



Street view of an eco-corridor

# Greenfill

## Development pattern workshop

### Description

The Greenfill development pattern serves to increase the quantity and connectivity of open space within stable, existing neighbourhoods and between major city open spaces. This pattern enhances ecological functioning within existing communities (e.g. water quality, air quality, energy use, etc.); reintroduces and connects natural corridors and ecological systems; and, improves access, recreation, and mobility opportunities for pedestrians, cyclists and transit. This pattern is key for developing a sustainable city and supports the 11 Sustainability Principles, in particular:

- Principle 2: *Create walkable environments;*
- Principle 3: *Foster distinctive, attractive communities with a strong sense of place;*
- Principle 5: *Preserve open space, agricultural land, natural beauty and critical environmental areas;* and,
- Principle 11: *Utilise green infrastructure and buildings.*

While Greenfill strategies are applicable to many existing development patterns in Calgary, the Greenfill development pattern specifically targets stable, low density residential communities with little and disconnected open space. The Low Density Residential pattern provided the base for examining the Greenfill pattern during the development pattern workshops.

### Challenges

The workshop addressed two challenges:

- To accommodate a minimum of 20% of the total land area as green, public open space in an existing 120-ha neighbourhood with currently 2% green open space. The pattern maintains the overall people and jobs already existing within the study area, and intensification only occurs when residential land is transformed into open space.
- To enhance the connectivity between new and existing open spaces within the site and with surrounding natural systems.

### Summary & conclusions

The Greenfill development pattern workshop illustrates that existing communities can accommodate a substantial increase in open space while maintaining similar population and employment capacities with only moderate and selective redevelopment, preserving a majority of the detached single family homes. The workshop highlighted the potential of enhanced open spaces to serve multiple functions, including stormwater management, urban forestry, community gardens, active play areas, pedestrian and cycling connectivity, and education purposes.

*Above:  
The Greenfill development pattern increases the ecological functioning within an existing community. An eco-corridor, with bioswales and community gardens, is one of the design strategies proposed by the workshop team. Eco-corridors strategically add open space and increase pedestrian and ecological connectivity within communities.*

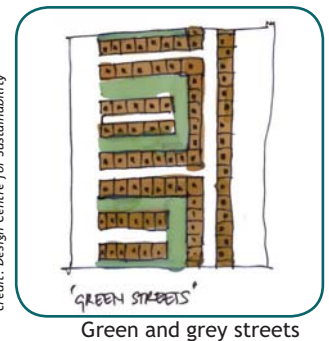
# Greenfill

## Design strategies

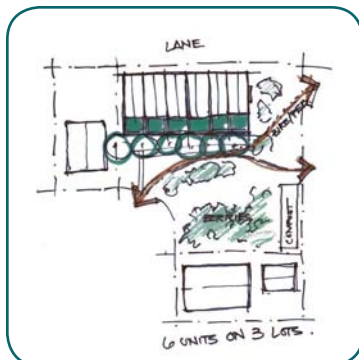
The workshop team addressed the challenge of enhancing open space and ecological function within existing low-density residential neighbourhoods without significantly changing the density or character of the area. Workshop participants developed strategies that increased multi-functional open space through the concepts of “eco-lot,” “eco-corridor” and “green street”. The team distributed these throughout the site in locations with the most potential for redevelopment and contribution to the open space network while maintaining over 80% of the single family parcels. A “green centre” for the neighbourhood reintroduces displaced units as low-rise apartments and seniors’ housing, providing new vitality and the opportunity for aging in place.

### 1 Green and grey infrastructure

- Design local streets for primarily non-auto uses. Select and emphasise **strategic routes for cars**.
- Turn less-traveled streets to **green streets**, and create **green lanes** where garages are accessed from the street. These places will preference people and natural systems while still providing access for emergency vehicles and guest parking.
- Incorporate **stormwater and bioretention in all ROWs**. New road designs should consider shared surfaces, one-way streets, south-facing bioswales and bioretention areas.



Right:  
The workshop team developed a series of strategies to increase the ecological functioning within an existing community and distributed these in strategic locations throughout the site. In the resulting “green filled” neighbourhood 20% of the land is green open space (versus the former 2%). The strategies are applicable to other neighbourhoods, and their aggressiveness depends on the level of greenfill desired.



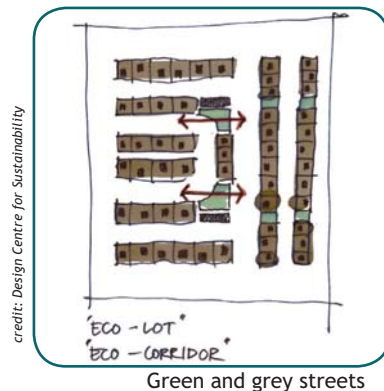
Strategic density to open up pedestrian connections

### 5 Strategic density

- Cluster **highest densities at the green centre** and along transit routes.
- Use strategic redevelopment of single family lots to create areas for eco-lots and eco-corridors. Encourage denser types of ground-oriented **attached homes** in these areas.

## 2 Multi-functional spaces

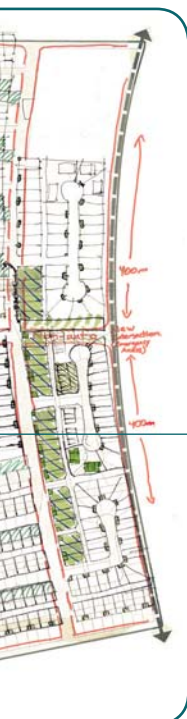
- Bring additional social amenities to the centre of each community - green space, places for seniors, gathering space, play areas, etc.
- Incorporate stormwater in all other uses - residential lots, streets, school sites, roofs, gardens, etc.
- Preserve school sites and use them for play fields, dry ponds, urban forest areas, and increased amenity spaces.
- Create eco-lots and eco-corridors that increase connectivity, provide stormwater infiltration, promote food growing and composting and encourage play and learning.



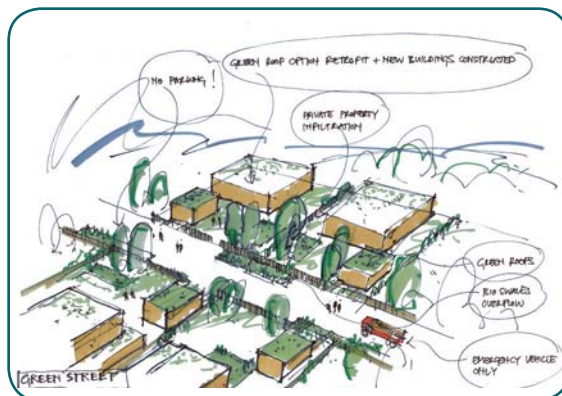
Green and grey streets

## 3 Ecological functions at all scales

- Create a neighbourhood-wide green system that uses green streets, lanes, and open spaces to connect people and ecological systems across the site.
- Use strategic parcels and blocks as eco-lots and eco-corridors to enhance connectivity and distribute ecological services across site.
- Ensure every parcel contributes to stormwater management through landscape design, south-facing gardens and bioretention areas. Require new construction to incorporate eco-roofs.



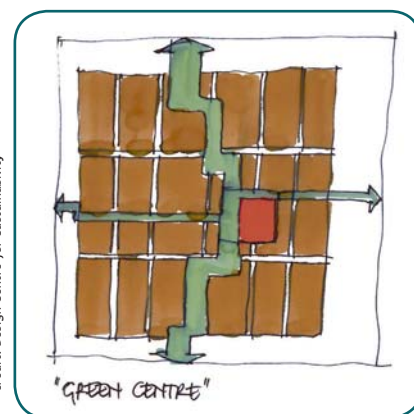
Greenfill plan



Green street with bio swales and green roofs

## 4 A vibrant green centre

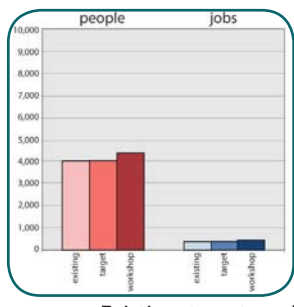
- Cluster highest densities, mixed use and new amenity opportunities to create a green centre for the neighbourhood.
- Provide a variety of housing types at the centre, including seniors' residences to accommodate changing lifestyles and enable aging in place.
- Create new centres of varying intensities at walkable intervals to ensure all residents have access to activities and amenities.



Green centre

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## Key questions & findings



Existing, target, and workshop population & jobs

### How many people and jobs can a Greenfill pattern hold?

The Greenfill pattern maintains the existing population and employment of an existing low density residential neighbourhood, accommodating an additional 280 new people and 50 new jobs in a 120-hectare area. This translates to a total population of 4,280 and 350 jobs, exceeding the population target by 7% and the employment target by 16%. Densities are 36 people/ha and 3 jobs/ha.

### What is the appropriate land use mix for a Greenfill pattern?

To achieve population and job targets for the Greenfill pattern while increasing the amount of open space, workshop participants converted 224 single family parcels (18% of units) to green space and higher density development. This redevelopment includes two apartment buildings (3-4 storeys), 1 seniors' residence, and approximately 200 ground-oriented, attached homes (Design strategy 5). The new "green centre" includes one 4-storey mixed use building (Design strategy 4). The team converted approximately 20% of local streets to "green streets", which provide increased ecological and recreation areas, while maintaining limited vehicle access (Design strategy 1). In the resulting "green filled" neighbourhood the percentage of the total land area that is green open space is increased from 2% to 20% (13% parks and conventional open space plus 7% green streets). The land use mix diversity index for the resulting Greenfill pattern is 0.59.

### What is the physical appearance of Greenfill pattern?

The Greenfill pattern maintains the single family character of the original low density residential neighbourhood, but with additional green spaces and natural areas for play, walking, cycling, food growing, and stormwater management (Design strategies 2 and 3). New, higher density residential and mixed use buildings and significant open space cluster around the neighbourhood green centre (Design strategy 4). Converted "green streets" and "green lanes" function primarily as linear parks, but also accommodate some parking, service, and emergency vehicles (Design strategy 1).

### What is the green infrastructure within a Greenfill pattern?

The Greenfill pattern incorporates green infrastructure at all scales, including a neighbourhood green centre, multi-functional "eco-lots" and "eco-corridors" within the residential fabric, and bio-retention areas within road and alley infrastructure and on residential parcels. New construction incorporates green roofs and handles stormwater on site (Design strategy 3).

### What is the phasing, replicability, and resiliency of a Greenfill pattern?

The team developed a hierarchy of strategies for the Greenfill pattern that are applicable to a variety of contexts, within varying time frames and at varying intensities. The consideration of parcel, block and neighbourhood scale strategies provide flexibility for implementation, and clear mandates for new construction ensure complementary functions for the future.

*Above:  
The workshop team maintained the population and employment of the 120-ha existing low density residential neighbourhood, and accommodated 280 new people and 50 new jobs.*

*Below:  
The comparison of the base (existing) Low Density Residential pattern land use mix to the applied Greenfill pattern land use mix shows a discrete intensification in the residential land use, the consequent increase in open space, and the transformation of 20% of street area into green streets. The resulting land use mix diversity index is 0.59.*

