TECHNICAL BULLETIN

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IN LANDSCAPE &
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Case Study:
Brookswood, Township of Langley, BC
alternative stormwater management

I. Introduction

Figure 5-1 - This system provides for two-way residential traffic, and a grassy or gravel shoulder that is constructed to allow for infiltration.

An alternative stormwater system for the community of Brookswood-Fernridge was developed in the early 1990s. To enable infiltration, the design for Brookswood-Fernridge called for a drainage system designed for the 5-100 year storm events, the 100-year storm consists of designated overland flow routes to minimize property damage and the 5-year system would convey flows to the respective ditch, culvert, pipe and detention ponds. These shallow grass swales are underlain with a crushed gravel trench and a continuous length of perforated pipe. Surface runoff from the road and adjacent properties flows to the grass swale where it infiltrates. When the ground is saturated, stormwater is conveyed to a designated inlet or outfall. The system provides water quality and groundwater recharge benefits through a stormwater infiltration process and provides an economic response to the project's stormwater management objectives.

II. Project Description

STORMWATER SYSTEM

Type of System Constructed
GRASS SWALE WITH PERFORATED PIPES AND INFILTRATION TRENCHES

Year
1980

Level of Stormwater Management
100-YEAR STORM

This technical bulletin investigates the rural residential community of Brookswood in the Township of Langley, BC. The Brookswood development is a rural residential community comprised of one-quarter acre lots. The objectives of the stormwater system for this development project were: (1) to reduce the flood potential in an area with a high water table; and, (2) to recharge ground water. In addition, the Brookswood development was required to re-use the native soil, due to its suitability for infiltration. The infiltration system installed in Brookswood is commonly used in the Lower Mainland region where suitable soils exist.

The residential area consists of single detached houses on a grid lot pattern. The streets in Brookswood drain to shallow grass swales at either side of the paved roadway. To maximize infiltration, a continuous length of perforated pipe is aligned below these grass swales. The perforated pipes are embedded within an infiltration trench composed of crushed gravel, and underlain with a layer of filter cloth as shown in Figure 5-2 and 5-3. Runoff infiltrates through the surface of the grass swale and continues to move through the underlying soil to eventually recharge the ground water. Overflow is directed along the surface of the swale and through the

INFRASTRUCTURE SYSTEM

Street Pattern
GRID

Utilities
GRID

Development Type
RURAL RESIDENTIAL

Typical ROW
20 METERS

perforated pipes to retention ponds where the water is held until displaced by subsequent runoff events. This infiltration system reduces flooding and ensures that any overflow is conveyed and adequately stored in retention ponds.

III. Site Conditions

Located southwest of the Township of Langley near the Surrey/Langley Township border, the site is in an area historically used for rural agriculture. The site is a largely rural region of the Fraser Valley with a very gently sloping topography.

The site is comprised of a sandy, gravely pervious soil, characterized by a pre-development condition of rapid drainage. The site is located on the Langley-Brookswood aquifer, which occupies a raised delta along the west boundary of the Township. The aquifer covers an area of about 38 square kilometres and extends into Surrey. The aquifer is comprised of coarse textured glacial outwash deposits and sands and gravels, and has an average thickness of 30 meters. The Langley-Brookswood aquifer is largely unconfined (in many areas the groundwater is encountered directly beneath the topsoil) and the water table is generally shallow (less than ten meters below ground surface). The aquifer is reportedly recharged from precipitation and exfiltration from local creeks (Water Resource, 2000).

IV. Evaluation

To date, in terms of infiltration and runoff mitigation, the system is considered successful by the Township of Langley. The infiltration system has met the objectives of recharging groundwater and mitigating flooding - the soil infiltration capacity allows for adequate drainage for even 100-year storm events.

Generally, the soil profile exhibited in Brookswood is highly suitable for infiltration, which is a desirable quality when applying BMPs to deal with stormwater issues. Yet, in this case the soil's ability to filter and cleanse is impeded by: 1) the depth and composition of the topsoil; and, 2) the relatively high water table in the area (pumps are used in the area to keep the water table down). The current low-density development of the Brookswood community allows the system to remain stable. To ensure an adequate system into the future, the Township recognizes that a high level of homeowner understanding of alternative stormwater management is required.

Best Management Practices
BMPS, such as infiltration swales and trenches, are one of the most effective ways to deal with non-point source pollution.

To address these issues the Township has developed a Water Resource Management Strategy. It reports that the most relevant issue relating to stormwater drainage is declining water quantity, which is attributed to reduced runoff. The Water Resource Management Strategy "recommends actions include upgrading and development of a Master Drainage Plan (MDP) and provision of erosion protection measures for areas of concerns"(Water Resource, 2000). The main goal of the MDP "is to

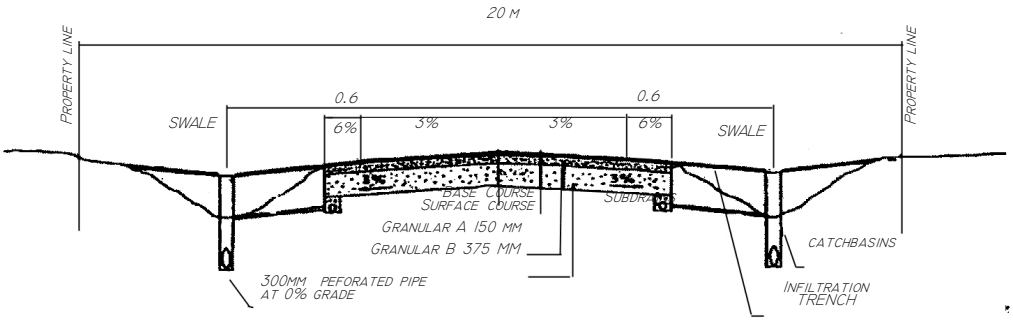

Figure 5-2 and 5-3 - Typical Cross Section and ROW.

develop a basin-wide drainage scheme to minimize potential increases of flood flows in receiving streams caused by the short-term and long-term developments in the basin" (Ibid).

MAINTENANCE

The infiltration trench with perforated pipe requires a system flush almost yearly due to the site's low gradient, which causes foliage and vegetative debris to accumulate in the pipes. This maintenance cost is between $1000-$5000 per year, and is competitive to the maintenance costs associated with conventional systems.

Maintenance costs increased due to a winter storm event that occurred in the early 1980s. Freezing temperatures during this event caused the ground to freeze and created a completely impervious condition (even the catchbasins froze), which was followed by flooding. This flooding was a prevalent problem throughout the Lower Mainland. The system was built to remain workable throughout conditions of ground freeze such that, as long as the catchbasins remained unfrozen the pipe would run full and the water would move straight to the outfall.

V. Summary

Table 5-1 - Case Summary

	Brookswood-Ferndale	
Project Description		
DEVELOPMENT		
Location	Langley	
Development Type	single-family residential	
No. of Units	6 units	
Developer	Penzer Enterprises	
Size (ha)	1.5	
Date of Construction	1993	
ROAD		
Street Pattern	curvilinear	
Typical ROW Width	20 meters	
UTILITIES		
Pattern	curvilinear	
STORMWATER		
Type of System	exfiltration/ infiltration	
Area Service	n/a	
Level of SW	5-100-year storm	
Large Storm Situation	3" in 24 hour	
System Length (m)	70	
Culverts	yes	
Site Condition		
BIOPHYSICAL		
Settlement Patterns	agricultural	
Post Development Condition	residential	
HYDROLOGICAL		
Average Rain Event	>1/2 inch in 24 hours	
GEOTECHNICAL		
Soils Profile - surface	to 30 metres	
Soils Profile - sub soils	none	
Site Grades	undulating	
Water Table Elevation	high	
Soil Infiltration Capacity	560mm/hour	
HABITAT		
Urban Forest Coverage	n/a	
Evaluation		
PROJECT COSTS	1993	2000
SWS costs	$5,292	$10,500
cost per ha	$3,528	$7,000
cost per acre	$429	$852
cost per linear metre	$76	$150
cost per linear foot	$23	$46
MAINTENANCE COSTS		
Yearly Expenses	$1000-$5000	
SWS Expected Lifespan	5-10 years	

Stormwater Installation Cost

Cost Equivalent to $150 PER METER SQUARE (2000)

The stormwater system installed in the Brookswood development allows infiltration of stormwater and provides an economic response to the project's stormwater management objectives. To date, there have been no comparative studies done between conventional curb and gutter systems and the Brookswood stormwater management system that establish a correlation between ground water quantity and quality (specifically with regard to the effects of stormwater infiltration and the disparities in discharges). Studies that monitor Brookswood's alternative stormwater system alongside the performance of conventional systems in neighbouring communities are needed to better understand their culmulative effects on such environmental factors as: groundwater quality and quantity; the quality of aquatic habitat; and flooding and erosion in local river and stream systems.

Resources

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Watt, Eugene, Engineering Department, Port Moody. 2000 Personal contact

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