SUSTAINABLE URBAN LANDSCAPES

Site Design Manual for BC Communities

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Authorship

This design manual was produced in a spirit of collaboration and teamwork by members of the James Taylor Chair under the guidance of the Headwaters Advisory Committee and the City of Surrey's Department of Planning and Development. Joanne Proft was project lead and coordinated the development of all parts of the manual. She was primary author of the Policy and Planning section and the Southeast False Creek, Burnaby Mountain Community, and East Clayton charrette case studies. Jackie Teed is recognized for her contributions to the Riverwalk case study and for her creative work on the design guidelines in Part Three. Jackie "reverse engineered" the charrette case study strategies from Part Two into the design guidelines and distilled them into their coherent format. Sara Muir is recognized for her careful work in producing the Introduction, Air, Water and People sections, and for her assistance on the design guidelines. Angela Gonyea is acknowledged for her creativity in establishing much of the graphic language embodied in the book illustrations as well as for producing many of the diagrams found throughout the book. Additional thanks are given to research assistants Katherine Isaac, Chris Midgley, Sherry LaRue, Peter Williams, Justen Harcourt, Geoff England, Ivy Tzur, Michael Enns, Dolores Altin, Myles Mackenzie and Shana Johnstone. Finally, Patrick Condon took leadership in establishing the goals, objectives, scope, and graphic language of the project. He also reviewed and edited all drafts produced by the project team.

*Government resource management agencies support the development and application of low impact development principles and design standards in new communities. In addition to supporting innovative sustainability pilot projects such as the East Clayton/Headwaters project, many of these agencies also have decision-making roles with respect to the four case studies presented in Part One. These studies are provided strictly for the purpose of illustrating different types of charrette design processes and outlining lessons learned from each. Their inclusion in this document in no way condones the acceptability or sustainability of any subsequent development proposals resulting from the design charrettes.

PREFACE

The Site Design Manual for BC Communities is rooted in several recent and extensive efforts to develop alternative development and engineering standards for the design of new (and for the retrofit of existing) communities in British Columbia. With the cooperation of citizens, government organizations, and related agencies, these efforts have been motivated by a shared belief that integrated processes and principles are crucial ingredients in the development of more sustainable communities and urban regions.

It is within our reach to create regions that can be maintained in the future and that are healthy for all living things. Certain new and, in some cases, revived practices are all that are required. Government and citizens are cognizant of this need for change and are making it happen. Provincial, federal, and regional jurisdictions, along with concerned citizens and public interest groups, have come together to implement an important shift in the way our new and revived neighbourhoods are built.

The Headwaters Project

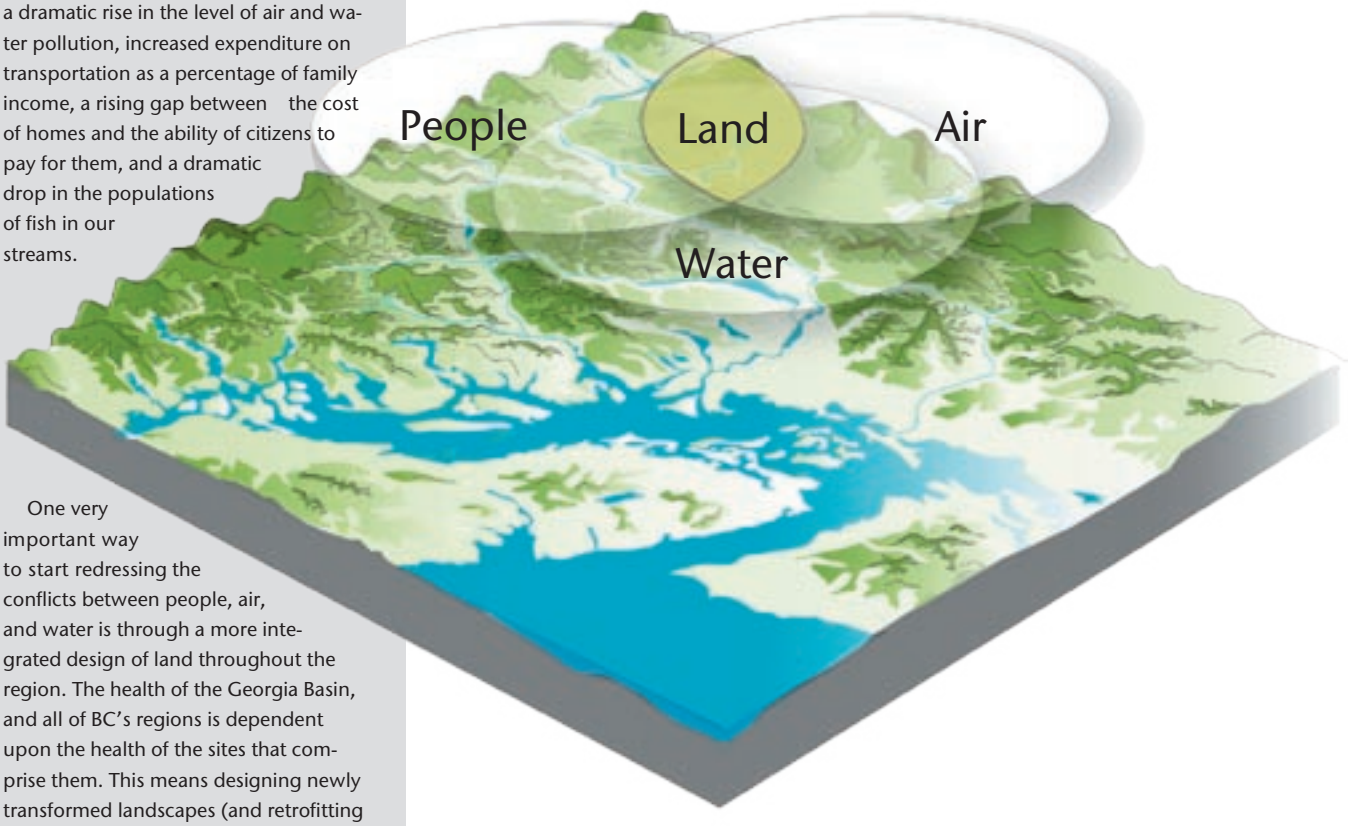
The genesis of this manual was the Headwaters Project, a multi-agency initiative to develop a model for more sustainable communities both within the Lower Mainland and beyond. The first and most important component of the Headwaters Project is the East Clayton Neighbourhood Concept Plan (NCP) for Surrey, British Columbia. Developed over the course of two and a half years (between 1999 and 2001), the East Clayton NCP was conceived as a template for designing more sustainable communities throughout British Columbia. The NCP used seven principles as the basis for developing a new community for 13,000 persons in the municipality of Surrey. These seven principles evolved through previous partnerships between the City of Surrey, the UBC James Taylor Chair, and various government and related agencies. The plan for East Clayton, as well as the process by which it was derived, represent a significant departure from status quo standards of planning and development. Its component parts were conceived as an integrated set of strategies that were to be applied holistically to the East Clayton site. For example, the effectiveness of the proposed ecological infrastructure system – which is intended to secure ecosystem function – depends upon the integration of the street network and reductions in impervious surface areas throughout the site. Similarly, issues of density, land-use integration, and street connectivity are expected to reduce automobile dependency while having a positive influence on neighbourhood walkability. The Plan's individual performance standards and guidelines are to be understood as mutually supportive and symbiotic elements of a larger whole. In this respect, the Headwaters Project offers one solution for meeting our need to densify our metropolitan regions and protect and maintain our precious environmental assets.

An important goal of the Headwaters Project was to document the principles, processes, and outcomes of the *East Clayton Neighbourhood Concept Plan* to provide a template for communities confronting similar issues and challenges. This manual is an important step in achieving this goal.

WATER, AIR, PEOPLE, LAND

The Georgia Basin is one of British Columbia's many unique and environmentally sensitive bioregions. The coastal bioregion is shaped by the dramatic peaks of the Olympic and Vancouver Island ranges on its south and west, and the Coast and Cascade ranges on its north and east. It is home to a rich diversity of ecological systems – systems that have supported human settlement for more than 10,000 years.

Unprecedented urban growth over recent decades has stressed the bioregion's natural systems, resulting in a dramatic rise in the level of air and water pollution, increased expenditure on transportation as a percentage of family income, a rising gap between the cost of homes and the ability of citizens to pay for them, and a dramatic drop in the populations of fish in our streams.



One very important way to start redressing the conflicts between people, air, and water is through a more integrated design of land throughout the region. The health of the Georgia Basin, and all of BC's regions is dependent upon the health of the sites that comprise them. This means designing newly transformed landscapes (and retrofitting existing ones) to respect and potentially enhance natural function and human quality of life. It means ensuring a healthy habitat for humans and other living things, ensuring a fair distribution of services and infrastructure among all communities, and providing quality affordable homes for citizens, while also preserving opportunities for future generations to enjoy these same benefits.

As the image above makes clear, we live on a dramatic but limited landbase. The interconnected systems of water, air and people – on the land – must first be seen and understood as an integrated whole before citizens and their elected leaders can act intelligently to protect them. This manual is intended to assist in building this understanding.

PART ONE
Setting a Context

Managing urban growth in British Columbia has become an increasing challenge. Over the past decade, British Columbia's population expanded by an average of about 65,000 persons per year. Over the next ten years, the population of our province is expected to grow from 3.9 million to beyond 4.7 million. This rapid growth has brought with it unprecedented demand for new homes, water, roads, shops, and places to work.

To meet this demand, many communities endlessly replicate the "status quo" suburban development pattern of large-lot, single-family homes located in car-oriented districts far from jobs and services. Although the typical suburban pattern successfully met post-war housing demands, it did so at a cost and now needs changing. It is clear that uncontrolled suburban sprawl has wasted precious land, cost our families more money than it should, increased the tax burden for succeeding generations, and doubled the per capita production of greenhouse gases (as compared to that produced by the inhabitants of pre-Second World War developments). It is now clear that standard post-war development patterns are at odds with provincial policies aimed at increasing regional sustainability. It is also clear that the replication of this pattern has far-reaching implications for the purity of our water and air, for our standard of living, and for the quality of our lives.

Who Is This Manual For?

This manual is intended for people interested in making better communities: citizens, elected officials, government regulators, NGOs, and those who plan and build new homes and communities. Unlike traditional design and engineering manuals whose treatments of site development, environmental protection, and drainage guidelines are presented separately and often in language exclusive to their intended audience, this manual tries to keep all of the pieces of the urban design puzzle together. We do this in order to avoid problems that have arisen when issues have been "disintegrated"; that is, when transportation planning has been discussed without reference to land-use; when storm drainage engineering has been discussed without reference to stream habitat protection; and when engineering and subdivision standards have been discussed without reference to economics.

This manual "re-integrates" these pieces of the sustainable urban region. As many of us now know, a sustainable community is one that balances ecology, economy, and equity. We have tried to maintain this balance in the way we have developed and organized this manual.

Organization

Part One begins with a review of current development trends and their effects on the interrelated components of our regional landscapes: water, air, and people. This is followed by a brief overview of the emerging policy and legislative context for sustainability within British Columbia. Part One ends with a discussion of four projects in the Lower Mainland where a design charrette was used to vision and plan a new community according to sustainable development principles. We feature the design charrette because it is one particularly effective model for overcoming the institutional barriers and regulatory gaps that impede the adoption of more sustainable local policy. While each project used the charrette differently, all were guided by very specific institutional and regulatory frameworks that supported sustainability.

Part Two documents the methodology for developing the Design Guidelines (featured in Part Three). In culling the scores of design ideas emerging from the four charrettes, we developed a **Taxonomy of Urban Sites**, which became the means for first organizing, and then communicating, the various components that make a sustainable community. The Taxonomy is informed by four tenets of sustainability – **green infrastructure, social infrastructure, movement, and cost** – and by four scales of urban design – **district, corridor, block, and parcel.** The design ideas that emerged from each of the charrettes in Part One are categorized according to the Taxonomy in the form of **Strategies**.

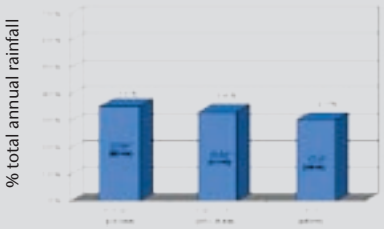
Together, the charrette Strategies and Taxonomy provide the methodological basis for **Six Overarching Principles** of sustainable community design, outlined in Part Three. These Principles were reverse engineered from the charrette Strategies and the years of policy development and research that preceded them. Together, they constitute a valid and defensible "first set" of principles for rethinking how our communities are designed.

Flowing from this process of sifting, sorting, and reverse engineering, and organized under Six Overarching Principles, are the **Design Guidelines**. It is important to emphasize that in order to achieve the highest degree of balance between ecological and urban systems, the Design Guidelines are not presented as fixed, prescriptive sets of instructions, but rather as a menu of options for adapting to each distinct site type and situation at the scales of the district, corridor, block, and parcel.

The manual concludes with a research and action framework for continuing our collective progress toward more liveable, affordable, and ecologically sound communities.

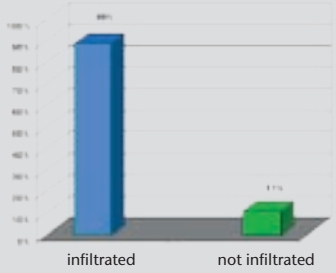
Water

Percentage of Total Annual Rainfall Attributable to Minor, Moderate and Substantial Rainfall Events.



In many areas of the Greater Vancouver Region, the majority of annual rainfall on a site is from minor and moderate (i.e., less than 1"/24 mm) rainfall events. Source: Kwantlen Park Raingauge data from Jan 1, 1962 - May 1, 1995. Surrey, BC, 1995.

Annual Rainfall Potentially Captured with a System that can Absorb 1"/24mm every 24 Hours.



Stormwater management systems designed to absorb 24mm (1 inch) per day, such as the East Clayton Infiltration System, will absorb almost 90% of all the rain that falls on a site. Infiltrating rain water ensures stream base flows are supported, stream peak flows are reduced, and flooding downstream is eliminated. Infiltration systems maintain the hydrological cycle of the soil and ensure that groundwater is recharged at pre-development rates. Infiltration is the single best way to protect most aquifers from depletion (and streams from degradation).
Source: City of Surrey Department of Planning and Development et al., East Clayton Neighbourhood Concept Plan, Section 6.

Right – Lost Streams of Vancouver
In many of our older urban environments, natural stream systems no longer exist. In the map of Vancouver on the near right, dashed lines represent the streams that used to flow overland. Today, over 95% of Vancouver's original stream systems flow through pipes buried beneath sidewalks and streets. Source: Fisheries and Oceans Canada, Fraser River Action Plan.

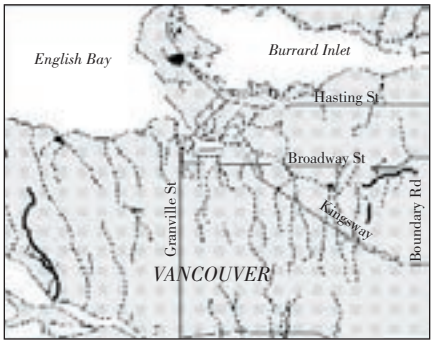
Urbanization causes significant changes to natural stream channels and hydrological function. Even on the "RainCoast" of British Columbia, the piping and channelling of stormwater runoff creates desert-like conditions in urban environments. Conventional stormwater management techniques disrupt surface flow and eliminate the opportunity for groundwater recharge. As a result, aquifer levels drop and streams dry up. When large rainfall events do occur in this artificially arid zone, severe flooding results, scouring what streams remain with up to a twentyfold increase in stormwater volume during storm events.

Water Quantity
It is only recently that we have learned that fish are more susceptible to water quantity changes than to water quality changes. As a consequence of the disruption to urbanized watersheds, the fish-bearing capability of virtually all of our urbanized stream systems has been destroyed. In the City of Vancouver alone, only six of the original sixty salmon-bearing streams still provide habitat.[1]

But it does not have to be this way. If we simply change the instructions we give to our engineers and ask them to infiltrate rain into the soil rather than to send it to streams through pipes, we could protect our urban streams, protect fish, and save money. For instance, the vast majority of rain that falls in many parts of the Greater Vancouver Regional District (GVRD) is in the form of frequent but small storm events (i.e., storms that deliver less than twenty-five millimetres of rain within twenty-four hours). These events also dominate in most other parts of the province. Systems that aim to capture and infiltrate this rainfall can reduce the amount of stormwater runoff from the site by nearly 90%. Infiltration systems, wherein rainwater is absorbed naturally into the ground, ensure that stream base flows are supported, reduce stream peak flows, and reduce flooding downstream. Such systems maintain the hydrological cycle of the soil and ensure that groundwater is recharged at pre-development rates. Infiltration is the single best way to protect most aquifers from depletion and streams from degradation.

Streamside vegetation also plays an important role in preserving soils, retaining nutrients, protecting in-stream habitat, and ensuring food supply for fish. Some studies indicate that thirty metres of streamside vegetation on both sides of any given watercourse is required in order to maintain a healthy riparian corridor. Such a canopy cover of riparian vegetation shades streams and helps to moderate water temperatures. Insects that reside in this vegetation also provide a constant source of food for fish. Fallen trees and branches provide cool resting places for fish as well as protection from predators. Roots and fallen trees reduce the energy of flowing water, which in turn helps to secure stream flow and to stabilize streambanks. Riparian plants bind soils in place and trap moving sediment, actually replenishing healthy soil and reducing erosion. During times of rising floodwater, vegetation filters surface runoff and slows overland flow. Slow-moving water then has more time to soak into the soil.

In healthy, well managed watersheds, stored groundwater is released back into the stream during periods of dry weather. If this hydrograph – which is dependent upon a healthy riparian corridor, interflow, and ground water recharge – is not maintained, then the stream channel will wash away or dry up. Even the riparian vegetation of non-fish-bearing parts of a stream plays a role in fish habitat. Upstream areas provide important food and nutrient sources, and they help to maintain the quality and quantity



of water flow downstream. These intermittent portions of streams are extensive throughout our regions, which makes them very difficult to protect when development occurs.

Water Quality

Non-point source (NPS) pollution – which includes pathogens, oxygen-depleting substances, nutrients, sediments, and toxins – has been identified as the major cause of water quality degradation. Urban land use and development plays a significant role in NPS pollution. Sprawling suburban development not only increases this pollution through erosion and sedimentation from land clearing and excavation, but also from related land-use activities; impermeable surfaces (i.e., roads, driveways, and parking lots that prevent the infiltration of water into the soil) generate large amounts of stormwater runoff and with it a host of NPS pollutants.

Our vehicles are largely responsible for such contaminants as oil, paint, lead, and organic compounds, not to mention toxic gases and particulates that are released into the atmosphere. Currently, the amount of petroleum residues washed off streets, highways, parking lots, and industrial sites each year exceeds the total worldwide spillage from oil tankers and barges.[2]

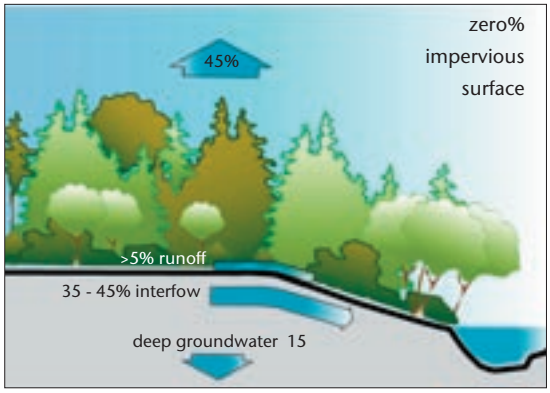
Nonetheless, per capita car use and per capita pavement allocation continues to rise, leading to even higher per capita pollution. Furthermore, low-density sprawl means that water quality is impacted over ever wider areas.

Thankfully, considerable research shows that integrated infiltration and evaporation/transpiration practices provide a cost effective alternative to conventional stormwater infrastructure. The benefits of these practices are that they:

- capture "first flush" pollution (which comes from small storms after long dry periods and contains the greatest number of pollutants)
- maintain "pre-development" peak rates of infiltration and evapotranspiration (as well as total water volume discharged into streams)
- protect existing dry-season base flows

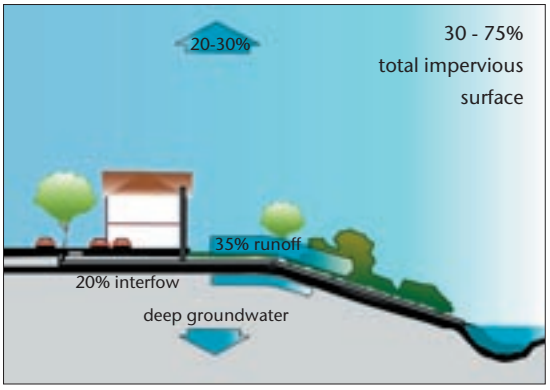
Such practices can also greatly reduce the pollution from urban stormwater and are typically more cost-effective over the long term than conventional infrastructure. In addition, they can increase habitat quality, add to the natural amenity of a community, and serve such multiple purposes as passive recreation and community education.[3]

The Hyrdological Effects of Urbanization[4]



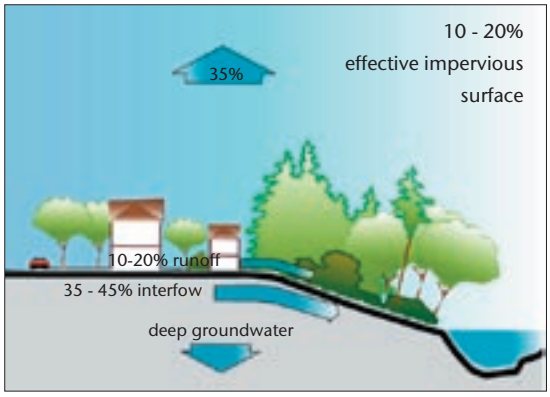
Pre-development hydrology

Streams are simply the manifestation of the infiltration performance of the soils in the watershed and the evapotranspiration performance of its vegetation. In a naturally functioning hydrological cycle, the majority of the rain that hits the site infiltrates the soil. Most of this infiltrated rainwater replenishes streams (through subsurface interflow), and some replenishes the deeper groundwater aquifer. Less than 5% actually flows across the surface as runoff. Maintaining predevelopment rates of infiltration (and thus virtually eliminating runoff) after development is essential if streams are to continue to survive.



Post-development (Conventional)

In conventional development, rainwater falling on a typical street cross-section is trapped between street curbs and cannot pass to the roadside soil. From the inlet grate on the street, almost all stormwater that falls moves via pipes that get progressively bigger until it is finally discharged into a stream, usually at velocities and volumes many times greater than those to which the stream has adjusted. The cumulative effects of this concentrated and artificial flow of water include increased flood potential, destabilized stream banks, increased water pollution, and reduced groundwater levels.



Post Development (Alternative)

Alternative development that limits impervious surface area achieves a much higher rate of infiltration than conventional development. Narrower streets, smaller building footprints, and riparian vegetation with continuous tree cover work together to mimic the natural hydrology of the site. Urbanizing an area without destroying streams, and the habitat necessary for fish survival, requires virtually all of the infiltration naturally occurring in the watershed to be maintained.

Notes:

1 Ministry of Environment, Lands and Parks, *Tackling Non-point Source Water Pollution in British Columbia*: An Action Plan (Victoria, BC: Ministry of Environment, Lands and Parks, 1998), 10.

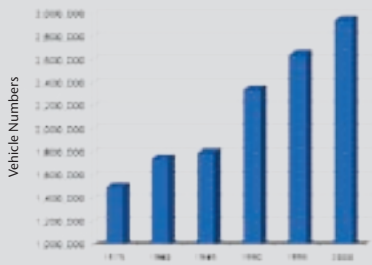
2 William Marsh, *Landscape Planning: Environmental Applications* (New York: Wiley, 1998).

3 A Pacific Northwest example of an open drainage infiltration system that has been successfully implemented is found in Bellevue, Washington. Implemented in the mid-1980s to mitigate the effects of flooding, the system cost a fraction of what a conventional piped-system would have cost and has successfully managed storms in excess of 100 year levels. In addition, the infiltration technologies have assisted in the protection of riparian areas, which continue to support salmonid fish populations. See C.L. Girling and K.L. Helphand, "Retrofitting Suburbia: Open Space in Bellevue, Washington, USA," *Landscape and Urban Planning 36* (1997): 301-33.

4 Various sources suggest a range of quantities for the performance of rainfall on forested and urbanized landscapes. The diagrams shown reflect the average, and most likely, performance expected on most landscapes within the lower mainland region and Georgia Basin. Please see: Environmental Protection Agency, "Guidance Specifying Management Measures for Sources of Nonpoint Source Pollution in Coastal Waters", #840-B-92-002 (Washington, DC: USEPA, 1993); Marx, Josh, et. al, *The Relationship Between Soil and Water: How Soil Amendments Aid in Salmon Recovery*, (Seattle, Washington: King County Department of Natural Resources, 1999); and CMH2Hill, *Provincial Stormwater Planning Guidebook* (Vancouver, BC: Department of Fisheries and Oceans, Ministry of Water, Land and Air Protection, Draft June, 2001): 6-22.

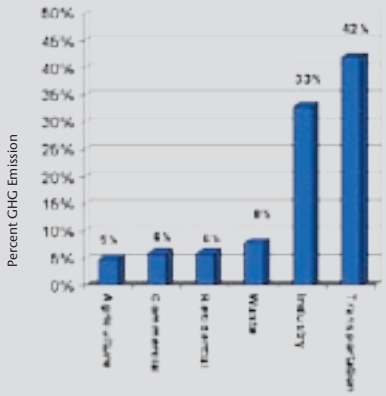
5 The increase in impervious surface cover results in detrimental effects towards stream ecosystems. Urban streams have become a gauge to the degree of disturbance by urbanization, facilitating better landscape management. See Michael J. Paul and Judy L. Meyer, "Streams in the Urban Landscape," *Annual Review of Ecological Systems 32* (2001): 333-65.

Passenger Vehicle Increase in Vancouver



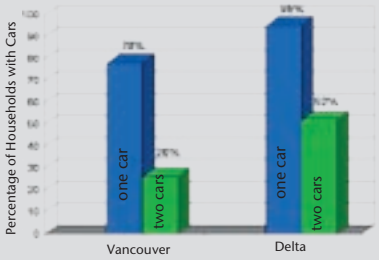
Vehicle numbers are based on the total ICBC Autoplan policies in effect. The steady growth in policies mirrors the increased traffic on Vancouver's roads.
Source: ICBC Statistics, 2000.

BC's Green House Gas (GHG) Emissions by Sector



Compared to other land use sectors, transportation is the largest and fastest growing source of GHG emissions in BC
Source: BC Ministry of Environment, Lands and Parks. Environmental Trends.

Car Ownership per Household



Car ownership per household is less in our urban communities, such as Vancouver, while in our suburban communities, such as Delta, almost all households rely on one or more cars.
Source: Statistics Canada. Canada Census 1996.

Air

One of our region's major air quality challenges is photochemical smog, which forms mainly in the eastern portions of the GVRD and Lower Fraser Valley during hot summer days.[1] The primary unhealthy ingredient in smog is "ground-level ozone." Ground-level ozone is produced through a reaction in the atmosphere between sunlight, nitrogen oxides, and volatile organic compounds from industrial and vehicle emissions. Elevated levels of ozone can cause respiratory problems for people and can damage vegetation, including agricultural crops.[2]

A second major air quality challenge is the atmospheric concentration of greenhouse gases (GHG), the accumulation of which influences global climate.[3] For British Columbia, global climate change could lead to rising sea levels and flooding, more frequent and severe weather events, and further declines in fish populations.[4]

The increase in automobile use due to urban sprawl significantly influences smog and GHG emissions. In British Columbia, transportation is the largest and fastest-growing source of GHG emissions, accounting for 41% of the current provincial total.[5] Within the GVRD, passenger vehicles alone account for 40% of the ozone smog in the Lower Fraser Valley Airshed.[6] Conventional suburban development brings with it a deep dependence on the automobile and results in a doubling of per capita vehicle kilometres travelled (VKT) per person per day.[7] Yet research also shows that North Americans will leave their cars at home if services and frequent transit are available within a five-minute walking distance.[8]

Mitigating Smog and GHG

In the metropolitan area of Vancouver, which has an average density of around forty units per hectare (sixteen units per acre), 22% of households do not own a car. The average car ownership per dwelling unit is approximately 1.2.[9] In Surrey and Delta – less dense areas of our region – the average car ownership per dwelling unit is approximately 1.8[10] and only 5% of households do not own a car. The number of households with two or more cars in Vancouver is 26%, while in Surrey and Delta it is 52%.[11] This is not simply a matter of residents of Surrey or Delta having more discretionary income than residents of Vancouver. The average annual income for a Vancouver resident is $40,354, while the average annual income for a Surrey resident is $34,598.[12] The dramatic difference in car ownership is explained by the fact that sprawling post-war communities such as Surrey and Delta are designed in such a way that one has no choice but to use a car. Conversely, residents of more compact pre-war urban communities such as Vancouver can meet many of their daily needs by walking or taking transit. Studies show that people living in communities with densities of twenty-five units per hectare (or ten units per acre), an interconnected street system, integrated land uses, and viable connections to local and regional transit contribute an average of 40% less GHG per capita on average than their suburban counterparts.[13]

Notes:

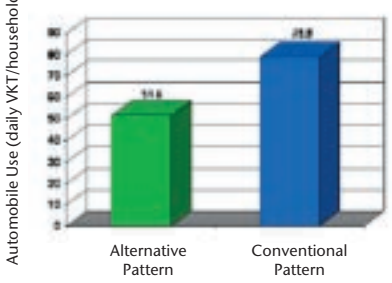
[1] Greater Vancouver Regional District, Air Quality Management Plan (Burnaby, BC: Greater Vancouver Regional District, 1994).
[2] Ibid.
[3] Ministry of Environment, Lands and Parks, British Columbia Climate Change Business Plan (Victoria, BC: BC Ministry of Environment, Lands and Parks, 2000), 2.
[4] Ibid.
[5] Ibid.
[6] Greater Vancouver Regional District, Air Quality Management Plan (Burnaby, BC: Greater Vancouver Regional District, 1994).
[7] See Canadian Mortgage and Housing Corporation, Greenhouse Gas Emissions from Urban Travel: Tool for Evaluating Neighbourhood Sustainability (Ottawa: CMHC/SCHL in partnership with Natural Resources Canada, 2000); or ibid., CMHC Research Highlight #50 (Ottawa: CMHC/SCHL in partnership with Natural Resources Canada, 2000). Both available on-line at: <http://www.cmhc.ca/publications/en/rh-pr/index.html>
[8] BC Transit, Transit and Land Use Planning (Vancouver: BC Transit Long Range Planning, 1994).
[9] Statistics Canada, Census Data, 1996.
[10] Ibid.
[11] Greater Vancouver Regional District, Livable Region Strategic Plan (Vancouver: GVRD, 2000).
[12] British Columbia Statistics, Income Profiles, 1996.
[13] See Criterion Engineers, Planners, The Benefits of Neotraditional Community Development (Portland, OR: Criterion Engineers, Planners, 1996), 18.

The Lower Fraser Valley Air Shed
The unique geographical features of the Lower Fraser Valley, along with the sea-to-shore breezes off the Strait of Georgia, restrict air-flow patterns and contribute to the region's ozone problem. Here, 80% of the smog is generated locally. Motor vehicles in the Vancouver area are the major source of NOx and VOC emissions.

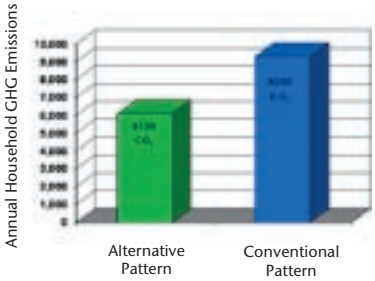
The Suburban Pattern
Conventional suburban development is characterized by single use development and is usually dominated by low-density housing, cull-de-sacs, and curvilinear streets connected to wide arterials. Its hierarchical street configuration means that even short trips are made by a car. Building more of the same kind of communities means building more (longer and wider) roads. Building more roads means more people are forced to drive, trips get longer, and air pollution increases.

The Alternative Pattern
Interconnected streets in a grid, or a modified grid pattern (as shown in this detail from the East Clayton Neighbourhood Concept Plan), provide multiple and alternative routes for moving through a community. Research shows that, in combination with higher than average household densities (i.e., above 25 units per hectare), a high degree of mixed land-use (including local employment opportunities), and access to frequent transit service, choice of travel mode increases and vehicle kilometres travelled can be significantly reduced.

Comparing Urban Travel Behaviour



Comparing GHG Emissions



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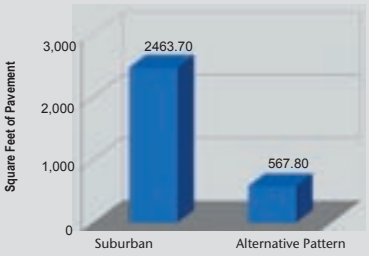
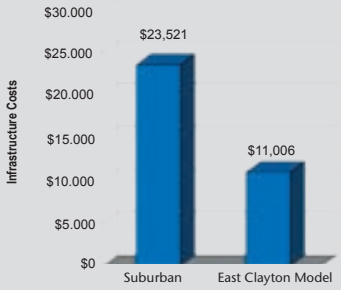
Using a software modelling tool, urban travel behaviour and GHG emissions are compared. As shown, average suburban weekday automobile use (in km/day) and GHG emissions are over 35% more than an equally sized alternative pattern. This is largely due to the alternative pattern's higher residential densities (approximately 25 units per hectare), higher employment densities, integrated streets, and frequent access to transit.
See Canadian Mortgage and Housing Corporation, Greenhouse Gas Emissions from Urban Travel: Tool for Evaluating Neighbourhood Sustainability or Research Highlight #50 under the same title.

Comparing Square Feet of Pavement



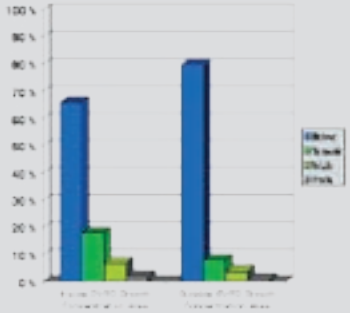
Conventional suburban development has four times more pavement per capita than the pre-war 'traditional' neighbourhood pattern.
Source: Condon and Teed, Alternative Development Standards.

Comparing Infrastructure Costs



The design of the neighbourhood can dramatically influence the cost of infrastructure. Because of their much more efficient use of land and higher densities, alternative development patterns can reduce infrastructure costs per dwelling unit by as much as $12,000 – less than half the cost per dwelling unit of a typical suburban development.
Source: Condon and Gonyea, "Status Quo Standards versus an Alternative Standard."

Comparing Modes of Travel



Within the Greater Vancouver Regional District (GVRD), people inside the Growth Concentration Area (GCA) drive less and walk, cycle, or use transit more than people outside the GCA. Source: Greater Vancouver Regional District, *Annual Report*.

People

Until recently, Canadian suburbs provided many people with a quality of life that they could not have afforded in urban centres. Suburbs offered young families ground-oriented homes at an affordable price, with easy access to schools and shops. In today's suburbs, jobs are increasingly available, with employment centres gradually going to where the people are located. As suburbs fill in, more and more public services are being provided, including improved transit services, shopping, schools, and important social amenities, such as parks and community centres. Many of our suburbs are socially and ethnically diverse and defy stereotypes of suburban homogeneity. In addition, our newer suburban communities still have the opportunity to protect and enhance habitat and the natural environment.

However, developable land in our region is in increasingly short supply, and the current suburban development pattern consumes three times more land per capita than did traditional pre-war neighbourhoods. This means that average suburban dwellers now have up to five times more pavement per capita than in more traditional urban neighbourhoods.[1] This has led to a corresponding increase in the impact, per person, on both the environment and the public purse. Automobile-centric communities and their associated separated land-uses create barriers to affordable housing (i.e., they result in suites and duplexes being illegal in most areas) and mean that one needs a car to satisfy even such minor needs as buying a loaf of bread or a litre of milk.

Infrastructure and Development Cost Charges: Affordability

The cost of building and maintaining the infrastructure of storm drains and arterial roads neccessary to support conventional suburban development is also reflected in the development cost charge (DCC) on new development and, in turn, in the cost of our new homes. DCCs are a one-time charge against single-family units or individual dwelling units in strata structures and can range up to almost $20,000 per dwelling unit.[2] The fees collected are used to pay for drainage, roads, and parks beyond the development site to serve new residents. The trend towards ever more expensive infrastructure, along with wider and more numerous roads to accommodate the near doubling of suburban per capita road use, has elevated DCCs and has had a significant impact on housing affordability. In addition, the replacement and upkeep costs of our overextended low-density infrastructure is consuming an increasing share of the municipal budget.[3] This scenario suggests that, over the long term, low-density sprawl is unsustainable without excessive new taxes. While favouring development within existing urban areas, where infrastructure costs are lower due to existing networks, DCCs currently act as a barrier to implementing more sustainable new communities. This is particularly the case in emerging urban areas outside the urban core — areas where the majority of our region's growth is occurring.[4]

Segregation of People by Income and Class

The rise of suburban car-dominated expansion also marks the rise of enforced segregation of land uses by activity (commercial versus residential), and residential density (low-density, single-family dwellings versus multi-family dwellings). Our cities have always contained areas dominated by people of means as well as areas dominated by people of much more modest resources. Currently, large areas of our cities are often zoned to eliminate housing diversity. Consequently, opportunities for social mixing are regulated out of existence within very large urban districts and even, in some extreme examples, within entire municipalities.

Providing different dwelling types (a mix of housing types, including a broad range of densities from single-family homes to apartment buildings) in the same neighbourhood, or even on the same street, can increase diversity and help to ensure a range of homes for a range of personal incomes. For example, a 3,000 square-foot lot might have a 6,000 square-foot lot on one side and a 4,000 square-foot lot on the other. One or more of these lots might have a duplex on it or include a secondary rental suite. This simple approach dramatically increases the affordability of homes on a given street and offers a socially diverse neighbour-hood that is capable of accommodating a variety of income levels. The value of this mixed parcel/mixed house approach has been amply demonstrated in older Vancouver neighbourhoods. Large areas of Vancouver contain wide ranges of house types within a one-minute walk from each other. People

Left
The automobile has provided British Columbians with freedom of motion and access to distant locations. Yet the unintended consequences of our car dependence are becoming painfully obvious. When all trips are by car, congestion is not just a nuisance, it is a curse. Yet, in too many suburban communities, daily needs can only be met in commercial districts that lie along busy arterials.

of various incomes mix casually and naturally during their daily routine.

The Automobile: Servant or Master?
The health of a community can be measured by the number of amenities located within walking distance. As one study notes, "when the necessities of daily life are located within walking distance, there will be community."[5] By this standard, the typical suburban community is far from well — largely because walking has become both unpleasant and dangerous. Recent studies indicate that the formation of social ties does not correlate to neighbourhood density but does correlate very strongly to the degree to which residents walk.[6] Sprawl and its associated automobile dependence decrease the opportunity for pedestrian traffic, resulting in less lively, less socially active streets. In addition, wide, curvilinear streets, which are typical of suburban communities, have a significant relationship to car-related injuries. In fact, as street width increases, there is an increase in accidents per kilometre per year.[7] As a result of unpleasant and unsafe streets, the number of adults and children walking to school and to work has declined dramatically since the 1970s. Although it used to be the most common way of getting around in cities and towns, today, only a small percentage of all trips are on foot.[8] Census information from 1996 indicates that only 6.6% of work trips within the GVRD's Growth Concentration Area (GCA) were on foot, while outside the GCA walking trips were even lower, garnering only 3.9% of the total mode split.[9]

Furthermore, in our suburbs driving and parenthood have become inextricably connected. Dispersed development causes parents to spend more than an hour a day driving. Whether they work or not, women with children now make an average of five car trips per day — 20% more than the average for all women and 21% more than the average for men.[10]

The proportion of people walking to work and taking transit is significantly higher in downtowns and regional centres than it is in less dense suburban areas. In the GVRD, 50% of work trips to downtown Vancouver are made by transit, walking, or cycling.[11] A study comparing automobile costs incurred in different cities close to shopping, jobs, and good public transportation spent from $2,000 to $4,000 less than the regional average for transportation of all kinds.[12] The study concluded that the savings were due to the availability of public transportation and city layouts that were amenable to walking.

Cars have clearly provided British Columbians with freedom of motion and access to distant locations — something that was not enjoyed by our grandparents. However, the unintended consequences of our car dependence are becoming painfully obvious. When all trips are by car, congestion is not just a nuisance, it is a curse. Between 1985 and 1996, GVRD rush-hour conditions worsened for regional commuters. On routes crossing the north and south arms of the Fraser River, peak hour travel increased by an average of almost 60%. In addition, the periods of rush-hour congestion are spreading over longer time periods, with hourly increases on the most congested routes of 60% to 80%.[13]

Car use is also endangering children in suburbs at rates four times greater than children in traditional communities. Transportation is now costing the average suburban family almost as much as housing, and this cost is continuing to grow.[15]

Yet, communities can be designed in such a way that the car is not the only option. Managing with one car rather than two, families can save up to $8,000 per year[16] – $8,000 that can be used for college education, a better home, or a more secure retirement.

Notes:

[1] Condon, Patrick, and Jacqueline Teed, Alternative Development Standards for Sustainable Communities (Vancouver: UBC James Taylor Chair in Landscape and Liveable Environments, 1997).
[2] In the GVRD, DCCs average about $10,000 per residential unit, with the City of Surrey having the highest rate, which is over $19,000 per unit.
[3] Patrick Mazza and Eben Fodor, Taking Its Toll: The Hidden Costs of Sprawl in Washington State (Seattle: Climate Solutions, 2000).
[4] Despite the often much lower DCC rates within higher-density areas of the GVRD, in 1999 43% of new urban residential development occurred in Surrey's emerging urban areas, which are located outside of the GVRD Growth Concentration Areas. See City of Surrey Corporate Report No. C014, 6 November 2000.
[5] Ray Oldenberg, quoted in Linda Baker, "Growing Pains/ Malling America: The Fast-Moving Fight to Stop Urban Sprawl," E Magazine 9 (3).
[6] Lance Freeman, "The Effects of Sprawl on Neighbourhood Social Ties," Journal of the American Planning Association 67 (1): 69-77.
[7] Peter Swift, Residential Street Typology and Injury Accident Frequency (Longmont, CO: Swift and Associates, 1998).
[8] The 1992 Greater Vancouver Region Travel survey indicates that an average of 14% of all trips are made by foot and/or bike. See Greater Vancouver Regional District, 1992 Travel and Demographic Characteristics (Burnaby, BC: GVRD, October 1997), 8-9.
[9] Greater Vancouver Regional District, 2000 Annual Report: Livable Region Strategic Plan, (Burnaby, BC: VRD, 2000), 29.
[10] Surface Transportation Policy Project, High Mileage Moms (Washington, DC: STPP, 1999).
[11] Greater Vancouver Regional District, 2000 Annual Report, 30.
[12] Barbara McCann, "Driven to Spend, Sprawl and Household Transportation Expenses," (Washington, DC: Surface Transportation Policy Project/Center for Neighborhood Technology, 2000), 10.
[13] Greater Vancouver Regional District, 1996 Vehicle Volumes, Classifications, and Occupancies (Burnaby, BC: 1997), 10-11.
[15] McCann, "Driven to Spend," 17; Patrick Mazza and Eben Fodor, Taking Its Toll: The Hidden Costs of Sprawl in Washington State (Seattle, Washington: Climate Solutions, 2000).
[16] Canadian Automotive Association, Driving Costs 2001 (Ottawa: CAA, 2001), 1.

"A healthy environment and a healthy economy are essential to the social, cultural, material, physical and spiritual well-being of British Columbians. Furthermore, the Province recognizes its obligation to protect, manage and use its resources and environment to fulfil its responsibiltiy to global well-being. Finally, the Province shall ensure that present-day decisions do not compromise the abiltiy of future generations to meet their own environmental and economic needs."

- Finding Common Ground : A Shared Vision for Land Use in British Columbia, Commission on Resources and the Environment, 1994.

Under the Local Government Act the purposes of a local governments are:

- *providing good government for its community*
- *providing the services and other things that the local government considers necessary or desirable for all or part of its community*
- *providing stewardship of the public assets of its community*
- *fostering the current and future economic, social and environmental well-being of its community (Local Government Act,S.2)*

Policy and Planning

The Emerging Context for Sustainability

British Columbians are increasingly concerned about the ecological, economic, and human costs of unsustainable urban development. BC public policies and programs have evolved in response to this concern. Generally, these policies state that all citizens have a right to clean water, fresh air, and affordable housing; that communities should be designed to reduce reliance upon the automobile; and that communities should foster a high quality of life for all residents. They also state that our streams and ecologically sensitive areas should be protected, both for their intrinsic value and for their value to present and future citizens.[1]

Yet while such policies promise solutions to a number of linked problems, each new policy solution often gives rise to new policy challenges. For instance, increasing density and creating compact communities is a very laudable goal and has a positive impact on transportation, land-use efficiency, and the affordability of housing. But increasing the number of houses on any particular piece of land might very well lead to increased damage to streams and groundwater resources. To make matters even more complex, responsibility for managing the integrated health of the urban landscape is fractured among different and often competing geographic jurisdictions, different levels of government, and different agencies within government. One or more agencies are responsible for deciding how many houses to place on a parcel, while a different set of agencies is responsible for protecting water resources.

However, policy makers, urban planners, and designers are now increasingly alarmed by the unforeseen social, economic, and environmental consequences that this jurisdictional separation has produced. In response, government representatives have produced policies and policy tools to reintegrate the various systems within the urban landscape and to plan them in a more coordinated manner. The section that follows charts our collective progress towards achieving this goal.

Planning Framework

Over 90% of the land in British Columbia is owned by the "Crown" (i.e., it is publicly owned). Of the remainder, about half falls within the Agricultural Land Reserve (i.e., lands restricted from uses other than agriculture). Thus, only 5% of all lands in British Columbia are available for urbanization. The majority of this developable land is located in the southwestern portions of the province, such as the southern Central Interior Okanagan. Our focus is on these landscapes — landscapes within which the vast majority of British Columbian citizens now live and where most of the next four million new British Columbian residents must find a home.

The administrative and legislative context for local land use planning is undertaken by the Ministry of Community, Aboriginal and Women's Services (formerly the Ministry of Municipal Affairs) through the British Columbia Local Government Act (formerly the Municipal Act). The Local Government Act officially grants community and neighbourhood planning power to municipalities and regional districts. Since 1997 extensive changes to the Local Government Act have given local and regional governments greater flexibility and more options for regulating land uses — especially land uses that might affect the environmental, social, and economic quality of their communities.[2]

A host of other provincial and federal ministries and agencies also have an important role in local land-use planning and intersect at different points and through different legislative and policy tools. Understanding how these levels of planning interrelate provides insight into the regulatory environment that shapes land use today (see facing page).

At the local level, the three types of plans that have the most immediate influence on site and community design are: regional growth strategies, official community plans (OCPs), and site development engineering and subdivision requirements. Conceptually, this framework functions as a hierarchy, whereby higher-order regional growth strategies (which should directly reflect provincial planning goals) provide the context for OCPs, which, in turn, provide the context for how specific requirements for site development and land-use control (e.g., zoning and land-use plans) are to be carried out.

It is also important to emphasize that the shaping of provincial policy is directly linked to federal program priorities, goals, and policies, a number of which have been ratified through international agreements and accords for sustainability. Internationally, by 1997 Canada had signed

Right
The enlarged context for policy and planning for sustainable land use is provided by the several national and international treaties, agreements, and accords that have been ratified over the past decade and a half. Many such international agreements have direct relevance to how environmental and land-use decisions are made at the site level.

Regional district plans, community plans, and site development engineering and subdivision requirements have the greatest immediate influence on site and community design. However, the scale of the watershed is increasingly used as a unit by which to assess and monitor environmental and community health and to establish priorities for the long-term management and protection of ecosystems. Organized according to natural systems (as opposed to political boundaries), watershed planning occurs at all scales, from the backyard or park to the entire river basin.

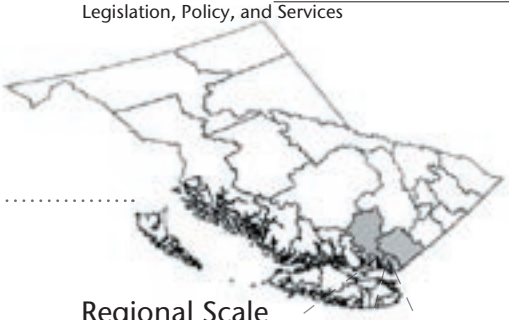
Scales of Urban Land Use Policy and Planning

National/International Scale

Several important international agreements, treaties, and accords provide the broad context for national and provincial land-use policy and programs. These include: the Convention on Biological Diversity (1992); the Rio Declaration on Environment and Development (1992); Agenda 21 (1992); and the Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997). Flowing from these broad directives are several federal environmental policies - including the Fisheries Act (1985), the National Policy for the Management of Fish Habitat (1992), and the national climate change process (1998) . In many cases these policies provide the context for setting quantifiable targets and thresholds for meeting sustainability goals at the local level.

Provincial Scale

Legislation, Policy, and Services



Provincial policies and legislation provide the context for local land-use planning.
*The **Local Government Act**, administered through the Ministry of Community, Aboriginal, and Women's Services (formerly the Ministry of Municipal Affairs) is the primary legislation governing settlement planning in British Columbia.*

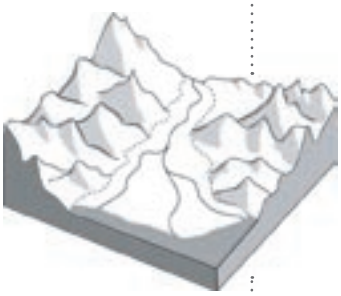
Regional Scale

Regional Growth Strategies
Systems and Servicing plans

*Section 25 of the Local Government Act requires the province's twenty-eight regional districts to prepare **Regional Growth Strategies** that address a district's common social, environmental, and economic objectives. Regional Growth Strategies are implemented through regional context statements and implementation agreements (see p. 20).*

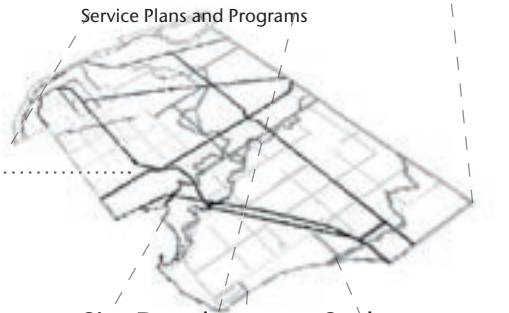
Watershed Scale

Watershed-based planning means that resource, *land-use, and community design decisions are made with an eye towards their potential effects on the watershed/drainage basin and the natural systems contained therein. Therefore, what happens at the scale of the individual parcel and street affects what happens at the scale of the watershed. Governance models such as the Fraser Basin Council and the Georgia Basin Ecosystem Initiative are two recent efforts to acknowledge the watershed as a critical unit of planning.*



Community/Municipal Scale

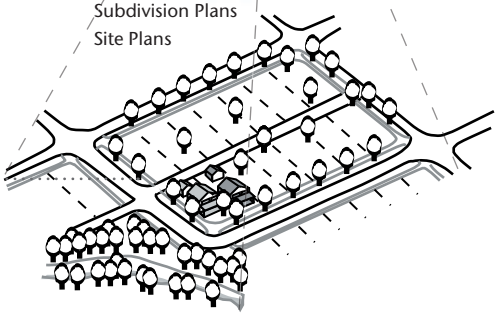
Official Community Plans
Local Area Plans/ Neighbourhood Concept Plans
Service Plans and Programs



*An **Official Community Plan** (OCP) is a bylaw adopted by a city council outlining specific land-use designations (including form and character of development) that determines servicing requirements for areas of growth within the community. OCPs establish a vision for a community that is consistent with its regional growth strategy and which is implemented by land-use by-laws and other control tools (such as municipal capital improvement plans, infrastructure plans, and local area or neighbourhood plans).*

Site Development Scale

Subdivision Plans
Site Plans



*The subdivision of private land into parcels is regulated by statute under the **Local Government Act, Land Title Act, and Strata Property Act**. Existing by-laws, the development goals of the community (as outlined in the OCP), and the need for new or expanded services are factors taken into account when subdivision applications are reviewed by the approving officer.*

Designating Development Permit Areas (DPAs) is one tool that allows local governments to protect environmentally sensitive areas and to achieve sustainable development objectives.

over 230 international agreements aimed at improving global environmental performance, many of which have relevance to how site and community design are carried out.

At the federal level, policies such as the Fisheries Act and the National Policy for the Management of Fish Habitat provide the context for provincial fish and habitat protection policy initiatives such as the Provincial Fish Protection Act, 1997, and the Streamside Protection Regulation (a 2001 amendment to the Fish Protection Act, discussed in greater detail below). These, in addition to many other recent provincial and joint federal/provincial efforts, create an enlarged scope for achieving sustainability goals at a more local level.

A Provincial Growth Strategy: A Brief History

During the past fifty years, public sentiment for increasing government control over urban land-use has waxed and waned. The formation of regional districts in the mid-1960s was a first step towards an integrated approach to managing urban growth, especially in the rapidly urbanizing regions of the Georgia Basin.[3] Amendments made to the Municipal Act in 1965 allowed the formation of regional districts. Originally, the province empowered regional districts to facilitate inter-municipal coordination, to provide municipal services to unincorporated rural areas, and to provide joint services — such as regional drainage, hospitals, and sewer and water systems — where efficient. While their implied function was to provide regional planning with direction, regional districts were "not conceived as a fourth level of government, but as a functional rather than a political amalgamation."[4]

Since its inception, the regional district model has come under scrutiny for several reasons. These include: lack of a clear mandate to manage regional environmental, social, and economic development issues; and competition and conflict arising when powers of jurisdiction are left ambiguous.[5]

The province commissioned two extensive reviews — one in 1978 and one in 1986 — aimed at clarifying the purpose and role of regional districts. The 1986 review was particularly important as it followed on the heels of a highly publicized 1983 dispute over whether the privately owned Spetifore farms could be protected from development under the regional plan put forward by the GVRD. This conflict eventually provoked the provincial legislature to strip regional districts of all regulatory regional planning authority — a move that would leave the future of regional districts uncertain at best.[6]

The 1986 review recommended several changes to the structure and purpose of regional districts. The most significant of these included: granting statutory powers to regional districts, thereby giving them more independence from the province; enabling more support and guidance from the Ministry of Municipal Affairs; and allowing greater rural representation.[7] While still awaiting legislation that would actually implement these recommendations in addition to returning planning powers to regional districts, municipalities in the GVRD entered into voluntary "service agreements" with the regional district board in order to maintain a cooperative regional/local planning perspective. Over the next decade, this proactive approach to regional planning led the GVRD to develop the Livable Region Strategy (1976) and Creating Our Future (1990). These were visionary blueprints for the landmark Livable Region Strategic Plan (adopted in 1996) and were created despite the absence of any direct legislative authority to undertake planning at a regional scale.

The Agricultural Land Reserve (1973)

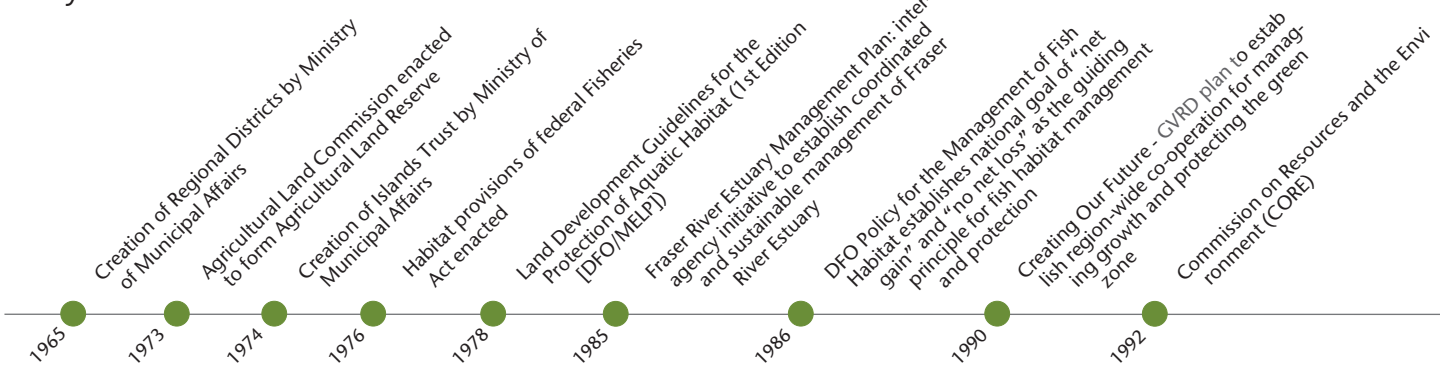
At the same time as the power of regional districts was being debated, concern over the province's disappearing agricultural land base was on the rise. The Agricultural Land Commission Act, 1973, was enacted in order to stop agricultural land from being urbanized. Prior to the introduction of the Agricultural Land Reserve (ALR), 6,000 hectares (15,000 acres) of BC agricultural land was lost to urban growth each year.[8] In essence, the act forbade the transfer of any active farmland in the province to urban uses. It did this through a blanket prohibition on subdividing large agricultural tracts into smaller parcels. The ALR thus established an urban growth boundary around many communities (particularly the fast-growing communities in the Lower Mainland) and provided a definite edge beyond which urban expansion could not go. In doing so, the provincial government protected half of all developable private lands from future urban development. Despite the promise of long-term protection, rapid population expansion between 1970 and 1990 resulted in the loss of over 750 hectares of agricultural land within the Georgia Basin to urban uses (this amounted to approximately 8.5% of the Georgia Basin's agricultural land).[9] This alarming trend was one of many through the 1980s and 1990s that prompted a closer look at regional sustainability and growth management issues.

The Commission on Resources and the Environment (CORE) and the Georgia Basin Initiative (1993)

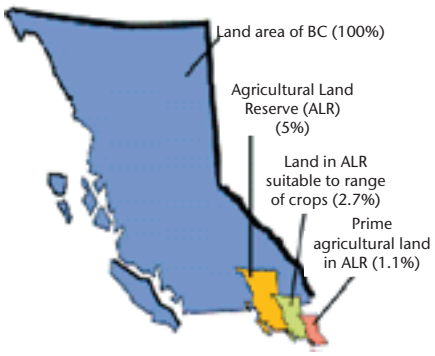
Throughout the late 1980s and early 1990s a series of province-wide initiatives were mounted to develop more sustainable — and, by definition, more integrated and consensus-based — approaches to provincial land and resource management. The provincial Commission on Resources and the Environment (CORE) Act, and its subsequent stakeholder process, provided the consummate summation of this emerging trend. The commission was established to develop "for public and government consideration a British Columbia-wide strategy for land use."[10]

Under its mandate, CORE published *Finding Common Ground: A Shared Vision*

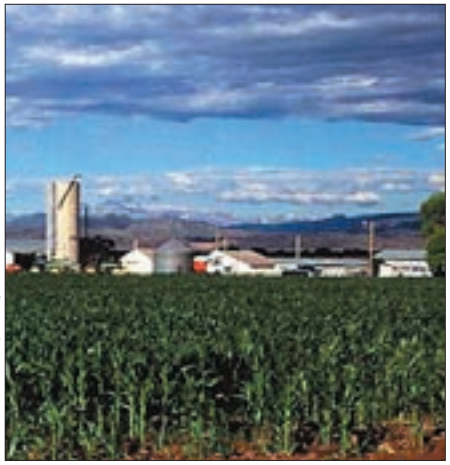
Policy Milestones: the last four decades



Right
Growth management policies recognize the importance of maintaining a productive and sustainable land base for the future. Yet agricultural land is scarce in BC. Today, 5% of the Provincial land base is protected for agricultural purposes under the Agricultural Land Reserve Act. Of this, approximately 1/5 is considered prime agricultural land. Prior to the creation of the Agricultural Land Reserve in 1973, it is estimated that 6,000 hectares (15,000 acres) of prime agricultural land was lost to urban development each year.



Source: Quayle, Stakes in the Ground: Provincial Interest in the Agricultural Commission Act (Victoria, BC: Ministry of Agriculture, Food and Fisheries, 1998).



for Land Use in British Columbia (1994). This groundbreaking report provided a framework for integrating principles of sustainability into multi-sectoral land-use planning and management decisions on a province-wide scale (for both private and public lands), and recommended ways of integrating these principles at regional, sub-regional, and local scales.

Prior to the CORE process, the British Columbia Round Table on the Environment and the Economy (formed in 1990) was also establishing sustainable development and management objectives for the province. In 1992 the round table committee was given a new mandate "to provide advice to government on how to manage the Georgia Basin."[11] One immediate result of this new mandate was the Georgia Basin Initiative, out of which came the report entitled *Georgia Basin Initiative: Creating a Sustainable Future (1993)*. This report provided recommendations that encompassed a wide spectrum of issues in the Georgia Basin, including governance, complete communities, environmental protection and economic development and energy use. Among those recommendations focusing on governance were: that a process be undertaken to develop new models of planning and governance for sustainability in the Georgia Basin; that this process involve all levels of government (local, regional, provincial, federal, Aboriginal); that it be an efficient governance model; and that transportation and comprehensive land-use planning be integrated at a regional scale.

The CORE process and the Georgia Basin Initiative were among the key precedents that provided the conceptual basis for the Growth Strategies Amendment Act.

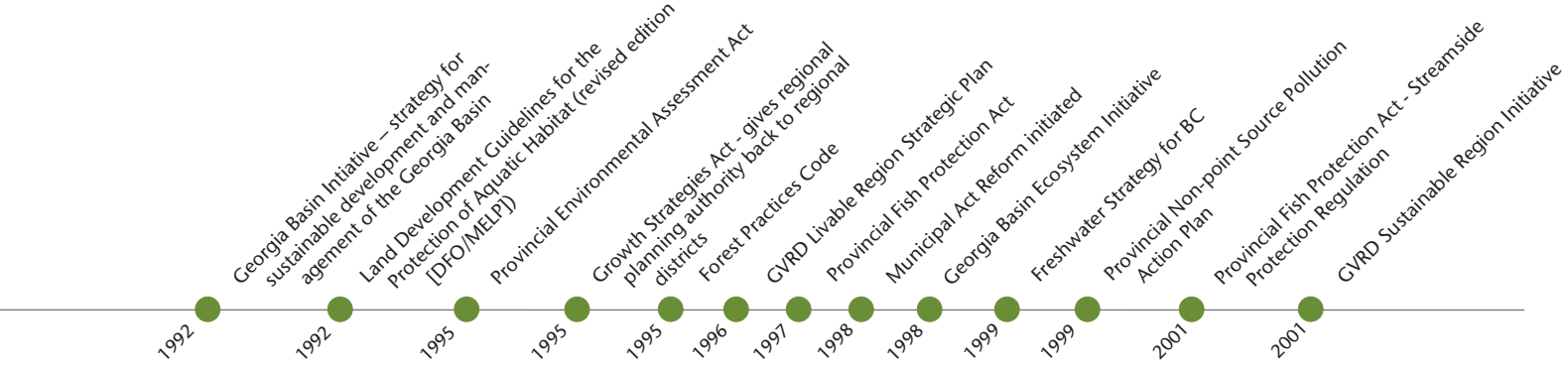
The Growth Strategies Amendment Act (1995)

The Growth Strategies Amendment Act was enacted in 1995[12] and constitutes Part 25 of the Local Government Act. This legislation has the potential to be one of the most powerful policy tools available for influencing sustainable land use throughout the urbanizing regions of British Columbia.[13] It enables regional districts and their member municipalities to achieve greater land-use coordination and integration through three important written agreements: regional growth strategies, regional context statements, and implementation agreements (see p. 20).[14]

A regional growth strategy must cover a period of at least twenty years and propose ways of addressing the common social, economic, and environmental objectives of member municipalities in relation to the regional vision. The strategy must include population and employment projections for the period covered by the growth strategy, and it must propose strategies for accommodating these projections in the areas of housing, transportation, regional district services, parks and natural areas, and economic development.[15]

In addition to these requirements, regional districts are encouraged to incorporate a host of planning goals into their growth strategies. Summarized, these goals are:

1. ***Avoid urban sprawl by using existing services***
2. ***Minimize use of automobiles and encourage walking, bicycling, and efficient use of public transit***
3. ***Move goods and services efficiently***
4. ***Protect environmentally sensitive areas***
5. ***Protect and secure a productive resource base***
6. ***Promote economic development to support communities***
7. ***Reduce and prevent air, land, and water pollution***
8. ***Provide adequate affordable and ap propriate housing***
9. ***Ensure adequate inventory of suitable land for settlement***
10. ***Protect quality and quantity of ground and surface water***



REGIONAL GROWTH STRATEGIES

Four regional growth strategies have been approved in the Greater Vancouver Regional District (1996), the Regional District of Nanaimo (1997), the Thompson Nicola Regional District (2000), and the Regional District of Central Okanagan (2000). Two additional growth strategies are nearing completion for the Capital Regional District and for the Fraser Valley Regional District. Once completed, over 75% of British Columbia's population will live in an area covered by a regional growth strategy.

***A Regional Growth Strategy** is a regional vision that spans a time frame of at least twenty years and that reflects a region's common social, economic, and environmental objectives.*

***Regional Context Statements** are completed by each municipality in a region. They describe the local policies, principles, and programs that support the regional growth strategy.*

***An Implementation Agreement** is a written understanding between the regional district and local and other governments. It spells out the details of how certain aspects of a regional growth strategy will be carried out.*

Right – Integrated Land-Use and Transportation Planning
Integrated land-use and transportation policies provide the housing, employment, and service mix essential to supporting a regional transit system. They also promote a community configuration that encourages walking and cycling instead of driving (e.g., through integrated streets). Transportation demand management (TDM) includes approaches to transportation that curb reliance on single-occupancy vehicle use, provide travel alternatives, and shorten travel distances. Regional growth strategies, regional transportation plans, and OCPs are among the planning tools available to help us implement transit-oriented development.

11. Support settlement patterns that minimize risks of natural hazards
12. Preserve, create, and link urban and rural open spaces
13. Promote the efficient use and conservation of energy
14. Provide responsible heritage steward ship[16]

It is worth noting that, as per Section 875 of the Local Government Act, municipalities are encouraged to work towards the purpose and goals of regional growth strategies in their OCPs.

Supporting Growth Strategies: More Comprehensive Policies

The picture of a more sustainable BC landscape is becoming clearer as policy, particularly at higher strategic planning levels, is beginning to integrate directives for improving air, water, and land resources in ways that are socially, ecologically, and economically sound. Legislation such as the Greater Vancouver Transportation Authority Act, 1998; the Fish Protection Act, 1997; and ongoing reforms to the Local Government Act point towards more comprehensive governance and planning for BC communities. Collectively, this legislation considers the important relationship between transportation and land use and enables us to find more effective tools for the protection and management of environmental, economic, and cultural resources at the local level.

Air Quality: Travel Behaviour and GHG Emissions

Dramatic increases in GHG emissions are a primary factor contributing to global climate change. In 1997 Canada was among 160 nations that negotiated the Kyoto Protocol under which industrialized countries will collectively reduce greenhouse gas emissions by 5.2%. When ratified, this agreement will commit Canada to reduce GHG emissions to 6% below 1990 levels by 2012. The single largest source of GHG emissions in the province is transportation (41% of total emissions).[17] Alternative transportation policies that focus on curbing reliance upon the single-occupancy vehicle, reducing distances between destinations, and lowering total emissions per vehicle, will have a significant effect on British Columbia's GHG emissions.

Among the strongest policy tools available to local governments for reducing transportation-related GHGs are integrated land use policies and transportation demand management strategies, both of which can be operationalized through regional growth strategies and OCPs.

The regional growth strategy for the District of Nanaimo (1997) includes policies for promoting concentrated growth through an urban growth containment boundary and the development of urban nodes. In addition, the growth strategy includes policies for enhancing mobility, where access by foot, bicycle, and transit is given priority over cars.[18] Similarly, the Regional District of Central Okanagan's regional growth strategy (2000) includes policies for encouraging more compact, mixed-use forms of development, investing in transit and other transportation demand management (TDM) programs, and providing safe and convenient places to walk and cycle. However, while these policies point in the right direction, in municipalities such as Nanaimo, the development of conventional suburbs still dominates. Nanaimo's transit use comprises only 3% of the total modal

split for work trips, compared to 23.7% in Vancouver.[19] In Kelowna, the transit share is even lower, at 2%.

Within the GVRD, coordinated land use and transportation planning has been institutionalized through the formation of a regional transportation authority. In 1998, the provincial government passed the Greater Vancouver Transportation Authority (GVTA) Act, which effectively realigned the management of Greater Vancouver's transit system, major roads, and bridges. Rather than being managed by separate agencies (with a varying degree of coordination between them), they are now managed by a single agency known as Translink. Under its mandate, Translink has taken on responsibility for the management of transportation-related servicing and infrastructure (with an additional focus on demand management and air quality) in order to meet the GVRD's regional growth strategy, the *Greater Vancouver Livable Region Strategic Plan* (LRSP). The LRSP policies address four primary goals:

1. *Protect the Green Zone*
2. *Build Complete Communities*
3. *Achieve a Compact Metropolitan Region*
4. *Increase Transportation Choice*

In early 2000, Translink produced its *Strategic Transportation Plan*,[20] which presents a blueprint for how, over the next five years, regional transportation will support regional growth strategy goals. TDM policies outlined in the plan include increasing transit investment, improving regional and local bicycle and walking networks, implementing a parking tax, and imposing vehicle charges (i.e., based on pollutant level of vehicle).[21]

Fish Protection and Water Quality

The rising concern over the future of BC water-based resources has resulted in significant changes to the legislation covering the planning, management, and conservation of aquatic systems. Over the past decade, a number of core policies have emerged that address the comprehensive protection, management, and enhancement of freshwater aquatic systems, focusing upon both water quality and quantity.

The Freshwater Strategy for British Columbia was released in draft form in 1993 and was developed over several years of consultation with agencies and stakeholders involved in water resource planning and decision making. The strategy was released in 1999 and, together with the Freshwater Action Plan, forms a framework for the development and implementation of freshwater-related legislation in British Columbia. Administered by the Ministry of Water, Land and Air Protection (formerly the Ministry of Environment, Lands and Parks), the strategy and action plans are guided by the seven *Provincial Freshwater Strategy Principles*:

1. *Ecosystem Integrity*
2. *Sustainability*
3. *Stewardship*
4. *User Pays*
5. *Precautionary Principle*
6. *Pollution Prevention*
7. *Public Awareness and Education*

The strategy and action plans also focus on the following three primary goals:

1. *Healthy Aquatic Ecosytems*
2. *Assured Human Health and Safety*
3. *Sustainable Social, Economic and Recreational Benefits of Water*

Certain key policies and programs are of particular significance to this manual as they focus specifically upon reducing the effect of urban settlement on the ecological integrity of sensitive stream systems and upon protecting the quality and quantity of groundwater resources.[22]

Fish Protection Act

The Fish Protection Act (FPA) and the more recent Streamside Protection Regulation (SPR) (which comes under Section 12 of the FPA) are two of the most important recent legislative tools for protecting the ecological integrity of streams and fish habitat.

Passed in 1997, the FPA now forms a key component of both the BC Freshwater Strategy and the BC Fisheries Strategy. The FPA provides legislative authority for considering the impacts on fish and fish habitat before approving new water licences, amendments to licences, or work in or near streams areas.

In early 2001 the provincial legislature enacted the SPR, which creates a mechanism for protecting streamside areas from the impacts of residential, commercial, and industrial development.[23] It recognizes the essential role that streamside areas play in protecting fish stocks, and it requires local governments to take a proactive approach to habitat protection. It builds on the guidelines found in the Land Development Guidelines for the Protection of the Aquatic Environment (1992).[24] While not directly addressing stream hydrology and water quality objectives, the SPR is intended as a companion to other initiatives under the Freshwater Strategy that are aimed at reducing the impacts of urbanization on stream hydrology.[25]

Left – Streamside Protection
The BC Provincial Stream Protection Regulation (SPR) Streamside Protection Policy Directives (2001) are part of the BC Fisheries Strategy and Freshwater Strategy. The SPR sets new standards for the protection of streamside areas that are vital to supporting fish stocks.

Water Quality

Priorities for improving water quality under the Freshwater Strategy include reducing and preventing pollution of groundwater, both from point sources (such as industrial sites and sewage treatment and discharge) and from non-point sources (such as agriculture and urban development). New requirements for designing and implementing regional liquid waste management plans (LWMPs) and the provincial Non-point Source Pollution Action Plan (1999) are just two initiatives that provide direction for addressing these growing threats to water quality.

Environmental Protection and Enhancement: New Directions in Local Governance

In 1997 the province began an extensive review of the Municipal Act, which was officially renamed the Local Government Act in 2000. Part 26 of the Act deals with planning and land-use management. It now gives local and regional governments greater flexibility with regard to regulating land-uses that might affect the environmental, social, and economic quality of their communities. More specifically, it provides improved tools for regulating new land-use and development as well as for managing human activities.[26] In this vein, local governments concerned with regional watershed protection can now limit the maximum percentage of an area of land that can be covered by impervious surfaces as well as regulate the management of runoff from developed sites.[28]

In addition to more general OCPs, municipalities are recognizing how local- and neighbourhood level plans can be important tools for guiding growth in ways that support municipal, regional, and provincial goals. The OCP for the City of Surrey, for example, includes guidelines and requirements for the preparation of Neighbourhood Concept Plans for Surrey's emerging urban areas (i.e., those areas outside the central core). This measure is meant to ensure that future growth can occur in a coordinated and efficient manner that is consistent with the GVRD's regional growth strategy.

Vision versus Reality

The scores of higher-order legislative changes that have occured over the past twenty-five years support regional and basin-wide goals for sustainability. As a result, municipalities and regions across the province are increasingly integrating environmental protection and growth management objectives into their regional growth strategies, OCPs, and other local planning frameworks.

Within the Lower Mainland Region, the inter-governmental Georgia Basin Ecosystem Initiative, the Fraser Basin Council, and emerging watershed-based planning initiatives reflect a rising consciousness and concern over how to manage the important and necessary relationships between the social, ecological, and economic health of watersheds and the corresponding health of local communities. Over the past five years, GVRD strategies coupled with federal, provincial, municipal, and non-government initiatives have resulted in increased dialogue on the need to apply sustainable development principles and practices to growth management and service programs. Outside the regulatory regime, community-based stewardship groups together with province-wide non-governmental organization (NGO) initiatives (such as Smart Growth BC), are building a shared awareness of urban sustainability issues among citizens and policy makers. Indeed, these efforts mark a shift towards more coordinated and acceptable approaches to meeting the challenges of sustainable urban development.

Yet despite the growing awareness, progressive changes to local level land-use, road, and subdivision by-laws (along with methods of financing them) have been slow to emerge. These changes are critical. Without them, regional, provincial, and even national goals may never be achieved.

Changing local bylaws and standards is especially challenging because many of them have been institutionalized as "best professional practice." Changing these standards, however logical, creates new stresses on institutions and unevenly distributes risk for agents of change, particularly for developers and municipal staff. We must find ways to share and distribute these risks. We must also find ways to overcome the conflict that seems to characterize our regulatory process in direct proportion to the stakes involved.

In the section that follows, we describe one particularly effective model for overcoming institutional barriers, regulatory gaps, and unequally shared risks.

Notes:

[1] British Columbia, Growth Strategies Amendment Act, 1995 (Part 25 of the Local Government Act, 1995); British Columbia, Bill 26 (otherwise known as the Local Government Statutes Amendment Act, 1997).
[2] British Columbia, Bill 26.
[3] Support for the concept of coordinated regional planning began with the formation of the Regional Planning Division of the Ministry of Municipal Affairs in 1947. The following year, amendments to the Town Planning Act officially recognized regional planning boards.
[4] British Columbia, Department of Municipal Affairs. *Regional Districts in British Columbia, 1971: General Review* (Victoria: Department of Municipal Affairs, 1971).
[5] Regional District Review Committee, Report of the Committee (Victoria: Ministry of Municipal Affairs, 1978), 13.
[6] Patrick J. Smith, "Regional Governance in British Columbia," *Planning and Administration 13, 2* (1986): 7-20.
[7] Dan Campbell, *Summary Report of the Regional District Survey Committee* (Victoria: Ministry of Municipal Affairs, 1986).
[8] British Columbia Agricultural Land Commission, *Agricultural Land Reserve Statistics* (Burnaby, BC: Province of British Columbia, 1997).
[9] British Columbia, Ministry of Environment Lands and Parks, *State of the Environment Report for British Columbia* (Victoria: Ministry of Environment, Lands and Parks, 1993), v.
[10] British Columbia, Commission on Resources and Environment Act, 1992. s. 4 (1).
[12] British Columbia, Growth Strategies Amendment Act, 1995.
[13] The strength of GSAs are not fully understood, especially as they relate to areas outside the rapidly urbanizing Lower Mainland, southern Vancouver Island, and southern Interior regions of British Columbia, where issues of growth are not as much of a concern as are issues of economic diversification and resource management. See Chris Gawronski, "Regional District Renewal: Reforming Regional Government in British Columbia" (MA Thesis, University of British Columbia, 1999).
[14] For a detailed discussion of these procedures, please see *Reaching Agreement on Growth Strategies* (c. 1998), which is available on-line on the Ministry of Municipal Affairs web site: <*http://www.marh.gov.bc.ca/GROWTH/PUBLICATIONS/Index.htm*>.
[15] Growth Strategies Amendment Act, s. 850 (1).
[16] Ibid., s. 849 (2).
[17] *Ministry of Environment, Lands and Parks, Environmental Trends in British Columbia 2000* (Victoria: Ministry of Environment, Lands and Parks, 2000), 27.
[18] Regional District of Nanaimo, *Growth Management Plan* (Nanaimo, BC: Regional District of Nanaimo, 1997).
[19] Don Alexander and Ray Tomalty, *The BC Sprawl Report 2001* (Vancouver: Smart Growth BC, 2001), 25.
[20] The responsibility of Translink, as established by the GVTA Act, is to provide a regional transportation system that moves people and goods efficiently, that supports the regional growth strategy, and that supports the air quality objectives and economic development of the region. See Translink. *Strategic Transportation Plan: 2000-2005* (Vancouver: Translink, 2000).
[21] Ibid., 33.
[22] A complete description of the Freshwater Strategy and Action Plan is available at <http://www.elp.gov.bc.ca/wat/wrs/freshwater/FSforBC.doc>
[23] Ministry of Environment, Lands, and Parks, *Regulatory Impact Statement in Support of the Streamside Protection Policy Directives Developed under Section 12 of the Fish Protection Act* (Victoria: Province of British Columbia, 2001).
[24] Barry Chilibeck, Geoff Chislet, and Gary Norris, *Land Development Guidelines for the Protection of Aquatic Habitat* (Victoria: Canada Department of Fisheries and Oceans [Pacific Region and Habitat Management Division] and BC Environment Integrated Management Branch, 1992).
[25] See Barry Chilibeck and Megan Sterling, Urban Stormwater Guidelines and Best Management Practices for Protection of *Fish and Fish Habitat* (Department of Fisheries and Oceans, Vancouver, 2000).
[26] British Columbia, Local Government Statutes Amendment Act, 1997. For a summary of tools for increased environmental protection, see the Ministry of Community, Aboriginal and Women's Services (Municipal Affairs) web site: <http://www.marh.gov.bc.ca/GROWTH/PUBLICATIONS/BILL26/intro3.html>
[27] Local Government Act, s. 907.
[28] City of Surrey Corporate Report, 24 November 1998.

Policies at a Glance*

	Goal	Regulating Agency	Tools
Air	GHG Emission Reduction	Translink BC Transit Greater Victoria Transportation Commission	Transit Priority Measures Transportation Demand Management *Trip Reduction Services* *Parking Taxes* *Road Charges and Fees* Air-pollution By-laws Bicycle Facilities and Regional Cycling Policies Air Care Traffic Calming
		Municipalities	Road-side Transit Infrastructure Investment Parking By-laws OCP Policies (e.g., priority for transit, pedestrian and bicycle movement and priority for infrastructure investment)
		Regional Districts	Regional Growth Strategies *Integrated Land-use Policies* *Air Quality Management Plans*
	Compact Land Use and Complete Communities	Municipalities	OCP Policies *Zoning by-laws* *Development Permit Areas* *Secondary suite allowance*
		Regional Districts	Regional Growth Strategies *Urban Containment Boundary* *Growth Concentration Area* *Transportation Demand Management*
Water	Water Quality and Stream Protection	DFO Ministry of Water, Land and Air Protection (WLAP)	Fisheries Act Fish Protection Act Streamside Protection Regulation (Policy Directives) Sensitive Stream Designation
		Municipalities	ESA inventories and DPA designation for environmental protection
	Stormwater Management	Municipalities	OCP policies indicating degree of imperviousness threshold for new development Watercourse Protection By-law Drainage By-laws Engineering BMPs
		Regional Districts	Liquid Waste Management Plans Watershed Health Classification System BMPs and By-laws
	Protection of Environmentally Sensitive Areas	Municipalities	OCP Policies Tree Protection By-law ESA inventories and DPA designation for environmental protection Conservation Covenants Municipal or Regional Parks Designation
	Creation of Parks/ Greenways	Regional Districts	Regional Growth Strategies *Urban Containment Boundary*
		Municipalities	Municipal or Regional Parks Designation Dedication of publicly owned land Donation or Dedication upon Subdivision Development Cost Charges
People	Complete and Compact Communities	Regional Districts	Regional Growth Strategies *Growth Concentration Area* *Regional Housing Projections* *Complete Community Policies*
		Municipalities	OCP policies (land use and housing mix targets) *Zoning By-laws (e.g., small lot zoning)* *Development Permit Areas* *Comprehensive Development Zone* *Heritage By-laws* Development Cost Charges Servicing Requirements Alternative Design Standards and Guidelines Agricultural Land Reserve

*The above table provides a cursory overview of policies and tools to influence more sustainable development in BC. For a more thorough overview and discussion of the regulatory tools available to local governments, please see:

Curran, *Environmental Stewardship and Complete Communities: A Report on Municipal Environmental Initiatives in British Columbia.*

Nolan et al., *The Smart Growth Guide to Local Government Law and Advocacy;* and Curran, *Environmental Stewardship and Complete Communities: A Report on Municipal Environmental Initiatives in British Columbia.*

CASE STUDIES

Case studies enable us to show that there are several possible solutions to a particular problem and to identify those conditions and processes that will achieve a successful outcome. For practitioners and policy makers, case studies offer strategies for, and solutions to, difficult problems. For citizens and community leaders, case studies are a rich source of information and a tool for developing useful evaluation strategies.

Each of the four charrette case studies includes the following baseline information:

- charrette location
- charrette date
- charrette type
- site type
- charrette client
- charrette participants

The text description of each charrette includes:

- a description of the political con text and background of the charr-ette
- an outline of the guiding policy that informed the charrette design brief
- a summary of charrette objectives
- a description of the design brief objectives
- a summary of key thresholds and performance measures
- a summary of conclusions and lessons learned

Illustrative plans show how the charrette teams resolved the multiple challenges posed by each of the charrette design briefs.

FURTHER RESEARCH

For a more detailed description of the history and use of case study methodology in the design professions, please see: Francis, "A Case Study Method for Landscape Architecture."

For further research on design charrettes, please see: Crofton, *Sustainable community planning and development: Design charrette planning guide;* Condon, *Sustainable Urban Landscapes: The Surrey Design Charrette*; Kelbaugh, *Common Place: Toward Neighbourhood and Regional Design*; and the National Charrette Institute at http://www.charretteinstitute.org/charrette.html.

Charrettes as a Process for Integration

Four Case Studies

This section features four case studies of community design charrettes that have incorporated sustainable principles. They are:

1. Southeast False Creek, Vancouver, BC
2. Burnaby Mountain Community, Burnaby, BC
3. Riverwalk on the Coquitlam, Coquitlam, BC
4. East Clayton, Surrey, BC

These four case studies are intended to show that there is no single formula for achieving more sustainable communities. Rather, just as there are many types of sites, so are there many potential solutions.

What is a Charrette?

The term "charrette" was coined over a hundred years ago at the Ecole des Beaux Arts in Paris. Students enrolled in the School of Architecture were expected to meet strict deadlines for the completion of design projects. When the deadline arrived, a small cart (in French, a "charrette") trundled down the aisle. Students had to toss their drawings onto the cart whatever their state of completion, for to fail to do so was to get a zero for the project. Much of this spirit of intensity is retained in our more modern and collaborative use of design charrettes. We would define the charrettes used to produce the designs in this section as a time-limited design event in which a diverse group of people strive to produce a mutually agreeable answer to a complex community design problem.

Why Use Charrettes?

Citizens, planners, and design professionals have recently come to regard design charrettes as an exceptionally effective tool for creating more sustainable new and retrofitted communities.[2] Sustainable communities are, by definition, integrated communities where ecological, social, and economic realms function together harmoniously and synergistically. The models for sustainable communities are found in healthy ecological systems, where each element contributes to the health of other elements.

In the past, issues of housing equity, stream protection, or capital planning were dealt with in a piecemeal and dis-integrated fashion. Charrettes were not necessary within such a context. However, if our objective is to reintegrate the elements of our urban ecology, then an integrated and ecological design and planning method is required.

All issues are "on the table" at a well designed charrette, and human creativity ensures that it is possible to integrate the elements of a complete and sustainable community. Design charrettes most often produce, if not a perfect answer to all of the issues on the table, at least a very good one. Our region and our world are in need of good answers to the complex and pressing challenges before us.

The charrette case studies that follow profile four different applications of design charrettes within the context of four distinct sites. The charrette sites include an urban brownfield site, a mountain-top site in a first-ring suburb, a river bluff at the foot of a mountain, and a flatland suburban greenfield site. The Southeast False Creek "visioning" charrette was a response to the need to develop visionary models for the retrofit of an urban waterfront site within the context of city planning policy. The Burnaby Mountain "design team selection" charrette was also highly visionary and facilitated the selection of the design team that would develop the master plan for the new community. The Riverwalk "consultant charrette" involved an integrated team of design, engineering, and environmental specialists in the development of a green infrastructure-based community plan for a sensitive hillside site on the shores of the Coquitlam River. Finally, the East Clayton "implementation charrette" was initiated to develop a regulatory and physical model for demonstrating principles of sustainability in an actual community in Surrey. This last point is key as the East Clayton charrette was intended both to provide a clear vision for a new type of community and to create a replicable model for developing similar communities in other areas, regionally and beyond.

Below
Charrettes are interdisciplinary, creative events in which participants strive to reach a mutually agreed upon solution to a set of complex problems within a short period of time. Charrettes focus on many things, ranging from reaching a consensus on a community's long-term vision to finding workable agreements to site-specific projects. They are an increasingly effective way of getting public support for some of the most challenging planning issues such as increasing density, protecting and restoring natural systems, establishing a mix of uses and a diversity of housing, and creating a vibrant public realm.

Near right: East Clayton implementation charrette (pgs. 41-49).

Far right: Southeast False Creek visioning charrette (pgs. 26-31).

Above
1 ***Southeast False Creek:*** Visioning Charrette
2 ***Burnaby Mountain Community:*** Design Team Selection Charrette
3 ***Riverwalk on the Coquitlam:*** Consultants Charrette
4 ***Headwaters Project:*** Implementation Charrette

Southeast False Creek

VISIONING CHARRETTE[1]

The Southeast False Creek Design Charrette was initiated to assist the City of Vancouver's Central Area Planning Division in clarifying a vision for a sustainable neighbourhood on the southeast shores of False Creek within the context of existing policy for the area. A charrette was considered an ideal way to test the feasibility of existing policy objectives for the site while exploring innovative urban design scenrios that could be used both here and on other sites.

Charrette Date
October 1998

Charrette Client
City of Vancouver Planning Department

Charrette Type
Visioning

Charrette Participants

Team One: Bob Yaro (New York); Bob Worden; Patrick Condon; Chris Phillips; Cynthia Mitchell (Australia);David Negrin; UBC Students: Varouj Gumuchian; Lisa Kwan; Sara Muir; Michael Wilkes

Team Two: Ian Carter; Doug Polland (Ottawa); Jane Durante; Moura Quayle; Lee Hatcher; Jeff Harold; Ray Spaxman; UBC Students: Baldwin Hum; Michael Toolin; Alex Kurnicki; Dimitri Samaridis

Team Three: Nigel Baldwin; Ron Walkey ; Catherine Berris; Bill Wenk, (Denver);Ian Theaker; Krish Krishnan; Ralph Segal; UBC Students: Pamela Phillips; Luc St. Laurent;Ceclia Achiam; Peter Walsh

Above
Southeast False Creek against the backdrop of downtown Vancouver, Stanley Park, and the North Shore mountains. The almost forty hectare parcel is the last remaining undeveloped portion of the False Creek waterfront.

On 26 October 1995, Vancouver City-Council voted to rezone the last remaining thirty-six hectares of industrially zoned False Creek shorefront for largely residential uses. This rezoning had been occurring for about thirty years, and, with this last parcel, a waterfront that had been 100% industrial (containing everything from rail yards, to shipyards, to sawmills, with only night watchmen for permanent residents) was to become home for over 20,000 Vancouverites. This last thirty-six-hectare parcel – referred to as Southeast False Creek (SEFC) – would complete the circle of high-density residential development surrounding False Creek; a ring of urban development that has become North America's most closely watched urban brownfields redevelopment initiatives. However, Vancouver City Council was to do something a bit different when it came time to authorize the development of SEFC, the last major parcel on the creek. It directed its planning staff to place an extraordinary emphasis on meeting a higher standard of environmental sustainability and energy efficiency than had been met at other areas within the city. Specifically, the council identified seven priorities for the Southeast False Creek neighbourhood:

1. *The land should be mostly used for housing.*
2. *In contrast to other portions of False Creek, where housing for singles and couples predominates, housing for families should be a priority.*
3. *Buildings and transportation systems should be designed to save energy.*
4. *The area should become a place to learn about building more sustainable communities.*
5. *A streetcar line should be incorporated.*
6. *Job sites should be integrated into the community in order to reduce the need for commuting.*
7. *Housing should be increased adjacent to Vancouver's Central Area.*

Guiding Policy
With council authorization, City staff set the wheels in motion to produce the planning and policy documents that would be the "rules for the game" during the development of SEFC. These documents included:

The Creekside Landing Plan (1997)[2]
This plan, submitted to council by the development consultant Stanley Kwok Consultants Inc. at the behest of the City of Vancouver Real Estate Department, argued that the urban design for SEFC should, in most respects, mimic the pattern of development taking place on the north side of False Creek. The consultants proposed a plan dominated by twenty-story-plus residential point towers. They felt that only by employing the urban development formula that was used successfully on the north shore of False Creek could the city generate enough capital to pay for cleaning up this polluted site.

Visions, Tools, and Targets: Environmentally Sustainable Development Guidelines for Southeast False Creek (1998)[3]
The City of Vancouver Planning Department commissioned the Sheltair Group to produce this study, partly in response to misgivings about the Creekside Landing Plan discussed above. The study was designed to provide: a working definition of sustainability for City staff, consultants, and the wider community; performance targets to guide sustainable planning and development; a data bank of exemplary sustainable community precedents; and a framework for full-cost accounting as a basis for redeveloping economic information regarding alternative building and neighbourhood designs. While this study was not an official policy document, the City Planning Department later incorporated much of its information into the official Southeast False Creek Sustainable Neighbourhood Policy Statement.

Southeast False Creek Sustainable Neighbourhood: A Policy Statement to Guide Development (1999)[4]
Using the previous documents as a foundation, the city developed an official SEFC policy document to help guide future development. The policy document was developed over several months through an extended, facilitated discussion with a multistakeholder Advisory Group.The document is unique in that it marked the first time that the City of Vancouver gave environmental, social, and economic sustainability objectives equal weight with density, open space, transportation, and land-use objectives. The vision for the site, as expressed in the policy statement, embodies a holistic and dynamic approach to sustainability: It stated that SEFC would become a neighbourhood "designed to maintain and balance the highest possible levels of social equity and livability, ecological health and economic prosperity, so as to support [residents'] choices to live in a sustainable manner."[5]

Charrette Goals and Objectives
The policy framework provided the context for launching the SEFC design charrette. In the spring of 1998 the City of Vancouver Planning Department engaged the ORCAD Group Inc. and PMC Associates to organize and run a four-day design charrette. The primary goal of the SEFC charrette was:

To provide council, staff, consultants and the larger community with different visions of what a community built in conformance with the proposed policies would be like.

This goal, and the October 1995 directives from city council discussed above, suggested the following more specific objectives for the charrette:

- *To test the efficacy of those aspects of the proposed policy statement and the performance targets that would be manifest in urban design before any attempt is made to apply them*
- *To create a setting in which leading BC designers can exchange ideas and viewpoints with outside experts in the field of sustainable design*
- *To establish new, more sustainable urban typologies in order to guide the planning and design of this site (these typologies would then be used as prototypes for other sites)*
- *To illuminate the connection between sustainability and liveability*
- *To make the sustainability functions of the site both transparent and didactic so that SEFC can serve its residents as well as educate the world*

Design Brief[6]
The SEFC Design Brief was developed from the policy documents outlined above. This point is key, as the charrette was conceived as a tool for exploring the implications of policy that had been developed through years of professional and citizen input. Charrette organizers extracted performance objectives and principles that had direct physical consequences for the site and translated them into a set of design instructions for charrette teams. Design team members were

challenged to meet or exceed objectives in the following four categories: (1) Land and Water, (2) the Built Environment, (3) Building Design and Performance, and (4) Cycles of Growth and Decay. A summary of these objectives is provided below.

1. Land and Water
Design team members were challenged to maintain the ecological health of the site. Objectives included:

- *Hold and absorb 100% of rainwater on the site or clean completely before discharge*
- *In order to allow for infiltration, ensure that at least 50% of the site is pervious surface*
- *Ensure that 80% of foreshore has habitat value*
- *Design buildings so that at least 25% of roofs are planted*
- *Ensure that 60% of green space has habitat value*
- *Provide 2.75 acres of "sustaining" open space/1,000 people*
- *Ensure that 25% of solid waste is treated on site*

2. The Built Environment
Design team members were to propose street, block, building, and parcel design strategies that would:

- *Accommodate an overall site density of forty-five units per acre with a net Floor Space Ratio (FSR) of 3 (300,000 square feet of residential space) and a gross FSR of 1.6*
- *Provide 200,000 square feet of office space (one foot of commercial space for each fifteen feet of residential space)*
- *Provide space for at least 1,000 jobs*
- *Provide a mix of housing types and tenures (i.e., 20% low-income housing and 35% family housing)*
- *Consider possibilities for integrating the community heart and commercial core along a pedestrian-friendly "High Street"*
- *Provide a maximum of one parking space per residential unit*

3. Building Design and Performance
Key objectives in this category addressed the incorporation of more sustainable site design, building technologies, and construction methods. Teams were instructed to:

- *Ensure that 75% of buildings on the site have good solar orientation*
- *Maintain existing and/or create new view corridors within the site so that people can see the surrounding landscape*
- *Propose building height limits that address solar orientation, views, and ground orientation while also meeting density targets*
- *Ensure that 90% of energy is from renewable sources*
- *Ensure that at least 5% of renewable energy is produced on site (i.e., through solar vol taic, solar hot water, and geothermal energy)*

4. Cycles of Growth and Decay
Design team members were to anticipate and capitalize on the cycles of growth and decay inherent in the urban system and to propose ways of meeting the following:

- *Reduce solid waste going to landfills to 20% of the per capita average for the city*
- *Consider placement of neighbourhood composting system*
- *Return all green waste (i.e., grass clippings, foliage) to soils*
- *Provide space and support for residents to grow 12.5% of their yearly consump tion of produce on site*

Conclusions and Lessons Learned
The SEFC visioning charrette provided a means through which an existing policy framework could be tested, explored, and potentially enriched through design. As should be the case with all well-conceived charrettes, the SEFC charrette was well grounded in research and policy, of which the Development Guidelines and the Policy Statement documents were two of the most important expressions.

While distinct in form, each urban design proposal conforms to the city's policy framework for a sustainable SEFC community while also provoking continued discussion and debate about the possibilities for a sustainable site. For example, while extending far beyond the scope of the event itself, issues such as economic feasibility and life-cycle costing were wrestled with by each of the charrette teams, who were informed by a careful reading of the design brief and existing policy directives. Thus the charrette became a venue for exploring how to reconcile the gap between currently established practices for determining the economic potentials of a project and emerging economic models grounded in sustainability theory. This is a particularly important issue in the case of brownfield sites, which often have additional costs for cleanup – costs which can put unexpected pressures on a development project to produce short-term economic gain in order to finance expensive cleanup activity.

In addition, brownfield sites are often very prominent and valued sites at the heart of mature communities. Consequently, gaining unanimous support for development of these sites at high but sustainable urban densities is often quite difficult. The charrette has been an effective tool for exploring how to meet multiple policy objectives for an area.

In sum, visioning charrettes such as SEFC allow a region's best minds to collaboratively produce scenarios for more sustainable communities. The SEFC charrette produced three design proposals, which allowed community stakeholder groups, city officials, and developers to evaluate existing policy and to more clearly envision a picture of alternative sustainable futures for the site. Citizens and elected officials can now use these proposals as policy tools to guide future efforts towards more sustainable urban growth.

Notes:

[1] Within the context of participatory community planning theory, the term "visioning" commonly connotes a specific stage of community involvement, in which community stakeholders articulate broad goals, aspirations and future directions concerning their community as one means of informing policy. In the SEFC process, the community visioning stage began long before the charrette event, involved a wide range of stakeholders, and resulted in the extensive policy base that informed the charrette design brief. We use the term to emphasize how this charrette was used to test this existing vision through an informed, exploratory design process, and to use the resulting plans and proposals to further refine the vision and thus inform future policy. For more discussion on the SEFC charrette process, please see: City of Vancouver and The ORCAD Consulting Group Inc. "Southeast False Creek Design Charrette: Exploring High Density Sustainable Urban Development." CMHC Research Highlight Socio Economic Series – Issue 81 (Ottawa: Canada Mortgage and Housing Corporation, 2001).
[2] Stanley Kwok Consultants Inc., "Creekside Landing – Southeast False Creek" (Vancouver, BC: Stanley Kwok Consultants, Inc., 1997).
[3] Sheltair Group Inc., "Visions, Tools and Targets: Environmentally Sustainable Development Guidelines for Southeast False Creek" (Vancouver, BC: Sheltair Group Inc. and City of Vancouver Planning Department, 1998).
[4] City of Vancouver Planning Department, *Southeast False Creek Policy Statement* (Vancouver, BC: City of Vancouver Planning Department, 1999).
[5] Ibid., 8.
[6] The ORCAD Consulting Group Inc. and PMC Associates, *Southeast False Creek Charrette: Design Brief* (Vancouver, BC: City of Vancouver, 1998).

Illustrative Plans

Southeast False Creek

Team One: Something Borrowed, Something New*

Team One accepted the standard grid street pattern of the surrounding urban fabric but shifted the angle of orientation at the mid-west point of the site. Less linear pedestrian and cyclist routes provide opportunities to "get off the grid" and to acquire a more intimate sense of individual neighbourhoods. Team one viewed the site as a "Town for the Post-Motor Age," and it saw streets as places where the car is "embraced, not banned" without neglecting the needs of pedestrians and cyclists. Many of the residential units were designed as four-storey townhouses along a traditional block pattern. These residences provide ground access to gardens, courtyards and streets and are attractive to families with children. Higher density residential dwellings are accommodated in mid-rise five- to six-storey blocks at the southern edge of the site facing First Avenue, and two twelve-storey high-rise towers at the southeast corner of the site. The design accommodates a broad range of live-work opportunities, making the entire development a "virtual incubator" for new industries that will form the core of the city's future economy. The preserved historic Domtar Building will function as the town hall, and a new boathouse/multipurpose centre will be situated on the waterfront. Green spaces reach into every portion of the community and link every district with the seawall, which is redesigned to offer a "softer" and more natural edge that will provide habitat for a range of birds and small mammals.

Team Two: Idiosyncrasy – Exploring the Spaces Between

Team Two accepted the existing grid pattern at the entry of the site but, once past the grid edge, ensured that paths/roadways quickly became "idiosyncratic." Traditional linear routes are transformed into more meandering passageways that provide opportunities for different kinds of engagement with the site and that echo the edges of shore and inlet. By providing a hierarchy of accessibility routes that serve to quickly reduce vehicle access as one moves further into the site, Team Two created a design that is "car-tolerant, not car-driven." This team designed a range of building heights on the site – ranging from ten- to thirty-storey high-rises in the eastern portion of the site, to two- to four-storey townhouses in the west. They divided the community into three primary subdistricts – high-density residential to the east, a "community focus" (with the school being part of a mixed-use building) at the centre of the site, and lower-density residential and parkland to the site's west. The team explored energy issues in detail, estimating that, with the right building orientation and design, 50% to 60% of domestic hot water could be supplied by solar energy.

Team Three: Embracing Traditional Form

Team Three's design continues the north-south, east-west city grid pattern throughout the site, creating unbroken vistas between their points of origin and termination. This team's approach to automobile access was to "accept the car but control it ... [not to] be mastered by it." The proposal uses a traditional Vancouver city block as the basic "building block." Blocks contain sixteen to twenty parcels, with each parcel accommodating four to eight building units (primarily in the form of three-and-a-half-storey townhouse complexes). Up to 128 to 160 dwelling units could be accommodated per building block, providing a high proportion of ground-oriented residences attractive to families with children throughout the site. Seven- to eight-storey buildings with double loaded corridors and internal courtyards provide for higher density accommodation. An east-west phased development approach is suggested, resulting in a "holding pattern" for the ecologically sensitive western zone that could utilize quickly evolving soil remediation technology for the latter stages of the development. Commercial life will eventually exist along First and Second Avenues and will congregate at several nodes (e.g., around the community centre) within buildings designed as flexible space that can adapt to meet market demand.

*Charrette team summaries adapted from: Fiona Crofton, *Charrette Synopsis: Southeast False Creek Vancouver, BC* (Vancouver, BC: The ORCAD Consulting Group Inc., 1998).

Southeast False Creek

Burnaby Mountain Community

DESIGN TEAM SELECTION CHARRETTE

The Burnaby Mountain Community design charrette was initiated to assist in the selection of a design team that would eventually complete a development plan for a new community for 10,000 residents at the top of Burnaby Mountain. A charrette was considered an ideal strategy for addressing a number of difficult site issues as well as for providing a relatively open design selection process. Four design teams (made up of Vancouver's top architects, landscape architects, and engineers) competed over an intensive two-day period to produce four design proposals for the 160 acre site.

Charrette date
February 2000

Charrette Client
Burnaby Mountain Community Corporation, Michael Geller, President

Charrette Type
Design Team Selection

Charrette Participants

Team One:
Henriquez Partners Architects/IBI Group
Perry + Associates
Urbanics Consultants Ltd.
Enkon Enrionmental Ltd.

Team Two:
Davidson Yuen Simpson Architects in association with Matsuzaki Architects Inc.
Vaughan Landscape Planning and Design Ltd.
McElhanney Engineering Ltd.
Coast River Environmental Services Ltd.
N.D. Lea Associates
Brook Development Planning Inc.
Harris Hudema

Team Three:
Hotson Bakker Architects, in association with Cornerstone Planning & Architecture
Coriolis Consulting Corp.
Enkon Environmental
CH2M Gore & Storie Ltd.
Lanarc Consultants Ltd.
Hunter Laird Engineering
Phillips Farevaag Smallenberg Inc.
The Sheltair Group Resources Consultants Inc.
Urban Systems Inc.
Ramsay Worden Architects
Nowarre & Badkerhanian Illustrations

Team Four:
Architectura, in association with Barry Downs Architect and Joseph Hruda of Civitas Inc.
Philips Wuori Long
Main Street Communications
Harris Hudema
Bunt & Associates
Kerr Wood Leidal Associates; Pottinger Gaherty Environmental Consultants Ltd.

Above
SFU was designed in 1963 by architects Arthur Erikson and Geoffrey Massey. Their concept integrated the campus into the fabric of the mountain top, where buildings, playfields, roads and paths were designed to reflect the natural terrain of the mountain, cutting and stepping down the hillside terraces, spreading into the surrounding landscape. The main spine is laid out in an east-west direction, following the ridge line. Along this ridge, all academic and social components align to meet with the university quadrangle, which anchors the east portion of the campus. The main circulation "ring road" both surrounds and connects the 1,000-acre university lands within its circumference.

On 26 November 1995 the provincial government, the City of Burnaby, and Simon Fraser University (SFU) announced the transfer of 332 hectares of land from SFU to the City of Burnaby. This undeveloped and largely forested land lay outside of the SFU "ring road" and was to remain as publicly accessible parkland in perpetuity. The transfer created one of the most significant natural reserves in the Lower Mainland region. In partial exchange for this land, the City of Burnaby approved an OCP for SFU that authorized the university to develop the "Burnaby Mountain Community," a new mixed-use community with housing for up to 10,000 residents.

The development of the Burnaby Mountain Community is the responsibility of Burnaby Mountain Community Corporation (BMCC), an entity established in 1998 to oversee the planning and development of a 160 acre portion of land immediately south and east of SFU. The SFU Board of Governors created the BMCC to achieve two goals: (1) to establish a complete community that complements existing and future university development, and (2) to establish an endowment fund and other sources of revenue to support the university.

The BMCC principles state that the community would "closely integrate with the existing and future University facilities, and build on the architectural and academic success of the University in a manner worthy of international acclaim." Most important, the community would be designed with full respect for the surrounding forest and streams and their ecological functions.

The Design Charrette Process

Early in the year 2000, as a first step towards implementing the SFU Official Community Plan, the BMCC planned and conducted a week-long community design charrette for the site. The objectives of the BMCC design charrette were:

1. *To generate a wide range of ideas to guide future planning options*
2. *To provide a basis for interaction be-tween the design teams, the university community, other special interest groups, and the BMCC*
3. *To test the SFU Official Community Plan and zoning by-law requirements as the basis for a sustainable community*
4. *To assist in the selection of an interdisciplinary team to oversee the preparation of a development and land-use plan as well as a subdivision application for the first phase of development*[1]

This last objective distinguishes the SFU charrette from the others reviewed in this manual. BMCC planned to hire one of the four teams of professional planners, landscape architects, architects, and engineers to develop a detailed master plan for the community after the charrette. This team would also help the BMCC secure whatever development permits were required as a precondition to developing the land.

Guiding Policy

This charrette, like the others featured in this manual, showed what would be the result if a community were built in conformance with previously approved public policies. Instructions in the design brief were distilled from hundreds of disparate policy objectives contained in a variety of pertinent public policy documents. Of these documents, those listed below were the most important.

The Simon Fraser University Official Community Plan (OCP) (1996)

The OCP [2] sets out the basic governing principles for the community and will form the basis for rezoning lands to enable development within the SFU ring road. The plan establishes the parameters for new residential development, including an allowance for up to 4,536 housing units in two major neighborhoods (East and South Neighbourhoods). The OCP also stipulates requirements for new school sites, parks, community facilities, and commercial services. It gives special attention to environmental issues related to watercourses, trees, vegetation, and wildlife. It also addresses the provision of new services, including roads, pedestrian and bicycle networks, water supply, sewers, waste collection, and watercourse and stormwater management.

A Vision for a Community on Burnaby Mountain

Extensive consultation with key stakeholders led to the creation of the BMCC. Prior to the establishment of the BMCC, there was ongoing consultation with various stakeholders at SFU. This process spawned a vision statement for the new community, which expressed the needs, desires, and aspirations of SFU community members and SFU's related constituents. The vision contains specific principles for creating an environmentally sensitive, socially diverse community that complements the one foreseen in the original campus plan. These principles informed the core design principles contained in the design charrette brief.

Environmental Reports[3]

The design brief also incorporated the core principles from a number of important reports focusing on identifying and protecting special features of the area's aquatic, avian, and terrestrial habitat. These reports highlighted the need to protect a number of stream headwaters located near the university and to preserve, as much as possible, existing forested areas.

Burnaby Mountain Community Corporation Planning Principles

Within the context of its broader mandate, the BMCC, under the direction of Michael Geller, developed the following planning principles to guide the development of the 160 acre site:

- *Provide a wide range of housing choices including rental housing, cooperative housing, individual ownership, and condominium ownership in order to appeal to a wide range of households*
- *Create a "complete community" by integrating a variety of retail, service, office, healthcare, and recreational uses with residential and research/university uses*
- *Develop a range of transportation options that: encourages transit over personal automobile use; identifies means for managing transportation demands, especially of commuters; reduces the importance of the automobile in the design of roads and parking provisions; and emphasizes bicycle and pedestrian networks as valid components of the community's transportation strategy*
- *Respect the architectural integrity of SFU by: developing a pattern of streets and buildings that responds to the original master plan and its primary circulation axis or spine; developing building forms and massing that complements and enhances the architectural character of the university; integrating new building designs into the mountainside setting*

Design Brief
Using the visions and policy objectives for the site, the design brief was divided into four broad topics: (1) Equity and Vibrancy, (2) Ecological Function, (3) Economy, and (4) Education. Specific objectives and performance targets under each of these categories included:

1. Equity and Vibrancy: Create a vibrant "university community" that fits the site.

- *Design a pedestrian friendly, ecologically responsible, and mixed-use "university community;"*
  - *100% of residents should be within 350 to 400 metres of shops, services, and transit*
  - *Reduce VMT by an average of 40% as a result of an integrated, mixed-use community pattern*
- *Provide a wide range of housing densities, types, and tenures;*
  - *East Neighbourhood: 1.7 FSR (60 u.p.a.) = 3,049 units*
  - *South Neighbourhood: 0.9 FSR (30 u.p.a.) = 1,488 units*
- *Provide for a finely grained and integrated blend of human activity that includes opportunities for work in the home and in job locations not presently provided by SFU;*
  - *Target at least 35% as family-oriented housing (i.e., households with children)*
  - *A proportion of housing units should be live-work units*
- *Establish urban typologies for building, community design, and circulation that respond to the original university master plan;*
  - *Building heights in the East Neighbourhood should not exceed 10 storeys or 33.5 m. (109.9 ft.)*
  - *20% of the site should be "green streets"*
  - *Future auto traffic should not exceed the peak commuter traffic currently occurring at SFU*
  - *Devote 60% of street surface to non-car modes*

2. Ecological Function: Produce "fish and people friendly" designs that protect and enhance the site's streams and forest.

- *Produce "fish friendly" designs that protect and enhance all environmen- tally sensitive and/or degraded areas;*
  - *Protect and maintain existing major watercourses as per DFO and Provincial Ministry guidelines*
- *Enhance the integration of the community into the forest edge;*
  - *Preserve significant trees and tree groupings*
  - *Preserve, create, and link public spaces*
  - *Preserve forest blocks, parks, and recreation areas. Maintain and enhance public access to riparian corridors where there is low risk of damage;*
  - *60% of open space should have habitat value*
- *Incorporate "green infrastructure," where road, utility, and storm-drain systems are integrated and compatible with the stream and habitat systems of the site;*
  - *No more than 50% of the site should be impervious*
  - *Ensure that at least 80% of all water that falls on the site during an average year is absorbed by the soil*

3. Economy: Build a community that is profitable, attractive, and that serves both the university and wider community.

- *Identify market-responsive design ideas to ensure that development secures a financial legacy for SFU*
- *Explore ways of reducing immediate and lifecycle costs of site infrastructure;*
  - *Cut total energy use of buildings to the target of 285 kWh/m² per year (about half of the norm)*
  - *At least 10% of the energy used on site should come from on-site renewable sources such as solar voltaics, passive solar, solar hot water, and geothermal energy*
  - *75% of buildings should have good solar orientation*
- *Demonstrate the relationship between liveability, affordability, and ecological compatibility in community form*

4. Education: Continue and extend the legacy of SFU as an educational leader and innovator.

- *Further the role of SFU as a leader of innovative architectural and community design and environmental stewardship;*
  - *Designs should communicate a spirit of holistic and continuous living and learning*
- *Provide a model for a "university community" that updates yet respects and extends the original SFU campus vision;*
  - *Built form should emphasize integration, communication, and education throughout the community*
- *Promote design concepts for the Burnaby Mountain Community as a twenty-first century model that will influence and shape new communities worldwide;*
  - *Render the working functions of the university and the natural environment highly visible*
  - *Schoolyards should be envisioned as interactive outdoor learning spaces for the entire community and should inspire children and adults alike*

Conclusions and Lessons Learned
The four proposals shown on pages 36 and 37 were produced over an intensive three-day period using the design brief as a guide. The process helped identify the tradeoffs between various, and sometimes conflicting, policy goals. It also fulfilled its purpose of assisting the BMCC in selecting a design team that would carry forward the development plan for this new community. Each of the four teams produced a bold vision for the community while meeting all the requirements of the design brief. This being said, it is important to note that the bylaws of the Architectural Institute of British Columbia prevent architects from competing for a commission by preparing plans concurrently. To address this, the Corporation retained an advisor, familiar with architectural competitions, to develop a set of guidelines to ensure that the process did not contravene the Institute's regulations. The result was a more collaborative process which further enhanced the success of the charrette.

The BMCC Board of Directors selected the Hotson Bakker team for their success in balancing the multiple goals of the design brief. The project team is currently preparing neighbourhood concept plans and detailed engineering and stormwater plans for the site in a manner that remains true to its original charrette proposal.

The following points summarize key attributes of, and lessons learned from, the BMCC designer selection charrette process.

- Designer selection charrettes are an excellent way of establishing equality among members of a team. (Without the charrette component the leader of the design team often closes out the creative input of key individuals on important plan strategies)
- Designer selection charrettes allow the design team to "hit the ground running" when and if they are selected to continue the planning project
- Teams that have a breadth of experience and in which participants are treated as equals tend to do better than others in this type of charrette
- Making changes to status quo development practices is easier on sites that are wholly owned by one entity than on sites that are owned by multiple entities

Notes:

[1] Patrick Condon, Joanne Proft, and Sara Muir, Burnaby Mountain Community Design Charrette Design Brief (Burnaby, BC: BMCC, 2000).
[2] City of Burnaby. Simon Fraser University Official Community Plan (Burnaby, BC: City of Burnaby Planning and Building Department, 1996).
3 City of Burnaby, Design Principles for Environmentally Sensitive Areas (Burnaby, BC: City of Burnaby Planning and Building Department, 1996); ENKON Environmental Limited. Tailed Frog Survey for the Simon Fraser Development Plan Concept Area (Surrey, BC: ENKON Environmental Limited, 1997); Garnder Dunster Associates, The Nature of Burnaby: An Environmentally Sensitive Areas Strategy, Draft. (Burnaby, BC: City of Burnaby Planning and Building Department, 1992); Kerr Wood Leidal Associates Ltd., "Appendix D: Discussion Paper on A Stormwater Management Strategy for Burnaby Mountain," in Development Plan Concept for Simon Fraser University, Final Draft (Burnaby, BC: Simon Fraser University, 1996).

Illustrative Plans

Burnaby Mountain Community

Team One: ***Connecting the Mountain to the Region***
Team One's proposal emphasized both experiential and physical connections between the mountain summit and the surrounding metropolitan region. Its plan provides a direct connection between the new university SkyTrain station (located at the base of the mountain) and various other types of transportation systems within the community, thus dispelling a feeling of isolation and encouraging alternatives to cars. Residential expansion and development of the east neighbourhood is organized around a road and block pattern that radiates out from the central spine of the university to frame significant views both to the north and south, and to allow buildings to have maximum access to sunshine. The mixed-use core merges with higher-density residential neighbourhoods along the east and north edges, which are served by curvilinear roads that respect the natural contours of the site. In a unique departure, this team chose to intensify the western portions of the site in order to achieve a balance between the land uses at the east and west reaches of the campus. The Discovery Park research facility in the south neighbourhood becomes the core of a mixed-use development where medium- and lower-density housing and an elementary school surrounds live/work housing and research facilities.

Team Two: ***An Urban Centre with a Preserved Edge***
Team Two gave top priority to preserving the forest edge and its associated stream systems. It concentrated development at the centre of the site, along the existing university axis, and maintained a healthy, forested edge along the south slope. "The Promenade" serves as the village "Main Street" and extends off the prominent main axis of the existing university, providing a strong organizing element for the community. Cross streets set perpendicular to this axis create a uniform system of urban blocks. Mixed-use buildings with at-grade commercial buildings line the promenade, while on either side are residential courtyard buildings; together, these create densely populated urban neighbourhoods. While this team fit most of the residential development into the east neighbourhood, it also included smaller increments of commercial and residential development in the western neighbourhood. A system of open spaces and trails connects all portions of the site. A new elementary school, located on the south slope, provides a key focal point for the plan. Here the large green open spaces provide a key stormwater function, while offering space for habitat preservation and traditional recreational activities.

Burnaby Mountain Community

Team Three: ***Town and Gown by Nature***
This Team's plan, "Town and Gown by Nature," attempts to forge connections between the university campus and the proposed community. Ground floor commercial uses line the "Main Street" spine, while upper floors change from academic uses to residential uses as one moves from west to east. This creates a seamless transition between the academic-focused western portion and the more commercial eastern neighbourhood. The pivot point between the two districts is a collection of civic buildings, which include Convocation Hall and a convention centre. The higher density neighbourhood is located along the upper portions of the site, with lower density residential areas located on the south and west slopes. A "flowing grid", which follows the contours of the site, allows easy and efficient connections between residential neighbourhoods, whether on car, bike, or foot. The streets of this grid are designed to minimum widths and include wide green boulevards that serve both for bio-infiltration and parking. Forest fingers of new growth, interspersed with more valuable mixed coniferous/deciduous forest, allow for a penetration of nature into the more urban reaches of the community.

Team Four: ***A Town Called Festival***
The image and form of the town of 'Festival' takes cues from the University's existing structure and the unique alpine location. Like the other teams, this team proposed a concentrated core along the eastern spine where the university fabric embraces the new community. A secondary axis intersects this primary spine and provides a strong north-south green boulevard that combines stormwater management functions within the context of a visually powerful boulevard. Extending out and beyond this green boulevard spine are a series of distinct neigbourhoods: "the blocks," "the forest," "the farm," and the "meadows." These neighbourhoods provide a diversity of housing types: 10-storey towers and terraced townhouses in the upper neighbourhoods, street oriented town houses further south, live-work and cohousing options in the central core, and tree-top and meadow housing in the southern and eastern portions of the site. Team Four's system of "green" streets provides for bio-remediation and infiltration of stormwater while "blue streets" provide pedestrian-oriented, rain-protected mews. Most of the south slope forest is maintained in this plan for habitat and as an area for faculty research and student learning.

Riverwalk on the Coquitlam

Charrette Date
February 2000

Charrette Client
Landview Group

Charrette Type
Consultant

Consultant Team

Aplin and Martin Consultants Ltd.
Tera Planning Ltd.
Golder Associates Ltd.
Moriarty/Condon Ltd.
Ward Consulting Group
CWMM Consulting Engineers Ltd.
Site Economics Ltd.

CONSULTANT CHARRETTE

Some charrettes involve a relatively closed group of participants in an effort to produce a proposal for a specific opportunity or problem presented by a specific site. The consultant charrette for the Riverwalk proposal involved designers, urban planning and environmental engineering specialists in a day-long charrette early in the development of their proposal for this sensitive hillside site. This charrette led to the basic urban form for the site as well as to the establishment of the fundamental role of "green infrastructure."

Above
The site shown in its local context. To the west of the site is Westwood Plateau, and to its south are the Coquitlam Town Centre and the River Springs development.

The Riverwalk Village proposal tests key principles of low-impact development on a fifty-three hectare (130 acre) greenfield site on the slopes adjacent to the Coquitlam River.
The site is located in the GVRD's "Growth Concentration Area" and was designated "Development Reserve" in the City's Official Community Plan. It is close to community infrastructure and is within three kilometers of regional commuter rail and the proposed "Millenium Line" Skytrain extension. Finally, the site can provide for a variety of housing types and tenures to meet increased demand for affordable homes in the city.

Given the site's location within a sensitive river ecosystem, the design challenge was to accommodate schools, commercial development, and market/non-market housing in a village community made up of distinct neighbour-hoods in ways that would reduce impacts to sensitive aquatic systems.

Guiding Policy:
Northeast Coquitlam Official Community Plan (2000)
The revised Coquitlam Official Community Plan (OCP)[1] was under development during the initial stages of planning for the Riverwalk site. The new OCP was adopted in July 2000. The OCP generally outlines the broad objectives and policies that will direct development within the community in an efficient and orderly fashion. Specifically, it outlines a long-range planning framework for developing this community and establishes principles to guide the planning and development process. The OCP designated the Riverwalk site a "Development Reserve," which means that it is recognized as an area for future development subject to confirmation of servicing and access. After its consideration as an amendment to the Northeast OCP, the Riverwalk proposal received municipal endorsement when City Council passed the adopting bylaw in September 2001.

Goals and Principles
The design brief for Riverwalk evolved over the course of the planning process and took into account input from the client, consultant team members, and City staff. Based on this input, the design team derived the following general goal for the Riverwalk site:

To enhance and preserve its special environmental features, to provide amenities for the benefit of surrounding neighbourhoods and region, and to create a village atmosphere and residential environment that is in harmony with its natural setting.[2]

In an attempt to achieve this goal, the team followed the planning principles outlined in the OCP:

1. *Protect the area's natural features and environmentally sensitive areas*
2. *Promote efficient use of resources, including land, energy, and capital*
3. *Create a complete community in terms of population, housing types, and uses and services*
4. *Increase transportation choices*
5. *Address regional and local housing needs by providing a diverse mix of housing types and tenures*
6. *Promote community and social well-being, including health, safety, and access to safety services*

Design Proposal
Proposed land uses at Riverwalk include high, medium and low density residential, village commercial, school, parks and recreation, linear park, and environmentally sensitive areas. A total of 1,100 new homes are planned. In order to conserve the area's prominent natural features and ecological function, almost 40% of the site is dedicated to natural lands, with an additional 13% dedicated to public parks, schoolyards, and play areas. The school site is flexible enough to accommodate both an elementary and middle school with separate street access. The Coquitlam River is protected with a significant buffer at the top of the bank. Passive recreation corridors will provide access to the river and waterfall north of the site.

The transportation system is intended to facilitate walking and cycling, and to accommodate transit service. Schools and commercial services are located on-site and within walking distance of all homes. Access to the site is via a bridge. The layout of internal streets follows the site's contours in order to minimize impact upon streams and the adjacent Coquitlam River.

Conclusions and Lessons Learned
The Riverwalk consultant team charrette was carried out in an atmosphere sensitive to further development of this area. This sensitivity was based on concerns about impact on the site's natural environment; the ability to fully mitigate all development associated impacts in this area, and the impacts from historic patterns of insensitive development in the Coquitlam River watershed. Consequently, the possibility for resolving the conflict between site and watershed environmental concerns and the compatibility of the development proposal with regional and community growth management strategies, set up a unique challenge for a charrette-based resolution.

The Riverwalk consultant team achieved a much higher degree of internal integration (incorporating ecological, planning, design, and engineering expertise) than other BC projects of its kind. However, unlike the process for the East Clayton area (see pages 42-47), it did not involve all possible stakeholders.

The key lessons learned from this consultant charrette are:

- Consultant charrettes involving a highly integrated consultant team can measurably reduce the environmental impact of plan but can be challenged for lack of stakeholder involvement.
- Low impact development principles can be applied to difficult sites such as Riverwalk, but implementation problems can be expected because of site sensitivity, the potential for impacts, and the feasibility of applying all required mitigation measures and/or developing acceptable compensation options to offset any residual impacts associated with development in this area. As such, any development will require extraordinary care on the part of both developers and municipalities.

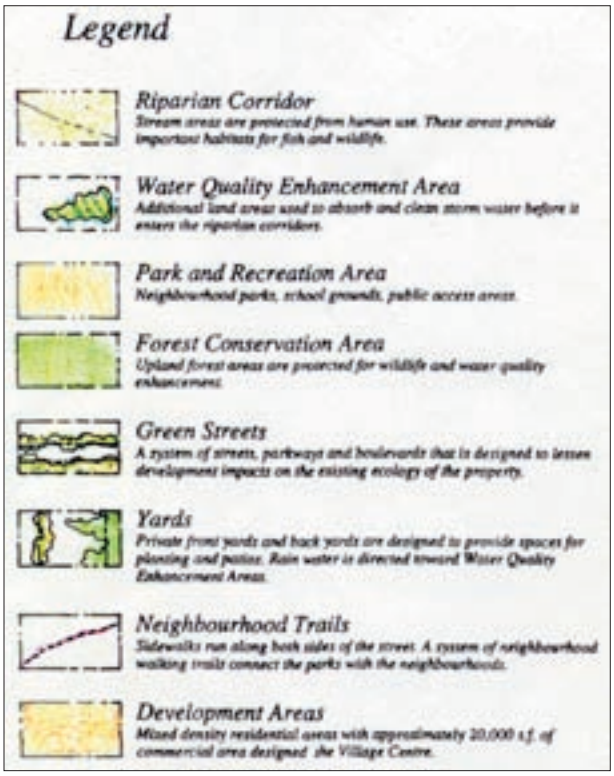
Notes:

[1]City of Coquitlam, *Northeast Coquitlam Official Community Plan* (Coquitlam, BC: City of Coquitlam Department of Planning and Development, 2000).
[2]Landview Group, *Riverwalk on the Coquitlam: Official Community Plan Amendment* (Coquitlam, BC: Landview Group, 2000).

Illustrative Plan

Riverwalk on the Coquitlam

Riverwalk on the Coquitlam



A Green Infrastructure Vision

Recognizing the wealth of natural amenities in and around the Riverwalk site, the design team concluded that the success of the project would depend on how effectively the plan protected and capitalized on both internal and external natural landscape features. This insight lead to a concept for the Riverwalk "green infrastructure" system – a system of streets, greenways, and open spaces that organizes and gives special character to the site. The features of this green infrastructure vision include:

- maintaining forest corridors in order to provide habitat and to visually absorb the community into the hillside
- incorporating natural features into parks and open space
- preserving streams that flow through the site to the Coquitlam River and act as a natural boundary between residential "blocks"
- aligning proposed streets with the natural topography in order to minimize disturbance, increase accessibility, and minimize stream crossings
- protecting streams with an overland stormwater drainage system

Streets, parks, yards, and open space are also part of the infrastructure system. These features capture, direct, and infiltrate rainwater on site in a way that copies pre-development patterns.

In addition to the comprehensive green infrastructure system, the plan integrates a high degree of affordable housing types (ranging from single-family homes to high-density townhomes) within neighbourhoods clustered around areas of community open space. Village commercial is located at the entry of the community, within a short walk or cycle of all residences.

IMPLEMENTATION CHARRETTE

An implementation charrette is perhaps the most complex and time intensive charrette of the four charrette types we present. The East Clayton charrette was desinged to achieve institutional and regulatory change. This process was set in motion when the Surrey City Council authorized their planning department to use seven principles of sustainable communities as the basis for developing the new community of East Clayton, and to use the process of the charrette to open up the planning process to involve designers and a diverse group of stakeholders.

East Clayton Charrette

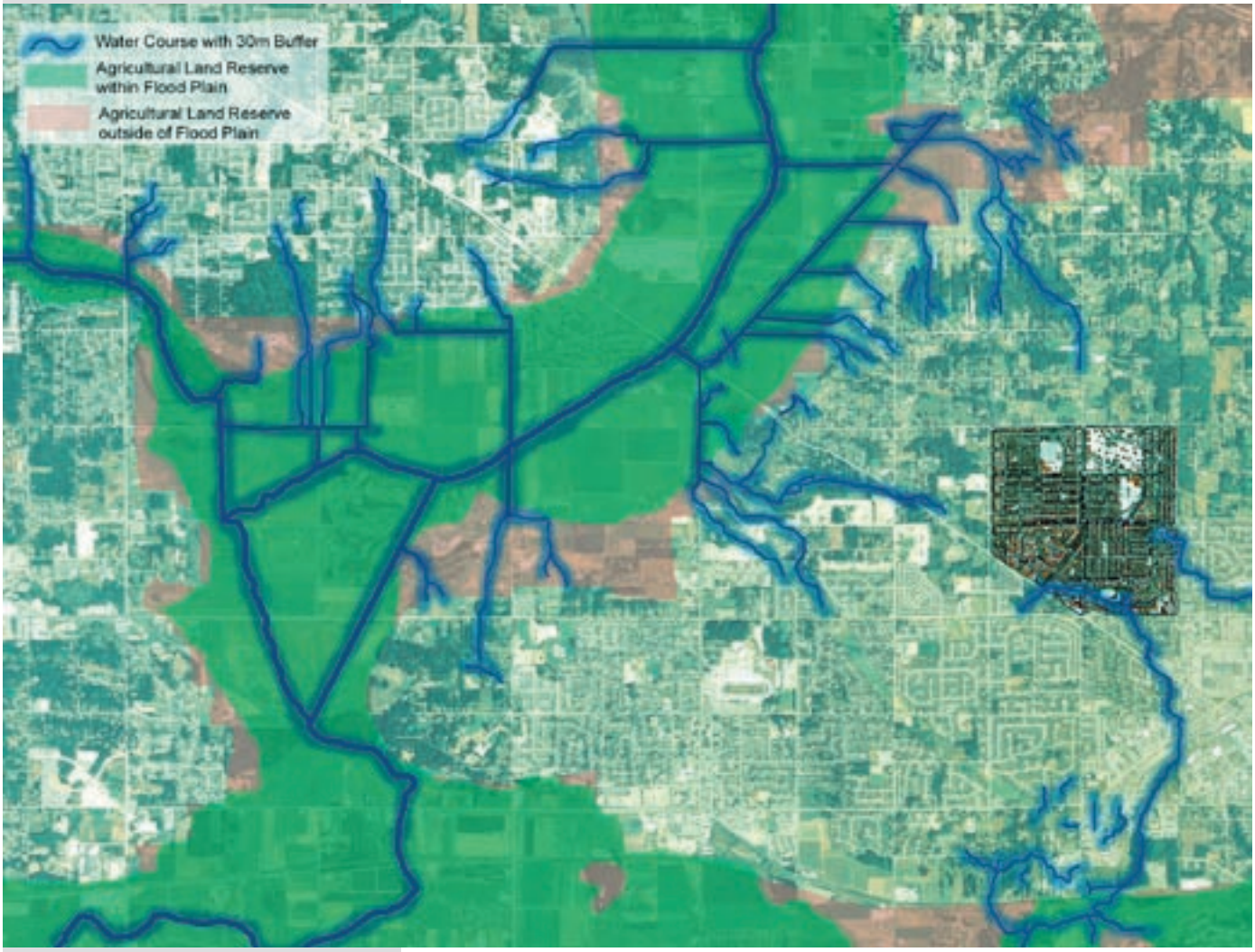
Charrette Dates
November 1999 and February 2000

Charrette Client
City of Surrey

Charrette Type
Implementation

Charrette Participants

City of Surrey:
How Yin Leung, Wendy Whelen, Fransisco Molina (Planning); Eric Emery (Engineering)
Jean Lamontagne (Parks, Recreation and Culture)
John Strandt (Fire); Gerry McKinnon and Dale Hadden (Operations)
Department of Fisheries and Oceans:
Barry Chillibeck
Ministry of Environment, Lands, and Parks:
Erin Stoddard
BC Hydro:
Allan Grant
East Clayton Community:
Norman Alexander, Amar Bains, Elsa Watts (Citizen Advisory Committee)
Developer:
John Turner (Progressive Construction)
Engineering Consultants: Sudu Vatagotagombura, Jane Farquason (Reid Crowther Ltd.)
Designers:
Bob Worden, Doug Ramsay (Ramsay Worden Architects Ltd)
Stacy Moriarty (Moriarty/Condon Ltd.)
Patrick Condon (UBC James Taylor Chair in Landscape and Liveable Environments)
Facilitators:
John Blakney (Pacific Resources Centre Ltd.)
Jennifer Crawford (Pacific Resources Centre Ltd.)
Environmental Consultant:
Helmut Urhan (Tera Planning)



Above
The 250 hectare East Clayton site is located on the eastern border of Surrey, geographically the largest and the fastest growing municipality in the Lower Mainland Region. Situated upland of the region's Agricultural Land Reserve (shaded area), the site also drains into two of the region's most significant water bodies (the Serpentine and the Nicomekl River).

The East Clayton Neighbourhood Concept Plan, and the charrette process from which it was produced is a larger initiative called the Headwaters Project. The Headwaters Project was initiated in January 1999 by the City of Surrey, the UBC Chair in Landscape and Liveable Environments, and the Pacific Resources Centre, with support from a host of government and related agencies.[1] Building on the momentum of previous joint projects in the Municipality of Surrey, notably the Surrey Design Charrette (1995)[2] and the Alternative Development Standards Workshop (1997),[3] this partnership convened with the goal of building a model community that would apply sustainable planning principles and alternative development standards "on the ground." The result would be a replicable model of how to develop more sustainable communities throughout the Lower Mainland and potentially beyond. The first and most important component of the Headwaters Project is the East Clayton Neighbourhood Concept Plan (NCP). The NCP was developed over a one-and-a-half-year period through an integrated and consultative design process that involved over 150 people from fourteen different constituency groups in a process that featured over a dozen information-sharing workshops, public open houses, and a unique four-day design charrette. This process was set in motion in 1998 when the Surrey City Council endorsed seven core principles to guide the NCP.

1. *Increase density and conserve energy by designing compact walkable neighbourhoods. This will encourage pedestrian activities where basic services (e.g., schools, parks, transit, shops, etc.)are within a five- to six-minute walk of homes.*
2. *Provide different dwelling types (a mix of housing types, including a broad range of densities from single-family-homes to apartment buildings) in the same neighbourhood and even on the same street.*
3. *Communities are designed for people; therefore, ensure that all dwellings present a friendly face to the street and to promote social interaction.*
4. *Ensure that car storage and services are handled at the rear of dwellings.*
5. *Provide an interconnected street network, in a grid or modified grid pattern, to ensure a variety of itineraries and to disperse traffic congestion; and provide public transit to connect East Clayton with the surrounding region.*
6. *Provide narrow streets shaded by rows of trees in order to save costs and to provide a greener, friendlier environment.*
7. *Preserve the natural environment and promote natural drainage systems (in which stormwater is held on the surface and permitted to seep naturally into the ground). (See pages 46-47 for a description of how these principles were incorporated into the East Clayton NCP.)*

The 250 hectare East Clayton site is located on the eastern border of Surrey, abutting the northwestern edge of Langley Township. The site drains into the broad Serpentine River and Nicomekl River flood plains, which are located to the west and south, respectively. These sensitive flood plains are protected from urban encroachment by their inclusion in the Agricultural Land Reserve and are designated as protected "green zone" lands in the GVRD's Livable Region Strategic Plan. Given these conditions, it was especially important that the development of East Clayton should neither cause damage to the streams that drain the site, nor increase the amount of water conveyed by those streams to flood-prone farms in the flood plain below. At the same time, the plan would need to help meet city- and region-wide demand for various types of housing, address the need for linking housing to local employment opportunities, and provide effective transportation and servicing links with existing urban centres (such as Langley and Cloverdale).

Guiding Policy

In addition to the Growth Strategies Amendment Act (1995) and the Livable Region Strategic Plan (1995), the NCP was also directed by the following policies:

Surrey Official Community Plan (1996)

Surrey's OCP "promotes planned community development – bringing together residents, business and city resources to guide the location and form of growth toward long term city and regional goals for complete and sustainable communities."[4] It identifies East Clayton as "urban." This means that the City will eventually serve the area with the infrastructure (e.g., water, sewer, roads) necessary to support urban densities of at least six dwelling units per acre and to supply employment opportunities for people who will live in the community.

Clayton General Land-Use Plan (1998)

The Clayton General Land-Use Plan contains the planning and implementation framework for the larger Clayton district and provides the context for the development of individual neighbourhoods within it.[5] More than half of the Clayton district was designated as "suburban," meaning that densities were to be at or below one unit per acre. East Clayton, the southeastern quadrant of the larger Clayton district, was designated urban and was to be the first portion of Clayton to be developed. The Clayton General Land-Use Plan includes objectives for developing a complete community that respects and maintains aspects of its rural character, provides jobs close to residents, provides a rich and varied natural environment for both human and wildlife use, and manages change both incrementally and efficiently.

With these policies as a context, the East Clayton Land-Use Plan had the following goal:

To build a community in the East Clayton area of Surrey that meets local, provincial, and federal policy objectives for sustainable development.[6]

Charrette Process

Planning for a more sustainable East Clayton community demanded an integrated planning method, and a multi-party approach to building policy and developing acceptable standards of commitment among diverse constituencies. The charrette method was chosen as the ideal format for meeting these demands. The charrette would build confidence in new ideas, provide time for reflection, and build acceptance for alternative ways of developing a community - all within a relatively short period of time.

Design professionals served to facilitate, not to lead, the charrette. Since the Headwaters Project was designed to produce a replicable model for circumventing institutional barriers, it was important that those typically vested with the authority to guide development be provided with new means to affect change.

Rules of the Game
The following simple guidelines offered insight, structure, and a level playing field to all those involved in the process:

1. *Build capacity for integration through shared awareness and determination to act jointly*
2. *Involve early on (preferably at the beginning) those people, agencies, and organizations that can influence planning policy and development standards (including their implementation)*
3. *Share information equally*
4. *Share resources across mandates for mutual gain*
5. *Build confidence in the process, in plan policies, and in alternative development standards*
6. *Ensure the direct involvement of municipal staff*
7. *Gain access to the necessary technical expertise*
8. *Deal with issues efficiently*

Design Brief
The most crucial part of initiating any implementation charrette process is writing the design instructions. These instructions are referred to as a design brief and must show stakeholder consensus. The Headwaters Project team held a series of workshops with various stakeholder groups to forge this consensus. These stakeholder groups were of several types, each constituting a "community of interest." They included: City of Surrey Planning, Engineering, Parks and Operations/Maintenance Departments; the Ministry of Agriculture; the Clayton Citizen's Advisory Committee; developers and builders; the Department of Fisheries and Oceans; the BC Ministry of Environment, Lands and Parks; the Surrey School Board; Translink; BC Hydro, public safety and emergency services. Each of these groups identified and/or suggested design and performance targets that they considered the most important. The brief organized the wide ranging performance standards into a number of general objectives under the overarching categories of: (1) Land and Water, (2) Community, and (3) Buildings and Energy.

1. Land and Water: Celebrate and protect the ecological performance of native habitats, hydrology, and landforms, and ensure that storm drainage systems do not alter stream systems.

- *Protect and enhance all environmentally sensitive and/or degraded areas (wetlands, watercourses, ravines, watersheds, ground water recharge areas, critical wildlife habitat areas, areas with fragile or unstable soils) maintaining and/or enhancing the ecological performance of native habitats, hydrology, and landforms.*
- *Preserve, create, and link urban and rural open space, including parks and recreation areas. Maintain and enhance public access to streams, where environmentally sustainable.*
- *Identify and enhance special recreation opportunities within the site (e.g., streams, topographic features, natural areas etc.).*
- *Protect natural habitat and improve stream flows and water quality to contribute to fish protection (as consistent with federal and provincial fish protection legislation).*
- *Create an integrated and linked system of green and open spaces that serves multiple functions.*
- *Integrate an urban forestry strategy with a water conveyance strategy.*
- *Incorporate natural drainage infrastructure that is compatible with fire protection systems.*

2. Community: Provide housing that is affordable to a range of incomes within neighbourhoods that connect residents to their destinations in efficient, people-friendly ways.

- *Housing Equity: Provide a balance of housing types so that houses meet the needs of a range of ages and lifestyles and are affordable to groups and individuals within a wide range of incomes. At least 20% of the housing shall be for persons with family incomes in the bottom third of incomes region-wide.*
- *Density and Mixed Housing: Supply higher-density housing in areas close to commercial areas. Mixed housing and densities are to be blended and balanced with existing uses (e.g., built residential areas, agricultural areas, commercial/industrial) through establishing compatible densities, housing types, lot sizes, and effective buffering.*
- *Special Needs Housing: Provide adequate special needs housing (e.g., seniors, disabled, family crisis victims, etc.).*
- *Safety: Employ proven methods of enhancing community safety and sociability.*
- *Public Safety and Fire Systems: Ensure fire equipment can be manoeuvred effectively through the streets. Set definitive service boundary for the provision of fire protection and ambulatory services.*
- *Jobs: Provide workspace in commercial, office, or light industrial facilities for the working population that are also consistent to targets set out in the Clayton General Land Use Plan.*
- *Schools: Locate schools away from major transportation corridors, within five minute walking distances from residential units, and in quieter neighborhoods.*
- *Integration of Land-Uses: Create a mix of building and land-uses, integrating residences, work, shopping, and services (community, professional, commercial, and institutional).*
- *Lane system: Ensure municipal services and utility work crews can gain access to lanes by using appropriate width and surface materials. Explore the use of various permeable low cost materials for surfacing lanes.*

3. Buildings and Energy: Maximize opportunities to reduce on site and off site energy use and demand.

- *Solar Heat: Reduce building energy requirements by providing optimal solar orientation for active and passive solar water-heating and day-lighting.*
- *Energy Infrastructure: Aim for the efficient use of utility infrastructure by considering utility system design as part of the community design. Provide as appropriate, or maintain flexibility so as to provide in the future, energy service from alternative technologies such as community-scale generating systems, district heating, and co-generation.*
- *Design with Climate: Enhance community microclimate through design response to wind, sun, vegetation, and precipitation.*
- *Auto Trip Reduction: Reduce number and length of commuter and daily-use automobile trips.*
- *Auto Alternatives: Provide safe, comfortable, barrier-free and direct pedestrian access to transit routes. Provide a multimodal community route system that gives walking and biking priority over auto travel.*

Conclusion and Lessons Learned

The lion's share of the guidelines included in the East Clayton Neighbourhood Concept Plan were developed at the four day East Clayton Charrette. The draft NCP was presented to the public in July 1999 and the land-use plan was approved in November 1999. The second phase of the Headwaters Project, now in its initial stages, involves the coordination and design of the first development project based on the standards and guidelines contained in the NCP.

Key lessons from the East Clayton implementation charrette are:

- Implementation charrettes have the advantage of involving all appropriate parties in determining the exact future design for a community. All parties take ownership of the plan and, ideally, are proud of it.
- Opposition is dealt with as part of the design process, not afterwards (when it is often too late).
- The charrette team should stay together as long as possible. Difficulties and miscommunication occurs when participants go their separate ways while issues are still outstanding.
- Implementation charrettes often produce more conservative results than do visioning charrettes. This is because inevitable compromises occur as an integral part of the design process rather than during implementation of the master plan.
- The design brief is crucial to the success of the charrette as it establishes the "rules of the game," to which all parties agree in advance.
- Participants must have sufficient authority to "negotiate on the fly" and to stand behind their decisions once the projects are implemented.
- The process takes many hours and can be costly. Funds ordinarily directed to creating standard neighbourhood area plans can and should be redirected into this kind of process.

Notes:

[1]The Headwaters Project is supported by: the Affordability and Choice Today Program (Federation of Canadian Municipalities), the Canada Mortgage and Housing Corporation, the BC Agricultural Investment Program, the BC Ministry of Agriculture and Food, the BC Ministry of Municipal Affairs, Environment Canada, Fisheries and Oceans Canada, the Greater Vancouver Regional District, and the Real Estate Foundation of BC.

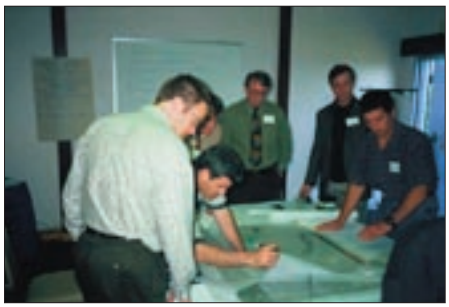
[2] Patrick Condon, Sustainable Urban Landscapes: The Surrey Design Charrette (Vancouver: UBC James Taylor Chair in Landscape and Liveable Environments, 1997).

[3]See Patrick Condon and Jacqueline Teed, Alternative Development Standards for Sustainable Communities Workbook, Charrette (Vancouver: UBC James Taylor Chair in Landscape and Liveable Environments, 1998).

[4]Greater Vancouver Regional District, Liveable Region Strategic Plan (Burnaby, BC: Greater Vancouver Regional District, 1995).

[5]City of Surrey Department of Planning and Development, City of Surrey Official Community Plan (Surrey, BC: City of Surrey, 1999).

[6]UBC James Taylor Chair in Landscape and Liveable Environments and Pacific Resources Centre, East Clayton Design Brief (Vancouver, BC: UBC James Taylor Chair in Landscape and Liveable Environments, 1999).



The Charrette Design Table
The design table structure for the charrette involved everyone with an interest in the East Clayton development process. Interests such as a landowner's concern over land values, a developer's hopes for a fair return on a residential development, environmentalists' desire for quality streams and the City's fear concerning its ability to cost-effectively maintain what is built, were only some of these concerns. The charrette design table structure ensured fair representation of these interests.

A Draft Land-Use Plan
Guided by the charrette design brief, the design table developed the first iteration of the East Clayton Land-Use Plan in four days. In these four days, the design table made crucial decisions regarding how the community would function as a sustainable unit in the larger Clayton district. Decisions regarding the site's ecological infrastructure, roads and circulation, housing densities, employment centres and community services were negotiated "on the fly".

Public buy-in
The NCP process was deliberately designed to promote awareness of the principles and concepts of a more sustainable urban community, to reinforce acceptable solutions at each stage, and to generate an acceptable plan. In May, 1999, the draft land-use plan was presented at a public open house. This gave citizens of East Clayton and its envrions an opportunity to see how the principles were embodied in the plan. It also allowed those involved to measure the level of constituent buy-in. Comment sheets indicated a high level of public acceptance and allowed the process to move forward to refining the draft plan for approval.

East Clayton

Outlined below are the seven principles approved by Surrey City Council to guide the NCP, accompanied by a description of how each is represented in the Land Use Plan. The NCP supports a variety of land-uses and residential/community types to maximize affordability, sociability, and availability of commercial services within easy walking distance for the proposed population of 13,000. Envisioned as a complete, mixed-use community, East Clayton is designed to promote social cohesion, local economic opportunities, and environmental stewardship while providing equitable access to housing and jobs and reducing dependence on the automobile.

1

Conserve land and energy by designing compact walkable neighbourhoods. This will encourage pedestrian activities where basic services (e.g., schools, parks, transit, shops, etc.) are within a five- to six-minute walk of their homes

Achieving a pedestrian-oriented neighbourhood requires that homes be within a walkable distance of shops and services and that streets be interconnected to provide the widest possible choices for reaching nearby destinations. Accordingly, residential neighbourhoods are to be structured around a fine-grained modified grid of streets and lanes, with block dimensions averaging 160 metres (525 feet) by 80 metres (250 feet). They are to be considered both public corridors and neighbourhood amenities, and are to accommodate automobile, pedestrian and bicycle traffic, while ensuring easy access to local destinations.

2

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Provide a mix of housing types, including a broad range of densities from single-family homes to apartment buildings in the same neighbourhood and even on the same street

The plan accommodates a wide variety of household types and tenures to serve a diverse and socially cohesive community. The plan promotes the integration of different family types and ages to strengthen the larger community. Creative and economic housing options will be encouraged, such as single-family homes with a second dwelling unit available to provide a "mortgage-aid" to young families. The secondary unit will provide an affordable housing option to individuals and families in need.

3

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Communities are designed for people; therefore, all dwellings should present a friendly face to the street in order to promote social interaction

Blocks are to be proportioned to create a fine-grained, interconnected network of streets to reduce congestion and to allow as many homes as possible to front directly onto public streets. Dwellings are situated closer to streets to ensure more "eyes on the street" and to create a larger, private backyard. Front yards will have buffers that ensure privacy and clearly distinguish between private and public space. Street trees, boulevard infiltration devices, and on-street parking will create a pleasant envelope for pedestrians and provide a buffer from passing traffic.

4

Ensure that car storage and services are handled at rear of dwellings
The existing site conditions (i.e., topography, vegetation, road network, and parcel configuration) determined the proposed community structure and lot sizes for East Clayton. Narrow lots demand lanes to prevent building fronts from being consumed by garages, front yards from being consumed by concrete, and residents from being closed off from contact with activities on the street by the barrier of the garage. Lanes allow cars to gain access to units from behind, resulting in a reduction of the required frontyard setback and an increase in useable backyard space. A small portion of the plan includes shallower blocks that have wider driveway access lots with no lanes.

5

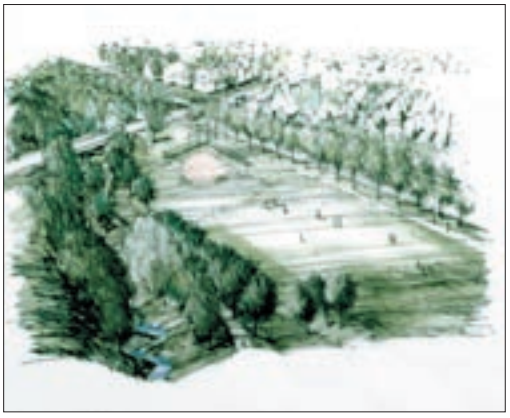
Provide an interconnected street network, in a grid or modified grid pattern, to ensure a variety of itineraries and to disperse traffic congestion; and provide public transit to connect East Clayton with the surrounding region
The organization of roads, blocks, parks, parkways and riparian areas responds to the site's topography and the location of its sub-watersheds. The street network is organized around a four-part hierarchy of streets, which includes arterials, collectors, local streets, and lanes.

6

Provide narrow streets shaded by rows of trees in order to save costs and to provide a greener, friendlier environment
Paved street widths for local and collector streets range from 6 metres (20 feet) to 11.3 metres (37 feet). Street rights-of-way range from between 17 metres (56 feet) and 22 metres (72 feet), depending on the specific infrastructure and servicing and amenity requirements of each individual corridor (i.e., drainage, traffic volume, and urban forestry).

7

Preserve the natural environment and promote natural drainage systems (in which storm water is held on the surface and permitted to seep naturally into the ground)
The backbone of the plan's ecological infrastructure is its linked system of streets and open spaces, which includes local streets, major and minor parks, schools, riparian protection areas, tree preservation areas, neighbourhood parks, and buffers. This system will have many beneficial functions. It will simultaneously satisfy social, recreational, and educational demands while meeting important ecological goals such as stream protection, stormwater management, and habitat preservation.



Drawing credit: Bill Wenk

Illustrative Plan

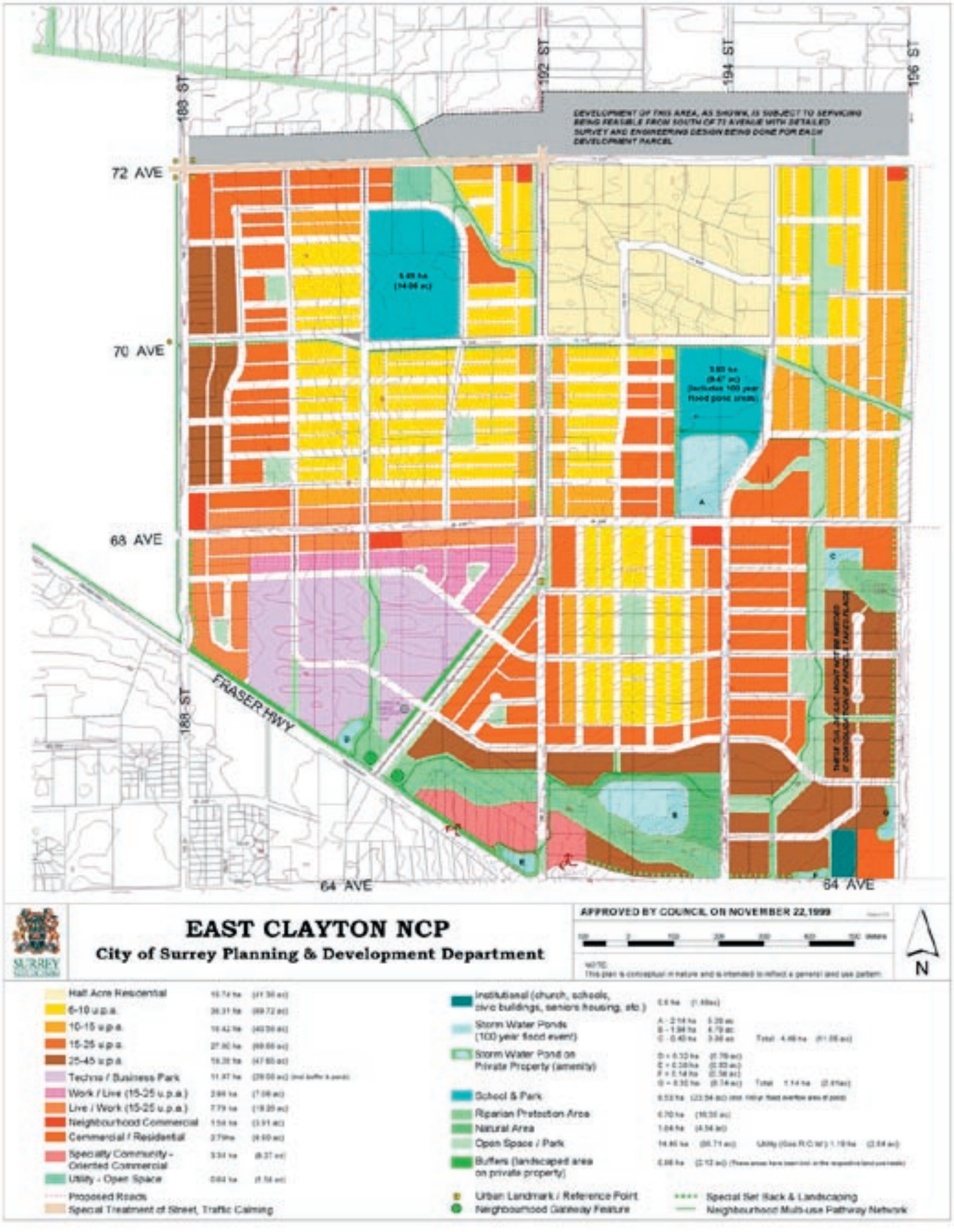
East Clayton

East Clayton Neighbourhood Concept Plan

The charrette team collaboratively produced the plan shown on these pages. They hoped that what the community envisioned would ensure the protection of the East Clayton environment while supplying a variety of affordable dwelling types. The plan calls for the production of approximately 4,500 homes, including single family detached, semi-detached, fee-simple row-house, coach houses, and apartments. These homes will accommodate 13,000 new residents at densities averaging twenty-five units per hectare, or ten units per acre (inclusive of park, commercial, and business park lands as well as land consumed by street rights-of-way). Land uses are highly integrated so that those living in the community can shop, work, and recreate without leaving the area. The focal point for this complete community would be "Clayton's Main Street" (located at the north-west corner of the community), where street-front commercial buildings and residences above shops will provide a commercial and public centre for the residents of East Clayton and, eventually, other communities within the larger Clayton district.

The plan is structured around a fine-grained, interconnected street/block system. This system allows easy movement by transit, car, foot, or bike. Tree-lined boulevards, infiltration devices, and on-street parking will buffer the pedestrian from passing traffic. The plan calls for lanes at the rear of most dwelling units so that trash, garages, and driveways will not deter from the friendliness of the street. Most importantly, the plan is designed to respond first and formost to the site's ecological carrying capacity. The site incorporates a system of streets, yards, parks, and other naturally absorptive areas in order to infiltrate runoff and avoid stream destruction and the flooding of lower-lying agricultural areas.

East Clayton



TAXONOMY OF URBAN SITES

From the four charrette case studies featured in the previous section come virtually hundreds of design strategies that address issues pertaining to air, water, people, and affordability. As a means of organizing these strategies into a coherent and useful framework we developed the Taxonomy of Urban Sites. The taxonomy is structured, on the one hand, by scales of urban design – district, corridor, block, and parcel – and, on the other, by sustainable design performance categories – ecological infrastructure, social infrastructure, movement, and cost. In this way, the charrette design strategies can be understood in terms of (1) the degree to which they address the specific sustainability challenges of air, water, people, and affordability, and (2) the scale, or unit of development, to which they are most applicable.

Drawing Credit: Bob Worden, Ramsay Worden Architects, Ltd.

PART TWO
A Design Method

In producing this manual, we poured over the results of work done here in British Columbia as well as in other parts of North America. We were looking for a way to organize and distill the vast number of sustainable design strategies into a logical and useful framework. At the same time, we wanted a framework that would be relevant to a variety of site situations and that would encompass the broad range of issues that bear on sustainable site design. For this reason, we chose to feature the case study results of the four charrette projects described in Part One.

What emerged from each of the four charrettes were clear and practical ideas for making our communities more sustainable. These design strategies are not new - they are grounded in years of research and public policy. They include designing mixed-use, compact communities around transit; designing interconnected streets to encourage walking and to reduce dependence on the car; and providing affordable and appropriate housing in a mix of forms and at a mix of densities. They also include a strong imperative to protect aquatic systems and their green infrastructure tributaries that are the neighbourhood streets.

Taxonomy of Urban Sites

In the process of distilling the charrette outcomes into a useful framework, we ran the risk of repeating the same failure we had identified in previous efforts: disintegrating the very thing we wanted to preserve - the whole cloth of sustainable urban communities. Consequently we have taken pains NOT to organize this work according to functional categories such as transportation, housing, stormwater systems, green space, and so on. What we offer instead is a two-tier taxonomy that is organized, on the one hand, by the **urban design scales** of *the district, the corridor, the block,* and *the parcel,* and, on the other hand, by the **sustainable design categories** of *green infrastructure, social infrastructure, movement,* and *cost*. The principles embedded in these four categories were distilled from seven principles outlined in the East Clayton Neighbourhood Concept Plan (2000) (see pp. 46-47).

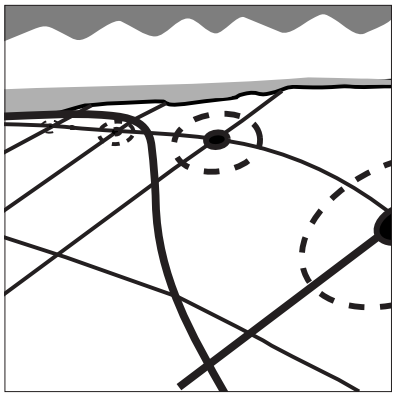
Urban Design Scale

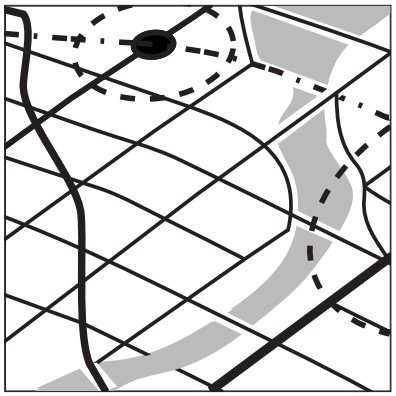
taxonomy of urban sites

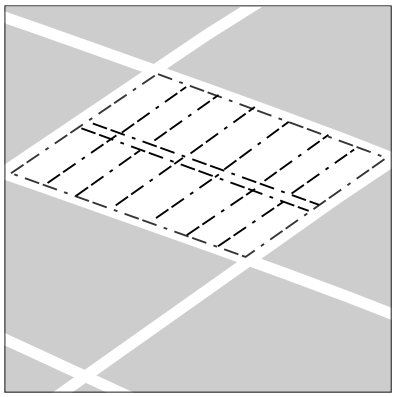
The district, corridor, block and parcel taxonomy is based on functional principles of urban design. Together and in pieces these units can be organized and configured in many ways to produce either more or less sustainable results. For each scale there are many different types of units. For instance, orthogonal blocks that form gridiron street patterns are one type of block, polygonal blocks that form radial webs are another, and green centered large blocks that allow natural landscapes to penetrate deeply into the fabric of the community are a third. In this and other respects, application of functional principles overrides adherence to any one stylistic urban design pattern.

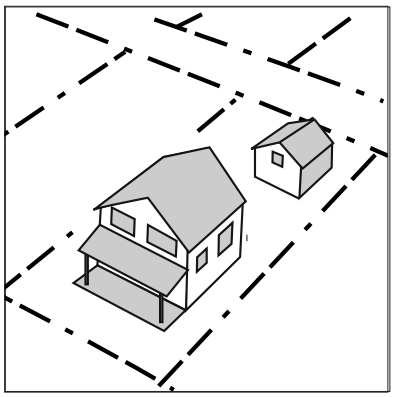
District
Districts are the geographic and social units that collectively comprise our urban regions. They are the places where we live, work, play, and exchange. They often represent the most local level of government (e.g., electoral wards). How districts are shaped and function can affect the entire region. Districts that concentrate services, housing, transit, and other activities of daily life within a walkable distance of residences benefit the region by reducing auto use and by distributing services evenly.

Corridor
Corridors are the conduits for moving materials, energy, and resources within and between neighbourhoods, districts, and regions. Be they streets, lanes, boulevards, pathways, or streams, corridors need to reflect their unique and specific functions. Regional transit corridors should be designed to coordinate and concentrate growth where it is most appropriate. Local corridors should be designed to be walkable and to connect residents to commercial services, transit stops, and natural areas. Laid over the urban fabric, a system of interconnected transportation corridors can and should yield to natural stream corridors without unduly compromising street interconnectivity.









Block
Blocks are the chunks of developable land that are available after a street pattern is imposed. Smaller blocks result from a more integrated (or net-like) street system, while large super-blocks are the result of a disintegrated dendritic (or tree-like) street system. The smaller the block, the finer the grain of development and the more permeable the neighbourhood.

Parcel
The parcel is the smallest increment of development. However, what happens at the scale of the individual house and yard has important social, economic, and environmental implications for the rest of the district. The post-1950s emphasis on the automobile has resulted in a whole new set of dimensions that demand ever-wider parcels to accommodate driveways and garages. Wider individual parcels mean less density in the aggregate, translating into more expensive infrastructure per individual parcel serviced. It also translates into a context that becomes, over time, so car-dependent that even the simplest of everyday needs cannot be satisfied without an automobile.

FURTHER RESEARCH

The concept of "green infrastructure" is becoming more widely accepted for maintaining the ecology, economy, and affordability of new and retrofitted communities, for minimizing maintenance costs of systems over the long term, and for eliminating a site's downstream impact on streams and natural areas. For further research into this topic, please see:

Moffat, *City Green: A Guide to Green Infrastructure for Canadian Municipalities.*

taxonomy of urban sites

While the word sustainability defies absolute definition, it has commonly come to represent that which balances social, ecological, and economic imperatives. When we apply sustainable thinking to problems of urban design, these imperatives translate into the interrelated categories of ecological infrastructure, movement, social infrastructure and cost. It should be emphasized that these four categories were derived from an original set of seven principles outlined in the East Clayton Neighbourhood Concept Plan, 2000 (see pgs. 46-47).

Green infrastructure
Green infrastructure refers to the ways in which natural systems are integrated into the structure of a community. Green infrastructure can mean using the naturally absorptive areas of the streets, forests, and open areas to allow rainwater to infiltrate the ground. It can also mean integrating stream systems with large natural areas (such as park and school sites) with greenways, as well as with bike and pedestrian trails, in ways that preserve and enhance their ecological function.

Movement
Organisms need a constant and efficient flow of materials and energy in order to survive. When this flow is interrupted or altered, the organism's health is compromised. So too with communities. Communities designed with an interconnected network of green streets, lanes, pathways, and streams provide ways to travel, provide rainwater with an opportunity to be dispersed and absorbed in many locations, and provide streams with the protection and nutrients needed to support essential fish and wildlife habitat.

Social infrastructure
Communities with a healthy social infrastructure are complete communities. Healthy social infrastructure means that housing, jobs, and services are clustered and that residents can walk to a transit stop or to a corner store. It means that housing is available and affordable for a variety of income groups and family circumstances within the same neighbourhood and even on the same street. It also means that public spaces are enriching and add quality, identity, and meaning to the fabric of a community. A healthy social infrastructure creates a community in which people want to remain.

Cost
Sustainable communities are affordable communities. This means that they contain homes that citizens can afford; provide an equitable and reliable distribution of services; provide a reasonable return on investment over the long term; and minimize the cost of restoring the environment, tax rates for citizens, and future capital costs to local governments.

FURTHER RESEARCH

Several North American urban design theorists use this framework of physical spaces as the key organizing principle for functioning communities. Please see:

Duany and Plater Zyberk and Company, Version 2.0. *The Lexicon of the New Urbanism.*

Calthorpe, *The Next America Metropolis.*

CHARRETTE STRATEGIES

The charrette strategies in this section are organized according to a common format that corresponds to the two-tiered "Taxonomy of Urban Sites" (outlined on pgs. 52-53). Each page outlines four strategies for addressing sustainability at the scale of either the District, Corridor, Block, or Parcel with a fourfold focus on the categories of Green Infrastructure, Movement, Social Infrastructure and Cost.

Charrette Strategy ID

Urban Design Scale
This identifies the urban design scale at which the charrette strategies apply.

Charrette Name

Charrette Icon

Sustainability Category
This identifies the sustainability category addressed by the strategy.

green infrastructure movement
social infrastructure cost

Charrette Strategy
This identifies a specific strategy for addressing the sustainable design category.

Illustration
This illustrates visually how the category was addressed.

Description
This describes why the strategy meets the sustainable design performance standard and how it was achieved.


E
Corridor
southeast false creek

Green Infrastructure

E1 Create urban gardens
Even a high-density residential area can provide habitat for songbirds, amphibians, plants, and insects. The image below demonstrates how this is done. The street system in this image is actually a linear habitat corridor that links to habitat areas along and just off the shore. Extensive planting of fruit and nut trees and fruit-bearing plants in and along these public ways provides the community with a "garden landscape" that is not only beautiful, but also edible!

Movement

E2 Create safe and comfortable streets
Designing streets for safety and comfort will encourage more people to use them. The cutaway view of this local street shows how this may be accomplished. A Narrow roadway (approximately 6 m wide) acomodates two travel lanes. Moving traffic is buffered from pedestrians by parking, located within grassy verges, on either side of the street. Street trees provide areas of shade and create a strong edge between the roadway and the sidewalk. The "zero" setback of the buildings gives the street an even stronger edge while balconies provide a means for further animating the street.

STREET SECTIONS: BOXER MANOR

62

Social Infrastructure

E3 Use streets to frame views
Grid street patterns usually protect long views; modified grid street patterns can protect long views and/or emphasize key structures or locations within the district. In the plan detail shown, the street orientation and design ensures that views to local landmarks such as the North Shore mountains, city hall, the downtown core, and Science World are maintained. The street wall – a three-to-four-storey continuous building wall set closely to the road – contributes to the impact of these views by "framing" the street.

Cost

E4 Centre activity on a "Main Street"
A primary through-corridor can become the commercial heart of the community. Team Two took the position that a centre could be linear and connect to the rest of the city along an active street corridor. Above, retail, services, and workshop spaces animate the Main Street while serving neighbourhood residents and those that pass through by foot, car, bicycle or streetcar.

District A - D

Southeast False Creek

A 1 Create a connected ecological network

A 2 Connect districts with transit

A 3 Let the centre define the community

A 4 Provide a variety of affordable housing types

Burnaby Mountain Community

B 1 Build on developed land first

B 2 Connect the mountain to the region

B 3 Link with common ground

B 4 Create a region of centres

Riverwalk on the Coquitlam

C 1 Fit development to the land

C 2 Put jobs near people; apply flexible zoning

C 3 Employ natural features to increase value

C 4 Share public facilities

East Clayton

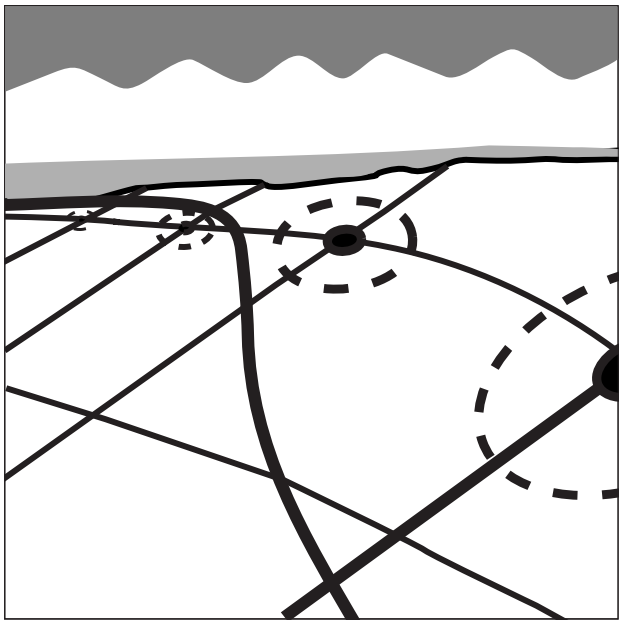
D 1 Use high points carefully

D 2 Design streets and streams as one system

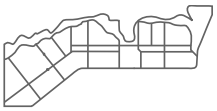
D 3 Centre every neighbourhood around a social space

D 4 Layer functions in open space

Districts are the geographic and social units that combine to form our urban regions. They are the places where we live, work, play and exchange. They often represent the most local level of government (as in electoral wards, for example). How districts are shaped and function can affect the entire region. Districts that concentrate services, housing, jobs and transit and other activities of daily life within a walkable distance of residences benefit the region by reducing auto use and by distributing services and employment evenly.



A
District
Southeast False Creek

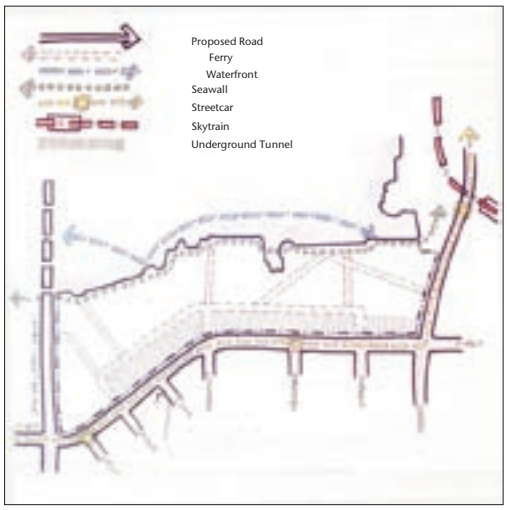


Green Infrastructure

A1 Create a connected ecological network
In this proposal, all green areas on the site are "working green" areas that are important to maintaining the site's ecological health. The plan detail shows part of a system that captures and cleans 100% of the stormwater and greywater (from residential sinks and washing machines) flowing from this residential block. This reed-lined biofiltration system leads to a network of linked treatment marshes adjoining the public seawall. The layering of ecological and recreational uses enhances the utility and amenity of this "working" landscape.

Movement

A2 Connect districts with transit
The image below shows numerous transportation modes in a linked system. These include SkyTrain, a ferry, a streetcar, roads, a waterfront path, and an underground path. Major on-site streets are connected to off-site streets, yet priority is given to walking and biking. The off-site connections allow SEFC residents to easily walk or bike to the Broadway Corridor, downtown, to the SkyTrain station at Science World, and to other regional transit links.



Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Social Infrastructure

A3 Let the centre define the community
In order to enliven the public realm, it is important to concentrate civic, institutional, and commercial activity. Community centres should accommodate a range of activities and adapt to changing needs over time. The image above shows a boathouse/multi-purpose centre on the waterfront. Such a facility, serving the larger community, provides boating access to the restored waters of False Creek while still providing flexible space for community groups and for civic celebrations.

Cost

A4 Provide a variety of affordable housing types
A sustainable community can accommodate a diverse mix of incomes and family types. The above image shows a sample of a broad range of housing types, sizes, and tenures, which makes the site attractive to every income, age group, and household type. Overall, at least 20% of housing in this proposal would be for low-income households; 35% would be for families with children (with 10% of this being intended for low-income families).

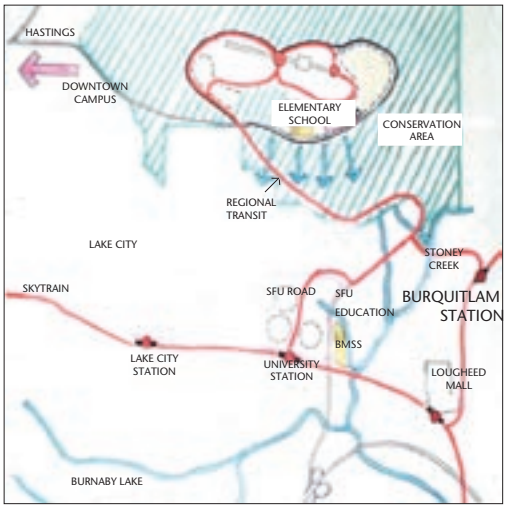
Burnaby Mountain Community

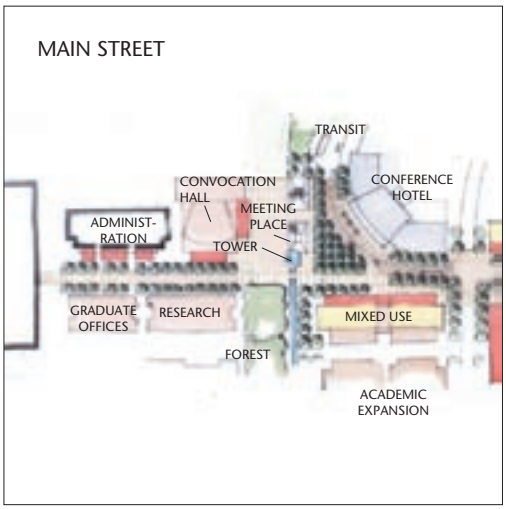
Green Infrastructure

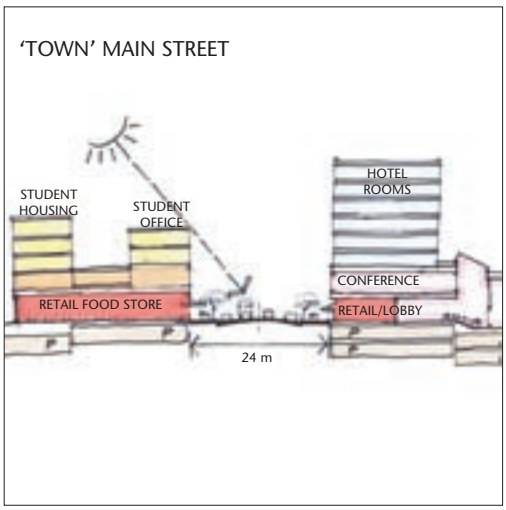
B1 Build on developed land first
Increasing density on already developed land means that sensitive areas can remain untouched. In Team Two's concept below, the footprint of new development replaces areas previously used for surface parking. Concentrating the bulk of high-density development here, and putting parking underground, ensures the preservation and enhancement of stream courses and forested areas to the south.

Movement

B2 Connect the mountain to the region
A region is made up of many interdependent communities. Providing frequent and efficient transit between these communities means a more liveable region. The above shows a concept for integrating Burnaby Mountain into the larger urban fabric via frequent bus service to the new SkyTrain station at the base of the mountain. A free community shuttle provides short hop trips within the mountain top community for residents and students.







Social Infrastructure

B3 Link with common ground
Creating new communities can often come at the expense of old ones. The above sketch shows a strategy for integrating the new community into the existing university campus by way of a central meeting place, or plaza. University-related uses are to the west while mixed-use commercial and residential line the street to the east. The centre is where "town and gown" meet and where the fabric of the university and the new community combine to create a community heart.

Cost

B4 Create a reigon of centres
Team Three proposed that integrating affordable housing for students, teaching and professional staff close to campus can create a vibrant community centre while measurably reducing the costs of commuting to other parts of the region. Money saved could in turn stay in the community. Above, four to six storey rental apartments over street level commercial uses would provide the necessary housing for students within walking distance of their studies.

C
District

Riverwalk on the Coquitlam

Green Infrastructure

C1 Fit development to the land
Building new communities means reshaping the landscape; but by working with the existing natural features you can reduce both cost and ecological damage. This is particularly true of hillside sites like Riverwalk: roads and houses follow the contours of the site; larger structures are on the flat areas where they will be the least disruptive; and development is fitted around existing creeks.

Movement

C2 Put jobs near people; apply flexible zoning
Zoning is used to restrict uses in designated areas. This typically results in a strong separation of uses – houses in one area, business and commercial services far away in another. Riverwalk is different. At Riverwalk, at-home businesses and live/work residences are allowed in most residential blocks. Residents can work in the community that they live in, rather than commuting long distances to other parts of the region.

Social Infrastructure

C3 Employ natural features to increase value
In most parts of BC, streams and rivers provide the obvious basis for linked greenway systems. Locating homes around these natural systems allows residents immediate access and can increase a property's value. The Riverwalk plan makes a riverside trail, the new proposed Coquitlam River Trail, a key feature of the community. This trail will connect the new community with natural areas to the north, residential districts to the south, and will give easy and enjoyable foot and bicycle access to the Village Centre.

Cost

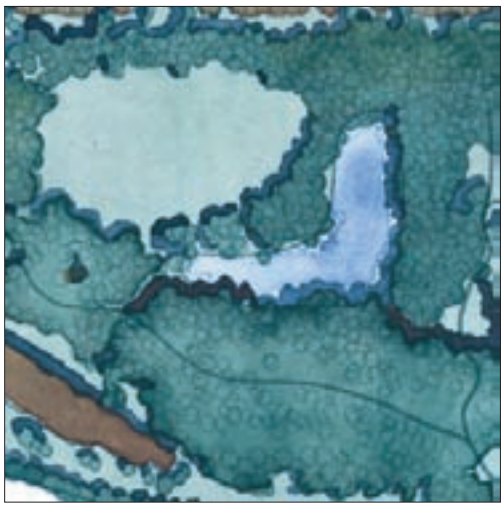
C4 Share public facilities
Municipalities often manage school, park, and natural areas separately, resulting in underutilized spaces, lost opportunities for enrichment and wasteful duplication of facilities. One answer is to create a joint recreation agreement, such as that envisioned for Riverwalk. This way school facilities (ei. gymnasiums and libraries) are open to the public after hours, thereby decreasing costs and fostering interaction between different age groups. In return parks and open space – such as the Coquitlam River Trail, can be used for educational purposes.

Green Infrastructure

D1 Use high points carefully
A stream begins at its headwaters. By protecting the origin of the stream, we ensure a healthier downstream environment and a healthier watershed. The concept sketch below (completed during the second day of the four-day charrette) illustrates how the charrette team responded to the inherent ecological capabilities of the site when making its first and most basic decisions.

Movement

D2 Design streets and streams as one system
Communities, like all living organisms, require a constant flow of materials and energy. In East Clayton, the streets are designed to work with the natural hydrological conditions of the site. Most rain that falls on the site will be absorbed within the street right-of-way itself, and what can't be absorbed is directed, through the integrated street network, to large natural areas where it can slowly replenish the water table.



Social Infrastructure

D3 Centre every neighbourhood around a social space
Single-use zoning creates reliance on cars and discourages walking. This is because destinations associated with satisfying basic needs (e.g., buying a litre of milk or going to play a game of frisbee) are beyond walking distance. In the image above, a small cluster of commercial services placed at a corner gives people in the neighbourhood easy access to their daily needs. Distributed within a five-minute walk of all homes, these clusters create small hubs of activity where residents can do small errands while socializing with their neighbours.

Cost

D4 Layer functions in open space
Typically, suburban parks and stormwater infrastructure are designed and serviced separately. This increases the total cost to the community and uses land inefficiently. In an alternative development pattern, parks and stormwater management are integrated so that the functions provided by one system support and benefit those provided by the other. Combining these systems reduces costs and land waste, ensuring maximum benefit for each dollar spent.

Corridor E - H

Southeast False Creek

E1 Create urban gardens

E2 Create safe and comfortable streets

E3 Use streets to frame views

E4 Centre activity on a “Main Street”

Burnaby Mountain Community

F1 Move stormwater along the street

F2 Fit streets to the slope

F3 Create a sense of enclosure

F4 Make streets cheaper

Riverwalk on the Coquitlam

G1 Use a bridge, not a culvert

G2 Design narrow streets

G3 Make streets to include many forms of transportation

G4 Use cheaper materials

East Clayton

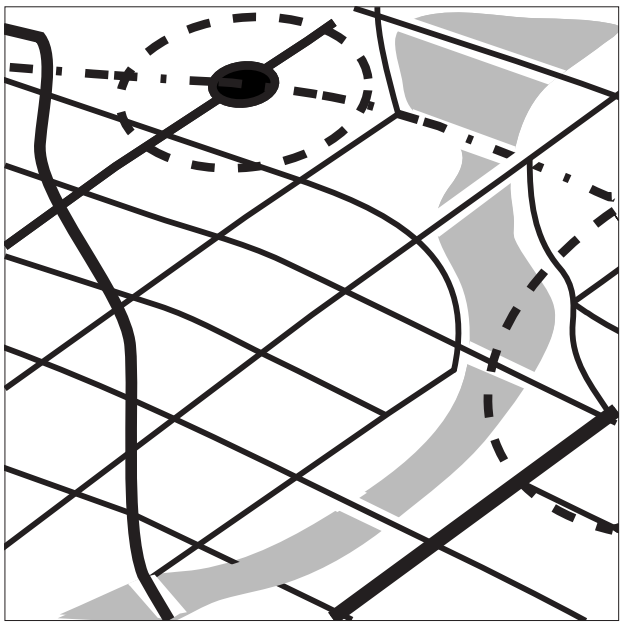
H1 Create an urban forest

H2 Design a network of interconnecting streets

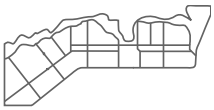
H3 Provide parking wisely

H4 Create a key location

Corridors are the conduits for moving materials, energy and resources within and between neighbourhoods, districts, and regions. Corridors of all types and at all scales — be they streets, lanes, boulevards, pathways or streams — need to reflect their unique and specific functions. Regional transit corridors should be designed to coordinate and concentrate growth where it is most appropriate. Local corridors should be designed to be walkable and connect residents to commercial services, transit stops and natural areas, and so on. Laid over the urban fabric, an interconnected street network can and should yield to natural stream corridors without unduly compromising street interconnectivity.



E
Corridor
Southeast False Creek



Green Infrastructure

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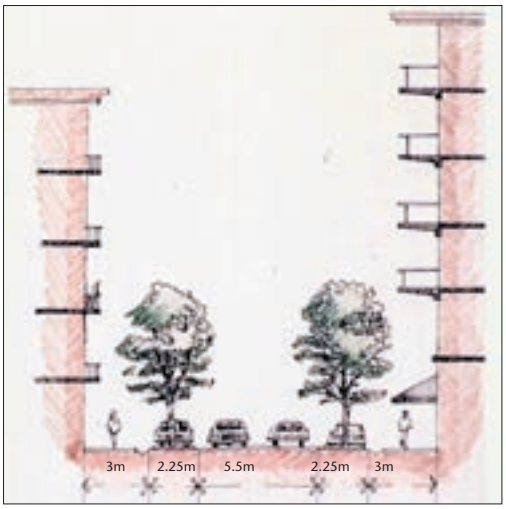

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Social Infrastructure

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A primary through-corridor can become the commercial heart of the community. Team Two took the position that a centre could be linear and connect to the rest of the city along an active street corridor. Retail, services, and workshop spaces animate the Main Street while serving neighbourhood residents and those that pass through by foot, car, bicycle or streetcar.

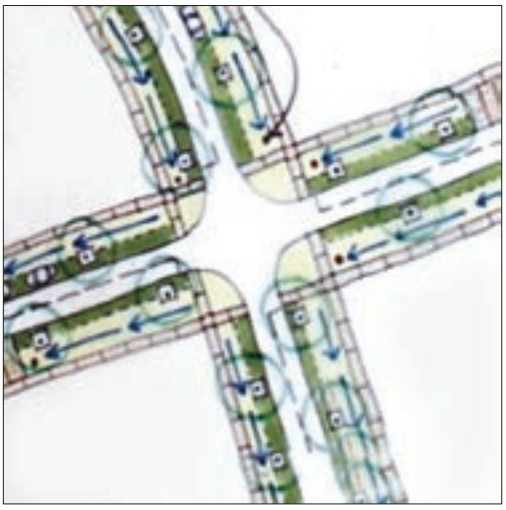
Burnaby Mountain Community

Green Infrastructure

F1 Move stormwater along the street
In conventional, hierarchical road systems, water and people move via conduits that get progressively larger. In contrast, narrow, interconnected streets handle stormwater on the surface, meaning that runoff can be dispersed between more than one route, rather than being funneled into a single, large pipe. Interconnecting street systems also ensure that neighbourhood destinations are always accessible via the shortest possible route, increasing the viability of walking and biking.

Movement

F2 Fit streets to the slope
Streets that follow the terrain create less disruption to the landscape, cost less to build and maintain, and efficiently move both water and people. In this example from the Team Two plan, streets are laid out in a "flowing grid" to follow the south facing slope of the site. Street slopes are between 5% and 7% or less allowing for ease of movement, whether one travels by foot, bike, wheelchair or any other mode of transportation.



Social Infrastructure

F3 Create a sense of enclosure
Buildings should reinforce the edges of the street and provide a defined and accomodating place for users. In the drawing above from the Team Three plan, seven storey maximum height buildings are set back minimum distances from the property line to provide an "urban" street enclosure, without being so tall as to blanket the street in dark shadow. Streets that frequently interconnect create shorter blocks, add more corner locations (good for commercial services), and give an urban rhythm to the street.

Cost

F4 Make streets cheaper
Unnecessary costs can often result from "over-building" infrastructure. Narrower, cheaper streets provide more room for infiltration trenches, street trees and sidewalks. Soft infrastructure, such as pervious sidewalks, reinforced grass shoulders, individual tree grates and overflow inlets replace expensive and ecologically destructive hard infrastructure such as curbs and gutters.

G
Corridor

Riverwalk on the Coquitlam

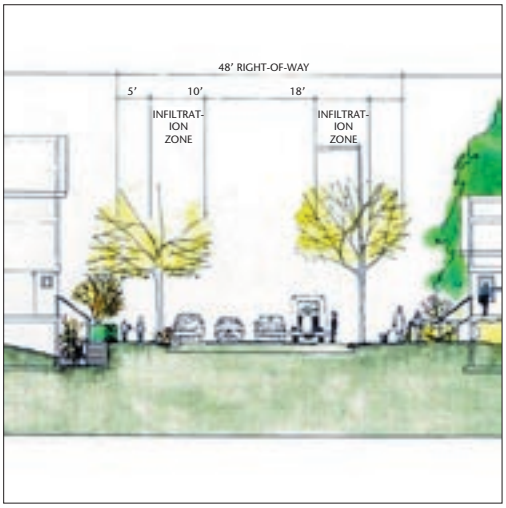
Green Infrastructure

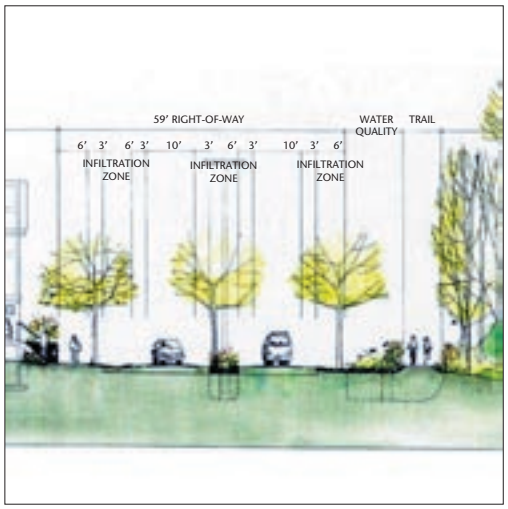
G1 Use a bridge, not a culvert
Culverts cause more impact to watercourses and are more difficult for wildlife to travel through than bridges. The Riverwalk proposal uses bridges instead to cross the creeks that flow through the site. Access to the site is also by bridge over the Coquitlam River, as illustrated below. The crossing location and bridge design were chosen to virtually eliminate direct environmental impacts to the Coquitlam River.

Movement

G2 Design narrow streets
Narrow streets encourage animated street activity. Small front yard setbacks, a narrowed travel lane and gravel verges that double as parking pull-outs give the street a comfortable scale for pedestrians and cyclists. Houses with front doors and windows close to the sidewalk provide eyes on the street. Street trees located between sidewalks and roadways protect pedestrians and completes the envelope of space that defines the walking corridor.

Drawing credit: Stacy Moriarty, Moriarty and Company, Ltd.





Social Infrastructure

G3 Make streets to include many forms of transportation
Streets carry more than just cars – other forms of transportation should feel welcome. The cut away view above shows a roadway that includes a pedestrian sidewalk, one vehicle travel lane in each direction and a trail for biking and walking. The planting area between the street and the trail protects pedestrians while cleaning storm water runoff from the street.

Cost

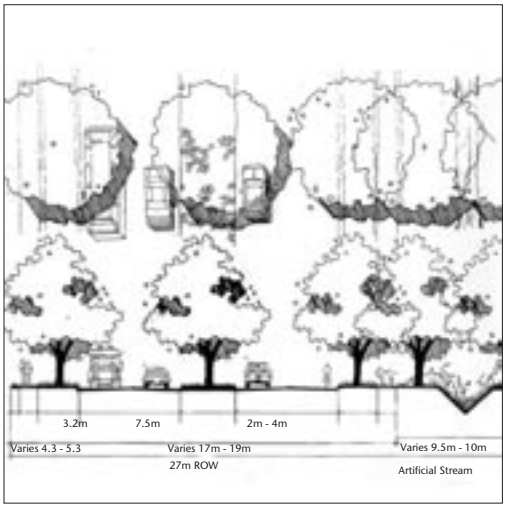
G4 Use cheaper materials
Reducing street width and switching to more natural materials calms traffic and makes streets less expensive to build. Crushed stone parking strips replace expensive and environmentally unfriendly curb and gutter systems.

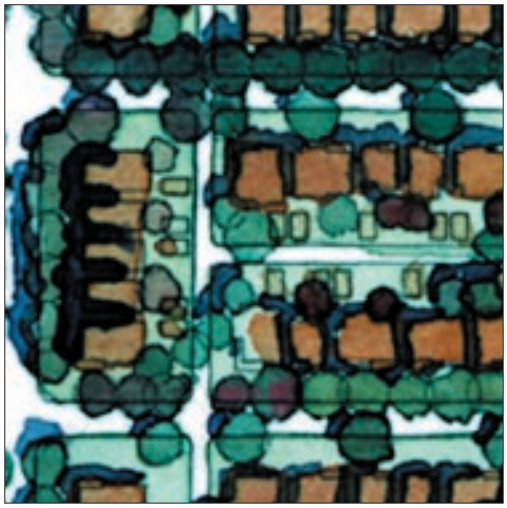
Green Infrastructure

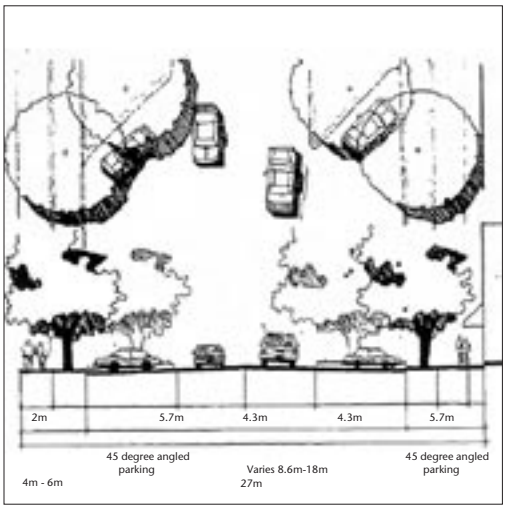
H1 Create an urban forest
Streets and other corridors are ideal locations for reestablishing forest and hydrological systems lost to development. On this "riparian parkway," a mix of trees provides a canopy large enough to cover 60 percent of the roadway. This linear forest becomes a habitat corridor for birds and gives shade to the sidewalk and the adjacent artificial stream.

Movement

H2 Design a network of interconnecting streets
East Clayton uses an interconnected system of streets, in a modified grid pattern, not only to disperse the flow of traffic, but also to ensure that many different needs are satisfied in the most efficient and healthy way possible. This includes the movement of water, fish, wildlife and people.







Social Infrastructure

H3 Provide parking wisely
Nothing is less interesting and more exposed than a sidewalk lined with parking lots. Dedicated parking lots in East Clayton are located behind, not in front of, commercial buildings. Parking on the street, on the other hand, is abundant. Angled parking, as shown above, creates a shield between pedestrians and passing cars. Lots of trees planted on parking islands and along the street edge ensure that the majority of the parking surface is shaded and that the perceived width of the street is dramatically reduced.

Cost

H4 Create a key location
When you concentrate stores, offices, and community services along a central corridor, it provides a focus for activity and provides enough customers to keep shops lively. "Main Streets," like the one shown above, have offices and residences above the stores, ensuring life on the street even after the stores are closed. The building is set snugly against the sidewalk so that pedestrians can see into shop windows, while overhangs and canopies provide protection from the rain.

Block I - L

Southeast False Creek

I 1 Manage stormwater in the middle of a block

I 2 Make short blocks

I 3 Encourage connection

I 4 Create flexible row-house blocks

Burnaby Mountain Community

J 1 Allow natural features to shape the block

J 2 Create mid-block connection

J 3 Layer public space into each block

J 4 Accomodate many parcel types within a block

Riverwalk on the Coquitlam

K 1 Manage stormwater block by block

K 2 Modify blocks to favour natural features

K 3 Design blocks to encourage flow

K 4 Design blocks efficiently

East Clayton

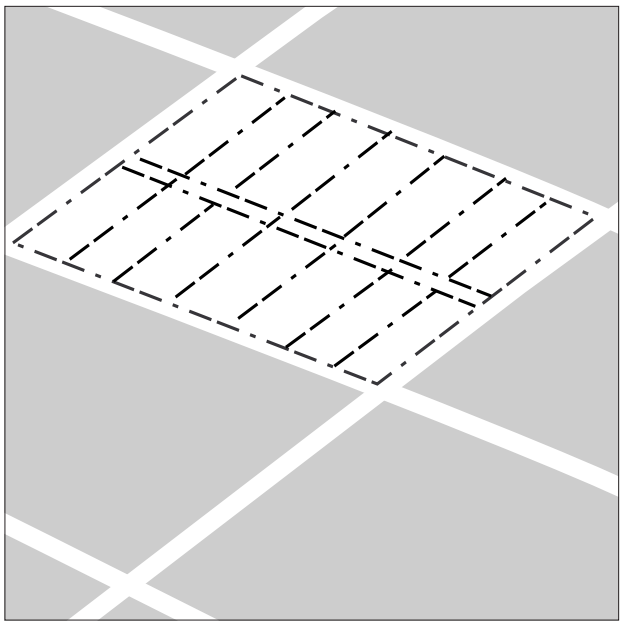
L 1 Wrap blocks around natural features

L 2 Make continuous sidewalks

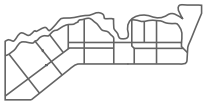
L 3 Layer public space into the block

L 4 Add density at the corners

Blocks are the chunks of developable land that are available after a street pattern is imposed. Smaller blocks result from a more integrated (or net-like) street system, while large super-blocks are the result of a disintegrated dendritic (or tree-like) street system dominated by dead-end blocks. The smaller the block, the finer the grain of development and the more permeable is the neigh-



I
Block
Southeast False Creek



Green Infrastructure

I1 Manage stormwater in the middle of a block
"Working greens" should be located prominently. This helps residents and visitors understand how the community's natural systems are managed. The image below shows a central stormwater bioremediation green. The space is used for recreation when it is dry but fills with water immediately after it rains. The space dries out after a day or so as water infiltrates into the soil.

Movement

I2 Make short blocks
Large blocks are impenetrable to the movement of people. Shorter blocks mean more intersections and more intersections mean slower car speeds. Team Three chose a block dimension of approximately 180m by 60m, which continues the block pattern established by the existing city fabric to the site's south.

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Social Infrastructure

I3 Encourage connection
The sidewalk is an essential connective element between blocks in a neighbourhood and between residents and the public life of the street. Tight setbacks and front stoops, as shown above, allow visual and even conversational exchange between residents and passers-by.

Cost

I4 Create flexible row-house blocks
The image above shows townhouse type buildings that, while seemingly all one size, are actually configured in a variety of ways. The elderly, empty-nesters, young families, and individuals can choose among a range of apartment and loft buildings, all of which are convenient to on-site stores and services and are within walking distance of local transit. This kind of diversity welcomes a range of income groups and provides affordable options even when family circumstances change.

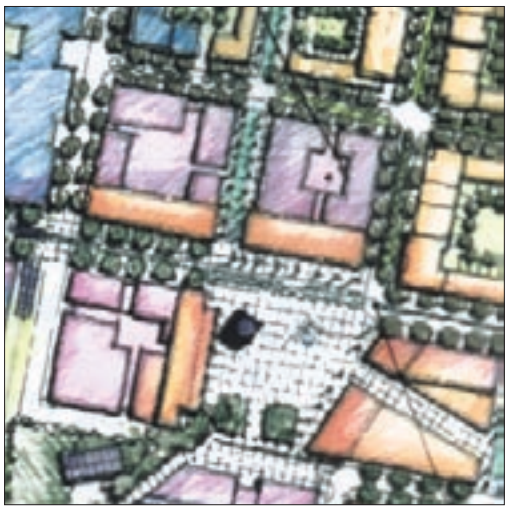
Burnaby Mountain Community

Green Infrastructure

J1 Allow natural features to shape the block
Environmental considerations should inform all design decisions. In the plan detail below, a larger residential block is broken into pieces by the preserved stream courses. 15 to 30 metre wide riparian setbacks from the top of the stream bank protect the habitat envelope of the stream, while intermittent pathways and bridges allow for the easy migration of fish, people, and wildlife.

Movement

J2 Create mid-block connections
In the original Erickson/Massey vision for SFU, cars were excluded from the campus proper and walking distances provided the yardstick for determining building scale and location. This example shows a mid-block pedestrian route that provides an alternative to walking on the street. The integration of water into the design makes this an appealing place to walk.



Social Infrastructure

J3 Layer public space into each block
Pedestrian-only streets can function as a linear public plaza, allowing people to move freely and interact without the disturbance of cars. In the design by Team Four, three-storey commercial and office buildings line the edges of the market place square, creating a sunny, flexible space for people to shop, stroll, study, and gather. The generous dimensions of the street allow for shops lining the street to spill out onto the sidewalk.

Cost

J4 Accommodate many parcel types within a block
Smaller blocks with many parcels create more opportunities for local economic development. This example of a 60 by 60 metre "Portland Block" (after the City of Portland OR, that has blocks this size) shows a grain of development that is highly efficient and adaptive. Zoning would be flexible enough to accommodate small businesses, live/work units, or commercial uses in the same block and even the same building.

K
Block

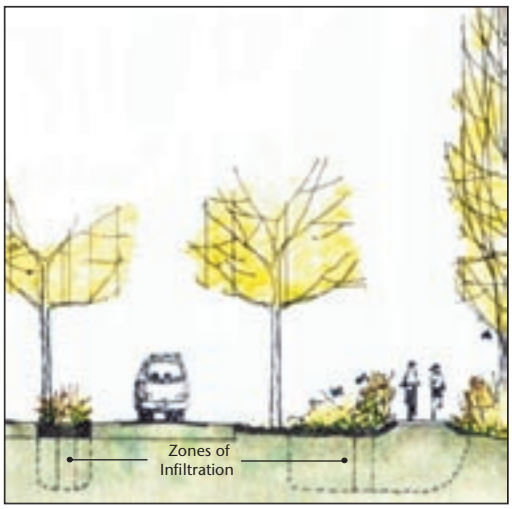
Riverwalk on the Coquitlam

Green Infrastructure

K1 Manage stormwater block by block
Preserving natural features is an ideal way to enhance neighbourhood identity. The Riverwalk plan uses the river and site's streams to divide the community into legible "blocks," each having its own identity and demonstrating a unique relationship to nature. Large central open spaces serve a dual purpose as a public green suitable for recreation or gatherings, and for stormwater management during heavy rain events.

Movement

K2 Modify blocks to favour natural features
A modified block pattern favours the location of natural features without unduly compromising connectivity. Many blocks in Riverwalk are oriented towards parks, riparian areas, and green streets. As shown below, blocks defer to the stream course, rather than diverting the stream. This course in turn becomes an essential connecting corridor for the movement of water and wildlife.



Social Infrastructure

K3 Design blocks to encourage flow
Streets and lanes are usually designed to the needs of the car. In this proposal, this view is changed to emphasize access for people instead. The location of pockets of development was decided first and the pattern of streets was laid out to connect them. Lanes are also provided where possible to access rear driveways and garages with suites above.

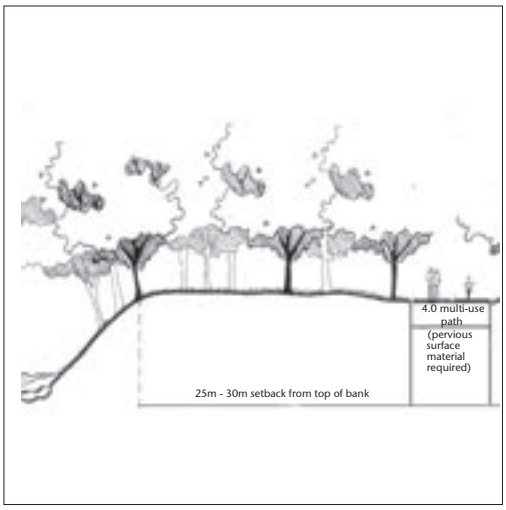
Cost

K4 Design blocks efficiently
Compressing commercial activities in a compact multi-storey building with street-oriented configuration saves construction costs while maximizing synergy between uses. Parking requirements of about 1 metre parking space per 1 metre commercial space (about half of the conventional standard) is critical to this strategy. Surface parking is located in the rear of the structure and on only 50% or less of the developed site. Diagonal parking is on all surrounding streets to supplement or replace surface parking. Underground parking is used wherever economically viable.

East Clayton

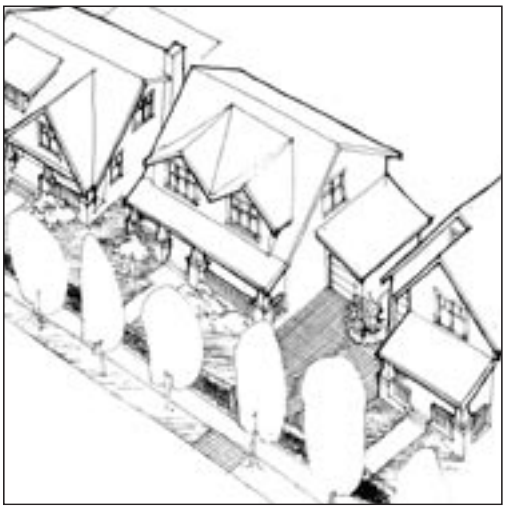
Green Infrastructure

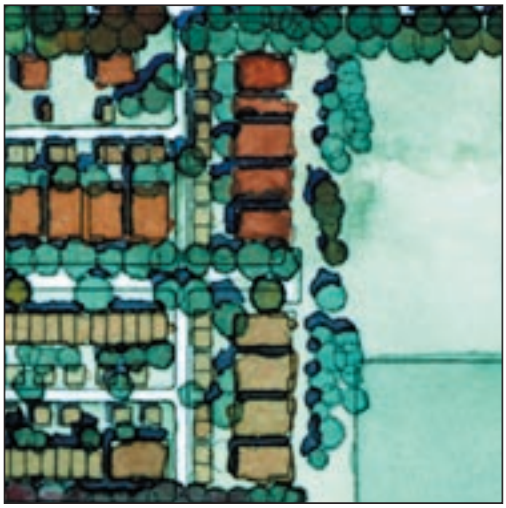
L1 Wrap blocks around natural features
Development should respect the ecological structure and function of important aquatic systems, for their importance to fish and wildlife, and for their intrinsic value. Blocks should form around these features, but should also allow people to connect with, and enjoy their special attributes. Access routes should impose as little disturbance as possible, be set back an appropriate distance from the top of bank, and be paved with a material that allows for natural infiltration.



Movement

L2 Make continuous sidewalks
Sidewalks are the connective tissue between blocks in a neighbourhood and between neighbourhoods in a district. Driveway entries are a considerable barrier to pedestrian comfort and connectivity. For this reason, rear lanes are ideal for maximizing pedestrian connectivity along the public street. Where front driveways are necessary, their impact can be limited by narrowing their entry at curbside and by pushing the garage back from the house facade, as shown below.





Social Infrastructure

L3 Layer public space into the block
How we structure neighbourhoods says a lot about what we value. Combining schools, parks, and stormwater retention areas within the centre of a community underlines their importance to residents and creates a venue for environmental learning. Designed appropriately, these large central community spaces can accommodate district-scale alternative energy and wastewater systems.

Cost

L4 Add density at the corners
Corner parcels are ideal places to add density as two sides of the unit will face a street. In the example above, a rental coach-house unit above and beside the garage provides an alternative to apartment living (or a less expensive owner-occupied home), thus enhancing the diversity of incomes and family types within a block without detracting from the single-family character of the neighbourhood.

Parcel M - P

Southeast False Creek

M 1 Step the envelope

M 2 Use tight setbacks

M 3 Provide semi-private open space for each home

M 4 Layer living and working

Burnaby Mountain Community

N 1 Minimize hard surfaces

N 2 Use lanes to increase access

N 3 Design homes around a courtyard

N 4 Design smart parcels

Riverwalk on the Coquitlam

O 1 Place buildings in response to natural features

O 2 Provide a front door on the street

O 3 Use lands to access open space

O 4 Layer living space on the parcel

East Clayton

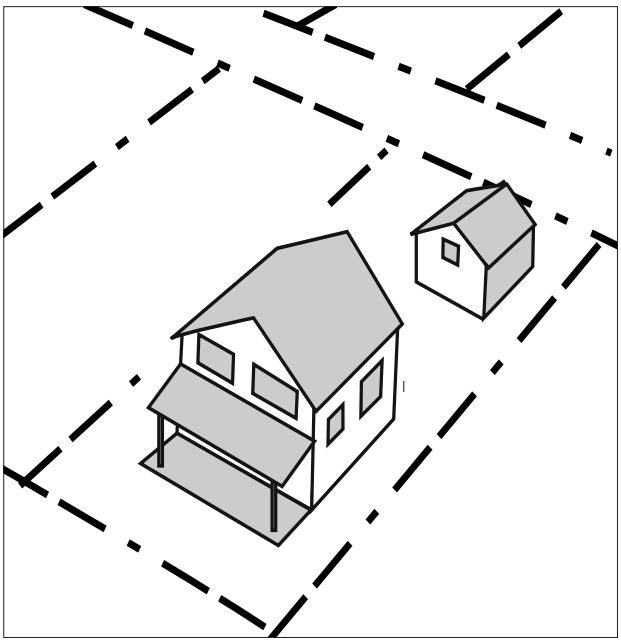
P 1 Design smart parcels

P 2 Maintain flow through the parcels

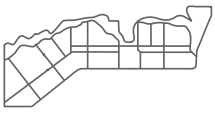
P 3 Create organic unity

P 4 Layer living and working

The parcel is the smallest increment of development. However, what happens at the scale of the individual house and yard has important social, economic and environmental implications for the rest of the district. The recent (post-1950) emphasis on the automobile has resulted in a whole new set of dimensions that demand ever-wider parcels to accommodate driveways and garages. Wider individual parcels mean less density in the aggregate, meaning more expensive infrastructure per individual parcel serviced. It also translates into a context that becomes, over time, so car dependent that even the simplest of everyday needs cannot be satisfied without a car.

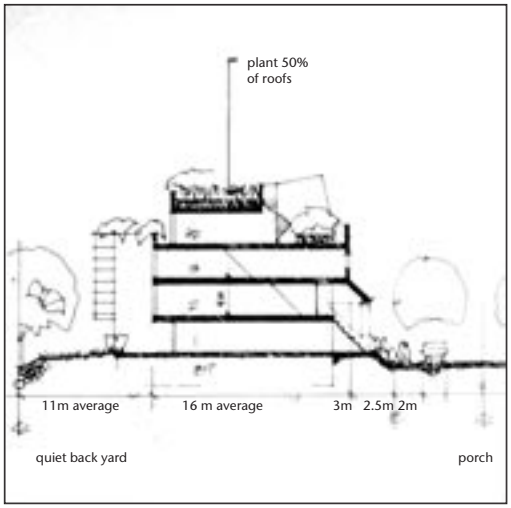


M
Parcel
Southeast False Creek



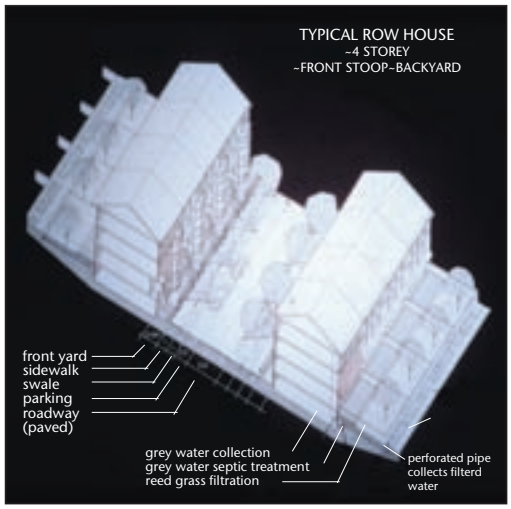
Green Infrastructure

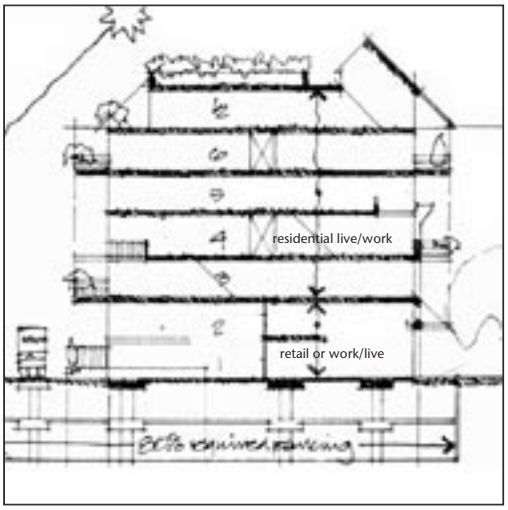
M1 Step the envelope
Incorporating "green infrastructure" into the function of buildings helped meet the "sustainaing space" objective of the Southeast False Creek charrette. The building shown below is terraced in order to maximize outdoor space, and is oriented towards the sun. This allows roofs to be planted for both gardening and cooling. Adjacent areas, including green walkways, courtyards, roadways and boulevards/swales, fuse buildings with green street systems to form uninterrupted green infrastructure.



Movement

M2 Use tight setbacks
A residential street's most important function may be to provide a place for people to interact. The image below shows a "porch street." Its narrow width and on-street parking combine to discourage through-traffic and to reduce car speed. Street trees and tight front yard setbacks create a pleasant and safe envelope for pedestrians while framing views at the ends of the street.





Social Infrastructure

M3 Provide semi-private open space for each home
In Team Two's proposed "townhouse district," each four-storey townhouse (shown above) has direct access to a private garden and is close to the nearby elementary school. Patios and balconies allow upper storey units and basement suites to also enjoy the outdoors and socialize with neighbours.

Cost

M4 Layer living and working
Mixed-use structures and settings help to create an economically vibrant community. The above section of a mixed-use building shows a flexible space that can adapt to diverse needs while promoting social exchange between live-work residents and day-use occupants. "Live-work" units like these allow a working parent to stay at home with young children rather than commuting long distances to work.

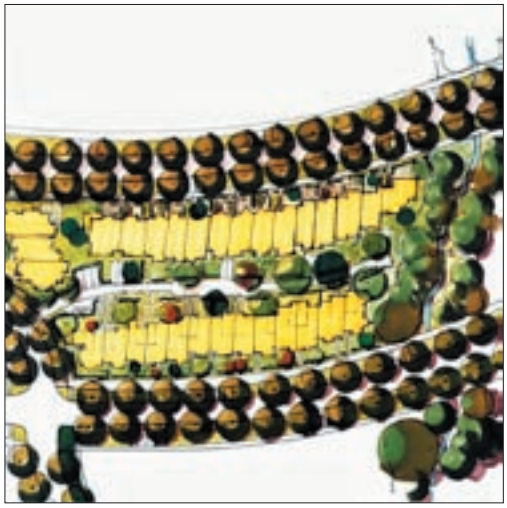
Burnaby Mountain Community

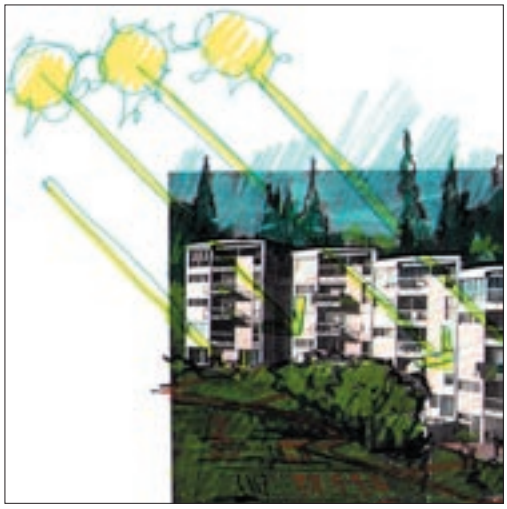
Green Infrastructure

N1 Minimize hard surfaces
Increasing density should not sacrifice natural systems. Above, narrow and tall buildings of about 10 storeys are nestled into the mountainside and invite absorptive "forest fingers" to penetrate the block. Large green roof gardens designed to infiltrate and store rainwater eliminate any contribution to storm water loads and downstream erosion.

Movement

N2 Use lanes to increase access
Whether in ground-oriented units or in higher density areas, people need access to natural areas. As shown, a rear lane gives each townhouse parcel access to the adjacent riparian greenway. With units overlooking the lane, it becomes a place for social interaction among neighbours and a safe place for children to play.





Social Infrastructure

N3 Design homes around a courtyard
Courtyard housing, wherein homes are organized around a semi-private open area, are ideal for enhancing social interaction, while giving residents access to outdoor space. As shown above in the sketch of a courtyard block, community gardens provide a shared resource for residents and create a venue for social interaction, environmental stewardship and experimentation.

Cost

N4 Design smart parcels
Energy efficiency begins at the scale of the individual parcel. A consideration as simple as building orientation can play a measurable role in reducing energy costs. Overhangs, high performance glazing and structural articulation can allow the sun to penetrate the building when it is most needed, and provide shade and cooling in hot summer months. In climates with long periods of sunshine, ground-source heating and cooling can be cost-effective alternatives to traditional energy sources.

O
Parcel

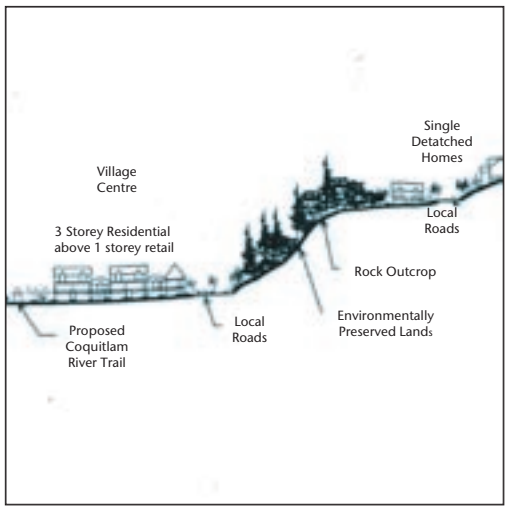
Riverwalk on the Coquitlam

Green Infrastructure

O1 Place buildings in response to natural features
Steeply sloping areas are easily damaged by development. Placing large lot/small footprint housing types on sloped but still buildable sites reduces development impacts. At Riverwalk, large footprint, high density buildings are located on the flatter, more forgiving, sites. The steepest slopes remain undeveloped.

Movement

O2 Provide a front door on the street
People like to have easy access to their home. A front door that gives direct access from the street means less distance to carry the groceries and safely shepherd one's kids. It also gives each family a public "face," which includes them in a community that they can care about and care for.



Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Social Infrastructure

O3 Use lanes to access open space
Like streets, parks provide an opportunity for socializing and casual day-to-day contact between neighbours. Here, the semi-public lane has the effect of extending the back yard and allows people to access the park without leaving the comfort of "home."

Cost

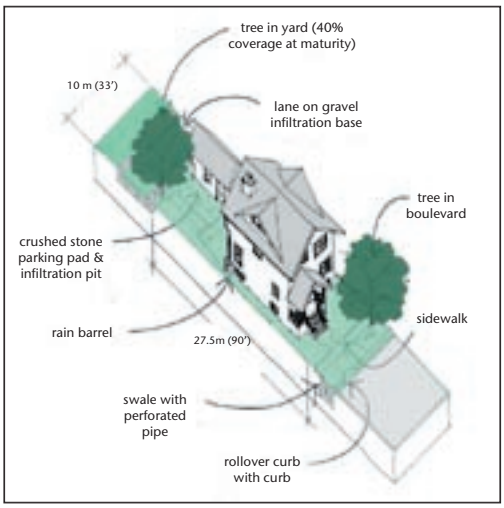
O4 Layer living space on the parcel
Secondary suites can help young families to afford their own home. Houses that back onto a lane have the option of a suite above the garage, as seen in this illustration. Separating the suite from the house gives homeowners and renters independent space, while access from the lane allows tenants to have their own front door on a public right-of-way.

Green Infrastructure

P1 Design smart parcels
Individual lawns and backyards in East Clayton will be like small sponges, capable of absorbing the rain that drains off roofs, parking surfaces, and pathways during typical rain events. Pervious pavers, or crushed stone-surfaced walkways and parking pads absorb water near where it falls. Splash pads and grading quickly direct roof water to underground infiltration chambers. These make the backyard soil "sponge" even more absorbent while ensuring that yard surfaces stay walkable.

Movement

P2 Maintain flow through large parcels
In many suburban areas, buildings and parking areas associated with commercial and industrial uses cover between 80% and 100% of the surface area. This means that the majority of rain falling on these sites cannot be absorbed naturally, but must be conveyed off-site. It also means that a single large building mass dominates the urban landscape. Breaking buildings into smaller envelopes as shown, allows for the healthier movement of water, air and people on the parcel.



Drawing credit: Bob Worden, Ramsay Worden Architects, Ltd.

Social Infrastructure

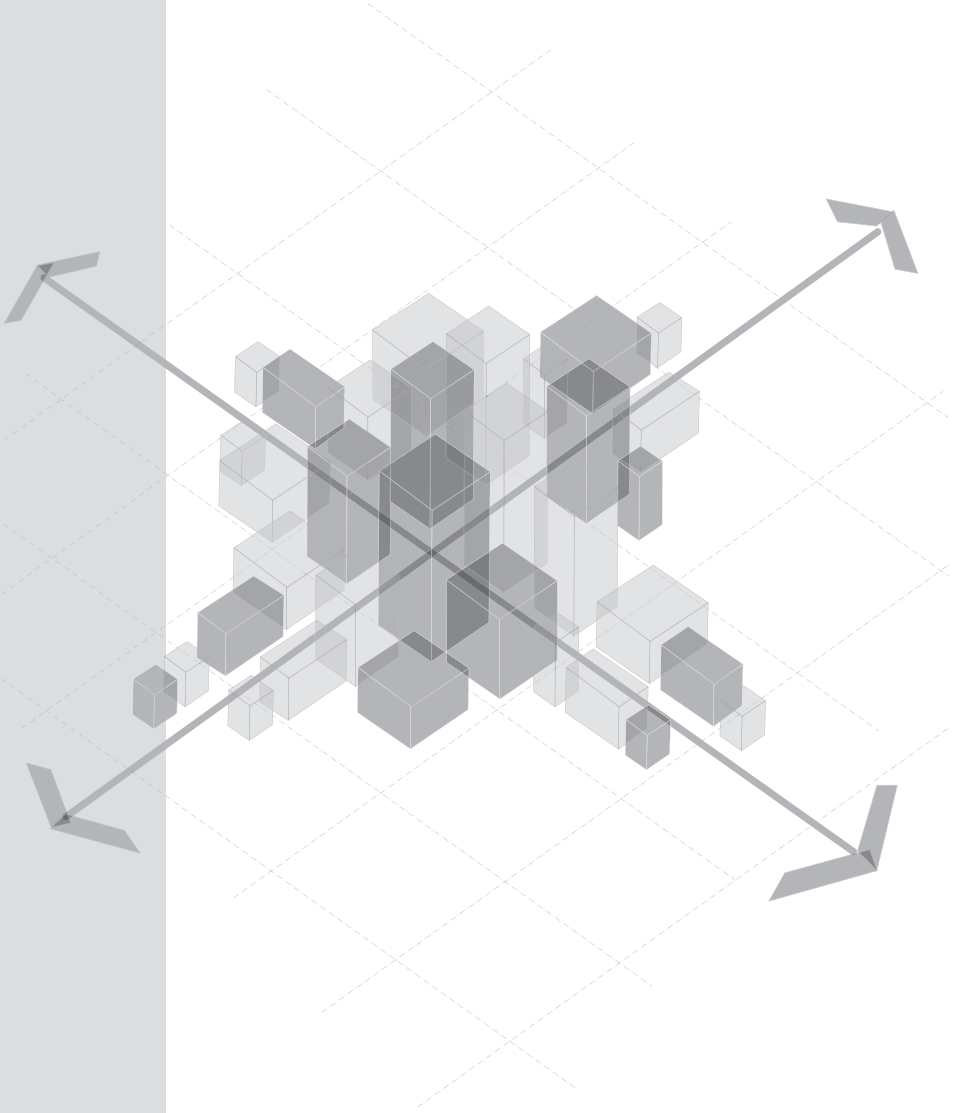
P3 Create organic unity
Creating organic unity means accomodating variation and change while maintaining the elements that make a community special. This allows people to connect with the past and feel more comfortable with the processes of change. On this residential street, a great diversity of housing and tenure types is masked by a powerful sense of unity. Peaked roof forms and people-friendly (as opposed to merely car-friendly) front facades maintain the "single-family feel" despite the fact that density is almost twice that of conventional suburban developments.

Cost

P4 Layer living and working
Layering living and working space within a single unit increases the diversity of a neighbourhood and provides affordable space for small businesses — businesses that might otherwise have to locate outside the neighbourhood. The live/work unit shown above has ground-floor office/retail space and a residence located on the upper floors.

A DESIGN APPROACH

The Charrette Strategies from Part Two revealed scores of ways to design more sustainable districts, corridors, blocks and parcels. In this section, we have distilled the Strategies, and grouped them into **Six Overarching Principles**. Each of the six principles address a range community and site design objectives (from capitalizing on natural assets, to creating vibrant urban centres) and each make up an essential piece of a unified whole. Flowing from these principles are a series of site and community **Design Guidelines** (beginning on page 86). The Design Guidelines are organized first, according to the four scales of urban design, and second, according to the Six Overarching Principles.



PART THREE
A Design Approach

Six Overarching Principles
Design Guidelines
Design Checklist

The following section presents Six Overarching Principles followed by a series of site and community Design Guidelines, which collectively constitute a tool kit for more sustainable community design.

The principles and guidelines were distilled from the Charrette Strategies from Part Two. In this way we reversed the usual process of working from the particular design rule to the general plan and instead derived the specific design rules from the integrated whole of the completed charrette proposals. This ensured that each principle and guideline was firmly grounded in a charrette proposal, which itself was informed by extensive policy for more sustainable development.

Six Overarching Principles

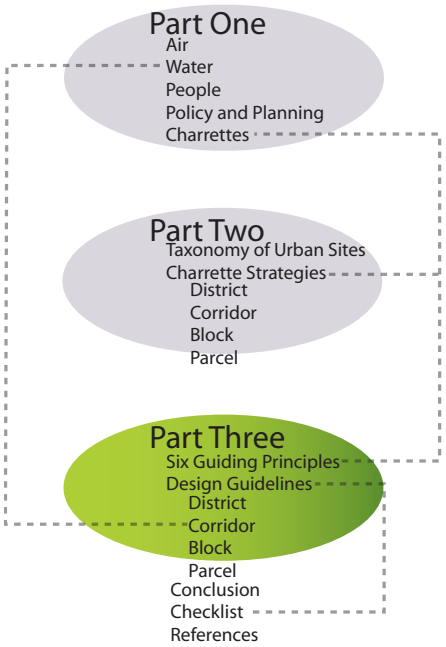
The Six Overarching Principles that emerged out of the Charrette Strategies are:

1 **Capitalize on the site**
2 **Connect the flows**
3 **Layer the systems**
4 **Create a centre**
5 **Employ an economy of means**
6 **Make it home**

Individually, the six principles address varying aspects of community and site design, from designing mixed-use, compact communities around transit, to designing interconnected streets and pathways, to providing affordable homes and services, to protecting watershed systems and their associated green infrastructure networks. Combined, the six principles deal with sites and districts as part of a larger, integrated system within which the health of each component part is dependent upon the health of the whole.

Design Guidelines

Together with the Charrette Strategies, the above principles provided the methodological basis for the **Design Guidelines** (introduced on page 86). Like the Charrette Strategies, the Design Guidelines are presented according to the four scales of urban design – district, corridor, block, parcel – featured in the Taxonomy of Urban Sites. They are then organized according to the appropriate overarching principle. As guidelines, they are not fundamentally regulatory or prescriptive in nature but are meant to provoke a rethinking of how sites, communities, and regions might be designed to meet multiple (and often competing) sustainability objectives.



capitalize on the site

Capitalizing on the site allows new blocks and districts to connect and add to existing blocks and districts. Finding the best fit between new and existing community elements is both equitable and efficient. For instance, a hillside community in which houses and streets follow the contours, and are situated on the more gently sloped benchlands, capitalizes on the site's topography. A retrofit of a brownfield industrial area that rebuilds degraded natural systems while also keeping some businesses in place capitalizes on existing site functions.

1

Photo source: Aplin and Martin Consultants Ltd.

Homes situated on hillside terraces capitalize on available views. Even partial views can bring a higher sale value to homes.

Photo source: Aplin and Martin Consultants Ltd.

Natural features can be preserved and carefully used for green infrastructure and recreational needs. Integration and protection of natural features adds value to the community, increases resident satisfaction, and reveals natural systems at work.

Photo source: Aplin and Martin Consultants Ltd.

Redevelopment of brownfield sites can meet the housing demands of a growing population and provide an opportunity to mitigate environmental damage caused by previous users. Development plans can also capitalize on existing residents and services to provide a foundation for community growth.

connect the flows

To connect the flows is to link together the elements of a community that connect neighbourhoods, districts, and regions. Neighbourhoods that are built around a transit hub in a district laced with multi-modal transportation corridors connect the flows. Transportation corridors that serve all the districts in a region further connect the flows. A neighbourhood or district in which stream corridors are recognized, celebrated, and cared for as a part of a larger regional system also connect the flows. A sustainable region is one in which the flows of people, cars, economic exchange, water, fish, and wildlife work together.

Photo source: Aplin and Martin Consultants Ltd.

Preserved stream corridors provide fish habitat and play a key role in a green infrastructure system. They also provide an ideal opportunity to connect the flow of people throughout the community.

A sustainable network of transportation corridors efficiently connects homes to employment and shopping hubs. Buses, cars, bicycles and pedestrians can get around on such a network.

An interconnected network of local streets provides direct and safe routes for multiple users, including pedestrians and cyclists. Lanes can be a valuable component of this network, providing access to the rear of parcels and an alternative route for cars, bikes and pedestrians.

layer the systems

Layering the systems means building many functions, or uses, into each element of a community, thus revealing how the landscape and community operate as one unit. Outdoor public space that fulfills recreation, stormwater management, and habitat needs is a layered space. A community that utilizes a stream corridor to enrich the experiences of children, enhance habitat, provide natural storm drainage, and supply pedestrian routes is a layered community. A neighbourhood that incorporates a variety of housing types in order to meet the changing needs of its residents is also a layered neighbourhood.

3

Layering commercial and residential uses, such as providing a neighborhood 'corner store,' allows residents to meet their daily needs within walking distance.

Layering working and living in one mixed-use development means at least one family member can work at home. Townhouses or apartments located above shops increase the variety of housing options available within the neighbourhood.

Riparian areas can be preserved for ecological and recreational functions. Layering outdoor public space, pedestrian corridors and storm drainage on and around stream corridors increases land use efficiency, mitigates impacts to water quality, provides easy access to nature for children, and reveals the wonder of natural processes to the community.

create a centre

To create a centre is to concentrate uses where they are most needed. Grouping residents and their daily needs around a dense core makes it easier for people to get what they need and can reduce dependence on cars. A neighbourhood that has a public green space as its focus has a centre; a community that is designed to cluster commercial uses, public services, and transit in one area has a centre; and concentrating higher-density pedestrian neighbourhoods around the core provides lots of customers for the centre. A centred community where development is efficiently concentrated also preserves and conserves open space and sensitive natural areas.

Transportation corridors attract commercial and retail uses and can provide a linear centre for the community. A carefully orchestrated "Main Street" can provide for the daily needs of local residents and become a destination location for visitors.

Photo source: Aplin and Martin Consultants Ltd.

A neighbourhood public open space provides a venue for celebrations and a place to congregate outside of the home. Situated along a pedestrian route, the open space centre can promote casual meetings and conversations.

Higher density pedestrian-oriented neighbourhoods located around the centre provide the population density required to foster a lively street life and support local commercial services.

economy of means

An economy of means is making it work with nothing wasted. It means less road per person, less land per house, fewer car trips per family, and more money in your pocket. A community that incorporates lighter, cheaper, smarter and greener infrastructure in order to clean stormwater, save costs, and bring nature to one's door employs an economy of means. A community that provides opportunities to work near or at home exhibits an economy of means. A house that has a suite above the garage in order to increase density and to decrease housing costs also exhibits an economy of means. Applying an economy of means capitalizes on all aspects of a site to create the best and most affordable community possible.

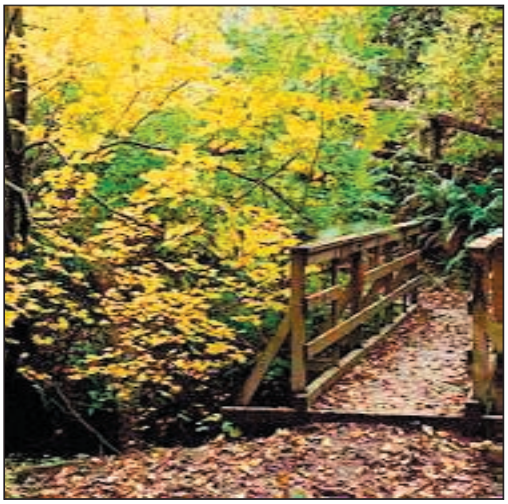
Neighbourhoods can capture, clean and infiltrate stormwater on-site. By working with, not against the natural cycles of the site, installation and repair costs can be reduced. Narrow streets with soft shoulders let stormwater be captured, cleaned and infiltrated where it falls.

A single family home with a secondary suite or coach house can provide housing for a variety of tenures and income levels. The suite also acts as a mortgage helper and provides space for elders or young adults to live independently, yet near their family.

More compact development requires less infrastructure, resulting in less road per person, less land per house, fewer car trips per person, and more accessible transit.

make it home

Nurturing a sense of home can be as simple as creating places for people to interact, or as grand as preserving a major natural area as the focus of the new or rebuilt community. A community that develops a park and greenway system around a creek corridor nurtures a sense of home for its children and for other creatures. Houses that front onto pedestrian-friendly streets allow people to meet and greet their neighbours. A community that nurtures a sense of home will be a community where residents can feel "at home."



By including recreation, storm water management and wildlife habitat functions, a preserved or restored creek corridor provides an immediately available opportunity for community residents to connect with more than just their house and yard. This enduring attachment can turn what was just the street where one lives to the place one calls home.

Shallow front yard setbacks, a front porch or stoop, and pedestrian friendly streets work together to make the neighbourhood welcoming. A neighbourhood where residents feel at home is a place where residents and visitors can socialize.

Greenways are linear recreational, travel, and habitat corridors linking pedestrains and cyclists to the surrounding community. They can also play an important part in a green infrastructure system. Streets that are comfortable for walking make people feel more at home.

DESIGN GUIDELINES

The Design Guidelines are organized first according to urban design scale, and second according to one of the six overarching principles.

The guidelines focus primarily on aspects of site and community design and, to a lesser degree, on engineering and implementation. They are grounded in sound research and/or emerging policy for more sustainable building, site and community design. Where appropriate, specific targets, thresholds and performance criteria are used to support the guideline; in other cases, links to further research and/or related policy are referenced. As illustrated below, each page is presented in a common format.

Overarching Principle
This lists which of the six overarching principles for creating or maintaining a sustainable community .

Sustainability Category
The green shaded squares identify which sustainable design category the guideline addresses.

green infrastructure
social infrastructure

movement
cost

Related Strategies/ Guidelines
This provides a cross-reference to related charrette strategies and design guidelines.

Description
This explains how the design objective fulfills the intentions of the principle.

Sidebar
This provides further information on how to achieve

Diagram
This illustrates how to achieve the design objective.

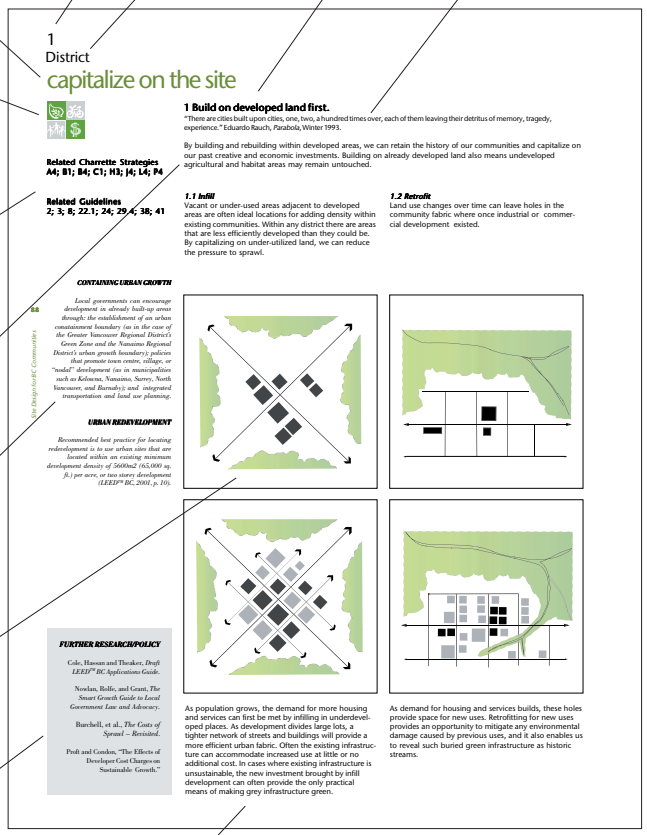
Further Research
This indicates where to find more detailed information on the topics addressed.

Design Guideline ID

Scale
This identifies the urban design scale at which the guiding principle applies.

Guideline Objective
This identifies one way to conform with the overarching principle.

Quote
This is just for fun.



Guideline
This describes a way to achieve the design objective.

District 1 - 14

Capitalize on the Site

1 Build on developed land first

2 Include existing residents

3 Fit development to the land

Connect the Flows

4 Design streets and streams as one system

5 Create a connected ecological network

6 Connect the district to the region

Layer the Systems

7 Layer functions in open space

Create a Centre

8 Create a region of centres

9 Let the centre define the community

10 Centre every neighbourhood around social space

An Economy of Means

11 Put jobs near people

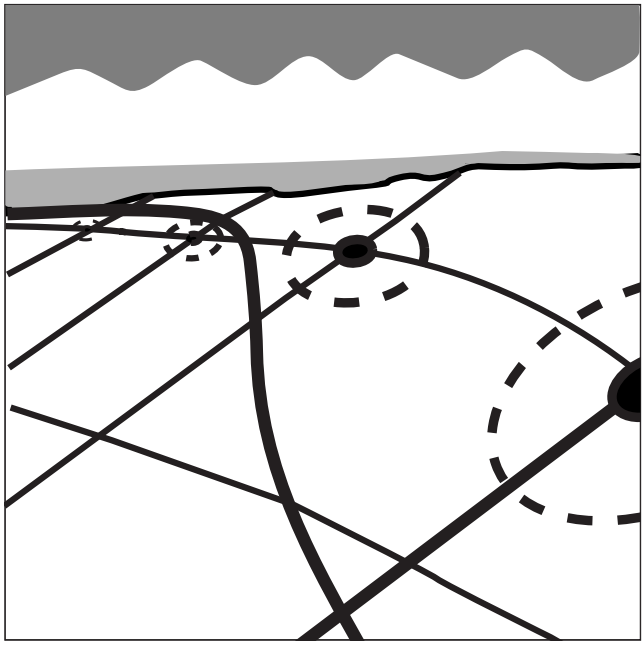
12 Share public facilities

13 Employ natural features to increase value

Make it Home

14 Derive community identity from the landscape

Districts are the geographic and social units that combine to form our urban regions. They are the places where we live, work, play and exchange. They often represent the most local level of government (as in electoral wards for example). How districts are shaped and function can affect the entire region. Districts that concentrate services, housing, jobs and transit and other activities of daily life within a walkable distance of residences benefit the region by reducing auto use and by distributing services and employment evenly.



1
District
capitalize on the site

Related Charrette Strategies
B1; C1; J4; L4; P4

Related Guidelines
2; 3; 8; 24; 29.4; 38

1 Build on developed land first

"There are cities built upon cities, one, two, a hundred times over, each of them leaving their detritus of memory, tragedy, experience." Eduardo Rauch, Parabola, Winter 1993.

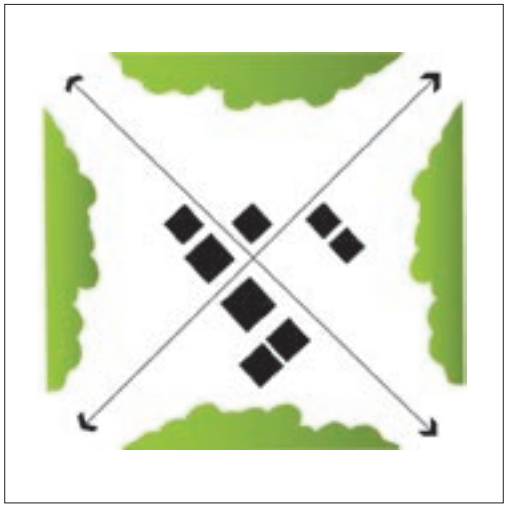
By building and rebuilding within developed areas, we can retain the history of our communities and capitalize on our past creative and economic investments. Building on already developed land also means undeveloped agricultural and habitat areas may remain untouched.

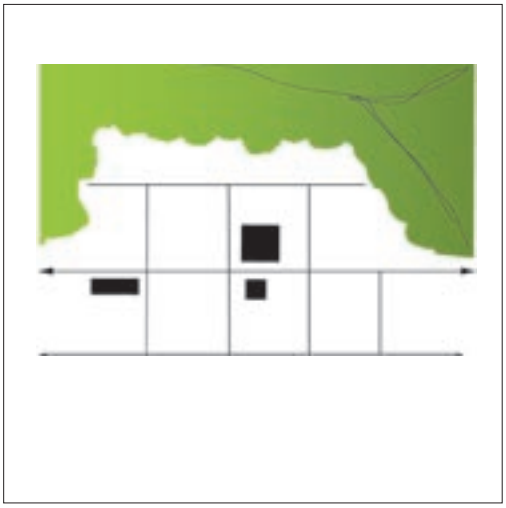
1.1 Infill

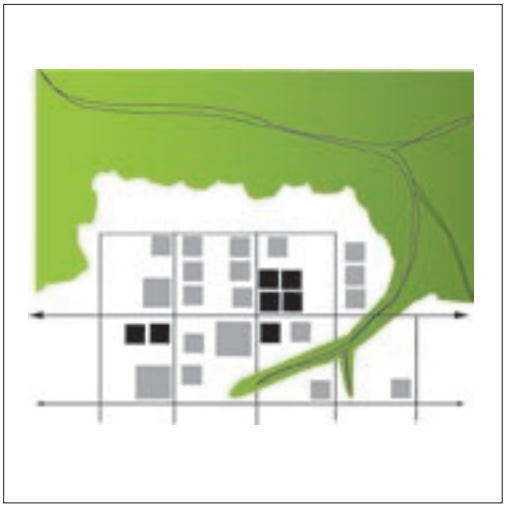
Vacant or under-used areas adjacent to developed areas are often ideal locations for adding density within existing communities. Within any district there are areas that are less efficiently developed than they could be. By capitalizing on under-utilized land, we can reduce the pressure to sprawl.

1.2 Retrofit

Land use changes over time can leave holes in the community fabric.This is particularly true where industrial or strip commercial development once existed. As demand for housing and services builds, these holes provide space for new uses. Retrofitting for new uses provides an opportunity to mitigate any environmental damage caused by previous uses, and it also enables us to reveal such buried green infrastructure as historic streams.







As population grows, the demand for more housing and services can first be met by infilling in underdeveloped places. As development divides large lots, a tighter network of streets and buildings will provide a more efficient urban fabric. Often the existing infrastructure can accommodate increased use at little or no additional cost. In cases where existing infrastructure is unsustainable, the new investment brought by infill development can often provide the only practical means of making grey infrastructure green.

CONTAINING URBAN GROWTH

Local governments can encourage development in already built-up areas through: the establishment of an urban conatainment boundary (as in the case of the Greater Vancouver Regional District's Green Zone and the Nanaimo Regional District's urban growth boundary); policies that promote town centre, village, or "nodal" development (as in municipalities such as Kelowna, Nanaimo, Surrey, North Vancouver, and Burnaby); and integrated transportation

URBAN REDEVELOPMENT

Recommended best practice for locating redevelopment is to use urban sites that are located within an existing minimum development density of 5600m2 (65,000 sq. ft.) per acre, or two storey development (LEED™ BC, 2001, p. 10).

FURTHER RESEARCH/POLICY

Cole, Hassan and Theaker, *Draft LEED™ BC Applications Guide.*

Nowlan, Rolfe, and Grant, *The Smart Growth Guide to Local Government Law and Advocacy.*

Burchell, et al., *The Costs of Sprawl – Revisited.*

Proft and Condon, "The Effects of Developer Cost Charges on Sustainable Growth."

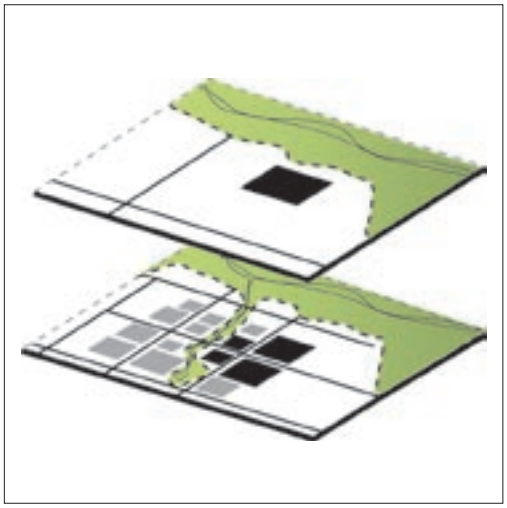
2 Include existing residents.

"When change occurs too suddenly and arbitrarily it's destructive. And when things don't change at all, that's destructive too." Jane Jacobs, Parabola, Winter 1993.

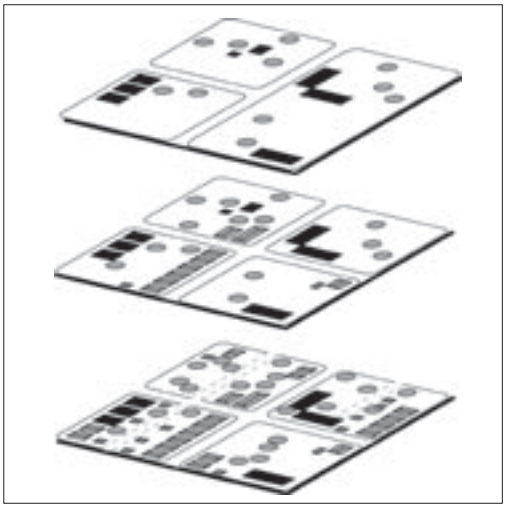
The inhabitants of every site of development have a history. It is important to take their needs and desires into consideration when planning to expand their community. It is often difficult for a new community to attract jobs and services; finding ways to include existing businesses and services would be of economic benefit to a developing community. Capitalize on existing residents and services in order to provide a foundation for community development and growth.

Related Charrette Strategies
A3; A4; B3; I4; J4; P3

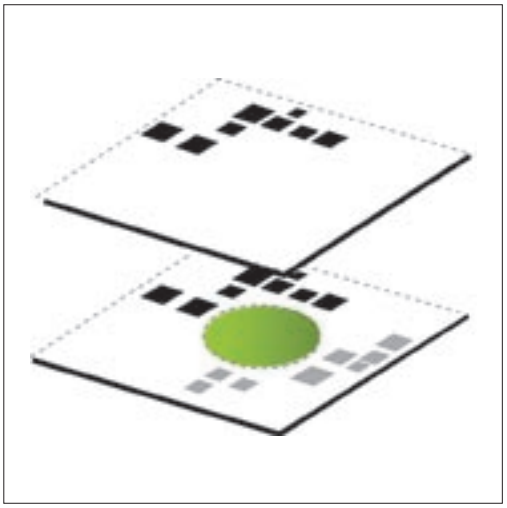
Related Guidelines
9; 32; 37; 41; 42



2.1 Fit the Old Into the New
Development that treats the site as a "clean slate" will necessarily displace existing businesses and residents. Develop plans that include space for existing users.



2.2 Grow Incrementally
Change works best when it occurs one step at a time. Incremental development is the best way to allow new uses to grow around existing ones, keeping jobs and services within the expanding community. Look for ways to add new homes to existing structures, new structures to existing lots, and new lots to existing communities. Resident opposition to change is often a function of the extent of that change. Existing residents can more easily embrace incremental, respectful, and organic growth.



2.3 Link with Common Ground
New development can disrupt and degrade adjacent communities. Providing a common meeting ground that physically and socially unites adjacent areas can successfully weave new development into old. Creating a park, public square, or new community building are just three ways of establishing a shared centre for a changing community.

INCREMENTAL CHANGE

Opposition to change can be mitigated by ensuring that the broad objectives of the community are reflected in local planning and development processes and that community stakeholders have a voice in the planning processes.

Methods for facilitating involvement and achieving community buy-in include:

- *Citizen involvement in OCP review processes;*
- *Identifying and monitoring performance indicators;*
- *Community-based mapping and environmental inventories; and*
- *Design charrettes (see Part One of this manual).*

FURTHER RESEARCH

La Rochelle, ed., "Citizen Involvment Tools" in *The Smart Growth Tool Kit.*

Sanoff, *Community Participation Methods in Design and Planning.*

Crofton, *Sustainable community planning and development: Participation tools and practices.*

capitalize on the site

Related Charrette Strategies
B1; C1; D4; F2; J1; K2; L1; O1

Related Guidelines
1; 7.3; 9.1; 15; 17; 27; 33

3 Fit development to the land

"...Thor stepped forward and with one blow of his hammer smashed the rock giant to bits." Tom White, Parabola, Winter 1993.

Building new communities means reshaping the landscape. Building "from the ground up" — respecting site hydrology, soil structure, topography, and natural features — can minimize the cost and consequences of development. Each district has a variety of landscape conditions that can help to direct the location and form of development. Understanding topography, soil, and hydrology is a necessary first step in the planning and development process.

3.1 Embrace Natural Features

Every district is home to important natural features. The careful use of natural features for recreation and green infrastructure adds value to the community, increases economic stability and resident satisfaction, and reveals how the world works. Integrate and protect natural features in order to capitalize on them for the mutual benefit of both human and non-human communities.

3.2 Use High Points Carefully

High points are very visible and desirable locations. When development leaves them unbuilt, environmental impacts are reduced while access to these points can be available to all. Capitalize on the district's high points in a district by preserving them for the whole community.

ECOSYSTEM PLANNING

Ecosystem planning is a means by which local governments can identify, map, prioritize and protect key environmentally sensitive features, such as watersheds, water-courses, flood-plains, riparian zones, wetlands, areas of biological diversity, steep slopes, habitat corridors, etc. in order to ensure that resource protection objectives are met as development proceeds.

Ecosystem Planning tools include:
- *Environmentally Sensitive Area (ESA) maps and inventories*
- *Watershed-based zoning*
- *Streamside Protection and Enhancement Areas*
- *Stewardship bylaws*

STREAMSIDE PROTECTION AND ENHANCEMENT AREAS

The Streamside Protection Regulation (Fish Protection Act, 1997, c. 21, ss. 12, 13 (1) and 37 (2)) identifies streamside protection and enhancement areas as those areas adjacent to a stream that link aquatic to terrestrial ecosystems. This includes both the riparian area vegetation and the adjacent upland vegetation influencing the stream.

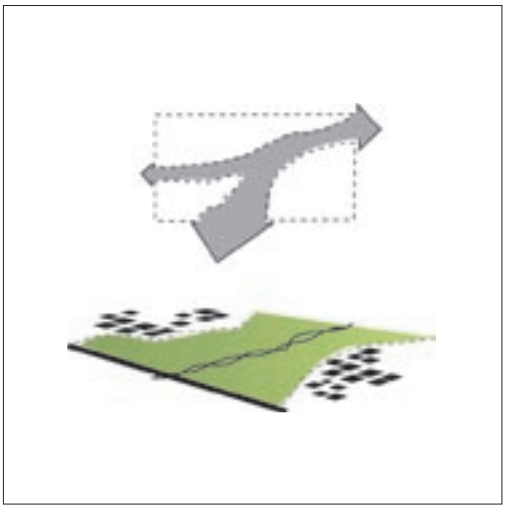
The regulation establishes protection and setback requirements for both permanent (perennial) and non-permanent (intermittent) streams. Setbacks are to be determined according to the presence or absence of and/or condition of riparian habitat along a stream bank.

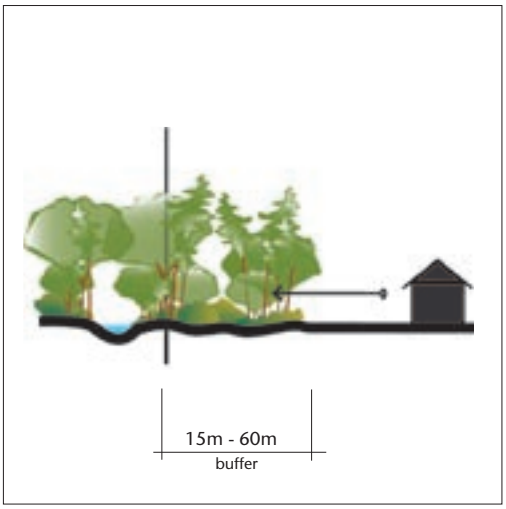
FURTHER RESEARCH/ POLICY

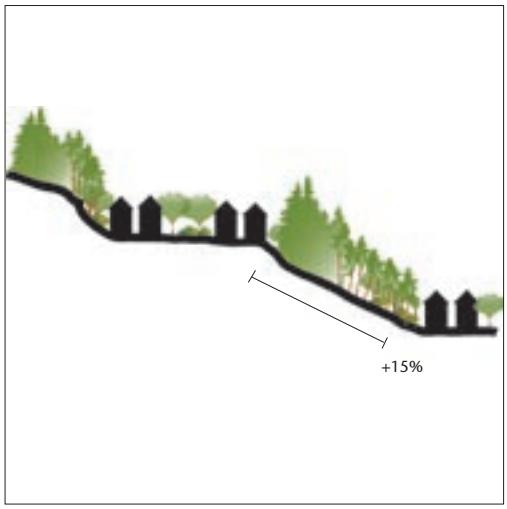
BC Ministry of Water, Land and Air Protection, *Regulatory Impact Statement in Support of the Streamside Protection Policy Directives Developed Under Section 12 of the Fish Protection Act. SBC 1997, c. 21 http://www.elp.gov.bc.ca/fsh/protection_act/sppd/index.html*

Chillibeck, Chislet, and Norris, *Land Development Guidelines for the Protection of Aquatic Habitat*.

Department of Fisheries and Oceans, Ministry of Envrionment, Lands and Parks, *Stewardship Bylaws: A Guide for Local Government.*







3.3 Buffer

Most people greatly value having nature close to home. Green systems should be protected for their social, economic, and ecological value. Streams require wide forested buffers in order to maintain water temperature and to ensure a food supply for fish. Human use in these areas must be carefully controlled, and in some cases, prohibited to preserve natural function and to maintain the qualities that give these areas their value.

3.4 Place More Density on Gradual Slopes

It is easier to build on gradual slopes (1% to 15%) than it is to build on steep ones. Steer intense development to gradual slopes as "table-flat" lands are often either best suited to agriculture or are environmentally sensitive. Reduce requirements for flat land in each lot to maximize land efficiency and to minimize earthworks. Connect developed terraces with streets that either follow the contours or that climb steeply over short distances.

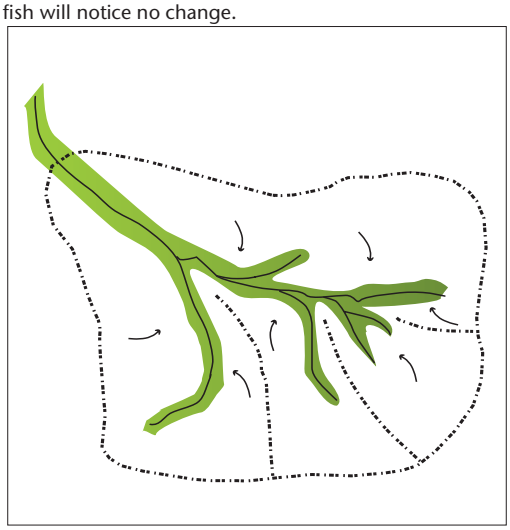
4 Design streets and streams as one system

"In Esmerelda, city of water, a network of canals and a network of streets span and intersect each other." Italo Calvino, Invisible Cities, 1972.

Conventional stormwater systems move all rainwater via underground pipes. Small pipes connect to bigger pipes until they disgorge dirty water into sensitive streams. Street systems must mimic stream and watershed systems to save them. Interconnected streets can hold, move, and absorb stormwater within the surface of each right-of-way. They must absorb stormwater just as do forests, holding almost all of the water that falls on the site in the soil so that it can gradually filter below ground to streams or to deep aquifers. Designing streets like forests and their streams means that, once the new community is built, the fish will notice no change.

Related Charrette Strategies
A1; D4; F1; F2; G1; H2; J1; K1; L1; N1

Related Guidelines
3; 4; 5; 7.3; 15; 16; 17; 19; 27; 36



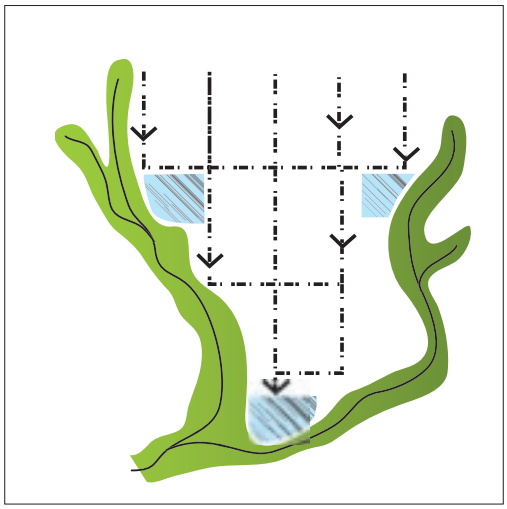
4.1 Understand the Watershed

Watersheds come in all shapes and sizes, from the scale of a river basin to that of an individual parcel and yard. What happens at each scale, from the district to the individual parcel affects the hydrological performance of the larger watershed.

WATERSHED BASED ZONING

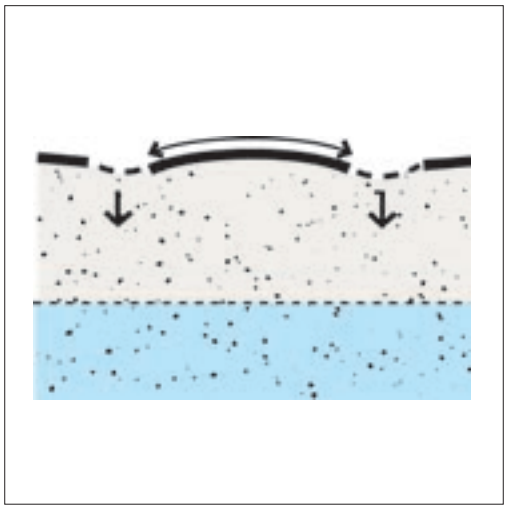
Watershed-based zoning establishes criteria for watershed health based on current physical, chemical, and biological health of streams, and their future desired condition. Based on these criteria, policies can be developed that address stream protection and buffer widths, development density, and limits on effective impervious areas (i.e., streets and roofs). This allows land use decisions to be based on whether a development meets established performance criteria for watershed health.

Under the Local Government Act, local governments can establish the maximum percentage of an area of land that can be covered by impermeable material. These maximum thresholds can then be applied at the scale of the watershed (S. 907 (3)).



4.2 Direct the Flow

Streets provide an ideal vehicle for integrating local watersheds to the larger hydrological system. The street network should work with, not against, the natural drainage patterns of a site. Small storms should all be absorbed by streetside and yard soils. Large storms, those that occur just a few times a year, are a different matter. Within the connected ecological network, large natural areas such as schools and parks are ideal places for diverting runoff from very large storms and for integrating biological treatment/wetland areas into the district. School and park sites also offer the best opportunity for increasing the biotic diversity of the site and for managing the headwaters of receiving streams.



4.3 Absorb and Clean Water

Research suggests that the health of watersheds is compromised when the effective impervious area (comprised mostly of streets and rooftops) exceeds 10% of an entire watershed. Reducing the width of streets will reduce the amount of impervious surface area, while using the roadside area to clean and absorb rainwater will minimize the impact of remaining impervious surfaces. It is possible to reduce a total impervious area of 50% to an effective impervious area of 10% or less through this means.

FURTHER RESEARCH/POLICY

Chilibeck and Sterling, *Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Fish Habitat.*

Centre for Watershed Protection, *The Practice of Watershed Protection: Techniques for Protecting and Restoring Urban Watersheds.* (www.cwp.org)

Province of British Columbia, *Local Government Act.* S. 907.

Richman & Associates, Dress & McKee, and Ferguson, *Start at the Source: Residential Site Planning & Design Guidance Manual for Stormwater Quality Protection.*

Related Charrette Strategies
A1; C1; C3; E1; F1; G1; H1; K1

Related Guidelines
3; 4; 6.3; 7.3; 8.1; 10.2; 13.1; 19; 27

5 Create a connected ecological network

"...beside a sacred fount the Tree is placed." The Epic of Gilgamesh, 4,000 B.C.

Virtually every part of a sustainable community has a function within the ecological system of the district. This is true of public as well as of private open space. Recognize the role of public and private open space in creating a district-wide green network. The green network of streets, yards, and parks serves both ecological and social purposes by supporting the surface drainage system, contributing to the urban forest, providing sufficient bird and fish habitat, maintaining base flows in streams, and providing areas for both passive and active recreation.

5.1 The Ecological Network

All public and private open space should combine to create a network of green infrastructure. This allows us to dramatically decrease the negative consequences of development while capitalizing on nature's generous recreational and aesthetic qualities.

5.2 Private Yards and Gardens

Because private open space is individually owned, we sometimes forget that each parcel is a part of a greater whole. Yards and gardens provide private outdoor space for residents, while well designed yards and gardens collect, clean, and infiltrate water. Vegetation can be layered to provide bird habitat — habitat that is sometimes more attractive to some bird species than are mature forests. Ideally, each private outdoor space should make a positive contribution to the ecology of the district.

5.3 Schools

Combined school and park sites can act as the green heart of a community and can be designed to enrich habitat and maximize the health of receiving streams. Areas of forest cover and naturalized wetlands or retention ponds can provide stream protection and bird habitat. The discharge of clean water and necessary nutrients into stream waters can be managed within this new form of public green infrastructure.

5.4 Utility Rights-of-Way

Many communities have utility rights-of-way (ROWs), which are publicly accessible under certain conditions; however, maintenance requirements generally discourage naturalization. These areas also often require yearly clearing. Nonetheless, ROWs can provide useful links for birds and other wildlife, pedestrians, equestrians, and bikes, thus contributing to movement through the district.

URBAN HABITAT

The East Clatyon Neighbourhood Concept Plan recommends at least 40% of school/ park sites be covered by tree canopy and that at least 50% of the sites' total area have habitat value.

FURTHER RESEARCH

Campbell and Pincott, *Naturescape British Columbia: Caring for Wildlife Habitat at Home. The Provincial Guide.* http://www.hctf.ca/nature.htm

Collyer and Holmes, *All Hands in the Dirt: A Guide to Designing and Creating Natural School Grounds. Vancouver,* BC: Evergreen Foundation. http://www.evergreen.ca/

Moffat, *City Green: A Guide to Green Infrastructure for Canadian Municipalities.*

City of Surrey Department of Planning and Development et al, *East Clayton Neighbourhood Concept Plan.*

5.5 Riparian Areas
Riparian areas, which are usually associated with natural streams, are locations that have been left undisturbed by development. These locations preserve precious habitat for significant numbers of bird, aquatic, and animal species. They also provide community residents with fully mature natural areas. Preserved riparian areas within a 10 minute walk can greatly increase the sale and resale value of new homes. When carefully integrated into the neighbourhood and preserved as public nature parks, riparian areas can be a very powerful capital asset to any community. This, of course, is in addition to their obvious value for protecting endangered ecological communities. Preserved riparian areas can, and should, also provide for bike and pedestrian trails. While these trails must be located so as to minimize impact to sensitive streams, opportunities for contact with nature should be taken advantage of.

5.6 Parks and Linear Open Space
Neighbourhood parks are irreplaceable aspects of the social functioning of a community and are well suited to stormwater infiltration. Linear open space — such as bike routes, greenways, and public parkways — connect the movement of people, water, and wildlife throughout the community. They both connect the individual components of the ecological network and provide valuable habitat/stormwater management services. Strive for a diverse urban forest comprised primarily of native trees (to provide native insects for fish and wildlife). For park sites, provide tree canopy over at least 50% of the site. This urban forest will help compensate for the loss of the original forest, replacing some habitat and substantially replicating lost hydrological function.

FURTHER RESEARCH

Hamilton and Quayle. *Impact of Riparian Suburban Greenways on Property Values.*

Netusil and Bolitzer, "The Impact of Open Spaces on Property Values in Portland, Oregon"

Netusil et al, "Can Open Spaces Be Self Financing: Results from Portland, Oregon"

6
District
connect the flows

Related Charrette Strategies
A1; C1; C3; D2; D4; E1; F1; F2; G1; G3; H1; H2

Related Guidelines
4; 5; 8.2; 14.3; 15; 16; 18; 25; 28

6 Connect the district to the region

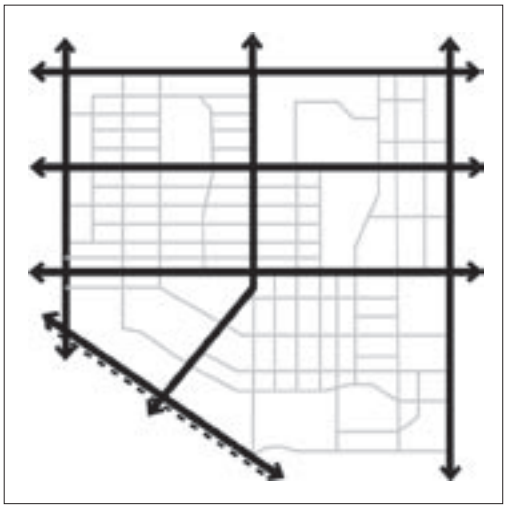
"What is more beautiful than a road? It is the symbol and the image of an active, varied life." George Sand, Consuelo, Vol. II.

Corridors are the arteries of a region. They connect the flows of materials, goods, residents, and wildlife within and between communities. A coherent system of interconnected streets can disperse traffic while creating important places at key intersections. Different types of corridors are appropriate for different types of movement. Street networks should respond to neighborhoods rather than vice versa. Connect the flows by making a district-wide network of different corridors.

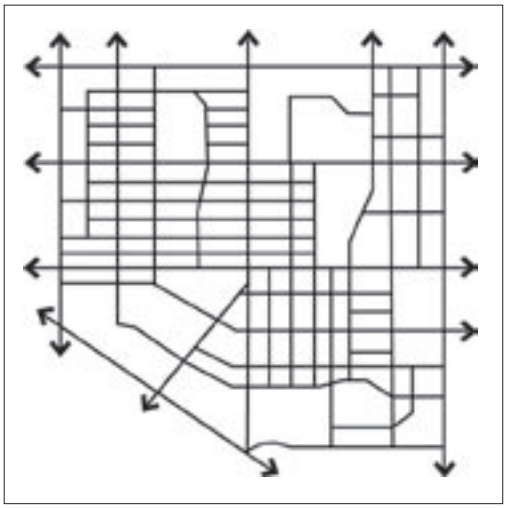
TRAVEL BEHAVIOUR

Changes in land use and the built environment can have a significant effect on travel demand (i.e., automobile trip duration and frequency, and modal choice).

Together with mixed-uses and high employment and housing densities, integrated street networks and pedestrian-oriented design measures can reduce vehicle kilometres travelled by 45% or more.



6.1 High Capacity Road Network
An efficient system of arterials can provide smooth-flowing connections between regional employment and shopping hubs and are often magnets for commercial activity. Calm arterials and make them compatible with pedestrian use. Provide designated commuter bike lanes along arterials when there is no other alternative. Let roads serve pedestrians, cyclists, and drivers.



6.2 Local and Collector Street Network
A sustainable street system is not hierarchical; rather, it is an integrated whole within which all roads contribute. Many of our older, and most liveable, cities include only local streets and "trolley-car" arterials in an interconnected street system. The interconnected street system is also an inclusive system, as it provides direct and safe routes for multiple users, including cyclists. This is in opposition to the hierarchical, disintegrated, disconnected system of cul-de-sac, residential, residential collector, collector, and suburban arterial street system strategy — a strategy that has generated unbearable levels of congestion on major streets.

6.3 Greenways and Bikeways
Greenways are linear recreational, travel, and habitat corridors that link pedestrians and cyclists to the surrounding community and regional open space system. Greenways can also perform important green infrastructure and ecological functions, such as habitat connectivity, surface stormwater conveyance, and biofiltration. The interlaced system of stream and greenway corridors provides a network of bike, pedestrian, and wildlife routes that connect important destinations within the district.

FURTHER RESEARCH

Litman, "Land Use Impact Costs of Transportation."

Cervaro, "Travel Choices in Pedestrian Versus Automobile Oriented Neighbourhoods."

Criterion Engineers and Planners, *Benefits of Neotraditional Development*.

7 Layer functions in open space

"...it has nothing that makes it seem a city, except the water pipes that rise vertically where the houses should be and spread out horizontally where the floors should be." Italo Calvino, Invisible Cities, 1972.

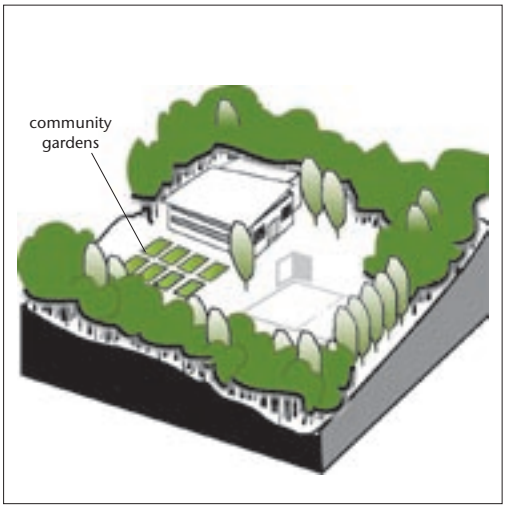
When people see the way things work, they begin to understand them. We love what we understand and we take care of what we love. Layer servicing, ecological, and social functions throughout private and public open space. Do this in an integrated way and make sure that it is visible. Schools, natural areas and private yards and gardens can all fulfill multiple functions.

Related Charrette Strategies
A1; C4; D4; I1; J1; J3; K1; K2; L1; L3

Related Guidelines
5; 12; 27; 30; 31

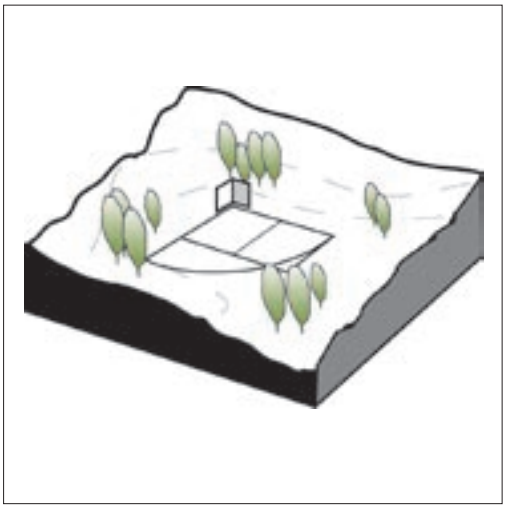
7.1 Social Functions

The school and schoolyard of a sustainable community can be a perfect example of integration. The school serves the educational needs of the community and can also provide a cultural and social resource. For example, portions of the schoolyard can serve as a site for community gardens.



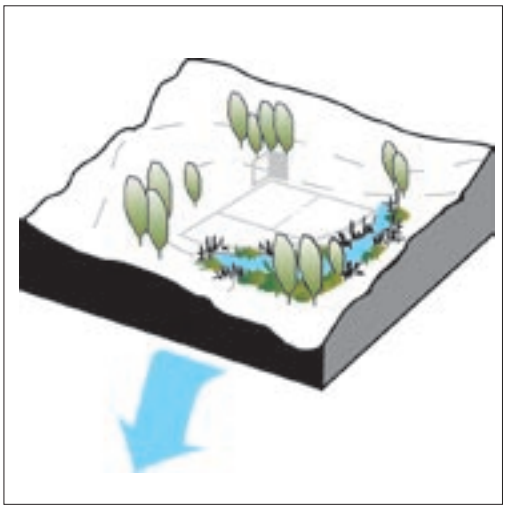
7.2 Recreational Functions

The schoolyard's playfields help to serve the community's recreational needs. Students use them during the day while on weekends and holidays they are used by residents and sports groups.



7.3 Ecological Functions

Integrated school/park sites can show students how their environment works.The large, flat, and open nature of school playfields also makes them an ideal location for stormwater storage. During the 5 to 100-year storm events (e.g., 7.5 to 12.5 centimetres of rain in 24 hours in the Lower Mainland), not all stormwater can be infiltrated where it falls. In such cases, excess stormwater can be conveyed (either on street verges or underground) to district playfields where it can be stored and slowly infiltrated into the soil and/or released clean, at controlled rates, into receiving streams. Forested and reforested areas on the site provide habitat and contribute to site hydrology.



WETLAND DESIGN

The design of retention/wetlands should achieve an optimum ratio between water depth and maintaining the appropriate aquatic and terrestrial habitat to support a rich and diverse ecosystem. On shared school/park sites, measures to ensure safety and provide access to a variety of users should be addressed through the appropriate use of vegetation, buffers and landform.

FURTHER RESEARCH

Furguson, I*ntroduction to Stormwater: Concept, Purpose, Design.*

Model Schools Program, Evergreen Foundation.
http://www.evergreen.ca/en/lg/lg.html

Richman and Associates, *Start at the Source.*

8
District
create a centre

Related Charrette Strategies
A3; A4; B2; B4; C2; E4; G3; H4; O4; P4

Related Guidelines
1; 5; 9; 11; 22

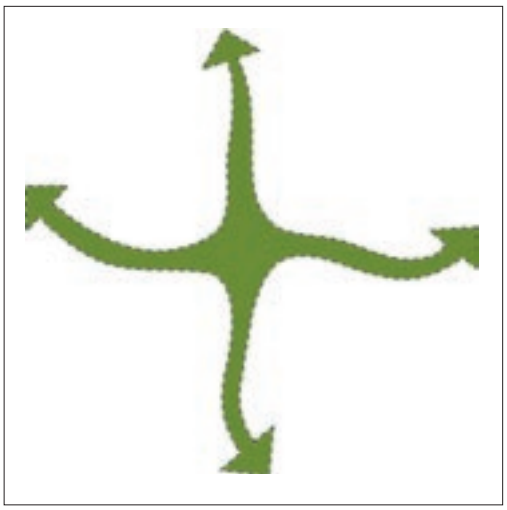
8 Create a region of centres

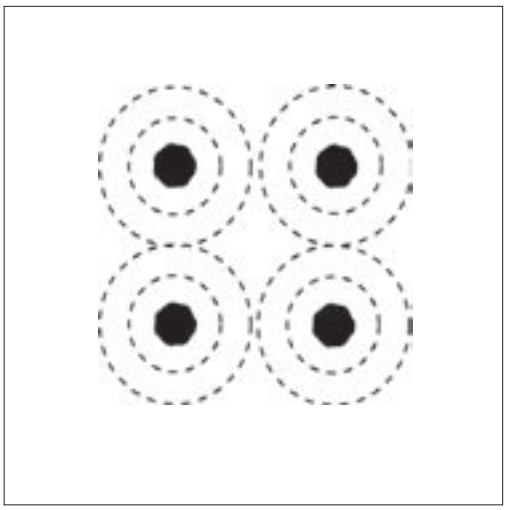
"...just as there is a best size for every animal, so the same is true for every human institution." J.B.S. Haldane, The World of Mathematics, 1956.

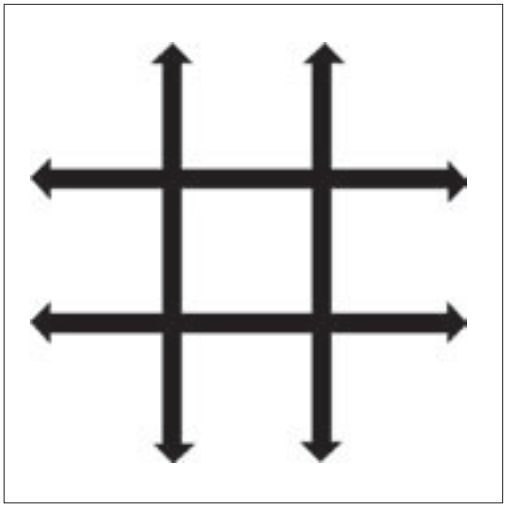
A region of concentrated centres provides jobs and services close to home, saves money on infrastructure, and makes a regional transit system viable. Centres work at multiple scales: neighbourhood centres combine to form a district, and district centres combine to form a region. Development based on centres means that each community can preserve valuable greenspace and farmland. The ecological and economic value of undeveloped land will remain well into the future.

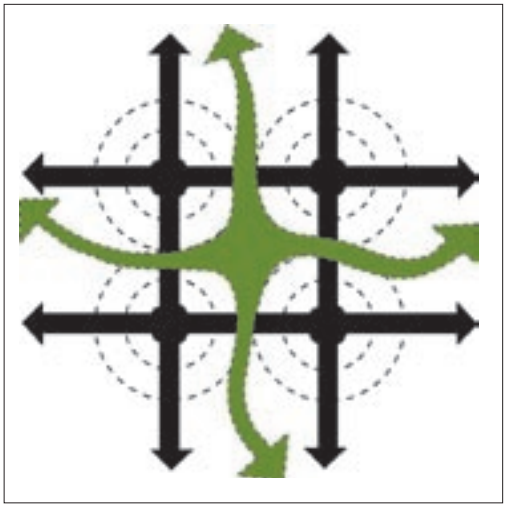
8.1 A Green Legacy
Drawing a line around natural assets such as stream corridors, wetlands, and low-lying agricultural areas identifies a green "backbone" around which a neighbourhood, district, or regional community may be structured. Locating growth around this framework means that areas with high ecological, social, and agricultural value will maintain their productivity and health.

8.2 Concentrate and Condense
Concentrated centres enhance social and economic function. Viewed as a district of neighbourhoods, each circle depicts a residential mix organized around a 5 minute walk to a small commercial and transit node: Viewed as a region of districts, each circle depicts a regional transit node surrounded by more intensive residential and commercial uses. These provide the density needed to support frequent service. Density may decrease with distance from the centre.









8.3 Connect the Centres
Efficient connections make a more liveable community. Within a neighbourhood or district, interconnected streets and an effective transit system help people meet their daily needs without a car. Regionally, high-capacity transit and major thoroughfares connect major activity centres. Regional connections catalyze sustainable economic and urban development and will reduce overall dependence on the automobile.

8.4 A Region of Centres
Neighbourhood centres combine to form a district, and district centres combine to form a region, while natural features provide the overall structure for development. Building communities around a green framework ensures that high-value ecological, social, and agricultural areas will be kept close to the people who benefit from them. At every scale, interconnected transportation corridors connect the centres.

CENTRES

An average neighbourhood density of 25 units per hectare (10 units per acre) is considered the minimum to support a viable transit system.

Given an average walking pace, neighbourhoods based on an average 5 minute walk would range in size from between 16 hectares (40 acres) up to approximately 30 hectares (75 acres).

FURTHER RESEARCH

Parsons Brinckerhoff Quade and Douglas, Inc., Cambridge Systematics,Inc. and Calthorpe Associates,"Making the Land Use Transportation Air Quality Connection – the Pedestrian Environment."

Calthorpe, *The Next American Metropolis.*

Holtzclaw, *Using Residential Patterns and Transit to Decrease Auto Dependence and Costs.*

9 Let the centre define the community

"Ah and around this centre: the rose of onlooking blooms and unblossoms." Rainer Maria Rilke, "The Fifth Elegy", in The Selected Poetry of Rainer Maria Rilke, 1982.

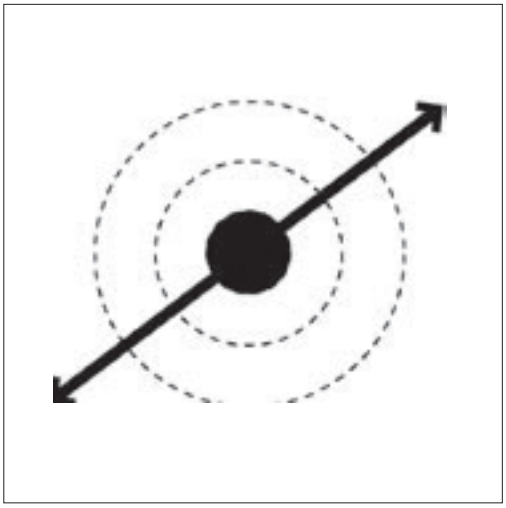
A neighbourhood centre gives a community its identity and its anchor. A neighbourhood centre may provide a place for informal social interactions or daily shopping. A district centre offers access to other districts, provides civic services, and satisfies weekly shopping needs. A region built of numerous centres equitably and economically fulfills the economic, transportation, and social needs of its citizens.

Related Charrette Strategies
A3; B2; E4; F3; H3; H4; M2; N3

Related Guidelines
1; 8; 10 ; 18; 22; 24; 39

9.1 Something at the Centre

A centre is not just a geographic location, it is also the point where all the radii of a circle meet. Within a community, it is the place where residents meet. Make a centre that means something to community residents: do this by including civic, economic, transportation, and social functions. Use civic buildings, public parks and squares, people-friendly streets, and a broad mix of activities including shopping, working, living, walking, sitting, playing, and watching.



LAND USE MIX

Employment densities and jobs/housing balance are two important factors affecting changes in travel behaviour.

The mix of uses in each district and neighbourhood centre will vary depending upon context and location; however the following are suggested ranges:

For neighbourhood centres

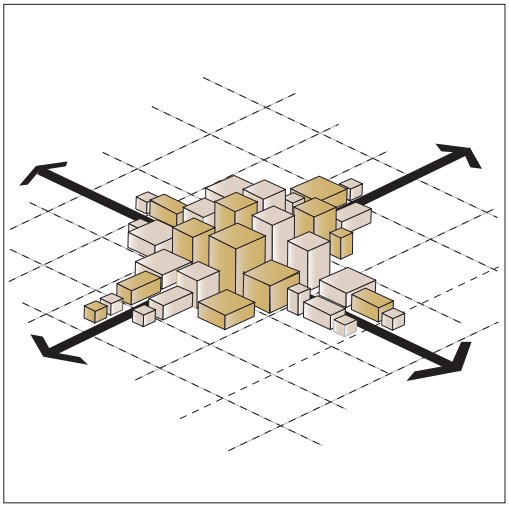
- *Public uses: 10% - 15%*
- *Employment: 10% - 20%*
- *Housing: 60% - 90%*

For district centres

- *Public uses: 10% - 15%*
- *Employment: 30% - 70%*
- *Housing: 30% - 70%*

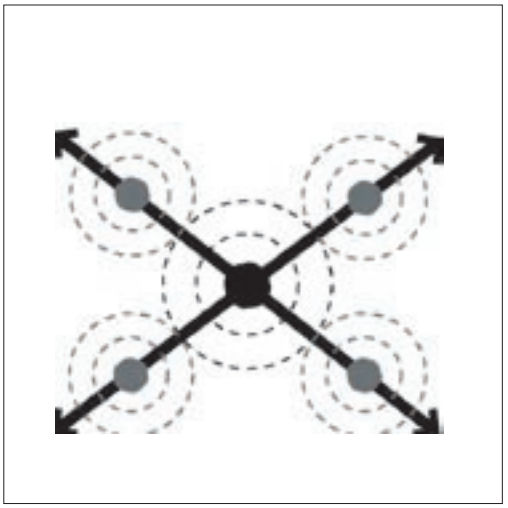
9.2 Denser at the Centre

Density is relative to urban context. This means development density will generally increase as one moves from a rural community to a suburban community to a city centre. Within each community there will also be a range of densities. Regardless of urban context, make each district denser at the centre. Include a variety of land uses and residential types to maximize diversity, activity and synergy between uses. This will ensure that more people are located close to their daily needs and that there will be a large enough population within the centre of the district for animated social exchange.



9.3 Districts of Smaller Centres

The neighbourhoods that make up a district are also organized around a centre. Structuring each neighbourhood according to a five-minute walk to commercial services and transit (a 400-metre-radius circle for relatively flat sites) adds convenience and reduces auto dependance.



FURTHER RESEARCH

Calthorpe, *The Next American Metropolis.*

Cervero and Radisch, "Travel Choices in Pedestrian Versus Automobile Oriented Neighborhoods."

Holtzclaw, "How Compact Neighborhoods Affect Modal Choice – Two Examples." http://www.sierraclub.org/sprawl/articles/modal.asp.

Institute of Transportation Engineers, *Traditional Neighbourhood Development Guidelines.*

10
District
create a centre

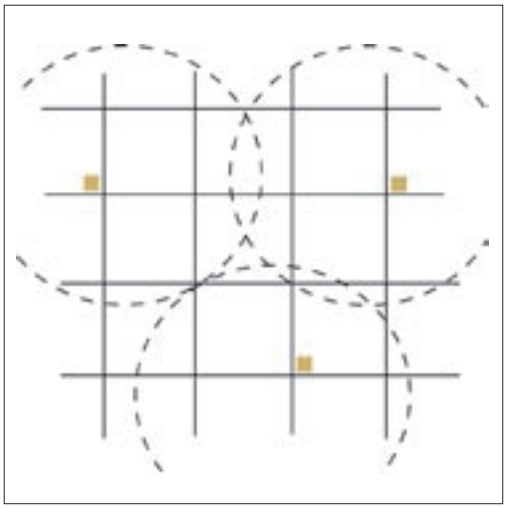
Related Charrette Strategies
A3; B3; D3; D4; E2; F3; I1; J3; L3

Related Guidelines
2; 5.6; 7; 9; 13.2; 29; 31; 35.2; 42.4

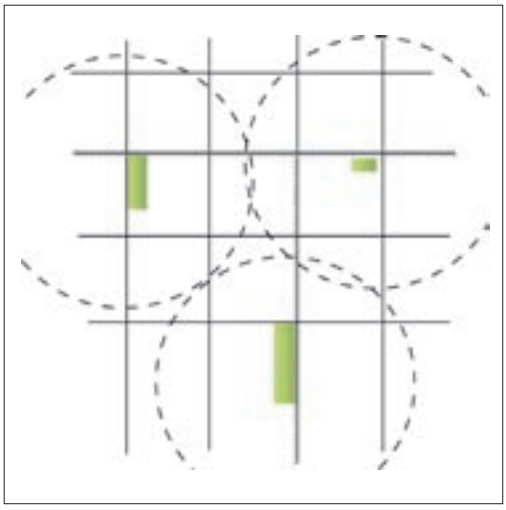
10 Centre every neighbourhood around social space

"In Mexico, in any small town plaza every Thursday and Sunday night with the band playing and the weather mild, the boys walk this way, the girls walk that, around and around, and the mothers and fathers sit on iron-scrolled benches and watch." Ray Bradbury, "The Boys Walk This Way, The Girls Walk That," in West, 1970.

Ideally, each block has some kind of gathering place. Some are small — a bench on the boulevard — while others can take up to a whole block. Ensure that each home is located within a 3 minute walk of social space. This social space need not be a garden or park but also may take the form of a public square or coffee shop with an outside seating area.



10.1 The Neighbourhood Store
Each family should be no further than a 5 minute walk from a neighbourhood store. This store may have a suite above it or may be located within an outbuilding of a family home. The neighbourhood store provides an opportunity for families to live and work in the same area, and, because it is small, the street can accommodate its parking needs. Situate the building close to the street in order to ensure a strong pedestrian orientation (i.e., build it to the property line or at a maximum setback of 2 metres). Because the store is in a residential area, its maximum lot coverage should be lower than that typical of commercial areas (i.e., it should be no more than 60%). The neighbourhood store serves a social function in that it is an identifiable landmark within the neighbourhood and a destination for children: "I'll race you to the store" is a cry that enriches any neighbourhood.



10.2 The Neighbourhood Park
The neighbourhood park is full of social opportunities: a place to run the dog, play tennis, or establish a community garden. A small park can provide a meeting place, while larger parks provide active recreation fields for residents and local sports clubs. Tailor each park to the needs of the community it serves. Locate a small park within a 3 minute walk (250 meters) of all homes and a large park within a 7 minute walk (700 meters) of all homes.

11 Put jobs near people

"In a city or a village which we have known well since our childhood we move in a tamed space, our occupations finding everywhere expected landmarks that favor routine." Czeslaw Milosz, Parabola, Summer 1993.

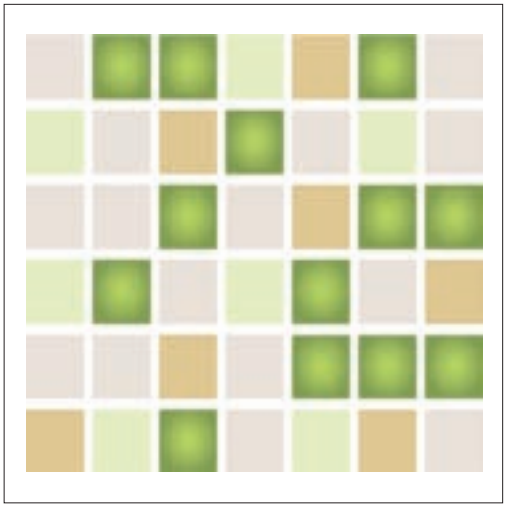
More and more people are commuting longer distances from home to work. In the GVRD, average commuting times have increased by up to 80% on the most congested routes during morning rush hour periods. If more jobs are located throughout a community, it will be easier and more cost effective for residents to travel between work and home. A fine-grained mix of land uses within each community, and within each neighbourhood, will put many people closer to their place of work. The money saved on commuting can then be used for more productive, less polluting uses.

Related Charrette Strategies
B4; C2; E4; H4; J4; M4; P4

Related Guidelines
1; 2; 8.3; 8.4; 9; 22; 38; 41

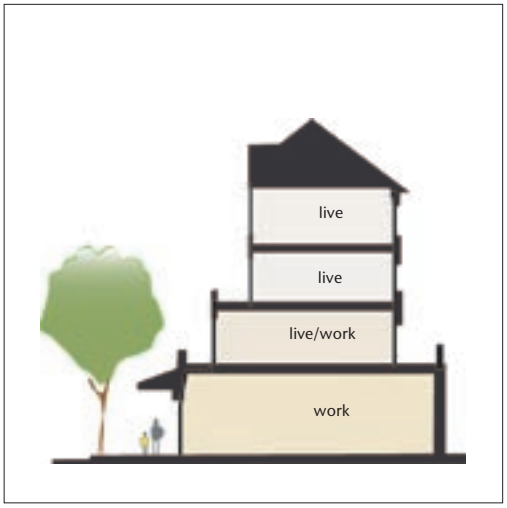
11.1 Flexible zoning

Zoning limits what kinds of land uses are allowed within a particular area of a community. Often zoning results in the dramatic separation of uses within a community by putting single-family houses in one place, apartments and townhouses in another, and business and commercial uses in yet another. This segregation of land uses disintegrates the community fabric. More flexible zoning intermixes residential, commercial, and business uses and ensures that jobs and services are located closer to the people who need them.



11.2 Live-Work

Combining working and living space can reduce a variety of costs. Workers are now applying the artisan tradition of living and working in one unit to various situations — from artists' studios to home-based offices. This eliminates the need for rental space while also allowing parents with young children to minimize child-care costs. Live-work areas function as a transition between residential areas and higher-density mixed-use, commercial, or industrial areas. Live-work areas should have a strong residential character combined with a continuous street frontage, direct pedestrian access, and parking similar to that found on a "Main Street."



EMPLOYMENT, HOUSING AND TRAVEL

Employment density and jobs/housing balance have the strongest relationship with travel behaviour. A 1990s survey of major US and Canadian cities found that doubling urban housing and employment densities can result in a 25% to 30% reduction in vehicle kilometres travelled (VKT) (Holtzclaw, 6-8 and 21). Changes in travel behaviour result if the following thresholds are met or exceeded. For reductions in work-related trips, 50-70 employees and 9-13 persons per gross acre (about 12 dwellings per net acre) is needed. For significant reductions in non-work (i.e., shopping trips) 75 employees and 18 persons per gross acre (about 20 dwellings per net acre) is needed (Frank and Pivo).

HOME-BASED WORK

Increasing numbers of British Columbians are incorporating work spaces in their homes. The 1996 census revealed that a total of 155,455 British Columbians, or 8.2% of the work force, worked at home.

FURTHER RESEARCH/ POLICY

Contreras, Ferrara Architects Inc.,*"Home Occupation Scenario: An Investigation of the Context for Live/Work Environments and Their Regulatory Requirements."*

City of Surrey Department of Planning and Development et al., Part 4.3 "Live/work, Work/ Live Areas." *in East Clayton Neighbourhood Concept Plan.*

Gurstein, *Wired to the World Chained to the Home.*

Live/Work and Work/Live: A Vancouver Overview.

12
District
an economy of means

Related Charrette Strategies
C3; D4

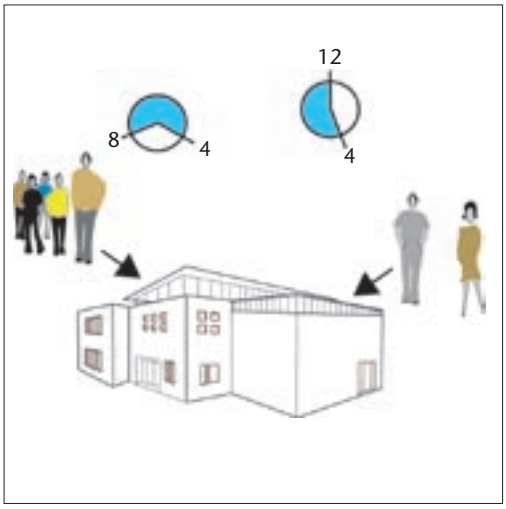
Related Guidelines
7.1; 7.2; 7.3; 10.1; 10.2

12 Share public facilities

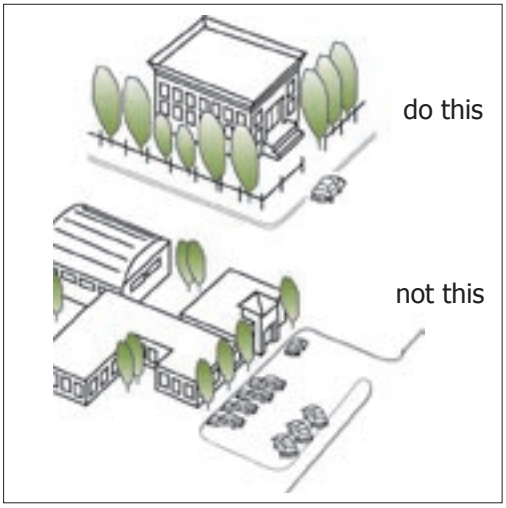
"The bridge is not supported by one stone or another," answered Marco, "but by the line of the arch that they form." Italo Calvino, Invisible Cities, 1972.

Public facilities are often built, maintained, and managed separately, even though many of their uses are complementary. This results in underutilized spaces and facility redundancy, while the management and maintenance of separate buildings is expensive. Shared facilities decrease costs and foster interaction between different age and interest groups. Use may be segregated either physically or over time, or it may be integrated in order to enhance community interaction.

12.1 Share Space
Schools and community recreation centres have overlapping and complementary uses. Schools, libraries, and recreation facilities are often short of the funds needed to supply the full range of facilities and resources that each would like to have. Bring schools, parks, community centres, and natural areas together at the green and/or civic heart of the community.



12.2 Share Time
Generally, school classrooms, gymnasia, and libraries go unused during the evening. Design and locate school facilities so that they are conducive to integrated continuing education classes. Lectures, exercise classes, gardening workshops, woodworking lessons, and community sports events are just a few of the potential nighttime uses shared facilities might host. Remember that these kinds of activities are usually enhanced if they are close to commercial sites, pubs, coffee shops, and convenience stores.



12.3 Schools Within Walking Distance
Putting schools within walking distance of virtually all residents means a larger number of smaller schools. Students in small schools get more attention from teachers, score better on tests and suffer less bullying, while their parents are more involved in student life. Also, more schools means that residents will have better access to school buildings and facilities like playgrounds. Ideally, elementary schools should be planned for no more than 400 students, and high schools should be planned for no more than 600 students.

FURTHER RESEARCH

Public Agenda Online. "Sizing Things Up: What Parents, Teachers and Students Think About Large and Small High Schools."

Cotton, K. School Size, School Climate, and Student Performance." www.nwrel.org/scpd/sirs/10/c020.html

13 Employ natural features to increase value

"A tree house, a free house, a secret you and me house, a high up in the leafy branches cozy as can be house." Shel Silverstein, Where the Sidewalk Ends, 1974.

The natural features of a site provide economic, and social benefits in addition to ecological benefits. Communities with an interconnected open space network are more desirable and have a higher housing value than do communities lacking such a network. Individual homes with a view, or homes fronting onto parks, also have a higher property value than do other homes.

Related Charrette Strategies
A1; C3; D4; E1; E3; I1; K1; L3; M1; N1; N3

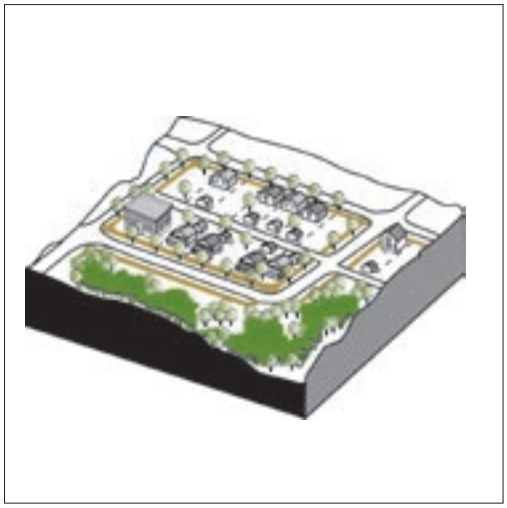
Related Guidelines
3.1; 5; 8.1; 10.2; 20; 27; 31; 33

13.1 Open Space Network
Parks and community greenspaces contribute to the property values and economic stability of the whole community. Interconnected pedestrian systems throughout the community mean that more homes have direct access to natural and recreational amenities. Proximity to greenspace also helps homes benefit from higher resale value.

PROXIMITY TO OPEN SPACE

Homes can appreciate by between 10% and 25% as a result of being within 500 metres of natural green space.

The increases in property tax revenue as a result of property appreciation can benefit communities by offsetting the purchase, development and maintenance costs associated with the newly acquired community green space (Netusil et al., 1999).



13.2 Front Onto Open Space
Higher-density housing forms, such as townhouses and low-rise apartments or condominiums, are ideally suited to fronting onto a park or open space. Proximity to the park and the view of open space has the effect of making a home seem larger than it is. Where one can gain access to units from a lane, a front street is not required (assuming the block is short enough to provide easy access from adjacent streets along a public sidewalk). Market value for units fronting onto parks is generally higher as a result. Homes overlooking parks also increase the security of park users.

13.3 Orient Toward Views
People everywhere appreciate a distant prospect; even partial views can bring increased value to homes. Most BC districts have actual or potential views of distant mountains. Particularly on hillside sites, houses oriented towards a view will have a higher sale value than those lacking such views.

FURTHER RESEARCH

Condon and Gonyea, "The Effects of Community Green Space on Property Value and Community Completeness."

Curran, and Draeseke,"Economic Benefits of Natural Greenspace Protection: The Effect on Real Estate Value."

Hamilton and Quayle, "Corridors of Green and Gold: Impact of Riparian Suburban Greenways on Property Values."

Netusil and Lutzhiser, "The Effect of Urban Open Space Type and Proximity on a Home's Sale Price: Portland, Oregon."

14
District
make it home

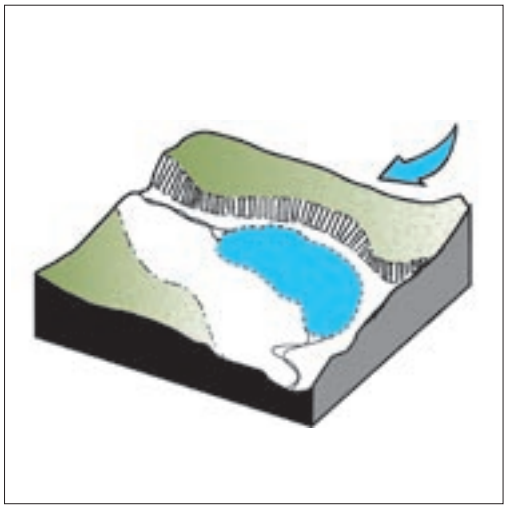
Related Charrette Strategies
C1; D1; E3; J1; K2; O1; P3

Related Guidelines
1; 2; 3; 13; 16; 27; 33; 43

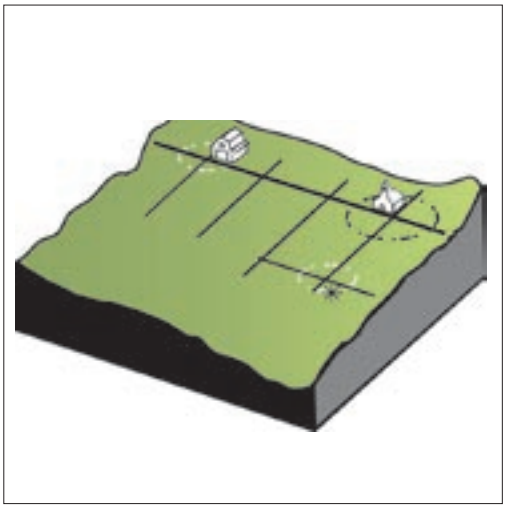
14 Derive community identity from the landscape

"There is a precipice between two steep mountains: the city is over the void, bound to the two crests with ropes and chains and catwalks." Italo Calvino, Invisible Cities, 1972.

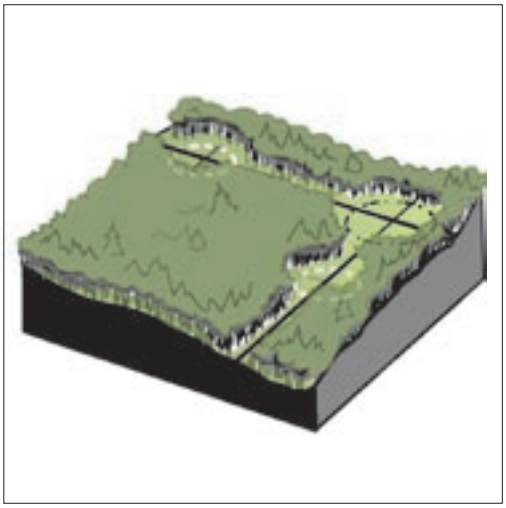
Communities shaped in response to the landscape create a strong connection between themselves and their residents. Once residents identify with a place and claim it as "theirs," they begin to love and to care for it. Make a community home by shaping it to the physical and cultural landscape.



14.1 Land
The physical landscape can contribute strongly to community identity. Each site has unique features, such as landform, water bodies, vegetation, wind, and light. By emphasizing and capitalizing on these features, each community can establish its own character.



14.2 Culture
The cultural landscape marks the history of the people who have lived in a place. This history is often revealed through an existing pattern of development, a monument, or the preservation of a unique natural feature. Weaving such elements into development projects ensures that, while developing a new identity, a community does not lose its old one.



14.3 Connections
Corridors connect communities, thus it is not surprising that communities have often been founded at the intersection of the corridors. In order to strengthen community identity, reinforce development around existing corridor intersections and establish development around new ones.

FURTHER READING

Busch, *The Geography of Home.*

Hough, *Cities and Natural Process: Towards a New Urban Vernacular.*

Kaplan and Kaplan, *The Experience of Nature: A Psychological Perspective.*

Corridor 15 - 26

Capitalize on the Site

15 Fit streets to the slope

16 Design streets to enhance natural features

Connect the Flows

17 Design a network of interconnecting streets

18 Connect transit to the community

Layer the Systems

19 Move stormwater along the street

20 Create urban gardens

21 Create an urban forest

Create a Centre

22 Create activity on a Main Street

An Economy of Means

23 Make streets cheaper

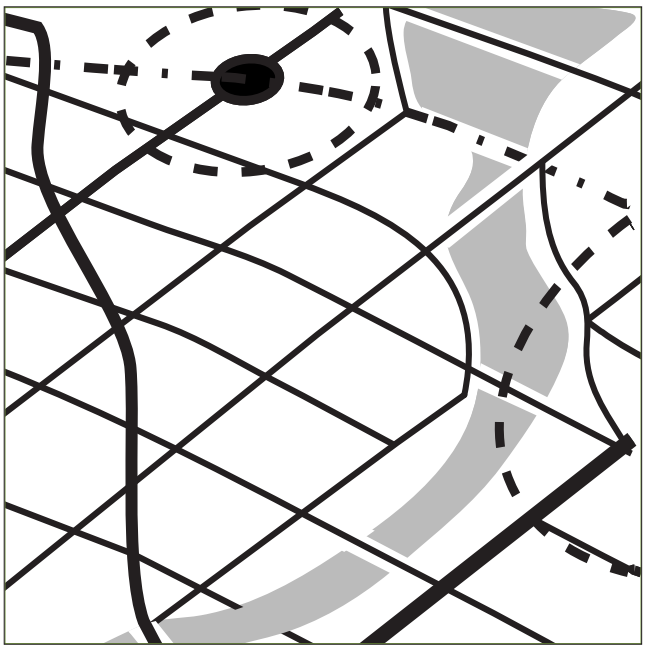
Make it Home

24 Provide parking wisely

25 Create safe and comfortable streets

26 Create a sense of enclosure

Corridors are the conduits for moving materials, energy and resources within and between neighbourhoods, districts, and regions. Corridors of all types and at all scales — be they streets, lanes, boulevards, pathways or streams — need to reflect their unique and specific functions. Regional transit corridors should be designed to coordinate and concentrate growth where it is most appropriate. Local corridors should be designed to be walkable and connect residents to commercial services, transit stops and natural areas, and so on. Laid over the urban fabric, an interconnected street network can and should yield to natural stream corridors without unduly compromising street interconnectivity.



15
Corridor
capitalize on the site

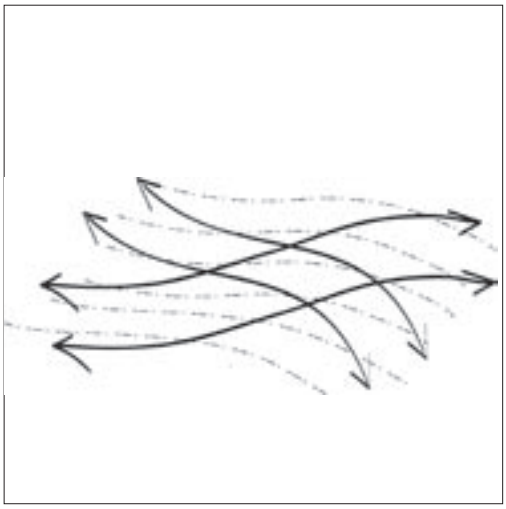
Related Charrette Strategies
C1; D2; F2; J1; K2; K3; L1

Related Guidelines
4.2; 17.2; 17.4; 27

15 Fit streets to the slope

"The city was on many levels; some streets — often mere alleys — had to negotiate an incline so steep that they cascaded into flights of stairs." Christine Whittimore, Parabola, Winter 1993.

As our communities grow and gently sloping land is consumed, development on sloped sites becomes more common. Streets designed to work with the existing terrain lessen impacts on sensitive slopes. This means building somewhat steeper streets that follow the contours of the land; it also means allowing minimum road widths in order to reduce the cutting up of the slope. Hillside streets must also be interconnected to reduce trip length and increases pedestrian utility. Capitalize on the site by allowing the shape of the land to direct the placement of an interconnected street network.

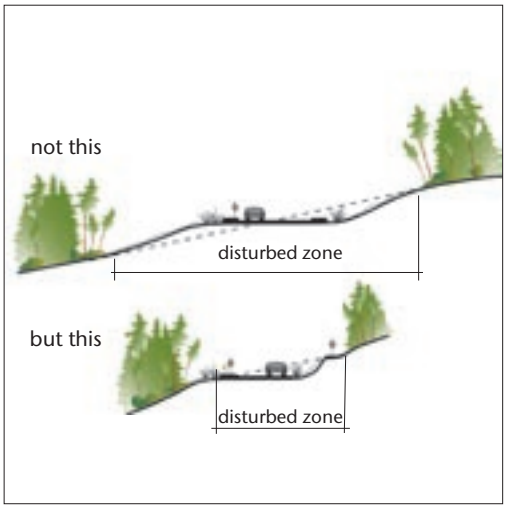


15.1 Work with the Contours

Envision the interconnected street network as a net that has been laid over the landscape. Some streets may run nearly parallel to the contours; cross streets may run gently at an angle to these contours so that, if possible, street gradients are kept to 7% or less. Capitalize on the site by fitting the interconnected street system to the land in a way that minimizes grading and maximizes interconnectivity and accessibility.

15.2 Steep Streets on Steep Slopes

Steep slopes sometimes surround pockets of developable land. Capitalize on such sites by strategically crossing some steep slopes in order to gain access to suitable development areas. Allow such streets to be steeper than the norm in order to minimize distance and the amount of disturbance to the slope (even a 12% gradient is manageable over short distances). Special accommodation for pedestrians and the physically challenged may be required, and allowances should be made for icy conditions. It is more sensible to deal with these needs on a case-by-case basis than it is to set a blanket maximum limit on street gradients. For example, restricting road gradients to a maximum of 6% on slopes greater than 10% often reduces previously attractive and ecologically significant slopes to rubble.



15.3 Narrow the Platform

Hillside streets must be cut into the slope. Minimize the effective width and impact of the street platform (often referred to as the street section) in order to reduce the amount of site disturbance. This can be done by simply narrowing driving lanes and sloping boulevards. The resulting platform will decrease the amount of cut and fill required to build the road and reduce the cost of construction. The minimum width of a platform is dependent upon the layout of buried services; consequently, cheap and practical alternative locations for some utilities may be sought. For example, lanes could be used for Hydro and telephone access. Lanes can also reduce width requirements for streets by accommodating parking in the rear. In extreme cases, providing a sidewalk on only one side of the street, or on an alternative alignment, can decrease platform impact.

16 Design streets to enhance natural features

"A new road, on stilts, swung up and out on the edge of town; from up there you could take in almost the whole city at a single view." Christine Whittimore, Parabola, Winter 1993.

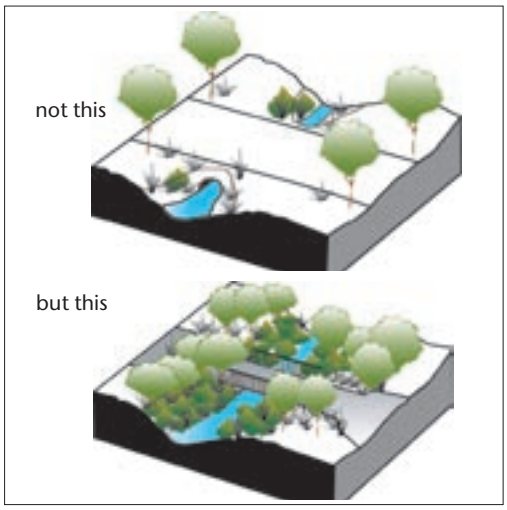
Every site has unique natural features that contribute to the overall function, experience, and identity of the community. Streets can give access to, and enhance, these features with only minor disturbances to the network and with no loss of connectivity. Narrow, inexpensive, one-lane wooden bridges can be built over streams; this will calm traffic, create a significant gateway feature, and virtually eliminate impacts on the stream below. Capitalize on the site by using streets to enhance natural features.

Related Charrette Strategies
E3; F2; F4; G2; K3; L1

Related Guidelines
3.1; 13; 17; 27, 29

16.1 Use a Bridge, Not a Culvert

Culverts have a greater impact on watercourses than do long-span narrow bridges, and they are more difficult for wildlife to traverse. For these reasons, it is wise to capitalize on the site by crossing streams and rivers with a long-span bridge. Make sure that the bridge is as narrow as possible. Until relatively recently, many bridges in British Columbia — even those located on main roads — were one-lane, "take-your-turn" bridges. Local roads and residential collector roads are candidates for the modern use of this type of bridge. Position the bridge so that it will cross the stream at the point that causes the least impact.

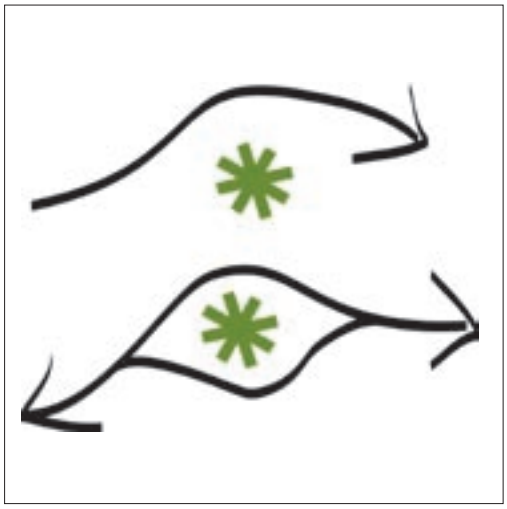


BRIDGES

Bridges are the preferred option for stream crossings as they allow the maximim amount of riparian vegetatation to be protected, maintain the natural stream bed, and maintain the natual hydological condition that existed before development. Bridge construction should always maintain the natural stream width and provide suitable footing to prevent erosion (Chilibeck et al. 1992; Lanarc, 1994).

16.2 Go around

Some natural features are so unique and/or ecologically sensitive that they must be preserved. A street network flexible enough to accommodate an occasional shift in order to move around such features may well heighten their visual impact, thus adding value to the community. Capitalize on the site by building streets around its most important natural features while maintaining overall street connectivity.



ROAD CONSTRUCTION

Road construction should be informed by the location of environmentally sensitive areas and stream courses. Where stream crossings are necessary, cross streams at a 90 degree angle to minimize disturbance.

16.3 Frame Views

Views can link residents to the larger community and contribute to a strong sense of place. Capitalize on the site by terminating streets on views and landmarks. Ensure that insensitive street siting or building massing (or orientation) does not unduly compromise views. Frame the views for heightened impact by setting buildings close to the street.

FURTHER RESEARCH

Chilibeck et. al., *Land Development Guidelines for the Protection of Aquatic Habitat.*

Lanarc Consultants, Ltd., *Stream Stewardship: A Guide for Planners and Developers.*

Arendt, *Conservation Design for Subdivisions: A Practical Guide to Creating Open Space Networks.*

17
Corridor

connect the flows

Related Charrette Strategies
A2; B2; C1; D2; F2; F4; G2; K2; N2

Related Guidelines
4; 6; 15; 19; 27; 29

WALKABLE NEIGHBOURHOODS

Residents in communities with interconnected street patterns, high employment and housing densities and pedestrian-oriented features (i.e., continuous sidewalks, street trees, etc.) tend to make three times more as many transit trips and nearly four times as many walking and bicycling trips as do residents of more non-integrated, lower density suburban areas with auto-oriented land use patterns (Parsons Brinckerhoff Quade and Douglas, Inc., 1993).

FURTHER RESEARCH

Centre for Housing Research, *Green Neighbourhoods.*

Duany Plater-Zyberk & Co., *The Lexicon of the New Urbanism.*

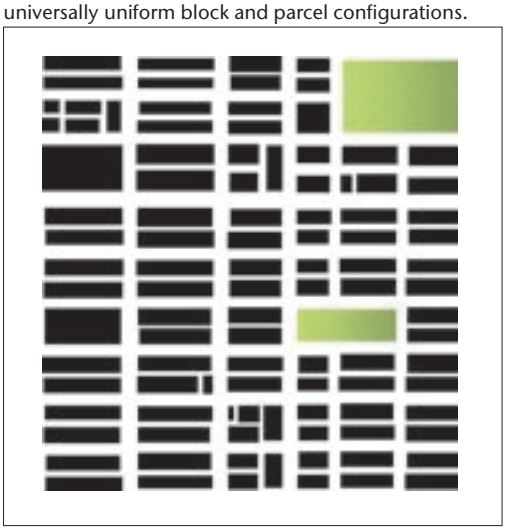
Parsons Brinckerhoff Quade and Douglas, Inc., et al., "Making the Land Use Transportation Air Quality Connection – the Pedestrian Environment."

17 Design a network of interconnecting streets

"The Emperor's Palace was in the centre of the city, where the two great streets meet." Jonathan Swift, Gulliver's Travels, 1726.

Streets are the veins of a community. They accommodate the flow of people and services. An interconnected network of streets makes common destinations accessible and the neighbourhood legible. A fine-grained street network reduces street congestion and ensures that trips are direct rather than circuitous. This means that people can walk easily to neighbourhood destinations rather than drive. For green streets, an interconnected network facilitates the capture and flow of rainwater.

17.1 The Rectilinear Grid
The rectilinear grid, common to most North American cities built between 1850 and 1940, disperses traffic efficiently throughout a legible network of streets and lanes and reduces arterial road loads. Occasional interruptions by public park space create neighbourhood centres. The grid is ideal for flat or gentle slopes (up to 8%). Break the grid at important natural systems without forfeiting connectivity. Use of this pattern results in universally uniform block and parcel configurations.



17.2 The Radial Web
In this hierarchical pattern, strong axes radiate out from a prominent centre. Intersections are often marked by important civic spaces or buildings. The radial web is a less legible pattern than the rectilinear grid but can provide more dramatic prospects. Use of this pattern results in generally uniform, but occasionally problematic, block and parcel configurations.

17.3 The Open-space Pattern
Rather than lanes or fences, this pattern puts "green fingers" behind most homes. These green fingers can include stormwater management, habitat, and recreation. The open-space pattern generally requires cul-de-sacs and may compromise interconnectivity. Foot and bike traffic can use green fingers. This highly organic network must necessarily respond to topography. Use of this pattern results in fairly uniform block and parcel configurations.

17.4 The Incremental Grid
In the incremental grid, streets occasionally depart from rectilinear orientations to accommodate terrain changes or to respond to historical accidents of community develop-ment (i.e., working around an undeveloped parcel). Major streets provide the primary ordering element. Local traffic is dispersed through a fairly chaotic, but still interconnected, internal network, while terminated vistas and varied streets provide interest. Use of this pattern results in a variety of block and lot configurations.

18 Connect transit to the community

"It is a shabby experience; nothing that would encourage people to use public transportation." Christopher Alexander, A Pattern Language, 1977.

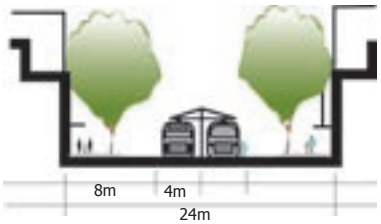
A viable transit system and a vibrant urban environment go hand in hand. Concentrated commercial and residential areas are a prerequisite for an efficient transit system. North Americans will leave the car at home if they live within a 5 minute walk of frequent transit. Research suggests that an overall density of 10 dwelling units per acre is a minimum threshold for an efficient transit system. Incorporate transit in a way that welcomes pedestrians and cyclists, brings life to streets, and offers alternatives to the car.

Related Charrette Strategies
A2; B2; E4; G3

Related Guidelines
6; 8.2; 8.3; 9; 22

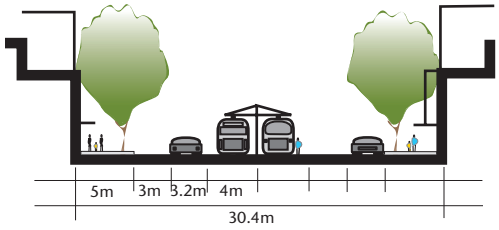
18.1 Transit "High Street"

One way to create a vibrant community heart is to create a transit "High Street," or "Main Street" — a street from which cars are either excluded or relegated to minority status. Such a street can be successful if frequent transit service is combined with high-density, mixed-use development. It allows for a narrower right-of-way, gives transit priority, and reduces the barriers to transit loading and unloading within the central median. Density is the key to success here. Successful examples of a High Street can be found at the centre of large areas of relatively high-density living (50 units per hectare and higher) and within mixed use and highly connected (and safe) street and path systems.



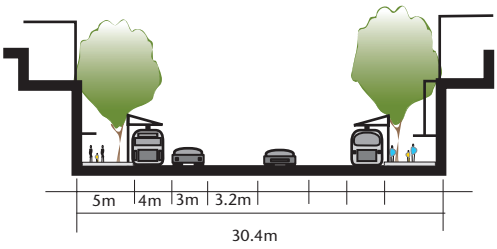
18.2 Urban Corridor

Light rail and automobile traffic can successfully share a single right-of-way. A right-of-way as narrow as 32 metres can accommodate a surface light-rail system and 4 lanes of traffic. An 8 to 10 metre central envelope serves the rail line, while two travel lanes on either side allow through-traffic. The curb lane doubles as a parking lane during non-peak times, and a minimum 4 metre wide sidewalk lined with street trees provides a safe and comfortable space for pedestrians.



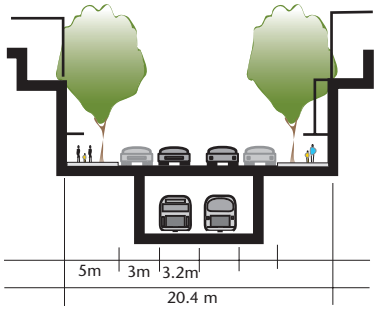
18.3 Sidewalk Off-load

When the surface light-rail line is on either side of the street, passenger movement occurs in much the same way as it does at a bus stop. This allows cars to use the central street surface. The train travels at curb's edge, becoming a pedestrian-scaled urban design feature. This eliminates parking but allows easy transition from sidewalk to trolley to sidewalk.



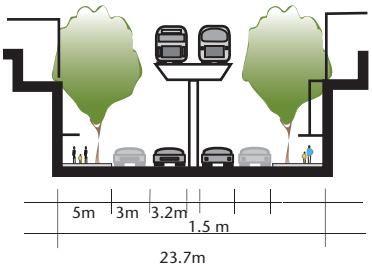
18.4 Below-grade Systems

Below-grade systems allow efficient transit movement without impeding surface traffic flow, but they do little to animate the street environment. They are more cost-effective in areas where transit infrastructure is developed in tandem with urban development. Although excavation costs can be prohibitive in existing urbanized areas, grade-separated systems generally have a quick travel speed. However, this time advantage is often offset by the increased time it takes to move between the street and the system below.



18.5 Above-grade Systems

Above-grade systems also place a premium on travel speed, but they are more difficult to integrate into the fabric of the street than other systems. For this reason, they are an effective regional system when combined with more street-friendly modes (i.e., surface rail, buses, trolleys) and used for intra-urban routes. Although grade-separated systems have a quick travel speed, this advantage may be offset by the increased time it takes to move between the street and the system above.



19
Corridor

layer the systems

19 Move stormwater along the street

"As you penetrate the flowing and no-flowing of water, the ultimate character of all things is instantly realized." Dogen Zenji, Shobogenzo, Sasuikyo.

Street corridors collect and transport stormwater. Ideally, most stormwater should be infiltrated into subsoils; however, stormwater from very large storms must be transported and stored. Layer movement on the street by using a system of corridors to capture, transport, and infiltrate stormwater. Generally, maintain street rights-of-way at no less than 40% pervious surface in order to accept runoff from paved areas and, thus, mitigate regional impacts to the urban watershed.

Related Charrette Strategies
D2; F1; F4; G4; H2; K1

Related Guidelines
4; 5; 15; 17; 20; 23.2; 23.3; 30.4

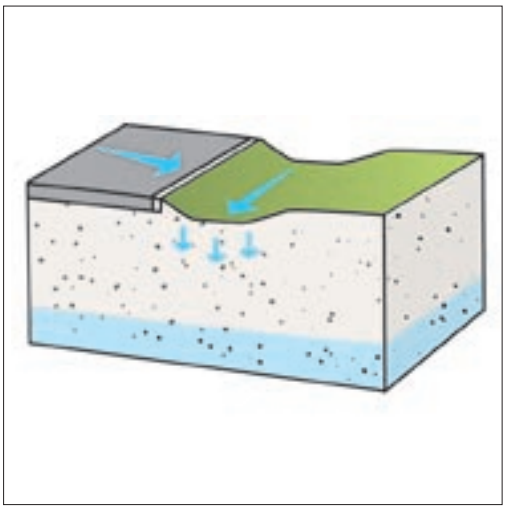
POLLUTANT REMOVAL

Roadside swales, verges and trenches are ideal for capturing and treating "first flush" runoff, which typically contains the highest concentration of pollutants.

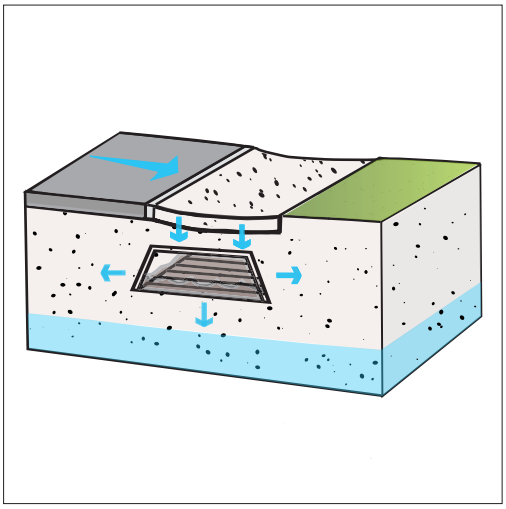
Vegetation planted within a swale increases its ability to filter and clean polluted stormwater. Slopes should be between 0.5% and 5% in order to maximize the contact of vegetation with runoff and to prevent scouring.

INFILTRATION CHAMBERS

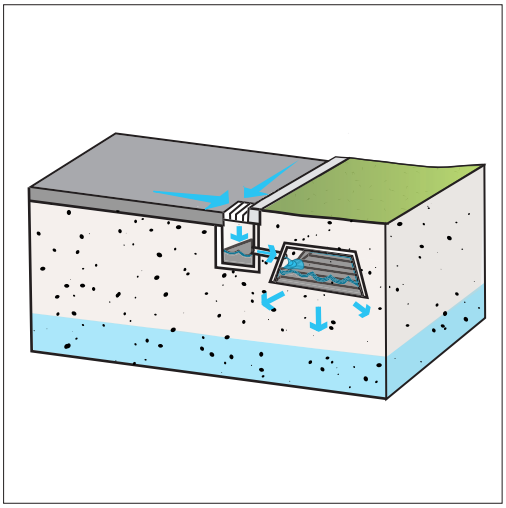
The use of subsurface infiltration chambers allows stormwater to be treated at its source before being released, at controlled rates to recharge groundwater. It also enables the reuse of treated water. Such systems are suitable for both new and retrofit sites (Condon and Gonyea, 2001).



19.1 The Roadside Swale
A variation on the rural ditch, the swale is a shallow, grassy channel that can be located in the roadside boulevard. Runoff from the street drains to both sides and is collected in the swale. Stormwater gradually infiltrates to the level of the water table after filtering through the grass and soil. Infiltration chambers just below a grassy boulevard can enhance infiltration at roadside zones. Excess water travels in the swales, or via infiltration chambers, along the network of streets to a holding pond where additional infiltration, evaporation, and transpiration occur.



19.2 The Crushed Stone Verge
Finish the shoulders of a street with crushed stone rather than with a curb and gutter. Runoff can infiltrate through the crushed stone into the soil. The crushed stone verge can be an effective stormwater management practice if it is properly maintained: used in conjunction with a subsurface infiltration chamber and filter cloth, it can dramatically increase infiltration capacity. The system can be installed with or without a flush (or rolled and slotted) curb.



19.3 The Curb and Gutter System
A standard curb and gutter system can be designed for infiltration. Runoff from the street can drain to both sides, where it is directed along the curb and into catch basins. However, unlike a standard stormwater system, the catch basins direct the stormwater to subterranean infiltration chambers located in a gravel trench under the boulevard. There it can infiltrate through the gravel into the soil. This system has the advantage of being most like conventional practice, but has the disadvantage of being the most costly of the three to install and maintain.

FURTHER RESEARCH/POLICY

Condon and Gonyea, "Case Study: Condord Roads Trial Project."

Metro Regional Services. *Green Streets: Environmental Designs for Transportation.*

Centre for Watershed Protection, *Design of Stormwater Filtering Systems.*

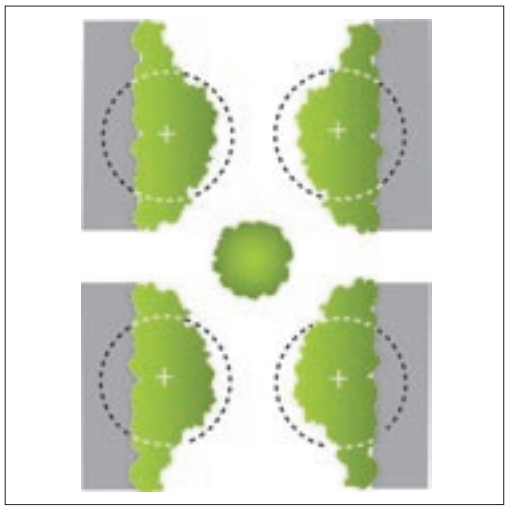
20 Create urban gardens.

"Tending a garden nourishes the human desire to give form to mystery." Anita Lange, Parabola, Spring 2001.

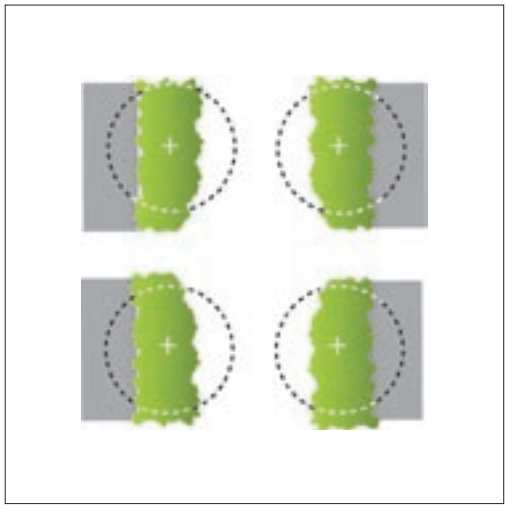
Even a high-density residential area can be filled with gardens. Parts of the street corridor that are not used for driving or walking can be used to plant linear "gardens". Individually, these gardens enhance the experience of the community and can demonstrably increase property value. they also provide an environmentally healthy alternative to conventional turf lawns. Together, small gardens throughout the city can enhance urban habitat and contribute to stormwater management. Layering the street with urban gardens that are cared for by community volunteers is both cost-effective and sustainable.

Related Charrette Strategies
E1; F4; G2; G4; H1; K1

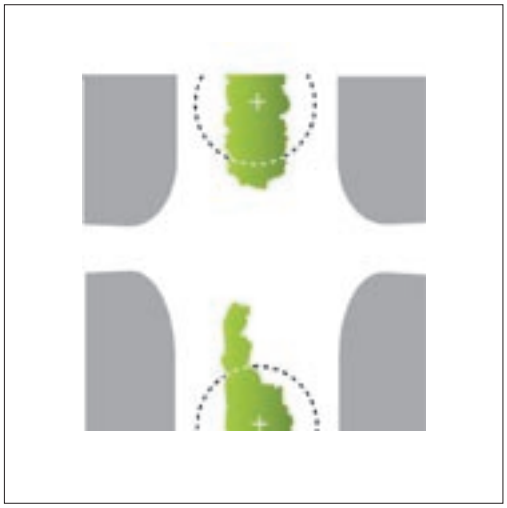
Related Guidelines
5; 20; 25; 30.4



20.1 The Traffic Circle and Bulge
Traffic-calming measures, such as traffic bulges and traffic circles, can do more than slow cars. Filled with trees and other plants rather than paved with concrete, these small areas can contribute greatly to the ecology and the appeal of the urban landscape.



20.2 The Boulevards
Trees are a crucial element of urban street boulevards. Every street should contain street trees with a mature height of over 20 metres, planted no more than 10 metres apart. A mature urban forest is a major component of an urban stormwater management and habitat enhancement strategy. In many parts of our province, residents have taken over the urban boulevards in front of their homes and planted them with gardens. Putting low-maintenance perennials under the trees lining central and side boulevards is a good idea as they can require less care than grass, are more attractive, and provide additional urban wildlife habitat.



20.3 The Island or Median
Islands and medians that direct the flow of traffic need not be paved. A simple, low-growing garden will provide a moment of relief from the stresses of driving while reducing the heat island and storm water impacts.

APPROPRIATE PLANTING

"In order to create and maintain the ideal lawn at its desired color, texture, and height we have brought the full weight of modern sicence to the task. Chemicals encourage or inhibit growth, water is redistributed and polluted, terrain is denuded, and machines mow incessantly" (Girling, Helphand, 1994, 217).

- *Low maintenance shrubs, perennial grasses and trees planted within public areas can replace conventional turfed areas. In doing so, these areas can fulfill water quality and stormwater management functions by absorbing moisture and sequestering pollutants in their rootmass.*
- *Choosing native, low maintenance vegetation also lessens the amount of pesticides and chemicals entering the soil.*
- *Deep mulch perennial plants in infiltration swales are best for infiltration and bioremediation of stormwater pollutants.*
- *To better direct the flow of water from the roadway, design plated areas to be slightly lower than the surface of the road.*

FURTHER RESEARCH

Ferguson, *Introduction to Stormwater.*

MacDonald, "Ecologically Sound Lawn Care for the Pacific Northwest."

Girling and Helphand, *Yard, Street, Park.*

21 Create an urban forest

"You should know that the foliage and trees are a manifestation of the mountain." Milarepa, The Hundred Thousand Songs.

Streets and other corridors are ideal locations for creating a lush urban forest. Street trees provide shade in hot weather and shelter from the rain; they provide bird habitat; with fall colours and spring buds, they also provide visual cues to the passing of seasons. Layer habitat and wonder onto the street by planting street trees that will grow into an urban forest covering at least 60% of the land with shady tree canopy.

Related Charrette Strategies
C3; D2; E1; F4; H1

Related Guidelines
4; 13.1; 20; 21; 23

COOLING

Extensive tree removal in urban settings results in the "urban heat island" effect, wherein trapped air and pollutants can increase tempurature by as much as 10 degrees Fahrenheit (Moll, 1989).

MITIGATING POLLUTION

Streets lined with trees can measurably reduce the level of particulates in air as well as sequester carbon and polluting chemicals.

STORMWATER MANAGEMENT

Trees facilitate absorption, evapotranspiration, and dissipation of rainfall, while roots trap and filter pollutants. Local rainfall characteristics, soil condition, and native forest species should inform tree selection (Luymes, 2000).

COST SAVINGS

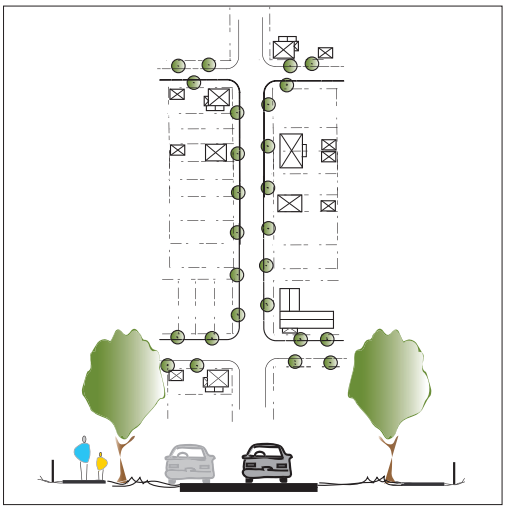
Each urban tree with a 50 year life-span provides almost $275/year (in 1985) reduction in air conditioning, erosion control, stormwater control, air pollution and wildlife shelter (Moll, 1989).

FURTHER RESEARCH

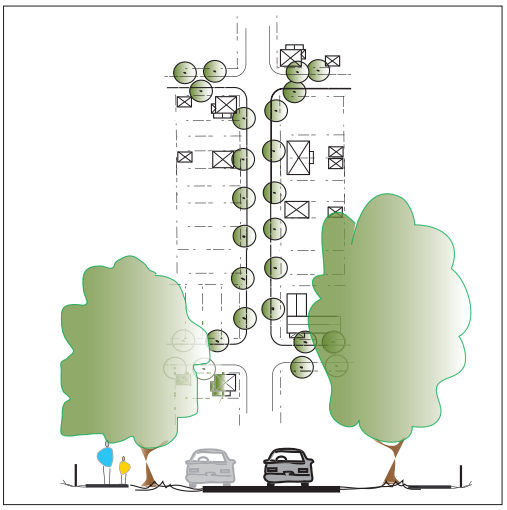
Environmental Protection Agency, *Cooling Our Communities: A Guidebook on Tree Planting and Light Colored Surfacing.*

Luymes, "The Hydrological Effects of Urban Forests with Specific Reference to the Pacific Northwest."

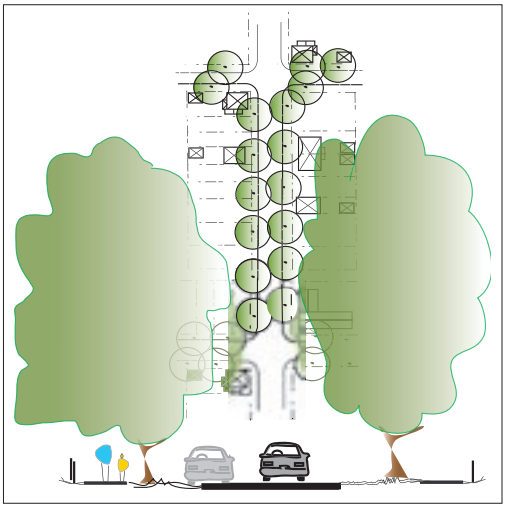
Moll and Abenrick, eds., *Shading our Cities.*



21.1 At Planting
Start by planting major street trees that will have a mature height of at least 15 metres and that are spaced no more than 10 metres apart along each street and in parking areas. For parking lots, provide 1 tree per 5 parking stalls. Set trees into permeable areas and, in parking areas, protect them with bollards or tree guards. Choose tree species that are suited to urban locations, and remember that planting different types of trees on different streets can provide individual corridors with a sense of identity and varied habitat.



21.2 At 15 Years
As the trees grow, the canopy begins to fill in and provide more shade on the street, sidewalk or parking lot.



21.3 At 30 Years
By maturity, an urban forest can provide a canopy large enough to cover 60% of the roadway and 50% of a parking area.

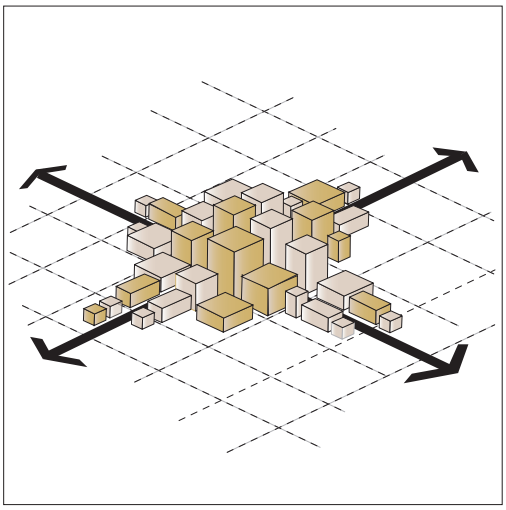
22 Centre activity on a Main Street

"The street rituals and encounters that seem so casual — the prolonged goodbyes, the 100 percent conversations — these are not at all trivial. They are manifestations of one of the most powerful impulses: the impulse to the center." William H. Whyte, City: Rediscovering the Center, 1988.

The centre of a district can develop in different forms. A public square, civic building, or community park each has the potential to foster community identity and interaction. A linear "centre" can also form when high-density development and commercial uses locate along a prominent street. The more people a Main Street attracts, the more active and lively it becomes. A Main Street will give access to, and complement, activities at the district centre.

Related Charrette Strategies
A3; B3; B4; C2; H4

Related Guidelines
8.2; 8.3; 8.4; 9; 11; 18; 24; 26

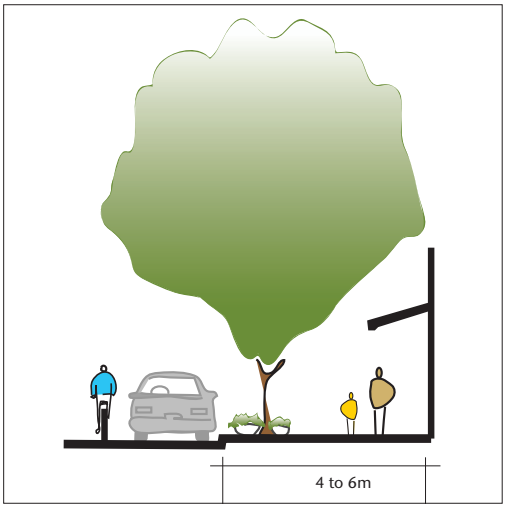


22.1 Key Location

The Main Street is located at the centre of the community, and is associated with landmarks. The primary role of the Main Street is to function as a social and service centre for the neighbourhood. It also provides an important service to those passing through. The street has no more than 2 travel lanes in each direction, and is lined on either side with parallel or angled parking. On-street parking provides direct access to shops and buffers the sidewalk from the street. Excessively high parking standards can make it nearly impossible to achieve critical mass in new centres; therefore, use minimum parking standards and provide access to frequent transit. There are many successful commercial districts where parking availabiltiy is only 25% of what is usually required in zoning bylaws.

22.2 Storefronts

Ideally, the buildings on the Main Street are mixed-use, with storefronts on the ground floor and office and/or residential units above. Depending on the urban context, buildings are no less than 2 storeys and no more than 7 storeys. Lot coverage of up to 90% and a shallow building setback ensures near continuous street frontage. Only interrupt the street frontage where there is a public square, landmark, or view. Each shop has a front door on the street. Internal shopping areas (such as malls) are discouraged. A separate entry gives people access to residential units located above shops. Wherever appropriate, cafes and restaurants spill out onto the street. Buildings on corner lots include architectural details that address both streets. When economic realities preclude multi-story development, single-story commercial development may provide a valuable "holding" function for the site until economic circumstances change.



22.3 Shopping Sidewalk

The sidewalk is no less than 3 metres wide, and up to 6 metres wide in areas of high pedestrian activity. Sidewalks are lined with lights, bicycle parking facilities, planters, and street trees (spaced as closely together as appropriate). Sidewalks serve shoppers, walkers, and watchers, and incorporate street furniture. Each shop has an awning and a sign that is designed and oriented to pedestrians. Some buildings have a well lit 1.5 metre arcade to offer additional protection.

FURTHER RESEARCH/POLICY

Swirsky et al., *Main Street...When a highway runs through it: A Handbook for Oregon Communities.*

City of Portland, *Portland Pedestrian Design Guide.*

City of Vancouver, *Transportation Plan.*

City of Vancouver, *Downtown Transportation Plan.*

23
Corridor
an economy of means

Related Charrette Strategies
F1; F2; F4; G2; G4; I2;

Related Guidelines
15; 19; 23; 25

23 Make streets cheaper

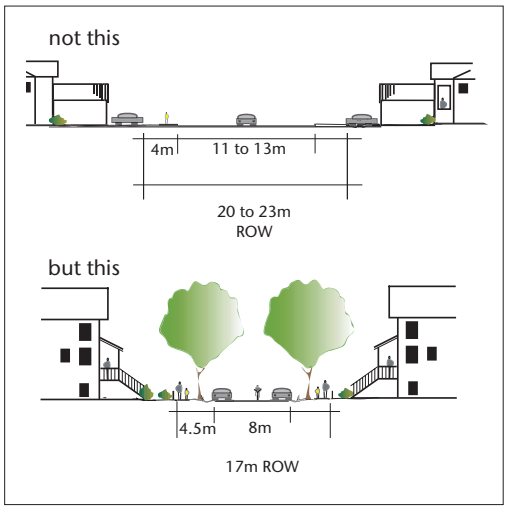
"You reach Diomira, a city with sixty silver domes, bronze statues of all the gods, streets paved with lead, a crystal theater, a golden cock that crows each morning on a tower." Italo Calvino, Invisible Cities, 1972.

Quality, connectivity, and comfort do not have to be sacrificed in order to reduce the costs of building streets. Make cheaper streets simply by narrowing street widths, eliminating costly and often environmentally damaging curb and gutters and paving only where necessary. Cheaper streets mean less cost to every resident and lower future taxes.

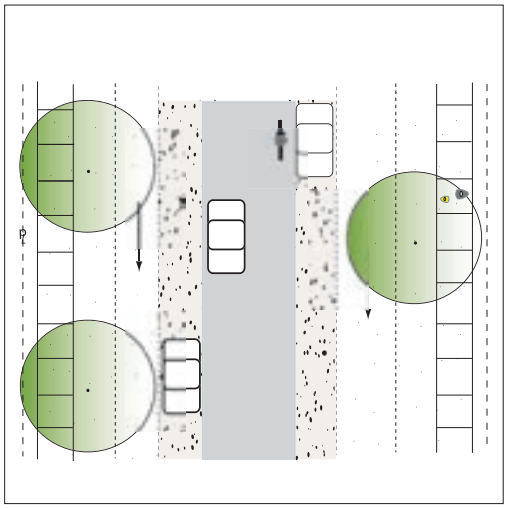
REDUCED WIDTHS

Many communities are now discovering that narrowing street widths need not affect functional performance.

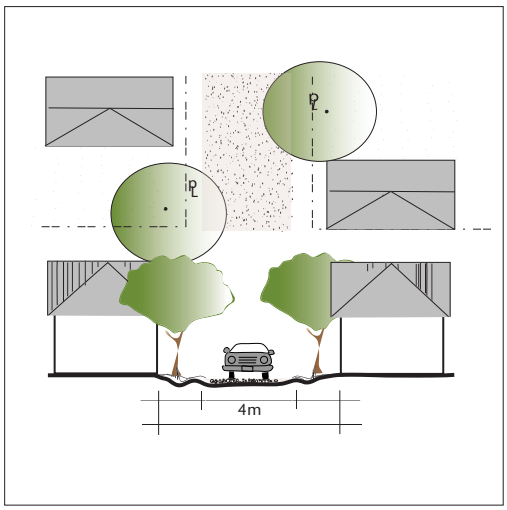
Both Eugene, and Portland, Oregon, have adopted "skinny street" ordinances in which local street standards have been narrowed to as little as 6 to 8 metres, depending upon parking requirements (Metro, 2000).



23.1 Narrow Streets
Narrow streets cost less to build and maintain than wide streets. Minimized paved surface area also results in lower material and labour costs. Reduced street widths mean less stormwater runoff and a decrease in the environmental and economic costs of stormwater management. Narrow streets also make more land available for housing, parks, and natural areas. Local streets should be queuing streets, with parking on both sides and one travel lane. Studies show that this type of street is 4 times safer for children than wide streets. Another benefit of narrow streets is that they are easier to shade with street trees.



23.2 Cheaper Material
Some materials are less expensive and more environmentally friendly than others. In order to decrease material costs, edge narrow streets with a crushed stone parking verge or grassy boulevard rather than with a curb and gutter. Grass swales and gravel verges allow rainwater infiltration and decrease the environmental and economic costs of stormwater management.



23.3 Unpaved Lanes
Lanes need not be paved with impervious material. Use 20 centimetre deep crushed stone pavement for increased stormwater infiltration. This type of construction has been used successfully for over 80 years on Vancouver lands.

FURTHER RESEARCH/POLICY

City of Surrey Department of Engineering, *Surrey Local Road Standards Review.*

Condon and Teed, *Alternative Development Standards for Sustainable Communities Workbook.*

Metro Regional Services, *Creating Livable Streets: Street Design Guidelines for 2040.*

Swift, *Residential Street Typology and Injury Accident Frequency.*

24 Provide parking wisely

"If the house is a machine for living, then the garage might reasonably be called a living room for a machine." Akiko Busch, Geography of Home, 1999.

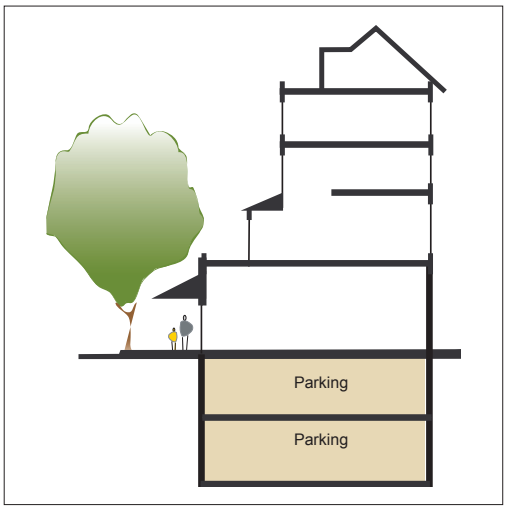
Cars make streets both accessible and active. However, few things eliminate street-life more quickly than a street-front parking lot. Every Main Street should include on-street parking. Overflow parking should be located in underground lots or on surface lots situated at the rear of buildings. Centre activity on the Main Street by locating parking wisely.

Related Charrette Strategies
B1; E2; H3; N1; P2

Related Guidelines
1; 25; 34; 36.1

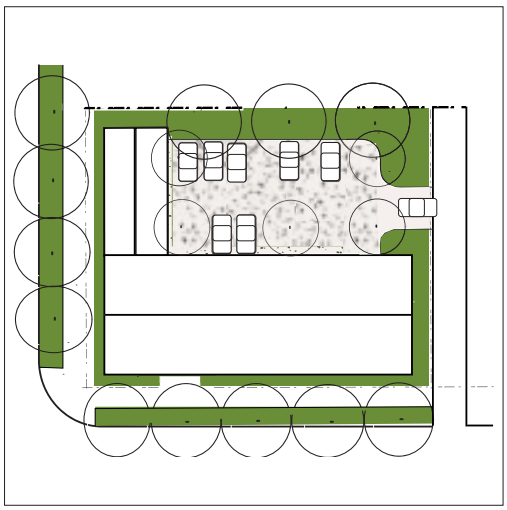
24.1 Street Parking

A good Main Street will provide plenty of parking without threatening the quality of the street experience. On-street parallel or angled parking in both directions gives direct access to storefronts and creates a buffer between pedestrians and the busy travel lanes. On-street parking also calms traffic. Recent research has verified these assertions, and recent projects utilizing these features have proven both safe and marketable.



24.2 Lot Parking

Parking lots should be located underground wherever economic circumstances and ecological constraints allow. Garage entries should be accessed by a rear lane or side street and should be structurally integrated into the building without becoming intrusive.



24.3 Parking at the Rear

When necessary, surface parking lots should be located behind buildings and accessed via a lane. Shops may have an additional rear entrance for customer or resident access. Surface parking lots should include large trees to reduce glare, absorb pollution, and help heal the spatial holes that these lots create in the urban fabric. Shade trees should be planted at a density of approximately 1 tree per 5 stalls and have a minimum mature height of at least 15 metres to ensure that, eventually, a minimum of 50% of the parking surface will be covered by tree canopy. Use permeable pavement or other strategies to reduce stormwater runoff. Where a mix of uses staggers parking needs, use shared parking areas to reduce the amount of land dedicated to surface parking.

PARKING

Parking for cars consumes a lot of land. Parking facilities require approximately 28 square metres per car, and can cost up to $21,000 per stall to construct. The money saved from reduced parking requirements can be used to improve public transit and pedestrian/bike facilities. One of the components of the Downtown Transportation Plan for Vancouver is to develop residential and commercial parking requirements in ways that are consistent with the objectives of promoting walking, cycling, transit, and ride-sharing as alternatives to the single-occupant vehicle.

FURTHER RESEARCH

Childs, *Parking Spaces: A Design, Implementation, and Use Manual for Architects, Planners, and Engineers.*

City of Vancouver, *Downtown Transportation Plan.*

Cole et al., *City of Santa Monica Green Building Design and Construction Guidelines.*

Related Charrette Strategies
E2; E3; F2; F3; H3; I1; I3; J2; L2; N2; O1

Related Guidelines
16.3; 17; 22.3; 24; 25; 26; 27; 28; 39

25 Create safe and comfortable streets

"The street was too empty; its emptiness had gotten bored and pulled my steps out from under my feet and clattered around in them, all over the street, as if they were wooden clogs." Rainer Maria Rilke, "Faces" in The Selected Poetry of Rainer Maria Rilke, 1982.

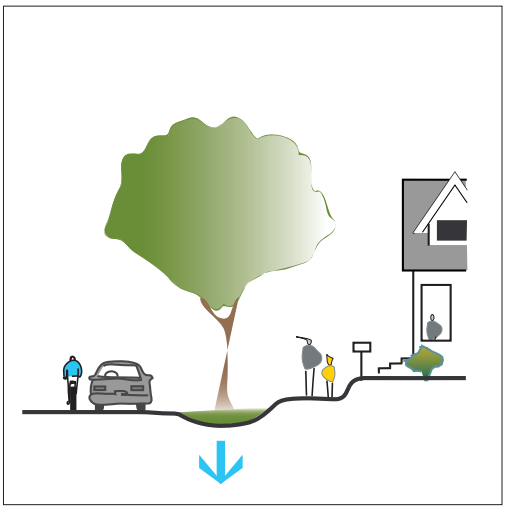
Streets are for public use and should be shared by all forms of transportation, including pedestrians, bicycles, wheelchairs, transit, and cars. On local streets, people walk and talk and sometimes play; on busier streets, people prefer to be separated from moving traffic. More people will use streets that are safe and comfortable, and more people means a more social, "neighbourghly" street life.

TRAFFIC CALMING

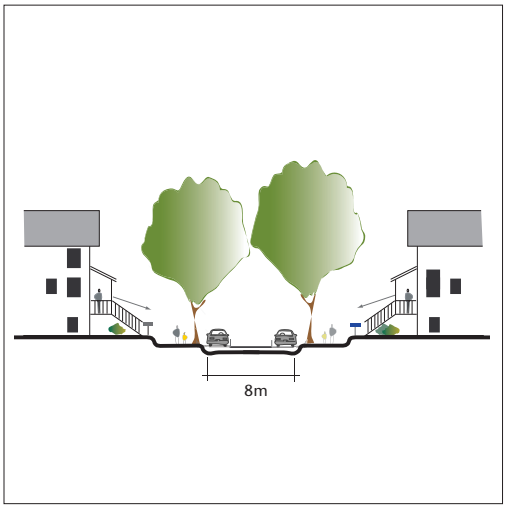
Traffic calming produces safer streets. Curb extensions, bulges and street narrowing reduced crashes in Vancouver by almost 75% (ICBC, 1996).

As streets get wider, pedestrian accidents increase. The safest residential streets are those no wider than 8 metres (ITE, 1997).

Parking on both sides of a local street provides "side friction" for passing motorists, effectively keeping travel speeds low (approximately 25 to 30 kph). Narrow streets become "queuing streets" where cars pull into spaces between parked cars to give the right-of-way to approaching vehicles (Burden, 1999).



25.1 Buffer
Busy streets are more comfortable for pedestrians if there is something to separate them from moving vehicles. Buffering can be as simple as creating wide sidewalks edged by boulevard infiltration parking strips, or as grand as building an arcade over the sidewalk. Street furniture, trees, bike racks, mailboxes, and newspaper boxes also provide a buffer between pedestrians and cars.



25.2 Narrow
A narrow street is more comfortable for walking than a wide street. Narrow the street by decreasing the width and/or number of driving lanes (as in queing "take-your-turn" streets), and by reducing the front-yard setback of buildings. Street trees easily shade narrow streets and provide a protective ceiling over people walking, playing, or talking below.

FURTHER RESEARCH

Karen Swirsky et al. 1999. *Main Street...When a Highway Runs Through it: A Handbook for Oregon Communities.*

Burden, *Streets and Sidewalks, People and Cars: The Citizens' Guide to Traffic Calming.*

Institute of Transportation Engineers, *Traditional Neighbourhood Development: Street Design Guidelines.*

Insurance Corporation of British Columbia, *Safety Benefits of Traffic Calming.*

Swift, *Residential Street Typology and Injury Accident Frequency.*

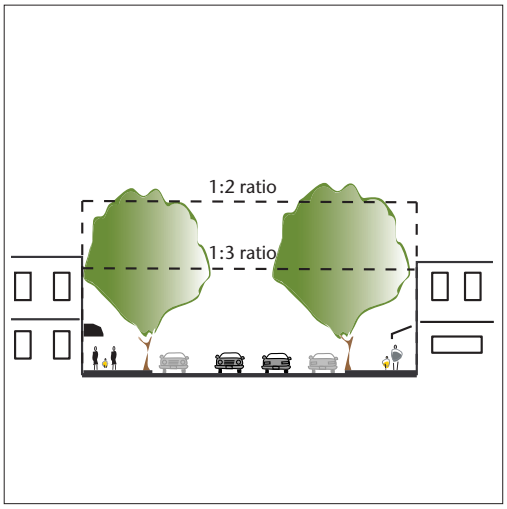
26 Create a sense of enclosure

"We raise to heaven that which is valuable to us: emblems of faith, enlightenment or government. But this vision must also be supported by small-scale buildings which reflect our intimate lives." HRH the Prince of Wales, Parabola, Winter 1993.

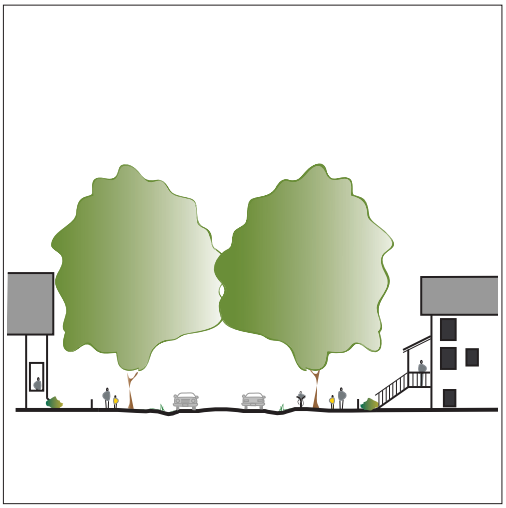
Vertical elements like trees and buildings create ceilings and walls for the space of the street. This helps to create a more pedestrian scale on the street and encourages drivers to slow down. A height-to-width-ratio of between 1: 2 and 1:3 provides an appealing sense of enclosure. Measure the width between building fronts or trees, and the height from the sidewalk to the building cornice. Trees are very effective at enclosing streets when it is not viable to construct multiple-storey mixed-use commercial buildings.

Related Charrette Strategies
E2; E3; F3; G2; H3; M2; O2

Related Guidelines
16.3; 22; 24; 25; 39



26.1 The Main Street
Ideally, a Main Street with a 25 to 35 metre wide right-of-way would have a continuous 2 to 3 storeys (around 10.5 metres) facade located at the sidewalk edge to create a "street wall." Buildings may include a range of heights within the 1:2 to 1:3 ratio spread. Street trees help enclose the space by providing a leafy "ceiling" over sidewalks and street.



26.2 The Residential Street
Street trees and houses can provide a pleasureable sense of enclosure for -residential streets. Use street trees that, at maturity, will form a canopy over at least 60% of the street. This will create a leafy ceiling that will provide partial shelter from rain as well as shade for those strolling below. Set houses close to the street, where they will provide a "friendly face on the street", making a safer street where it is possible to get to know your nieghbours.

Block 27 - 32

Capitalize on the Site

27 Allow natural features to shape the block

Connect the Flows

28 Make continuous sidewalks

29 Design blocks to encourage the flow of people

Layer the Systems

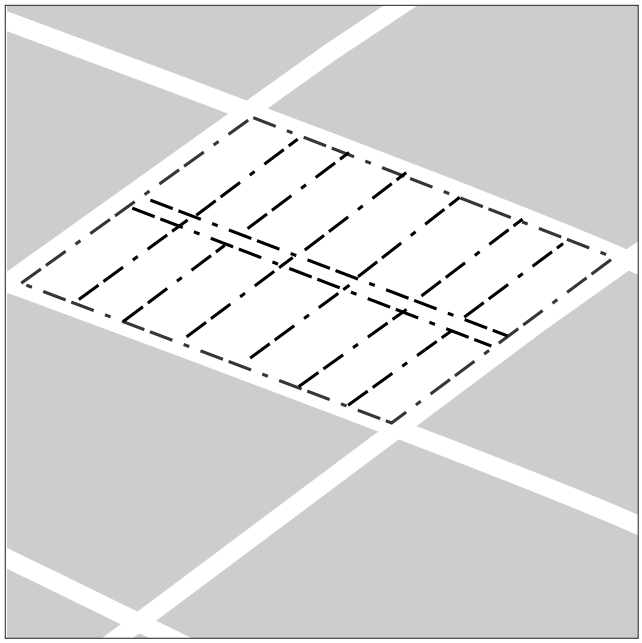
30 Manage stormwater block by block

31 Layer public space onto each block

An Economy of Means

32 Make flexible blocks

Blocks are the chunks of developable land that are available after a street pattern is imposed. Smaller blocks result from a more integrated (or net-like) street system, while large, super blocks are the result of a non-integrated, dendritic (or tree-like) street system dominated by dead-end streets. The smaller the block, the finer the grain of development and the more permeable the neighbourhood is for movement.



capitalize on the site

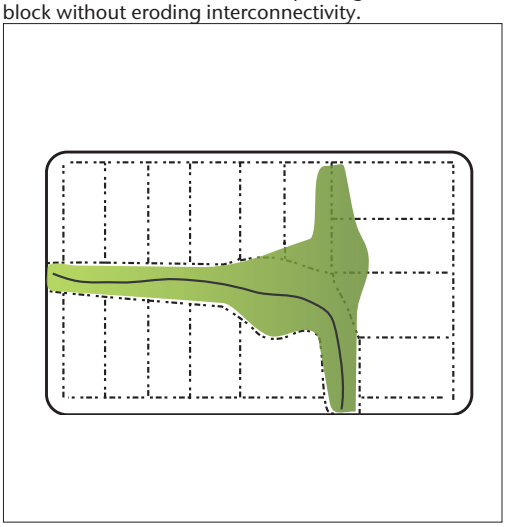
Related Charrette Strategies
B1; C1; C3; F2; I2; J1; K1; L1

Related Guidelines
1; 3; 13; 15; 29.1; 30

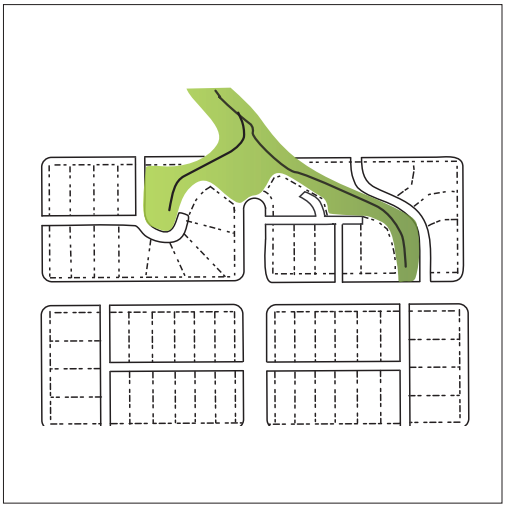
27 Allow natural features to shape the block

"Cities, like dreams, are made of desires and fears, even if the thread of their discourse is secret." Italo Calvino, Invisible Cities, 1972.

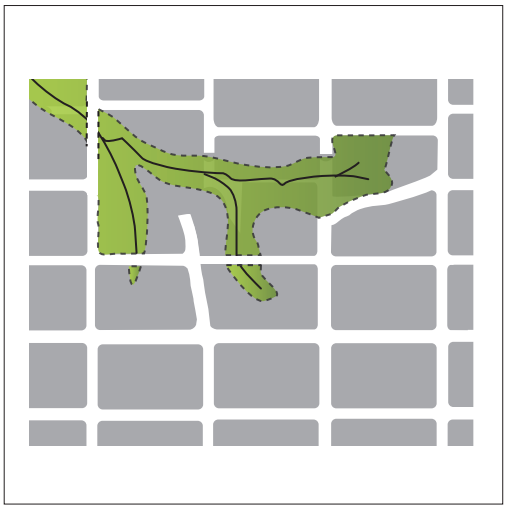
The shape of blocks is not random. In a sustainable community, the block design should satisfy two imperatives: (1) merge blocks with the landscape; and (2) maintain a high degree of interconnectivity and permeability. The recommended maximum standard block length for interconnectivity is 180 metres. Interconnected blocks are easy to understand and to get around in; they are also welcoming. Blocks modified by the landscape are distinguishable from one another and make unique neighbourhoods. Capitalize on the site by allowing natural features to shape the block without eroding interconnectivity.



27.1 Wrapped Block
An individual block may wrap itself around a natural feature. The residents whose properties contain the natural feature may hold it either in common (through a strata title for example) or individually (with restrictive covenants on use).



27.2 Pierced Block
A natural feature may pierce one side of a block. Certain streets may "dead-end" in order to maintain the ecological integrity of the natural feature and to provide easy pedestrian access to the site. Preserve the natural feature as a part of a larger public open space system. Houses wrap around the feature and residents benefit from it in many ways. Avoid having a "wall" of backyard fences around the feature. This may be done either by fronting houses onto it or by providing a public space transition between yards and natural areas, such as a lane.



27.3 Modified Block Pattern
A very extensive natural feature might influence the form of many blocks. In some cases a modified street grid favours the natural feature; in others, the structure of streets favours corridor connectivity. The resulting pattern of modified blocks is at once efficient and responsive to key natural features. The natural feature may also act as an automobile-free corridor.

ENVIRONMENTALLY SENSITIVE AREAS AND DEVELOPMENT PERMIT AREAS

Areas of high natural value can be identified as Environmentally Sensitive Areas (ESAs) within a community's Official Community Plan. A community's inventory of ESAs can then inform the placement of roads, block configuration, densities, and other elements of a development through the designation of Development Permit Areas (DPAs). Development in these areas is only allowed through Development Permits, which can contain certain restrictions on development (e.g., watercourse protection, protection and/or enhancement of environmentally sensitive or hazardous areas). See Local Government Act, s. 879 (1) for the range of possible terms allowed under Development Permits.

BLOCK SIZES

Portland Metro Green Streets standards recommends that an ideal block size for both residential and "town centre" uses be between 60 metres to 120 metres in length.

FURTHER RESEARCH/POLICY

Chilibeck, *Land Development Guidelines for the Protection of Aquatic Habitat.*

Department of Fisheries and Oceans and Ministry of Environment, Lands and Parks, *Stewardship By-Laws: A Guide for Local Government.* p. 62.

Metro Regional Services, *Green Streets: Environmnetal Designs for Transportation.* p. VII-1.

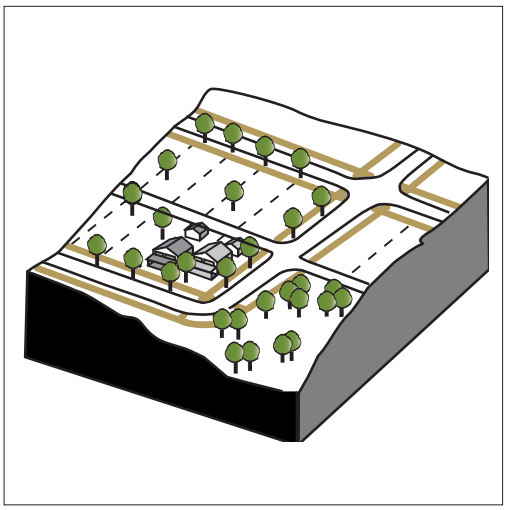
28 Make continuous sidewalks.

"Blanket Lizard didn't like the hard ground, because it hurt his feet." from Australian Aboriginal Childrens' Story.

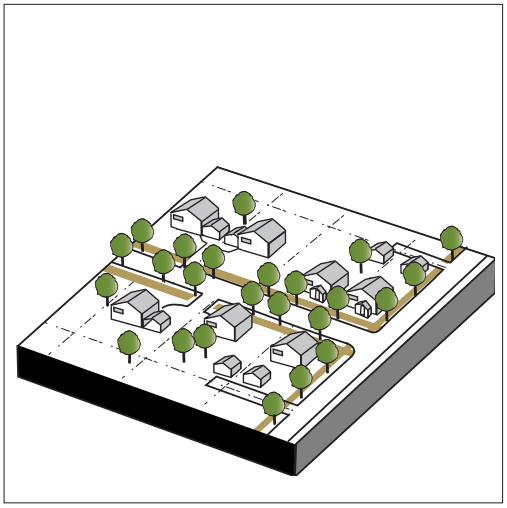
People like to feel safe and comfortable when they walk in the community. This means that streets must have sidewalks on both sides — sidewalks that connect to each other as well as to a specific destination. Minor interruptions to pedestrian flow can appreciably reduce pedestrian activity, so connect the flows by making sidewalks continuous sidewalks.

Related Charrette Strategies
E2; F2; G3; H3; I2; I3; L2

Related Guidelines
22.3; 24; 25; 29



28.1 Encourage Connection
Sidewalks must connect to each other and/or terminate at important destinations. Locate sidewalks on both sides of the street. Having just one sidewalk means small children and the elderly must cross streets unsafely just to go for a walk.



28.2 Discourage Interruption
Wherever possible, locate car storage and service at the rear of buildings and provide lane access. If this is done, then cars will cross the sidewalk at only 2 to 4 places per block rather than at scores of places (i.e., wherever there is a front driveway). For streets with fronting garages, minimize car crossings by sharing one driveway "curb cut" that is accessible to two parcels. Sidewalks frequently interrupted by driveways are unsafe for small children and the elderly.

FURTHER RESEARCH

Burden "Streets and Sidewalks, People and Cars: The Citizens' Guide to Traffic Calming."

Institute of Transportation Engineers, *Traditional Neighbourhood Development Street Design Guidelines.*

Swirsky, Karen, et al., *Main Street...When a Highway Runs Through It: A Handbook for Oregon Communities.*

29
Block
connect the flows

Related Charrette Strategies
E2; F2; F3; G2; G3; H2; I2; J2; K3; O3

Related Guidelines
5; 13; 15; 17; 23.1; 25; 26

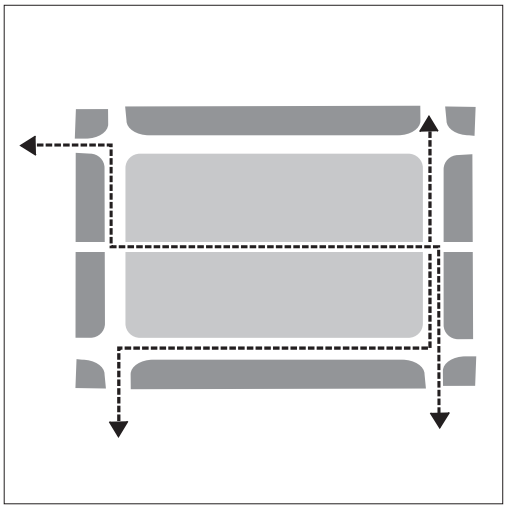
29 Design blocks to encourage the flow of people

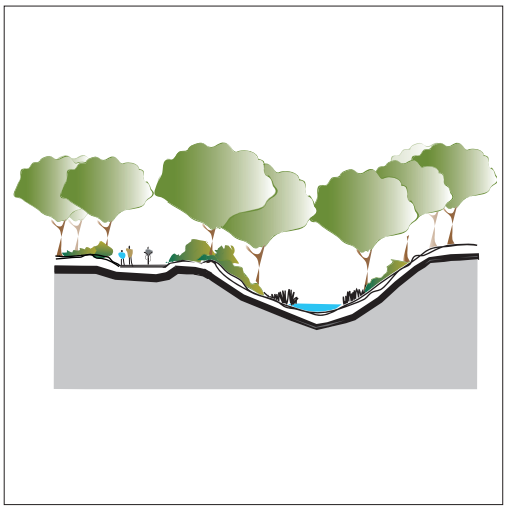
"Naturally, when he is in the horse's ear, Poucet orders it to turn right or left." Gaston Bachelard, The Poetics of Space, 1964.

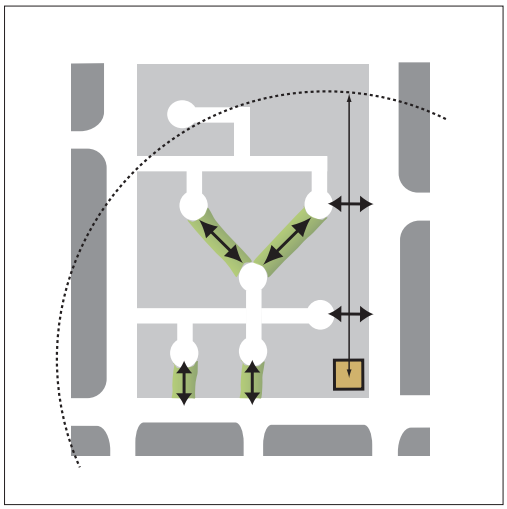
Conventional suburban blocks are often "superblocks" and have circuitous, confusing, and impermeable road systems. This discourages walking, as virtually all trips take longer than they should. The length of blocks should respond to a pedestrian time-measure, which means that streets should interconnect. Within highly pervious fine-grained street networks, common destinations are accessible by direct routes. Compact walkable neighbourhoods also conserve land and energy. Connect the flows of people. Allow people to move freely between blocks.

29.1 Short Blocks
Walking distances should provide the yardstick for determining block dimension. A length of 180 metres is an appropriate maximum block length (virtually all blocks in Vancouver are this length or shorter). Shorter blocks mean more intersections, and more intersections mean reduced car speeds, and fewer pedestrian fatalities on local roads.

29.2 Mid-block Connections
Where it is impossible to avoid large blocks, provide mid-block pathways between parcels or through buildings in order to increase access to the neighbourhood and to provide an alternative to walking on the street. Lighting and visibility should maximize pedestrian safety and comfort. In order to ensure safety, crosswalks and/or signage should indicate crossings at mid-block. Any public path of the mid-block type must be a minimum width of 6 metres.







29.3 Greenways and Trails
Blocks divided by natural features can maintain connectivity and ecological value. Locate greenways near riparian and other sensitive areas at a minimum of 15 metres from the top of the bank. This allows enough width to maintain continuous tree cover, which will preserve habitat connectivity and prevent sunshine from overheating stream water, which is lethal to fish. Permit cyclists to use the edge of riparian buffers.

29.4 Retrofit Large Blocks
Retrofitting existing suburban road systems for increased connectivity is extremely challenging. Wherever opportunities present themselves, make every effort to improve pedestrian and bicycle connectivity to surrounding circulation systems. Increase connectivity for pedestrians and bikes by opening culs-de-sac to foot and bicycle traffic.

FURTHER RESEARCH

Swift and Painter. "Residential Street Typology and Injury Accident Frequency".

30 Manage stormwater block by block.

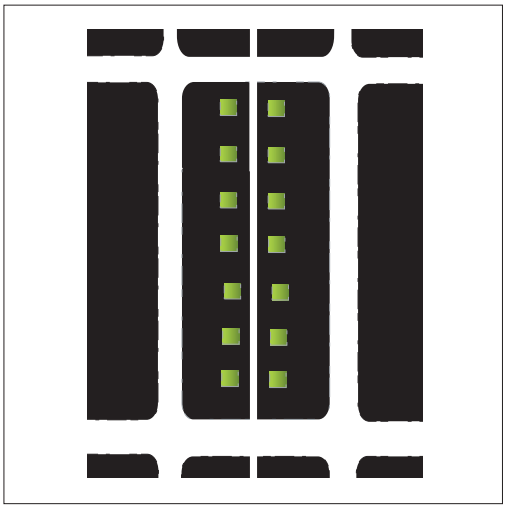
"My nostalgia is for what I feel disappearing all around me." Janet Heyneman, Parabola, Summer 1993.

Blocks function as living space and define transportation corridors, and they can also play an important role in the ecological function of the neighbourhood. Large community detention ponds are expensive to build and maintain and while they can be very effective at handling peak flow reduction, they have been shown to be of little benefit in reducing the additional volumes generated by development. The best place to mitigate the bulk of stormwater consequences of urbanization is at the source — in the yards and on the streets of our new communities. Collect, store, and infiltrate as much stormwater as possible on each block, and ensure that all streets, yards, and park spaces play a role in this.

Related Charrette Strategies
A1; D2; D4; E1; F1; I1; J1; K2; N3

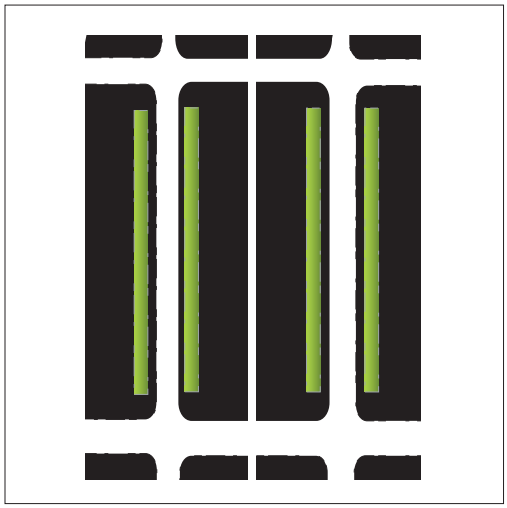
Related Guidelines
4; 5; 7.3; 19; 20; 27; 31

30.1 The Parcel
Infiltrate roof drainage within every parcel on a block to cut the need for stormwater systems in half. Rock pits, retention grading, water retaining planting areas (rain gardens), and rain barrels are viable and practical options.



30.2 The Middle
The middle of a block can serve as a semi-private open space "lane" or "greenway" for a group of single-family residents, a multiple family dwelling, or an apartment. This area can also act as a swale to collect, store, and infiltrate stormwater. Planting the area with shade trees provides bird habitat, and increases soil porosity for increased infiltration.

30.3 The End
Another option is to set aside a portion of a block for the collection, storage, and infiltration of stormwater. This "rain garden" area would also provide a pocket of open space for residents.



30.4 The Street
Street corridors are ideal places for the collection and transportation of stormwater. An interconnected street network can function as an interconnected stormwater network if it is used to capture, transport, and infiltrate stormwater. A boulevard that includes a roadside infiltration swale and street trees provides all this as well as shade and habitat.

INFILTRATION

The most frequent rainfall events in the lower mainland are those that generate between 4 and 24 mm per day. These small events are also those that carry the greatest amount of pollutants. Whether on individual lots, or within public rights-of-way, infiltration strategies should be chosen with the following factors in mind:

- *depth to bedrock*
- *depth to groundwater*
- *proximity to stream corridor*
- *soil percolation rate*
- *density of tree canopy*
- *composition of exisiting forest*
- *steepness of topography*
- *level of maintenance*

(adapted from Metro Regional Services, 2001).

FURTHER RESEARCH

Centre for Housing Innovation, *Green Neighbourhoods: Planning and Design Guidelines for Air, Water and Urban Forest Quality.*

Furguson, *Introduction to Stormwater Management.*

Metro Regional Services, *Green Streets: Environmental Designs for Transportation.* p.V-1b.

31
Block
layer the systems

Related Charrette Strategies
B3; C3; D3; H3; J3; K1; L3; N3

Related Guidelines
2.3; 10; 13; 17; 29; 30; 42.4

31 Layer public space onto each block.

"Doors that open on the countryside seem to confer freedom behind the world's back." Ramon Gomez de la Serna, Echantillons.

Locate parks or public open spaces within a 3 minute walk of each home. This is especially practical when neighbourhoods contain numerous small parks rather than a single large park. Spread more and smaller areas of recreation space evenly throughout the community so there is park space within a short walk of all residents. Layer public spaces into the fabric of blocks so as to complement the larger open spaces that serve the entire district. Organize each space and allocate use according to local needs. Include gardening or small-scale agriculture as a popular and rewarding element of sustainable community design.

31.1 The Piece
A single lot or block end can provide a crucial community recreation area within easy resident access. A corner lot is a good choice because it will have two sides open to the street; a block end is even better because it has three sides exposed to surrounding streets.

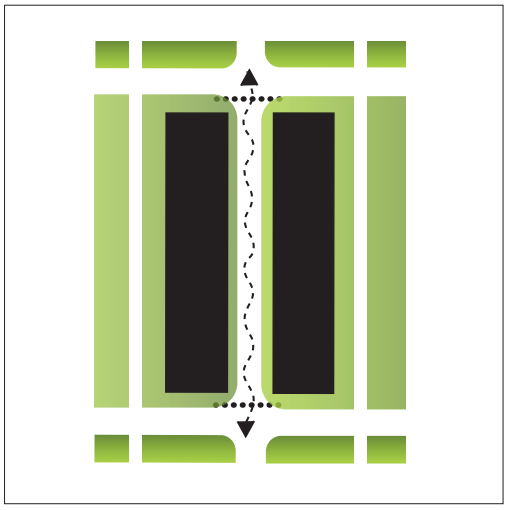
31.2 The Middle
While ordinarily used as an effective service and car storage zone, the middle of a block can sometimes serve as shared communal activity space. In the detail of the Village Homes (Davis, California) plan at left, the small private backyards of the residential lots open out onto a central pedestrian spine that provide connectivity throughout the block.

FURTHER RESEARCH

Corbett and Corbett, *Designing Sustainable Communities: Learning from Village Homes.*

Girling and Helphand, *Yard, Street, Park.*

31.3 The Whole
Perhaps the most attractive and useful public space is the whole block park. Houses can then front onto the park, allowing residents to survey park activities easily and informally. Parks of this kind should provide a "green heart," – a community centre for all residents. (Discourage situations in which houses back onto a park, as this generally results in a "wall" of private fences surrounding the space.)



31.4 The Pedestrian Street
Pedestrian streets function like a public square where people can interact and move around freely. Pedestrian streets can be successful as commercial streets because they attract people who are shopping and strolling. Short segments of pedestrian-only streets, attached to standard streets on either end, are usually the most active as they have the added benefit of being close to other transportation modes and parking. The "Third Street Promenade" in Santa Monica is a highly successful example of this. Consider closing down some streets to car traffic during special occasions, but be careful when considering closing main shopping streets to cars as the success rate for this strategy is sharply divided.

an economy of means

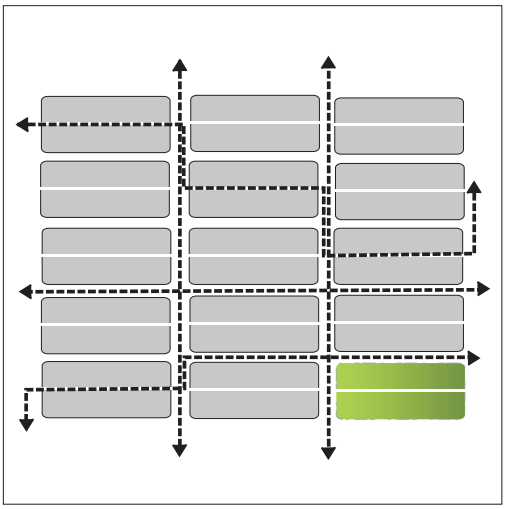
32 Make flexible blocks

"Contemplating these essential landscapes, Kublai reflected on the invisible order that sustains cities." Italo Calvino, Invisible Cities, 1972.

Related Charrette Strategies
A3; C2; I4; J4; M4

Related Guidelines
1.2; 11; 41; 37; 38

The people who live in a block pay the cost of building and maintaining it. Adding even one more house to a street significantly decreases the cost to each individual household. A mix of lot sizes and housing types increases block density without creating a monotonous streetscape.



32.1 Flexible Use
Blocks of no more than 90-by-180 metres are highly efficient and cost-effective because they may be adapted to a variety of residential, commercial, and institutional use. Smaller blocks also create a pedestrian-friendly neighbourhood, which encourages cycling and walking and decreases auto dependence.

32.2 One Block, Many Parcel Types
Each block can accommodate a variety of parcel sizes to suit various living options. The resulting block would include a variety of tenure types (renters and owners), a variety of ages and incomes, and increased architectural variation on the street while still preserving the "single-family feel" of the district.

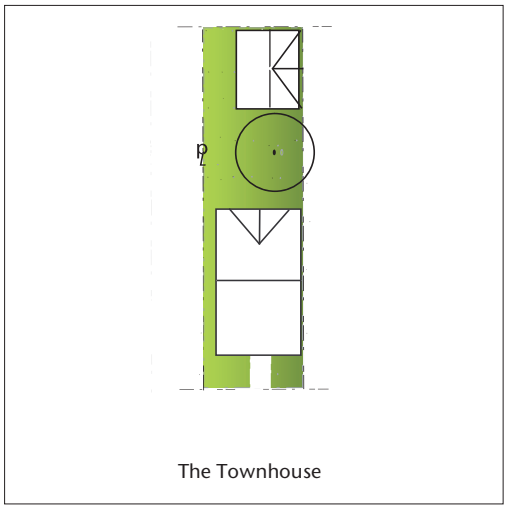
FURTHER RESEARCH

Metro Regional Services, *Green Streets: Environmental Designs for Transportation.* pg. VII-1.

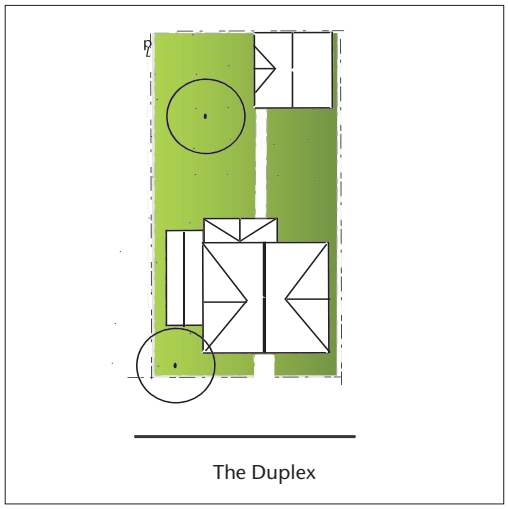
an economy of means

Related Charrette Strategies
A3; C2; I4; J4; M4

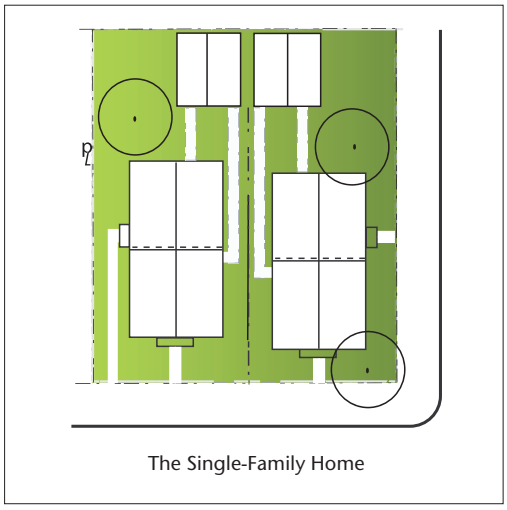
Related Guidelines
1.2; 11; 37; 38; 41



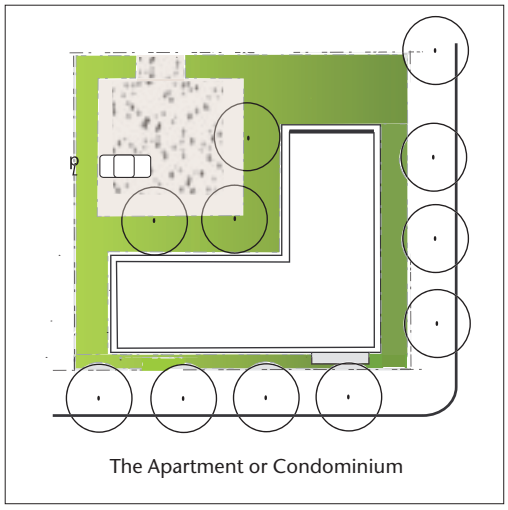
The Townhouse



The Duplex



The Single-Family Home



The Apartment or Condominium

FLEXIBLE LOTS

A "flexible lot" can accommodate a variety of house types and still fit into a standard block. As shown, townhouse lots would be 50% to 66% the width of the single family home lot, front-back duplexes would fit on the same size lot as the single-family home, while the apartment block could be built on 3 to 5 single-family home lots combined. The flexible lot accommodates a variety of housing types, engenders social mixing, accommodates ageing in place, and provides land use flexibility over time.

Parcel 33 - 43

Capitalize on the Site

33 Shape buildings in response to natural features and phenomena.

Connect the Flows

34 Maintain flow through large parcels.

35 Use lanes to increase access.

Layer the Systems

36 Minimize hard surfaces.

37 Layer living space within each parcel.

38 Layer living and working.

Create a Centre

39 Provide a front door on the street.

An Economy of Means

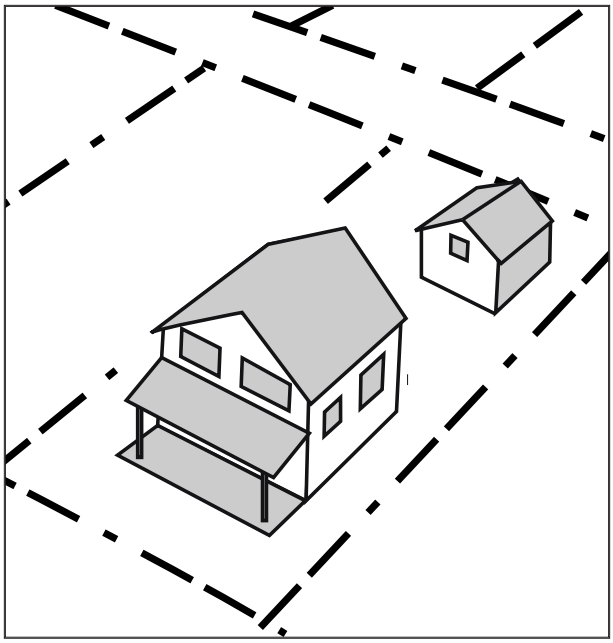
40 Design smart parcels.

41 Provide a variety of housing types.

42 Provide semi-private open space for each home.

43 Create organic unity.

The parcel is the smallest increment of development. However, what happens at the scale of the individual house and yard has important social, economic and environmental implications for the rest of the district. The recent (post-1950s) emphasis on the automobile has resulted in a whole new set of dimensions that demand ever-wider parcels to accommodate driveways and garages. Wider individual parcels mean less density in the aggregate, meaning more expensive infrastructure per individual parcel serviced. It also translates into a context that becomes, over time, so car dependent that even the simplest of everyday needs cannot be satisfied without a car.



capitalize on the site

Related Charrette Strategies
C1; K2; M1; N1; N4; O1; P3

Related Guidelines
3; 27; 36; 40; 43.1

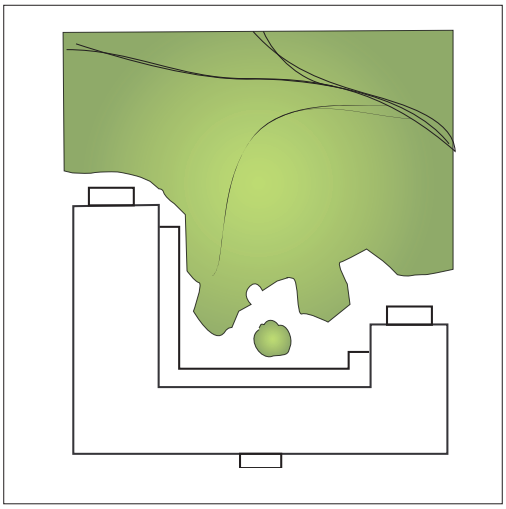
33 Shape and place buildings in response to natural features and phenomena.

"The image of these houses that integrate the wind, aspire to the lightness of air, and bear on the tree of their impossible growth a nest all ready to fly away." Gaston Bachelard, The Poetics of Space, 1964.

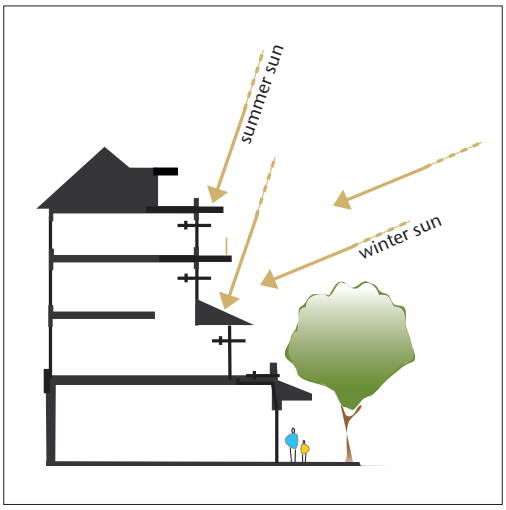
Increased density need not sacrifice natural features. Carefully articulated and placed, buildings can add to the appeal of a place while they heighten the impact of natural features. Carefully placed buildings can also utilize topography and solar orientation to aid in heating and cooling. Capitalize on the site by considerately situating higher-density buildings where residents may take advantage of the benefits provided by natural features. Ensure that siting, massing, or orientation does not unduly compromise views and landmarks.

PASSIVE SOLAR GAIN

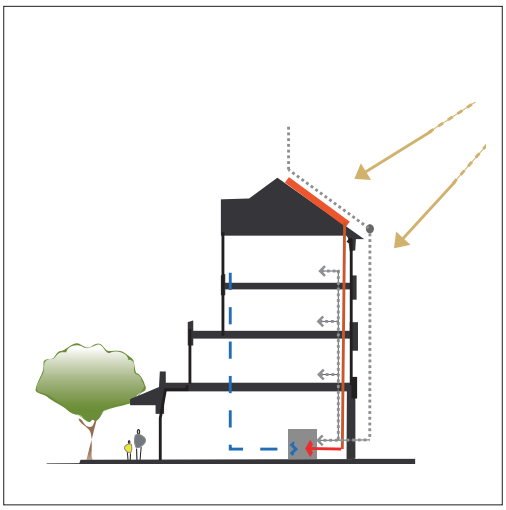
Buildings incorporating windows that are high in heat transmissivity can significantly reduce annual operating energy costs. Combined with daylight controls (e.g., light shelves, awnings, etc.), total annual energy savings can be further increased (by up to 40% over buildings without these features) (Cole et al., SF - pp. 6-14).



33.1 Articulate the Plan
Articulate large buildings in response to a natural edge (such as that of a forest or riparian buffer zone). The articulated plan allows the natural edge to penetrate into the parcel, and it also provides multiple opportunities for viewing the landscape.



33.2 Step the Envelope
Stepping the envelope and/or dramatically articulating the façade of a building provides more opportunities for light to penetrate to the deeper recesses of residential units. Window area should maximize the availability of natural light into units. Overhangs, light shelves and awnings should be provided to allow the low winter sun, but not the high summer sun, to penetrate interior spaces. A balcony for each unit lets residents nurture plants and to stay in contact with both nature and their community below. Use façades that help to frame a view and that are part of a street wall.



3.33 Use Energy Wisely
Consider the use of solar water pre-heating, photovoltaic panels, wind power, geothermal heat exchange, fuel cells, or other alternative energy sources when siting buildings and infrastrcture in order to reduce energy demand and save life-cycle costs.

FURTHER RESEARCH/POLICY

BC Ministries Responsible: Employment and Investment and Finance and Corporate Relations, *Performance Targets for Pilot Projects – Green Buildings Program.*

Cole et al., *City of Santa Monica Green Building Design and Construction Guidelines.*

City of New York Department of Design and Construction, *High Performance Building Guidelines* http://www.nyc.gov/html/ddc/html/highperf.html

34 Maintain flow through large parcels.

"An invisible landscape conditions the visible one; everything that moves in the sunlight is driven by the lapping wave enclosed beneath the rock's calcareous sky." Italo Calvino, Invisible Cities, 1972.

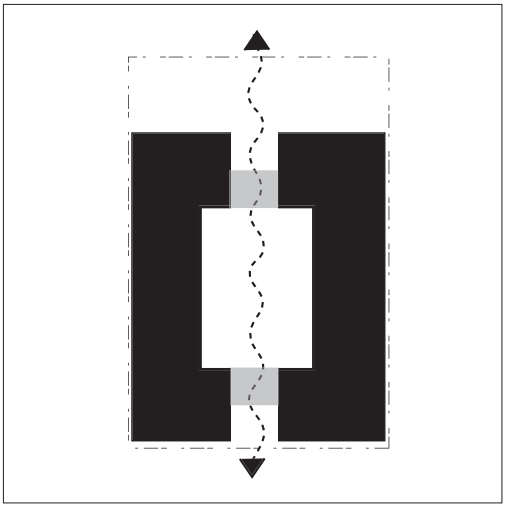
Texture, complexity, and intricacy in urban development enhances the flow of air, light, water, people, and other creatures. The parcel should be designed with this in mind.

Related Charrette Strategies
J2; K3; N1; P1; P2

Related Guidelines
29; 36; 40

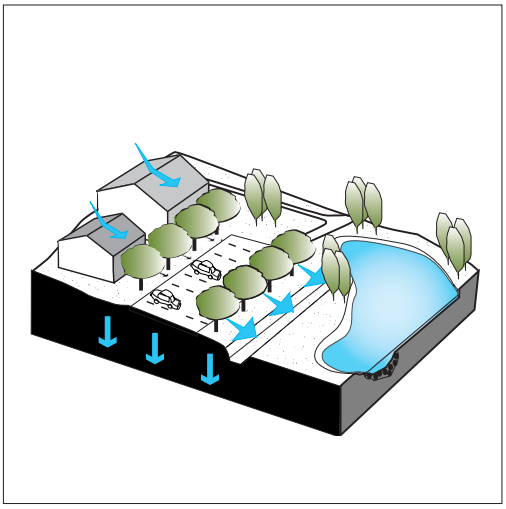
34.1 Penetrable Buildings

Large building footprints can feel imposing and may reduce the quality of interior spaces. Where possible, reduce large building footprints and provide pedestrian access through buildings in order to allow the free movement of people, light, and air. Entrances, foyers, and lobbies that contain many large windows make buildings seem welcoming as they allow light to penetrate interior spaces. Open courtyards and airy entries provide light and natural ventilation for large buildings.



34.2 Water Flow

Manage water flow on larger parcels. Large building footprints and vast parking lots lead to higher percentages of impervious surfaces on the parcel. Use porous paving and/or infiltration devices for parking areas and paths, and use landscaped areas as "rain gardens" for stormwater management. Where possible, create some smaller parking stalls and use one-way aisles in conjunction with angled parking to reduce impervious surface cover. Plant shade trees so they will cover 50% of the parking surface at maturity. This will reduce heat and improve stormwater management. Create an on-site retention pond for peak flow reductions and to slow infiltration into the soil.



GREEN PARKING

Incorporating stormwater best management practices (BMPs) into the design of parking lots can reduce total nutrient export by up to half of that exported from a conventionally designed parking lot (Zielinski, 28). Bio-swales, stormwater planters, trees, and rooftops of adjacent buildings can become links in a "chain" of BMPs that slow the rate of flow and assist in breaking down pollutants in runoff from large parking surfaces.

Specific BMPs should be chosen for the type of remediation needed and according to site characteristics. For example, sedimentation devices work best at breaking down coarse particulate, while marshes and wetlands are better at treating fine particulate. Choosing a combination of measures will ensure a complete and comprehensive system. Remember that in general, infiltration is many times more effective than conveyance and treatment based strategies.

FURTHER RESEARCH

Center for Watershed Protection. *The Importance of Imperviousness.*

Richman and Associates et al., *Start at the Source: Residential Site Planning & Design Guidance Manual for Stormwater Quality Protection.*

Zielinski, J. "The Benefits of Better Site Design in Commercial Developments."

35
Parcel
connect the flows

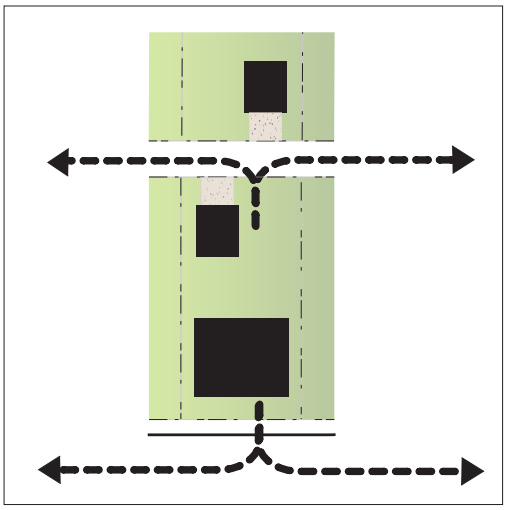
35 Use lanes to increase access.

"Those who get too used to using maps can't see the real roads under their feet." Joseph Bruchac, "First Day after the Sun Dance," Parabola, Summer, 1982.

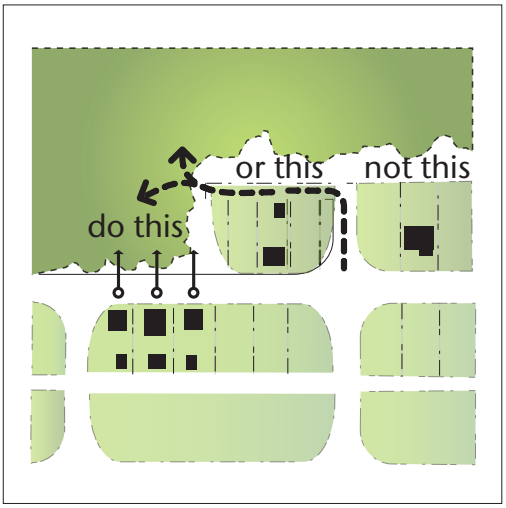
Lanes increase both accessibility to each parcel and connectivity throughout the community. A lane bisecting a block creates opportunities for increased flow: for people, for bikes, and for stormwater. Where a lane ends on public open space, it gives residents access to common open space. Connect the flow of people and stormwater by providing lanes as well as streets.

Related Charrette Strategies
A1; H2; K3; M2; N2: O2; O3

Related Guidelines
5; 17; 29.1; 39



35.1 Lanes for All
It is very difficult to provide attractive and social small-lot housing served by front drives. Rear lanes give one access to a parcel from either end of it. Primary units have their front door on the street, while the lane provides access to car storage, deliveries, and secondary units or coach houses. Building setbacks and entries should allow sufficient privacy while also providing surveillance of the street or lane. In residential areas, front setbacks should be minimal to preserve land and protect the street (between 3 and 5 metres).



35.2 Open Space Access
Parcels should front onto open space, not back on to them. Where backing parcels onto natural areas cannot be avoided, lanes will provide a more public edge than would a row of backyard fences. Lanes also provide a venue for social interaction among neighbours and a safer, potentially more visible place for children to play.

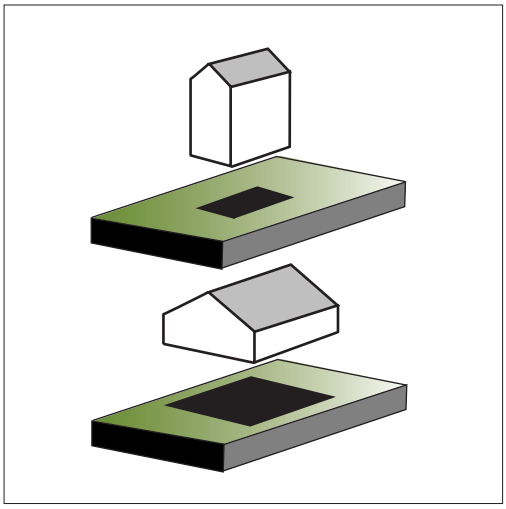
36 Minimize hard surfaces.

"The chateau planted on the hilltop had a cluster of cellars for roots." Gaston Bachelard, The Poetics of Space, 1964.

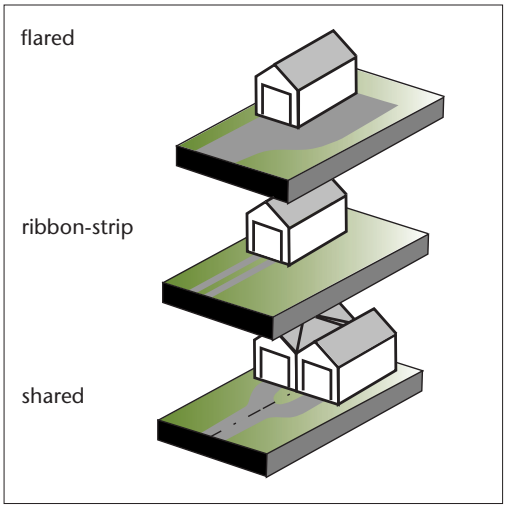
What goes on under the surface is important. Allowing rain water to infiltrate onto front and back yards supports streams and groundwater aquifers by replenishing them during dry months. Allow rainwater to infiltrate the soil all year around. Every yard can play a part in infiltration. Layer living and ecological systems onto each parcel by minimizing hard surfaces, providing space and soil for a lush garden, and maximizing rainwater infiltration.

Related Charrette Strategies
B1; H3; N1; O1; P1; P2

Related Guidelines
1; 24; 33; 34; 40



36.1 Build up Not Out
Building up, rather than out, creates a smaller footprint for the same square footage. This ensures that more of the lot is available for rainwater infiltration and that higher overall densities can be achieved without eliminating yards and gardens. For the elderly, inexpensive lifts can be incorporated into a tall, narrow 3 storey house for less than the cost of an equal sized 1 storey home.



36.2 Decrease Driveways
As people have come to own more cars, driveways have come to cover a larger percentage of each parcel. Concrete driveways are impervious to rainwater. Minimize concrete surfaces by constructing a narrow driveway, and include a flare to provide a parking court next to the garage. Alternatively, use a "ribbon-strip" driveway rather than a full paved slab. Sharing a side-yard driveway between parcels also reduces pavement. Use paving stones, permeable asphalt, or crushed stone or gravel to make "hard" surfaces more pervious.

SITE PERMEABILITY

Different land uses have different perviousness levels with commercial/ industrial uses often covering up to 90% of a site. Reducing the amount of effective impervious area (impervious areas directly connected to the drainage system) of a development can measurably increase watershed health.

BUILDING COVERAGE

The following provides suggested ranges for lot coverage in order to maximize stormwater infiltration on a site (City of Surrey, 2000).

Residential	
single-family	*45%*
duplex and townhouse	*55% - 65%*
high density/mixed-use	*55% - 80%*
Commercial	
mixed-use	*80%*
neighbourhood	*50%*
Industrial	*50 - 70%*

PERMEABLE MATERIALS

Permeable surface materials (such as porous asphalt, individual pavers, crushed gravel, or another equally effective material) should be used as appropriate for car storage, walkways, and other surfaces around buildings. All other non-pervious areas should drain into a pervious surface area.

FURTHER RESEARCH/POLICY

City of Surrey Department of Planning and Development, "Land-use and Development Performance Standards and Design Guidelines." In *East Clayton Neighbourhood Concept Plan.*

Metro Regional Services, *Green Streets: Environmental Designs for Transportation 2040.* p. VI - 21.

BC Ministry of Water, Land and Air Protection, Envrionment Canada., *Stormwater Planning: A Guidebook for British Columbia (Draft).*

37
Parcel
layer the systems

37 Layer living space within each parcel.

"He was a man with only one story: he had his cellar in his attic." Joe Bousquet, La neige d'un autre age.

Houses with a single level of living space cannot answer all of the needs of a family unless spread out over a large area. Layer living space within each lot to decrease the area of each lot, reduce housing costs, provide private family space, and foster community cohesion. It is often financially difficult for young families to own their own homes. Secondary suites provide "mortgage helpers" increasing the range of people that can afford a home while providing low cost rental housing for those who need it. These strategies also allow residents to age in place and/or provide a private place for teenagers. Domestic-scale elevators can provide full accessibility in tall houses and are often more cost-effective than building the same living area in a single-floor house.

Related Charrette Strategies
A3; I4; J4; L4; M4

Related Guidelines
11; 32; 41

AFFORDABLE LIVING

In the GVRD, there are approximately 60-70,000 secondary suites, accounting for approximately 20% of the rental housing supply. However, many of these are "illegal" due to restrictive zoning and inflated impact fees imposed by many municipalities. A recent study found that secondary suites in urban areas consume less than 40% of the water, produce less than 40% of the garbage, and add only 36% as much volume to roads than do primary dwelling unit occupants. Yet, in many municipalities, impact fees are upwards of 80 to 100% of that paid by the regular suite (Eberle and Kraus, 1999).

ENERGY EFFICIENT LIVING

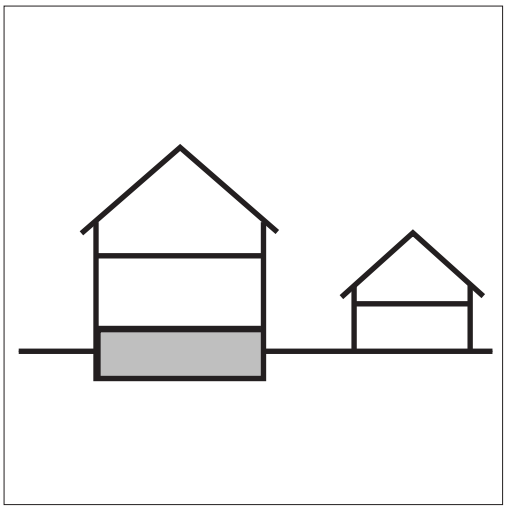
Secondary suites provide the following energy-saving benefits:
• Increased viability of public transit;
• Reduced costs of recycling and reuse, as well as collection of waste;
• Reduced demand for materials used for constructing residential neighbourhoods (due to lower average per household residential space); and
• Lower household energy use per person since multiple dwelling units can be heated or cooled using less energy per unit of area than other forms of housing.
(Adapted from Canadian Urban Institute in Eberle and Kraus, 1999).

FURTHER RESEARCH/POLICY

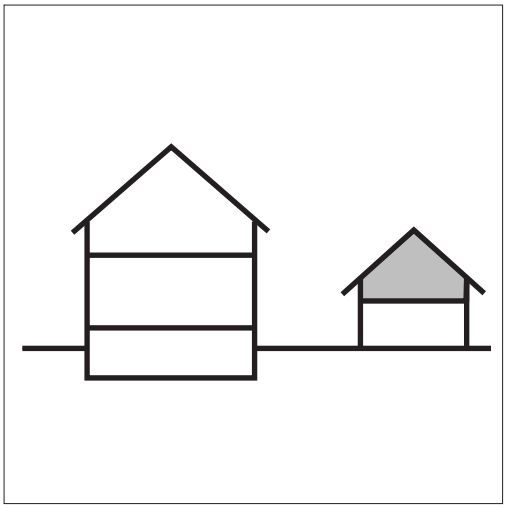
Canadian Urban Institute, *Housing Intensification: Policies, Constraints and Options.*

Eberle and Kraus, *Measuring the Impact of Secondary Suites On Municipal Services and Infrastructure.*

Energy Pathways Inc. *Second Dwelling Units in Rural and Village Settings.*



37.1 The Basement Suite
The basement suite is a model common to BC. It can be totally independent from the upper floors, or it can have optional access between dwelling units. Complete segregation is ideal for market rental units, which can supplement the family income. Complete or partial internal interconnectivity, such as a shared kitchen on the main floor, is ideal either for live-in parents who may need care or for an older child who needs some degree of independence. In each case, a separate entrance is desirable to give the resident a sense of independence. Some kind of semi-private outdoor space around the entrance is also recommended. Sound insulation between units is essential for safeguarding privacy and enhancing liveability.



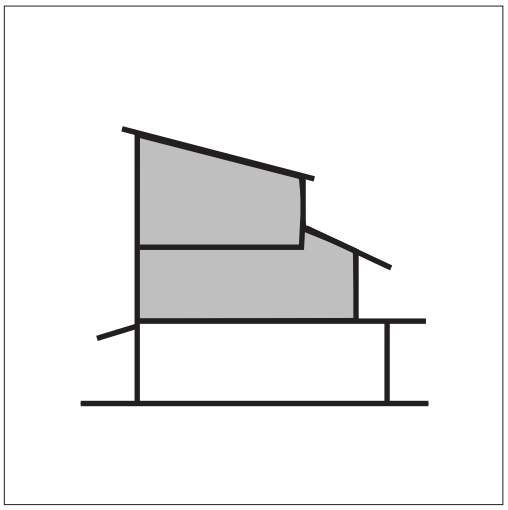
37.2 The Carriage House
A suite above the garage is ideal for parcels accessible from a lane. Separating the suite from the house gives homeowners and tenants a greater sense of independence. Lane access means easy car access for tenants, who keep a watchful eye on the lane. A carriage house is also ideal for a home office or an artist's studio, eliminating the need to rent work space elsewhere. Corner lots are ideal for a carriage house because the principal entry may face the flanking street; otherwise, the entry must connect to the street via the side yard.

37.3 The Attic
Often thought of as a mere storage space, the attic has great potential for increasing the living space in a small house. Although not always suited for secondary suites, the attic is ideal for a teenager suite, office, or studio. Even small or low attics can provide enough area and height to warrant a sleeping loft for children or guests.

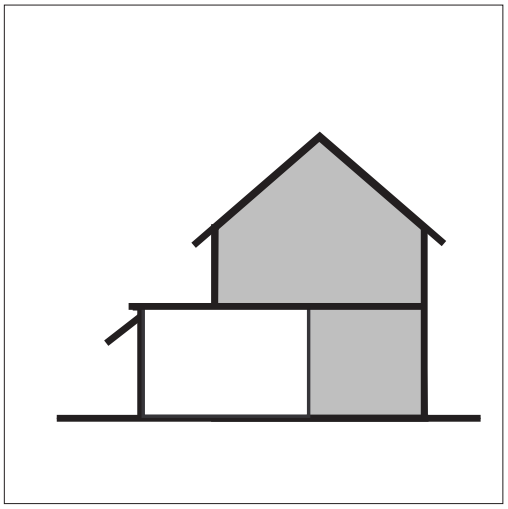
38 Layer living and working.

"This is not simply a home office. It is the room of a man's life." Akiko Busch, Geography of Home, 1999.

Living and working in the same place is not a new idea. Almost everyone has lived near a local corner store that is attached to a full house or has a suite above it. Artists often live in a loft that also functions as their studio. By simply expanding this idea to include offices, retail shops, and craftspeople, many more people can live and work in the same place. From lofts in mixed-use buildings to single-family detached homes that incorporate office space, ensure that there are layered working and living spaces throughout the community.



38.1 Live Above
Situate a loft or second-floor suite above a studio, office, or storefront. This allows individuals or a couple to live and work in the same place.



38.2 Live Beside
"Barnacle" a studio, office, or storefront onto the side of the main home. This gives enough room for a large family and allows family members to work in the same place.

Related Charrette Strategies
B4; E4; I4; L4; P4

Related Guidelines
8; 9; 11; 32; 37

DESIGNING FOR LIVING AND WORKING

The detailed design of each live/work unit will vary according to the nature of work being undertaken as well as the family needs of the household. In addition to these variables, the design of homes with combined living and working spaces should consider the following:

- *Occupation and scale of work*
- *Housing type and environmental/ community context*
- *Amount and characteristics of equipment*
- *Gender and stage of life cycle*
- *Telecommunication/transportation access*
- *Number and frequency of clientele*

(Adapted from Cullen in Gurstein, 2001, p.144).

ENVIRONMENTAL DESIGN

The integration of working space into living space should maximize human comfort and environmental quality. Important considerations include: access to natural light and ventilation, visual and acoustical privacy, and adequate work and storage space. A physical connection between the working and living space should be provided. Work units should have direct pedestrian access to the street.

FURTHER RESEARCH

Gurstein, Wired to the World, Chained to the Home.

City of Surrey Department of Planning and Development et al., "Section 4.3: Live/Work - Work/Live Areas," *East Clayton Neighbourhood Concept Plan.*

Contreras, Ferrara Architects Inc. *Home Occupation Scenario.*

39
Parcel
create a centre

39 Provide a front door on the street

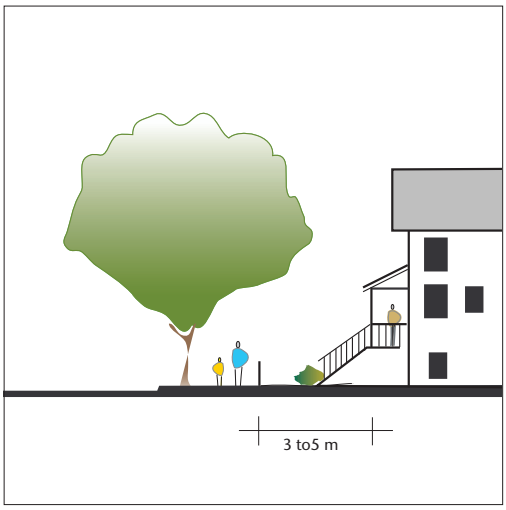
"If there is any part of the home that does not belong exclusively to the people who live there, it is the front door." Akiko Busch, Geography of Home, 1999.

The edge between the building and the street is a crucial space. It both separates and connects residents to the public realm. Placing homes and shops close to the street edge provides more "eyes on the street" and makes the community a safer and friendlier place for everyone.

Related Charrette Strategies
F3; G2; H3; I3; M2; O2

Related Guidelines
24; 25; 26; 28

39.1 A Friendly Face
Houses with windows, doors, and porches on the street allow residents to keep a watchful eye on activity. A porch and front door on the street provide an opportunity to be outside at home, thus encouraging residents to engage with passers-by. A good porch has a clear depth of at least 1.8 metres and is raised a minimum of 0.5 metres above the ground. A low line of vegetation or a fence of no more than 1 metre in height located along the property line makes this semi-private realm quite comfortable as it provides a clear distinction between the front yard and the public street. Houses on corner lots should address both streets. Even when residents are not physically present, the friendly face of the house creates a sense of imminent use and of security. Gated communities preclude public street activity and, thus, are not consistent with sustainable planning principles. Help to establish "eyes-on-the-street" by locating the garage at the rear of the house, off a lane.



39.2 Tight Setbacks
Houses set close to the street have more of a presence than do those situated further back. A small front-yard setback creates a larger backyard area for private outdoor use. Locate single-family dwellings no more than 5 metres from the property line. Allow porches and stoops to project 1 metre into the setback, and allow stairs to extend into the setback as required. Place townhouse setbacks at no more than 4 metres. It is preferable to build mixed-use and commercial buildings to the front lot line, although a 2 metre setback is sometimes acceptable.

39.3 Garage on the Side
Driveway accessed homes on small lots can have a friendly face on the street if the garage door is set back a minimum of 2 metres from the façade so that the visual focus is maintained on the residential portion of the building. A recessed garage also allows parking on the driveway and within the property line, while the façade of the house remains visble, close to the street.

FURTHER RESEARCH

Allen Jacobs. *Great Streets.*

Jane Jacobs. *The Death and Life of Great American Cities.*

40 Design smart parcels.

"Being blind, it does not see what it is building; it is interested only in the interior of its dwelling; and even if it could see, as it never leaves home it would be unable to appreciate the external appearance." Maurice Maeterlinck, Parabola, Winter 1993.

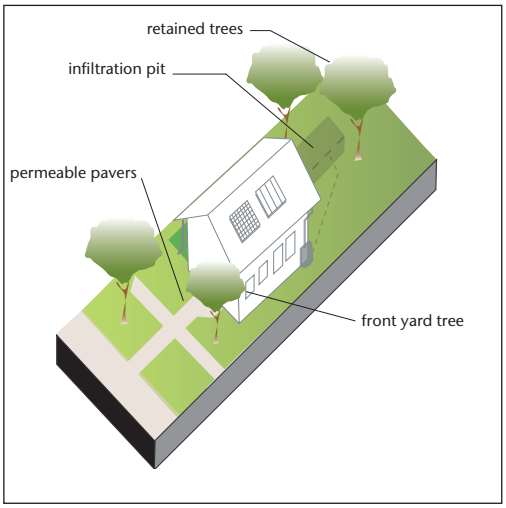
We often build our homes without fully considering how the house, yard, and roof function. Sustainability at the parcel level, multiplied by the thousands of parcels in any district, can affect the sustainability and economy of an entire region. Houses that capture and (re)use energy and resources are cost-effective and reduce environmental impact. This decreases community environmental repair and maintenance costs. Engender a personal understanding of sustainability and decrease costs at the source by making the parcel more sustainable.

Related Charrette Strategies
N1; N4; O1; P1; P2

Related Guidelines
33; 34; 36

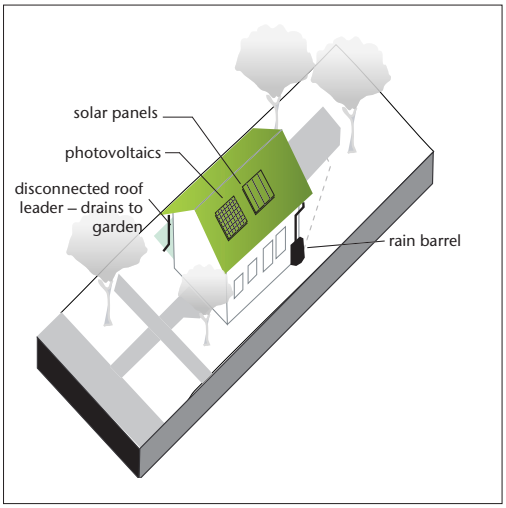
40.1 The Yard

The yard is like a small sponge; it can absorb all the rain draining off roofs, parking areas, and pathways. Use materials such as crushed stone or pervious pavement for permeable driveways and paths. Cover no more than 50% of a parcel with buildings and impervious surfaces. Design all permeable areas, such as lawns and gardens, to accept runoff. A concave lawn edged by gardens can collect and infiltrate stormwater on-site. Yards are also an important part of the urban forest and should be planted with shade trees that, at maturity, should cover 40% of the lot. Stockpile topsoil during development for redistribution; the resulting topsoil can be twice the original depth. Soil porosity must be maintained throughout construction and tested before occupancy permits are issued.



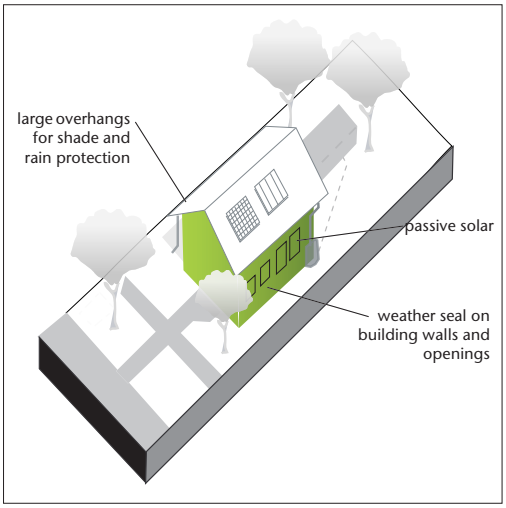
40.2 The Roof

The roof is often overlooked as a functional element of the sustainable home. A rooftop cistern can collect rainwater for irrigation, while water from the roof can be filtered for household use. Rain barrels attached to downspouts can provide water for irrigation and remove water from storm drains. Alternately, a splash pad at each downspout can dissipate water into yard turf. A flat roof is ideal for a roof garden: it provides a place to grow flowers and food for those who do not have access to a garden plot on the ground. When lifecycle costs are considered, green roofs are cost-competitive with conventional roofs as, if properly maintained, they seldom need to be replaced. Solar panels mounted on or in the roof of a house can convert sunlight into energy cost-effectively. Stored for later use, this energy can be used to run appliances and generate heat. Orient rooftop gardens and decks so as to maximize solar gain and quality of view.



40.3 The House

Collection and use of solar radiation at a house-by-house scale can greatly reduce reliance on off-site energy sources. Absorbing heat from the sun can be as simple as orienting the windows of buildings to the south. Overhangs, awnings, or trellises prevent the high summer sun from overheating the house, while the low winter sun can penetrate and warm the home. Double-paned windows and insulation prevent heat loss. Ground-source heat pumps are more cost-effective than conventional heating systems, and district-wide heat systems are more efficient still. A composting toilet combined with greywater filtration can completely eliminate a home's contribution to off-site liquid waste. Simple blackwater package systems are now available to treat waste from about 20 homes. Treated correctly, clean discharges from black and greywater systems provide an excellent and safe source for irrigation water and for slow release into infiltration storm systems, thus uring summer base flows in nearby streams.



GREEN YARDS

Minimizing site disturbance during construction will assist in maintaining soil hydrology while preserving vegetation and nearby watercourses. A thorough site inventory and assessment should be undertaken at the design stage to ensure proper consideration and protection of environmental features.

GREEN ROOFS

Roofs that are moderately sloped or flat provide ample space for growing gardens or for providing habitat for local birds. Even roofs with a pitch of up to 45% can accommodate planting, although greater consideration to prevent soil slipping and to ensure adequate water retention in the substrate are required. Adequate roof drainage and waterproofing are important considerations on all green roofs.

Recommended depths for soil are:

groundcovers:	*30 cm*
urban agriculture + flowers:	*30 - 45 cm*
shrubs:	*45 - 60 cm*
trees:	*76 - 92 cm*

(Cole et al., 1999, LA - p.13.)

GREEN CONSTRUCTION

Minimizing, reusing, and recycling construction and demolition waste will reduce the energy consumption of buildings before they are occupied. Waste Management Plans ensure construction-site recycling of various construction materials and by-products.

FURTHER RESEARCH

Wooliams, *Planning, Design and Construction Strategies for Green Buildings.*

Cole et al., *City of Santa Monica Green Building Design and Construction Guidelines.*

GVRD, "Construction/Demolition Recycling Program."http: //www.gvrd. bc.ca/services/garbage/jobsite/index.html

Peck and Callaghan, *Greenbacks from Green Roofs Forging a New Industry in Canada.*

41
Parcel
an economy of means

Related Charrette Strategies
A4; B4; D4; I4; J4; L4; M3

Related Guidelines
8.3; 32; 37; 38

41 Provide a variety of housing types

"Skyscraper, skyscraper, scrape me some sky: tickle the sun while the stars go by." Dennis Lee, Alligator Pie, 1974.

Different families have different needs particularly when it comes to housing needs. The type of residence a family needs depends upon family size, income and the age and physical requirements of family members. Often these needs change over time. If a community contains a full range of housing types residents of all types can find a home there.

RESIDENTIAL MIX

Complete communities provide a healthy mix of housing types at densities that support a viable transit system. For example, the following minimimum thresholds used for the East Clayton Neighbourhood Concept Plan achieve an average net density of 25 units per hectare.

Single family detached
Half-acre (4 upa): 9%

Single Family detached and duplex
Low Density (6 - 10 upa): 19%

Single Family detached and duplex
Medium Density (10 - 15 upa): 16%

Town house and apartment
Medium-High Density (25 - 45 upa): 15%

Apartment/condominium
Mixed-use (25 - 45 upa): 10%

FURTHER RESEARCH / POLICY

City of Surrey Department of Planning and Development, et al., "Section 3: Land Use Statistics." *East Clayton Neighbourhood Concept Plan.*

41.1 The Single Family Home
Single-family homes are attractive for many families. A yard provides opportunities for living, for recreating, and for gardening. While they consume more land than other forms, they can be built on lots as small as 232 m^2 (2500 sq. ft.). Secondary suites can be included to help young families afford their first home, and for family and life-cycle flexibility over time.

41.2 The Duplex
Duplexes offer many of the same amenities as do single-family houses but usually at a lower price and greater land use efficiency. Both households can share a garage off of the back lane while having individual front doors and porches facing onto the public street. Optional secondary suites, either on the ground floor of each unit or as coach houses, can further decrease mortgage costs for each family. Larger parcels and corner lots are ideal locations for duplexes.

41.3 The Townhouse
A townhouse answers the needs of residents who want more than an apartment but who cannot afford (or do not want) a large yard. Like the single-family home or duplex, each townhouse unit can have a front door on the street with a porch and small front garden. Rear lane access to car storage is generally required so as to prevent a continuous wall of garage-fronts on the street. A small yard provides private outdoor space. Noise penetration can be minimized by careful party-wall construction.

41.4 The Apartment or Condominium
Higher-density units located at the heart of the community provide residents with affordable housing close to their daily needs. Often much less expensive per unit than a single-family home, apartments are suitable for those buying a first home, for recent empty-nesters, or for renters whose investment priorities do not include committing to a mortgage. A balcony for each unit offers an essential connection to nature and the outside community.

42 Provide semi-private open space for each home

"Civilization is not only a city that works by allowing people to live near one another, but a good city — one which enables its inhabitants to live good lives together." Daniel Kemmis, Parabola, Winter 1993.

There is something wonderful about being outside and at home at the same time. It provides both a certain sense of security and opportunities for social interaction (e.g., with neighbours and passers-by). When located next to a street or public park, semi-private open space can provide watchful neighbours to deter crime. Make it home by providing semi-private open space (i.e., a front yard, however small) between the inside of the dwelling and the street.

Related Charrette Strategies
E2; I3; M3; N3

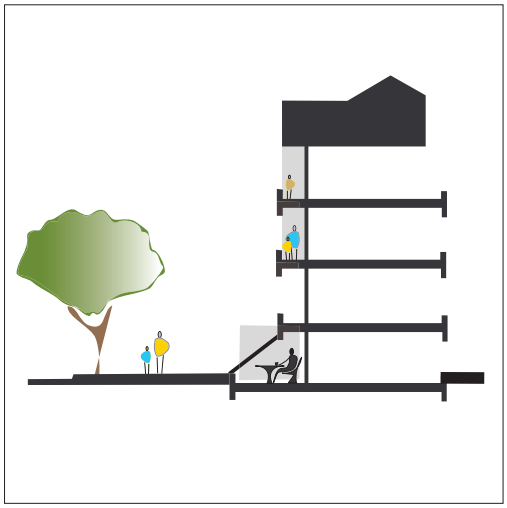
Related Guidelines
25; 28.1

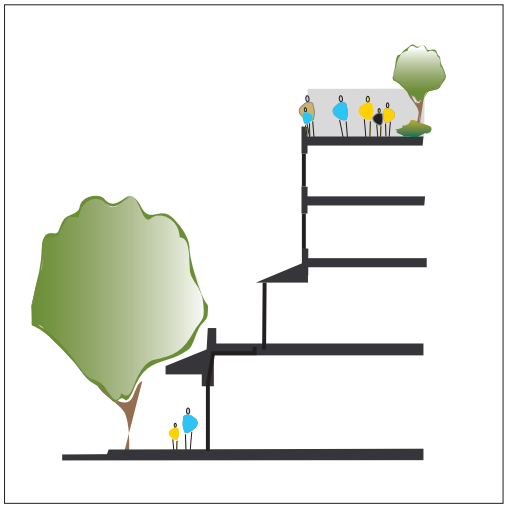
42.1 The Front Porch

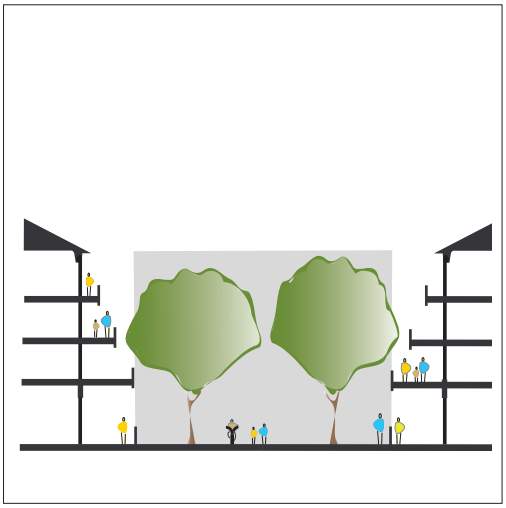
A front porch is ideal for watching street activity. Conversation with strangers or acquaintances is comfortable when conducted within the secure porch space. The front yard also acts as a transition between public and private space. A front porch gives each home a public and friendly face on the street contributing to a more secure and social public realm.

42.2 The Balcony and Patio

A balcony provides a strong sense of security, allowing for the anonymous viewing of the public realm. Less social than a front porch, a balcony on the street does make that street feel safer. In a pinch, a wide window ledge and a window that opens wide provides an inside-outside experience for an apartment. For multiple-family dwellings and live-work/work-live situations, a patio attached to ground-floor units can provide many of the amenities offered by a full-sized backyard.







42.3 The Rooftop Garden

From single-family homes to apartment towers and live-work/work-live situations, a rooftop garden offers a unique outdoor experience. Residents rarely have the opportunity to visit the roof, and a rooftop garden offers a perfect excuse to do so. It is an ideal location for a kitchen garden because it receives full sun. Rooftops with a view are also a great place to host a party or just to look at the stars. A rooftop garden provides an opportunity to be both outdoors and at home.

42.4 The Courtyard

In multiple-family homes it is not always possible to provide outdoor space for individual units. A shared courtyard gives residents without a yard the opportunity to be both outside and at home. Some courtyards are fully contained at the centre of the building. Located at one edge of the property by the street, a courtyard, like a front porch, can provide opportunities for interaction between residents and passers-by.

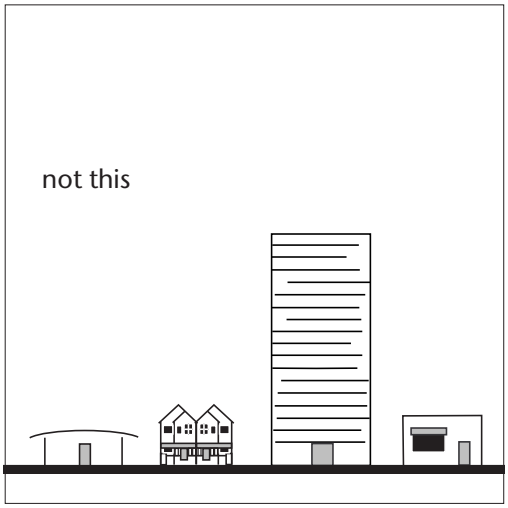
Related Charrette Principles
All

Related Guidelines
All

43 Create organic unity

"The birds of Naloot build their nests of stone just as the people do." Virginia Baron, Parabola, Winter 1993.

A community creates or preserves an identity when it exhibits an organic unity. Organic unity does not suggest that everything is the same – far from it. Organic unity means adhering to the basic rules of climate, culture, and economics of a place, while encouraging wide variations within those constraints. This means that infill buildings should adhere to the same climatic and social cues of its older neighbours. It also means that new communities should produce homes and shops that respect the lessons learned over the generations in other parts of the region. In short, sustainable buildings are made home when they gracefully accept the gifts of their place, expressing these same gifts in their form and character.



43.1 Form
Structures, when combined to form a sustainable community, form an organic continuity. This continuity is impelled by both cultural and physical imperatives. Ignoring these imperatives can produce disastrous results. Juxtaposing incoherent building forms (like those illustrated at left) produces airflow turbulence around buildings and blocks the warming sun from lower structures, leading to excessive building energy use. A similarly wasteful transportation pattern often emerges in such areas, leading to higher than necessary automobile dependence. This incoherent pattern also produces serious cultural problems. Citizens perceive a threat to their sense of "home" when incompatible new building forms are proposed for their neighbourhoods. Often it seems that any proposal for change will provoke neighbourhood resistance; however, experience has shown that citizens will accept building proposals which respect their unwritten formal rules for "home," even when the proposed building departs from typical building density, tenure type, and allowed use.

43.2 Character
If we imagine that the form of a building is like the form of the human body, then we can also imagine that the character of a building is like the character of an individual human face. A building presents a certain kind of face to the community, either welcoming or cold, either dominated by cars or dominated by people, either cheaply commercial or socially refined. Sustainable communities have building faces that are compatible with the underlying social, economic, and ecological imperatives of the community. They welcome neighbours, save expense, and capitalize on the climate while preserving the ecology. For example, large roof overhangs protect building skins from rain, admit winter sun, and provide protected places for conversing with passersby. Make it home by striving for a diverse yet organically connected assembly of building faces – faces that both express the individuality of their inhabitants and their common connection to the world outside.

A COMPLETE COMMUNITY

At right is one example of how many of the design guidelines shown on previous pages could be applied in one district. This is a community within which:

- There is a place to live no matter what your age, your income, your family circumstances, or your stage of life.
- Local businesses and commercial services are within a five minute walk.
- Streets are interconnected and pedestrian friendly.
- People and porches dominate the streetscape, not cars.
- Streets are designed with lighter, greener, cheaper infrastructure – to save money and to save fish.
- Parks and natural areas are part of the comprehensive green infrastructure system and are always within a short walk of all homes.
- Public transportation is a convenience to all.

Homes in communities like this have been shown to be up to 40% more valuable than homes in conventionally designed communities. This added value is a reflection of the extent to which citizens desire this way of life. Why then don't we build all communities this way? Part of the answer is that changing the intricate set of codes that currently govern the design of communities, while needed to yield the kind of community shown, is a challenging, time-intensive process. These kinds of changes don't happen by themselves. Design tools, such as those shown in this manual, provide a necessary point of departure, while the continued and collective efforts of citizens, elected officials, developers, lenders, parks departments, municipal engineers, federal and provincial regulators are crucial for translating them into daily practice.

Designed and drawn by Stacy Moriarty, Moriarty and Company Ltd.

CONCLUSION

Those of us involved in writing and producing this manual know that achieving more sustainable communities and regions is an evolving process. Our empirical, local, and cultural knowledge of sustainable practices continues to unfold as we continue to learn more about the interactions between human and natural systems.

This being said, the strategies and guidelines in this manual can make a measurable contribution towards making our regions, communities, and neighbourhoods more sustainable. Incorporating years of applied research and community-based design, this manual helps explain why current development trends are incapable of sustaining us in a manner that will allow us to protect human health and the environment in livable, equitable, and affordable ways. It then provides practical strategies and guidelines for reversing these trends.

Upon completion of this manual, the development and approval of detailed engineering standards for East Clayton continues amidst widening policy debate about the value of integrated stormwater management and watershed-based planning in BC. Consequently, the Headwaters Project and East Clayton NCP provided a unique and timely opportunity to influence the most current policy and practice relating to sustainable community design. To varying degrees, this can also be said of two of the other case studies provided in this manual (Southeast False Creek and the Burnaby Mountain Community), which also used charrettes to demonstrate local, regional, and national policy goals pertaining to sustainability. These charrettes proposed viable models for efficient land use, for protecting and restoring important fish and wildlife habitat, for preserving clean and natural stream flows, for providing for a fair share of regional employment, and for providing ample affordable housing and transportation choices. From all of the charrette projects contained in this manual, we derived the design guidelines, contained in Part Three of this manual.

Design – however comprehensive and far-reaching – is only a start. It is now crucial for these sustainable proposals to be implemented so that their environmental, social, and economic performance can be monitored. Their results can then be used to improve our understanding of sustainable community design and to enhance the evolution of better development practices. Where possible and appropriate, we will continue to disseminate the results of these projects to as wide an audience as possible. In this way, we hope this manual can serve as a living record of our collective progress toward creating more environmentally sound, equitable, and complete communities.

Further Research

Given the wide range of variables involved in planning, designing, financing, and implementing more sustainable communities, it is impossible and impractical to cover it in a single volume. In addition to issues related to site and community design (described in detail in this manual) are market, technological, and regulatory variables, all of which also influence the degree of sustainability of any given project. Addressing these will involve continued and coordinated efforts among government, NGOs, and private-sector groups that will have to develop appropriate, equitable, and realistic frameworks for sustaining the health of regions and bioregions over the long term. What follows provides a three-tiered framework (organized under the headings of Economy and Equity; Ecology; and Education) for further discussion and research.

1 Economy and Equity

Incentives

Building sustainable communities means changing how cities are financed and serviced. In a sustainable community, engineering services (drainage, roads, sewage, energy), land uses (compact, mixed-use communities), and financing for infrastructure must be coordinated and affordable for both the developer and the city. What are the range of financing levers, such as development cost charges (DCCs), that can be restructured to help achieve a more sustainable urban landscape, thus enhancing affordability and mitigating the economic and ecological consequences of urban development?

Risk Management

By their very nature, innovative technologies often cost more at the outset than over the long term. Viewed through a lifecycle lens, they may prove much less costly than conventional technologies. However, lifecycles often involve different "owners" of the technology and, therefore, different financial stakes. Financing and risk management programs need to take into account the integrated aspects of sustainable communities and recognize the long-term horizon of community implementation. What are the most effective risk management strategies for both developers and local governments? What are the strategies that enable the additional risks associated with our first efforts towards more sustainable development to be distributed among those who stand to gain long-term benefit?

Alternative Financing

Sustainable communities must also be affordable and fair. Alternative financing tools, such as location-efficient mortgages and tax or development offsets, allow lenders to recognize the hidden assets of complete communities (e.g., public transit and higher density), ensuring that more low- and moderate-income families, first-time homeowners, and dedicated transit users can obtain mortgages (or larger mortgages than those for which they would otherwise qualify). How can these tools increase home purchases in BC communities, boost transit ridership, reduce energy consumption, and improve air quality?

2 Ecology

Urban Forestry

Due to the increasing degradation of stream habitat, urban stream hydrology is becoming an increasingly urgent issue. Research shows that stream hydrology is affected when effective impervious surfaces reach 10% of total watershed area. Urbanization typically results in impervious surfaces of 50% or more. Ways must be found both to reduce the effective impervious surface to below 10% while continuing to accept the necessity of high-density development (for affordability- and transportation-related imperatives). Urban forests (i.e., street trees and yard trees) can absorb, transpirate, evaporate, and mitigate stormwater in a way akin to that of natural forests. Yet region-specific data on urban forests and their influence on watershed quality is rare.

Watershed-based Planning
The emergence of frameworks for community-based watershed planning at various levels of government suggests a more integrated consideration of the impact of urban development on sensitive ecological systems. Watershed-based approaches to development recognize the importance of the watershed as a fundamental unit of planning and design. In simple terms, watershed-based planning means that resource, land use, and community design decisions are made with an eye towards their potential effects on the watershed and the natural systems contained therein. Understanding the human, aquatic, riparian, and terrestrial features, conditions, processes, and interactions of watersheds (and their component parts) in their "natural" state provides a basis for developing performance targets for maintaining the optimum post-development health of natural systems. The use of engineering best management practices and integrated green infrastructure (as described herein) are design strategies whose purpose is to ensure that development reflects the dynamics of the watershed. Continued efforts towards watershed based community planning and management will provide the necessary frameworks for designing, implementing and monitoring integrated green infrastructure systems in our communities.

3 Education
Environmental and Social Learning
Entrenched attitudes and lack of familiarity with new concepts make it difficult to change institutional and individual attitudes towards achieving sustainable community development. Until these attitudes are changed, progress will be slow and halting. Education operates at a variety of levels, from the grade school to the media. Education ministries are struggling to find ways to integrate new information about the sustainability of their communities into the curriculum. However, incorporating green infrastructure into the urban landscape can automatically change the landscape in a way that creates opportunities for learning. These physical opportunities can be integrated into school grounds and supplemented with learning materials. Ideally, this effort could make natural systems a part of the everyday reality of the developing child. Much more research is needed in order to understand how best to achieve this and other educational goals.

Selling Sustainability
At the same time, if the principles of sustainability are to form the basis for a new development movement, consumers must also understand and embrace them. Bringing this about requires developing marketing strategies to appeal not only to early adopters of sustainable communities, but also to those who are not yet aware of the options afforded by more complete community living. This involves educating consumers about the benefits of sustainable communities as well as about the responsibilities of ongoing management and stewardship. Public agencies can provide the lead by developing policies that support more efficient, sustainable land use and development; developers and builders can help make the case by providing affordable, efficient, and attractive communities; and government and non-profit groups can provide a means for helping individuals to understand the benefits of sustainable communities as well as for developing community-based strategies essential for the immediate and long-term stewardship of sustainable community resources.

The "Bottom Line"
All of the principles, strategies, and guidelines outlined in this manual are conceptually linked to one fundamental insight: urban design decisions made on one site, if repeated for all other similar sites, profoundly influence the ecological, social, and economic health of the entire urban region. This fact is increasingly well understood in our region and beyond. Citizens, elected officials, appointed officials, and other stakeholders increasingly recognize that urban design decisions produce regional consequences and that the solutions to many important regional issues must be found at the site level. It is our hope that this manual helps provide some of these much needed solutions.

APPENDIX
Sustainability Checklist

On the pages that follow, we provide a sustainability checklist for evaluating community design proposals. Each item on the checklist is keyed to an item in the manual, and in this way represents an abbreviated summary of our recommendations. We hope that it will be a useful tool for BC citizens, planners, engineers, regulators and developers. Municipalities might decide to use the list as a basis for evaluating development applications and/or assigning infrastructure credits or DCC reductions (if a proposed development achieves a minimum level of compliance). Citizens might use the checklist as a way to discuss a project and evaluate its merit. Developers might use the checklist as a tool to enhance communication with citizens and elected officials, and as a marketing tool. While not intended as a scientific or absolute measure of sustainable development, this checklist does provide a consistent basis for comparison between options, and should help citizens and their elected officials set, and then meet, their sustainability targets.

District
sustainability checklist

		Yes	No	Take Action
1	Do site development, engineering and subdivision requirements reflect the purpose and goals of the regional growth strategy?	☐	☐	☐
2	Do site development, engineering and subdivision requirements reflect Official Community Plan principles?	☐	☐	☐
3	Does the development reflect the goals/objectives of regional Liquid Waste Management, pollution management, and/or watershed plans and strategies?	☐	☐	☐
4	Does the development utilize existing infrastructure networks?	☐	☐	☐
5	Does the development support a coordination between land-use and transportation ?	☐	☐	☐
6	Are residents and community stakeholders involved in the planning and design process?	☐	☐	☐
7	Does the development reflect an understanding of watershed forms and processes?	☐	☐	☐
8	Is the development located outside areas identified as environment tally sensitive and/or hazardous?	☐	☐	☐
9	Does the development support and link to a regional ecological network?	☐	☐	☐
10	Are alternative storm water management design standards incorporated to reduce downstream impacts of development?	☐	☐	☐
11	Does development maintain pre-development hydrological conditions?	☐	☐	☐
12	Are riparian zones sufficient to protect the aquatic and terrestrial features necessary for fish survival?	☐	☐	☐
13	Do riparian zones layer ecological protection and passive recreational access in mutually supportive ways?	☐	☐	☐
14	Are public parks, school sites and wetlands integrated to maximize recreational, environmental learning, and community development opportunities?	☐	☐	☐
15	Is the development concentrated around commercial and transportation nodes?	☐	☐	☐
16	Do residential and employment densities support the regional transit system?	☐	☐	☐
17	Does the development incorporate a mix of uses?	☐	☐	☐

Related Guideline/Pg.	Rationale				
Pg. 20	Regional growth strategies provide a long range course of action for meeting common social, economic and environmental objectives.	✓	✓	✓	✓
Pg. 17	An OCP outlines broad principles and objectives for the form and character of development within a community. It should be supportive of the regional growth strategy.	✓	✓	✓	✓
Pg. 21, 22	Liquid Waste Management Plans, air pollution management strategies and watershed plans are specific tools that support regional environmental protection objectives.	✓			
1.1, 8.2, 8.3	Developing within existing infrastructure networks saves costs associated with expansion of road and water networks.		✓		
6.1, 6.2, 6.3	Coordinating land use and transportation planning can reduce trip distances and vehicle kilometres travelled (VKT) and curb reliance on cars.			✓	
Pg. 24	Multi-stakeholder, community-based processes help ensure that concerns regarding development are voiced and conflicting issues can be reconciled in an efficient, mutually agreeable manner.	✓	✓	✓	✓
3.1, 4.1, 4.2, 5.1	Watershed based planning ensures that resource, land use and community design decisions are made with an eye towards their potential impacts on the watershed and the natural systems therein.	✓	✓		
1.2, 3.1, 3.3, 3.4	Identifying environmentally sensitive and/or hazardous areas prior to development ensures the long term protection of fragile ecological systems.	✓			
3.3, 5.1, 5.5, 5.6, 6.3, 7.3	An ecological network connects habitat corridors, urban forests, large riparian areas and agricultural areas and enhances biodiversity.	✓			
4.2, 4.3, 7.3	Conventional storm water management techniques disrupt surface flow and eliminate the opportunity for groundwater recharge.	✓			
4.1, 4.1, 4.3, 7.3	Maintaining pre-development hydrological conditions after development occurs ensures the hydrological health of the watershed.	✓			
3.1, 3.3, 5.5	Riparian zones are crucial for supporting habitat related to stream health and for filtering sediment and pollutants from runoff.	✓			
3.1, 5.1, 5.5	Combining environmental protection with passive recreation is an important way of increasing public awareness of the value of ecologically sensitive areas and increasing support for their ongoing stewardship.	✓			✓
7.1, 7.2, 7.3, 12.1, 12.2	Combined school/park sites can simultaneously fulfill educational, recreational and community needs in a cost effective manner.	✓			✓
8.2, 8.3, 8.4, 9.2, 9.3	Concentrating and combining land uses creates more complete communities and provides the population densities needed to support transportation modes other than the car.			✓	✓
8.2, 8.3, 9.1, 9.2	A minimum residential density of 25 uph and employment densities of between 125 - 175 employees per hectare on business-related parcels support regional transit service and can lead to significant reductions in VKT.		✓	✓	
10.1, 11.1, 11.2	Mixing land uses provides an opportunity for families to live and work in the same area, curbing reliance on automobiles, and contributing to social vibrancy.		✓	✓	✓

District
sustainability checklist

		Yes	No	Take Action
18	Is the street system interconnected to allow multiple paths for movement through the community?	☐	☐	☐
19	Are all residences in the development located within a 400 metre (5 minute walk) of neighborhood stores, parks and transit?	☐	☐	☐
20	Are greenways and bikeways integrated into the transportation network?	☐	☐	☐
21	Does the development enhance local identity and character?	☐	☐	☐
22	Are public facilities (e.g., schools and community centres) shared to accommodate different uses at different times of the day?	☐	☐	☐
23	Are homes oriented towards open space and/or views to the maximum extent possible?	☐	☐	☐
24	Are opportunities for regional food production maximized?	☐	☐	☐
25	Has the incorporation of district-scale energy and servicing infrastructure been considered?	☐	☐	☐

Corridor

26	Does the development meet requirements for riparian protection?	☐	☐	☐
27	Are streets designed to infiltrate and treat storm water?	☐	☐	☐
28	Are stream crossings designed to minimize impact on aquatic habitat?	☐	☐	☐
29	Are opportunities for habitat enhancement incorporated into streets and corridors?	☐	☐	☐
30	Does the street network respond to existing topography and minimize earth works and site engineering?	☐	☐	☐
31	Are commercial activities centered on a pedestrian oriented 'Main Street'?	☐	☐	☐
32	Are on-site parking requirements minimized while on-street parking is maximized?	☐	☐	☐
33	Is parking located such that it does not detract from the pedestrian environment?	☐	☐	☐
34	Are streets designed to be safe and comfortable for pedestrians and cyclists?	☐	☐	☐
35	Are streets designed to frame important views?	☐	☐	☐

Related Guidelines	Rationale					
6.2, 6.3,11.1, 11.2	An integrated system of streets accommodates all transportation modes within a continuous and connected network and reduces trip distances.	✓		✓		
8.1, 8.3, 13.1	Locating neighbourhood commercial uses and parks within a five minute walk of all residents will dramatically reduce short car trips.			✓	✓	
6.3, 8.1, 13.1	Greenways are important movement corridors for people, water and wildlife both throughout a district and between districts in a region.	✓		✓		
2.1, 2.2, 14.1, 14.2, 14.3	Local identity and character is maintained and fostered through a careful attention to physical and cultural landscape features.				✓	
7.1, 12.1, 12.2	Lectures, exercise classes, gardening and cooking workshops, and community sports are a few of the potential afternoon and evening uses.		✓		✓	
13.1, 13.2, 13.3	Locating homes near and orientating towards park and open space can increase property values.		✓		✓	
8.1,3.4	Preservation of land with high agricultural values or providing open space for community gardens can provide space for food production.		✓		✓	
5.1	Development should be consistent with the minimization of waste disposal needs and energy use.	✓	✓			

Corridor

16.1, 16.2	Maintaining the ecological integrity of riparian systems is crucial for the survival of aquatic and terrestrial species.	✓				
15.3,19.1, 19.2, 19.3, 23.1	Narrow streets require less pavement and reduce runoff quantity, while an interconnected network disperses runoff flow.	✓		✓		
16.1, 17.3	Stream crossings should cause the least possible disruption to stream banks and channel structure.	✓		✓		
20.1, 20.2, 20.3, 21	Traffic bulges, boulevards and traffic islands can be planted to create habitat for birds and other small creatures and to allow for infiltration and evapotranspiration of rainwater.	✓		✓		
15.1, 15.2, 15.3, 23.1, 23.3	Fitting streets to the land minimizes construction costs and environmental impacts.	✓	✓			
22.1, 22.2, 22.3, 24.1	A pedestrian oriented 'Main Street' provides shops and services that cater to the district.			✓	✓	
22.1, 22.3, 26.1	Reducing minimum on-site parking standards is an important transportation demand management strategy which must also be matched by maximizing on-street and lane parking.		✓	✓		
22.3, 24.2, 24.3, 25.1	Locating parking underground or behind buildings reduces the impact of cars on the pedestrian environment. On-street, parallel, or angled parking in both directions gives direct access to storefronts and creates a buffer for pedestrians.		✓	✓		
25.1, 25.2, 26.2	Designing for the needs of pedestrians and cyclists curbs dependence on automobiles.			✓	✓	
13.3	Framing key views connects people to the landscape and can increase the value of homes.				✓	

Block
sustainability checklist

		Yes	No	Take Action
36	Are blocks designed to maximize the infiltration and storage of ground water?	☐	☐	☐
37	Are blocks designed to embrace and protect important environmental features?	☐	☐	☐
38	Do sidewalks connect blocks on both sides of the street?	☐	☐	☐
39	Are interruptions to the sidewalk minimized?	☐	☐	☐
40	Are blocks short enough to provide easy movement for pedestrians?	☐	☐	☐
41	On longer blocks are there mid-block connections to greenways or trails?	☐	☐	☐
42	Are there multiple lot sizes within each block to accommodate many housing and tenure types?	☐	☐	☐
43	Are setbacks minimized to create a sense of enclosure on the street?	☐	☐	☐
44	Do blocks incorporate space for public gathering and/or local stewardship activities (e.g., composting; community gardening)?	☐	☐	☐

Parcel

45	Are building footprints reduced to maximize infiltration of rainwater?	☐	☐	☐
46	Does building and site design minimize energy and material inputs?	☐	☐	☐
47	Are buildings articulated in response to natural features and phenomena?	☐	☐	☐
48	Are opportunities for water reuse and recycling incorporated into the building and site design?	☐	☐	☐
49	Are a variety of living spaces layered within the parcel to accommodate different family and income types?	☐	☐	☐
50	Do homes present a friendly face to the street?	☐	☐	☐
51	Are garages placed behind or recessed back from a house?	☐	☐	☐
52	Are opportunities for social interaction within each parcel maximized?	☐	☐	☐

Related Guidelines	Rationale				
30.1, 30.2, 30.3, 30.4	Each block should incorporate areas for the filtering, absorption, and infiltration of storm water.	✓			
27.1, 27.2, 27.3	The formation of blocks should: a) reflect the landscape structure; and b) maintain a high degree of interconnectivity and permeability.	✓		✓	
28.1	Continuous sidewalks on both sides of the street encourage pedestrian use of the street.			✓	✓
28.2	Curb cuts and driveways are barriers to pedestrian movement. Sharing driveways and locating car storage and services at the rear of the buildings are two ways to minimize interruptions to sidewalks.			✓	✓
29.1	Shorter blocks (of between 150 meters to 180 meters in length) means more intersections, shorter routes, and slower cars.			✓	✓
29.2, 29.4	Mid-block pathways allow pedestrians to move through large blocks.			✓	✓
32.2	Smaller blocks are cost effective and flexible because they can be adapted for multiple types of land-use.		✓	✓	✓
31.4	Buildings should reinforce the edges of the street and provide a comfortable place for users.			✓	✓
31.1, 31.2	Small areas of open space within each block or neighbourhood can become venues for social interaction, habitat enhancement and environmental learning.	✓			✓

Parcel

36.1	Minimizing the floor plate of a building reduces the effective impervious area of a parcel and therefore reduces storm water quantity.	✓			
33.1, 33.2, 3.33, 40.2, 40.3	Optimal solar orientation, high-performance glazing, recycled building materials, and the use of alternative energy sources reduce life-cycle costs of buildings.	✓	✓		
33.2, 40.1, 40.2, 40.3	Articulating building envelopes according to site features and natural phenomena allows light to penetrate into spaces within a building while maximizing views outwards.	✓			✓
34.2, 40.1, 40.2	Disconnecting roof leaders, rain barrels, and porous paving are cost-effective, low maintenance methods of reducing storm water runoff.	✓	✓		
37.1, 37.2, 37.3, 38.1, 8.2	Incorporating multiple dwelling types and tenures into a parcel provides a mortgage helper for homeowners and increases the social diversity of a neighbourhood.		✓		✓
39.1, 39.2, 39.3	Buildings with windows, doors, and porches oriented towards streets allow for passive surveillance while increasing social interaction among neighbours.				✓
36.2, 39.3	Minimizing the impact of garages creates a stronger relationship between public and private space along the edge of the street and parcel.				✓
42.1, 42.2, 42.3, 42.4	Patios, balconies, and rear lanes allow for varying degrees of interaction among residents of a nieghbourhood.				✓

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