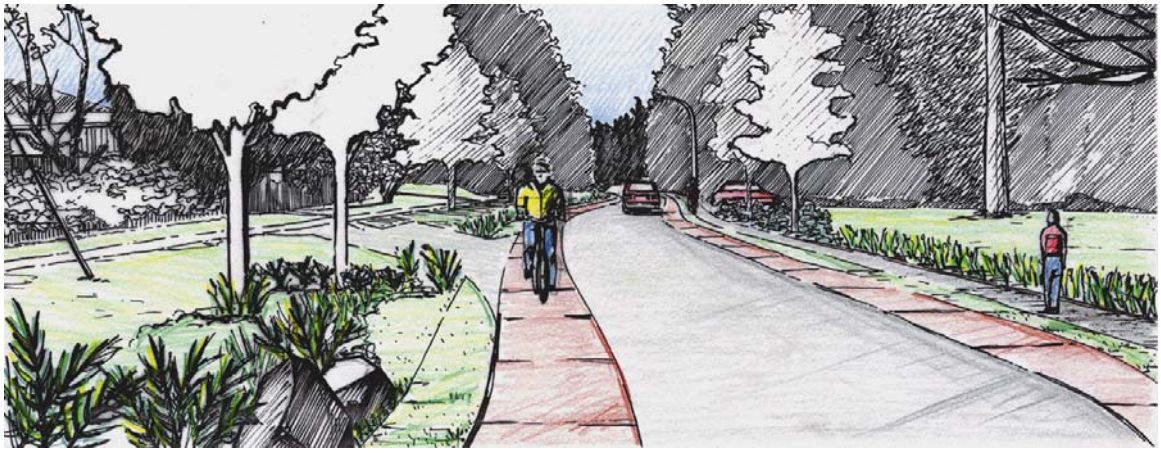
Crown Street



Vancouver's First Environmentally Sustainable Street

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Crown Street – Vancouver's First Environmentally Sustainable Street

INTRODUCTION

The City of Vancouver has undertaken an exciting new approach to residential street design and storm water management. Vancouver's Crown Street has recently become the City's first environmentally sustainable street. The design uses innovative ideas to integrate transportation into an environmentally sensitive setting. The City of Vancouver wishes to nominate this project for the TAC Environmental Achievement Award.

SCOPE & HISTORY

In 2001, residents of the 6200 block of Crown Street petitioned to have their badly deteriorated street reconstructed and the chronic run off problems addressed. The residents expected a standard curb and gutter treatment to replace the existing soft shoulder conditions. However, the Official Community Plan for the area aimed to maintain a rural aesthetic and disallowed such treatment. The City responded by suggesting a new and innovative design that would fit the overall character of the area, beautify the street, and nurture the salmon habitat that existed just south of the street.

Modelled after a design in Seattle called SEA Street (Street Edge Alternatives), which used vegetated swales and retention ponds to facilitate storm runoff, the Crown Street design aimed to address historic drainage issues, water quality in the nearby salmon streams, pedestrian safety, parking, and of course the deteriorated road surface. After a thorough consultation process with the residents and a few modifications to suit their needs, the proposal gained the support of the residents and design began.

The main goals of the design were to provide an adequate surface for vehicle travel, force speeding traffic to slow down, facilitate pedestrians safely, provide ample resident and visitor parking, and address a wide range of drainage issues.

The drainage issues were of particular consideration for the design. Crown Street is a tributary to the Musqueam Watershed which contains the last two salmon bearing creeks in Vancouver. There have been significant efforts in the past by The Musqueam Indian Band, The David Suzuki Foundation and other interest groups to preserve and restore the Musqueam Watershed. Thus, the City wished to support these efforts by applying a unique environmentally friendly design. The design aimed to minimize impervious surfaces and facilitate runoff through a network of swales and retention ponds. This would allow water to infiltrate the ground and be filtered by natural vegetation before reaching the creeks. In addition, it would reduce volume extremes entering the creeks in periods of heavy rain.

Upon further analysis, it became clear that if anything was to be done to better the salmon habitat in the creeks, the culverts that facilitated them under Crown needed to be replaced in conjunction. This drove the cost of the project up too high and it was put on hold until the finances could be worked out. In April 2003, The Federation of Canadian Municipalities, Green Municipal Funds, awarded the City a grant of $563, 000, almost half of the projected costs. This funding made the project possible and in October 2004 construction of Vancouver's First Environmentally Sustainable Street began.

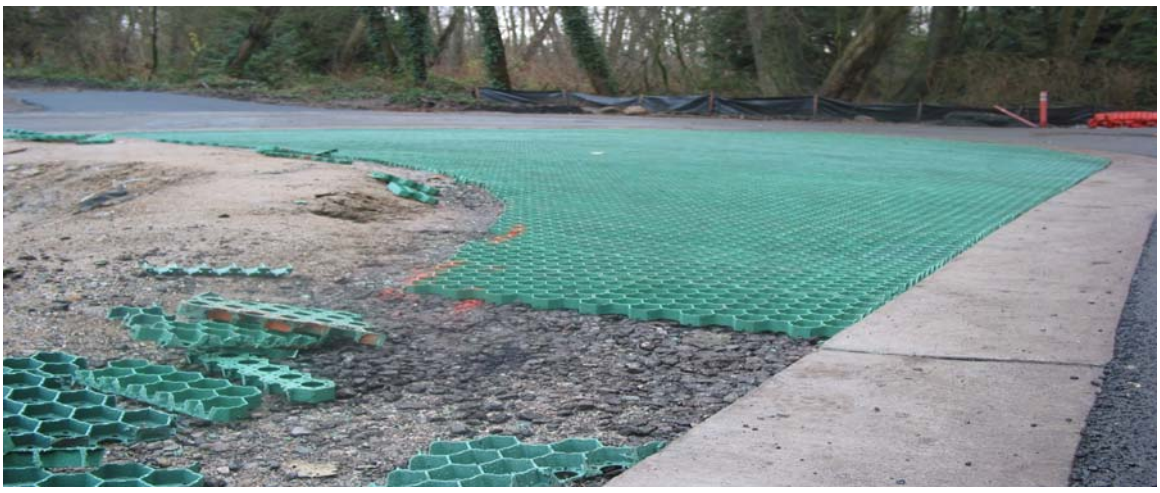
INNOVATIVE TECHNOLOGIES

In order to achieve the design goals, Crown Street showcases a number of innovative technologies and recycled products. When one looks upon Crown, it's obvious that it is a special street. Upon closer inspection, it is the innovative ideas that make it so special, they are as follows.

Structural Grass Road Edges

This is one of the most interesting features of the project. Flanking the road are 0.6m wide strips of structural grass. This structural grass was created by using a product called Golpla. Golpla is basically plastic matting with honeycomb shaped voids on the surface. It is laid down on a structural base and filled with topsoil. The base and Golpla can support the load of a car while the topsoil allows for grass growth. So grass actually becomes part of the driving surface. The picture below shows Golpla on a structural soil base.

Figure 1: Golpla on Structural Soil



As shown in Figure 1, the Golpla is honeycomb in shape and sits upon a structural soil base. Once the voids are filled with topsoil it provides a medium for grass growth and can support the load of a car.

Structural Soil

One of the hidden treasures on Crown, structural soil is a product innovated by the City of Vancouver. It is basically structural fill with some organic material mixed in. It provides support while allowing the grass to root itself beyond the topsoil that fills the Golpla.

Swales and Retention Ponds

A network of swales and retention ponds was built to facilitate storm runoff. Swales are basically ditches but shallower and broader so they're not so obtrusive. This network is designed to handle a 10 year storm with overflow directed into the adjacent park land. The system allows water to infiltrate the ground while being filtered by natural vegetation before entering the salmon habitat south of the project. The swales and ponds were decorated with over 3000 native plants. These plants will help filter contaminants from the water as well as reduce erosion.

Crown Street exists at about a 5% grade. As a result drop structures made from recycled granite curbs were used in the swales as weirs and drop structures.

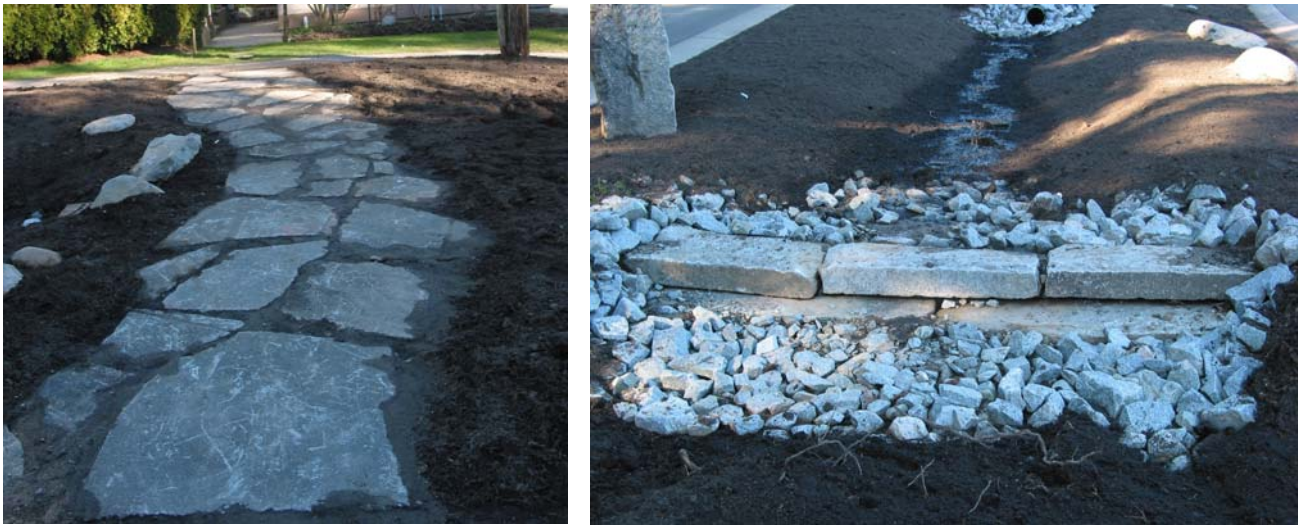
Figure 2: Swale

As illustrated in Figure 2, the swales are shallow and unobtrusive. Once planted and hydroseeded they add green space to the streetscape.

Recycled Concrete Sidewalks and Granite Curbs

Consistent with the environmental theme of the project, recycled concrete walks were provided from the road to the residents' properties. They are made up of old sidewalks that have been removed from other areas of the City and salvaged for applications such as this. Additionally, granite curbs that were installed during Vancouver's formative years then removed for street upgrades have also been salvaged and applied as drop structures in the swales. Some of these granite curbs are nearly a century old; the residents of Crown were thrilled to have a piece of the City's history used on their new street. Both applications of recycled materials add an architectural finish and reduce waste.

Figure 3: Recycled Concrete Walks and Recycled Granite Drop Structure

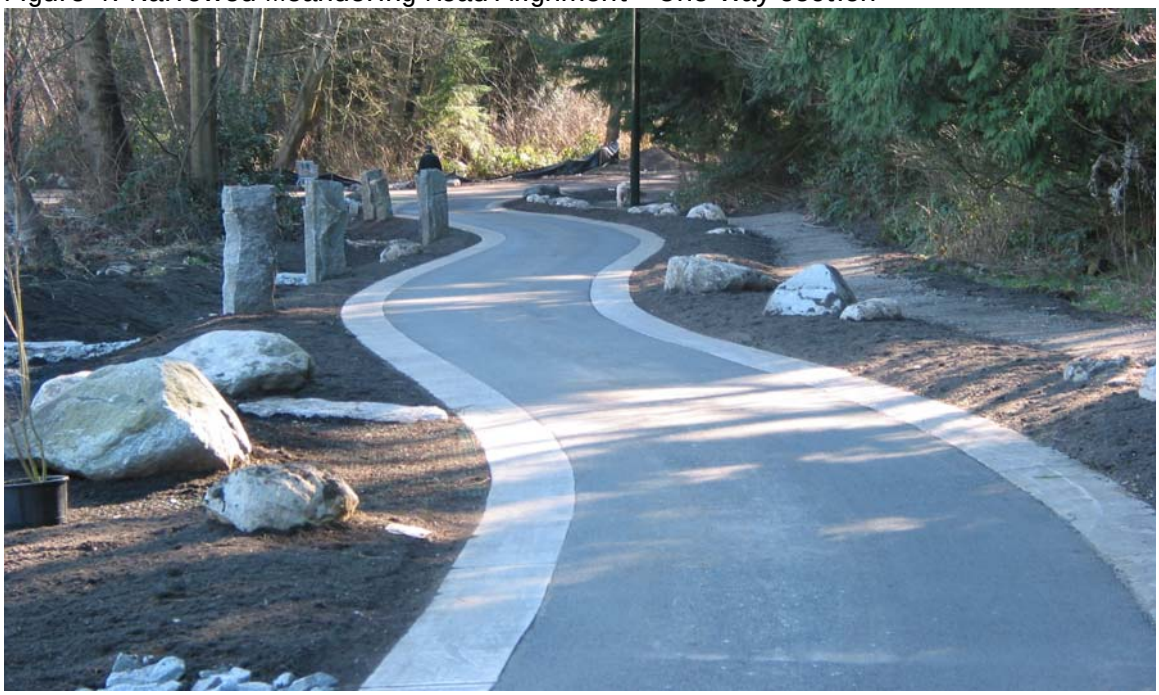


As shown in Figure 3, the use of recycled materials adds an architectural finish.

Narrowed Meandering Road Alignment

To minimize impervious surfaces further, the road width was narrowed to 6.7m rather than the City's usual standard of 8.5m. A narrow asphalt surface of 3.5m is bordered by 1m strips of concrete that are designed to visually narrow the road. Then there is an additional 0.6m on each side of structural grass, bringing the total road width to 6.7m.
Also, the alignment meanders gently which breaks up long sightlines and forces traffic to slow down.
The picture below is of a one way section where the road forks around a vegetated island which can be seen in the left of the picture. This one way section is only 3.0m wide, made up of 2.2m of asphalt and bordered by .4m of concrete, as shown in Figure 4.

Figure 4: Narrowed Meandering Road Alignment – One Way Section



As illustrated in Figure 4, the narrowed, meandering alignment forces traffic to slow down to safely manoeuvre the gentle curves.

COSTS AND FUNDING

Phase I of Crown, including consulting fees, cost $875K. A traditional curb and gutter treatment has been estimated at approximately $450K. However, being the showcase

project that it is, Crown had many special features that won't be included on a more standard version of the project. If we consider making the following changes, we see the cost begin to come down dramatically. The following table illustrates the potential savings for similar projects in the future.

Table 1: Cost Savings For Future Sustainable Streets Projects

Item	Scope	Approximate Savings
Eliminate meandering Alignment	Savings occur on survey, factor of difficulty for construction and reduction in material quantities.	$35 000
Eliminate Golpla	Although an attractive item on the project, elimination of the Golpla offers large savings.	$50 000
Pathways	There were two pathways constructed for Crown. These likely would not be on future projects.	$20 000
Street Lighting	New street lighting was included on Crown, however normally it is a separate local improvement option.	$40 000
Reduce Landscaping	On future projects the landscaping should be reduced.	$20 000
Consultant Fees	As part of the Grant Agreement it was necessary to hire an outside Consultant. This will not be necessary on future projects	$100 000
Contractor's Profit	Also part of the Grant Agreement, it was necessary to contract out the construction. City crews will perform future projects eliminating profit margins.	$120 000
	Total Savings	**$385 000**

As shown in Table 1, if we eliminate costs that won't be applicable to future projects as well as reduce the level of detail, the price becomes comparable to a standard curb and gutter treatment. By making these changes we maintain the environmental benefits of a swale/pond system and can still include significant landscaping; two benefits that a curb and gutter option can't offer at a similar price.

An additional and very significant benefit of the Crown Street project is the degree of community building and participation. The project, through its consultation process, has brought the residents together with themselves and the City. City staff reflect fondly of the general buzz that the neighbourhood was feeling when construction was

ongoing. With the residents playing an active role in the planning of the street, they take pride in its success and maintenance.

THE FUTURE OF CROWN

Crown Street is currently being monitored in partnership with the University of British Columbia, Institute for Resources Environment and Sustainability. Dr. Ken Hall has started the monitoring period with a group of students and it is intended to continue over the next 5 years. Also, there are preliminary plans to establish some permanent monitoring equipment so long term data can be collected and compared to similar data that is collected throughout the city. Crowns success will be based on

- The quality of sediments that accumulate in the ponds
- The ground water quality collected from piezometers
- Trace metals in discharge storm runoff
- Total hydrocarbon fraction
- Temperature, conductivity, turbidity

All this data will be compared to a street just east of Crown, Holland Street, which uses a traditional curb and gutter system. We will be able to compare the water quality leaving both streets to determine how well Crown Street is performing. Finally, the number of the salmon spawning season each year will also reflect Crown's success. Once the success of Crown has been determined, the City hopes to make it a local improvement option for residents petitioning to have work done to their street.

CONCLUSION

Crown Street is an exciting new face to residential street design in Vancouver. Utilizing innovative ideas it pushes forward the City of Vancouver's initiatives to provide residents with functional streets while minimizing impact to the environment. The efforts shall no doubt have a positive impact on the creek habitat as well as the residents' day to day use of the new street. Based on the monitoring period and overall success of the project, the treatment could become a local improvement option for residents petitioning to have their street reconstructed. The City of Vancouver wishes to thank The Federation of Canadian Municipalities for their contribution as well as The TAC Environmental Council for their consideration towards Crown Street for the Urban Environmental Achievement Award.