain Birkdale Village

<table>
<thead>
<tr>
<th>SPATIAL UNIT</th>
<th>POPULATION</th>
<th>POP CHANGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOWN</td>
<td>1,294</td>
<td>3,014</td>
</tr>
<tr>
<td>COUNTY</td>
<td>404,270</td>
<td>511,211</td>
</tr>
<tr>
<td>METRO AREA</td>
<td>971,391</td>
<td>1,162,140</td>
</tr>
<tr>
<td>STATE</td>
<td>5,881,766</td>
<td>6,632,448</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau

The explosive growth of Huntersville stimulated local action. In 1994, town leaders instituted a development moratorium so that local planners, elected officials, and the public could discuss the best way to grow. There was increasing concern that Huntersville would be overrun by Charlotte’s encroaching sprawl. In the words of then-mayor Randy Quillen, the town “did not want to get run over by that sprawl everybody talks about. We had to do something” (Mitchell 2002, p. 28). It was obvious to the town that if trends continued, the rural charm and small-town feel that made Huntersville an attractive community would be lost forever. Concern over this outcome motivated the town to adopt a New Urban development ordinance. The New Urban development ordinance formed the basis of a new long range plan to accommodate development and meet the place-based goals and aspirations of residents (Town of Huntersville 1998).

SITE DESIGN FEATURES

Birkdale Village exemplifies the town’s New Urban development approach. The Village is the urban core of a much larger Birkdale community which includes The Greens at Birkdale, a neighborhood of condominiums and single-family homes, and The Birkdale Golf Club, a neighborhood of single-family homes sited around an 18-hole golf course (see Figure 2).
Birkdale Communities

Birkdale Village contain 320 apartments, 300,000 square feet of retail space, and 200,000 square feet of office space (see Figure 3). The 52-acre site thus has a gross residential density of 6.2 units per acre. Since 7.4 acres are dedicated to the McDowell Creek floodplain and have not been developed, Birkdale Village also has a net density of 7.2 units per acre.

As all the buildings of Birkdale Village are mixed-use, there are no single-family homes in the Village itself; these are located in the Greens and Golf Club neighborhoods. Most residents who live in these single-family homes are within a one-half mile walk of the Village. The Village also includes the 16-screen Birkdale Cinema; a principle landmark for motorists and pedestrians. The movie theater anchors the main shopping street, which offers a diverse selection of goods available from national retail chains such as Banana Republic (clothing), Barnes and Noble (books), Dick’s (sporting goods), Victoria’s Secret (intimate apparel), and Williams-Sonoma (kitchenware).
Overall, Birkdale has experienced considerable market success. Since the project’s inception, all the lots in the Greens and Golf Club neighborhoods have been sold and all the Village apartments have been rented. Monthly rents in the Village range from $775 to $1,400 (Pappas Properties and Crosland Development 2002).

The Village contains extensive parking. As will be discussed in more detail, the developers organized Birkdale Village as a system of parking blocks bounded by streets and sidewalks. The central blocks contain two-story parking decks hidden behind four-story buildings. The more numerous peripheral blocks surround the central blocks and contain single-story, or surface, parking lots that front the street. All blocks contain on-street parking. Although surface parking lots may be built upon in the future, planners and developers do not anticipate this scenario through 2010.

**LAND USE POLICY FRAMEWORK**

The Town of Huntersville implemented four key land use policies that influenced how Birkdale Village impacted the Lake Norman watershed: 1) A New Urban development ordinance; 2) A watershed overlay district ordinance; 3) A parking ordinance; and 4) permission for developers to site stormwater detention ponds in floodplains.

The town’s first influential land use policy was its New Urban development ordinance. The town made a decision in 1994 to place a moratorium on further development until
officials and residents could produce a better alternative to sprawl. After more than a year of study, on November 16, 1996, the town adopted an ordinance that required all new developments to follow New Urban design principles. Last amended on July 16, 2001, the new ordinance mandated the more intense development that characterizes New Urbanism. However, New Urban developments are also highly impervious. The higher imperviousness produces higher runoff volumes. Higher runoff volumes require higher levels of stormwater management for proper runoff control and treatment.

The second influential land use policy was an ordinance that defined a watershed overlay district for the Mountain Island Lake sub-watershed. The town intended the watershed overlay district to protect public drinking water supplies through stormwater management. The town had standing to protect drinking water supplies through State of North Carolina statutory law. State statutes specified stormwater management as a method of watershed protection to mitigate the harmful impact of urban development on watersheds used to supply drinking water (North Carolina General Assembly 2000).

The watershed overlay district ordinance classified the Mountain Island Lake sub-watershed into two areas. “Critical areas” had more stringent regulations since they were more susceptible to development. Critical areas were more susceptible to development because they included steep slopes, poorly drained soils that easily erode, and higher groundwater vulnerability. “Protected areas” had less stringent regulations since they were less susceptible to development. Protected areas were less susceptible to development because they include modest slopes, well drained soils that do not easily erode, and lower groundwater vulnerability.

Birkdale Village is entirely in a protected area. This protected area designation provided developers with three options that defined the maximum allowable site imperviousness based on the level of stormwater management, otherwise known as best management practices (BMPs), the developers provided (Town of Huntersville 1996, p. 66):

1) 24% imperviousness: may use curbs and gutters to drain runoff (no BMPs required)
2) 36% imperviousness: must replace curbs and gutters with grassy swales to drain runoff (no BMPs required)
3) 70% imperviousness: may use either curbs and gutters or grassy swales to drain runoff (BMPs required to control and treat all site runoff)

If the developer does not implement any stormwater management, the town allows the developer to pave up to 24% of the site. If the developer replaces standard curbs and gutters with pervious, grassy swales, the town allows the developer to pave up to 36% of the site. If the developer agrees to implement BMPs to control and treat all site runoff, the town allows the developer to pave up to 70% of the site. Thus, if the developer offers grassy swales as opposed to curbs and gutters, the town rewards the developer with the option to pave an additional 12% of the site. If the developer goes so far as to implement BMPs to control and treat all site runoff, the town rewards the developer with the option to pave an additional 46% of the site. Since New Urban development demands high
imperviousness, Birkdale Village developers chose to pave 70% of the site and implement BMPs.

The town’s third influential land use policy was its parking ordinance. The parking ordinance had three important limitations.

First, the ordinance did not specify a maximum limit on the total number of parking spaces. The ordinance only set a minimum requirement for parking spaces: no less than two parking spaces per 1,000 square feet of non-residential development and no less than 1.5 parking spaces per unit of residential development. The ordinance does not meet New Urbanism’s limit on parking: no more than three parking spaces per 1,000 square feet of mixed-use development (both non-residential and residential) (Duany, Plater-Zyberk, and Speck 2000). Since the town’s ordinance did not cap the amount of parking in Birkdale Village, the number of spaces built exceeds the New Urban maximum.

Second, the town’s parking ordinance did not require developers to conceal parking behind buildings. The ordinance does not meet New Urbanism’s “rule of thumb” that developments should not include more off-street parking than can be concealed behind buildings, and no more buildings than the amount of concealed parking can support (Duany, Plater-Zyberk, and Speck 2000, p. 208). Since the town’s ordinance did not require developers to hide parking behind buildings, most of the parking areas in Birkdale Village directly abut the street (see Figure 4).

![Figure 4. Aerial Photo of Birkdale Village (Under Construction – July 2002)](image-url)
Third, the town’s parking ordinance did not require developers to build parking in multi-level decks instead of surface parking lots. Multi-level decks are more land use efficient and create far less imperviousness than surface parking lots that contain the same number of parking spaces, albeit much more expensive to build. The amount of imperviousness generated by a deck is inversely proportional to the number of levels the deck contains. For example, a two-level parking deck yields only half the imperviousness of a surface parking lot if both deck and lot have the same number of parking spaces. Since the town’s ordinance did not require multi-level parking decks, most of Birkdale Village parking is in surface lots.

The town’s fourth influential land use policy was the town’s acceptance of stormwater management (BMP) ponds built in floodplains. The town allowed the developers of the Greens at Birkdale to site their stormwater detention pond partially in the McDowell Creek floodplain before it granted approval for Birkdale Village. The town’s action meant that the entire pond was at risk from flooding. Although the developers intended the pond to control and treat runoff, a flood could flush out the pond’s sediments, heavy metals, and nutrients captured from runoff and pollute Lake Norman. When Birkdale Village was under review, the town gave Birkdale Village developers permission to siphon a portion of Birkdale Village’s runoff into the portion of the Greens at Birkdale Pond located in the floodplain. Now even more pollutants from runoff may enter McDowell Creek and Lake Norman during a flood.

Mecklenburg County initiated its floodplain protection program in 1993 to prohibit such outcomes. The intent of the county program was to protect life and property from flooding, and county streams and rivers from the polluted runoff of development. The county program would not have allowed developers to site stormwater BMP ponds in floodplains. However, the town approved the construction of the Greens at Birkdale Pond in September, 1998. The town did not adopt Mecklenburg County’s Stormwater Initiative Management (S.W.I.M) regulations until October, 1999. Once the pond was in place, the county’s efforts were unable to prevent its use to handle additional runoff. Though the county mandated that all property owners pay a stormwater utility fee to protect floodplains, the pond was permanent.

SITE DESIGN

Huntersville’s four land use policies translated to three site design issues that defined Birkdale Village’s impact on the Lake Norman watershed. First, the New Urban and watershed overlay district ordinances together produced a highly impervious development but no clear standards for stormwater management. Second, the town’s parking ordinance allowed the developer to build as much parking the way the developer wanted: predominantly large surface parking lots. Third, the town allowed developers to site a stormwater management pond in the McDowell Creek floodplain even though Mecklenburg County’s floodplain management program aimed to prevent such threats to the watershed. Although the county program required the developers to pay for the impact of Birkdale Village on downstream property owners, the pond stayed put.
Imperviousness

The developers of Birkdale Village maximized imperviousness at 70% to accommodate high densities of mixed-use buildings and parking. In return, they provided BMP ponds for stormwater runoff. Since the town did not specify the type or standards of the required BMPs, the developers used two existing off-site ponds that already served the Greens at Birkdale and Birkdale Golf Club neighborhoods (see Figure 5) to handle most of the runoff from Birkdale Village; they built a small pond on the site to handle the remaining runoff.

![Figure 5. Storm Water Pond Distribution Plan](image)

The overlay district ordinance mandated BMPs if developers paved more than 36%, but no more than 70%, of the site. However, the ordinance generalized the 70% impervious limit to the entire parcel, not specifically to the developed portion of the parcel. Only the developed portion of a parcel generates runoff and thus necessitates BMPs. Because the ordinance did not specify impervious limits to the developed portion of Birkdale Village, the developers exceeded 70% imperviousness in the developed portion. Since stormwater drainage areas for BMPs must contain the developed portions that generate stormwater runoff, the stormwater drainage area for Birkdale Village also exceeded 70% imperviousness.

Although Birkdale Village contained 52 acres, the developers could only build on 44.6 acres. These 44.6 acres required BMPs to control and treat stormwater runoff. The other 7.4 acres fell within the McDowell Creek floodplain. The developers could not build in
the floodplain, so those 7.4 acres did not require BMPs to control and treat stormwater runoff. The town’s watershed overlay district ordinance allowed 70% impervious acres out of a total of 52 acres, or 36.7 acres. Since the developers could not pave the 7.4 acres in the McDowell Creek floodplain, they sited all 36.7 acres of imperviousness on the remaining 44.6 acres; the total stormwater drainage area. As a result, the total stormwater drainage area was 82% impervious. A higher concentration of imperviousness implies more runoff must receive control and treatment from BMPs because less runoff will encounter pervious areas where it can soak into the ground or water vegetation. For example, a 100% impervious stormwater drainage area offers no opportunity for runoff from rooftops, driveways, and sidewalks to flow over yards or gardens; all runoff must go to a BMP. Thus, the BMPs for Birkdale Village received a higher volume of runoff than the 70% maximum imperviousness standard intended by the town’s ordinance.

Table 2 shows imperviousness exceeded 70% not only for the total stormwater drainage area of Birkdale Village, but also for each BMP pond’s stormwater drainage area. Each pond receives a higher volume of runoff than if the ordinance had capped imperviousness for each pond’s stormwater drainage area at 70%. In particular, note that the Greens at Birkdale Pond (14.5 impervious acres) and the Birkdale Golf Course Pond (11.3 impervious acres) are not located on the Birkdale Village site. Their combined impervious cover, 25.8 out of 36.7 total impervious acres, means 70% of all Birkdale Village runoff drains to BMP ponds the developers of Birkdale Village did not build. Since the developers did not build these ponds, they were not accountable for them during the site plan review process. This outcome becomes particularly poignant since the Greens at Birkdale Pond had been built in the McDowell Creek floodplain. Furthermore, the drainage area for this pond is the largest and most impervious. 14.5 out of 36.7 total impervious acres in Birkdale Village drain to the Greens at Birkdale Pond, 40% of Birkdale Village runoff and its pollutants could be washed into McDowell Creek during a flood, an event during which BMPs are supposed to safeguard the watershed.

Table 2. Acres of Impervious and Pervious Area in Birkdale Stormwater Pond Drainage Areas

<table>
<thead>
<tr>
<th>STORMWATER POND DRAINAGE AREAS</th>
<th>TYPE OF AREA</th>
<th>ACRES</th>
<th>% DRAINAGE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens at Birkdale Pond (off-site)</td>
<td>Impervious</td>
<td>14.5</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>Pervious</td>
<td>1.5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>16.0</td>
<td>100</td>
</tr>
<tr>
<td>Birkdale Golf Course Pond (off-site)</td>
<td>Impervious</td>
<td>11.3</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Pervious</td>
<td>2.6</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>13.9</td>
<td>100</td>
</tr>
<tr>
<td>Birkdale Village Pond (on-site)</td>
<td>Impervious</td>
<td>10.9</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Pervious</td>
<td>3.8</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14.7</td>
<td>100</td>
</tr>
<tr>
<td>Total Drainage Area</td>
<td>Impervious</td>
<td>36.7</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Pervious</td>
<td>7.9</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>44.6</td>
<td>100</td>
</tr>
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</table>

Source: Birkdale Stormwater Detention Pond Plan
The town’s watershed overlay district ordinance did not provide a clear relationship between imperviousness and stormwater management. This link is critical for New Urban developments to be watershed protective. Highly impervious developments require effective stormwater runoff control and treatment. If BMPs are not prescribed according to the amount of runoff they must manage, the risk of stormwater management failure increases and the watershed jeopardized.

To place this finding in perspective, it is useful to compare Birkdale Village with Southern Village, a New Urban development in Chapel Hill, North Carolina. Both developments are located in rapidly growing communities and were designed to combat sprawl. Both developments are located in watersheds that supply drinking water and recreational opportunity. However, the Town of Chapel Hill adopted an ordinance and implemented it in such a way that there is a clear link between the level of imperviousness and the BMPs designed to treat the runoff the imperviousness generates.

Like Huntersville, Chapel Hill had an ordinance that offered options to developers (Town of Chapel Hill 1981, p. 60):
1) 24% imperviousness (BMPs not required)
2) 50% imperviousness (BMPs required and must control runoff from the first inch of rainfall)

However, there were several important differences between the Town of Chapel Hill ordinance and the Town of Huntersville ordinance. First, Chapel Hill’s ordinance limited developers to 24% imperviousness without BMPs, compared with 36% imperviousness permitted by the Huntersville ordinance (although the developer would have to switch from curbs and gutters to grassy swales to pave up to 36% of the site). Second, Chapel Hill’s ordinance limited developers to 50% imperviousness with BMPs, compared with 70% imperviousness permitted by the Huntersville ordinance. Furthermore, Chapel Hill’s ordinance specified a standard for BMPs, which could be measured to determine BMP success: control runoff from the first inch of rainfall. Huntersville’s ordinance did not specify a standard for its BMPs. Finally, through its implementation of the ordinance, the Town of Chapel Hill required BMPs to control and treat runoff from the entire site. Developers could not exempt floodplains. Thus, no Southern Village BMP pond drainage areas exceeded 50% imperviousness. The Town of Huntersville exempted developers from treating runoff from floodplains. Thus, all Birkdale Village BMP pond drainage areas exceeded 70% imperviousness.

It is not clear that the Town of Chapel Hill ordinance is necessarily better for watershed protection than the Town of Huntersville ordinance. Fifty-percent imperviousness is low for a high-density, mixed-use New Urban development. Critics may consider this stricter standard more conducive to sprawl. A blanket reduction in imperviousness may push development to other parcels. Some areas can handle much more imperviousness than 50% if runoff is properly treated, while other areas should have much less imperviousness. Rigid impervious limits without consideration of site characteristics may be potentially harmful to a watershed. However, Southern Village sits on steeper
slopes made of soils that easily erode. Thus, lower impervious limits may be more appropriate on a more hydrologically sensitive landscape.

The Chapel Hill ordinance appears more tailored to its environment, while the Birkdale Village ordinance is more general. The Chapel Hill ordinance established a better link between level of imperviousness and level of stormwater management than the Birkdale Village ordinance. The Chapel Hill ordinance limited the amount of runoff from a more hydrologically sensitive site and specified a standard by which BMPs controlled and treated runoff.

Parking

The developers justified excess imperviousness in Birkdale Village by anticipated parking demand. The central location of the Village with respect to the surrounding community, its proximity to an interstate highway, and the rapid growth of the entire area prompted developers to make Birkdale Village a regional commercial and employment center. The rapid growth of Huntersville and Mecklenburg County, combined with the build-out of the Birkdale community, convinced developers that most shoppers and employees would patron Birkdale Village from well beyond reasonable walking distance. Since there is currently only one bus that serves the Birkdale Community, and since there will no rail transit and extended bus service in Huntersville before 2010 (Charlotte Area Transit System 2002) the developers maintained the need for abundant parking.

The Town of Huntersville established a parking ordinance with design limitations concerning watershed protection. The town’s ordinance did not specify a maximum parking limit, nor did the ordinance require the developers to limit parking based on the amount they could hide behind buildings. Both of these features are significant parking characteristics of New Urbanism. Furthermore, the ordinance did not require the developers to build parking in decks, as opposed to surface parking lots. Parking decks are less impervious than surface lots and thus generate less runoff. To illustrate the first limitation, Table 3 compares the town’s minimum parking requirements, New Urbanism’s maximum parking requirements, and the amount of parking actually built for Birkdale Village.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>TOWN OF HUNTERSVILLE MINIMUM</th>
<th>NEW URBAN MAXIMUM</th>
<th>NUMBER BUILT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>480</td>
<td>394</td>
<td>600</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>900</td>
<td>1,350</td>
<td>1,504</td>
</tr>
<tr>
<td>Total</td>
<td>1,380</td>
<td>1,744</td>
<td>2,104</td>
</tr>
</tbody>
</table>

Table 3. Total Birkdale Village Parking Spaces: Town of Huntersville Minimum, New Urban Maximum, and Number Actually Built

<table>
<thead>
<tr>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town of Huntersville Parking Ordinance (2001)</td>
</tr>
<tr>
<td>Revised Birkdale Village Master Plan (2001)</td>
</tr>
</tbody>
</table>
The developers provided parking for 320 residential apartments and 450,000 square feet of non-residential development. Table 3 shows the developer met the town’s minimum standards for parking. The developer provided 120 more residential parking spaces and 604 more non-residential parking spaces than required. However, Duany, Plater-Zyberk, and Speck (2000) prescribe a maximum of three parking spaces per 1,000 square feet of mixed-use construction in New Urban developments. Since Birkdale Village is a New Urban, mixed-use development, it should have no more than 394 residential parking spaces (320 apartments at an average apartment size of 1,231 square feet) and 1,350 non-residential parking spaces. Table 3 shows the developer built 206 more residential parking spaces and 154 more non-residential parking spaces than what is prescribed by New Urbanism.

There were three basic parking designs in Birkdale Village: decks, surface lots, and street parking. The developers built all the parking decks in the central blocks, all the surface parking lots on the surrounding, peripheral blocks, and street parking in both (see Figure 6). The central blocks contained 785 parking spaces (600 residential and 185 non-residential), or 37% of the total parking in the Village, while the peripheral blocks contained 1,319 parking spaces (all non-residential), or 63% of the total parking in the Village. While Birkdale Village’s central blocks conformed to New Urban and watershed protective parking design standards, the peripheral blocks did not.

Figure 6. Parking Plan
The four central blocks of Birkdale Village contain a total of four parking decks, constructed of two levels each. Each level of each deck is the same area. These decks are more watershed protective than surface parking lots. The surface area of one level of the deck defines the deck’s imperviousness. The other levels do not affect runoff because they are built within the same envelope of imperviousness. Assuming that the parking spaces in decks and surface lots are the same size and that the deck and surface lot contain the same number of spaces, the runoff generated by a deck such as those in Birkdale Village is only half that of a surface parking lot.

Excess parking pushed Birkdale Village’s stormwater drainage area imperviousness over 70%. According to New Urban parking limits, Birkdale Village contains 206 unnecessary residential and 154 unnecessary non-residential parking spaces. If the developers had followed New Urban standards, the Village would have 360 fewer parking lot spaces (206 residential deck spaces could be made non-residential).\(^2\) 360 excess surface parking spaces translate to 144,000 square feet, or 3.3 acres, of excess imperviousness. Furthermore, developers could have decked the remaining surface parking (1,319-360=959 spaces). The result would have been 479.5 fewer surface lot spaces. At 400 square feet of imperviousness per space, 479.5 excess parking spaces translate to 191,800 square feet, or 4.4 acres of excess imperviousness. Removal of 7.7 acres of unnecessary parking lots reduces total stormwater drainage area imperviousness from 36.7 acres (82% imperviousness) to 29 acres (65% imperviousness).

Developers argue legitimately that parking decks are much more expensive to build than surface parking lots – $12,000 per deck space versus $1,500 per lot space (Duany, Plater-Zyberk, and Speck 2000, p. 207). It would have cost developers an additional $8.8 million to reduce Birkdale Village’s drainage area imperviousness to 65% based on the suggested parking changes. However, developers could have used the 5% impervious cover difference between the new parking layout and the town’s 70% impervious limit (2.2 acres) to construct new buildings. The increased revenue from rent would have offset at least some of the cost for more parking decks. Furthermore, these new buildings would conceal the new decks from the street.

**Floodplain Protection**

Mecklenburg County was one of the first local governments in the United States to initiate a floodplain protection program in 1993 to address the impact of future development on floodplains. The increased runoff from future development will expand floodplain boundaries. The subsequent risk of flooding to properties once outside the floodplain increases dramatically. To protect county property owners from future flooding, the county established a program to map expanded floodplains that account for expected future development at build-out under current zoning designations. The program also established buffer setbacks from the floodplain to keep development away. The county charged a stormwater utility fee to all property owners to support this program; a way for property owners to compensate for the impact their development has on the floodplains downstream.\(^3\)
Birkdale Village developers pay nearly $900 per impervious acre per year (an annual total of $33,030) to compensate for Birkdale Village’s impact on the McDowell Creek floodplain. However, the developers of the Greens at Birkdale partially sited their BMP pond in the McDowell Creek floodplain more than a year before the town adopted the county’s new buffer regulations. The town then approved the drainage of the most impervious portion of the Birkdale Village site site (91% imperviousness) to the Greens at Birkdale Pond. As discussed earlier, the Greens at Birkdale pond drainage area contains nearly 40% of all imperviousness on the Birkdale Village site. Thus, 40% of Birkdale Village runoff drains to a BMP that could fail during a flood, particularly since the inlet for Birkdale Village runoff is in the portion of the pond located in the McDowell Creek floodplain. Mecklenburg County’s program does not address the potential threat of a flood-breached stormwater pond. Although the town no longer permits developers to site BMP ponds in floodplains, the risk from this pond remains.

CONCLUSIONS

What Worked?

The Town of Huntersville established goals to both protect watersheds and combat sprawl and then adopted land use policies to achieve these goals. This was difficult to do in the face of rapid growth, but Huntersville did meet with some success. The Town successfully adopted a New Urban development ordinance as a step in the right direction to stop sprawl. Furthermore, the town also adopted ordinances to limit imperviousness in developments and require best management practices in more intense developments. Finally, the town did receive some benefit from Mecklenburg County’s initiative to remap floodplains, establish protective buffers, and find a way to make property owners pay their share, even though the town did not adopt county regulations until after the two ponds that handled 70% of the runoff from Birkdale Village had been built off-site.

What Did Not Work?

The excessive parking at Birkdale Village overshadowed many of the good land use policies guiding the development’s implementation. The overflow of parking in the form of surface parking lots created nearly eight acres of unnecessary imperviousness. The parking glut was further complicated since it created levels of imperviousness and runoff the town did not anticipate. Vulnerability of the stormwater BMPs intended to protect Lake Norman from runoff was most evident by the developers use of a stormwater detention pond partially located in the McDowell Creek floodplain. Although it has the highest risk of flooding, this pond handles 40% of Birkdale Village’s runoff. Such a flood-prone concentration of pollutants and sediment creates a serious threat for downstream water quality.
What Did Birkdale Village Teach Us?

- High imperviousness is part of New Urban development, but communities must mitigate the effects of the runoff high imperviousness generates. Impervious limits should reflect the topography and soils of the site; blanket standards could potentially be more harmful than helpful if they push development to other parcels. Also, New Urban development must be carefully sited in areas that are not hydrologically sensitive: flat ground to moderate slopes, well drained soils, that do not erode easily, and areas that are not critical for groundwater recharge.

- Stormwater BMPs should be designed to control and treat runoff from the amount of imperviousness specified by the community and sited to reduce risk of failure from flooding or other hazards.

- Excessive parking leads to excessive imperviousness and harms watersheds. Parking for New Urban developments should be kept within New Urban guidelines and reflect the walkability and transit-orientation of the development. Towns that promote New Urban development should adopt maximum parking ordinances. Permitted parking should be provided as decks rather than surface lots to reduce imperviousness. Decks are much more land use efficient and can be concealed behind buildings so they are not visible from the street.

- Communities should be more proactive in protecting their floodplains and watersheds from high-risk development. If communities are in the process of adopting or studying new guidelines and regulations for better watershed protection, they should work with developers to adhere to the new guidelines. Otherwise, developers may rush to “beat the clock” and get their project approved before the community can legally adopt the new ordinances. The same holds true if a higher-level government agency is developing a new plan or program.
REFERENCES


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1 The developers of Birkdale Village temporarily scaled back the project in the October 2001 master plan to include 450,000 square feet of retail and office space. This was 50,000 square feet less than the previous master plan which the Town planner referenced when he responded to the research team’s survey about the site parameters. The new information was learned upon a revisit to both the site and the Town of Huntersville to calculate the amount and distribution of parking in April 2002.

2 A typical parking stall is 9.5 feet wide and 19 feet long, or 180.5 square feet (Center for Watershed Protection 1995). A typical parking space includes the stall but also the concrete overhang at the edge of the stall, a narrow six-inch curb, the parking aisle, or module that allows access to the stall, and the stall’s share of the common parking lot imperviousness (such as fire lanes, entrances, internal circulation, and other features). Thus, the average impervious area created by a parking space is about 400 square feet.

3 This fee should be proportionate to their property’s impact on the watershed and its floodplains. The idea for such a fee derives from tax benefit equity theory, in that fees are paid in proportion to services rendered or burdens placed. This approach has been used to pay for the burdens of development in other communities which face natural hazard risks from flooding and coastal storms (Deyle and Smith 2000).