

# FOUNDATIONAL RESEARCH BULLETIN

**SUSTAINABILITY BY DESIGN**  
*A Design Vision for a Sustainable  
Region of 4 Million*

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## **Demystifying Density: A comparison of different forms of density in five case studies in the Greater Vancouver Region**

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### **I. Introduction**

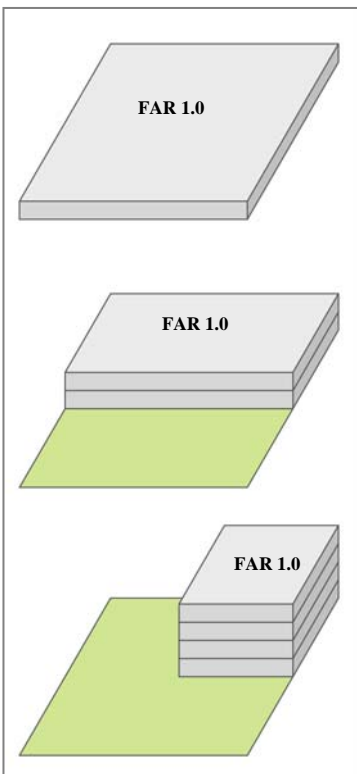
Many suggest that compact developments conserve land, promote liveability, transportation efficiency, and walkability<sup>1</sup>. In the Greater Vancouver Regional District (GVRD), higher density developments and corresponding benefits are one of four strategies of the Livable Region Strategic Plan, *Achieve a Compact Metropolitan Region*. This strategy supports efficient growth management as a means to maintain environmental quality and create more balanced and livable communities<sup>2</sup>. However, plans to accommodate more compact developments (those with higher densities) in predominantly single family neighbourhoods are often poorly received by local residents. Community members frequently associate proposed higher development with loss of property value, increase in crime, and congestion. These types of concerns are usually raised against any increases in density no matter how well or how poorly the project is designed. Yet, ample evidence suggests well designed high density projects can make criminal behaviour more difficult, reduce dependence on the automobile, and increase overall community value.

This research bulletin attempts to document some of the community benefits of well designed higher density infill development projects. It provides an analysis of five case studies within the GVRD where significant neighbourhood intensification has occurred. These studies illustrate different forms of well-designed higher density projects successfully integrated within lower density neighborhoods. They also exhibit resulting benefits including increased public parks and open space, reduction in car use, housing equity, more jobs and services in the neighbourhood, and reduced infrastructure costs.

### **II. Density vs. form of density**

Building density refers to the population occupying a given area of land<sup>3</sup>. It can be measured as number of dwelling units per hectare (uph), applicable only to residential use, and as a floor to area ratio (FAR), applicable to all uses. Both measures can be net or gross; net density includes the parcel size only, while gross density measures the entire development site including streets, open spaces, amenities, etc.

These numerical measurements, though crucial in determining the economics and other quantitative dimensions of site development, fail to convey the qualitative or “look and feel” of a higher density development. While a higher or lower FAR measure indicates higher or lower density, there are a variety of built forms that can share the same measure. High density is not necessarily synonymous to high-rise buildings<sup>4</sup>. Figure 5-1, through an example of three different built forms, all with the same FAR, illustrates how density (its numerical value) and *form* of density can be very different things.



*Figure 5-1: The diagram illustrates three different built forms for a density value of net floor to area ratio (FAR) of 1.0. This means that for every square metre of parcel there is a total of one square metre of building floor area. As shown in the diagram, a building's floor area can be spread across the entire parcel or stacked into storeys and still maintain a FAR of 1.0.*



(a) Arbutus Walk



(b) Capers Block



(c) Oakridge Centre

Oakridge Centre Policy Statement, City of Vancouver



(d) Highgate Village



(e) NewPort Village

Figure 5-2: These five examples of neighbourhood intensification within the GVRD, illustrate different built forms within net densities over 2.0 FAR.

### III. Case Studies: Different forms of density in the Greater Vancouver Region

The following five case studies are examples of neighbourhood intensification within the GVRD. With densities considerably higher than those of their neighbouring areas, the case studies illustrate different built forms within densities above 2.0 net FAR. Each of the completed projects has been well received with few post development concerns about crime, property value, or congestion.

#### *Arbutus Walk, Vancouver*<sup>5</sup>

**10.1 Ha**

This redevelopment of a former brown field site, once the Carling O'Keefe brewery, is an example of neighbourhood densification within a lower density context. With a density of 2.1 net FAR (1.4 gross FAR, 144 gross uph), the development combines 1,450 dwelling units (10% of which are non-market), with 1,000 m<sup>2</sup> for retail and commercial activity. It also includes a greenway that connects the neighbourhood to an adjacent park and senior housing. With low to mid-rise buildings and many separate front entrances and porches, Arbutus Walk blends well into the established single and two-family detached neighbourhoods that surround it.

#### *Capers Block, Vancouver*<sup>6</sup>

**0.5 Ha**

Capers Block in Vancouver's Kitsilano neighbourhood is an example of mixed-use densification on a neighbourhood retail street. It is a low-rise mixed-use building that accommodates 78 dwelling units together with retail and office space for the neighbourhood. The building enhances the street life through a continuous retail street-front and a semi public courtyard. With a net density of 2.5 FAR and 156 uph, Capers Block increases the density of the area, yet integrates well within the surrounding lower density residential neighbourhood.

#### *Oakridge Centre, Vancouver*<sup>7</sup>

**11.3 Ha**

The redevelopment of Oakridge Centre will turn a conventional shopping mall site into a mixed-use neighbourhood. It will combine residential, commercial, and office uses, expand the existing public open space, and improve housing affordability (with 20% affordable housing). A variety of building types, including low-rise, mid-rise, and high-rise buildings, achieve a net density of 2.8 FAR (2.1 gross FAR). Low and mid-rise buildings wall the street responding to the scale of the surrounding community while helping to shape public outdoor spaces. Grouping the towers in two clusters reduces the impacts on views, creates new views, minimizes shadowing on public spaces, and places new residents closer to major public streets with easier access to the proposed Canada line Station. It is the only one of the five projects not yet built at the time of this report but is included here as the best available example of a shopping mall densification or a "grey field infill project."

#### *Highgate Village, Burnaby*<sup>8</sup>

**4.3 Ha**

Highgate Village is an urban redevelopment close to Edmonds, one of three municipal town centres in Burnaby. The former Middle gate Mall site has been transformed into a mixed-use block, combining residential and commercial activity. Highgate Village achieves a density of 3.7 net FAR (2.5 gross FAR) through four high-rise towers, and low-rise residential and retail-commercial buildings. It provides 20% (0.86 ha) of the site for public open space, with a public plaza facing south and a garden that creates a pedestrian east-west connection through the site.

#### *NewPort Village, Port Moody*<sup>9</sup>

**5.5 Ha**

NewPort Village in Port Moody's Inlet Centre is another example of mixed-use neighbourhood intensification at a density significantly higher than surrounding blocks. NewPort Village features a pedestrian friendly environment that provides commercial and office uses and houses 900 new dwelling units. The heart of the neighbourhood is

the village centre, with a market square surrounded by low-rise buildings with retail at ground level and residential units above. Five high-rise towers are located at the edges of the site to avoid overwhelming the street. The density is 3.9 net FAR (2.5 gross FAR, 164 gross uph).

**IV. Results: Density trade-offs**

With densities ranging from 2 to 4 net FAR, the case studies illustrate how these are achieved through different combinations of low-rise, mid-rise, and high-rise building types. When compared to a conventional shopping mall with large parking areas (net FAR 0.3<sup>10</sup>), the density and diversity provided by adequately designed neighbourhood intensifications remediate the monotony of large parking lots and lack of spatial enclosure necessary to maintain street life<sup>11</sup>. In addition to improved built form, some of the other benefits that have been gained as a result of these intensified neighbourhood developments include a net increase in parks and open space in their districts, a reduction in per capita car use, a reduction in infrastructure costs, additional jobs and services close to surrounding homes, and, in some cases, financing for non-market, subsidized housing units for lower income families.

**Increased public parks and open space**

The four neighbourhoods include a variety of public open spaces, comprised of parks, greenways, squares, and plazas. The amount of these - measured as a percentage of the total site area - is higher (in some cases considerably higher) than the standard provision of neighbourhood parks (5 to 10 acres for a ¼ mile radius area, which is 4 to 8% of the area)<sup>12</sup>. Moreover, in all four cases, the intensification projects provided the land and financing for public open space where none had previously existed. In terms of accessibility, in the case study examples all residents are within a 5-minute walking distance to public open space, while in typical suburban areas only 30% of the population is within a 5-minute walk to parks<sup>13</sup>.



(a)



(b)



(c)



(d)

*Figure 5-3: Higher forms of density and parks & open space:*

*(a) The green spine in Arbutus Walk provides pedestrian and bicycle pathways connecting the neighbourhood to Lord Tennyson School and Kitsilano Community Centre.*

*(b) Arbutus Walk provides a variety of park spaces in an attempt to accommodate different needs and age groups.*

*(c) The enclosed public plaza in Capers Block provides urban space for residents of the building and the community.*

*(d) A publicly accessible green roof in NewPort Village provides a view over the village towards the North Shore mountains.*





(a)



Oakridge Centre Policy Statement, City of Vancouver (b)



(c)



(d)

Figure 5-4: Higher forms of density, walkable environments and different housing types:

(a) Narrow internal streets, attractive sidewalks, and pedestrian rights-of-way in Arbutus Walk.

(b) Oakridge Centre redevelopment plans to transform the existing area to a pedestrian environment with wide, double-tread pedestrian walkways.

(c) Apartment homes in low and high rises overlook the Town Square in Highgate Village.

(d) Different housing types in NewPort Village provide opportunities for citizens of different backgrounds and age to live in the same neighbourhood. Low-rise residential units are set back over small shops, and high-rise buildings are set back to avoid overwhelming the street.

### **Reduction in car use**

In these case studies, car use is measured by the weekday household travel behaviour in Auto Vehicle Kilometres Travelled (VKT)<sup>14</sup>. These case study developments have made walking to access daily needs a realistic option. Increasing the neighbourhood density, making viable transit improvements, and, introducing a diversity of uses and appropriate design, make walking and biking feasible transportation options. This results in a reduction in car use per capita, and lowers per capita emissions and fuel consumption. It should be noted that while per capita use of the car decreases as density rises, total aggregate car trips within the district may rise just by virtue of their being so many more people. Even so, this is not always the case. Downtown Vancouver doubled its population between 1990 and 2000 (from 40,000 to 80,000). During this period the total aggregate number of car trips in the downtown actually dropped.

### **Reduction in infrastructure**

The amount of area of street per household reflects a neighbourhood's infrastructure costs on a per capita basis. Generally speaking the higher the density the lower the per capita cost of infrastructure, since a single 400 foot road can serve either 4 dwelling units or 400, but still cost the same. The four neighbourhood developments studied show 6-16 m<sup>2</sup> of paved street per household, which is significantly lower than that a conventional lower density suburban pattern of approximately 132 m<sup>2</sup> paved street per household<sup>15</sup>.

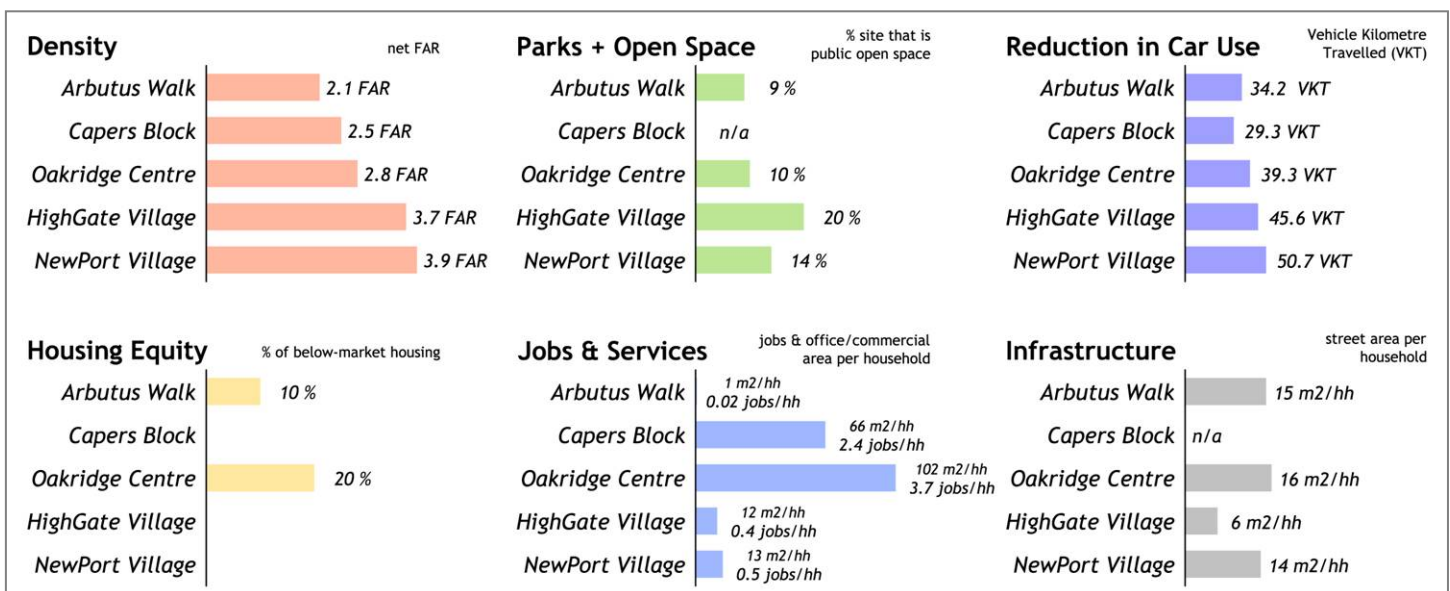
### **Additional jobs and services**

All five case studies are mixed-use developments that include retail, commercial and/or office uses together with residential use. The amount of retail and office space per household (Figure 5-5) indicates both the services available within the neighbourhood

and the job-housing balance<sup>16</sup>. An adequate value for the latter is 1 job per household<sup>17</sup>. In terms of retail types, small local businesses add character to a neighbourhood, but are only viable with higher densities. In NewPort Village, the many small local stores, and absence of conventionally designed big-box retail malls, provide a unique identity to the neighbourhood.

### Housing equity

Providing a range of housing opportunities and choices to accommodate all sectors of the community enhances housing equity and is a key aspect for building complete communities. Higher densities open up the possibility for municipalities and developers to include affordable housing. The percentage of affordable housing in Arbutus Walk and Oakridge Centre would not have been economically viable in a lower density development as the financing for the units was derived from what amounted to a tax on the projects' eventual revenues. Both neighbourhoods also include senior housing, again financed by the project.



## V. Conclusion

Figure 5-5: The bar graphs quantify the density trade-offs related to parks and open space, reduction in car use, housing equity, jobs and services, and infrastructure costs.

The five case studies of neighbourhood intensification in the GVRD provide an overview of different ways of incorporating well designed higher density developments into existing lower density neighbourhoods. They illustrate how, when designed adequately, higher density infill projects can accommodate a growing population and offer measurable benefit to the community. They also show how to successfully accomplish a key Livable Region Strategic Plan objective: *Achieve a Compact Metropolitan Region*. Compact developments can take on a variety of built forms, including low-rises, mid-rises, and high-rises. They can increase parks and public open space, jobs, and services within walking distance of housing. They can result in lower car use and infrastructure costs per household. They can also provide economic means to increase the amount of parks and open space, and provide affordable housing in a community. Finally, they show how density can be custom designed for different community contexts, and how a neighbourhood's quality depends not on the density value per se, but in the design of the form of density.

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**Notes**

- <sup>1</sup> US Green Building Council, 2007, *LEED for Neighborhood Development Rating System Pilot Version*, Developed through partnership of the Congress for New Urbanism, Natural Resources Defence Council, and US Green Building Council, LEED
- <sup>2</sup> Greater Vancouver Regional District, 1996, *Livable Region Strategic Plan*, p.12
- <sup>3</sup> Javier Mozas, Aurora Fernandez Per, 2006, *Density: New Collective Housing*, a+t ediciones
- <sup>4</sup> Javier Mozas, Aurora Fernandez Per, 2006, *Density: New Collective Housing*, a+t ediciones
- <sup>5</sup> City of Vancouver 2003, *Arbutus Neighbourhood*, [www.city.vancouver.bc.ca](http://www.city.vancouver.bc.ca);  
Canada Mortgage and Housing Corporation (CMHC), *The Carlings at Arbutus Walk*, Residential Intensification Case Studies, Built Projects, [www.cmhc.ca](http://www.cmhc.ca); and Design Centre for Sustainability 2006, *Greater Vancouver Green Guide*, School of Architecture and Landscape Architecture, University of British Columbia
- <sup>6</sup> City of Vancouver 1999, *Capers Block - 2211 West 4th Avenue*, [www.city.vancouver.bc.ca](http://www.city.vancouver.bc.ca)
- <sup>7</sup> City of Vancouver 2007, *Oakridge Centre Policy Statement*, Community Services, Current Planning, [www.vancouver.bc.ca](http://www.vancouver.bc.ca)
- <sup>8</sup> Highgate Village, Bosa Properties, [www.highgatevillage.ca](http://www.highgatevillage.ca); and City of Burnaby Planning Projects, Major Projects to August 30, 2006
- <sup>9</sup> Vance, E. and McIntyre, J. 2003, *Building at the Edge: Newport Village* in the Conference "Putting the Urban in Suburban: The Modern Art and Business of Place Making", Markham, ON, February 2003, p.14-17
- <sup>10</sup> Net density of 0.3 FAR in shopping mall site in Lynn Valley Town Centre, District of North Vancouver, BC, 2007
- <sup>11</sup> Christian Norberg-Schulz, 1979, *Genius Loci: Towards a Phenomenology of Architecture*, Rizzoli, New York
- <sup>12</sup> James D. Mertes and James R. Hall, 1995, *Neighbourhood Park, Park, Recreation, Open Space and Greenway Guidelines*, National Recreation and Park Association Printing Office, US
- <sup>13</sup> P. M. Condon and J. Teed, 1998, 71% population with >5 minute walking distance to public open space in Status Quo pattern, Newton, Surrey, *Alternative Development Standards for*

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*Sustainable Communities*, Chapter 2, James Taylor Chair in Landscape and Liveable Environments, University of British Columbia

<sup>14</sup> The VKT data for the five case studies has been obtained using the CMHC Tool for evaluating Neighbourhood Sustainability, Canada Mortgage and Housing Corporation (CMHC)

<sup>15</sup> P. M. Condon and J. Teed, 1998, Paved street surface in Status Quo pattern, Newton, Surrey, *Alternative Development Standards for Sustainable Communities*, James Taylor Chair in Landscape and Liveable Environments, University of British Columbia

<sup>16</sup> The number of jobs has been estimated under the general assumption of 1 job per 300 square feet of retail or office space.

<sup>17</sup> Jobs/Housing Balance, Sustainable City Progress Report, Santa Monica, 2006 [www.smgov.net](http://www.smgov.net)