

Country Lanes: Greening Local Transportation

Organization

City of Vancouver — Streets Design Branch, Engineering Department

Status

Started 2003, ongoing

Overview

During the summer of 2003, the City of Vancouver constructed three “Country Lanes” as part of a demonstration project to evaluate more sustainable alternatives to regular lane paving.

Each of the Country Lanes was designed to improve natural infiltration to reduce the amount of surface water entering the storm/sewer system, calm traffic, and to improve the general aesthetics of residential lanes and alleys. The three lanes were constructed to test different features, including permeable pavers, concrete driving strips, structural grass and swales.

After evaluating the three designs for their durability and performance, a standard Country Lanes design will be developed. Vancouver is also planning to develop a “Sustainable Street” that incorporates many of the features of the Country Lanes.

Budget: \$225,000. The demonstration project was funded through General Revenues. Future installations may be cost shared with residents through the Local Improvements process.

Contact

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Resources

- City of Vancouver — Sustainable Lanes (www.city.vancouver.bc.ca/engsvcs/streets/design/enviro.htm#streets#street)

Community context

With an older grid street system, the majority of Vancouver’s residential neighbourhoods include rear lanes and alleys that form an important component of the city’s local transportation network.

Vancouver’s lanes provide access to off street parking for residents and are used for municipal garbage and recycling collection. Lanes are also frequently used for residential construction access and utility services and servicing, including electricity, telephone, gas and cable.

The original lanes were simple and unpaved. Over the years however, most of the lanes have been upgraded and paved with asphalt from edge to edge through the Local Improvements process. Unlike the lanes they replaced, the new lanes are non-permeable, reduce urban green space, permit higher speed travel and tend not to be as aesthetically pleasing as the original lanes.

Policy context

Upgrades to lanes and streets in Vancouver are generally achieved through the Local Improvement Process, which enables the City and property owners to share the cost of an improvement project. Before a Local Improvement is approved by Council, there must be support from the local residents. Resident-initiated projects require 67% local support to proceed, while City-initiated projects require 50% objections to be defeated.

The first attempt to implement a Country Lane was through the Local Improvement Lane process. City staff worked with the first test site neighbourhood to gather the required support for the process. The Local Improvement process did not pass however, as many residents were reluctant to pay for a project with an unknown cost.

After Country Lane implementation failed through the Local Improvement process, the Country Lanes Demonstration Project was presented to City Council as a demonstration project where the City would pay the entire cost of the trial project. City Council unanimously approved the project in July 2002.

Rationale and objectives

The Country Lanes Demonstration Project originated from community desire for the City to provide a more environmentally friendly and visually attractive alternative to Vancouver's existing asphalt lanes. The initiative was further propelled by a policy directive from the City's Corporate Management Team which encouraged staff to "incorporate enhanced sustainability into all the City Operations as a way of doing business."

In response to this policy directive and increased community interest in an alternative lane treatment, Vancouver's Streets Design Branch initiated a process to design a more environmentally sustainable lane.

To help guide the Country Lanes Demonstration Project's design process, the project team established the following goals and objectives:

- To design an environmentally positive lane treatment that incorporated natural stormwater drainage and filtration
- To reduce discharge into the sewer system, replenish groundwater and reduce peak flows into local streams and rivers
- To improve the local air quality by increasing the local green space
- To provide a more aesthetically pleasing lane treatment that would encourage residents to take more ownership of the lane and help create a more livable community
- To educate the public about stormwater management and the effects their actions might have on the local ecosystem

Actions

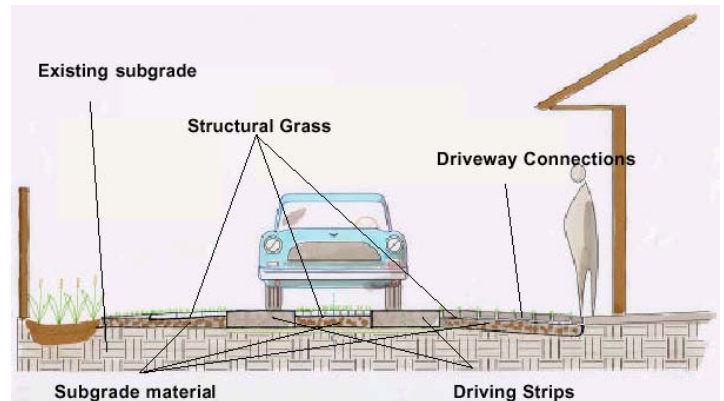
Regular community input from City residents determined that many Vancouver neighbourhoods wanted lanes to be less sterile, use less asphalt and to be more environmentally friendly. When it was suggested that residents wanted their lanes to be more rural and less urban, the idea of a "country" lane versus a "city" lane was developed.

Vancouver's Streets Design Branch selected three trial locations around the city that were based upon community interest and support. A preliminary Country Lane design was undertaken and an extensive investigation into material selection was conducted for each design component.

Each of the three lanes was constructed using different materials and techniques, with the design being refined with each subsequent installation using the lessons learned from the previous lane.

Although each of the three pilot lanes were designed to test different approaches and construction techniques, the basic design for the Country Lanes features two driving

strips down the centre of the lane to carry the vehicle weight surrounded by some form of structural grass (i.e., grass grown in a structural grid system). The basic design is illustrated below and is followed by a brief summary of the key design components.



Country lane design components

Driving strips. The driving strips are required to provide the structural strength for vehicles using the lane. Several materials were considered for the driving strips including concrete, asphalt, gravel and structural grass. Ultimately gravel was selected as the most cost effective and durable material.



Concrete driving strips being built

Structural grass. Structural grass is required to provide some additional structural strength in locations where vehicles turn off the driving strips. Two products were selected for testing, Golpla and Geoblock. It should also be noted that since the project began, additional products have emerged that may be worth investigating.



Structural grass placement

Lane entrances and driveway connections. In addition to the driving strips, the lane entrances and driveway connections were given special consideration. At lane entrances, the turning of heavy multi-axle vehicles places a large stress on the lane surface. At these locations, concrete aprons and permeable pavers were extended into the lane to provide a more durable surface for these movements. Permeable pavers, gravel and broken concrete (salvaged from City operations) were installed and evaluated at different driveway and garage connections.



Permeable paver lane entrance

Subgrade material and preparation. The base material for the Country Lanes design was particularly challenging as it had to allow for good drainage, provide strong structural integrity for heavy vehicular traffic, provide sufficient nutrients and retain enough moisture to promote healthy grass growth throughout the year. The City decided to develop an engineered soil to meet the above requirements. This soil is a mixture of ¾” aggregate that interlocks to provide structural strength, and a sand/soil mixture filling the voids to provide a growth medium for healthy grass root development and allow for drainage.

Drainage. Although two of the three lanes had pre-existing drainage collection systems in place, it was determined that natural infiltration would provide sufficient drainage, even during significant storm events. In-situ infiltration tests were performed on each lane to ensure adequate drainage of the subsoils. In addition, laboratory results indicate that short and long-term drainage of the engineered soil base is sufficient for providing adequate drainage.

The final lane design proposed by the Streets Design Branch is based on the performance of each lane, resident feedback and overall project costs. The design has been simplified to reduce costs as well as design and construction time.



Construction methodology

- Base preparation with 20 mm minus crushed aggregate (#9) up to 140 mm below final grade. Compact to 95% modified proctor density.
- Placement of 100 mm of structural soil across the entire lane (regardless of driving strips, driveway connections, etc.) Compact to 95% modified proctor density.
- Leveling course of sand across the entire lane (~15 mm)
- Structural grass across the entire lane, approximately 350 cm wide, extended and cut where appropriate to meet driveway connections
- Structural grass driveway connections and driving strips filled with gravel. Everywhere else filled with sand/topsoil mix and seeded and some pre-grown grass at select locations
- Lane on lane entrances may be made out of asphalt or concrete. Dimensions and material dependent on site

Results

The Country Lane Demonstration Project has also been recognized throughout the Lower Mainland, Canada and internationally with requests for design data from many cities and municipalities.

The project won the 2003 Technical Innovation Award from the American Public Works Association, as well as an honourable mention for the 2003 Environmental Award from the Canadian Association of Municipal Administrators.

The project has also been an overwhelming success in terms of community involvement and education. Resident feedback suggests the majority of residents are happy with their Country Lanes. In fact, in a follow-up questionnaire, 52% of respondents stated that they would be prepared to pay an extra 50% to have a Country Lane rather than a full width asphalt lane. Another 33% were undecided.



Country lane before and after

Participants

The Country Lanes Demonstration project closely involved community members at the pilot sites. Residents were able to customize features, help with plantings and get involved with lane maintenance. One of the lanes was developed next to an urban agriculture demonstration garden operated by a local environmental organization called City Farmer whose members were actively involved in their lane's construction and maintenance.

The five person project team included Wally Konowalchuk, EIT, Project Manager; David Desrochers, P. Eng.; Brian Willock, P. Eng.; Jonathon Helmus; and Jeff Markovic, ASCT.



Community members assisting with construction

Resources

The Country Lanes Demonstration Project cost approximately twice as much as paving a full width. Elevated costs are due to:

- Learning curve for each lane
- Hand formed concrete driving strips
- Dry mix concrete failure and replacement
- Permeable paver driveway connections and lane entrances
- Granite cobble lane entrances
- Broken concrete driveway connections
- Working with new materials (structural grass, structural soil, etc.)
- Construction of the lane in strips rather than one uniform section

It is estimated that as crews become accustomed to the new construction methods and the design is refined, Country Lanes will cost between 25-100% more than asphalt. It is estimated that a lane with extruded concrete driving strips will cost between 50-100% more than full width asphalt. A Country Lane with structural gravel driving strips is estimated to cost 25-50% more than full width asphalt.

Country Lanes will always cost a premium over asphalt lanes, as Country Lanes have more construction steps than asphalt lanes, and there is considerably more detailed or hand work.



A Country Lane in Vancouver

Lessons learned

As a demonstration project involving three different types of lanes, the Country Lanes Project helped resolve several design, maintenance and planning concerns before being implemented city-wide.

Design and construction. A number of design and construction approaches will be incorporated in future Country Lane projects. Although too numerous to mention here, some of the key recommendations include:

- Use structural grass across the entire lane surface of the lane to create a stronger, more durable grid network.
- Construct driving strips using a structural grass product filled with gravel to provide the necessary strength while still providing visual indication to drivers for the best driving path.
- Pre-grow grass to be used in the structural grass material to improve “finished” look of lane.
- Use 100mm layer of structural soil across the entire lane width regardless of structural grass treatment.

Drainage. Preliminary results show that the lanes are highly permeable and there are no associated runoff problems. However, it is difficult to direct any overland flow when using a structural grass material. Unlike asphalt lanes, structural grass does not easily allow for a lip to be constructed to channel flow. Care needs to be taken during construction to ensure that the grade of the lane does not direct flow into driveways.

Community involvement. Although community feedback was generally positive, some residents were disappointed by the lack of input they had in their lane design. It is important that residents are both involved in the design process and understand the cost limitations associated with “customizing” the lane.

Maintenance. The ongoing maintenance associated with Country Lanes has yet to be determined. As Country Lanes have the potential for frequent and time consuming maintenance, monitoring over the next 5 to 10 years is important to assess their long term requirements. Possible maintenance issues include:

- Mowing of grassed areas
- Maintenance of planted areas including watering and weeding
- Concrete cracking of the driving strips, driveway connections and lane entrances
- Deterioration of the structural grass product including plastic decomposition, settlement and flexing
- Potential drainage issues associated with overland flow

To date, the City has assumed highly repetitive maintenance such as mowing while watering and weeding will be done by lane residents. Inadequate maintenance may alter the permeability of the lane and create major drainage issues.

Utilities maintenance and construction access.

Lanes are frequently used for utility services which need to be repaired or replaced. Repairing a Country Lane after a utility cut is likely to be a very difficult and costly task which could require the reconstruction of the entire lane. This raises the question about the appropriateness of using a structural grass product which may not be easily repaired and replaced.

Similarly, lanes are often used for construction vehicles. In many cases the only access available for construction vehicles may be to use the Country Lane. These properties need to be identified and flagged at the building permit stage. In addition, a larger damage deposit would be required from the builder. The City currently requires an \$800 deposit for lane damage. This amount would need to be significantly increased to cover any damage caused to the Country Lane and to deter contractors from using the lane if other access options are available.

Next steps

Although the project has been a success, several key design and implementation issues have yet to be resolved before Country Lanes can be confidently implemented throughout the city. Most notably perhaps is the need to determine how Country Lanes can be equitably and efficiently accommodated by the Local Improvement process.

The City is currently evaluating implementing Country Lanes Vancouver-wide through the Local Improvement process. Two implementation processes are under review. One would involve establishing one standard lane design suitable for all situations that would be included as part of the City Bylaw. The second option is to design each lane individually with input from the community. In this case, a bylaw would need to be drafted for each lane. It would also require significant staff resources to undertake the community consultation and design process.

Based partly on the success of the Country Lanes Demonstration Project, the City is planning to develop a “Sustainable Street” that incorporates the lessons learned from the lanes and their design features.