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Orange County Department of Planning

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County Reply – Mandatory Review of Local Planning Action as per NYS General Municipal Law §239-1, m, &n

Local Referring Board: Town of Newburgh Zoning Board of Appeals **Referral ID #:** NBT14-14M

Applicant: City of Newburgh **Tax Map #:**

Proposed Action: “Appeal” related to the approved clearing and grading permit for CRH Realty VIII, LLC. **Local File #:**

Reason for County Review: The appeal is related to real property parcels that are within 500 feet of NYS Route 300 and the municipal boundary with the Town of New Windsor.

Date of Full Statement: March 24, 2014

Comments:

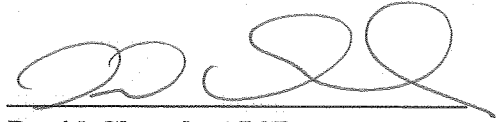
County Planning is in receipt of the GML §239 referral for the above referenced appeal. Based upon our review of the submitted materials, our office has found potential inter-municipal or county-wide impacts that would result from its approval. As initially stated in our letter dated October 15, 2013 our office would like to reiterate to the Board the high sensitivity of this project site due to its proximity to Washington Lake, which is approximately 600 feet from the southern property line. The areas currently slated for development drain directly to Washington Lake, a drinking water supply owned and operated by the City of Newburgh. Consistent with the County Comprehensive Plan and the County Water Master Plan, both adopted by the County Legislature, source water supply protection is of highest importance. Additionally, the County is actively involved in at least two relevant regional intermunicipal initiatives: a Watershed Management Plan for the Quassaick Creek (Washington Lake ultimately drains to the Creek), and a water supply facilities plan for interconnections between the towns of Newburgh and New Windsor, and the City of Newburgh to address predictable future demand and to define alternative supplies when NYC aqueduct water is unavailable. Information about both of these projects is available at <http://waterauthority.orangecountygov.com>. With both of these projects, absolute protection of current water supply sources, such as Washington Lake, is an essential element. Therefore, based upon our review, we offer the following **advisory** comment:

1. At the time the clearing and grading permit was approved by the Town Planning Board there were significant outstanding concerns with the proposed site plan. This was in the form of a review letter from our office dated January 24, 2014, see attached, and from the City of Newburgh Engineer. Many of the outstanding comments had the potential to significantly change the site plan prior to its approval. Therefore it is logical that the clearing and grading associated with the limits of disturbance at the time could significantly change.

County Recommendation: Local Determination

Date: April 9, 2014

Prepared by: Chad M. Wade, R.L.A.
Planner



David Church, AICP
Commissioner of Planning

As per NYS General Municipal Law 239-m & n, within 30 days of municipal final action on the above referred project, the referring board must file a report of the final action taken with the County Planning Department. For such filing, please use the final action report form attached to this review or available on-line at www.orangecountygov.com/planning.



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(YIC) 1124/14 MIS dated 1/29/14 CR
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**County Reply – Mandatory Review of Local Planning Action as per
NYS General Municipal Law §239-1, m, & n**

Local Referring Board: Town of Newburgh Planning Board

Referral ID #: NBT01-14N

Applicant: CRH Realty VIII, LLC

Tax Map #: 97-3-1, 2, 6, 7, 8
& 26

Proposed Action: Subdivision in conjunction with a 65,390 sq. ft. medical
office building.

Local File #: 2013-18

Reason for County Review: The real property parcels involved in the proposed action are within 500 feet of
NYS Route 300.

Date of Full Statement: December 31, 2013

Comments:

County Planning is in receipt of the GML §239 referral for the above referenced subdivision. Based upon our review of the submitted materials, our office has found no evidence that significant inter-municipal or county-wide impacts would result from approval of the subdivision. Our office has identified potential local problems and would like to include the following as advisory comments:

1. County Planning recommends that the remaining lands at the intersection of Union Avenue/NYS Route 300 and Old Little Britain Road should be considered by the Board and the Applicant for use in the proposed development in order to move the building and its parking further from City owned land and Washington Lake to the south and provide additional natural buffering of Washington Lake.


At a minimum, the future development of the undeveloped parcel is needed in the form of a conceptual coordinated site plan. It is recommended that the Board determines the extent of this conceptual review and think about access between the two site plans and the potential interconnection of stormwater management facilities. See the attached pages from *Orange County Design Manual* on parking lot considerations.

2. In coordinating, County Planning recommends that the Board work with the Applicant to develop fully comprehensive access and maintenance agreements related to may be required prior to approval.

County Recommendation: Local Determination

Date: January 24, 2014

Prepared by: Chad M. Wade, R.L.A.
Planner


David Church, AICP
Commissioner of Planning

As per NYS General Municipal Law 239-m & n, within 30 days of municipal final action on the above referred project, the referring board must file a report of the final action taken with the County Planning Department. For such filing, please use the final action report form attached to this review or available on-line at www.orangecountygov.com/planning.

Cc: Siby Zachariah-Carbone, Permit Field Engineer.



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County Reply – Mandatory Review of Local Planning Action as per NYS General Municipal Law §239-l, m, & n

Local Referring Board: Town of Newburgh Planning Board

Referral ID #: NBT01-14N

Applicant: CRH Realty VIII, LLC

Tax Map #: 97-3-1, 2, 6, 7, 8
& 26

Proposed Action: Site plan in conjunction with a 65,390 sq. ft. medical office building.

Local File #: 2013-18

Reason for County Review: The real property parcels involved in the proposed action are within 500 feet of NYS Route 300.

Date of Full Statement: December 31, 2013

Comments:

County Planning is in receipt of the GML §239 referral for the above referenced site plan. Based upon our review of the submitted materials, our office has found potential inter-municipal or county-wide impacts that would result from its approval. As initially stated in our letter dated January 10, 2013(attached) our office would like to reiterate to the Board and the Applicant the high sensitivity of this project site due to its proximity to Washington Lake, which is approximately 600 feet from the southern property line. The areas currently slated for development drain directly to Washington Lake, a drinking water supply owned and operated by the City of Newburgh. Consistent with the County Comprehensive Plan and the County Water Master Plan, both adopted by the County Legislature, source water supply protection is of highest importance. Additionally, the County is actively involved in at least two relevant regional intermunicipal initiatives: a Watershed Management Plan for the Quassaick Creek (Washington Lake ultimately drains to the Creek), and a water supply facilities plan for interconnections between the towns of Newburgh and New Windsor, and the City of Newburgh to address predictable future demand and to define alternative supplies when NYC aqueduct water is unavailable. Information about both of these projects is available at <http://waterauthority.orangecountygov.com>. With both of these projects, absolute protection of current water supply sources, such as Washington Lake, is an essential element. Therefore, based upon our review, we offer the following **Binding** comments:

- 1) The Board should work with the Applicant to refer the site plans and appropriate documentation to the City of Newburgh Planning Department and Engineer for a coordinated review.

Stormwater and Water Quality

- 2) While we appreciate that the Applicant has indicated that 89 parking spaces will be made using permeable pavement and that bioretention facilities will be constructed within some of the parking lot islands, additional measures should be taken to better manage stormwater before it leaves the site so as to ensure there are no water quality impacts to Washington Lake. The Board should work with the Applicant to incorporate **Green**

Infrastructure (GI)¹ to the maximum extent practicable. This should be implemented in accordance with Chapter 5 *Green Infrastructure of the NYSDEC 2010 Stormwater Management Design Manual*. Based upon the potential impacts to Washington Lake, County Planning offers the following:

- a) Soil testing. Although the USDA's Soil Survey classifies the majority of the site as Class D soils, the Board should work with the Applicant to implement appropriate soil testing on site to conclude the actual soil types and their infiltration capacity. This would provide more conclusive soil information than the USDA's Soil Survey, which is admittedly only recommended for use in "general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as... certain conservation and engineering applications." Our hope is that onsite testing will reveal that conditions are more suitable than initially expected for GI practices. Conversely, if the testing confirms inadequate soils for infiltration practices, the Applicant may need to rethink the stormwater management currently proposed within the site plan.
- b) Examples of potential additional GI practices. While the Applicant has incorporated some GI practices, additional practices should be evaluated for the potential incorporation throughout the site plan, potentially reducing the need for traditional stormwater infrastructure. Specifically, we have identified the following additional GI opportunities that could potentially be incorporated, many of which can be implemented with or without specific concern of soil classification:
 - i) Pervious pavement has been extensively studied in cold climates showing great success. The typical benefits include capital cost savings, reduction of deicing and anti-icing practices, minimal damage from frost heave, reduction of black ice and increased water quality. Ideally the entire parking lot should be considered for pervious pavement, leaving the main access point and aisle adjacent to the building impervious to handle the heavier loads.

Stewart Airport has implemented a successful pervious parking lot which was able to manage all the stormwater associated with Hurricane Irene and Tropical Storm Lee, in an area classified as D soils by the USDA. They have also indicated the maintenance is not as difficult. Our office recommends that the Applicant contact Greg Reszka, greszka@panynj.gov, of the Port Authority in order to obtain information that may contribute to the design and maintenance of pervious pavement. Other great sources for information on the success of porous pavement in cold climates are Tom Ballestero at the University of New Hampshire Stormwater Center, Nina Bassuk at the Cornell University Urban Horticulture Institute and Patrick O'Reilly P.E. at the Lamont-Doherty Earth Observatory in Rockland County.

The Applicant has provided 133 parking spaces above that required by the *Zoning Code*. The Board should work with the Applicant to potentially land bank the 133 parking spaces, leaving them as turf parking or only constructing them as needed in the future. Whether constructed now or in the future at a minimum, the amount of parking over the required amount be constructed as pervious pavement. See the attached pages *Porous Asphalt Pavements for Stormwater Management in Cold Climates* for more information.

- i) Integration of rain gardens into any and all proposed landscape areas which can be designed to accommodate sheet flow of stormwater or disconnection of roof leaders, including, but not limited to foundation plantings and parking lot islands.

¹ GI stormwater practices utilize methods that introduce stormwater back into the ground close to where it would have entered under predevelopment conditions and techniques that maximize the use of vegetation to remove pollutants and slow the velocity of stormwater. GI practices are in contrast to conventional stormwater treatment methods, which collect and pipe stormwater to retention or detention ponds that typically only provided basic water quality treatment, if any.

- ii) At this stage in the design process the building's architecture has the opportunity to be structurally designed to incorporate the capacity to handle the minimal increased weight loads associated with the soil medium and plantings of a green roof. Additionally this has the opportunity to create usable space for future employees and patients. The green roof has the ability to take on the form of a park space and incorporate aspects of a healing garden.
- iii) Two (2) inch to three (3) inch caliper trees, which is the typical size planted in association with site plans, on average dependent on species, have the ability to intercept between 200 and 300 gallons of stormwater runoff in a year. The amount intercepted will only increase as the tree matures. In order to ensure the health and vigor of the tree plantings, The Board should work with the Applicant investigate the use of structural soil under the previous pavement mentioned above.
- iv) Vegetative swales should be considered to replace the traditional catch basins and piping to convey stormwater throughout the site. Vegetative swales can be creatively designed with a series of check dams to allow pooling of stormwater in an effort to slow velocities, increase soil contact time and allow sediments and pollutants to settle out.
- v) Conservation of natural areas and preservation of riparian buffers should be considered along the south side of the project site. The following practices can aid in increasing the amount of land preserved.
 - (1) Building foot print reduction, see comments no. 1 below under our advisory comments for more information.
 - (2) Parking area reduction, see comment no.1 below under our advisory comments for more information.

Ultimately GI has the ability to take on numerous forms and can be implemented through creative design in almost any development scenario. See the attached pages from *Orange County Design Manual* on LID commercial applications.

- 3) Traditional maintenance practices of the parking and landscape has the ability to cause significant impacts to water quality.
 - a) There are no areas designated for snow storage. This needs careful consideration in order to prevent snow, which when plowed may be contaminated with salt and other pollutants, from being inappropriately managed on site; melting snow could quite feasibly contribute contaminants to Washington Lake. The Board should work with the Applicant to develop snow storage onsite which allows the melting snow substantial contact time with the soils and surface vegetation in an effort to remove contaminants.
 - b) The SWPPP simply indicates that salt and sand will not be used in the areas of porous pavement. The Board should work with the Applicant to expand this provision to limit the use of sodium chloride on the entire site due to the proximity of Washington Lake. An eco-friendly deicing alternatives should be used onsite and that it's use be indicated on the site plans and within the approval documents, as appropriate. This discussion should also indicate similar eco-friendly alternatives to herbicide, pesticide and fertilizer to be utilized during and after construction.

Transportation and Transit

- 4) The adopted *Orange County Comprehensive Plan, Strategies for Quality Communities* outlines the County's growth and development Goals and policies. One of these overall Goals is to "promote a multi-modal transportation network that meets the needs of all segments of the County's current and future population for intra- and inter- County travel, and that adequately supports anticipated economic development." Based upon the *Comprehensive Plan*, County Planning offers the following:

- a) The proposed development is located in the service area for the local bus routes in the City of Newburgh which extends out into the towns of Newburgh and New Windsor, including many destinations on Union Avenue/NYS Route 300. Additionally the proposed development is in the service area of the ADA Paratransit Service and the Town of Newburgh Dial-A-Bus, which are door-to-door and curb-to-curb transit options, respectively. The Board should work with the Applicant to **provide an internal bus stop(s)**, to accommodate local bus service, ADA Paratransit and the Town of Newburgh Dial-A-Bus. Additionally, Board should ensure that the bus stop(s) are close to the building entrance, turning radii throughout the development are able to accommodate the buses utilized and the overhead clearance near the buildings main entrance is adequate. The chosen area should allow for pull off, out of the lane of traffic to allow safe loading and unloading of riders, including those that are handicap. See the attached pages from *Orange County Design Manual* on bus accommodations..

Given the anticipated use of the proposed development it is likely that all three (3) services, although not guaranteed, mentioned above may provide services on a regular basis to the proposed facility. In order to obtain more information on the above mentioned transit options and the types of buses utilized, County Planning recommends that the Applicant contact and work with Transit Orange via their website at www.transitorange.info or via the transit planners in the County Planning office at (845) 615-3850 in order to open the discussion with the transit operators.

- b) Although there are currently limited pedestrian facilities along Union Avenue/NYS Route 300, a number of businesses exist that would likely benefit from the future workers of the proposed development. Banks, restaurants and stores are within a close enough proximity to the site that they could be accessed without a vehicle if pedestrian amenities existed. The Board should work with the Applicant and the NYSDOT to **take a hard look at the possibility of incorporating pedestrian facilities along Union Avenue/NYS Route 300**. The State passed a complete streets legislation in 2011, therefore the NYSDOT may require the design and installation of the pedestrian facilities as deemed appropriate along Union Avenue/NYS Route 300 as part of the highway work permit. At the very least, the NYSDOT Region 8 Bicycle and Pedestrian Coordinator will need to review and complete the *Pedestrian Generator Checklist* in order to assess the potential need for pedestrian facilities; even with the caveat that none exist under current conditions. Past discussions with Region 8 have indicated the need and want to add pedestrian facilities, even if disconnected at this point in time, to the Union Avenue/NYS Route 300 corridor.

County Planning recommends that the Board additionally review in conjunction with this letter our letter dated January 10, 2013 attached, related to the subdivision portion of the proposed development. In addition to the above mentioned **Binding** comments, our office has identified potential local concerns and offers the following **Advisory** comments:

- 5) **Impervious surfaces.** The site plan provided as part of this review, particularly the building footprint, is significantly different from the one submitted during the variance process. The Applicant was granted a height variance associated with a three (3) story building containing a smaller overall footprint. Our office recommends, at a minimum, the Board work with the Applicant to compare and contrast both building options with an eye towards potentially providing a larger land area undisturbed along the southern property line and reducing the amount of impervious surface. This gain of impervious area may have the ability to provide additional buffering of Washington Lake or to implement Green Infrastructure stormwater management.

Based upon the proposed grade changes associated with the retaining walls, noted to be upwards of ten feet in height based upon the spot elevations provided with the site plan, County Planning recommends that the Board work with the Applicant to seriously consider raising the first floor elevation of the building so as to

consider parking beneath the building to offset the impact of the proposed parking and minimize the amount of impervious surface coverage.

- 6) Maintenance district. Due to the proximity to a drinking water supply, our office recommends that the Board work with the Applicant and the Town Board to develop a stormwater maintenance district in order to ensure that maintenance of the stormwater facilities is reliable and adequate. Our office, working with Orange County Soil and Water Conservation District, completed an inventory and assessment of stormwater ponds within the Quassaick Creek Watershed in the summer of 2012 and found that the vast majority of ponds are not appropriately maintained and not providing the intended level of stormwater management. Even those ponds owned by successful businesses, which presumably would have the funds to perform routine maintenance, were frequently filled with sediment and/or garbage and had damaged infrastructure. Allowing maintenance issues to fester often exacerbates the problem, ultimately costing more to rectify than routine maintenance would have cost.

Creating a stormwater district would enable inspection and maintenance to be institutionalized by the Town of Newburgh. This legal arrangement would help to ensure that the stormwater infrastructure receives regular inspection and maintenance for years to come; thereby reducing the likelihood that inadequately-treated stormwater will enter Washington Lake.

- 7) Pedestrian safety. The pedestrian circulation throughout the proposed development is disconnected in some instances, with crosswalks that do not provide useful access. The amount of vehicles that will be regularly circulating throughout the development can cause conflicts and significant safety concerns if pedestrians have limited access to safe areas. Pedestrian safety is especially important for this type of proposed use, given that many clients will be sick or injured. County Planning recommends that the Board work with the Applicant to develop a layout that focuses more attention on the pedestrian, as advocated in the *Orange County Design Manual, 2011*. The majority of the parking layout can be realigned to accommodate pedestrians. For example portions of the proposed parking can be realigned to offer either a central pedestrian corridor or two pedestrian corridors on either end of the parking -similar to the central corridor on the east side of the proposed building. See the attached pages from *Orange County Design Manual* on corridors and parking lot considerations.

Such pedestrian considerations on-site and off-site mentioned under our binding comments 4(b) would also enable and encourage an employee to walk outside more often. This is in line with the County's Healthy Orange program, of which Crystal Run Healthcare is a partner. The attached Healthy Orange 2008 *Healthy Community Design Fact Sheet* has additional program details.

- 8) Additional parcel. Although mentioned in our letter regarding the subdivision, our office would like to reiterate and recommend that the remaining lands at the intersection of Union Avenue/NYS Route 300 and Old Little Britain Road be considered by the Board and the Applicant for use in the proposed development in order to move the building and its parking further from City owned land and Washington Lake to the south and provide additional natural buffering of Washington Lake.

At a minimum, the future development of the undeveloped parcel is needed in the form of a conceptual coordinated site plan. It is recommended that the Board determine the extent of this conceptual review and think about access between the two site plans and the potential interconnection of stormwater management facilities. Fully comprehensive access and maintenance agreements related to may be required prior to approval. See the attached pages from *Orange County Design Manual* on parking lot considerations.

- 9) Drainage. It looks as though the proposed drop curb inlets, according to the detail, are the entire length and flush with the pavement. Although from the site plan it looks as though proposed drop curb openings are spaced evenly along the length of the bioretention areas. If this is the case, this method is known to cause maintenance concerns and concentrate the stormwater flow which can cause erosion and undermining of the parking lot and the bioretention area. County Planning recommends that the Board work with the Applicant to provide a drop curb the entire length of the bioretention area to allow a more even sheet flow into the bioretention areas. For safety reasons, an aesthetically pleasing guardrail or other application may be warranted for installation to prevent accidental car intrusion to the bioretention areas.
- 10) Landscaping. There is no Plant List provided with the landscape plans, but based upon the plant codes provided, there are likely species listed as invasive or showing invasive tendencies in NYS. County Planning recommends that the Applicant review the NYSDEC invasive species list, <http://www.dec.ny.gov/animals/65408.html> and Cornell Cooperatives Extensions Invasive Species Program, http://www.nyis.info/?action=israt_m_plant to develop the proposed plant list that does not include any species listed on either of the aforementioned sources and provides it to the Board for review. Ideally native varieties of plant materials should be considered throughout the site over introduced species.

In addition to the plant list recommended above, our office recommends that the Board work with the Applicant to develop a more comprehensive landscape plan, which incorporates foundation plantings, implements more trees to increase canopy cover and over time provide shade for the vast parking lot, addresses turf areas, and provided extensive notes on warranties, planting specifications, soil specifications, etc. Additionally, County planning recommends that discussions with NYSDOT include incorporating street trees as part of the landscape plan in order to boost the urban forest along the Union Avenue/NYS Route 300 corridor. Furthermore the stormwater facilities should be planted in accordance with the *NYSDEC 2010 Stormwater Management Design Manual*. In many known instances, even though appropriate species are specified and planted, maintenance of plantings can be abandoned through improper maintenance. Facilities should be both appropriately planted and maintained in order to aid in the removal of pollutants and the improvement of the quality of the collected stormwater. Therefore County Planning recommends that the maintenance portion of the SWPPP include site specific maintenance that defines the plantings proposed in the facilities to ensure proper growth and education of those performing the maintenance.


Ideally a landscape architect or other qualified professional should be consulted to ensure species are appropriate for the proposed microclimates along with addressing the concerns mentioned above.

Our office appreciates additional opportunities to review and comment on any changes that are made hereafter.

County Recommendation: Approval with Modification as per Comments 1, 2, 3(a), 3(b), 4(a), & 4(b)

Date: January 24, 2014

Prepared by: Chad M. Wade, R.L.A.
Planner


David Church, AICP
Commissioner of Planning

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Cc: Siby Zachariah-Carbone, Permit Field Engineer.
Llisa Mondello, NYSDOT Region 8 Bicycle and Pedestrian Coordinator.

SPECIAL SECTION: SUSTAINABILITY

Porous Asphalt Pavements for Stormwater Management

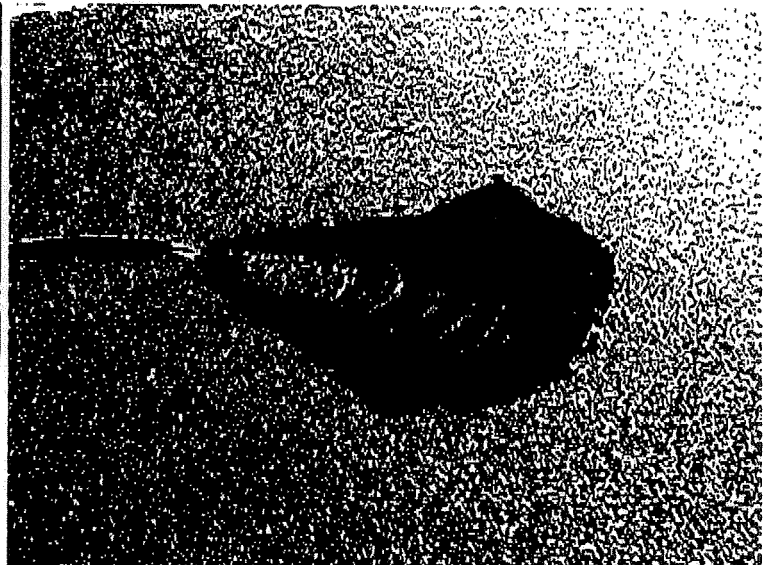


Figure 1. Construction of the UNH porous asphalt lot, October, 2004. Figure 2. Infiltration of 30 gallons per minute from a 2-inch hose at UNH.

By Robert M. Roseen, P.E., Ph.D. and Thomas P. Ballesterio, Ph.D., P.E.

Porous pavements are being recognized as an innovative stormwater management strategy that is both feasible and cost effective. In keeping with EPA requirements for Phase II of the Clean Water Act and the Total Maximum Daily Load (TMDL) program, municipalities are beginning to require improved stormwater management. These practices are designed to limit additional contaminant loading, in some instances to reduce existing loadings, and to limit effective impervious cover. This is a high standard that simply cannot be met with most conventional stormwater management practices using curb and gutters, and stormwater ponds and swales.

In northern climates, the selection of stormwater management strategies is further complicated by the need to consider the functionality of systems

in cold weather. Recent research has demonstrated that stormwater management systems using infiltration and filtration mechanisms, when properly designed, have demonstrated cold-weather performance exceeding conventional practices by measures of both water quality and hydraulics.

One of the greatest benefits of the use of porous pavements is the capital cost savings when compared with other common stormwater management approaches. Eliminating curbing, catch basins, and stormwater ponds can result in great savings. Porous pavements also have the benefit of a reduced need for deicing and anti-icing practices. This benefit is significant both in the potential economic savings for winter maintenance and the environmental benefits. Chloride-laden stormwater runoff, from winter-treatments, is toxic to aquatic

life, degrades drinking water supplies, and cannot be reduced from runoff by treatment but rather only through reduced application. For standard pavements, reduced salt application is balanced with public safety.

Background

Increased contaminant loading from developed land uses with elevated levels of imperviousness is clear (USEPA 1983; Pitt et al 2004; NCHRP 2006), and conventional stormwater management is doing only a modest job at mitigating impacts. Accumulation of heavy metals, organics, and inorganic compounds can be acute in urban snow runoff (Sansalone et al 1996, 2002; Glenn, 2002), further accentuating the need for effective winter stormwater management in northern climates. Low impact development stormwater designs and, in

in Cold Climates

particular porous pavements, have been shown to be extremely effective at reducing contaminants from impervious surfaces (Ferguson, 2003; Dietz and Clausen, 2007; Dietz, 2007) in northern climates (Roseen, et al 2006), and for reducing peak flow, lag time, and runoff volume (Hood et al, 2007). Porous pavements in cold climates have been found to be more resistant to freezing than standard pavements, due largely to the disconnection to subsurface moisture and from rapid thawing due to the infiltration of meltwater (Backstrom 2000).

Study Area The study area is located in Durham, N.H., at the University of New Hampshire Stormwater Center (UNHSC). The porous asphalt test facility was constructed as two equivalently sized parking lots: one with standard dense-mix asphalt and the other with porous asphalt. The impervious lot generates surface runoff whose characteristics can then be compared to the flow from the bottom of the porous asphalt lot. The lots are used for commuter parking and routine bus traffic. The area is frequently plowed and salted during the winter months. The climatology is coastal, cool temperate with an average annual precipitation of 48 inches (122 cm). The mean annual air temperature is 48°F, with the average low in January of 16°F, and the average high in July of 82°F.

Design and Durability The mix design for porous asphalt has been in use for decades as open-graded friction course (OGFC), a pavement mix with a void content commonly in the 18-20 percent range. For porous pavement systems, the primary difference is that the open-

graded mix is placed as a full-depth (4") pavement designed to infiltrate into the subbase. Specifications can be found at a variety of places including industry associations (NAPA, 2002, 2003), stormwater manuals (PADEP, 2006), and watershed assistance groups (UNHSC, 2007). Structural durability and life cycle are major concerns when selecting pavement type.

The principal cause of parking lot pavement breakdown in northern climates is freeze-thaw cycling. Parking lots in these areas have a typical lifespan of around 15 years. By design, an open graded, well-drained porous pavement system incorporating significant depth will have a longer life cycle from reduced freeze-thaw susceptibility and greater load-bearing capacity than conventional parking lot pavements. Design guidelines for freeze-thaw consideration reflect frost depth ranges from 48-52" from coast to inland. For porous pavements, greater depth of frost is not the concern but rather the increase in the rate of cycling between freeze and thaw. This rate is highest near the coast.

It is important to understand that porous asphalt as a stormwater management system is just that: a system. This system includes porous asphalt at the surface, a stone (choker course) immediately below, and the finer filter material (sand to gravel). A significant degree of water quality improvement occurs in this filter course. In low-permeable soil, the filter course will need to be underlain by a drainage layer consisting of stone and drainage pipe. For the UNH site, this drainage layer was constructed in order to monitor and sample the

water that passes through the porous asphalt system.

Hydraulics The winter performance of porous asphalt pavements tends to be one of the greatest concerns by design professionals. Recent findings by researchers show, however, that there are fewer problems with the functioning of the porous asphalt than with the performance of conventional technologies like swales and ponds. Researchers at the University of New Hampshire Stormwater Center have been monitoring the hydraulic and water quality performance of many different stormwater technologies since 2004. The winter hydraulic performance of porous asphalt has been one of the most significant findings. In fact, it has been found that surface infiltration rates are not negatively impacted from frost penetration but are actually higher during winter months than in summer.

Surface infiltration rates have been recorded monthly for three years and show a repeating trend of oscillating infiltration rates of about 2000 cm/hr in the winter to 1000 cm/hr in the summer. The infiltration capacity remains high during winter, even when there is significant frost penetration, sometimes in excess of 12 inches. The porous asphalt does freeze, however it generally freezes as a porous medium and not a solid block. Freezing rain and rain on snow can freeze at the surface. Minor salting and plowing at such times can return the surface to high infiltration.

The well-drained nature of the parking lot subbase ensures that the void space remains open, even during periods of prolonged freezing. While the filter may indeed freeze, it does not freeze solid and infiltration capacity is preserved. Monitoring of frost depth penetration before and after winter runoff has shown that chloride-laden meltwater serves to thaw the frozen filter media.

During the three-year period of monitoring, there has been no surface runoff from the parking lot. During this period, the Northeast region has experienced an increase in extreme

SPECIAL SECTION: SUSTAINABILITY



Figure 3. Comparison of dense-mix asphalt (left) and porous asphalt (right) on the same day, one hour after blowing.

storm events with two 100-year storms in the past three years. Runoff has occurred as designed through the subdrainage with an average of 88 percent peak flow reduction and increased lag times of 460 percent. Because impervious surfaces increase runoff quantities and velocities, slowing down the runoff (measured by lag time) is an important facet of stormwater management. The net water balance for the site was a 25 percent reduction in volume, with little or no runoff during the hottest months. This has been accomplished for a site with relatively poor infiltrating soils (hydrologic soil group C) where infiltration as stormwater management is often not considered. This is a substantial accomplishment in that for many infiltration systems the design guidance recommends limiting to sites with >0.5 inches/hour infiltration rates, and this site does not qualify under those guidelines. This design guidance appears to be most appropriate for infiltration systems with high ratios of watershed area to filter area, such as bioretention or sand filters (>25:1). However, for porous pavements the watershed area to filter area ratio should be a maximum of 5 to 1. Poorly infiltrating soils can be easily accommodated with design variations allowing storage for extended infiltration.

Hydraulic Parameter	Performance
Peak Reduction	88%
Lag Time	460%
Volume Reduction	25%

Water Quality At the base of the UNHSC system is drainage pipe that drains into a swale. In this pipe, water flow rate and water quality (temperature, conductivity, dissolved oxygen, pH, and turbidity) are monitored real time (every five minutes). In addition, an automated sampler collects one-liter water samples in Teflon bags at various intervals during storms. These water samples are sent to a certified lab for analysis of water quality. The water quality performance for the porous pavement system has been exceptional and has not varied seasonally. The porous asphalt design tested at UNHSC is distinctive in its use of a medium-grained sand for a reservoir base and filter course. This refinement enhances its effectiveness in treating water quality. Typical performance efficiencies have exceeded 95 percent for total suspended solids (TSS), total zinc (TZ), and total

petroleum hydrocarbons in the diesel range (TPH) and approximately 42 percent for total phosphorus (TP).

The UNHSC has focused on these parameters because each is considered a common measure of stormwater pollution, each is a common pollutant in national water quality impairments (303D listings of the Clean Water Act), and each is always measured in the runoff on the UNHSC impervious asphalt lot. The source of TPH is most likely from vehicle drippings and atmospheric deposition. No nitrogen removal occurred as would be expected from a non-vegetated system (if nitrogen were a concern, it could be addressed with a small vegetated system located at the subdrain outlet).

Contaminant	Influent Concentration (ug/l)	Effluent Concentration (ug/l)	Removal Efficiency (%)
Total Suspended Solids (TSS)	20,000	200	99
Total Zinc (TZ)	67	2	97
Total Petroleum Hydrocarbons (TPH)	10	0.1	99
Total Phosphorus (TP)	86	50	42

Chloride and Winter Maintenance Winter pavement maintenance requires a substantial effort and entails substantial cost in

continued on page 33

SPECIAL SECTION: SUSTAINABILITY

northern climates. In New Hampshire, routine blowing, anti-icing and deicing is common for more than four months a year. Maintenance strategies for improving efficiency and effectiveness of winter practices are valuable. Winter research conducted at the UNHSC on porous asphalt has shown that salt application can be reduced by 75 percent and the porous asphalt can still meet two important winter measures: friction, and snow and ice cover. Studies examined porous and non-porous parking lots and evaluated reduced salt application rates. The areas were evaluated for the degree (percentage) of snow and ice cover, and the friction factor (measured by a standardized test method - ASTM E303-93). A 75 percent reduction was possible based on snow and ice cover (with only 25 percent of the salt, the snow and ice cover on the porous asphalt was the same as on dense-mix asphalt), whereas a 100 percent reduction was determined for the friction factor (porous asphalt, even with no salt, has higher frictional resistance than dense-mix asphalt with 100 percent of the normal salt application). Therefore, a sizable reduction in salt application rate is possible for porous asphalt without compromising braking distance or increasing the chance of slipping and falling.

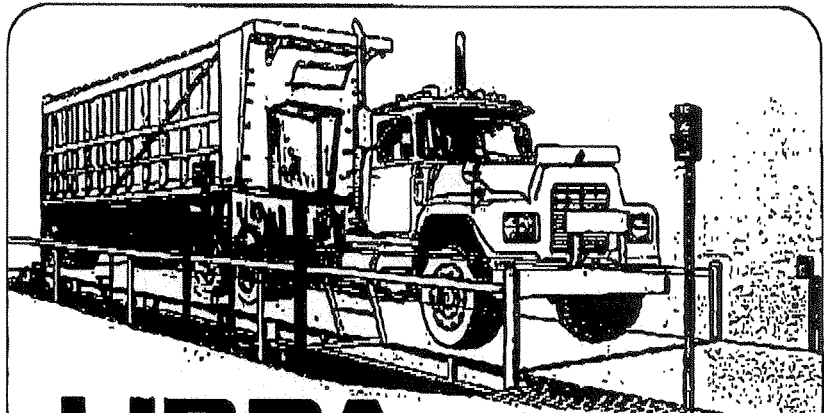
Summary Porous asphalt systems can be an extremely effective approach to stormwater management even in northern climates. Unlike retention ponds, they do not require large amounts of additional space. Instead, rainfall drains through the pavement surface and infiltrates directly into the subsurface. This significantly reduces runoff volume, decreases its temperature, improves water quality, and essentially eliminates impervious surface. It also speeds snow and ice melt, dramatically reducing the salt required for winter maintenance. The use of porous asphalt for parking lots is one watershed-based strategy that can provide solutions both for new developments and for areas being redeveloped.

Dr. Robert Rosecr, P.E., is an assistant research professor of civil engineering at University of New Hampshire and the UNH Stormwater Center Director. Dr. Thomas P. Ballester, P.E., is an associate professor of civil engineering at UNH and the lead scientist for the UNH Stormwater Center.

For more information about the UNH Stormwater Center, go to <http://www.unh.edu/erg/cstev>.

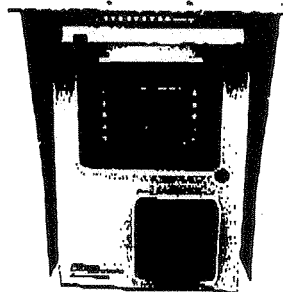
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Kiosks pay for themselves
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The Libra Self-Service Kiosks allow material suppliers to increase revenue by handling more truck traffic without increasing the number of operators. The kiosks increase customer satisfaction by reducing in-ward times, and by allowing the extension of site operating hours.

Benefits include:

- Increases truck throughput without increasing costs
- Allows operating hours to be extended for less cost
- Frees scale house operators to handle other responsibilities
- Significantly reduces data entry & ticket errors
- Reduces in-ward times
- Improves customer satisfaction
- Quickly and automatically identifies trucks
- Controls truck flow

Kiosks are available to handle all of the various roles in ticketing, including check-in, check-in with tare, checkout, and ticket printing. The kiosks act as extensions of the Generation3 system and fit seamlessly into its powerful infrastructure. Any number of kiosks can be added to a Generation3 to improve a site's operation, in keeping with Libra's design philosophy, the kiosks are highly configurable and mold themselves to the practices of each site. Besides providing clear, concise, configurable instructions to drivers, they can be configured to control external equipment such as traffic lights and gates.

SPECIAL SECTION: SUSTAINABILITY

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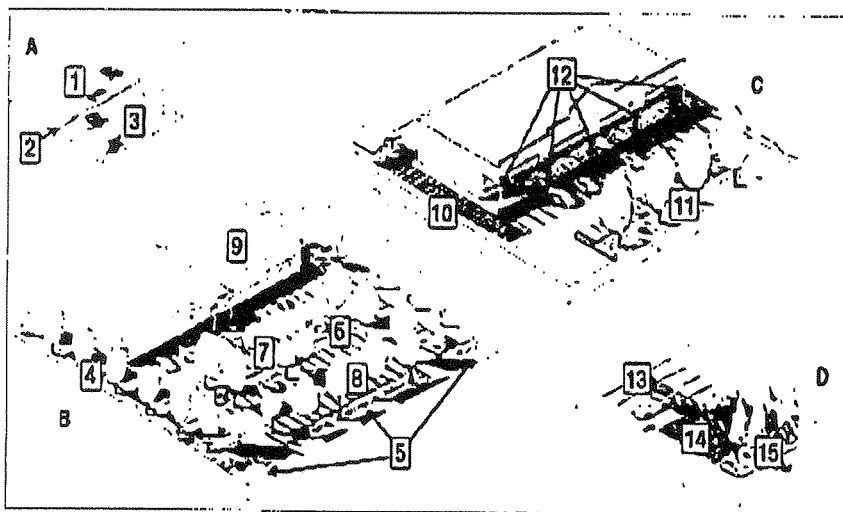
- Ultra low NOx emissions of <15 ppm @ 3% O₂ on natural gas
- Precise air flow control via VFD for stability and fuel efficiency
- Reduced energy consumption with VFD
- Compact modular design
- Easily adaptable to long-nose variations
- Sealed in construction for quiet operation
- Patent pending lean burn premix technology



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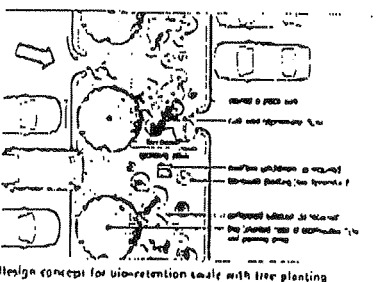
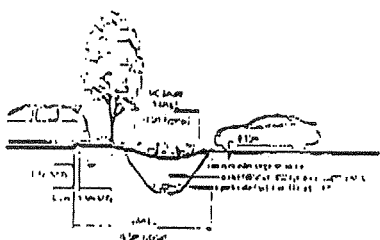
DETAILS



N50 LID commercial Applications

- A
 - 1. Bioretention (Grading)
 - 2. Bioretention (Inlet)
 - 3. Bioretention
- B
 - 4. Grass Swale
 - 5. Bioretention
 - 6. Bioretention
 - 7. Permeable Pavers (Walkway)
 - 8. Permeable Pavers (Overflow parking)
 - 9. Green Roof
- C
 - 10. Permeable Pavers
 - 11. Bioretention (To storm drain system)
 - 12. Disconnectivity (Disconnect downspouts)
- D
 - 13. Permeable pavers
 - 14. Bioretention
 - 15. Grass swale

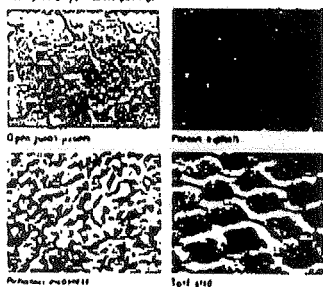
N50 LID applications - commercial



N51 Parking lot bioswales

Large volumes of polluted water run off of commercial parking lots. To the greatest extent possible this water should be captured and cleaned in bio swales with plants before being released into the ground. (photo, top center)

Examples of permeable paviors:



N52 Permeable pavings

Permeable paving materials can help reduce run-off as well.



Courtesy of Nvus Non Associates



Courtesy of Kevin Robert Perry, City of Portland

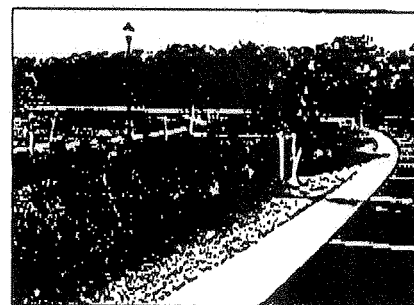


Courtesy of Tom Lipman, City of Portland

Photos above
Green streets can work in urban conditions.

Photos below

Curbless details on roads and parking lots allow water to run off into bioswales.



N50
N51
N52

Nature



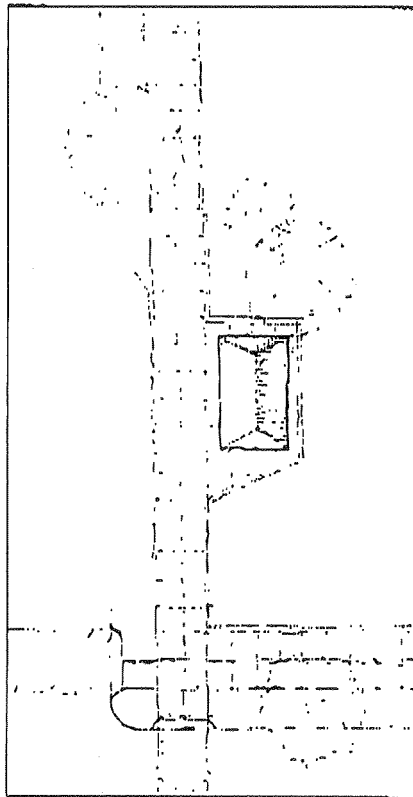
Fig. 7 Forest Connectivity in the Landscape

Typical in rural settings

- Minimize number of crossings of natural features
- Maximize connectivity with mixed-use nodes. Maintain 660' connectivity standard where possible.
- Road alignments should follow topography to minimize cutting and filling.
- Where possible, create neighborhood parkway edges where development fronts onto natural features.
- Maintain continuity of natural systems within developed areas by integrating natural and constructed drainage systems and plantings.



Courtesy of National Complete Streets Coalition



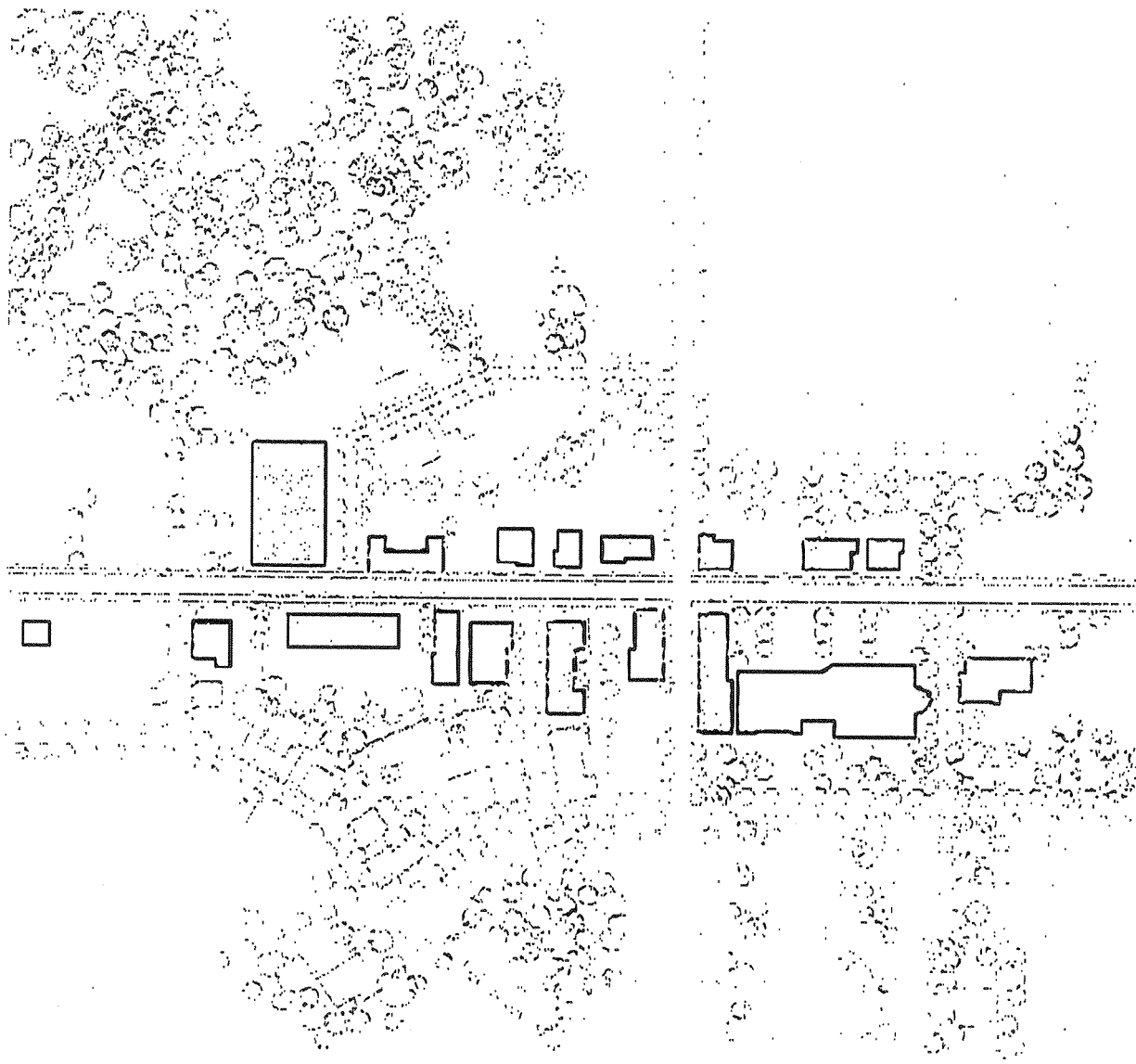
Bus Accommodation

Especially in the suburbs, buses should be a desirable transit alternative to the automobile. If this is to be the case, excellent accommodations should be provided:

- Highly visible, well designed and comfortable shelters with ample space for pedestrians.
- Adequate space for the buses to stop, with turn-out spaces on the roadway if necessary.
- Clear and complete signage about schedules, routes as well as a neighborhood orientation map.
- Visible locations near supporting land-uses, community destinations and important intersections.

PLACES

Preferred Development



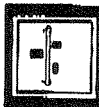
Corridors

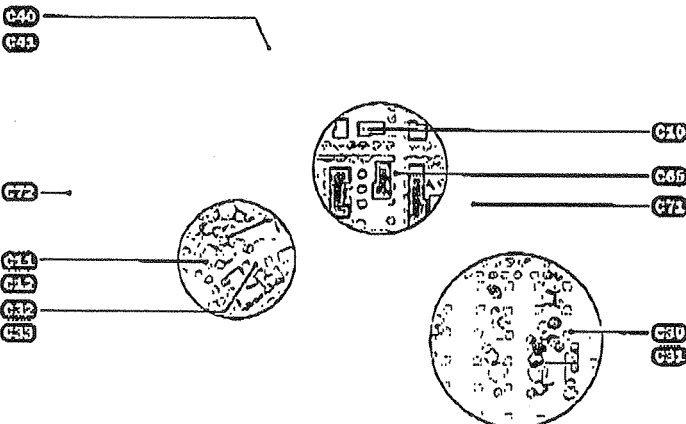
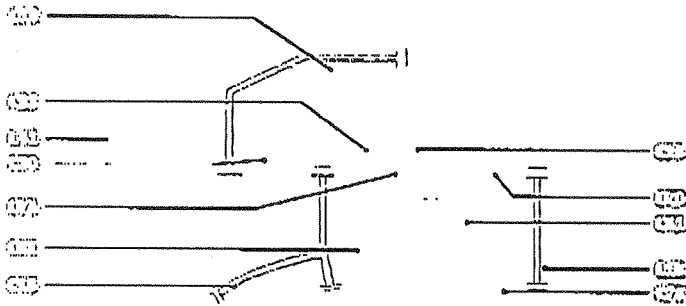
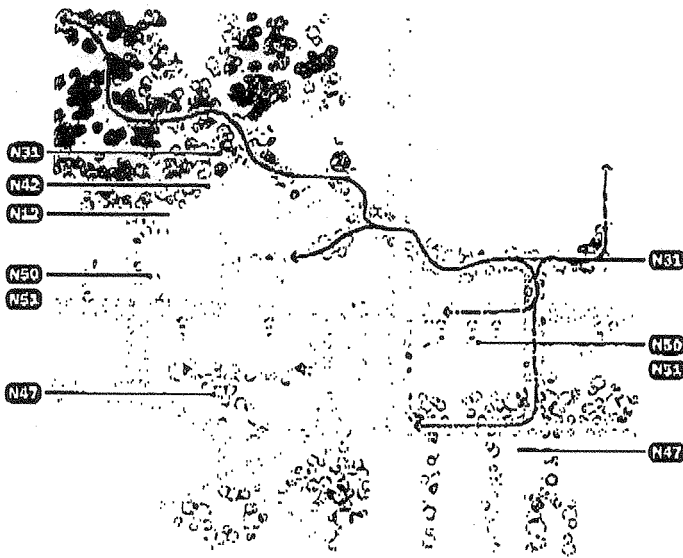


Preferred Development

Preferred Development Plan, Details

- Through progressive redevelopment, buildings are sited uniformly along the corridor.
- Connections are made between parcels to minimize traffic on the commercial arterial.
- New through connections are made between the corridor and the surrounding neighborhoods.
- Urban forestry (street trees, new pocket parks) are used to create a continuous greensward, protecting natural systems and enabling a network of pedestrian connections between the corridor and the surrounding areas.
- Parking areas are reduced in scale either by redesigning them more efficiently or by allowing shared parking.
- Zoning allows a diverse mix of uses.
- The auto-corridor is reconceived as a shared pedestrian-oriented public space. While even a well-designed commercial corridor will not be a true "main street," a pedestrian environment is created. There are uniform streetscape standards for lighting, paving and landscaping; there is a complete network of sidewalks.
- Along important roads, there are uniform setback standards.
- Parking is on the sides of or behind buildings.





Nature

Create the urban forest

- Landscape parks and plazas..... **N81**
- Create green streets..... **N70, 71, 72**

Create linked open spaces

- Link protected resource areas on individual parcels..... **N20, 47**
- Create and link parks and greenways..... **N31**

Protect natural and scenic resources

- Create resource-specific plans and regulations..... **N40, 41, 42, 80, 81, 82**
- Mandate conservation subdivisions... **N10, 11, 12**
- Protect watersheds and freshwater wetlands..... **N42, 45, 50, 51, 60, 46**
- Protect farmlands..... **N12**

Streets

Maximize connectivity

- Create a connected street network... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**
- Create new roads and connections into and between developments..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**
- Create a trail network..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**

Design streets for people

- Design for pedestrians and bicycles..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**
- Design beautiful streets..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**

Manage the automobile

- Deal with parking creatively..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**
- Accommodate transit..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**
- Traffic-calm roads..... **C40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100**

Communities

Create diversity of land use

- Integrate neighborhood civic uses... **C20, 21, 22**
- Create diversity of housing types.... **C12, 40, 50**
- Provide for flexible use/mixed use... **C10, 11, 22**

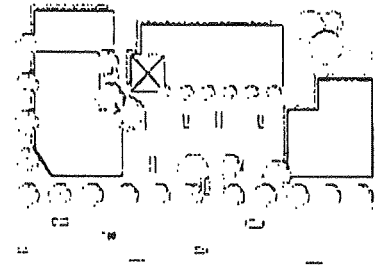
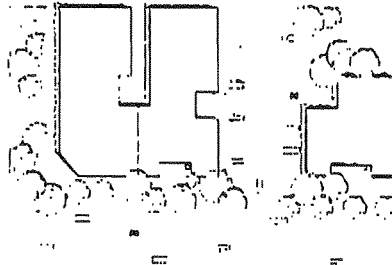
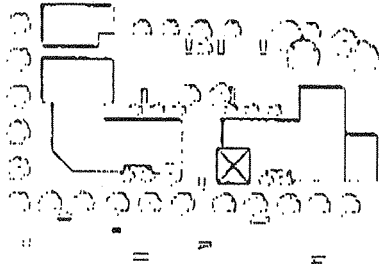
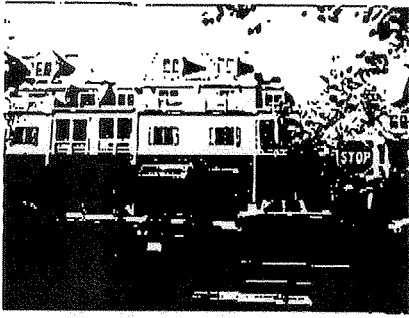
Create beautiful neighborhoods

- Orient buildings to streets..... **C30, 32, 33, 40, 50, 73, 74**
- Promote context-sensitive design..... **C65, 66, 67, 68, 73**

Create pedestrian-oriented commercial areas

- Promote mixed-use buildings..... **C10, 11, 22**
- Promote infill development..... **C87, 88**
- Create "main street" environments..... **C60, 61, 65, 65, 66, 75**





Preferred

The parking lot is in the middle of the block so that the impact on the street wall and sidewalk experience is minimized. The storefront is on the sidewalk.

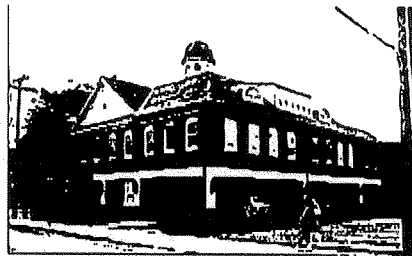
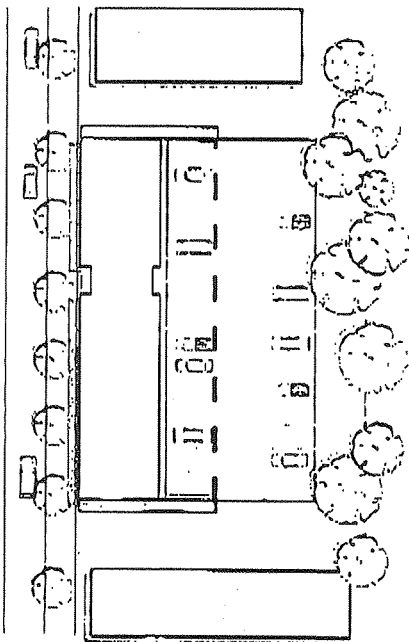
Acceptable

The parking lot is oriented in a way that minimizes its impact on the street frontage and pedestrian experience. Some storefront is still on the sidewalk.

Unacceptable

The parking lot destroys the continuity of the pedestrian experience. The parking lot has to be crossed to get to the storefront.

parking garage



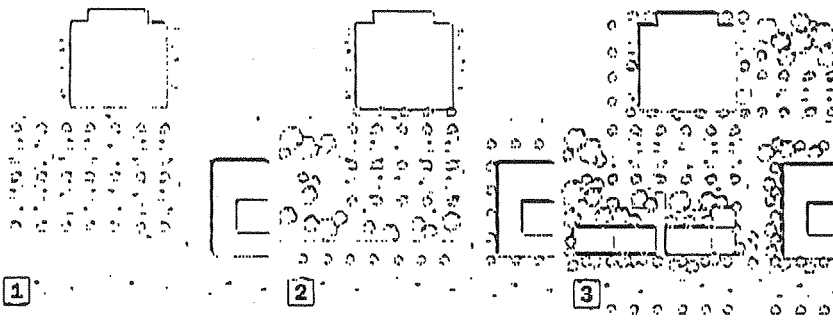
back view



sidewalk view

Small parking lot partially under building

Surface parking lots should be placed behind buildings. For sites that are not deep, parking lots can be partially under the building as shown in the adjacent photograph. In this way, the character of the street is maintained. Small parking decks can also be located behind buildings and where sites are not deep enough, the retail or mixed-use building can "wrap" or be partially built over the parking structure.



@@@ Parking lot redevelopment

Drawing sequence showing progressive redevelopment of large-format, auto-oriented retail on a commercial corridor:

1. Parking area for a typical suburban 50,000 sq. ft. store is determined by high

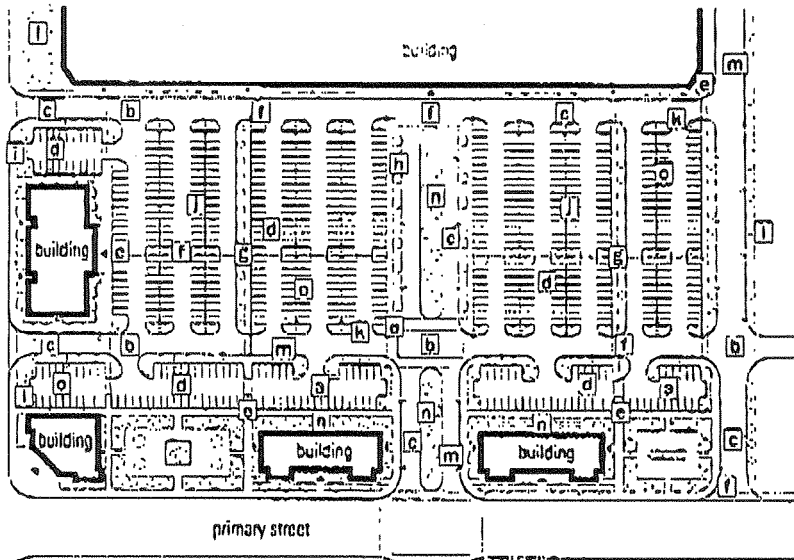
ratios such as 5 per 1000 sq. ft., large 10' by 20' stalls and 25' wide aisles.

2. Total area for parking reduced by lowering ratio to 4 per 1000 sq. ft., 9' by 18' stalls and 24' aisles. This leaves space for enhanced landscaping and pedestrian improvements.



Courtesy of Toronto City Planning

3. New sidewalk-oriented development is possible by breaking the lot up into smaller areas (40 spaces) and relocating some of the smaller parking areas to the sides or backs of buildings. New sidewalk-oriented development is now possible along the corridor frontage.



@@@ Large parking lot design

- a. Parking concealed behind street-fronting buildings and landscaped open space.
- b. Parking lot access driveway shared between multiple destinations.
- c. Main drive aisle clear of parking spaces.
- d. Large parking area divided into smaller parking courts.
- e. Direct and continuous pedestrian network.
- f. Clearly marked pedestrian crossing.
- g. Designated internal pedestrian pathway with shade trees.
- h. Minimum 10' wide landscaped medium with shade trees (bio-retention opportunity).
- i. Minimum 10' wide landscaped area with shade trees and low plantings for screening.
- j. Parking row (20-23 continuous spaces maximum) with landscaped breaks.
- k. End of row island with shade trees (minimum 1000 cubic ft. soil volume).
- l. Consolidated landscape area (bio-retention opportunity).
- m. Coordinated lighting scheme.
- n. Bio-retention area/rain garden.
- o. Permeable surface (when feasible)

@@@ Parking lot screening

Where portions of surface parking lots have to be along the edge of a sidewalk, the parking lots must be properly screened with landscaping or with an architectural wall or trellis.



A decorative wall, fencing and shade trees screen views into the parking lot

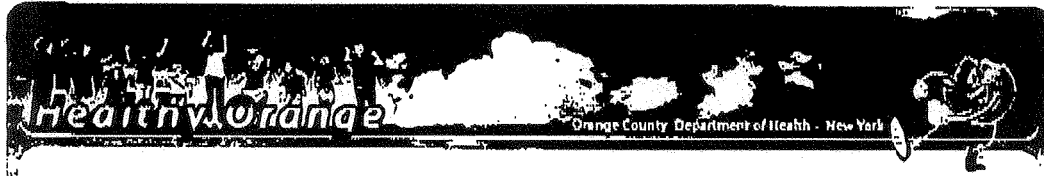


A low hedge and shade trees enhance the public sidewalk and screen lot edge

Courtesy of Toronto City Planning

Parking Design





Healthy Orange Team

Background: Orange County's Healthy Orange Team is a coalition of agencies working together to address the problem of childhood obesity. Partnership meetings are held quarterly.

Mission: the mission of the Healthy Orange Team is to promote a healthy lifestyle for children and families in Orange County through education, communication, collaborations, advocacy and policy change.

Partners: Our partnership includes a wide range of agencies who share a common goal of promoting healthy lifestyle for families in Orange County.

This spring, the Healthy Orange Team sponsored the first Week of Walking at various locations in Orange County. For more information, visit our [calendar of events](#) or [click here](#). Coming this spring, our partners are exploring opportunities for community gardens.

Move More

Americans of all ages need to incorporate more movement in their daily lives. Adults need at least 30 minutes of activity 5 days each week. This can be done by choosing to bike or walk instead of driving, taking stairs instead of elevators, or pushing a lawnmower instead of riding one. Children need at least 60 minutes of active play daily. They need to run, climb, jump, and just get up and move around, away from their desks, the television and computer games."

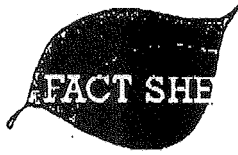
Twenty minutes of vigorous physical activity three times a week, such as sports, aerobics, working out in the gym, and running, have added health benefits. Johnson says, "But it's important to understand that you don't need to sweat in a gym or run a marathon to reap the health benefits of daily physical activity. Even 30 minutes a day, broken up into shorter increments of ten or fifteen minutes, can greatly improve your health."

Thirty minutes of physical activity (walking or other physical activity) on most days is recommended by the Surgeon General and research has shown that the benefits of walking and moderate physical activity for at least 30 minutes total on most or every day of the week can help you:

- Reduce the risk of coronary heart disease
- Improve blood pressure and blood sugar levels
- Improve blood lipid profile
- Maintain body weight and lower the risk of obesity
- Enhance mental well-being
- Reduce the risk of osteoporosis
- Reduce the risk of breast and colon cancer
- Reduce the risk of non-insulin dependent (type 2) diabetes
- Did you know that for every hour of regular, vigorous exercise we do -- like brisk walking -- we can live two hours longer?

Healthy Orange Partner List

American Cancer Society
 American Heart Association
 City of Newburgh Youth Bureau
 Cornell Cooperative Extension
 Crystal Run Health Care
 Grace Episcopal Church
 Greater Hudson Valley Family Health Center
 Hilltop Children's Nursery
 Hoops Express, Inc.
 Hudson River Health Care
 Hudson Valley Food Bank
 Junior League of Orange County
 Just Say Yes to Fruits and Vegetables
 Maternal Infant Services
 Mental Health Association of Orange County
 Middletown ABCD
 Middletown Care
 Middletown Day Nursery
 Middletown Head Start - Recap
 Middletown Community Health Center
 The City of Middletown
 Middletown City School District
 Middletown YMCA
 Mt. St. Mary College
 Newburgh Head Start
 Newburgh Enlarged City School District
 Orange County Community College
 Orange County Department of Health
 Orange County Land Trust
 Orange County Planning
 Orange County Systems of Care
 Orange County WIC Program
 Orange County Youth Bureau
 Orange County YWCA
 Orange Regional Medical Center
 Pediatric Care of the Hudson Valley
 POW'R Against Tobacco
 St. Francis of Assisi Food Pantry
 St. Luke's Cornwall Hospital
 St. Theresa's Nursing Home
 Times Herald Record
 Urban Farmers League
 The United Way



National Center for Environmental Health
Division of Emergency and Environmental Health Services



Healthy Community Design

The way we design and build our communities can affect our physical and mental health. This fact sheet explains healthy community design and its health benefits.

What Is Healthy Community Design?

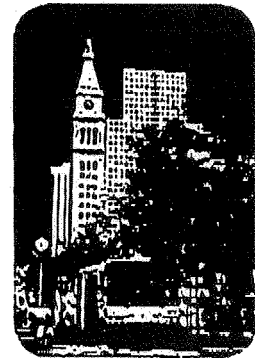
Healthy community design is planning and designing communities that make it easier for people to live healthy lives. Healthy community design offers important benefits: Decreases dependence on the automobile by building homes, businesses, schools, churches and parks closer to each other so that people can more easily walk or bike between them.

- ☐ Provides opportunities for people to be physically active and socially engaged as part of their daily routine, improving the physical and mental health of its citizens.
- ☐ Allows persons, if they choose, to age in place and remain all their lives in a community that reflects their changing lifestyles and changing physical capabilities.

What Are the Health Benefits of Healthy Community Design?

Healthy community design can provide many advantages:

- ☐ Promote physical activity.
- ☐ Improve air quality.
- ☐ Lower risk of injuries.
- ☐ Increase social connection and sense of community.
- ☐ Reduce contributions to climate change.



What Are Some Healthy Community Design Principles?

Healthy community design includes a variety of principles:

- ☐ Encourage mixed land use and greater land density to shorten distances between homes, workplaces, schools and recreation so people can walk or bike more easily to them.
- ☐ Provide good mass transit to reduce the dependence upon automobiles.
- ☐ Build good pedestrian and bicycle infrastructure, including sidewalks and bike paths that are safely removed from automobile traffic as well as good right of way laws and clear, easy-to-follow signage.
- ☐ Ensure affordable housing is available for people of all income levels.
- ☐ Create community centers where people can gather and mingle as part of their daily activities.
- ☐ Offer access to green space and parks.

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Conclusion

Designing and building healthy communities can improve the quality of life for all people who live, work, worship, learn, and play within their borders—where every person is free to make choices amid a variety of healthy, available, accessible, and affordable options.

Resources

For more information, go to
<http://www.cdc.gov/healthyplaces>.



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