Village of Harrison Hot Springs

LIQUID WASTE MANAGEMENT PLAN

CTQ

ENGINEERING PLANNING URBAN DESIGN

HARRISON HOT SPRINGS

Naturally Refreshed

DECEMBER 2016

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

STATEMENT OF QUALIFICATIONS & LIMITATIONS

The Liquid Waste Management Plan (the "Report") contained herein has been prepared by CTQ Consultants Ltd. ("CTQ") for the benefit of The Village of Harrison Hot Springs ("VHHS") in accordance with the agreement between CTQ and VHHS, including the scope of work detailed therein (the "Agreement").

The information used to prepare the storm and sanitary models and this Report was obtained from record information provided by VHHS, site reconnaissance by CTQ and various tests to check the model.

The Report has been prepared to assist the VHHS to understand the existing condition of the overall storm and sanitary system and to plan for future growth within the community. Possible growth patterns were provided to CTQ by VHHS to enable future population scenarios to be included in the storm and sanitary model.

The information contained herein is to be read as a whole and such sections should not be extracted and read out of context.

As the Report is based on possible future population and development growth patterns, trigger points for capital and operational improvements have been identified and should be updated periodically to reflect actual conditions.

Unless expressly stated to the contrary in the Report or the Agreement, CTQ:

- shall not be responsible for any events or circumstances that may have occurred since the date on which the Report was prepared;
- shall not be responsible for any inaccuracies contained in information that was provided to CTQ by other firms or agencies;
- agrees that the Report represents professional judgment for the specific purpose described in the Report and the Agreement, but CTQ makes no other representations with respect to the Report or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed, in writing, by CTQ and VHHS;
- as required by law;
- for use by governmental reviewing agencies.

Any use of this Report is subject to this Statement of Qualifications and Limitations. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report.

LETTER OF SUBMISSION

CTQ

ctqconsultants.ca

Project No.: 12004-21

COST

TIME

QUALITY

December 8, 2016

Village of Harrison Hot Springs
495 Hot Springs Road
Harrison Hot Springs, BC V0M 1K0

Attention: Mr. Ian Gardner, Operations Manager

Re: Village of Harrison Hot Springs Liquid Waste Management Plan

Please find attached the Liquid Waste Management Plan. Do not hesitate to contact either myself or other CTQ Consultants Staff at any time regarding this report. I can be reached at the address and telephone number below, or via email at mcameron@ctqconsultants.ca.

Sincerely,
CTQ CONSULTANTS LTD.

Matt Cameron, P.Eng. FEC
Managing Partner
MHC/bw

1334 St. Paul Street, Kelowna, BC, V1Y 2E1 Phone: (250) 979-1221

Page 1 of 1

SIGNATURES

Report Prepared By:

Dylan deSousa, EIT
Project Engineer
CTQ Consultants Ltd.

Report Prepared By:

Justin VannPashak, EIT
Project Engineer
CTQ Consultants Ltd.

Report Reviewed By:

2016-12-08
Matt Cameron, P. Eng., FEC
Managing Partner
CTQ Consultants Ltd.

ACKNOWLEDGEMENTS

As a Resort Municipality, VHHS faces the difficulty of constructing and maintaining infrastructure sufficient to serve a large number of day trip and short term visitors sustained by a relatively small tax base.

The VHHS operations personnel were invaluable in finding archived data, responding to inquiries, and providing context. Thanks to:

Madeline MacDonald, Chief Accounting Officer
Ian Gardner, Manager of Operations
Bruce Malfait, Utilities Chief Operator
Todd Kafi, Public Works Foreman

EXECUTIVE SUMMARY

Intro

The Village of Harrison Hot Springs (VHHS) is located in the Fraser Valley among the Coastal Mountains on the southern shore of the 65 km long Harrison Lake. The Village is serviced by a sanitary network comprised of approximately 12 km of sanitary piping, 6 lift stations, and one siphon. The main trunk runs along McCombs Drive, eventually crossing the Miami River at the Hot Springs Rd bridge. The Sanitary system outlets from Pump Station 1 (PS 1) to the Waste Water Treatment Plant. The existing storm system infrastructure spans across 24 major catchment areas, primarily discharging into the Miami River. The stormwater is conveyed through approximately 10 km of storm pipes and ditches and is directed to 22 separate outfall locations.

The purpose of the Liquid Waste Management Plan (LWMP) is to establish a strategy for providing the optimum levels of service to the tax payers of the community now and into the future. This will be accomplished by updating information from previous studies and reports and by using more sophisticated software able to analyze more robust data dynamically. Complexity for this effort arises due to the seasonal variation in demand, a result of tourist traffic surges during the summer months.

Existing and future storm and sanitary system demands were reviewed and modeled by Autodesk Storm and Sanitary Analysis ™ (SSA) software. The impact of developing to the full vision of the Zoning Bylaw of 2015 and combining various growth scenarios were investigated. The model was used to quantify upgrades to the pipe network, outfalls, pump stations, and the WWTP. Seasonal effects, pipe capacity, and minimum velocity analysis impacts were quantified, facilitating recommendations for future improvements.

Findings

The most common deficiencies found in the analysis of the VHHS Storm System include, pipes undersized for 10-year storm event, lack of storm water treatment in at discharge locations, and pipes in poor condition. The existing system has five pipe segments which are undersized for the design storm events, which cause surcharging of the connected manholes. Three more segments will become undersized after estimated future growth occurs. Urban runoff within VHHS currently does not undergo treatment prior to discharge to into the Miami River and Harrison Lake. This untreated urban runoff can potentially carry contaminants which are harmful to the overall health of the existing aquatic ecosystems

Three types of deficiencies were encountered in the analysis of the VHHS Sanitary System. The most common deficiencies were low velocities in pipes, the result of which is insufficient cleanout of solid waste which can lead to serious issues if not addressed. Six pipes were found to be of insufficient diameter or slope to achieve minimum velocity criteria. There was only one over-capacity length of sanitary sewer and it coincides with a section that is also deficient in pipe-full velocity, both these deficiencies can be solved by the recommendations made in this report.

Storm Recommendations

There are many techniques for addressing storm pipes which do not meet flow requirements for design rainfall events. The most common include increasing the diameter or slope of the storm main, installation of storm water detention facilities, and implementing Low Impact Development (LID) techniques to help promote groundwater infiltration. It is recommended that all storm mains that are currently surcharging during the 10 year – 1 hour storm event to be upsized to a suitable diameter to convey the required flow rates. It is also recommended to evaluate the possibility for stormwater reduction through LID principles for future developments and during upgrades to the existing system. Storm water treatment for sediment and pollutants prior to discharge into Miami River is imperative to the overall health of the existing ecosystems. Storm water can be fully treated for standing oils, sediment, and other heavy metal pollutants with the installation of gravity based Oil and Grit Separators and Bio-filtration Units. It is recommended to have some form of stormwater treatment at all discharge locations into the Miami River or Harrison Lake.

Sanitary Recommendations

There are two common methods for improving low pipe-full velocities in sanitary pipes, they can be used in conjunction or independently and both require replacement of existing infrastructure. The most used solution is the installation of pipes with increased diameter to the deficient pipe, larger pipes achieve cleanout velocities at flatter grades. Alternatively, you may also simply increase the grade of a replacement pipe with the same diameter as the deficient pipe. This is suitable in cases where downstream pipes are smaller diameter than the suggested replacement pipe. If replacement is deemed too costly, regular flushing of deficient sanitary lines can be a temporary maintenance plan. Our recommendation is that all deficient pipes be replaced with higher grade pipe, resized to a larger diameter, or a regular cleanout schedule be established to ensure no damage to adjacent properties. These recommendations vary based on location of deficiency, higher priority pipes are recommended for replacement. Since the only section of pipe that was over capacity was also velocity deficient, increasing its diameter to address deficient velocity will also improve its capacity sufficiently to meet demand.

General Recommendations

Missing data provided one of the most significant difficulties in analyzing the current and future capabilities of the Liquid Waste System. It is highly recommended that efforts to collect necessary data to evaluate VHHS liquid management be undertaken as soon as possible. This includes a survey of all existing drainage and sanitary infrastructure and flow meters to be used in both the storm and sanitary pipe and manhole networks. Effort should be made to record this data in formats that are compatible with modern software, primarily GIS, Civil 3D,and SSA in an effort to keep costs of future analysis down and facilitate rapid updates to information. Project sheets and cost estimates have been provided for this work. It is strongly recommended to adopt MMCD Design guidelines, with modifications as necessary, for all construction of Municipal Works.

On-Going Projects

VHHS is already pursuing the replacement of the siphon system that crosses the Miami River. The analysis performed in the SSA model used to produce this report will be useful in the design of this crossing. Price estimates and some details were included in this report where they were relevant.

Summary Tables
Tables 10.1, 10.2 & 10.3 in **Section 10** identify and quantify the capital improvements identified as part of this Liquid Waste Management Plan. Upgrades to the storm and sanitary infrastructure will be required as population increases. Pricing and timing will depend on demand management strategies, preliminary design, and the ability to secure funding. Refer to the relevant sections for discussion and recommendations.

Final Remarks
This Liquid Waste Management Plan is to be read in conjunction with the Figures and Tables found in the appendices, which include recommendations based on CTQ's knowledge and expertise in Liquid Waste Manage Systems. In the process of generating the LWMP, CTQ has made available Civil 3D and GIS shapefiles for improved record keeping. These files are fully editable and can be updated to reflect changes to the system should VHHS carry out any improvements.

ABBREVIATIONS

LWMP	Liquid Waste Management Plan
FVRD	Fraser Valley Regional District.
MMCD	Master Municipal Construction Documents. Documents created by MMCD Association - a non-profit society supported by BC municipalities to create improved construction documents for roads, sidewalks, sewers, water, traffic signals and street lighting.
OCP	Village of Harrison Hot Springs Official Community Plan. Bylaw 864 March, 2007.
VHHS	Village of Harrison Hot Springs.
SSA	Autodesk Storm and Sanitary Analysis
IDF Curve	Intensity Duration Frequency Curve
EPA SWMM	US Environmental Protection Agency Storm Water Management Model
WWTP	Waste Water Treatment Plant
LID	Low Impact Development
Report	Liquid Waste Management Plan
MOTI	Ministry of Transportation and Infrastructure
DCC	Development Cost Charge

1. Introduction

1.1 Storm System Background

Stormwater is rain that lands on rooftops, roads, and sidewalks that runs over the land and into the stormwater sewer system, instead of soaking into the soil. The increase in hard, impermeable surfaces (e.g. roads, sidewalks, roofs etc.) associated with urban development and expansion can greatly increase the amount of stormwater runoff, how fast it moves, and the pollutants it picks up along the way.

The traditional approach to dealing with stormwater was simply to move it away as quickly as possible through pipes and engineered waterways. However, dealing with this large volume of fast moving, often polluted water can cause many problems, including:

- Erosion and flooding
- Degraded water quality
- Ecological damage and habitat loss
- Expensive stormwater sewer system upgrades

These issues are likely to grow much more challenging in the future due to two increasing pressures:

- Population growth, leading to more development and densification, and;
- Climate change, resulting in more severe storms.

The Village of Harrison Hot Springs (VHHS) has 24 major catchment areas with 22 catchment's releasing directly into the adjacent water courses. This abundance of storm water discharge locations creates a difficulty with maintaining water quality entering the streams and rivers. A second underlying issue, is the relatively flat topography throughout the village. This presents special difficulties in ensuring pipes can handle the ultimate flow generated by rainfalls to meet the desired hydraulic requirements.

1.2 Sanitary System Background

Reliable management of Sanitary Wastewater is vital to a community's environmental, economic and social wellbeing. The function of a safe and dependable sanitary handling and treatment has implications beyond its significant impact on health. A well-managed sanitary system contributes to the local economy by adequately accounting for future growth, facilitating optimized development, ensuring efficient land-use, preserving low development costs, and facilitating efficient maintenance of infrastructure.

The VHHS sanitary utilities make possible the collection, conveyance, and treatment of sanitary waste water. Extensive development and redevelopment projects have been undertaken over the past 10 years as the popularity of the community grows and demands on the underground utilities continue to grow. There are 6 pumps, one siphon, and approximately 12 km of sanitary pipe works supporting the community. Each pump and siphon connects a sub-basin to network which is ultimately destined for the WWTP. The majority of this pipe is asbestos concrete, in more recent years the use of PVC pipe has become more representative.

Previous analysis and design details CTQ reviewed in preparation of the LWMP include the Sewer Modeling Report completed by Dayton and Knight in 2003. The use of more sophisticated software like SSA should generate results that are more representative of the dynamic nature of demand and use cycles, it also allows for optimized solutions. There is a close relationship between water usage and sanitary system usage, as such, the Water Master Plan generated by CTQ in 2015 was relied on to provide further insight into the results and data produced for this report.

The demands of a destination community like VHHS are unique and of a seasonally varying nature; this fact has implications on all aspects of the model. Summer months have higher demands and this unique demand pattern is localized within the system, affecting some sub-basins more dramatically than others. This fluctuation has an effect on everything from peaking factors to usage time patterns and will certainly have an effect on the requirements of the system.

It is with these challenges and constraints in mind that VHHS has commissioned CTQ Consultants to generate a comprehensive Liquid Waste Management Plan, reviewing and providing recommendations for its Sanitary and Storm Water Management strategies. This will in turn provide a road map for a systematic handling of liquid waste in the community with significant implications for the economic, environmental, and social health of VHHS into the future.

1.3 Purpose of this Liquid Waste Management Plan

A LWMP provides opportunity for a community to develop a long-term plan for building, financing, and managing their liquid waste infrastructure. The LWMP forms the implementation plan for the management of liquid waste from collection, through treatment and resource recovery, to residual disposal. The LWMP will act as the controlling framework for the capital planning and improvement schedule storm and sewage infrastructure

Careful planning and integration of water, sewage and stormwater infrastructure can minimize environmental impacts, reduce life cycle costs and provide flexibility for future expansion or upgrade off facilities. Asset management is essential for the long-term investment in infrastructure represented in a LWMP where components are often designed for 50 to 100 years of service. Infrastructure such as storm and sanitary sewers, on-site sewage disposal systems, storm runoff detention and infiltration systems, water supply pipelines, reclaimed water transmission pipelines, pump stations, treatment plants, industrial pre-treatment facilities, sludge treatment works, and outfalls must be viewed as interrelated systems to a certain degree. Below is a list of key objectives when developing a LWMP.

1. Identify the issues and problems	7. Options for liquid waste reduction
2. Discuss the evaluation criteria	8. Options for liquid waste reuse
3. Review population and flow projections	9. Evaluate feasible options
4. Review past relevant reports	10. Prepare capital plan
5. Review existing infrastructure	11. Select preferred options
6. Prioritize feasible options	12. Document the process

VHHS recognizes the challenges ahead, and commissioned CTQ Consultants to generate a comprehensive Liquid Waste Management Plan to review the system in its their entirety and provide a roadmap for the storm and sanitary infrastructure over the coming years.

2. Existing System (2016)

2.1 Storm Infrastructure

The existing storm system infrastructure spans across 24 major catchment areas. All but two of the catchments have direct outfalls into the Miami River or Harrison Lake, the remaining convey water down Hot Springs Road via a ditch system and infiltration through rock- pits. The extent of the storm infrastructure includes the following below (**Figure 1**):

- 155 manholes and drywells;
- 14 storage/infiltration locations;
- 1,509 metres of ditch;
- 8,702 metres of storm pipe with diameters ranging from 200mm to 900mm ; and
- 20 outfall locations.

The existing system contains many components that are reaching the end of their life expectancy, damaged, or constructed with out-dated materials. A list outlining these deficiencies is outlined in **Section 5.2**.

2.2 Sanitary Infrastructure

The sanitary sewer piping material within the VHHS is predominantly Asbestos Cement, which was used as a pipe material for the majority of the system prior to the use of PVC pipe. Both materials have similar hydraulic properties. The system is primarily a network of gravity pipes connected to a handful of forcemains. The existing Sanitary System is comprised of the following:

- 7 pressurized forcemains;
- 7 pump stations;
- 152 junctions; and
- Over 12,000 metres of pipe.

The seven (7) pressurized force mains convey material from the seven (7) pump stations, connecting sub-basin to sub-basin. All sub-basins terminate in Sub-basin 7, ultimately collecting at Pump Station 1 (PS 1) which outlets via twin 400mm PVC forcemains to the WWTP. Design of the replacement for the Siphon commonly referred to as PS 7 that crosses the Miami River is currently underway and will be completed in 2017 by CTQ.

2.2.1 Process Overview

The Existing Sanitary System is illustrated on **Figure 4** and **Figure 5**, which show the configuration of pipes and the boundaries of the sub-basins, respectively.

1. Sub-basin 1 is the southernmost sub-basin in the system, collecting sanitary waste and conveying in to PS 4 where a 4 kW pump is used to outlet to sub-basin 2 by forcemain to MH 12;
2. Sub-basin 2 collects waste water along the trunk line that conveys waste north along McCombs drive to PS 3, another 4 kW pump is used to outlet to sub-basin 4 via forcemain to MH 29;
3. Sub-basin 3 outlets via forcemain to sub-basin 2, servicing the Springs RV Resort, and using a 1.1 kW pump at PS 5;
4. Sub-basin 4 collects and conveys from MH 29 to PS 7, which is the siphon connection that crosses the Miami River adjacent to the Hot Springs Rd bridge and outlets into sub-basin 7;
5. Sub-basin 5 collects and coveys from the westernmost development to PS 6 where a 1.1 kW pump outlets to PS 3 via forcemain;
6. Sub-Basin 6 collects and conveys sanitary waste from the northeast corner of VHHS to PS 2, where a pump outlets to Sub-Basin 7 via forcemain; and
7. Sub-basin 7 is the low end of the system, all sanitary waste is collected into PS 1 and then a 16.5 kW pump is used to transmit the liquid waste to the WWTP.

3. Storm System Modeling

3.1 Hydrological Design Criteria and Assumptions

For the development of storm system model, Autodesk Storm and Sanitary Analysis (SSA) was selected as the ideal software to utilize. SSA is the premiere software for storm water modeling allowing the user to, with ease, run different rainfall scenarios and add projected growth for future models.

3.1.1 Model Parameters

SSA has many hydrology methods to choose from, the most appropriate was the US Environmental Protection Agency Storm Water Management Model (EPA SWMM). The Horton infiltration method was used, which allows the model to account for decrease in infiltration rates over time as soils go from completely dry to saturated. Different hydraulic routing techniques are used to predict the flow of storm water within a system. Hydrodynamic Routing was used in SSA to allow for channel storage, backwater, entrance losses, exit losses, flow reversal, and pressurized flow.

The Manning Equation was used for partial pipe flow through Gravity Pipes:

$$Q = \frac{AR^{0.667}S^{0.5}}{n}$$

Where:Q = Rate of Flow in m^3/s
A = Cross Sectional Area in m^2
R = Hydraulic Radius (A/wetted perimeter) in m

S = Slope of Hydraulic Grade Line
n = Roughness Coefficient = 0.011 for all pipe

3.1.2 Rainfall Criteria

VHHS Subdivision and Development Bylaw No. 578 does not indicate any storm water management guidelines, it is recommended that an update to the bylaw be completed to include information outlined throughout the LWMP and MMCD guidelines. For the purpose of the LWMP the criteria followed will be based on MMCD Guidelines and surrounding municipalities and agencies.

The Minor System is made up of street gutters, catch basins, and underground pipes. The purpose of the minor system is to prevent flooding and property damage and minimize public inconvenience and must be designed to handle storm events with a return period of up to 10 years. The Major System is comprised of overland flow, outfalls, and storage areas and must be designed to protect the public and prevent significant property damage due to flooding from rare storm events with a return beyond the 10 year storm event

The Intensity Duration Curve (IDF Curve) used was based on the following IDF curve equation and design coefficients. The coefficients used are based on the values generated for the District of Agassiz in 2014. These values are transformed into hyetographs for each rainfall event, and then entered into SSA to develop the design rain fall events used in the model.

IDF Curve Equation: $I = AT^b$

Where: *I = rainfall intensity (mm/hr)*

T = time in hours; and

A & B = coefficients

TABLE 3.1 IDF Curve Values for 1 Hour Storm

Return Periods (Years)	2	5	10	25	50	100
Coefficient A	11.4	13.8	15.5	17.5	19	20.5
Coefficient B	-0.413	-0.427	-0.434	-0.441	-0.445	-0.448
Rainfall Depths (mm)	11.4	13.8	15.5	17.5	19	20.5

3.1.3 Time of Concentration

Time of concentration is defined as the time needed for water to flow from the most remote point in a sub-catchment to the sub-catchment outlet. Time of concentration is calculated by SSA using the EPA SWMM kinematic wave method. This method takes into account rainfall intensity, surface roughness coefficient, sub-catchment width, and sub-catchment average slope. The sub-catchment width is a user defined value which is calculated from the length of sub-catchment channel and contributing area to define a comparable rectangular channel. Adjustments should be made to this width parameter to produce a good fit to measured runoff hydrographs. This value is generally a key parameter in calibrating peak flow and total runoff volume.

3.1.4 Land Use and Imperviousness

In order to develop an accurate model, each sub-catchment area must be characterized by land use and corresponding impervious and pervious area. These values dictate how much of the rainfall is absorbed back into the ground vs. captured and conveyed by storm infrastructure. For the sub-catchments which have only a single land use type, the following table was used to define the impervious percentage. These values were determined with multiple checks throughout the town. For areas that do not fall within one of the categories or for combination areas, AutoCAD area calculations were completed to define the impervious percentage.

TABLE 3.2 Land Use Impervious Coefficients

Land Use	% Impervious
Commercial / Industrial	80
Multi Family	60
Subdivision	40
Natural Environment	2

4. Sanitary System Modeling

4.1 Hydrological Design Criteria and Assumptions

The analysis of the sanitary system is most dependent on adequately quantifying the contributing population. As discussed, an accurate estimate of population for VHHS is difficult to establish due to the proportion of tourist traffic to permanent residents. It is unlikely that simply using developed unit counts or average zone densities will adequately account for the variable demand. VHHS hosts over 300,000 visitors annually. Various alternative demand and population estimates have therefore been considered.

4.1.1 Model Parameters

Hydrodynamic link routing was selected for use in the SSA Model.
The Hazen – Williams Equation was used for pressurized flow through forcemains:

$$Q = \frac{CD^{2.63}S^{0.54}}{278780}$$

Where: Q = Rate of Flow in L/s

D = Internal Pipe Diameter in mm
S = Slope of Hydraulic Grade Line in m/m
C = Friction Coefficient = 120 for all pipe

The Manning Equation was used for partial pipe flow through Gravity Pipes:

$$Q = \frac{AR^{0.667}S^{0.5}}{n}$$

Where:Q = Rate of Flow in m^3/s
A = Cross Sectional Area in m^2
R = Hydraulic Radius (A/wetted perimeter) in m
S = Slope of Hydraulic Grade Line
n = Roughness Coefficient = 0.011 for all pipe

Pump performance data and curves were provided for PS 1 through PS 6, details for the Siphon at the Miami River Crossing were available as part of our work at designing a replacement. Manning roughness values are 0.011 for both Asbestos Cement and PVC pipes.

4.1.2 Population Criteria

A very conservative population was used to account for seasonal variability. It assumes full development of the zones as per VHHS Zoning Bylaw 1020 of 201. This is likely the most conservative population estimate (highest population), estimating a total population of 4447.

The following densities were used in corresponding zoning:

TABLE 4.1 Zoning Densities

ZONE	DENSITY (people/ha)
R1	28
R2	6
R3	35
R4	31
C1	30
C2	55
C3	30
C4	30
C5	32
C6	30
C7	91
P1	200

Water demand information is available through CTQs previous work on the Water Master Plan, this information was used to check the SSA model results. These methods should provide an adequate representation of existing demand constraints and be a suitable platform upon which projection models of future demand can be based. The growth models used in CTQ's Water

Master Plan to project future populations were used to establish the best population estimate with growth under consideration.

The MMCD provides design guidelines for Sanitary Systems, these were referenced in establishing criteria from per capita average flow and peaking factor calculation.

Per capita average flow: 300 L/d/c
Inflow and Infiltration: 0.17 L/s/ha

Peaking Factor Calculation : PF: $6.75P^{-0.11}$

Where: PF = Peaking Factor
P = Population and Equivalent

Detailed time pattern in keeping with that used in water master plan available in **Appendix B.**

4.1.3 Inflow and Infiltration

The MMCD also provides inflow and infiltration allowances:

Inflow and Infiltration: 0.17 L/s/ha

It was noted in the Dayton and Knight report (2003) that higher than expected flows may have been a result of winter rain infiltration, this will be considered as we move forward with more detailed models.

5. Storm System Deficiencies (2016)

The VHHS has not yet adopted set subdivision and development guidelines which would specify design and construction policies and procedures. As a result, various storm infrastructure components throughout the Village have been designed and constructed in a way that adversely effects the existing system. Some examples of these deficiencies include flat or negative slope storm mains, and undersized pipe diametres. To prevent issues such as these from occurring in the future, It is strongly recommended that MMCD standards be adopted for municipal infrastructure design and construction.

Recommendation

- Adopt MMCD Design guidelines, with modifications as necessary, for all construction of Municipal Works

5.1 Existing System Model Results

The pipe information and model results for the existing VHHS storm infrastructure system can be found in **Appendix A**. The model results are based on criteria discussed in **Section 3.1**. Existing pipe information was gathered from asbuilts supplied by the village and the 2008 Drainage Features Survey by Eaton Land Surveyors Ltd.

Autodesk SSA was used to analyze the drainage systems ability to handle the 1 in 10 year rainfall event. The pipes that are undersized for this event will be outlined in **Section 5.2**. Main trunk lines at the low end of the system that are directly connected to the outfall will be given a higher priority due to their high impact on the entire system when flooding or failure occurs. Pipes sections that are near the high end of a sub-catchment system will be given a lower priority.

5.2 Existing System Deficiencies

Table 5.1 list all deficiencies that were found with the existing drainage system. A number of deficiencies were found upon initial review of the drainage system including:

- Pipes with negative slope.
- Pipes undersized for 10-year storm event.
- Clogged manholes.
- Pipes in poor condition.
- Lack of storm water treatment at discharge locations.

TABLE 5.1 Storm Infrastructure - Existing System Deficiencies

Deficiency ID	Location	Pipe/Manhole ID	Deficiency	Immediate Fix Required?
1	**Cedar Avenue**	D101 to D102	Negative Slope	Yes
2	**Maple Street**	D303 to D305	No Slope	No
3	**Angus Estates**	Varies	R.O.W. registration on private properties	No
4	**Naismith Avenue West, Driftwood Avenue and Chestnut Avenue**	Varies	Ditch alteration by property owners	Yes
5	**22 Discharge Locations**	Varies	Stormwater treatment required	Yes
6	**Driftwood Avenue**	D908	Clogged manhole	Yes
7	**Pine Avenue**	D1701 to D1704	Vitrified clay pipe	Yes
8	**Cedar Avenue**	D101 to D102	Pipe undersized during 10-year storm	Yes
9	**Lillooet Avenue**	D406 to D409	Pipe undersized during 10-year storm	Yes
10	**Lillooet Avenue**	DW508 to D501	Rock pit overflow pipe required	Yes
11	**Lillooet Avenue**	DW509 to D501	Rock pit overflow pipe required	Yes
12	**Echo Avenue**	D602 to D606	Pipe undersized during 10-year storm	Yes
13	**Hadway Drive**	D1913 to D1912	Pipe undersized during 10-year storm	Yes
14	**Myng Crescent**	D2101 to OUT21	Outfall undersized during 100-year storm	Yes
15	**Myng Crescent**	D2201 to OUT22	Outfall undersized during 100-year storm	Yes

16	**Hot Springs Road**	Full Length	Road revitalization to include storm system	Yes
17	**McPherson Road**	D2413 to D2414	Collapsed Pipe Section	Yes
18	**McCombs Drive & McPherson Road**	Along McCombs Drive	Standing water in ditch	Yes
19	**McCombs Drive**	D1606 to OUT15	Collapsed Pipe Section	Yes

Hot Springs Road is one of the main storm deficiencies throughout the Village. The road is under the Jurisdiction of the Ministry of Transportation and Infrastructure (MOTI), however the lack of storm water management along the road corridor has an impact on the overall VHHS storm system. VHHS should work with MOTI to develop a design that both works for storm control and functionality.

Recommendation

- Collaborate with MOTI to ensure future road improvement projects suit the stormwater management requirements for VHHS.
- Asses other projects that may be completed in-junction with the works on Hot Springs Road.
- Complete a thorough inventory of storm assets in VHHS, carried out in a standard geospatial system and including CCTV of existing pipes.

5.3 Allowable Runoff from Developments

Currently the VHHS does not require developers to construct on-site works to limit peak stormwater discharges. Future developers should be limited to a maximum post-development release rate equal to the pre-development 10-year peak flow rate. The developer will be responsible for providing onsite systems to regulate the peak storm water discharge to the proposed criteria. Typically this is achieved with storage facilities, flow control structures, and infiltration techniques.

Recommendation

- Update bylaws to ensure new developments sufficiently control peak flows and water quality exiting the site.

5.4 Storm Water Quality and River Discharge

Land development and urbanization will have a negative impact on effected watersheds and the quality of stormwater run off if certain measures are not taken. The following are the main negative impacts that may occur.

- Alteration of the natural hydrology of the water course in the form of increased peak flows and decreased infiltration.
- Soil erosion which can negatively affect riparian areas and existing ecosystems. This results from the increase in peak flows down stream of developments.
- Wash-off of pollutants such as oil and grease, pesticides, fertilizers, fine sands, and road salt.

The first two items can be easily mitigated with constraints implemented to limit the peak flow that can be released from future developments. Infiltration through LID techniques should be promoted wherever possible to limit the overall change to the watersheds natural hydraulic cycle.

The majority of pollutants are contained in what is known as the "first flush", this is the initial portion of the rainfall which produces surface run-off. Based on the Ministry of Environment (MoE) Guidelines, water quality treatment is required for frequently occurring rainfall events. All flows up to 50% of the 2-year (1 hour duration) flow must be routed through some form of water quality treatment facility utilizing “best management practices” to remove suspended solids and floatables. This guideline should be followed at all discharge locations to Miami River. **Appendix A** shows at table listing each outfall and the corresponding flow required to be treated.

Currently VHHS has 19 storm water outfalls directed into the Miami River and a single outfall into Harrison Lake. Each outfall is lacking adequate erosion protection and water quality management. Implementing the latter will significantly help to reduce the impact on the surrounding ecosystems and protect aquatic life in the Miami River from the discharge of contaminated waters.

Recommendation

- Install water quality control systems at all 20 storm outfall locations as per Improvement Project # 11.

5.4.1.1 Rip Rap Design

Storm water outfalls typically have high velocities during peak rainfall events. These high velocities will eventually erode the ground, changing the natural formation of the river banks if proper erosion protection is not implemented. Storm water outfall locations should be lined with rip rap for protection as per the Ministry of Transportation (MoT) guidelines in **Appendix E**.

5.4.1.2 Treatment Options

Storm water treatment for sediment and pollutants prior to discharge into Miami River is imperative to the overall health of the existing ecosystems. Storm water treated can be categorized into two main types:

- Gravity based Oil and Grit Separators (OGS)
- Bio-filtration

Gravity based OGS are the most effective way to remove standing oils and sediment from collected storm water. However, OGS systems can lack the ability to capture other pollutants such as, Lead, Copper, Zinc, Phosphorus, and Nitrogen. This can be mitigated through the use of a pollutant filter media during the separating process.

Bio-filtration works best to remove all suspended solids and pollutants from the storm water, but lacks the ability to filter most oils. Bio-filtration systems are recommended for areas with decreased oil levels in the storm water, such as residential neighborhoods. In commercial and industrial areas, which have stormwater with increase oil content, bio-filtration can be used in line with gravity based OGS systems to provide a full array of stormwater treatment.

5.5 Storage and Infiltration

Storage and infiltration techniques are an effective way to decrease peak flows throughout the conveyance system. Ultimately, this will reduce the overall size of pipes required to convey flows through the village to the outfall locations. Storage facilities can be in a magnitude of different forms but most commonly:

- Underground Storage such as tanks, drywells, and rock pits.
- Above Ground Storage such as dry ponds, wet ponds, and swales.

The type of storage is entirely dependent on the specific application and site characteristics. Infiltration techniques should be used wherever possible, permitting site soil conditions are acceptable. Some LID storage and infiltration design alternatives can be found in **Appendix E.**

6. Sanitary System Deficiencies (2016)

6.1 Linear Assets

One of the weaknesses of the VHHS Sanitary System is the lack of readily available information with respect to as-built drawings and construction conditions. There were discrepancies in the record information and drawings reviewed by CTQ for the completion of this report. These issues related primarily to the geospatial locations of assets. Field measurements were taken to reconcile all known issues, but it is highly recommended that full inventory of sanitary assets be carried out. This will serve to verify the outcome of this analysis, while also ensuring future efforts to model and plan the Sanitary System are most reliable.

Because VHHS has not yet adopted development guidelines which include design and installation policies, there has been some inconsistency in the requirements for the design and construction of municipal infrastructure. In 2014, VHHS experienced a sanitary line rupture which appeared to be due to inconsistent backfill - a rock in direct contact with the line created a point load, weakening the line at that location. Other underground work within the Village has also revealed installation practices which could adversely impact the service life of underground assets. To address these concerns in the future, it is strongly recommended that MMCD standards be adopted for municipal infrastructure design and construction.

Recommendation

- Complete a thorough inventory of sanitary assets in VHHS, carried out in a standard geospatial system and including CCTV of existing pipes. The use of widely utilised coordinate systems like NAD 83 UTM Zone 10 offer advantages when dealing with municipal infrastructure over large areas. The use of localized co-ordinates on a scale as large as VHHS is strongly discouraged.
- Adopt MMCD standards of design and construction for municipal infrastructure.

6.2 Existing System Model Results

The pipe information and model results for the existing VHHS storm infrastructure system can be found in Appendix B. The model results are based on the criteria discussed in Section 4.1. Existing pipe information was gathered from record drawings supplied by the village and the 2003 Dayton and Knight report "Sanitary Sewer Modelling to Assess System Deficiencies."

Autodesk SSA was used to analyze the sanitary system's ability to handle the current demand on the sanitary system. This tool offers more accurate results, better able to quantify dynamic sanitary systems than older, steady-state models. There are two main deficiencies that the model can identify with regards to the sanitary pipe network, velocity and capacity deficiencies. The pipes that are inadequate in these regards will be discussed in Section 6.3. As is the case with the Drainage system analysis, downstream main pipelines will be given higher priority than end runs at the high end of the system.

Lacking flow data information was also an issue with regards to modelling the existing sanitary system. Flow data serves to provide a better understanding of the effect of drainage cross-connects to the sanitary system, a costly inefficiency that cannot be thoroughly quantified without flow data. Sanitary usage data also provides means to more accurately calibrate the model and provide trends for future infrastructure planning.

Recommendation

- Along with the thorough inventory of existing assets, installation of equipment to monitor sanitary flows should also be carried out. This will greatly improve processes of identifying current deficiencies and indentifying future priorities.

6.3 Existing System Deficiencies

Table 5.1 lists all deficiencies that were found with the existing sanitary system.

TABLE 6.1 Storm Infrastructure - Existing System Deficiencies

Deficiency ID	Location	Pipe/Manhole ID	Deficiency	Immediate Fix Required?
S1	**McCombs Drive**	S23 to S26	Low Flow Velocity and Low Capacity	Yes
S2	**Miami River Drive**	S29 to S30	Low Pipe-Full Flow Velocity	No
S3	**PS-7 Siphon Replacement**	S37 to S39	Exposed Pipeline in Miami River Bed	Yes

6.4 Surcharged pipes

Surcharge issues at current demands were not found, detailed flow data would provide a basis for more accurate surcharge analysis.

6.5 Over capacity Pipes

According to the MMCD, gravity sewers should be designed to flow at less than full depth as follows:

Sewer Diameter	Percentage of Diameter
150 mm and 200 mm	50%
250 mm	60%
300 mm and larger	70%

One segment of pipe is over capacity, between manholes S23 and S26. This pipe also produces sub-optimal pipe-full velocities and is listen in the S5 deficiency ID. The recommended remedy will solve both the velocity and capacity problems.

6.6 Low Velocity Pipes

The MMCD suggests a minimum pipe-full velocity of 0.60 m/s for gravity sewers, for force mains, the minimum velocity should be 0.75 m/s. Low flow velocity is most likely at end sections of the system and areas constrained by minimal elevation changes. The use of design and constructions standards that deviate from the MMCD may also contribute to these deficiencies.
Recommendations focus on replacement of deficient infrastructure, with recommended designs.

6.7 Pump Systems

Without flow data, proper evaluation of the pump systems is not possible. Performance and capacity can better be assessed once flow metres are installed. This will also facilitate the evaluation of pump conditions and maintenance schedules.

6.8 Operation and Maintenance Recommendations

Four top end/ dead end segments of sanitary pipe were discovered to have deficient pipe full velocities to ensure pipe cleanout as follows:

Manholes	Location	Diameter	Length	Turnover Volume	Flush Volume
S59 to S60	**Echo Avenue**	0.15 m	116 m	2,050 L	6,150 L
S98 to S97	**Lakeburg Crescent**	0.15 m	64 m	1,131 L	3,393 L
S144 to S145	**Miami River Drive**	0.2 m	104 m	3,267 L	9, 801 L
S148 to S149	**Rockwell Drive**	0.2 m	148 m	4,650 L	13,450 L

Rather than replace these deficient pipes with larger diameter pipes or increasing their grades, an inspection and maintenance plan should be established. This plan should include periodic inspection by CCTV and flushing at regular intervals to ensure adequate performance of the infrastructure.

Recommendation

- CCTV inspection and regular flushing of deficient pipe segments. It is most cost effective to ensure regular CCTV inspection of these locations coincides with other CCTV projects to save on incremental costs. Flushing procedure should involve the flushing of three (3) times the full turnover volume for the pipe segment being flushed. The flushing of sanitary pipes may be carried out at the same time as water system flushing to cut costs.

7. Future Development and Demand

7.1 Population Projections

Population growth is challenging to predict for a community such as Harrison Hot Springs. VHHS is heavily tourism-dependent, with a high percentage of seasonal residents. The lack of industry, combined with the single sector job opportunities, aging demographic, and relatively small population within the community mean that typical population growth models cannot be applied compares Statistics Canada population and age data for VHHS and the much larger Fraser Valley Regional District.

TABLE 7.1 Census data

	1986	1991	1996	2001	2006	2011	Average Annual Growth Rate
Village of Harrison Hot Springs (VHHS)	569	655	898	1,343	1,573	1,468	6.3% (1986-2011) 4.2% (1996-2011)
Median Age (VHHS)				43.7	49.8	54.0	

Fraser Valley Regional District (FVRD)	222,397	237,550	257,031	277,593	1.7% (1996-2011)
Median Age (FVRD)		36.6	38.2	39.6	

Between 1986 and 2011, the population of VHHS increased an average of 6.3% per year. During the five year interval between 2006 and 2011, the population **decreased** by 6.5%. In contrast, the population of the FVRD has steadily increased since 1996, at an average of 1.7% per year, with no period of decline. The growth rate for VHHS over the same time interval was 4.2% per year.

It is also worth noting that although the median age of residents in both VHHS and FVRD increased in the decade between 2001 and 2011, the median age of VHHS residents increased by over 10 years, whereas in the FVRD as a whole the difference was a more modest 3 years.

Because the profile of the VHHS population is so distinct from FVRD, and indeed from the province of BC, projecting that population 25, 50 or even 10 years into the future is challenging. **FIGURE 3** illustrates several different population projections for VHHS. The 1986-2011 census data can be seen as a heavy, bright green line, with the most recent census population (1,468) noted at year 2011. Statistical analysis of the census data results in a linear regression illustrated by the black dotted line, with a population forecast in the year 2036 of 2,733.

The 1.7% FVRD growth rate is represented by the red dashed line. For VHHS, this growth rate underestimates the current population, and does not fit the population profile. Likewise, the blue dashed line, which is based on 3.87% cumulative annual growth (based on the VHHS census data between 1986 and 2011), results in a population in the year 2036 which is also out of line with the current declining population.

For resort focused communities, disposable income of people both within and outside the province has a large impact on population growth, and is strongly connected to the economy.

The average annual rate of growth between 1986 and 2011 is 6.3%, and is illustrated by the purple dashed line resulting in an estimated year 2036 population of 2367 people. Similarly, when only the data between 1996 and 2011 is examined, the 2036 population is estimated at 2,417 (orange dashed line).

So where does that leave the VHHS population projection over the next two decades? In the absence of a crystal ball, and with the development community subject to highs and lows similar to those experienced over the past 25 years, it is estimated that the 2036 population will be in the range of 2,367-2,733 people. It will be important to re-evaluate this projection when the next census becomes available in 2016. A single large development, or sharp increase or decrease in the number of overnight tourist visits, could greatly impact the projected numbers.

Recommendation

- Re-evaluate population projections when the 2016 census data becomes available.

7.2 Development Projections

In 2014, a detailed study was conducted by the VHHS Department of Development and Community Services which projects ultimate build out densities for all land within the Village. A copy of this report is included as **APPENDIX D**.

Based on OCP land use designations, except where zoning has been amended to a Comprehensive Development Zone, maximum future development is predicted to be comprised of 15,976 m^2 commercial area, 1,240 potential new redevelopment units, and 45 units of residential infill (construction on vacant lots).

FIGURE 2 shows the Development Projection areas, as well as a breakdown of the type of development anticipated in each area.

8. Future System Analysis

8.1 Future Storm System Analysis

8.1.1 Guiding Principles

The LWMP will act as the major guiding principles for the development of an accurate Capital Plan to aid the VHHS in proactively maintaining the level of service of storm infrastructure. This can be achieved through implementing a strategic plan which repairs and replaces storm infrastructure before failure occurs, which may result in high unforeseen costs. Regulating the impact of new development on existing storm infrastructure is a key component to limiting the required downstream improvements as future growth occurs. New development should be limited to the amount of storm water that can be released into the VHHS storm conveyance system as per **Section 5.3**. This will help to reduce down-stream impacts to the existing drainage system. In tandem with limiting the allowable future development run-off, storm water peak flows can be reduced through other source control measure including, groundwater recharge systems, storage and flow control systems, and various Low Impact Development (LID) techniques.

8.1.2 Storm Water Reduction

Low impact stormwater management strategies should be used wherever feasible to reduce the amount of stormwater throughout the system. Effective source control measures can greatly reduce peak flows throughout the network and reduce the size of inline infrastructure such as, storm mains, storage facilities, and treatment units. Conventional drainage systems should be allowed only when low impact methods prove unfeasible. However, if conventional systems are to be implemented, appropriate measures should be taken to mitigate potential negative downstream impacts. Below is a list of LID techniques that are commonly used, for more detail see **Appendix E**:

- Infiltration rain garden and swales;
- Bio swales;
- Wetland Restoration;
- Pervious pavements; and

- Green roofs;
- Drywells.

Recommendation

- Evaluate the possibility for stormwater reduction for future developments and during upgrades to the existing system.

8.1.3 Model Development and Analysis

The future model was based on the VHHS full development projections presented in **Appendix D**. The model parameters were update to match the full build out scenario for future analysis. The future model was analyzed based on the infrastructure capacity to operate during the 10 year storm event. Growth of the VHHS seems to be primarily infill of existing developed areas with potential for new developments to occur. When greenfield sites are developed, bylaws should be set in place to limit the amount of storm water allowed to be release offsite as per **Section 5.3**. This will significantly reduce the amount of storm infrastructure improvements which will be required as further development occurs. **Table 8.1** list all deficiencies that were found with the future drainage system upon analysis of the model results.

TABLE 8.1 Storm Infrastructure - Future System Deficiencies

Deficiency ID	Location	Pipe/Manhole ID	Deficiency	Immediate Fix Required?
20	**Miami River Drive**	D1003 to OUT10	Pipe undersized during 10-year storm	No
21	**Balsam Avenue**	D1406 to D1405	Pipe undersized during 10-year storm	No
22	**Diamond Street**	D1904 to D1906	Pipe undersized during 10-year storm	No
23	**Mount Street**	D905 to OUT9	Upgrade swale to piped system	No
24	**Nasmith, Echo, and Lillooet Avenue**	Varies	Upgrade streets to full urban standard	No
25	**Myng Crescent**	D2201 to OUT22	Outfall undersized during 100-year storm	No

Recommendation

- Collect storm system flow data with a non-contact flow meters and rain gauge that can be located throughout the VHHS system.

8.2 Future Sanitary System Analysis

There is one known sanitary infrastructure improvement underway that has been included in the sanitary system model:

- PS 7 Siphon Upgrades

8.2.1 Guiding Principles

To preserve full value of the information being generated, interpreted, and analyzed, it is our goal to provide editable, up-to-date, convertible, and accessible system data. This record and model-generated data can then serve as a resource than can be referenced and modified at the discretion VHHS. This information will take electronic form in the most up-to-date formats available, chiefly Civil 3D and GIS, adequate for use as a living repository for system data as new information becomes available and modifications are made. Paper and hard disk back-up will also be provided.

8.2.2 Sanitary Waste Reduction

Much research has been undertaken to define effective strategies for improving waste management efficiency. The prevailing notion is that efforts to increase the efficiency of waste management programs are most effective when they conform to the “waste hierarchy” of reduction, reuse, and recycling, in respective order of efficacy. This applies to liquid waste as much as any other form of waste. Engineering solutions that pertain to the hierarchy generally address functions of reuse and recycling, but any waste management program should prioritize the physical reduction of waste, as it has been demonstrated to be most successful at minimizing demand on waste management systems.

In the context of liquid waste reduction, successful strategies are economic in nature, composed chiefly of stimulus or penalty structures to encourage a reduction in waste production and to discourage inordinate load on the system. Household reduction of waste can be facilitated through the use of grey water processes, a measure of re-use that results in system-wide reduction of liquid waste. The BC Building Code (BCBC) is pro-active in implementing new technology into codes and guidelines for use in net-zero building design and construction. It can be a useful resource in identifying liquid waste reduction strategies. Notably in this context, the BCBC provides guidelines for the installation, use, and maintenance of composting toilets, an increasingly popular method of reducing household liquid waste output.

With regards to the reduction of liquid waste at the scale of the VHHS, it is difficult to generate widespread buy-in. As such, strategies that implement engineered processes with intentions of re-use and recycling can add value to a municipal waste management program. Technology and processes have been used to successfully re-use and recycle part of the liquid waste produced in other jurisdictions. These jurisdictions have had success in recapturing energy from sanitary waste, often in the form of methane. This method has been used in the developing world and developed world alike, speaking to its simplicity and Return on Investment (ROI).

Ultimately, an effective strategy to increase the efficiency of the VHHS sanitary network should address the incremental reduction of waste that must be processed. Some strategies apply economic techniques, others involve infrastructure upgrades. The first and likely most effective solution should be to eliminate cross-connections. Technological improvements can also be used to facilitate re-use, recycling, and energy recapture, adding value to the VHHS Liquid Waste Management System. Below is a list of Waste Reduction techniques that are commonly used, for more detail see **Appendix E:**

- Grey water reuse;
- Biosolid Fertilizers; and
- Biogas recapture;
- Composting.

9. Cross-connection Assessment

Storm and sanitary cross connections appear to be a prevalent problem for the VHHS. Cross connections can lead to un-necessary demands on the wastewater treatment plant (WWTP) and sanitary conveyance network. Possible cross connections may include the following:

- Roof, foundation and lawn drains tied directly into sewer system;
- Cracked sewer mains and services;
- Uncapped or broken cleanouts and faulty manholes; and
- Direct tie-in from catch basin or storm main.

Reduction of cross connections flows can show a significant cost savings from a WWTP perspective. Below outlines a list of all know storm services tied into the sanitary system.

- Rainbow RV Park(606 Hot Springs Road)
- Village Motel(280 Esplanade Ave.)
- Harrison Hot Springs Resort
- Residential Development South of Emerald Avenue

The first step in reducing the volume of liquid waste conveyed by the sanitary system in VHHS will be to quantify then eliminate the introduction of storm and ground water into the system. This can be achieved through the identification and elimination of cross-connection points and minimizing rain dependent infiltration. The estimated impact of cross connections in VHHS is somewhere between 150 L/s and 290 L/s It is therefore evident that eliminating this unnecessary treatment would result in substantial savings for VHHS. An infrastructure inventory and status assessment will provide the needed data to carry out the analysis in conjunction with flow data collected by the recommended flow metres.

10. Capital Works Plan and Cost Estimates

TABLE 10.1, 10.2 & 10.3 identify and quantify the capital improvements identified as part of this Liquid Waste Management Plan. Upgrades to the storm and sanitary infrastructure will be required as population increases. Pricing and timing will depend on demand management strategies, preliminary design, and the ability to secure funding. Refer to the relevant sections for discussion and recommendations.

10.1 Drainage Improvements

TABLE 10.1 Capital Improvements

Improvement ID	Project	Purpose	Cost	DCC Eligible?	Priority
1	Cedar Avenue	Increase pipe capacity	**$ 131,052**	Partial	Medium
2	Lillooet Avenue "A"	Increase pipe capacity	**$ 144,760**	Partial	Medium
3	Lillooet Avenue "B"	Provide rock-pit overflow	**$ 50,824**	Partial	Medium
4	Echo Avenue "A"	Increase pipe capacity	**$ 138,920**	Partial	Medium
5	Hadway Drive	Increase pipe capacity	**$ 119,752**	Partial	Medium
6	Pine Avenue	Upgrade degrading pipe	**$ 288,908**	Partial	Medium
7	McPherson Road	Remove/replace collapsed pipe	**$ 32,906**	Partial	Medium
8	McCombs Drive & McPherson Road	Catchbasin adjustment & installation	**$ 18,094**	No	Medium
9	McCombs Drive	Upgrade collapsing pipe	**$ 176,288**	No	Medium
10	Myng Crescent	Increase pipe capacity	**$ 95,924**	Partial	High
11	Storm Water Treatment	Stormwater treatment required at outfalls	**$1,200,000**	Partial	High
12	Miami Drive	Increase pipe capacity	**$ 180,534**	Partial	Low
13	Balsam Avenue	Increase pipe capacity	**$ 119,020**	Partial	Low
14	Diamond Street	Increase pipe capacity	**$ 61,980**	Partial	Low
15	Mount Street	Increase pipe capacity	**$ 248,412**	Partial	Low
16	Nasmith Road	Upgrade to piped system	**$ 403,668**	Partial	Low
17	Echo Road "B"	Upgrade to piped system	**$ 439,060**	Partial	Low
18	Lillooet Avenue "C"	Upgrade to piped system	**$ 421,000**	Partial	Low

High Priority Total	**$1,873,674**
Medium Priority Total	**$1,101,504**
Low Priority Total	**$1,295,924**
Grand Total	**$4,271,102**

The priority rating has been given to each project based on the following criteria:

- High: If the current infrastructure provides a hazard risk to the surrounding environment or private property if mitigation is not taken.
- Medium: If the current infrastructure is undersized and surcharges during the 10-year rainfall event.
- Low: If the future infrastructure sized for the ultimate build-out is undersized and surcharges during the 10-year rainfall event.

10.2 Sanitary Improvements

TABLE 10.2 Sanitary Capital Improvements

Improvement ID	Project	Purpose	Cost	DCC Eligible?	Priority
S1	McCombs Drive	Increase capacity	**$ 186,512**	Partial	High
S2	Miami River Drive	Increase flow velocity	**$ 127,392**	No	High
S3	PS-7 Siphon Replacement	Permanent replacement of pump and piping	**$ 570,679**	Partial	High

High Priority Total	**$313,904**
On-Going	**$570,679**
Grand Total	**$884,583**

The priority rating has been given to each project based on the following criteria:

- High: If the current infrastructure provides a hazard risk to the surrounding environment or private property if mitigation is not taken.
- Medium: If the current infrastructure is does not generate adequate full condition flow velocity or is undersized for current demands.
- Low: If the future infrastructure sized for the ultimate build-out is undersized and surcharges under increased population demands.

TABLE 10.3 General Projects

Improvement ID	Project	Purpose	Cost	DCC Eligible?	Priority
19	Inventory Survey and Infrastructure Assessment	Gain further accuracy with VHHS Infrastructure Models and Asset Management	**$ 51,000**	No	High
20	Flow Metre Installation	Flow Data Collection of Drainage and Sanitary	**$ 63,000**	No	High

Total $ 114,000

10.3 Development Cost Charges Guidelines

Utility revenue sources available to VHHS include:

- Sewer Utility Rates
- Development Cost Charges (DCC)
- Developer Funding
- Grants
- Taxes
- Public Private Partnerships (P3)

It is important to examine each capital project in terms of the applicable revenue source(s). For a municipality such as VHHS, where there is no industrial base and costs are shouldered by a relatively small commercial and residential population, identifying and pursuing grant funding from higher levels of government is a necessity. The British Columbia Ministry of Community Services published a second edition of the Development Cost Charge Best Practices Guide in 2000. It would be of great benefit to VHHS to pursue the establishment of a DCC policy that conforms to the recommendations of the guide to ensure adequate revenue for utilities.

Excerpt from DCC Best Practices Guide prepared by the BC Ministry of Community Services (full text in Appendix F):

Many cities and towns in British Columbia face significant development pressure, which requires the expansion of existing or the installation of new infrastructure systems, to support new development and its demand on utilities and services. However, the costs associated with these infrastructure requirements create significant public sector burdens. Increasingly all governments are facing significant constraints in the use of general purpose taxation and have placed greater emphasis on the “user pay”, or “benefiter pay”, principle. In response to these pressures, DCCs have been utilized by local governments as a cost recovery mechanism for apportioning infrastructure project costs amongst developers of land. DCCs allow monies to be pooled from many developers so that funds can be raised to construct the necessary services in an equitable manner. Simply, the municipality can be considered to be the co-coordinator of the capital program and administrator of the funds collected.

DCCs are established within a layered governance structure. At the most direct level, DCCs are subject to the policy and technical bulletins issued by the Ministry whose responsibility it is to review and approve the bylaws submitted by local government. this level lies under the legislative framework described by the sections of the Local Government Act (section 932 – 937) related to DCCs. the provincial legislation is enacted under the authority of the provincial government as set out in the Canadian Constitution. The guide bridges the broad legislative framework with specific
local government practice, clarifies Ministry policies and practices, and identifies best practices for establishing DCC programs and related bylaws.

At the risk of oversimplifying a complex issue, DCCs are generally determined by dividing the net capital infrastructure costs attributable to new development over a certain time period, by the corresponding number of projected development units (or area) that will be developed in that same time period. DCC calculations typically coincide with the Financial Plans. DCCs are commonly imposed on a range of land uses, including both residential and non-residential.

The policy considerations in developing a DCC bylaw include the following:

- An appropriate public process;
- The extent of application of the charges (municipal-wide or area-specific);
- The time frame for the DCC program (build out or revolving);
- The categories of land use to be charged;
- The appropriate units for the charges (a unit or area basis);
- The eligibility of projects;
- The recoverable DCC costs; and,
- The assist factor.

Recommendation

- Develop and implement a DCC policy that conforms to the Best Practices set out by the BC Ministry of Community Service by 2020.

10.4 Cost Estimates

Detailed project cost estimates are presented in **APPENDIX C** for each recommended capital improvement project..

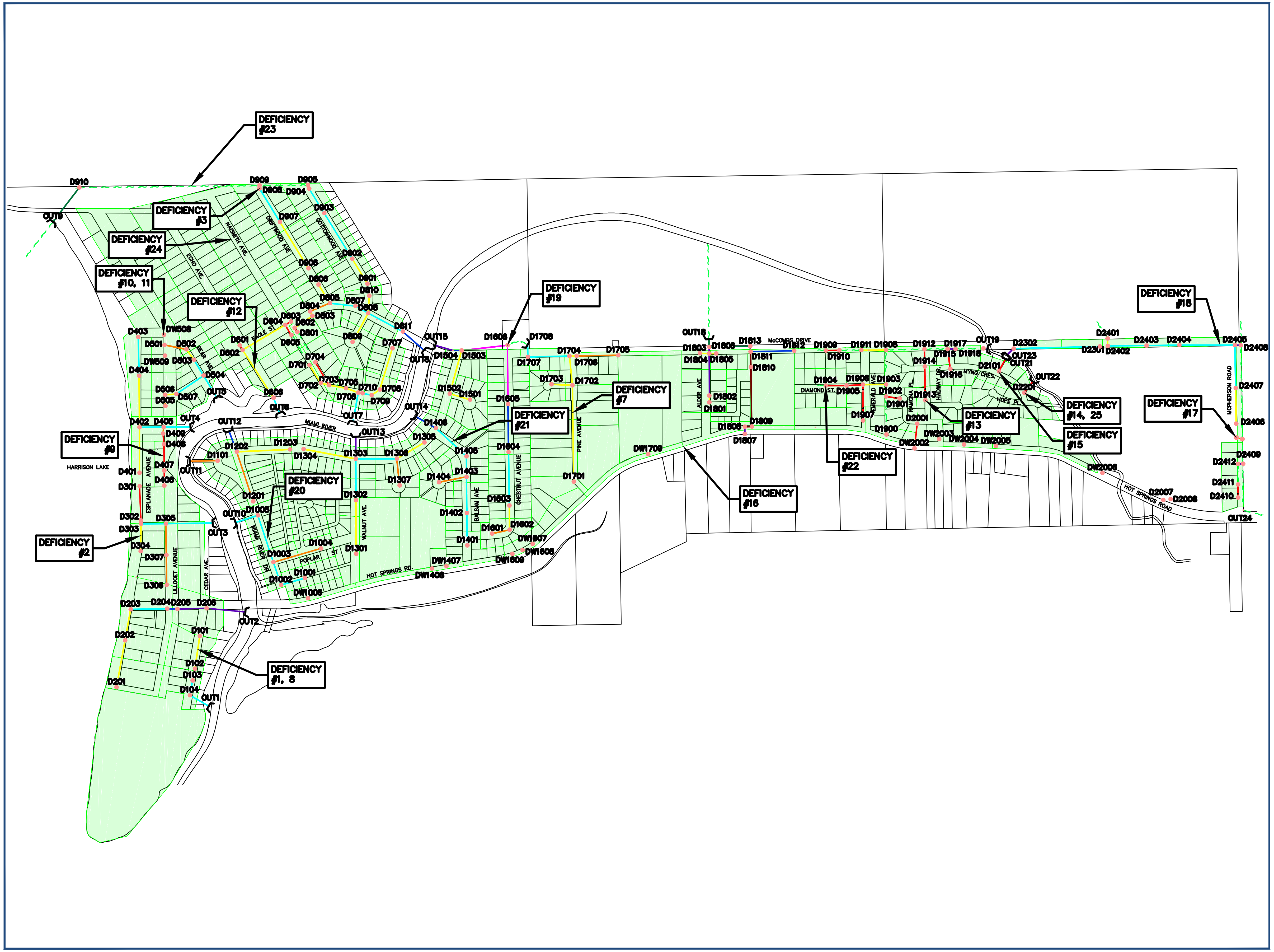
11. Figures

Figures 1 through 5 are included in the following pages.

Appendix A – Storm Model Data

Appendix B – Sanitary Model Data

Appendix C – Project Costs Estimates



N

0 100 200 300 400 500

Scale 1:9000

Legend

- 200mm Stormmain
- 250mm Stormmain
- 300mm Stormmain
- 375mm Stormmain
- 450mm Stormmain
- 500mm Stormmain
- 600mm Stormmain
- 750mm Stormmain
- 900mm Stormmain
- Overland Flow Ditch
- D11 Junction
- DW11 Rock Pit
- OUT1 Outfall
- Catchment Area

Village of Harrison Hot Springs

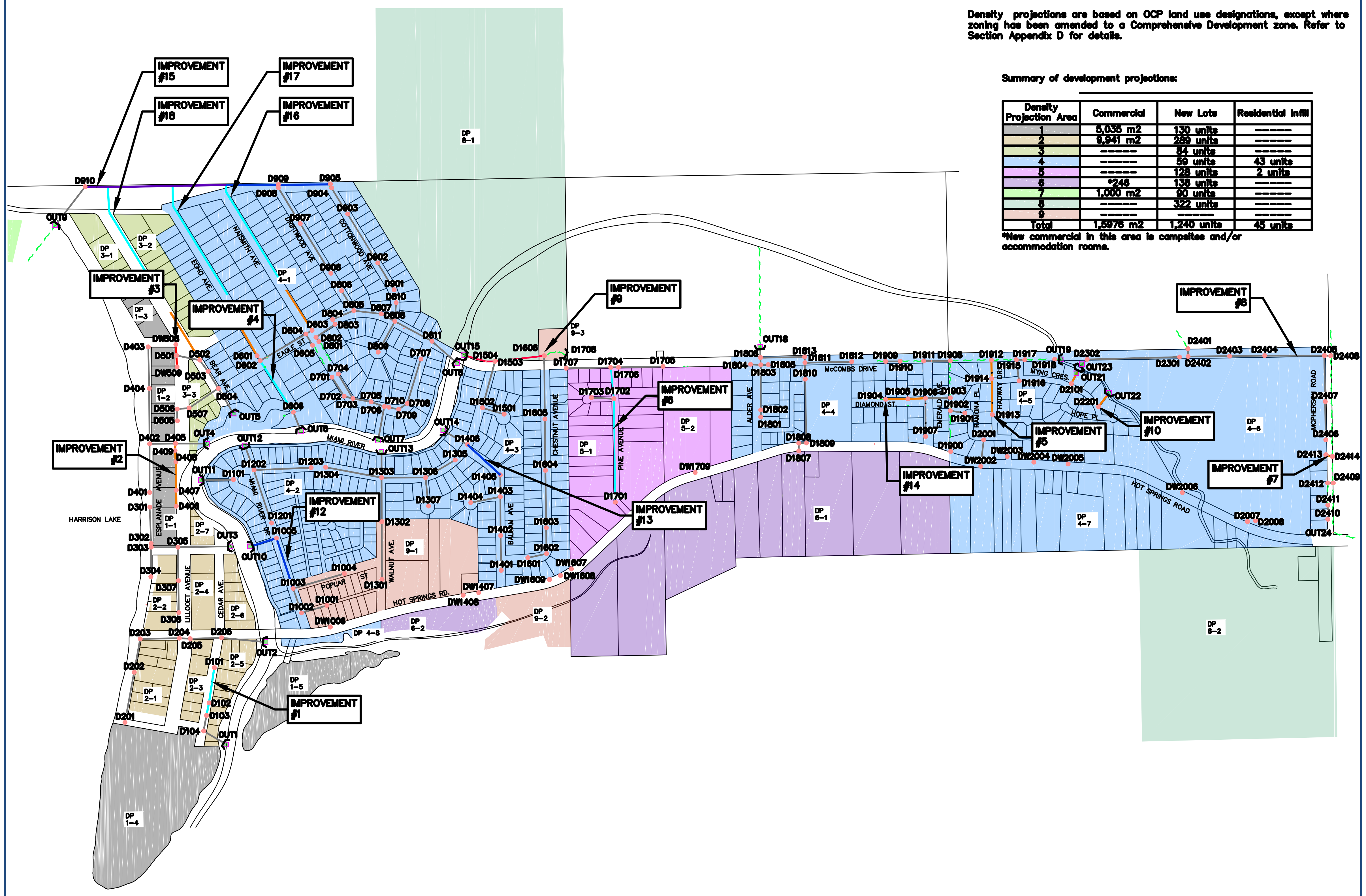
2016 Existing Storm System
Figure 1

Project No. 12004 -21
Date: October 2016 Revision No. 0

HARRISON HOT SPRINGS
Naturally Refreshed

CTQ
ENGINEERING PLANNING URBANDESIGN

L:\General Data\Projects-2012\12004-21 - Liquid Waste Management Plan\4-CAD\Figures\12004-21 - Report Figure 1.dwg



Density projections are based on OCP land use designations, except where zoning has been amended to a Comprehensive Development zone. Refer to Section Appendix D for details.

Summary of development projections:

Density Projection Area	Commercial	New Lots	Residential Infill
1	5,035 m2	130 units	------
2	9,941 m2	289 units	------
3	------	84 units	------
4	------	59 units	43 units
5	------	128 units	2 units
6	*246	138 units	------
7	1,000 m2	90 units	------
8	------	322 units	------
9	------	------	------
Total	1,5976 m2	1,240 units	45 units

*New commercial in this area is campsites and/or accommodation rooms.

N

0 100 200 300 400 500

Scale 1:9000

Legend

- Existing Stormmain
- 200mm Future Stormmain
- 250mm Future Stormmain
- 300mm Future Stormmain
- 375mm Future Stormmain
- 450mm Future Stormmain
- 500mm Future Stormmain
- 600mm Future Stormmain
- 650mm Future Stormmain
- 750mm Future Stormmain
- 900mm Future Stormmain
- Overland Flow Ditch
- Proposed Stormwater Treatment Unit
- D11 Junction
- DW11 Rockpit
- OUT1 Outfall

Village of Harrison Hot Springs

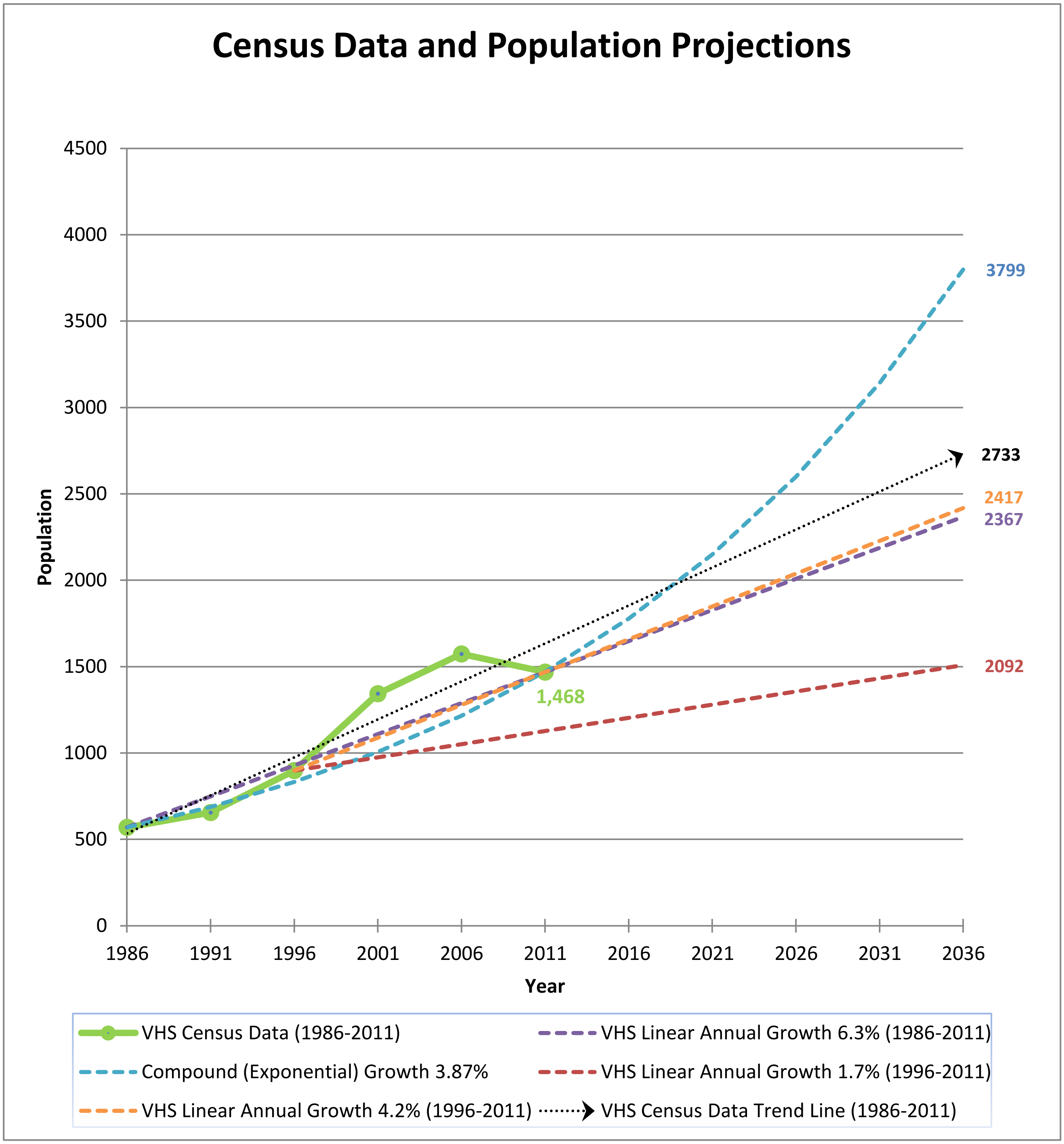
2016 Future Storm System Figure 2

Project No. 12004 -21
Date: October 2016
Revision No. 0

HARRISON HOT SPRINGS
Naturally Refreshed

CTQ
ENGINEERING PLANNING URBANDESIGN

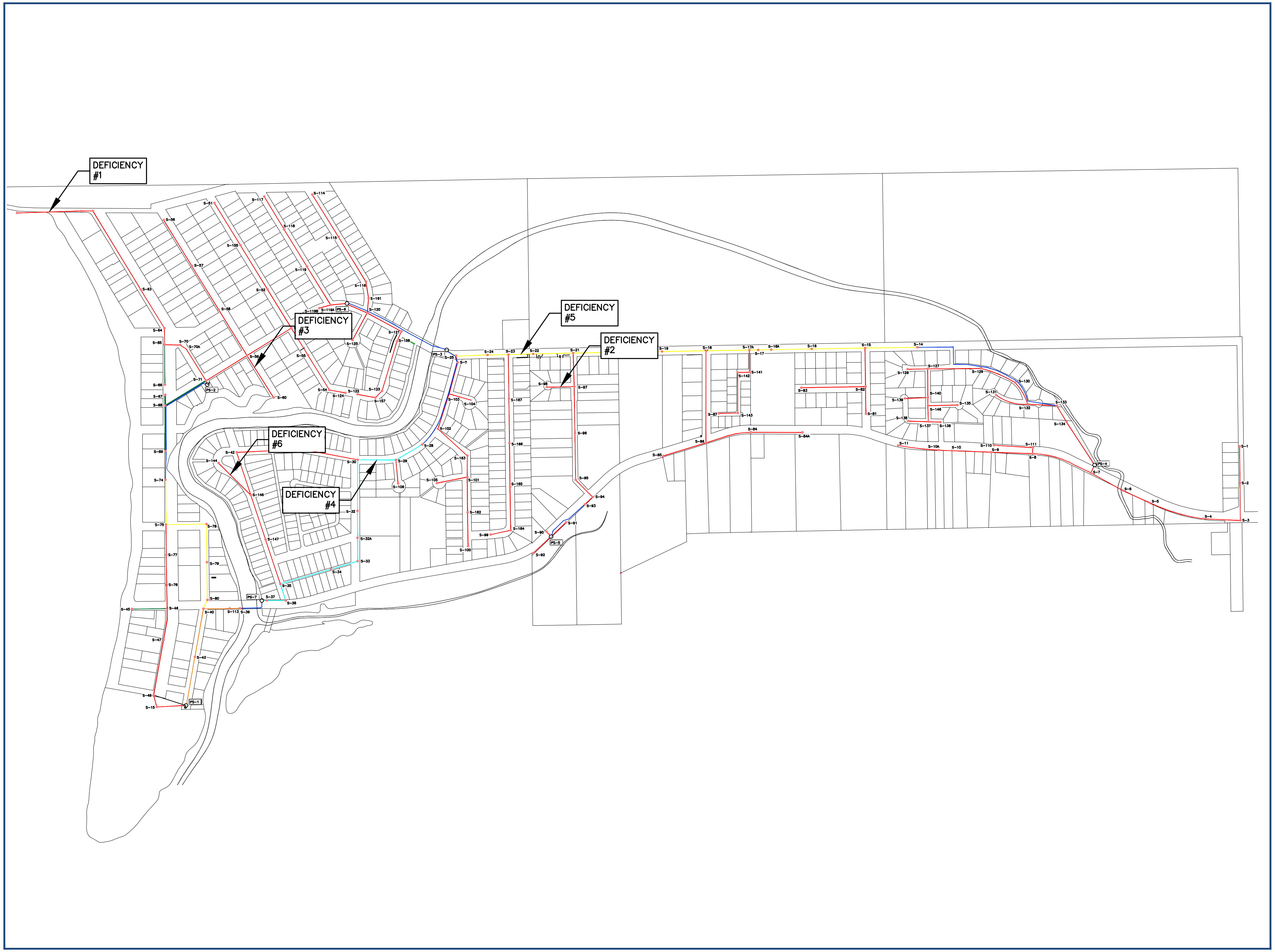
L:\General Data\Projects-2012\12004-21 - Liquid Waste Management Plan\4-CAD\Figures\12004-21 - Report Figure 2.dwg



HARRISON HOT SPRINGS
Naturally Refreshed

CTQ

FIGURE 3:
Census Data and Population Projections
Liquid Waste Management Plan
12004-21



N

0 100 200 300 400 500

Legend

- 150mm SANITARY
- 200mm SANITARY
- 250mm SANITARY
- 300mm SANITARY
- 350mm SANITARY
- 150mm FORCEMAIN
- S-11 Manhole

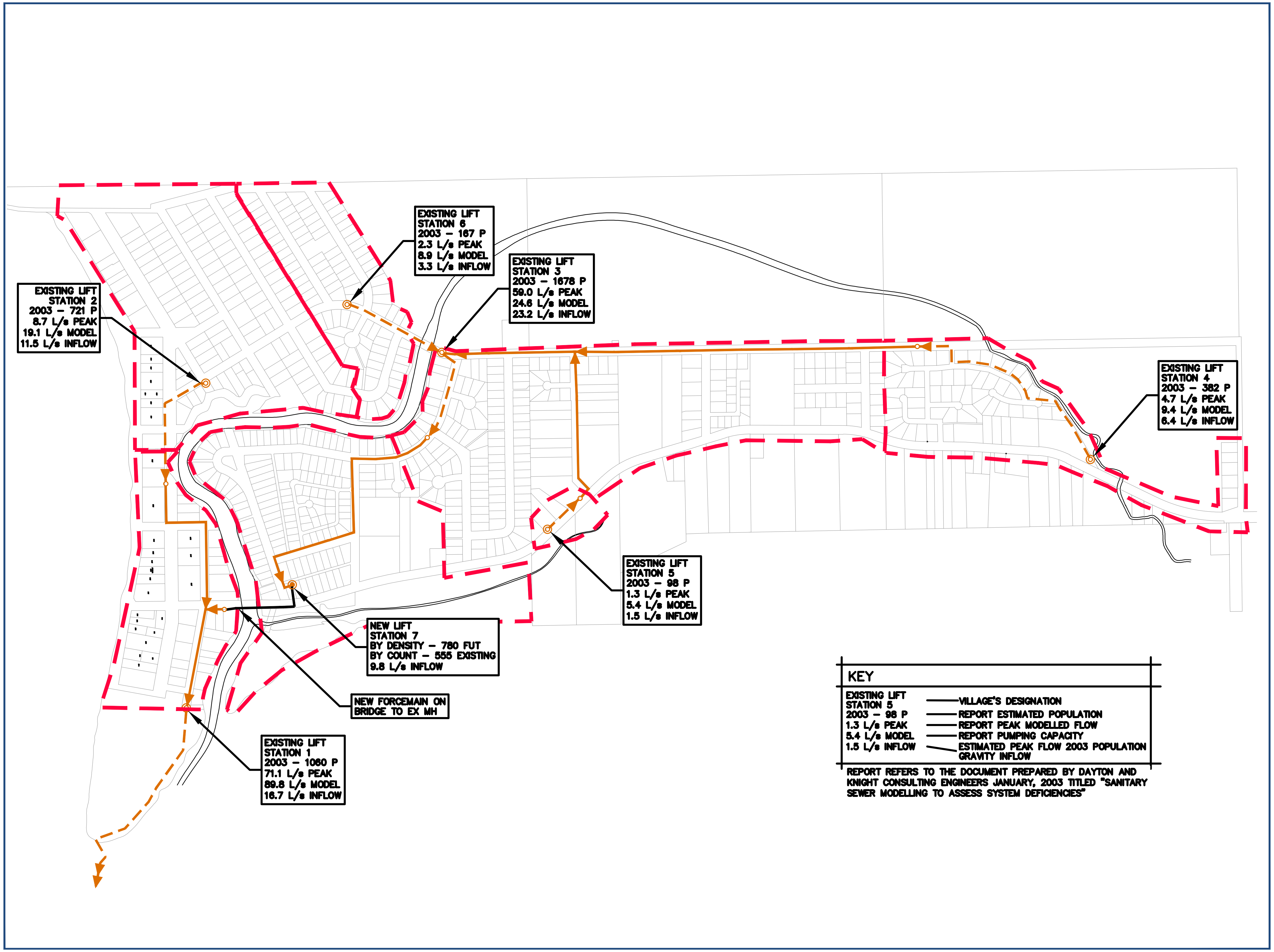
Village of Harrison Hot Springs

2016 Existing Sanitary System
Figure 4

Project No. 12004 -21
Date: October 2016 Revision No. 0

HARRISON HOT SPRINGS
Naturally Refreshed

CTQ
ENGINEERING PLANNING URBANDESIGN



N

Legend

- SUB-BASIN BOUNDARY
- SANITARY FORCEMAIN
- SANITARY GRAVITY MAIN

Village of Harrison Hot Springs

2016 Existing Sanitary System
Figure 5

Project No. 12004 -21
Date: October 2016
Revision No. 0

HARRISON HOT SPRINGS
Naturally Refreshed

CTQ
ENGINEERING PLANNING URBANDESIGN

L:\General Data\Projects-2012\12004-21 – Liquid Waste Management Plan\4-CAD\Figures\12004-21 – Report Figure 5 (SAN).dwg

FIGURE 6 - Recommendations summary table

Description		Recommendations		
ISSUE #1: 2016 STORM SYSTEM DEFICIENCIES				
2016 System Deficiencies - Capacity	ID # 8 - Cedar Avenue - Undersized during 10-year storm	1.1	Complete Improvement Project # 1	
	ID # 9 - Lillooet Avenue - Undersized during 10-year storm	1.2	Complete Improvement Project # 2	
	ID # 10 / 11 - Lillooet Avenue - Overflow pipe required	1.3	Complete Improvement Project # 3	
	ID # 12 - Echo Avenue - Undersized during 10-year storm	1.4	Complete Improvement Project # 4	
	ID # 13 - Hadway Drive - Undersized during 10-year storm	1.5	Complete Improvement Project # 5	
	ID # 14 / 15 - Myng Crescent - Outfall Undersized during 100-year storm	1.6	Complete Improvement Project # 10	
	ID # 16 - Hot Springs Road - Piped or overland storm network does not exist.	1.7	Collaborate with MOTI to ensure future road improvement projects suit the stormwater management requirements for VHHS.	
2016 System Deficiencies - Failing Infrastructure	ID # 1 - Cedar Avenue - Pipe negative slope	1.8	Complete Improvement Project # 1	
	ID # 2 - Maple Street - Pipe has flat slope	1.9	Continue to monitor for clogging due to low flows in pipe. Pipe capacity is sufficient for the design storm events.	
	ID # 3 - Cedar Avenue - Pipe negative slope	1.10	Register R.O.W. for all storm easements through private property.	
	ID # 4 - Naismith Avenue West, Driftwood Avenue and Chestnut Avenue - Ditch altercation by property owners	1.11	Develop a Ditch Altercation Bylaw to allow the VHHS to enforce the re-instatement of overland flow routes altered by property owners	
	ID # 6 - Driftwood Avenue - Clogged manhole	1.12	Complete Improvement Project # 15	
	ID # 7 - Pine Avenue - Vitrified clay pipe falling apart	1.13	Complete Improvement Project # 6	
	ID # 17 - McPherson Road - Collapsed pipe section	1.14	Complete Improvement Project # 7	
	ID # 18 - McCombs Drive & McPherson Road - Collapsed pipe section	1.15	Complete Improvement Project # 8	
	ID # 19 - McCombs Drive - Collapsed pipe section	1.16	Complete Improvement Project # 9	
ISSUE #2: 2016 SANITARY SYSTEM DEFICIENCIES				
2016 System Deficiencies - Velocity and Capacity	ID # S1 - Rockwell Drive - Low flow velocity	2.1	Complete Improvement Project # S1	
	ID # S2 - Lakeburg Crescent - Low flow velocity	2.2	Complete Improvement Project # S2	
	ID # S3 - Echo Avenue - Low flow velocity	2.3	Complete Improvement Project # S3	
	ID # S4 - Miami River Drive "A" - Low flow velocity	2.4	Complete Improvement Project # S4	
	ID # S5 - McCombs Drive- Low flow velocity and Capacity	2.5	Complete Improvement Project # S5	
	ID # S6 - Miami River Drive - Low flow velocity	2.6	Complete Improvement Project # S6	
	ID # S7 - PS-7 Siphon Replacement - Low Capacity	2.6	Complete Improvement Project # S7	
ISSUE #3: FUTURE SYSTEM CONSIDERATIONS				
Future System Considerations - General	ID # 20 - Miami River Drive - Undersized during 10-year storm	3.1	Complete Improvement Project # 12	
	ID # 21 - Balsam Avenue - Undersized during 10-year storm	3.2	Complete Improvement Project # 13	
	ID # 22 - Diamond Street - Undersized during 10-year storm	3.3	Complete Improvement Project # 14	
	ID # 23 - Mount Street - Undersized during 10-year storm	3.4	Complete Improvement Project # 15	
	ID # 24 - Nasmith Avenue, Echo Avenue, and Lillooet Avenue - Upgrade to full urban standard	3.5	Complete Improvement Project # 16 / 17 / 18	
	ID # 25 - Myng Crescent - Outfall Undersized during 100-year storm	3.6	Complete Improvement Project # 10	
	ID # 26 - Inventory Survey and Infrastructure Assessment	3.7	Complete Improvement Project # 19	
	ID # 27 - Installation of Sanitary Flow Metres	3.8	Complete Improvement Project # 20	
ISSUE #4: STORM WATER TREATMENT & LOW IMPACT DEVELOPMENT (LID) TECHNIQUES				
Surface Water Quality	Urban runoff within VHHS currently does not undergo treatment prior to discharge to surface water, potentially carrying contaminants	4.1	Upgrade all 23 storm outfall locations as per Improvement Project # 8	
	New land development projects do not have strict requirements for storm water quality treatment	4.2	Update bylaws to ensure new developments sufficiently control peak flows and water quality exiting the site	
	Land use upstream of Harrison Lake can impact water quality	4.3	Ensure VHHS is identified as a stakeholder on land use issues relating to watershed health, and is represented where decisions potentially affecting water quality are made.	
Low Impact Development (LID) Techniques	Infiltration techniques and detention facilities are not commonly found throughout the VHHS storm network. This causes large peak flows and decreased water quality within the network and discharge locations.	4.4	Evaluate the possibility for stormwater reduction through LID principles for future developments and during upgrades to the existing system.	
		4.5	Refer to Appendix E for LID design alternatives	
ISSUE #5: DATA MANAGEMENT				
Data and Asset Management	Limited and/or inaccessible information regarding storm and sanitary utility assets results in additional expenditures to locate information on an "as-needed" basis, or to redo work previously completed	5.1	Create a Storm and Sanitary Asset Management database to house all data (reports, photos, drawings, incidents) relating to the storm and sanitary utility	
		5.2	Locate as-built drawings and construction inspection reports in archives, digitize and add to a Storm and Sanitary Asset Management database.	
		5.3	Implement and reference a basic GIS system	
		5.4	Create spreadsheet to track all storm and sanitary-related breaks and leaks. Info regarding location, probable cause, date, pipe size, and conditions noted when repairing (ie - installation/bedding conditions) are all important to track as the system ages.	
		5.5	Purchase non-contact flow meters and rain gauge that can be located around the VHHS storm and sanitary systems to collect accurate flow data for future modeling.	
ISSUE #6: POLICY AND REGULATION				
Development Design, Approval and Construction	Historically, there is inconsistency in the design and construction, and integration of drainage and sanitary utility infrastructure	6.1	Adopt MMCD Design guidelines, with modifications as necessary, for all construction of Municipal Works	
		6.2	It is recommended that all new development undergo an engineering review which includes a sanitary and storm model analysis to determine the impact of demand to the VHHS system prior to approval being issued.	
ISSUE #7: ASSET MANAGEMENT				
Demand Management	Lack of Master Planning documents limits the prioritization and coordination of Capital Projects for roads networks and transportation system	7.1	Create Master Planning documents for transportation system	
		7.2	Create an overall Asset Management Plan, including a decision matrix to prioritize projects	

Appendix A – Storm Model Data

Appendix A - Storm Model Data
Pipe Table - Existing System (2016)

Pipe ID	Inlet ID	Outlet ID	Length (m)	Average Slope (%)	Pipe Diameter (mm)	Peak Flow 10-Year Storm (LPS)	Peak Flow 100-Year Storm (LPS)	Design Flow Capacity (LPS)	Peak Flow 10-Year Capacity (%)	Peak Flow 100-Year Capacity (%)
DITCH 17-1	D1708	D1606	47.5	0.8	900	121	190	1441	8%	13%
DITCH 19-1	D1900	D1902	86.7	0.5	600	19	26	470	4%	6%
DITCH 19-2	D1902	D1903	27.5	0.5	600	46	62	470	10%	13%
DITCH 19-3	D1903	D1908	78.5	0.5	600	160	206	470	34%	44%
DITCH 19-4	D1910	D1911	50.2	0.1	600	20	28	298	7%	9%
DITCH 19-5	D1908	D1912	87.8	0.3	600	181	235	364	50%	65%
DITCH 19-6	D1912	D1915	52.9	0.4	600	199	253	444	45%	57%
DITCH 19-7	D1917	D1918	63.5	0.6	600	225	289	508	44%	57%
DITCH 23	D2302	OUT23	20.0	0.5	600	27	37	470	6%	8%
DITCH 24-1	D2408	D2414	219.9	0.0	600	52	77	298	17%	26%
DITCH 24-2	D2411	D2412	46.8	0.9	600	20	28	638	3%	4%
DITCH 24-3	D2409	OUT24	105.4	0.5	600	77	117	470	16%	25%
DITCH 9-1	D905	D909	110.3	0.2	900	77	107	877	9%	12%
DITCH 9-2	D909	D910	411.2	0.5	900	220	306	1387	16%	22%
DITCH 9-3	D910	OUT9	98.5	0.5	900	333	473	1387	24%	34%
LHC-06	D2414	D2409	50.7	0.0	600	61	91	298	20%	31%
STM 1001	D1001	D1002	56.3	0.5	380	6	25	134	5%	18%
STM 1002	D1002	D1003	54.9	0.5	380	19	32	133	14%	24%
STM 1003	D1004	D1003	113.0	0.4	250	61	79	42	144%	186%
STM 1004	D1003	D1005	112.7	0.4	380	82	116	85	97%	137%
STM 1005	D1005	OUT10	53.4	0.5	380	116	170	134	86%	127%
STM 101	D101	D102	75.6	-0.3	300	46	57	55	84%	103%
STM 102	D102	D103	27.3	0.2	300	95	95	47	203%	204%
STM 103	D103	D104	33.8	1.4	380	96	96	222	43%	43%
STM 104	D104	OUT1	50.0	1.9	380	138	156	262	53%	59%
STM 1101	D1101	OUT11	63.6	0.5	250	25	34	46	54%	74%
STM 1201	D1201	D1202	118.9	0.3	250	27	37	36	75%	101%
STM 1202	D1203	D1202	121.8	0.4	300	37	51	69	54%	73%
STM 1203	D1202	OUT12	50.0	0.5	450	62	85	218	28%	39%
STM 1301	D1301	D1302	122.7	0.4	300	56	78	68	83%	114%
STM 1302	D1302	D1303	94.0	0.4	380	85	113	119	72%	95%
STM 1303	D1304	D1303	121.2	0.5	300	33	45	70	47%	65%
STM 1304	D1305	D1306	73.1	0.5	300	43	60	70	61%	85%
STM 1305	D1307	D1306	61.1	0.4	250	4	6	43	10%	13%
STM 1306	D1306	D1303	93.6	0.4	380	45	64	119	38%	53%
STM 1307	D1303	OUT13	50.8	0.5	600	184	253	470	39%	54%
STM 1401	D1401	D1402	74.0	0.3	380	37	55	110	33%	50%
STM 1402	D1402	D1403	82.7	0.5	380	73	102	130	56%	79%
STM 1403	D1404	D1403	64.2	0.5	250	28	39	46	62%	85%
STM 1404	D1403	D1405	46.7	0.0	380	100	142	85	118%	167%
STM 1405	D1405	D1406	94.7	0.7	380	137	195	161	85%	121%

STM 1406	D1406	OUT14	52.7	0.5	450	170	246	218	78%	113%
STM 1501	D1501	D1502	48.1	0.4	300	35	48	68	52%	71%
STM 1502	D1502	D1503	102.3	2.2	300	68	93	154	45%	60%
STM 1503	D1503	D1504	19.5	0.5	450	242	356	218	111%	163%
STM 1504	D1504	OUT15	42.1	0.5	600	242	341	470	51%	72%
STM 1601	D1601	D1602	40.8	0.7	250	22	29	54	40%	54%
STM 1602	D1602	D1603	55.2	0.5	300	21	29	72	30%	40%
STM 1603	D1603	D1604	122.0	0.3	380	20	41	94	22%	44%
STM 1604	D1604	D1605	109.3	0.2	450	59	80	151	39%	53%
STM 1605	D1605	D1606	134.4	0.5	500	132	160	284	47%	56%
STM 1606	D1606	D1503	104.2	0.1	500	198	273	146	135%	186%
STM 1701	D1701	D1702	220.0	0.0	300	49	63	47	105%	135%
STM 1702	D1703	D1702	47.7	0.5	300	23	32	74	31%	43%
STM 1703	D1702	D1704	67.1	0.3	300	76	123	57	133%	217%
STM 1704	D1705	D1706	94.6	0.3	250	16	25	35	45%	70%
STM 1705	D1706	D1704	16.6	1.5	300	47	63	128	37%	49%
STM 1706	D1704	D1707	95.1	1.1	380	122	182	202	61%	90%
STM 1707	D1707	D1708	27.7	0.6	380	133	198	148	90%	134%
STM 1801	D1801	D1802	15.1	0.1	300	24	34	47	52%	72%
STM 1802	D1802	D1803	96.0	0.0	600	17	27	298	6%	9%
STM 1803	D1804	D1803	21.6	0.5	300	11	14	74	14%	19%
STM 1804	D1805	D1803	15.7	0.5	300	15	20	74	20%	27%
STM 1805	D1803	D1806	15.3	0.2	600	36	51	298	12%	17%
STM 1806	D1807	D1808	16.6	0.5	600	39	52	470	8%	11%
STM 1807	D1808	D1809	16.2	0.3	750	39	52	671	6%	8%
STM 1808	D1809	D1810	136.0	0.2	750	37	51	593	6%	9%
STM 1809	D1810	D1811	35.1	0.4	750	62	87	763	8%	11%
STM 1810	D1812	D1811	99.2	0.7	450	99	136	258	38%	53%
STM 1811	D1811	D1813	12.1	0.1	900	151	212	877	17%	24%
STM 1812	D1813	D1806	93.9	0.2	900	151	211	905	17%	23%
STM 1813	D1806	OUT18	17.4	0.5	900	182	260	1387	13%	19%
STM 1901	D1901	D1902	31.3	2.7	200	28	37	59	47%	63%
STM 1902	D1904	D1905	47.5	0.5	200	37	39	25	148%	155%
STM 1903	D1905	D1906	37.5	0.9	200	37	39	33	113%	119%
STM 1904	D1907	D1906	81.6	0.9	200	9	11	34	26%	34%
STM 1905	D1906	D1903	52.7	0.9	300	83	100	98	85%	102%
STM 1906	D1909	D1910	30.8	0.6	200	20	28	28	73%	100%
STM 1907	D1911	D1908	56.6	2.6	300	20	27	168	12%	16%
STM 1908	D1913	D1914	76.9	0.0	200	20	20	16	128%	129%
STM 1909	D1914	D1912	39.1	3.1	200	20	21	63	32%	33%
STM 1910	D1916	D1915	45.6	3.3	200	32	43	65	49%	66%
STM 1912	D1915	D1917	18.0	1.4	600	225	293	783	29%	37%
STM 1913	D1918	OUT19	8.5	0.5	450	224	289	211	106%	137%
STM 201	D201	D202	108.7	0.2	300	38	56	47	81%	120%
STM 202	D202	D203	71.9	0.2	300	35	57	49	72%	115%

STM 203	D203	D204	83.4	0.2	380	39	57	86	45%	67%
STM 204	D204	D205	23.1	0.4	450	150	244	203	74%	120%
STM 205	D205	D206	66.8	0.3	600	150	230	364	41%	63%
STM 206	D206	OUT2	89.0	0.2	600	174	259	315	55%	82%
STM 2101	D2101	OUT21	31.0	0.5	200	16	22	25	64%	86%
STM 2201	D2201	OUT22	31.9	0.5	200	40	40	25	160%	160%
STM 2301	D2301	D2302	196.5	0.5	380	13	17	134	10%	13%
STM 2401	D2401	D2402	16.8	0.5	300	0	1	74	0%	1%
STM 2402	D2402	D2403	88.6	0.6	380	21	28	145	15%	20%
STM 2403	D2403	D2404	74.7	0.2	380	35	52	85	41%	61%
STM 2404	D2404	D2405	127.0	0.0	380	53	81	85	62%	95%
STM 2405	D2406	D2407	81.5	0.5	300	19	26	74	26%	35%
STM 2406	D2407	D2405	98.0	0.4	380	19	25	115	16%	22%
STM 2407	D2405	D2408	13.4	0.1	600	61	94	298	20%	32%
STM 2408	D2410	D2411	30.0	0.3	200	21	29	18	114%	157%
STM 2409	D2412	D2409	11.7	3.7	600	20	28	1273	2%	2%
STM 2410	D2413	D2414	13.6	1.2	250	27	35	56	48%	63%
STM 301	D304	D303	62.7	1.7	300	75	106	137	55%	77%
STM 302	D301	D302	77.5	0.2	200	36	41	16	229%	260%
STM 303	D302	D303	8.0	2.3	200	37	42	53	69%	79%
STM 304	D303	D305	56.7	0.0	380	114	129	85	134%	152%
STM 305	D306	D307	67.9	0.5	250	35	47	46	76%	102%
STM 306	D307	D305	71.3	0.5	250	35	47	46	77%	102%
STM 307	D305	OUT3	106.6	0.5	380	209	256	134	156%	191%
STM 401	D401	D402	103.6	0.2	300	30	43	47	63%	92%
STM 402	D403	D404	88.4	0.5	380	58	79	134	43%	59%
STM 403	D404	D402	117.8	0.1	300	54	58	47	116%	125%
STM 404	D402	D405	55.2	0.5	380	107	137	133	80%	103%
STM 405	D406	D407	34.0	0.2	200	31	31	16	193%	193%
STM 406	D407	D408	60.3	0.0	200	31	31	16	196%	196%
STM 407	D408	D409	24.1	5.1	200	31	31	80	39%	39%
STM 408	D409	D405	15.1	0.7	250	32	32	55	58%	58%
STM 409	D405	OUT4	61.4	0.5	380	136	168	134	101%	125%
STM 501	D501	D502	50.7	0.5	250	0	10	46	0%	23%
STM 502	D502	D503	29.7	0.5	300	30	41	74	40%	55%
STM 503	D503	D504	42.1	0.2	380	71	91	93	77%	98%
STM 504	D505	D506	25.1	0.5	250	40	55	45	88%	121%
STM 505	D506	D507	25.5	0.5	300	40	54	74	54%	73%
STM 506	D507	D504	74.9	0.5	380	39	54	135	29%	40%
STM 507	D504	OUT5	57.4	0.5	380	107	144	134	80%	107%
STM 601	D601	D602	12.6	1.0	200	47	56	36	133%	158%
STM 602	D603	D604	15.1	0.5	200	27	36	25	106%	143%
STM 603	D605	D604	27.7	0.5	200	31	39	25	122%	156%
STM 604	D604	D602	112.6	0.5	300	58	75	77	76%	97%
STM 605	D602	D606	130.0	0.5	300	114	118	74	153%	159%

STM 606	D606	OUT6	37.0	0.5	380	136	146	134	101%	108%
STM 701	D701	D702	47.9	1.5	300	23	31	127	19%	25%
STM 702	D702	D703	19.7	1.2	300	23	31	116	20%	27%
STM 703	D704	D703	60.7	0.5	200	26	35	25	102%	141%
STM 704	D703	D705	39.2	0.7	300	49	63	85	57%	74%
STM 705	D705	D706	29.7	0.9	300	69	89	102	68%	88%
STM 706	D707	D708	98.5	0.6	300	23	30	78	29%	39%
STM 707	D708	D709	22.4	1.0	300	37	51	106	35%	48%
STM 708	D709	D710	21.1	0.5	380	37	49	134	27%	36%
STM 709	D710	D706	9.8	0.8	380	36	49	165	22%	30%
STM 710	D706	OUT7	66.8	0.5	380	104	135	134	78%	101%
STM 801	D801	D802	11.2	1.0	200	20	27	36	56%	75%
STM 802	D802	D803	48.9	0.8	300	20	26	91	21%	29%
STM 803	D803	D804	11.5	3.7	300	19	26	201	10%	13%
STM 804	D804	D805	49.0	0.5	250	19	26	46	42%	57%
STM 805	D806	D805	49.9	0.9	300	36	48	101	36%	48%
STM 806	D805	D807	58.6	0.2	380	53	73	85	62%	86%
STM 807	D807	D808	33.2	0.8	380	53	69	174	30%	39%
STM 808	D809	D808	74.7	0.6	300	29	39	80	36%	49%
STM 809	D810	D808	39.8	0.7	300	32	43	85	38%	50%
STM 810	D808	D811	89.7	0.4	380	109	139	119	92%	117%
STM 811	D811	OUT8	64.1	0.5	450	107	138	218	49%	63%
STM 901	D901	D902	66.5	0.7	300	25	34	85	29%	40%
STM 902	D902	D903	122.2	0.3	380.0	23.9	33.0	104.5	23%	32%
STM 903	D903	D904	65.5	0.2	380.0	58.6	81.3	85.0	69%	96%
STM 904	D904	D905	8.7	0.5	380.0	58.6	81.3	134.3	44%	61%
STM 905	D906	D907	124.1	0.5	0.3	41.9	56.6	75.8	55%	75%
STM 906	D907	D908	89.2	0.4	0.4	87.0	114.4	117.3	74%	98%
STM 907	D908	D909	6.9	0.5	0.4	86.0	114.1	134.3	64%	85%
STM2001	D2001	DW2002	56.7	3.1	0.2	14.5	19.8	50.1	29%	40%

Pipe ID	Inlet ID	Outlet ID	Length (m)	Average Slope (%)	Pipe Diameter (mm)	Peak Flow 10-Year Storm (LPS)	Peak Flow 100-Year Storm (LPS)	Design Flow Capacity (LPS)	Peak Flow 10-Year Capacity (%)	Peak Flow 100-Year Capacity (%)
DITCH 17-1	D1708	D1606	47.5	0.8	900	147	184	1441	10%	13%
DITCH 19-1	D1900	D1902	86.7	0.5	600	19	26	470	4%	6%
DITCH 19-2	D1902	D1903	27.5	0.5	600	46	62	470	10%	13%
DITCH 19-3	D1903	D1908	78.5	0.5	600	155	192	470	33%	41%
DITCH 19-4	D1910	D1911	50.2	0.1	600	20	28	298	7%	9%
DITCH 19-5	D1908	D1912	87.8	0.3	600	185	239	364	51%	66%
DITCH 19-6	D1912	D1915	52.9	0.4	600	252	325	444	57%	73%
DITCH 19-7	D1917	D1918	63.5	0.6	600	277	351	508	55%	69%
DITCH 23	D2302	OUT23	20.0	0.5	600	27	37	470	6%	8%
DITCH 24-1	D2408	D2414	218.8	0.0	600	65	101	298	22%	34%
DITCH 24-2	D2411	D2412	46.8	0.9	600	20	28	638	3%	4%
DITCH 24-3	D2409	OU24	105.4	0.5	600	101	158	470	22%	34%
DITCH 9-3	D910	OUT9	98.5	0.5	900	442	593	1387	32%	43%
FUT-501	DW509	D501	24.8	0.5	200	18	19	20	91%	97%
FUT-502	DW508	D501	23.1	0.5	200	25	29	20	123%	142%
FUT-901	D905	D909	110.3	0.2	450	74	100	138	54%	72%
FUT-902	D909	FD902	138.2	0.5	450	159	210	219	73%	96%
FUT-903	FD901	FD902	122.0	0.5	380	104	143	107	97%	133%
FUT-904	FD902	FD903	127.7	0.5	600	250	334	471	53%	71%
FUT-905	FD904	FD903	152.8	0.5	380	111	156	107	104%	146%
FUT-906	FD903	FD905	112.7	0.5	600	344	453	469	73%	97%
FUT-907	FD906	FD905	157.9	0.5	380	125	170	108	117%	158%
FUT-908	FD905	D909	32.6	0.5	900	444	597	1378	32%	43%
LHC-15	D2414	D2409	51.9	0.0	600	60	93	298	20%	31%
STM 1001	D1001	D1002	56.3	0.5	380	38	53	134	28%	39%
STM 1002	D1002	D1003	54.9	0.5	380	41	53	133	31%	40%
STM 1003	D1004	D1003	113.0	0.4	250	65	81	42	154%	191%
STM 1004	D1003	D1005	112.7	0.4	450	120	158	138	87%	115%
STM 1005	D1005	OUT10	53.4	0.5	450	154	211	218	70%	97%
STM 101	D101	D102	75.6	0.1	380	43	64	85	51%	76%
STM 102	D102	D103	27.3	0.2	380	93	141	85	110%	165%
STM 103	D103	D104	33.8	1.4	380	93	139	222	42%	63%
STM 104	D104	OUT1	50.0	1.9	380	134	199	262	51%	76%
STM 1101	D1101	OUT11	63.6	0.5	250	28	38	46	61%	83%
STM 1201	D1201	D1202	118.9	0.3	250	27	37	36	75%	101%
STM 1202	D1203	D1202	121.8	0.4	300	37	51	69	54%	73%
STM 1203	D1202	OUT12	50.0	0.5	450	62	86	218	28%	39%
STM 1301	D1301	D1302	122.7	0.4	300	64	89	68	94%	130%
STM 1302	D1302	D1303	94.0	0.4	380	93	132	119	78%	110%
STM 1303	D1304	D1303	121.2	0.5	300	33	45	70	47%	65%
STM 1304	D1305	D1306	73.1	0.5	300	43	60	70	61%	85%

STM 1305	D1307	D1306	61.1	0.4	250	29	37	43	67%	87%
STM 1306	D1306	D1303	93.6	0.4	380	69	93	119	58%	78%
STM 1307	D1303	OUT13	50.8	0.5	600	215	296	470	46%	63%
STM 1401	D1401	D1402	74.0	0.3	380	81	107	110	74%	97%
STM 1402	D1402	D1403	82.7	0.5	380	120	157	130	92%	121%
STM 1403	D1404	D1403	64.2	0.5	250	29	39	46	64%	85%
STM 1404	D1403	D1405	46.7	0.0	380	150	195	85	177%	230%
STM 1405	D1405	D1406	94.7	0.7	450	177	248	262	67%	95%
STM 1406	D1406	OUT14	52.7	0.5	450	204	300	218	94%	137%
STM 1501	D1501	D1502	48.1	0.4	300	35	48	68	52%	71%
STM 1502	D1502	D1503	102.3	2.2	300	73	97	154	47%	63%
STM 1503	D1503	D1504	19.5	0.5	450	301	395	218	138%	181%
STM 1504	D1504	OUT15	42.1	0.5	600	301	394	470	64%	84%
STM 1601	D1601	D1602	40.8	0.7	250	24	33	54	45%	61%
STM 1602	D1602	D1603	55.2	0.5	300	24	33	72	34%	46%
STM 1603	D1603	D1604	122.0	0.3	380	23	39	94	24%	42%
STM 1604	D1604	D1605	109.3	0.2	450	74	101	151	49%	67%
STM 1605	D1605	D1606	134.4	0.5	500	157	187	284	55%	66%
STM 1606	D1606	D1503	104.7	0.1	650	255	315	295	87%	107%
STM 1701	D1701	D1702	220.0	0.1	380	41	60	85	48%	71%
STM 1702	D1703	D1702	47.7	0.5	300	22	30	74	30%	41%
STM 1703	D1702	D1704	67.1	0.3	380	69	97	103	67%	94%
STM 1704	D1705	D1706	94.6	0.3	250	49	65	35	140%	185%
STM 1705	D1706	D1704	16.6	1.5	300	80	107	128	63%	83%
STM 1706	D1704	D1707	95.1	1.1	380	135	172	202	67%	85%
STM 1707	D1707	D1708	27.7	0.6	380	161	198	148	108%	133%
STM 1801	D1801	D1802	15.1	0.1	300	38	53	47	81%	112%
STM 1802	D1802	D1803	96.0	0.0	600	30	45	298	10%	15%
STM 1803	D1804	D1803	21.6	0.5	300	11	14	74	14%	19%
STM 1804	D1805	D1803	15.7	0.5	300	15	20	74	20%	27%
STM 1805	D1803	D1806	15.3	0.2	600	46	69	298	15%	23%
STM 1806	D1807	D1808	16.6	0.5	600	52	72	470	11%	15%
STM 1807	D1808	D1809	16.2	0.3	750	52	71	671	8%	11%
STM 1808	D1809	D1810	136.0	0.2	750	50	69	593	8%	12%
STM 1809	D1810	D1811	35.1	0.4	750	74	104	763	10%	14%
STM 1810	D1812	D1811	99.2	0.7	450	99	136	258	38%	53%
STM 1811	D1811	D1813	12.1	0.1	900	162	229	877	18%	26%
STM 1812	D1813	D1806	93.9	0.2	900	162	227	905	18%	25%
STM 1813	D1806	OUT18	17.4	0.5	900	205	293	1387	15%	21%
STM 1901	D1901	D1902	31.3	2.7	200	28	37	59	47%	63%
STM 1902	D1904	D1905	47.5	0.5	250	42	51	46	92%	112%
STM 1903	D1905	D1906	37.5	0.9	250	42	51	60	71%	86%
STM 1904	D1907	D1906	81.6	0.9	200	35	37	34	102%	109%
STM 1905	D1906	D1903	52.7	0.9	300	114	131	98	116%	134%
STM 1906	D1909	D1910	30.8	0.6	200	20	28	28	73%	100%

STM 1907	D1911	D1908	56.6	2.6	300	20	27	168	12%	16%
STM 1908	D1913	D1914	76.9	0.2	250	44	47	29	151%	163%
STM 1909	D1914	D1912	39.1	2.4	250	76	87	99	77%	88%
STM 1910	D1916	D1915	45.6	3.3	200	32	43	65	49%	66%
STM 1912	D1915	D1917	18.0	1.4	600	282	351	783	36%	45%
STM 1913	D1918	OUT19	8.5	0.5	450	277	351	211	131%	166%
STM 201	D201	D202	108.7	0.2	300	43	65	47	92%	138%
STM 202	D202	D203	71.9	0.2	300	40	65	49	81%	131%
STM 203	D203	D204	83.4	0.2	380	44	65	86	51%	76%
STM 204	D204	D205	23.1	0.4	450	160	262	203	79%	129%
STM 205	D205	D206	66.8	0.3	600	160	256	364	44%	70%
STM 206	D206	OUT2	89.0	0.2	600	184	283	315	58%	90%
STM 2101	D2101	OUT21	31.0	0.5	250	21	28	46	46%	62%
STM 2201	D2201	OUT22	31.9	0.5	250	53	67	46	116%	148%
STM 2301	D2301	D2302	196.5	0.5	380	13	17	134	10%	13%
STM 2401	D2401	D2402	16.8	0.5	300	0	2	74	0%	3%
STM 2402	D2402	D2403	88.6	0.6	380	21	31	145	15%	22%
STM 2403	D2403	D2404	74.7	0.2	380	50	72	85	58%	84%
STM 2404	D2404	D2405	127.0	0.0	380	69	103	85	81%	121%
STM 2405	D2406	D2407	81.5	0.5	300	19	26	74	26%	35%
STM 2406	D2407	D2405	98.0	0.4	380	19	25	115	16%	22%
STM 2407	D2405	D2408	13.4	0.1	600	75	117	298	25%	39%
STM 2408	D2410	D2411	30.0	0.3	200	21	29	18	114%	157%
STM 2409	D2412	D2409	11.7	3.7	600	20	28	1273	2%	2%
STM 301	D304	D303	62.7	1.7	300	76	106	137	55%	77%
STM 302	D301	D302	77.5	0.2	200	36	41	16	229%	260%
STM 303	D302	D303	8.0	2.3	200	37	42	53	69%	80%
STM 304	D303	D305	56.7	0.0	380	113	129	85	134%	152%
STM 305	D306	D307	67.9	0.5	250	35	47	46	77%	102%
STM 306	D307	D305	71.3	0.5	250	35	47	46	77%	102%
STM 307	D305	OUT3	106.6	0.5	380	209	256	134	156%	191%
STM 401	D401	D402	103.6	0.2	300	30	43	47	64%	92%
STM 402	D403	D404	88.4	0.5	380	58	79	134	43%	59%
STM 403	D404	D402	117.8	0.1	300	53	57	47	114%	122%
STM 404	D402	D405	55.2	0.5	380	106	128	133	80%	97%
STM 405	D406	D407	34.0	0.2	250	42	54	29	145%	184%
STM 406	D407	D408	60.3	0.0	250	42	54	29	147%	187%
STM 407	D408	D409	24.1	5.1	250	42	54	146	29%	37%
STM 408	D409	D405	15.1	0.7	250	42	54	55	77%	99%
STM 409	D405	OUT4	61.4	0.5	380	139	182	134	104%	136%
STM 501	D501	D502	50.7	0.5	250	38	40	46	83%	89%
STM 502	D502	D503	29.7	0.5	300	61	66	74	83%	89%
STM 503	D503	D504	42.1	0.2	380	98	118	93	106%	128%
STM 504	D505	D506	25.1	0.5	250	40	55	45	88%	121%
STM 505	D506	D507	25.5	0.5	300	40	54	74	54%	73%

STM 506	D507	D504	74.9	0.5	380	39	53	135	29%	39%
STM 507	D504	OUT5	57.4	0.5	380	128	162	134	96%	121%
STM 601	D601	D602	12.6	1.0	200	56	67	36	158%	187%
STM 602	D603	D604	15.1	0.5	200	30	41	25	120%	163%
STM 603	D605	D604	27.7	0.5	200	35	46	25	139%	182%
STM 604	D604	D602	112.6	0.5	300	64	86	77	83%	112%
STM 605	D602	D606	130.0	0.5	380	125	168	134	93%	125%
STM 606	D606	OUT6	37.0	0.5	380	144	197	134	108%	146%
STM 701	D701	D702	47.9	1.5	300	23	33	127	19%	26%
STM 702	D702	D703	19.7	1.2	300	23	33	116	20%	29%
STM 703	D704	D703	60.7	0.5	200	26	35	25	102%	141%
STM 704	D703	D705	39.2	0.7	300	49	63	85	57%	74%
STM 705	D705	D706	29.7	0.9	300	69	89	102	68%	87%
STM 706	D707	D708	98.5	0.6	300	23	30	78	29%	39%
STM 707	D708	D709	22.4	1.0	300	42	58	106	40%	54%
STM 708	D709	D710	21.1	0.5	380	42	55	134	31%	41%
STM 709	D710	D706	9.8	0.8	380	41	56	165	25%	34%
STM 710	D706	OUT7	66.8	0.5	380	109	141	134	81%	105%
STM 801	D801	D802	11.2	1.0	200	20	27	36	56%	75%
STM 802	D802	D803	48.9	0.8	300	20	26	91	21%	29%
STM 803	D803	D804	11.5	3.7	300	19	26	201	10%	13%
STM 804	D804	D805	49.0	0.5	250	19	24	46	42%	53%
STM 805	D806	D805	49.9	0.9	300	40	55	101	40%	54%
STM 806	D805	D807	58.6	0.2	380	58	74	85	68%	87%
STM 807	D807	D808	33	1	380	58	72	174	33%	41%
STM 808	D809	D808	75	1	300	33	40	80	41%	50%
STM 809	D810	D808	40	1	300	42	56	85	50%	67%
STM 810	D808	D811	90	0	380	123	153	119	104%	129%
STM 811	D811	OUT8	64	1	450	122	152	218	56%	70%
STM 901	D901	D902	67	1	300	25	34	85	29%	40%
STM 902	D902	D903	122	0	380	24	33	105	23%	32%
STM 903	D903	D904	66	0	380	58	79	85	69%	93%
STM 904	D904	D905	9	1	380	58	77	134	43%	57%
STM 905	D906	D907	124	1	300	47	62	76	62%	82%
STM 906	D907	D908	89	0	380	92	123	117	79%	105%
STM 907	D908	D909	7	1	380	90	124	134	67%	92%
STM2001	D2001	DW2002	57	3	200	15	20	50	29%	40%

Outfall ID	Existing System 50% of Peak Flow 2-Year Storm (LPS)	Future System 50% of Peak Flow 2-Year Storm (LPS)	Outfall Location	Treatment Required
OUT1	45	42	Miami River	Yes
OUT2	55	58	Miami River	Yes
OUT3	63	63	Miami River	Yes
OUT4	50	50	Miami River	Yes
OUT5	38	38	Miami River	Yes
OUT6	44	51	Miami River	Yes
OUT7	37	39	Miami River	Yes
OUT8	37	43	Miami River	Yes
OUT9	109	145	Harrison Lake	Yes
OUT10	37	51	Miami River	Yes
OUT11	9	10	Miami River	Yes
OUT12	21	21	Miami River	Yes
OUT13	62	73	Miami River	Yes
OUT14	57	71	Miami River	Yes
OUT15	92	108	Miami River	Yes
OUT18	61	68	Miami River	Yes
OUT19	80	98	Miami River	Yes
OUT21	6	7	Miami River	Yes
OUT22	15	18	Miami River	Yes
OUT23	9	9	Miami River	Yes
OUT24	25	32	Hot Springs Road Ditch	No

Appendix B – Sanitary Model Data

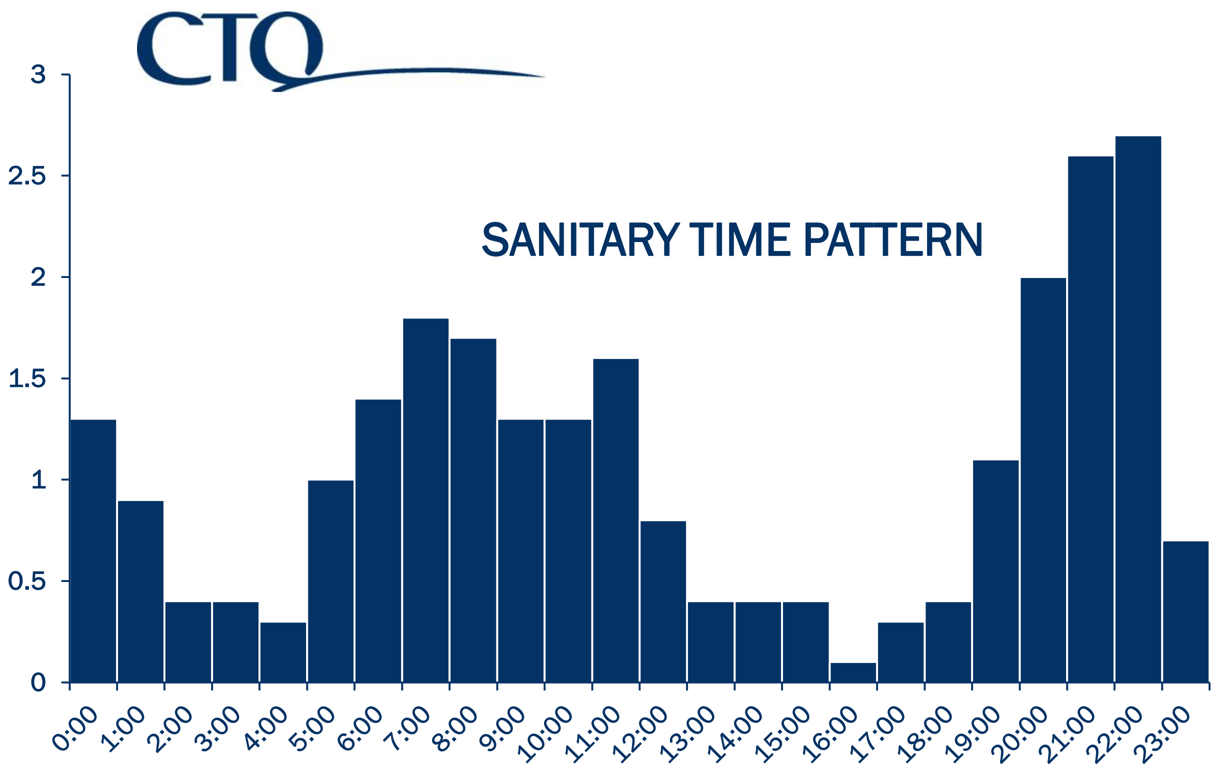
Appendix B - Sanitary Model Data
Pipe Table - Existing System (2016)

Inlet ID	Outlet ID	Length (m)	Average Slope (%)	Pipe Diameter (mm)	Peak Flow (LPS)	Design Flow Capacity (LPS)	Peak Flow 100-Year Capacity (%)
1	2	83.51	0.3800	0.200	0.320	24.00	1%
2	3	85.28	0.4500	0.200	0.740	25.88	3%
3	4	85.03	0.2900	0.200	1.090	21.02	5%
4	5	126.69	0.3500	0.200	1.290	22.05	6%
5	6	67.21	0.5400	0.200	2.040	28.37	7%
6	7	83.42	0.3200	0.200	2.690	22.05	12%
7	12	19.91	0.4500	0.200	30.140	26.06	116%
8	7	140.34	0.4600	0.200	7.070	26.38	27%
9	8	95.27	0.3500	0.200	4.760	22.81	21%
10	9	88.61	0.4600	0.200	2.900	26.37	11%
11	10	123.10	0.2700	0.200	0.320	19.76	2%
14	15	119.23	0.2400	0.300	28.870	56.37	51%
15	16	121.89	0.1800	0.300	29.890	48.56	62%
15.2	PS1	66.69	0.5200	0.200	23.580	28.08	84%
16	16A	92.17	0.2000	0.300	28.570	50.51	57%
17	17A	20.10	0.2000	0.300	28.630	50.98	56%
18	19	100.18	0.2000	0.300	36.600	51.07	72%
19	20	99.33	0.1400	0.300	36.220	42.91	84%
20	21	103.30	0.1800	0.300	38.800	49.02	79%
21	22	91.35	0.1800	0.300	49.580	47.83	104%
22	23	56.40	0.2000	0.300	49.820	50.47	99%
23	24	47.35	0.1100	0.380	54.430	67.34	81%
24	25	72.13	0.2400	0.380	54.300	97.60	56%
25	26	24.81	0.1600	0.300	61.200	45.89	133%
28	29	69.58	0.2200	0.350	12.540	80.05	16%
29	30	87.19	0.0800	0.350	13.800	48.85	28%
30	32	116.56	0.2400	0.300	15.690	50.77	31%
31	30	121.56	0.2500	0.250	0.320	34.92	1%
32	33	114.71	0.1400	0.300	16.960	42.68	40%
33	34	63.23	0.2200	0.350	23.280	81.12	29%
34	35	120.65	0.1300	0.350	24.560	62.78	39%
35	36	40.24	0.1700	0.350	31.510	66.57	47%
37	39	53.10	-0.7000	0.200	31.380	44.28	71%
40	43	111.55	0.2600	0.350	66.250	87.90	75%
41	42	103.34	0.2900	0.250	0.320	37.87	1%
43	44	112.33	0.2600	0.350	66.610	87.60	76%
45	46	80.73	0.5000	0.150	0.320	12.19	3%
46	47	71.96	0.5800	0.200	1.210	29.61	4%
47	49	127.81	0.5400	0.200	1.210	28.48	4%
49	15.2	28.00	0.7900	0.200	15.660	34.36	46%
52	53	103.52	0.3000	0.200	2.800	21.21	13%

53	59	118.75	0.3400	0.200	7.000	22.50	31%
54	55	92.80	0.3200	0.200	1.920	22.04	9%
55	53	72.43	0.2800	0.200	3.010	20.37	15%
56	57	122.53	0.5900	0.150	0.320	13.80	2%
57	58	116.59	0.3400	0.200	2.070	22.71	9%
58	59	123.17	0.3200	0.200	3.130	22.09	14%
59	71	109.74	0.3300	0.200	13.620	22.20	61%
60	59	113.45	0.2300	0.150	1.400	8.62	16%
63	64	103.52	0.4000	0.200	5.310	24.40	22%
64	65	37.43	0.4000	0.200	6.970	24.54	28%
65	70	35.65	0.4200	0.200	9.160	25.14	36%
66	65	91.50	0.5000	0.150	1.400	12.76	11%
67	68	25.08	2.2700	0.150	0.150	27.14	1%
68	71	108.90	0.5100	0.150	1.170	12.79	9%
69	68	103.49	0.8300	0.150	0.320	16.41	2%
70	70A	16.69	0.4200	0.200	9.160	16.43	56%
71	0	9.16	0.4400	0.300	1.400	75.52	2%
74	75	101.91	0.3500	0.300	31.330	67.93	46%
75	78	92.36	0.4000	0.300	32.790	70.36	47%
76	77	67.86	0.3800	0.200	0.320	23.99	1%
77	75	69.17	0.3800	0.200	0.740	23.77	3%
78	79	87.01	0.4000	0.300	33.020	72.49	46%
79	80	85.80	0.2900	0.300	16.770	61.69	27%
80	40	22.15	0.5900	0.300	34.680	87.56	40%
81	82	62.11	0.3900	0.200	0.320	24.10	1%
82	15	87.97	0.3600	0.200	2.460	23.38	11%
83	82	146.35	0.3400	0.200	0.320	22.66	1%
84	86	103.85	0.3700	0.200	0.320	23.45	1%
85	86	101.98	0.3400	0.200	0.320	22.71	1%
86	18	209.86	0.3500	0.200	7.240	22.86	32%
87	143	43.00	0.3700	0.200	0.320	23.65	1%
90	89	15.07	0.5300	0.200	0.320	28.24	1%
91	89	46.39	0.4500	0.200	0.320	26.08	1%
92	PS5	55.29	0.4200	0.200	0.320	29.95	1%
93	94	24.29	0.4900	0.200	14.500	27.25	53%
94	95	55.03	0.3600	0.200	15.900	23.37	68%
95	96	106.55	0.3600	0.200	9.460	23.15	41%
96	97	106.18	0.3600	0.200	10.300	23.19	44%
97	21	76.45	0.6300	0.200	12.350	29.74	42%
98	97	62.35	0.1900	0.150	0.320	7.90	4%
100	162	76.93	0.3600	0.250	0.320	41.64	1%
101	163	48.50	0.3300	0.250	3.550	40.37	9%
102	103	83.95	0.2700	0.250	4.700	36.79	13%
103	25	88.20	0.3100	0.250	6.270	38.89	16%
104	103	52.82	0.5300	0.250	0.390	51.17	1%

105	101	70.62	0.2800	0.250	0.320	11.83	3%
106	29	53.83	0.3500	0.250	0.320	41.76	1%
110	111	88.75	0.4700	0.200	0.320	26.67	1%
111	8	13.75	0.4400	0.200	0.980	25.61	4%
113	40	59.89	0.2700	0.250	31.500	36.33	87%
114	115	114.06	0.3500	0.200	0.320	22.67	1%
115	116	119.67	0.3500	0.200	1.430	22.96	6%
116	161	38.22	0.3100	0.200	2.440	21.72	11%
117	118	87.76	0.3200	0.200	0.320	21.90	1%
118	119	99.69	0.3200	0.200	1.190	21.96	5%
119	119A	102.58	0.2900	0.200	2.090	20.96	10%
120	154	50.75	0.3500	0.200	7.140	23.09	31%
121	120	88.45	0.3500	0.200	1.970	21.81	9%
122	157	41.68	0.3400	0.200	0.320	22.47	1%
123	158	117.59	0.3500	0.200	1.000	22.89	4%
124	54	37.10	0.3500	0.200	1.400	22.95	6%
125	120	70.57	0.3800	0.200	0.320	23.07	1%
126	127	45.78	0.3700	0.200	0.320	22.92	1%
127	129	121.34	0.4000	0.200	4.360	24.63	18%
129	130	84.47	0.4000	0.200	5.240	24.59	21%
130	132	57.01	0.4000	0.200	5.650	24.62	23%
131	132	76.22	0.3900	0.200	0.320	24.32	1%
132	133	66.27	0.4400	0.200	6.990	25.20	28%
133	134	43.36	0.3500	0.200	7.470	22.80	33%
134	12	117.19	0.3700	0.200	7.470	23.48	32%
135	146	67.14	0.4000	0.200	0.320	24.58	1%
136	137	27.38	0.4000	0.200	0.320	24.57	1%
137	140	54.91	0.2700	0.200	1.260	20.26	6%
138	137	46.03	0.3900	0.200	0.320	24.24	1%
139	140	52.55	0.4000	0.200	0.320	20.01	2%
140	127	18.29	0.3800	0.200	3.270	23.98	14%
141	17A	50.62	0.3600	0.150	1.300	10.73	12%
142	141	26.94	0.3700	0.150	1.060	10.97	10%
143	142	84.30	0.3700	0.150	0.640	10.92	6%
144	145	103.68	0.1500	0.250	0.320	27.61	1%
145	147	106.62	0.2300	0.250	2.680	33.35	8%
146	140	18.43	0.4300	0.200	1.100	1.58	70%
147	35	106.51	0.3400	0.250	3.660	31.21	12%
148	149	146.22	0.1200	0.200	1.400	13.22	11%
149	150	26.69	0.6400	0.200	1.400	30.94	5%
150	63	209.80	0.4000	0.200	1.400	33.00	4%
155	52	118.75	0.2300	0.200	1.620	57.91	3%
157	123	21.69	0.3700	0.200	0.660	22.02	3%
158	121	25.04	0.4000	0.200	1.970	24.50	8%
159	154	37.99	0.3200	0.200	2.810	21.79	13%

161	120	33.23	0.4500	0.200	3.160	23.29	14%
162	101	80.43	0.2500	0.250	1.920	35.05	5%
163	102	89.94	0.2800	0.250	3.800	37.06	10%
164	165	99.12	0.2500	0.250	1.250	35.30	4%
165	166	99.44	0.2800	0.250	2.100	37.30	6%
166	167	101.17	0.2600	0.250	2.920	35.63	8%
167	23	100.76	0.2900	0.300	3.980	61.31	6%
421	145	102.84	0.2700	0.250	0.940	36.67	3%
511	155	112.78	0.5600	0.200	0.320	28.97	1%
991	164	45.12	0.3100	0.250	0.770	39.15	2%
119B	119A	27.25	0.3300	0.200	0.320	22.28	1%
16A	17	29.47	0.2000	0.300	27.380	51.57	53%
17A	18	98.92	0.3900	0.300	29.510	71.76	41%
70A	71	85.09	0.4200	0.200	9.160	26.58	34%
84A	84	75.04	0.4000	0.200	0.320	0.78	41%



SANITARY TIME PATTERN
3
2.5
2
1.5
1
0.5
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00

Appendix C – Project Costs Estimates

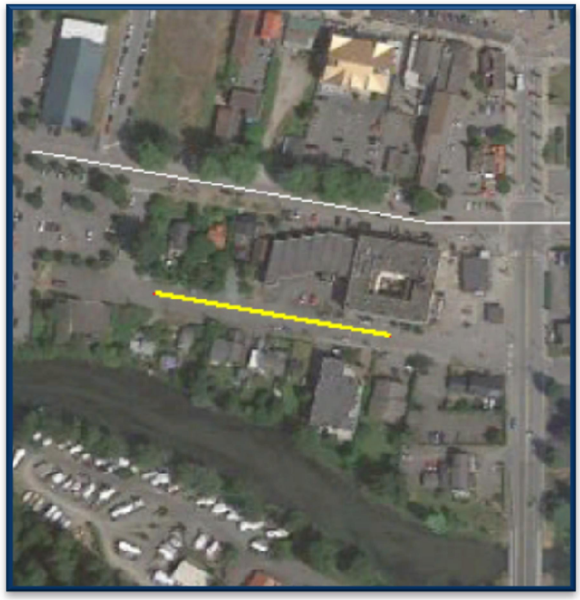
2016 Storm Projects Cost Estimate

Project: CEDAR AVENUE
Location: D101 to D103

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: CEDAR AVENUE

Location:



Project Description: Upgrade 103m of existing storm main from 300mm to 375mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: No

Project Limits: D101 to D103

Project Details:

Pipe Length:	103	m
Pipe Size:	375	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: Yes
Related Water Projects: No

Cost Estimate Summary

Construction:	$	81,907.50
Contingency (Level C):	$	20,476.88
Engineering & CA	$	12,286.13
Specialists:	$	16,381.50
Subtotal:	$	131,052.00
Land Acquisition:	$	-
Total Project Cost:	$	131,052.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - CEDAR AVENUE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 300mm Stormmain	m	103	$ 100.00	$ 10,300.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	309	$ 20.00	$ 6,180.00
Section 2 Sub-Total							$ 16,480.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	206	$ 10.00	$ 2,060.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	309	$ 55.00	$ 16,995.00
Section 3 Sub-Total							$ 19,055.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	103	$ 7.50	$ 772.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	103	$ 200.00	$ 20,600.00
	33 44 01		Manholes and Catch basins				
4.3		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	3	$ 3,750.00	$ 11,250.00
4.4		1.5.4	Remove and Dispose Existing Manhole	ea	3	$ 1,250.00	$ 3,750.00
Section 4 Sub-Total							$ 36,372.50
Sub-Total of Section 1 to 4							$ 81,907.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 12,286.13
5.2			Contingency	C		25%	$ 20,476.88
5.3			Provisonal for Dewatering Cost			20%	$ 16,381.50
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 49,144.50
Total (not including taxes)							$ 131,052.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Cedar Avenue from D101 to D103.
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

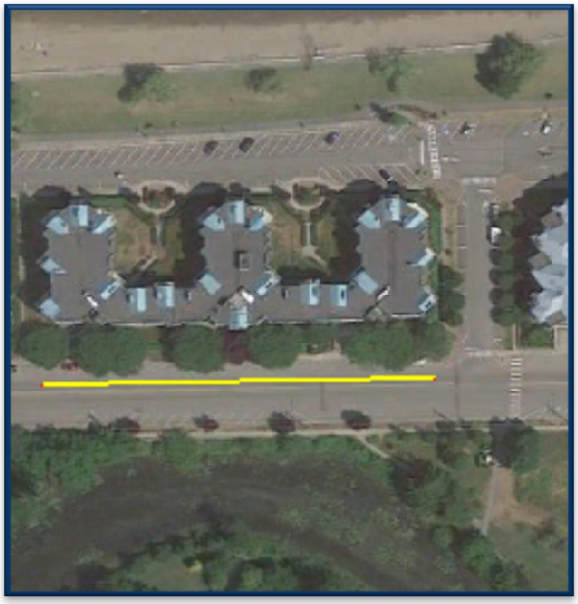
Project: LILLOOET AVENUE "A"
Location: D406 TO D409

Date of Estimate: December 2, 2016

Priority: Medium

Project Name: LILLOOET AVENUE "A"

Location:



Project Description: Upgrade 118m of existing storm main from 200mm to 250mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: No

Project Limits/Address: D406 TO D409

Project Details:

Pipe Length:	118	m
Pipe Size:	250	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	90,475.00
Contingency (Level C):	$	22,618.75
Engineering & CA	$	13,571.25
Specialists:	$	18,095.00
Subtotal:	$	144,760.00
Land Acquisition:	$	-
Total Project Cost:	$	144,760.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - LILLOOET AVENUE "A"
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 200mm Stormmain	m	118	$ 100.00	$ 11,800.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	354	$ 20.00	$ 7,080.00
Section 2 Sub-Total							$ 18,880.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	236	$ 10.00	$ 2,360.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	354	$ 55.00	$ 19,470.00
Section 3 Sub-Total							$ 21,830.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	118	$ 7.50	$ 885.00
	33 40 01		Storm Sewers				
4.2.		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	118	$ 160.00	$ 18,880.00
	33 44 01		Manholes and Catch basins				
4.4		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	4	$ 3,750.00	$ 15,000.00
4.5		1.5.4	Remove and Dispose Existing Manhole	ea	4	$ 1,250.00	$ 5,000.00
Section 4 Sub-Total							$ 39,765.00
Sub-Total of Section 1 to 4							$ 90,475.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 13,571.25
5.2			Contingency	C		25%	$ 22,618.75
5.3			Provisonal for Dewatering Cost			20%	$ 18,095.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 54,285.00
Total (not including taxes)							$ 144,760.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Lillooet Avenue from D406 TO D409.
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

Project: LILLOOET AVENUE "B"
Location: DW508 TO D501 & DW509 TO D501

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: LILLOOET AVENUE "B"

Location:

Project Description: Install 58m of 200mm storm main from DW508 TO D501 & DW509 TO D501 in order to provide overflow capacity during 10-year storm event.

DCC Eligible: No

Project Limits/Address: DW508 TO D501 & DW509 TO D501

Project Details:

Pipe Length:	58	m
Pipe Size:	200	mm
Tie-ins:	4	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Cost Estimate Summary		
Construction:	$	31,765.00
Contingency (Level C):	$	7,941.25
Engineering & CA	$	4,764.75
Specialists:	$	6,353.00
Subtotal:	$	50,824.00
Land Acquisition:	$	-
Total Project Cost:	$	50,824.00

Notes:

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - LILLOOET AVENUE "B"
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 5,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.1		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	174	$ 20.00	$ 3,480.00
Section 2 Sub-Total							$ 3,480.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	116	$ 10.00	$ 1,160.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	174	$ 55.00	$ 9,570.00
Section 3 Sub-Total							$ 10,730.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	58	$ 7.50	$ 435.00
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	200mm PVC Storm Main - Native Backfill	m	58	$ 140.00	$ 8,120.00
4.3		1.6.9	Drainage Tie-In - 200mm diameter into existing manhole	ea	4	$ 1,000.00	$ 4,000.00
Section 4 Sub-Total							$ 12,555.00
Sub-Total of Section 1 to 4							$ 31,765.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 4,764.75
5.2			Contingency	C		25%	$ 7,941.25
5.3			Provisonal for Dewatering Cost			20%	$ 6,353.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 19,059.00
Total (not including taxes)							$ 50,824.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Lillooet Avenue from DW509 to D501 and DW508 to D501.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

Project: ECHO AVENUE "A"
Location: D602 TO D606

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: ECHO AVENUE "A"

Location:

Project Description: Upgrade 130m of existing storm main from 300mm to 375mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: No

Project Limits/Address: D602 TO D606

Project Details:

Pipe Length:	130	m
Pipe Size:	375	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	86,825.00
Contingency (Level C):	$	21,706.25
Engineering & CA	$	13,023.75
Specialists:	$	17,365.00
Subtotal:	$	138,920.00
Land Acquisition:	$	-
Total Project Cost:	$	138,920.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - ECHO AVENUE "A"
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 5,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 300mm Stormmain	m	130	$ 100.00	$ 13,000.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	390	$ 20.00	$ 7,800.00
Section 2 Sub-Total							$ 20,800.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	260	$ 10.00	$ 2,600.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	390	$ 55.00	$ 21,450.00
Section 3 Sub-Total							$ 24,050.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	130	$ 7.50	$ 975.00
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	130	$ 200.00	$ 26,000.00
	33 44 01		Manholes and Catch basins				
4.3		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.4		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 36,975.00
Sub-Total of Section 1 to 4							$ 86,825.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 13,023.75
5.2			Contingency	C		25%	$ 21,706.25
5.3			Provisonal for Dewatering Cost			20%	$ 17,365.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 52,095.00
Total (not including taxes)							$ 138,920.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Echo Avenue from D602 TO D606
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

2016 Storm Projects Cost Estimate

Project: HADWAY DRIVE
Location: D1913 to D1912

Date of Estimate: December 2, 2016

Priority: Medium

Project Name: HADWAY DRIVE

Location:

Project Description: Upgrade 116m of existing storm main from 200mm to 250mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: No

Project Limits/Address: D1913 to D1912

Project Details:

Pipe Length:	116	m
Pipe Size:	250	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Cost Estimate Summary

Construction:	$	74,845.00
Contingency (Level C):	$	18,711.25
Engineering & CA	$	11,226.75
Specialists:	$	14,969.00
Subtotal:	$	119,752.00
Land Acquisition:	$	-
Total Project Cost:	$	119,752.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - HADWAY DRIVE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 7,500.00	$ 7,500.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 7,500.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 200mm Stormmain	m	116	$ 100.00	$ 11,600.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	261	$ 20.00	$ 5,220.00
Section 2 Sub-Total							$ 16,820.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	174	$ 10.00	$ 1,740.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	261	$ 55.00	$ 14,355.00
Section 3 Sub-Total							$ 16,095.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	116	$ 7.50	$ 870.00
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	116	$ 160.00	$ 18,560.00
	33 42 13		Pipe Culvert				
4.3		1.5.3	End Walls - Standard Drawing S14, S15	ea	1	$ 5,000.00	$ 5,000.00
	33 44 01		Manholes and Catch basins				
4.4		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.5		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 34,430.00
Sub-Total of Section 1 to 4							$ 74,845.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 11,226.75
5.2			Contingency	C		25%	$ 18,711.25
5.3			Provisonal for Dewatering Cost			20%	$ 14,969.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 44,907.00
Total (not including taxes)							$ 119,752.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Hadway Drive from D1913 to D1912
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

Project: PINE AVENUE
Location: D2101 to OUT21 & D2201 to OUT22

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: PINE AVENUE

Project Description: Upgrade 287m of existing storm main from 300mm virtrified clay to 375mm PVC in order to provide flow capacity during 10-year storm event and to replace the existing degrading pipe.

DCC Eligible: No

Project Limits/Address: D1701 to D1704

Project Details:

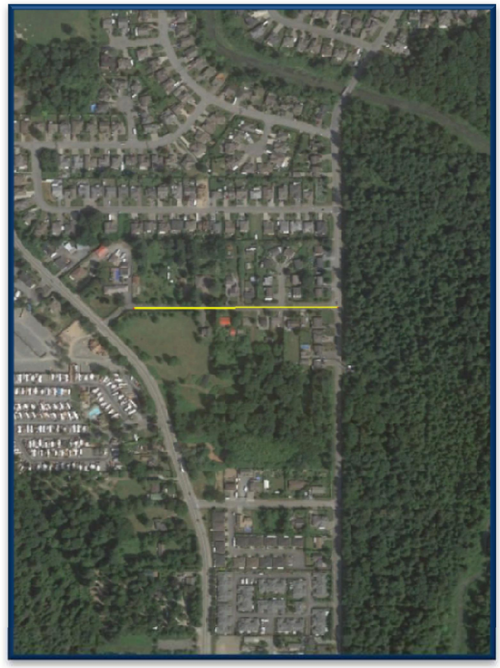
Pipe Length:	287	m
Pipe Size:	375	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Location:



Site Photograph:

Cost Estimate Summary

Construction:	$	180,567.50
Contingency (Level C):	$	45,141.88
Engineering & CA	$	27,085.13
Specialists:	$	36,113.50
Subtotal:	$	288,908.00
Land Acquisition:	$	-
Total Project Cost:	$	288,908.00

Notes:

1. Assume all manholes are in need of replacement.

2. Virtrified Clay Pipe is at end of life and no longer meets required level of service.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - PINE AVENUE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 5,000.00	$ 5,000.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 2,000.00	$ 2,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 7,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 300mm Stormmain (Virtrified Clay)	m	287	$ 100.00	$ 28,700.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	861	$ 20.00	$ 17,220.00
Section 2 Sub-Total							$ 45,920.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	574	$ 10.00	$ 5,740.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	861	$ 55.00	$ 47,355.00
Section 3 Sub-Total							$ 53,095.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipelines				
4.1		1.6.2	CCTV Pipeline Inspection	m	287	$ 7.50	$ 2,152.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	287	$ 200.00	$ 57,400.00
	33 44 01		Manholes and Catch basins				
4.3		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	3	$ 3,750.00	$ 11,250.00
4.4		1.5.4	Remove and Dispose Existing Manhole	ea	3	$ 1,250.00	$ 3,750.00
Section 4 Sub-Total							$ 74,552.50
Sub-Total of Section 1 to 4							$ 180,567.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 27,085.13
5.2			Contingency	C		25%	$ 45,141.88
5.3			Provisonal for Dewatering Cost			20%	$ 36,113.50
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 108,340.50
Total (not including taxes)							$ 288,908.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Pine Avenue from D1701 to D1704.
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

Project: McPherson Road
Location: D2413 to D2414

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: McPHERSON ROAD

Location:

Project Description: Remove and replace 15m of collapsed 250mm storm main. Install new lawn basin and outfall structure.

DCC Eligible: No

Project Limits/Address: D2413 to D2414

Project Details:

Pipe Length:	15	m
Pipe Size:	250	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Site Photograph:

Cost Estimate Summary

Construction:	$	21,937.50
Contingency (Level C):	$	5,484.38
Engineering & CA	$	3,290.63
Specialists:	$	2,193.75
Subtotal:	$	32,906.25
Land Acquisition:	$	-
Total Project Cost:	$	32,906.25

Notes:

1. Assume lawn basin and outfall structure are both in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - PINE AVENUE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 2,500.00	$ 2,500.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 500.00	$ 500.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 3,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 300mm Stormmain (Virtrified Clay)	m	15	$ 100.00	$ 1,500.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	45	$ 20.00	$ 900.00
Section 2 Sub-Total							$ 2,400.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	30	$ 10.00	$ 300.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	45	$ 55.00	$ 2,475.00
Section 3 Sub-Total							$ 2,775.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	15	$ 7.50	$ 112.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	15	$ 160.00	$ 2,400.00
	33 42 13		Pipe Culvert				
4.3		1.5.3	End Walls - Standard Drawing S14, S15	ea	1	$ 5,000.00	$ 5,000.00
	33 44 01		Manholes and Catch basins				
4.4		1.5.2	Top Inlet Lawn Basin	ea	1	$ 3,750.00	$ 3,750.00
4.5		1.5.4	Remove and Dispose Existing lawn Basin / Outfall Structure	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 13,762.50
Sub-Total of Section 1 to 4							$ 21,937.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 3,290.63
5.2			Contingency	C		25%	$ 5,484.38
5.3			Provisonal for Dewatering Cost			10%	$ 2,193.75
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 10,968.75
Total (not including taxes)							$ 32,906.25

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on McPherson Road Avenue from D2413 to D2414.
2. Assume lawn basin and outfall structure are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

Project: McCombs Drive / McPherson Road
Location: Along McCombs Drive

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: McCOMBS DRIVE / McPHERSON ROAD

Location:

Project Description: Remove and replace 170m of collapsed and poor condition storm main. Install new 600mm PVC storm main with outfall structure. Install new inlet structure to collect flow from upstream ditch.

DCC Eligible: No

Project Limits/Address: Along McCombs Drive

Project Details:

Pipe Length:	0	m
Pipe Size:	0	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	12,062.50
Contingency (Level C):	$	3,015.63
Engineering & CA	$	1,809.38
Specialists:	$	1,206.25
Subtotal:	$	18,093.75
Land Acquisition:	$	-
Total Project Cost:	$	18,093.75

Notes:

1. Assume catchbasin does not need replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - PINE AVENUE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 5,000.00	$ 5,000.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ -	$ -
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 5,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.1		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	25	$ 20.00	$ 500.00
Section 2 Sub-Total							$ 500.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	15	$ 10.00	$ 150.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	25	$ 55.00	$ 1,375.00
Section 3 Sub-Total							$ 1,525.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	5	$ 7.50	$ 37.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	200mm Catchbasin Lead - Native Backfill	m	5	$ 400.00	$ 2,000.00
	33 44 01		Manholes and Catch basins				
4.3		1.5.1.1	Lawnbasin	ea	1	$ 2,500.00	$ 2,500.00
4.4		1.5.4	Adjust existing catbasin	ea	1	$ 500.00	$ 500.00
Section 4 Sub-Total							$ 5,037.50
Sub-Total of Section 1 to 4							$ 12,062.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 1,809.38
5.2			Contingency	C		25%	$ 3,015.63
5.3			Provisonal for Dewatering Cost			10%	$ 1,206.25
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 6,031.25
Total (not including taxes)							$ 18,093.75

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on McCombs Drive / McPherson Road.
2. Assume does not need replacement.

CONTRACTORS INITIAL __________

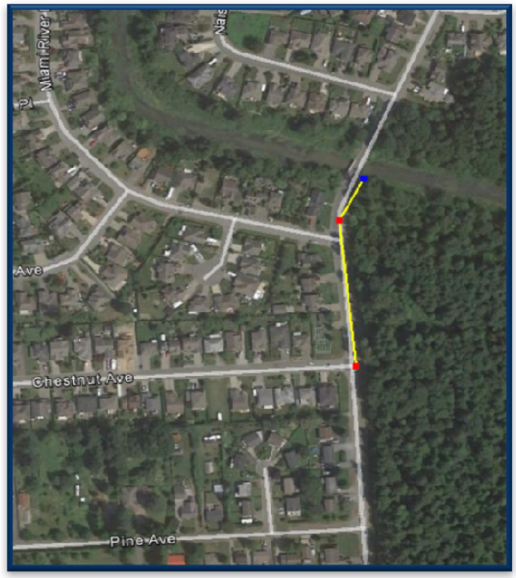
2016 Storm Projects Cost Estimate

Project: McCombs Drive
Location: D1606 to OUT15

Date of Estimate: December 2, 2016 Priority: Medium

Project Name: McCOMBS DRIVE

Location:



Project Description: Remove and replace 170m of collapsed and poor condition storm main. Install new 600mm PVC storm main with outfall structure. Install new inlet structure to collect flow from upstream ditch.

DCC Eligible: No

Project Limits/Address: D1606 to OUT15

Project Details:

Pipe Length:	170	m
Pipe Size:	650	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: Yes
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	117,525.00
Contingency (Level C):	$	29,381.25
Engineering & CA	$	17,628.75
Specialists:	$	11,752.50
Subtotal:	$	176,287.50
Land Acquisition:	$	-
Total Project Cost:	$	176,287.50

Notes:

1. Assume manholes and outfall structure are both in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - PINE AVENUE
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 2,500.00	$ 2,500.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 7,500.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing Stormmain	m	170	$ 100.00	$ 17,000.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	0	$ 20.00	$ -
Section 2 Sub-Total							$ 17,000.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	0	$ 10.00	$ -
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	0	$ 55.00	$ -
Section 3 Sub-Total							$ -
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	170	$ 7.50	$ 1,275.00
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	650mm PVC Storm Main - Native Backfill	m	170	$ 400.00	$ 68,000.00
	33 42 13		Pipe Culvert				
4.3		1.5.3	End Walls - Standard Drawing S14, S15	ea	1	$ 7,500.00	$ 7,500.00
4.4		1.5.3	Inlet Structure	ea	1	$ 5,000.00	$ 5,000.00
	33 44 01		Manholes and Catch basins				
4.5		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.6		1.5.4	Remove and Dispose Existing Manhole / Outfall Structure	ea	3	$ 1,250.00	$ 3,750.00
Section 4 Sub-Total							$ 93,025.00
Sub-Total of Section 1 to 4							$ 117,525.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 17,628.75
5.2			Contingency	C		25%	$ 29,381.25
5.3			Provisonal for Dewatering Cost			10%	$ 11,752.50
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 58,762.50
Total (not including taxes)							$ 176,287.50

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on McCombs Drive from D1606 to OUT15.
2. Assume lawn basin and outfall structure are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

Project: MYNG CRESCENT
Location: D2101 to OUT21 & D2201 to OUT22

Date of Estimate: December 2, 2016 Priority: High

Project Name: MYNG CRESCENT

Location:

Project Description: Upgrade 63m of existing storm main from 200mm to 250mm in order to provide flow capacity during 10-year storm event and install new outfall structures.

DCC Eligible: Yes

Project Limits/Address: D2101 to OUT21 & D2201 to OUT22

Project Details:

Pipe Length:	63	m
Pipe Size:	250	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Site Photograph:

Cost Estimate Summary

Construction:	$	59,952.50
Contingency (Level C):	$	14,988.13
Engineering & CA	$	8,992.88
Specialists:	$	11,990.50
Subtotal:	$	95,924.00
Land Acquisition:	$	-
Total Project Cost:	$	95,924.00

Notes:

1. Assume all manholes are in need of replacement.
2. Assume all outfall structures are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - MYNG CRESCENT
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 5,000.00	$ 5,000.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 15,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 200mm Stormmain	m	63	$ 100.00	$ 6,300.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	10	$ 20.00	$ 200.00
Section 2 Sub-Total							$ 6,500.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	15	$ 10.00	$ 150.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	50	$ 55.00	$ 2,750.00
Section 3 Sub-Total							$ 2,900.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	63	$ 7.50	$ 472.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	63	$ 160.00	$ 10,080.00
	33 42 13		Pipe Culvert				
4.3		1.5.3	End Walls - Standard Drawing S14, S15	ea	2	$ 7,500.00	$ 15,000.00
	33 44 01		Manholes and Catch basins				
4.4		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.5		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 35,552.50
Sub-Total of Section 1 to 4							$ 59,952.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 8,992.88
5.2			Contingency	C		25%	$ 14,988.13
5.3			Provisonal for Dewatering Cost			20%	$ 11,990.50
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 35,971.50
Total (not including taxes)							$ 95,924.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Myng Crescent from D2101 to OUT21 & D2201 to OUT22
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

2016 Storm Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

Project: STORM WATER TREATMENT
Location: 22 Discharge Locations Throughout the VHHS

Date of Estimate: December 2, 2016 Priority: High

Project Name: STORM WATER TREATMENT

Location:
Refer to Figure 2 for Storm-Water Treatment unit locations.

Project Description: Upgrade each storm outfall to provide water quality treatment to all flows up to 50% of the 2-year rainfall event.

DCC Eligible: Partial

Project Limits/Address: 22 Discharge Locations Throughout the VHHS

Project Details:

Discharge Locations	20	each
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Cost Estimate Summary

Construction:	$	800,000.00
Contingency (Level C):	$	200,000.00
Engineering & CA	$	120,000.00
Specialists:	$	80,000.00
Subtotal:	$	1,200,000.00
Land Acquisition:	$	-
Total Project Cost:	$	1,200,000.00

Notes:
Prices based on average cost of treatment units.
(Prices will vary with catchment)

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - STORM WATER TREATMENT
Requirements to address current (2016) system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Note		Incidental	
1.1	01 57 01	1.6.1	Environmental Protection	Lump Sum	20	$ 5,000.00	$ 100,000.00
	01 58 01	1.3.1	Project Identification	Note		Incidental	
Section 1 Sub-Total							$ 100,000.00
2.0 Utilities (MMCD Section 33)							
	33 44 01		Manholes and Catch basins				
2.1		SS	Oil / Water Seperater Unit - c/w all required pipes and fittings	ea	20	$ 30,000.00	$ 600,000.00
2.2		SS	Bio-swale Filtration System	ea	20	$ 5,000.00	$ 100,000.00
Section 2 Sub-Total							$ 700,000.00
Sub-Total of Section 1 to 2							$ 800,000.00
3.0 Soft Costs							
			Soft Costs				
3.1			Engineering & CA			15%	$ 120,000.00
3.2			Contingency	C		25%	$ 200,000.00
3.3			Provisonal for Dewatering Cost			10%	$ 80,000.00
3.4			Land Acquisition	sq.m	0	$ -	$ -
Section 3 Sub-Total							$ 400,000.00
Total (not including taxes)							$ 1,200,000.00

ASSUMPTIONS:

1. Prices based on average cost of treatment units. (Prices will vary with catchment)

CONTRACTORS INITIAL _________

HARRISON HOT SPRINGS
Naturally Refreshed

2016 Storm Projects Cost Estimate

Project: MIAMI DRIVE
Location: D1003 to OUT10

Date of Estimate: December 2, 2016 | Priority: Low

Project Name: MIAMI DRIVE

Location:

Project Description: Upgrade 166m of existing storm main from 375mm to 450mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: D1003 to OUT10

Project Details:

Pipe Length:	166	m
Pipe Size:	450	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	112,834.00
Contingency (Level C):	$	28,208.50
Engineering & CA	$	16,925.10
Specialists:	$	22,566.80
Subtotal:	$	180,534.40
Land Acquisition:	$	-
Total Project Cost:	$	180,534.40

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - MIAMI DRIVE
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 15,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 375mm Stormmain	m	166	$ 100.00	$ 16,600.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	349	$ 20.00	$ 6,972.00
Section 2 Sub-Total							$ 23,572.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	232	$ 10.00	$ 2,324.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	349	$ 55.00	$ 19,173.00
Section 3 Sub-Total							$ 21,497.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	166	$ 7.50	$ 1,245.00
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	450mm PVC Storm Main - Native Backfill	m	166	$ 220.00	$ 36,520.00
	33 42 13		Pipe Culvert				
4.3		1.5.3	End Walls - Standard Drawing S14, S15	ea	1	$ 5,000.00	$ 5,000.00
	33 44 01		Manholes and Catch basins				
4.4		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.5		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 52,765.00
Sub-Total of Section 1 to 4							$ 112,834.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 16,925.10
5.2			Contingency	C		25%	$ 28,208.50
5.3			Provisonal for Dewatering Cost			20%	$ 22,566.80
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 67,700.40
Total (not including taxes)							$ 180,534.40

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Miami Drive from D1003 to OUT10
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

2016 Storm Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

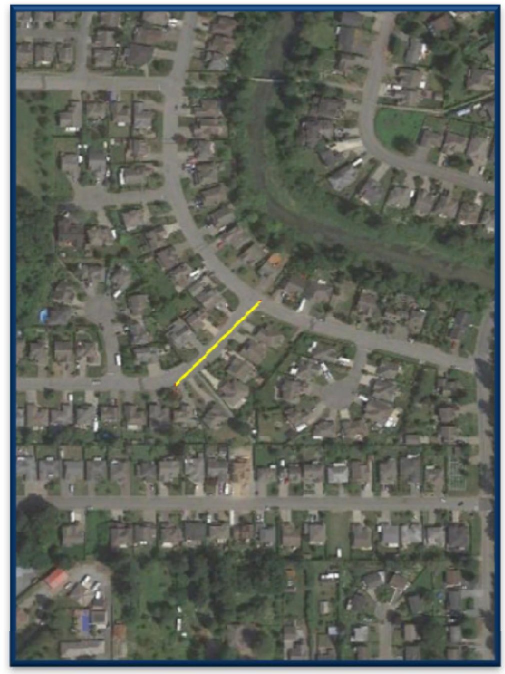
Project: BALSAM AVENUE
Location: D1406 to D1405

Date of Estimate: December 2, 2016

Priority: Low

Project Name: BALSAM AVENUE

Location:



Project Description: Upgrade 95m of existing storm main from 375mm to 450mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: D1406 to D1405

Project Details:

Pipe Length:	95	m
Pipe Size:	450	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	74,387.50
Contingency (Level C):	$	18,596.88
Engineering & CA	$	11,158.13
Specialists:	$	14,877.50
Subtotal:	$	119,020.00
Land Acquisition:	$	-
Total Project Cost:	$	119,020.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - BALSAM AVENUE
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 375mm Stormmain	m	95	$ 100.00	$ 9,500.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	285	$ 20.00	$ 5,700.00
Section 2 Sub-Total							$ 15,200.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	190	$ 10.00	$ 1,900.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	285	$ 55.00	$ 15,675.00
Section 3 Sub-Total							$ 17,575.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
4.1		1.6.2	CCTV Pipeline Inspection	m	95	$ 7.50	$ 712.50
	33 40 01		Storm Sewers				
4.2		1.6.1, 1.6.2	450mm PVC Storm Main - Native Backfill	m	95	$ 220.00	$ 20,900.00
	33 44 01		Manholes and Catch basins				
4.3		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
4.4		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 31,612.50
Sub-Total of Section 1 to 4							$ 74,387.50
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 11,158.13
5.2			Contingency	C		25%	$ 18,596.88
5.3			Provisonal for Dewatering Cost			20%	$ 14,877.50
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 44,632.50
Total (not including taxes)							$ 119,020.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Balsam Avenue from D1406 to D1405
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Storm Projects Cost Estimate

Project: DIAMOND STREET
Location: D1904 to D1906

Date of Estimate: December 2, 2016 Priority: Low

Project Name: DIAMOND STREET

Location:

Project Description: Upgrade 85m of existing storm main from 200mm to 250mm in order to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: D1904 to D1906

Project Details:

Pipe Length:	85	m
Pipe Size:	250	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Site Photograph:

Cost Estimate Summary

Construction:	$	38,737.50
Contingency (Level C):	$	9,684.38
Engineering & CA	$	5,810.63
Specialists:	$	7,747.50
Subtotal:	$	61,980.00
Land Acquisition:	$	-
Total Project Cost:	$	61,980.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - DIAMOND STREET
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 1,000.00	$ 1,000.00
	01 57 01	1.6.1	Environmental Protection	Lump Sum	1		$ -
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 1,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 200mm Stormmain	m	85	$ 100.00	$ 8,500.00
Section 2 Sub-Total							$ 8,500.00
3.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
3.1		1.6.2	CCTV Pipeline Inspection	m	85	$ 7.50	$ 637.50
	33 40 01		Storm Sewers				
3.2		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	85	$ 160.00	$ 13,600.00
	33 44 01		Manholes and Catch basins				
3.3		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	3	$ 3,750.00	$ 11,250.00
3.4		1.5.4	Remove and Dispose Existing Manhole	ea	3	$ 1,250.00	$ 3,750.00
Section 3 Sub-Total							$ 29,237.50
Sub-Total of Section 1 to 3							$ 38,737.50
4.0 Soft Costs							
			Soft Costs				
4.1			Engineering & CA			15%	$ 5,810.63
4.2			Contingency	C		25%	$ 9,684.38
4.3			Provisonal for Dewatering Cost			20%	$ 7,747.50
4.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 23,242.50
Total (not including taxes)							$ 61,980.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Diamond Street from D1904 to D1906
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

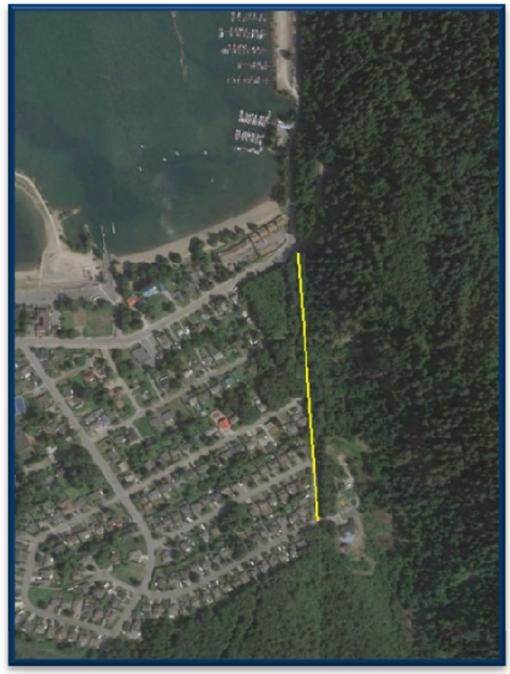
2016 Storm Projects Cost Estimate

Project: MOUNT STREET
Location: D905 to OUT19

Date of Estimate: December 2, 2016 | Priority: Low

Project Name: **MOUNT STREET**

Location:



Project Description: Upgrade 521m of existing storm ditching from to 450mm and 650mm storm main.

DCC Eligible: Yes

Project Limits/Address: D905 to OUT19

Project Details:

Pipe Length:	521	m
Pipe Size:	450 & 600	mm
Tie-ins:	0	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Site Photograph:

Cost Estimate Summary

Construction:	$	155,257.50
Contingency (Level C):	$	38,814.38
Engineering & CA	$	23,288.63
Specialists:	$	31,051.50
Subtotal:	$	248,412.00
Land Acquisition:	$	-
Total Project Cost:	$	248,412.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - MOUNT STREET
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 2,000.00	$ 2,000.00
1.2	01 57 01	1.6.1	Environmental Protection	Lump Sum	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 7,000.00
2.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
2.1		1.6.2	CCTV Pipeline Inspection	m	521	$ 7.50	$ 3,907.50
	33 40 01		Storm Sewers				
2.2		1.6.1, 1.6.2	450mm PVC Storm Main - Native Backfill	m	222	$ 220.00	$ 48,840.00
2.3		1.6.1, 1.6.2	600mmPVC Storm Main - Native Backfill	m	299	$ 240.00	$ 71,760.00
	33 44 01		Manholes and Catch basins				
2.4		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	6	$ 3,750.00	$ 22,500.00
2.5		1.5.4	Remove and Dispose Existing Manhole	ea	1	$ 1,250.00	$ 1,250.00
Section 2 Sub-Total							$ 148,257.50
Sub-Total of Section 1 to 2							$ 155,257.50
3.0 Soft Costs							
			Soft Costs				
3.1			Engineering & CA			15%	$ 23,288.63
3.2			Contingency	C		25%	$ 38,814.38
3.3			Provisonal for Dewatering Cost			20%	$ 31,051.50
3.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 93,154.50
Total (not including taxes)							$ 248,412.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on Mount Street from D905 to OUT19
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

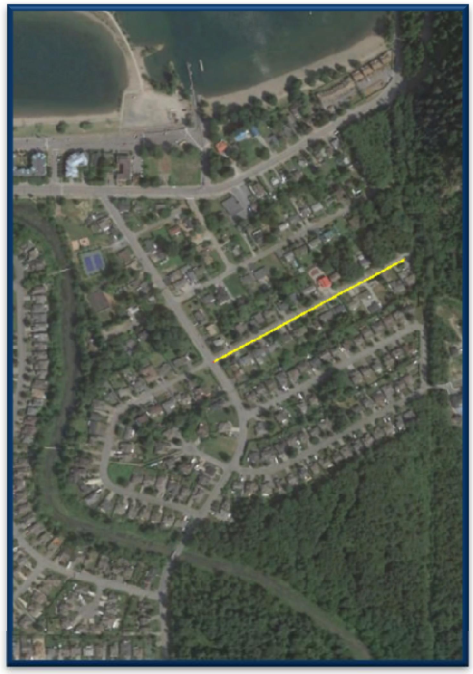
2016 Storm Projects Cost Estimate

Project: NASMITH AVENUE
Location: Eagle Street to Mount Street

Date of Estimate: December 2, 2016 Priority: Low

Project Name: NASMITH AVENUE

Location:



Project Description: Upgrade 350m of road corridor to full urban standard to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: Eagle Street to Mount Street

Project Details:

Pipe Length:	329	m
Pipe Size:	250 & 375	mm
Tie-ins:	2	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: Yes

Site Photograph:

Cost Estimate Summary

Construction:	$	252,292.50
Contingency (Level C):	$	63,073.13
Engineering & CA	$	37,843.88
Specialists:	$	50,458.50
Subtotal:	$	403,668.00
Land Acquisition:	$	-
Total Project Cost:	$	403,668.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - NASMITH AVENUE
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.1		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	987	$ 20.00	$ 19,740.00
Section 2 Sub-Total							$ 19,740.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	658	$ 10.00	$ 6,580.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	987	$ 55.00	$ 54,285.00
Section 3 Sub-Total							$ 60,865.00
4.0 Concrete Features							
	03 30 20		Concrete Walks, Curb And Gutter				
4.1		1.4.3	Machine Placed or Precast Curb & Gutter	m	700	$ 115.00	$ 80,500.00
Section 4 Sub-Total							$ 80,500.00
5.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
5.1		1.6.2	CCTV Pipeline Inspection	m	329	$ 7.50	$ 2,467.50
	33 40 01		Storm Sewers				
5.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	227	$ 200.00	$ 45,400.00
5.3		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	102	$ 160.00	$ 16,320.00
5.4		1.6.9	Drainage Tie-In - XXXmm diameter into existing manhole	ea	2	$ 1,000.00	$ 2,000.00
	33 44 01		Manholes and Catch basins				
5.5		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	4	$ 3,750.00	$ 15,000.00
Section 5 Sub-Total							$ 81,187.50
Sub-Total of Section 1 to 5							$ 252,292.50
6.0 Soft Costs							
			Soft Costs				
6.1			Engineering & CA			15%	$ 37,843.88
6.2			Contingency	C		25%	$ 63,073.13
6.3			Provisonal for Dewatering Cost			20%	$ 50,458.50
6.4			Land Acquisition	sq.m	0	$ -	$ -
Section 6 Sub-Total							$ 151,375.50
Total (not including taxes)							$ 403,668.00

ASSUMPTIONS:
1. Proposed stormmain replacement to be installed on Nasmith Avenue from Eagle Street to Mount Street
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

2016 Storm Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

Project: ECHO ROAD "B"
Location: Eagle Street to Mount Street

Date of Estimate: December 2, 2016 Priority: Low

Project Name: ECHO ROAD "B"

Location:

Project Description: Upgrade 375m of road corridor to full urban standard to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: Eagle Street to Mount Street

Project Details:

Pipe Length:	365	m
Pipe Size:	250 & 375	mm
Tie-ins:	2	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Cost Estimate Summary

Construction:	$	274,412.50
Contingency (Level C):	$	68,603.13
Engineering & CA	$	41,161.88
Specialists:	$	54,882.50
Subtotal:	$	439,060.00
Land Acquisition:	$	-
Total Project Cost:	$	439,060.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - ECHO ROAD "B"
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.1		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	1095	$ 20.00	$ 21,900.00
Section 2 Sub-Total							$ 21,900.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	730	$ 10.00	$ 7,300.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	1095	$ 55.00	$ 60,225.00
Section 3 Sub-Total							$ 67,525.00
4.0 Concrete Features							
	03 30 20		Concrete Walks, Curb And Gutter				
4.1		1.4.3	Machine Placed or Precast Curb & Gutter	m	750	$ 115.00	$ 86,250.00
Section 4 Sub-Total							$ 86,250.00
5.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
5.1		1.6.2	CCTV Pipeline Inspection	m	365	$ 7.50	$ 2,737.50
	33 40 01		Storm Sewers				
5.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	265	$ 200.00	$ 53,000.00
5.3		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	100	$ 160.00	$ 16,000.00
5.4		1.6.9	Drainage Tie-In - XXXmm diameter into existing manhole	ea	2	$ 1,000.00	$ 2,000.00
	33 44 01		Manholes and Catch basins				
5.5		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	4	$ 3,750.00	$ 15,000.00
Section 5 Sub-Total							$ 88,737.50
Sub-Total of Section 1 to 5							$ 274,412.50
6.0 Soft Costs							
			Soft Costs				
6.1			Engineering & CA			15%	$ 41,161.88
6.2			Contingency	C		25%	$ 68,603.13
6.3			Provisonal for Dewatering Cost			20%	$ 54,882.50
6.4			Land Acquisition	sq.m	0	$ -	$ -
Section 6 Sub-Total							$ 164,647.50
Total (not including taxes)							$ 439,060.00

ASSUMPTIONS:
1. Proposed stormmain replacement to be installed on Echo Road from Eagle Street to Mount Street
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

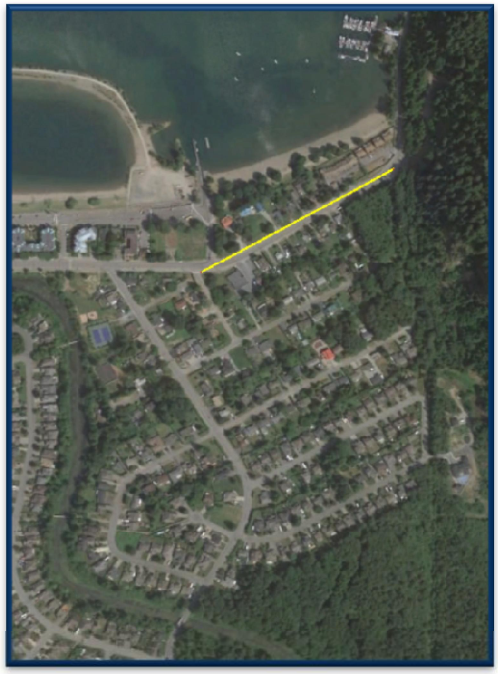
2016 Storm Projects Cost Estimate

Project: LILLOOET AVENUE "C"
Location: Spruce Street to Mount Street

Date of Estimate: December 2, 2016 Priority: Low

Project Name: LILLOOET AVENUE "C"

Location:



Project Description: Upgrade 310m of road corridor to full urban standard to provide flow capacity during 10-year storm event.

DCC Eligible: Yes

Project Limits/Address: Spruce Street to Mount Street

Project Details:

Pipe Length:	375	m
Pipe Size:	250 & 375	mm
Tie-ins:	2	each

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Sanitary Sewer Projects: No
Related Water Projects: No

Site Photograph:

Cost Estimate Summary

Construction:	$	263,187.50
Contingency (Level C):	$	65,796.88
Engineering & CA	$	39,478.13
Specialists:	$	52,637.50
Subtotal:	$	421,100.00
Land Acquisition:	$	-
Total Project Cost:	$	421,100.00

Notes:

1. Assume all manholes are in need of replacement.

Village of Harrison Hot Springs
Storm Infrastructure Upgrade - LILLOOET AVENUE "C"
Requirements to address future system deficiency
Class 'C' Cost Estimate

December 2, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.1		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	1125	$ 20.00	$ 22,500.00
Section 2 Sub-Total							$ 22,500.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	750	$ 10.00	$ 7,500.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	1125	$ 55.00	$ 61,875.00
Section 3 Sub-Total							$ 69,375.00
4.0 Concrete Features							
	03 30 20		Concrete Walks, Curb And Gutter				
4.1		1.4.3	Machine Placed or Precast Curb & Gutter	m	620	$ 115.00	$ 71,300.00
Section 4 Sub-Total							$ 71,300.00
5.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipelines				
5.1		1.6.2	CCTV Pipeline Inspection	m	375	$ 7.50	$ 2,812.50
	33 40 01		Storm Sewers				
5.2		1.6.1, 1.6.2	375mm PVC Storm Main - Native Backfill	m	255	$ 200.00	$ 51,000.00
5.3		1.6.1, 1.6.2	250mm PVC Storm Main - Native Backfill	m	120	$ 160.00	$ 19,200.00
5.4		1.6.9	Drainage Tie-In - XXXmm diameter into existing manhole	ea	2	$ 1,000.00	$ 2,000.00
	33 44 01		Manholes and Catch basins				
5.5		1.5.1.1	Storm Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	4	$ 3,750.00	$ 15,000.00
Section 5 Sub-Total							$ 90,012.50
Sub-Total of Section 1 to 5							$ 263,187.50
6.0 Soft Costs							
			Soft Costs				
6.1			Engineering & CA			15%	$ 39,478.13
6.2			Contingency	C		25%	$ 65,796.88
6.3			Provisonal for Dewatering Cost			20%	$ 52,637.50
6.4			Land Acquisition	sq.m	0	$ -	$ -
Section 6 Sub-Total							$ 157,912.50
Total (not including taxes)							$ 421,100.00

ASSUMPTIONS:
1. Proposed stormmain replacement to be installed on Lillooet Avenue from Spruce Street to Mount Street
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL __________

2016 Sanitary Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

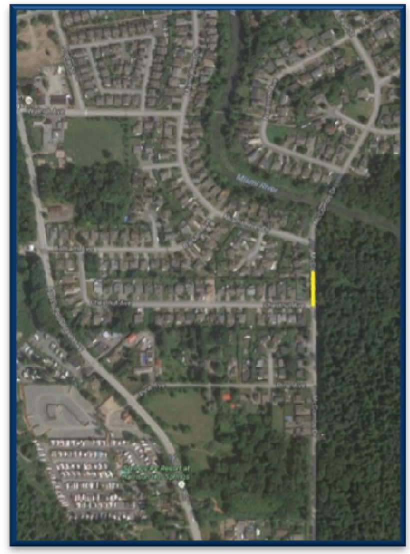
Project: McCombs Drive Sanitary
Location: S23 to S26

Priority: High

Date of Estimate: December 7, 2016

Project Name: **McCombs Drive**

Location:



Project Description: Upgrade 148m of existing sanitary sewer from 300mm to 375mm in order to provide minimum velocity and improve capacity.

DCC Eligible: Yes

Existing Zoning: R2

Project Limits: S23 to S26

Project Details:

Pipe Length:	148.00	m
Pipe Size:	375	mm

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Drainage Projects: YES
Related Water Projects: No

Cost Estimate Summary

Construction:	$	116,570.00
Contingency (Level C):	$	29,142.50
Engineering & CA	$	17,485.50
Specialists:	$	23,314.00
Subtotal:	$	186,512.00
Land Acquisition:	$	-
Total Project Cost:	$	186,512.00

Notes:

1. Assume all manholes are in need of replacement.

December 7, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 57 01	1.6.1	Environmental Protection	Lump Sum	1		$ -
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 300mm Sanitary Sewers	m	148	$ 100.00	$ 14,800.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	444	$ 20.00	$ 8,880.00
Section 2 Sub-Total							$ 23,680.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	296	$ 10.00	$ 2,960.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	444	$ 55.00	$ 24,420.00
Section 3 Sub-Total							$ 27,380.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
		1.6.2	CCTV Pipeline Inspection	m	148	$ 7.50	$ 1,110.00
	33 40 01		Sanitary Sewers				
		1.6.1, 1.6.2	375mm DR35 PVC Sanitary Main - Native Backfill	m	148	$ 300.00	$ 44,400.00
	33 44 01		Manholes and Catch basins				
		1.5.1.1	Sanitary Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 55,510.00
Sub-Total of Section 1 to 4							$ 116,570.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 17,485.50
5.2			Contingency	C		25%	$ 29,142.50
5.3			Provisonal for Dewatering Cost			20%	$ 23,314.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 69,942.00
Total (not including taxes)							$ 186,512.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on ROAD from XXX to XXX
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Sanitary Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

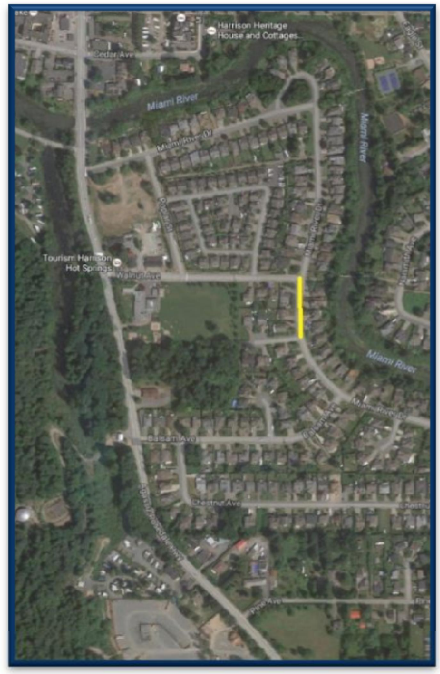
Project: Miami River Drive Sanitary
Location: S29 to S30

Priority: Medium

Date of Estimate: December 7, 2016

Project Name: **Miami River Drive**

Location:



Project Description: Upgrade 88m of existing sanitary sewer from 350mm to 450mm in order to provide minimum velocity and improve capacity.

DCC Eligible: Yes

Existing Zoning: R2

Project Limits: S29 to S30

Project Details:

Pipe Length: 88.00 m
Pipe Size: 450 mm

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: TBD
Related Drainage Projects: NO
Related Water Projects: NO

Cost Estimate Summary

Construction:	$	79,620.00
Contingency (Level C):	$	19,905.00
Engineering & CA	$	11,943.00
Specialists:	$	15,924.00
Subtotal:	$	127,392.00
Land Acquisition:	$	-
Total Project Cost:	$	127,392.00

Notes:

1. Assume all manholes are in need of replacement.

December 7, 2016

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
1.0 General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
1.1	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	Lump Sum	1	$ 10,000.00	$ 10,000.00
	01 57 01	1.6.1	Environmental Protection	Lump Sum	1		$ -
	01 58 01	1.3.1	Project Identification	Note		`	
Section 1 Sub-Total							$ 10,000.00
2.0 Earthworks and Site Preparation (MMCD Section 31)							
	31 23 01		Excavating, Trenching and Backfilling Underground Utility				
2.1		1.10.4	Removal and Disposal of Existing 350mm Sanitary Sewers	m	88	$ 100.00	$ 8,800.00
	31 24 13		Roadway Excavation, Embankment and Compaction				
2.2		1.8.4	Remove Existing Asphalt, Curbs and Gutters, Sidewalks, Utility Strips, Driveways	sq.m	264	$ 20.00	$ 5,280.00
Section 2 Sub-Total							$ 14,080.00
3.0 Roads and Site Improvement (MMCD Section 32)							
	32 12 16		Hot-Mix Asphalt Concrete Paving				
3.1		1.5.7	Saw Cut Asphalt	m	176	$ 10.00	$ 1,760.00
3.2		1.5.8	Permanent Pavement Restoration (including all base gravels and subgrade prep.)	sq.m	264	$ 55.00	$ 14,520.00
Section 3 Sub-Total							$ 16,280.00
4.0 Utilities (MMCD Section 33)							
	33 01 30		CCTV Inspection of Pipeslines				
		1.6.2	CCTV Pipeline Inspection	m	88	$ 7.50	$ 660.00
	33 40 01		Sanitary Sewers				
		1.6.1, 1.6.2	450mm DR35 PVC Sanitary Main - Native Backfill	m	88	$ 325.00	$ 28,600.00
	33 44 01		Manholes and Catch basins				
		1.5.1.1	Sanitary Manhole - base, risers, lid, slab, cover and frame 1050mm diameter	ea	2	$ 3,750.00	$ 7,500.00
		1.5.4	Remove and Dispose Existing Manhole	ea	2	$ 1,250.00	$ 2,500.00
Section 4 Sub-Total							$ 39,260.00
Sub-Total of Section 1 to 4							$ 79,620.00
5.0 Soft Costs							
			Soft Costs				
5.1			Engineering & CA			15%	$ 11,943.00
5.2			Contingency	C		25%	$ 19,905.00
5.3			Provisonal for Dewatering Cost			20%	$ 15,924.00
5.4			Land Acquisition	sq.m	0	$ -	$ -
Section 5 Sub-Total							$ 47,772.00
Total (not including taxes)							$ 127,392.00

ASSUMPTIONS:

1. Proposed stormmain replacement to be installed on ROAD from XXX to XXX
2. Assume all manholes are in need of replacement.

CONTRACTORS INITIAL _________

2016 Sanitary Projects Cost Estimate

HARRISON HOT SPRINGS
Naturally Refreshed

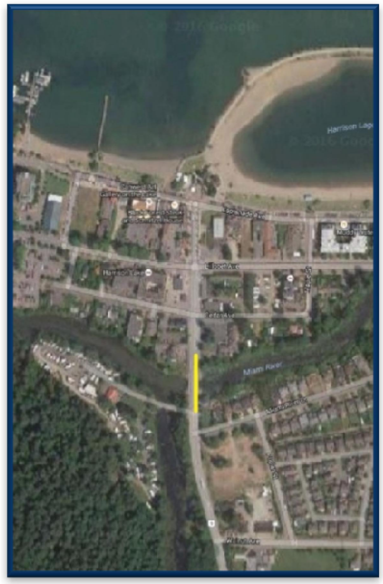
Project: Siphon Replacement
Location: S37 to S39

Priority: HIGH

Date of Estimate: December 7, 2016

Project Name: **Siphon Replacement**

Location:



Project Description: Permanent replacement of pump and piping crossing the Miami River at PS-7.

DCC Eligible: YES

Existing Zoning: R2

Project Limits: S37 to S39

Project Details:

Pipe Length:	114.00	m
Pipe Size:	150	mm

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Site Photograph:

Design Consultants: CTQ
Drawing Number: N/A

Related Road Projects: TBD
Related Drainage Projects: NO
Related Water Projects: NO

Cost Estimate Summary

Construction:	$	496,242.50
Contingency (Level C):	$	74,436.38
Specialists:	$	-
Subtotal:	$	570,678.88
Land Acquisition:	$	-
Total Project Cost:	$	570,678.88

Notes:

1. Assume all manholes are in need of replacement.

MASTER MUNICIPAL CONSTRUCTION DOCUMENTS ASSOCIATION

SCHEDULE OF QUANTITIES AND UNIT PRICES

VHHS - Siphon Replacement
12004-08
Class B - Cost Estimate

CTQ

APPENDIX 1

See paragraph 5.3.1 of the Instructions to Tenderers – Part II

All prices and *Quotations* including the *Contract Price* shall include all *Taxes*, but shall not include *PST/GST*. *PST/GST* shall be shown separately.

6/1/2016
12004-08
Project Manager/CA: MC
Prepared By: DD
Reviewed By: ST

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
General MMCD Contract Requirements							
	01 33 01	1.8.1	Project Record Documents	Note		Incidental	
	01 51 01	1.6.1	Temporary Utilities and Lighting	Note		Incidental	
	01 53 01	1.9.1	Temporary Facilities	Note		Incidental	
	01 55 00	1.5.1	Traffic Control, Vehicle Access and Parking	ls	1	$ 10,000.00	$ 10,000.00
	01 57 01	1.6.1	Environmental Protection	ls	1	$ 5,000.00	$ 5,000.00
	01 58 01	1.3.1	Project Identification	Note		Incidental	
General MMCD Contract Requirements Sub-Total							$ 15,000.00
1.0 Earthworks and Site Preparation							
	31 24 13		Roadway Excavation, Embankment and Compaction				
1.1		1.8.4	Remove Existing Asphalt & Curbs and Gutters	sq.m	650	$ 5.00	$ 3,250.00
1.2		1.8.9	Subgrade Preparation (Provisional Item)	sq.m	645	$ 2.00	$ 1,290.00
Section 1 Sub-Total							$ 4,540.00
2.0 Roads and Site Improvement							
	32 11 16.1		Granular Sub-Base				
2.1		1.4.3	350mm - 75mm Minus Granular Sub-Base (Provisional Item)	sq.m	645	$ 9.00	$ 5,805.00
	32 11 23		Granular Base				
2.2		1.4.2	150mm - 19mm Crushed Granular Base Gravel (Provisional Item)	sq.m	645	$ 7.50	$ 4,837.50
	32 12 16		Hot-Mix Asphalt Concrete Paving				
2.3		1.5.1, 1.5.2	Asphalt Pavement - 75mm	sq.m	645	$ 30.00	$ 19,350.00
2.4		1.5.7	Saw Cut Asphalt or Concrete Pavements	m	235	$ 5.00	$ 1,175.00
	32 31 13		Chain Link Fences & Gates				
2.5		1.5.3	Remove & Reinstate Ground Bolted Fence	m	30	$ 30.00	$ 900.00
Section 2 Sub-Total							$ 32,067.50
3.0 Concrete Features							
	03 30 20		Concrete Walks, Curb And Gutter				
3.1		1.4.3	Machine Placed Rollover Curb & Gutter - per Standard Drawing S4	m	11	$ 180.00	$ 1,980.00
3.2		1.4.3	Machine Placed Rollover Curb & Gutter - per CTQ Detail	m	35	$ 120.00	$ 4,200.00
	03 40 01		Pre-Cast Concrete				
3.3		1.4.5	Remove and Reinstate Concrete NoPost Barriers	m	65	$ 15.00	$ 975.00
Section 3 Sub-Total							$ 7,155.00
4.0 Utilities							
	33 01 30.1		CCTV Inspection Of Pipelines				
4.1		1.6.2	CCTV Pipeline Inspection	m	114	$ 5.00	$ 570.00
	33 30 01		Sanitary Sewers				
4.2		1.6.1, 1.6.2	200mm DR35 PVC Sanitary Main - Native Backfill	m	24	$ 160.00	$ 3,840.00
4.3		1.6.1, 1.6.2	250mm DR35 PVC Sanitary Main - Native Backfill	m	79	$ 180.00	$ 14,220.00
4.4		1.6.1, 1.6.2	350mm DR35 PVC Sanitary Main - Native Backfill	m	11	$ 200.00	$ 2,200.00
4.5		1.6.3	100mm Sanitary Service Connections - per Standard Drawings S7, S9 c/w Inspection Chamber	ea	1	$ 2,000.00	$ 2,000.00
4.6		1.6.7	Sanitary Tie-In - 200 mm diameter into existing manhole	ea	1	$ 1,000.00	$ 1,000.00
4.7		1.5.4	Remove and Dispose Existing 350mm AC Sanitary Main	m	40	$ 100.00	$ 4,000.00
4.8			Cap for Ex. 350mm AC Sanitary Main	ea	2	$ 500.00	$ 1,000.00
4.9			Cap for Ex. 150mm PVC Sanitary Main	ea	1	$ 500.00	$ 500.00
	33 34 01		Sewage Forcemains				
4.10		1.8.2, 1.8.3	150mm DR17 PVC Forcemain - c/w bridge hangers	m	20	$ 270.00	$ 5,400.00
4.10		1.8.2, 1.8.3	150mm DR17 PVC Forcemain - Native Backfill	m	130	$ 220.00	$ 28,600.00
4.11		1.8.3	150mm - 90 Degree Bend	ea	2	$ 500.00	$ 1,000.00
4.12		1.8.3	150mm - 45 Degree Bend	ea	2	$ 500.00	$ 1,000.00
4.13		1.8.3	150mm - 15 Degree Bend	ea	1	$ 500.00	$ 500.00
4.14		1.8.5	Air-Release Valve - Standard Drawing W6	ea	1	$ 1,000.00	$ 1,000.00
4.15			Lift Station - as per CTQ Dwg. D-81 c/w Wet Well	ea	1	$ 283,000.00	$ 283,000.00
4.16			Lift Station Genset	ea	1	$ 60,000.00	$ 60,000.00
	33 44 01		Manholes and Catch basins				
4.16		1.5.1.1	Manhole - base, frame, risers, lid, slab, cover and frame 1050mm diameter	ea	4	$ 3,600.00	$ 14,400.00
4.17		1.5.1.6	Overbuilt Manhole on Existing System - 1050mm diameter	ea	1	$ 7,000.00	$ 7,000.00
4.18		1.5.4	Remove and Dispose Existing Manhole	ea	1	$ 1,250.00	$ 1,250.00

CONTRACTORS INITIAL _________

VHHS - Siphon Replacement
12004-08
Class B - Cost Estimate

Item	MMCD Section	Payment Item	Specification Title - Item Description	Unit	Quantity	Unit Price	Amount
4.19			Abandon and Decommission Existing Manhole - per CTQ Dwg. C-82	ea	1	$ 1,500.00	$ 1,500.00
4.20			Abandon and Decommission Existing Siphon - per CTQ Dwg. C-82	ea	2	$ 1,750.00	$ 3,500.00
Section 4 Sub-Total							$ 437,480.00
SUB TOTAL OF SECTIONS 1 TO 4							$ 496,242.50
CLASS B CONTINGENCY (15%)							$ 74,436.38
SUB TOTAL WITH CONTINGENCY							$ 570,678.88

ASSUMPTIONS:

1. Condition of existing roadbase gravels to be confirmed in field.
2. Depth of asphalt to be confirmed in field.

L:\General Data\Projects-2012\12004-21 - Liquid Waste Management Plan\3-Design\Cost Estimate\[3 - SAN Cost Estimate - 12004-21.xlsx]Miami 2 - Summary

CONTRACTORS INITIAL _________

2016 Liquid Waste Projects Cost Estimate

Project: Inventory Survey and Infrastructure Assessment
Location: Village-wide

Priority: HIGH
Date of Estimate: December 2, 2016
Target Year:

Project Name: **Inventory Survey and Infrastructure Assessment**

Project Description: Perform an inventory survey tied to a standard Coordinate System (NAD 83 UTM Zone 10) compatible with modern GIS and design software. Record all pipe sizes and materials. Measure all manhole locations and pipe inverts. Combine with visual inspection of infrastructure where possible, recording photos and results of inspection.

DCC Eligible: No

Project Details:

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: N/A
Related Sanitary Sewer Projects: N/A
Related Drainage Projects: N/A

Recommended Coordinate System:

Cost Estimate Summary

Survey and Data Processing:	$	40,000.00
Contingency (Level C):	$	10,000.00
Engineering & CA	$	1,000.00
Specialists:	$	-
Subtotal:	$	51,000.00
Land Acquisition:	$	-
Total Project Cost:	$	51,000.00

Notes:

Price includes storm and sanitray infrastructure survey

2016 Liquid Waste Projects Cost Estimate

Project: Flow Metre Installation
Location: Village-wide

Priority: HIGH
Date of Estimate: December 2, 2016
Target Year:

Project Name: **Flow Metre Installation**

Project Description: Purchase of 2 non-contact area/velocity flow meters plus one portable rain gauge.

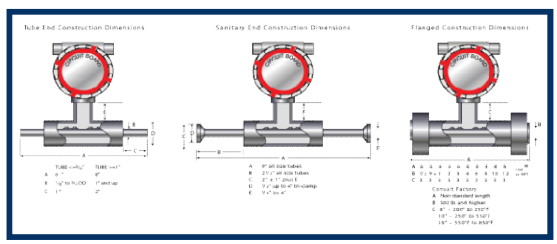
DCC Eligible: No

Land Acquisiton Req'd: None
Total Land Cost: $0.00

Design Consultants: N/A
Drawing Number: N/A

Related Road Projects: N/A
Related Sanitary Sewer Projects: N/A
Related Drainage Projects: N/A

Flow Metre:



Cost Estimate Summary		
Flow Meter (1 unit = $20,000)	$	40,000.00
Portable Rain Gauge	$	5,000.00
Engineering	$	6,750.00
Contingency (Level C):	$	11,250.00
Subtotal:	$	63,000.00
Land Acquisition:	$	-
Total Project Cost:	$	63,000.00

Notes:

Flow meters and rain gauge can be moved around the village storm and sanitary system to collect required data.

Appendix D - Development Projections

Village of Harrison Hot Springs

Development Projections

Summer 2014

Development Projections – Harrison Hot Springs

9 sub-areas

Density projections will be based on OCP land use designations, except in cases where a zoning was amended to a Comprehensive Development Zone. Generally there are few sites in the Village that may experience significant growth. The majority of the community is developed and the move forward with the east land sector Regional Park will impact development and population growth in Harrison Hot Springs.

In sub-areas where commercial space is built out, development projections will not identify existing commercial space. Only future commercial space will be identified.

Lot size is based on BC assessment data provided by the Regional District.

Summary of development projections:

Area	Commercial	New Lots	Residential Infill
1	5,035 m^2	130 units	-----
2	9,941 m^2	289 units	-----
3	-----	84 units	-----
4	-----	59 units	43 units
5	-----	128 units	2 units
6	*246	138 units	-----
7	1,000 m^2	90 units	-----
8	-----	322 units	-----
9	-----	-----	-----
Total	**1,5976 m^2**	**1,240 units**	**45 units**

*New commercial in this area is campsites and/or accommodation rooms.

Area 1: Waterfront Commercial

The OCP designates this area as Waterfront Commercial. Tourist commercial is the focus of this area. Permitted uses include: accommodation uses (hotels, motels, and resorts), restaurants, and speciality retail oriented toward tourist based services. Densities in the area are similar to Area 2 allowing up to 150 units per hectare and a maximum floor space ratio of 1.75 for commercial uses. The intention of this designation is to achieve a strong tourism area. While residential development is permissible, the focus should be on the tourism component. The ground floor should be oriented toward tourism commercial uses.

Area 2: Village Centre

The OCP designates this area as "Village Centre Area". The following uses are permitted: commercial, residential and public uses. Emphasis is on mixed commercial – residential uses. Commercial uses may include: personal service establishments, banks, business and professional offices, retail and grocery stores. The focus of this area is to provide community-oriented services. Density thresholds are: commercial maximum floor space ratio of 1.5, up to a maximum of 2.0. Residential density is 150 units per hectare.

Generally this area can be characterized as built-out. There is one parcel located at 120 Esplanade Avenue that is currently vacant and may be re-developed. Council adopted a bylaw amendment to allow a seven storey building to be constructed with retail on the ground floor. There are a few other properties that are currently occupied with single family dwellings and are protected with legal non-conforming status. Some type of re-development may take place on these lots. Maximum floor space ratios are based on a figure of 2.0, which is the maximum achievable under the OCP which includes density bonusing.

Area 3: Lakeshore Residential

The OCP designates this area as Lakeshore Residential. Medium density multi-family residential is the focus of this designation. Uses will be related to residential uses and will have a maximum density of 35 units per hectare. Consideration must be given to height, form and character, on-site parking and access.

Area 4: Low Density Residential

The OCP designates these lands as Low Density Residential. This is a low density designation that envisions single family and duplex dwellings. The maximum density threshold is 20 units per hectare. Creation of new lots is limited to a few larger parcels that can accommodate subdivision into conventional smaller lots. The majority of additional dwelling units will come in the form of construction of a dwelling unit on a vacant lot. This will not yield additional DCCs because the charge was likely paid at the time of original subdivision.

Area 5: Neighbourhood Planning Area – Pine Avenue (Low Density Residential)

A Neighbourhood Planning Area guides future land use for this area. It has been identified as an area for small lot subdivision or multi-family residential development in the form of townhomes or other medium density uses. This area is comprised of three large lots (2 of which are vacant) and 14 large single family lots that range in size from 0.2 ha (0.5 acre) to 0.4 ha (1 acre). While these lots could be re-developed if a land assembly were successful, without strong market forces this sub-area is unlikely to generate new subdivisions. These lands generally have no development constraints such as RAR or geotechnical hazards etc.

Area 6: Tourist Commercial

The OCP designates this area as Tourist Commercial. It is an area that is in transition with recent applications for OCP and Zoning Bylaw amendments that, if adopted, could allow medium density residential development (townhomes). Other uses in this area include RV camping developments and single family dwellings. The OCP envisioned this as a tourist commercial area that would provide tourism amenities. However, the past uses including a mini golf course were not successful. Because the area is in flux, development projections will utilize both commercial and residential development.

Area 7: Marine Tourist Commercial

The OCP designates these lands, located at the northern boundary of the Village, as Marine Tourist Commercial. Uses permitted in this designation are oriented toward marine tourisms uses and may include: marina, marina accommodation, restaurants and related retail uses. Council recently amended the zoning for one site to permit a multi-family residential use that will include a mixed-use commercial/retail building, and houseboat development. The other properties have limited development potential. They are comprised of an art gallery (property is Village owned) and water lot leases that the Village holds.

Area 8: Resource

The OCP designates this land as Resource. The intention of this designation is to maintain undeveloped lands in their natural state for uses that include both public and private recreation, public use and agriculture. These lands are also located in the Agricultural Land Reserve and are therefore pursuant to Agricultural Land Commission Act, able to be used for farm use. This permits a broad number of uses that fall within the definition of farming. Any change to the OCP designation would require approval from the Agricultural Land Commission, which adds a level of uncertainty for re-development. Should these privately owned lands be re-developed, it is likely that a clustered development would take place that would leave a large portion of the lands in their natural state and develop only one portion of the site. Applying a density calculation consistent with Low Density Residential.

Area 9: Public Uses

The OCP designate these lands as public use. A wide range of uses comprise the Public Use designation, including but not limited to: Municipal land and facilities, Fire Hall, School, Water Treatment Facility, etc. For obvious reasons, these lands do not have development potential. They will simply be highlighted on mapping.

Appendix E – Design Resources

Image 1:
Conceptual Overview

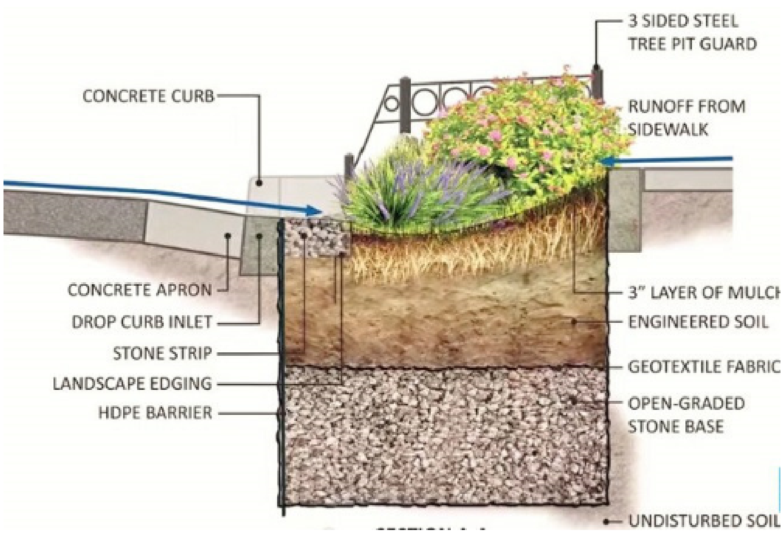


Image 2:
Conceptual Cross Section

Image 1:
Landscaping Example

HARRISON HOT SPRINGS
Naturally Refreshed

CTQ

Bioswale Design Sheet
Liquid Waste Management Plan
12004-21

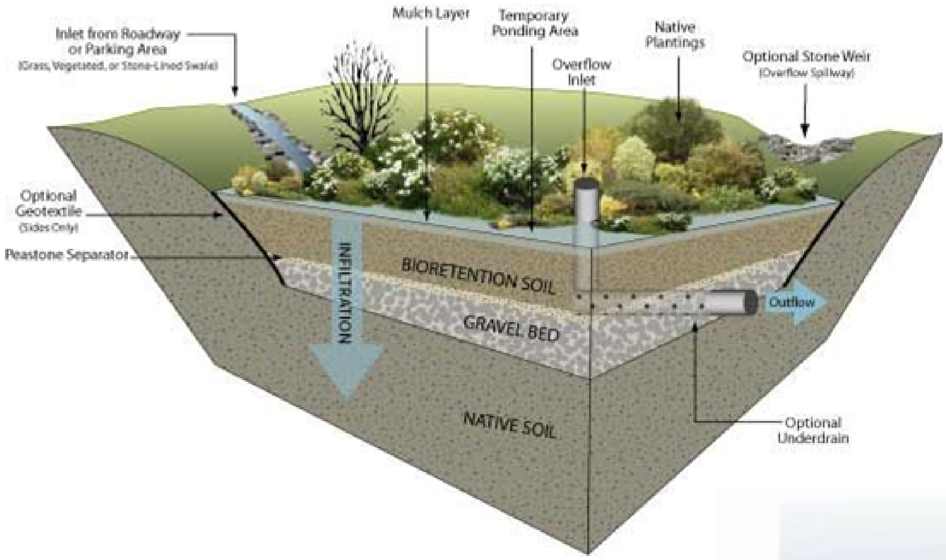


Image 1: Rain Garden

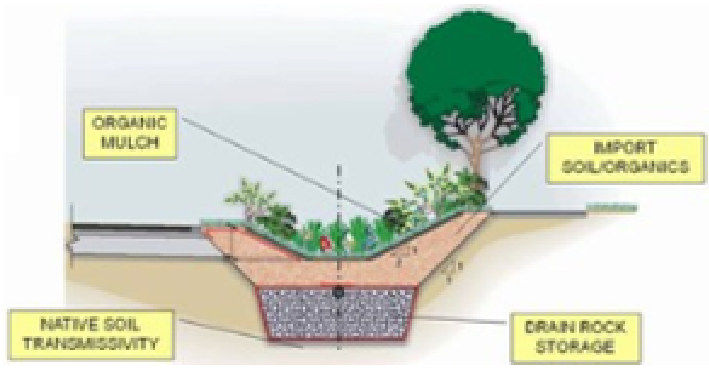


Image 2: Roadside Bioretention Pond

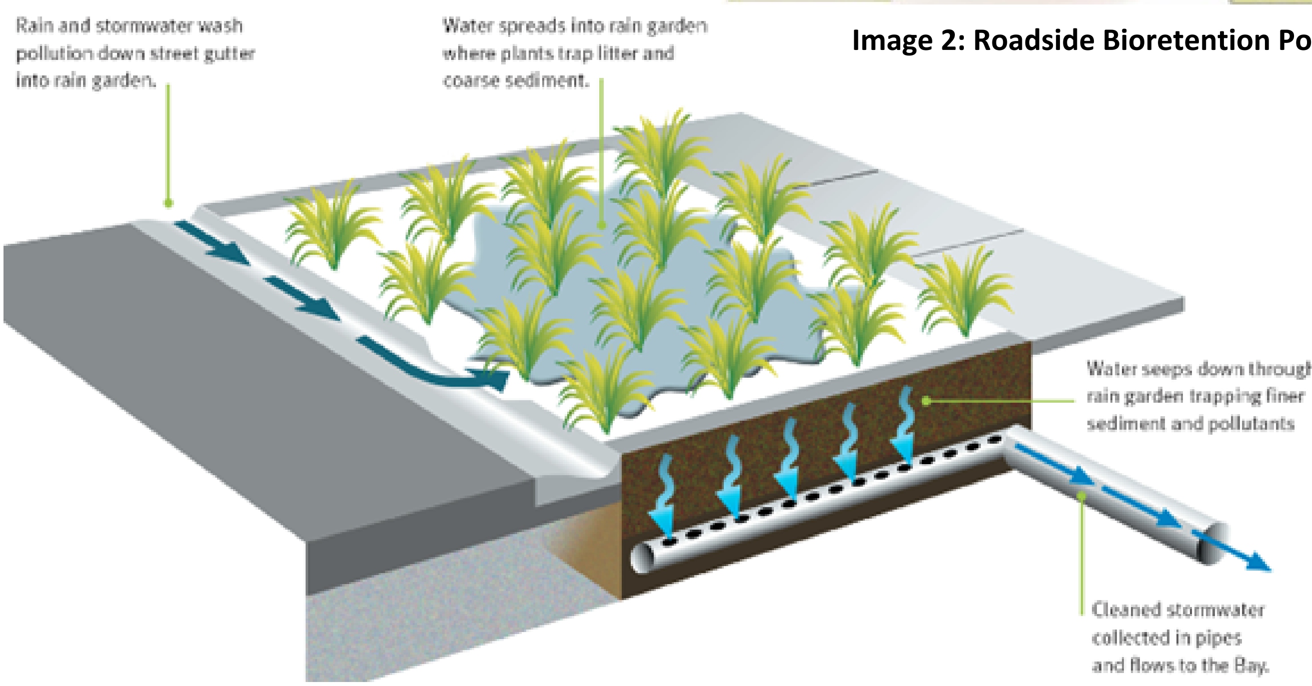


Image 3: Urban Bioretention Pond

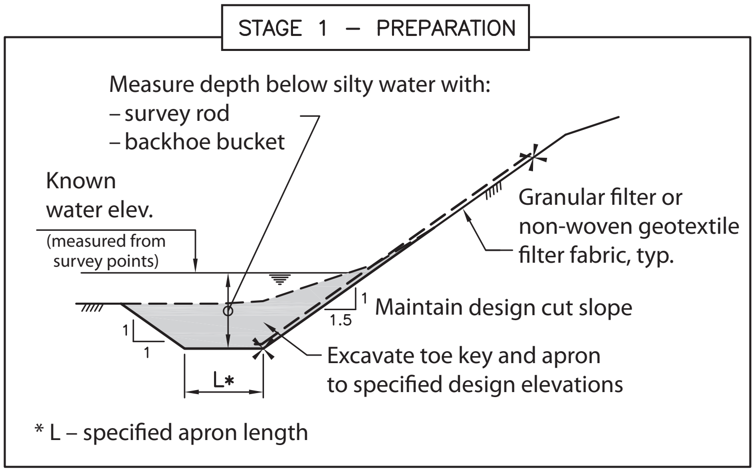
HARRISON HOT SPRINGS
Naturally Refreshed

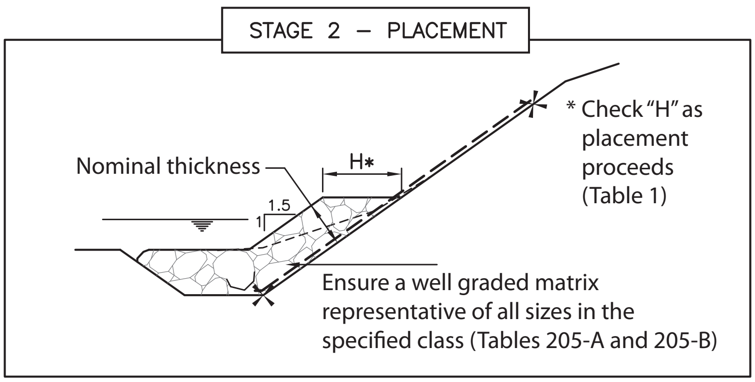
CTQ

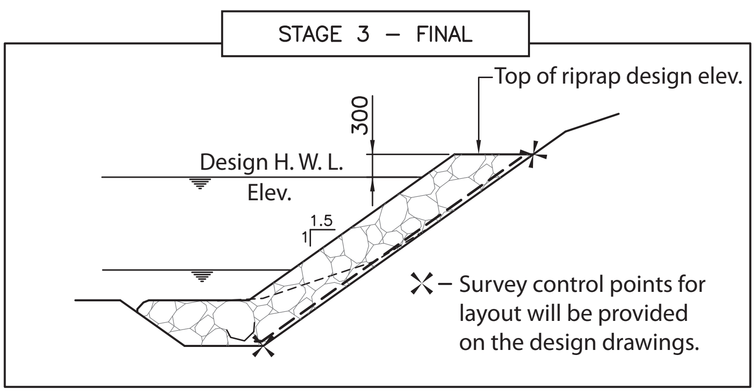
Rain Garden / Bioretention Design Sheet
Liquid Waste Management Plan
12004-21

Riprap Installation Guide – 1

BRITISH COLUMBIA
Ministry of Transportation and Infrastructure







WOLMAN EXAMPLE – CLASS 500 KG

For every 100 rocks set aside in Quarry, you need the following:

- From Table 205-B: 15%=330, 50%=715, 85%=1030mm, 100%=<1220mm
- The riprap has to meet ALL the following conditions

Class 500	330	715	1030	1220
15% (330mm)	15 rocks less than 330mm	85 rocks bigger than 330mm		
50% (715mm)	50 rocks less than 715mm		50 rocks bigger than 715mm	
85% (1030mm)	85 rocks less than 1030mm			15 rocks bigger than 1030mm
100% (<1220mm)	All 100 rocks less than 1220mm			

Table 1: Riprap Horizontal Dimensions

Class of Riprap (kg)	Nominal Riprap Thickness (mm)	Surface Width, H (mm)	
		2H : 1V Slope	1.5H : 1V Slope
10	350	783	631
25	450	1006	811
50	550	1230	992
100	700	1566	1262
250	1000	2236	1803
500	1200	2684	2163
1000	1500	3355	2704
2000	2000	4473	3606
4000	2500	5591	4507

Table 205-A: Gradation of Rock Sizes in Each Class of Riprap – **Mass (kg)**

Class of Riprap (kg)	Nominal Riprap Thickness (mm)	Rock Gradation Percentage Smaller Than Given Rock Mass (kg)		
		15%	50%	85%
10	350	1	10	30
25	450	2.5	25	75
50	550	5	50	150
100	700	10	100	300
250	1000	25	250	750
500	1200	50	500	1500
1000	1500	100	1000	3000
2000	2000	200	2000	6000
4000	2500	400	4000	12000

Table 205-B: Approximate Average Dimension of Each Specified Rock Class Mass (Sg=2.640) – **Equivalent Diameter (mm)**

Class of Riprap (kg)	Approximate Average Dimension (mm)			
	15%	50%	85%	<100%
10	90	195	280	330
25	120	260	380	450
50	155	330	475	565
100	195	415	600	715
250	260	565	815	965
500	330	715	1030	1220
1000	415	900	1295	1535
2000	525	1130	1630	1935
4000	660	1425	2055	2440

Riprap Installation Guide – 2

Ministry of Transportation and Infrastructure

CONSTRUCTION MONITORING

- Hold and Witness Points
  - Rock quality (hardness and gradation) (hold)
  - Stake-out (hold)
  - Clearing and grubbing (witness)
  - Toe/ Terminal end-key excavations (witness)
  - Preparation of back slope/ surface (witness)
  - Application of filter(s) (witness)
  - Toe construction (witness)
  - Front slope / H-width / thickness / gradation (witness)
  - Design height (witness)
- Getting the Right Size Riprap
  - by Visual Inspection with colour-coded samples from Tables 205-A and 205-B
  - one set at quarry and one at worksite
- Checking Gradation at Quarry and Worksite
  - Wolman Pebble Count (see example other side)
- Placement
  - Controlled placement on specified design slope (no end dumping)

POOR INSTALLATION

- Single rocks (not graded)
- Toe not keyed
- Inadequate thickness
- Steep slope (not visible)

GOOD INSTALLATION

- Environmental monitor
- Good site separation
- Toe and Terminal Ends are keyed
- Well graded matrix
- Design slope
- Sufficient thickness

Image 1: Domed Methane Recapture

Image 2: WTTP With Biogas Return

Image 3: Methane to Electricity

HARRISON HOT SPRINGS

Naturally Refreshed

CTQ

Municipal Biogas System Design Sheet
Liquid Waste Management Plan
12004-21

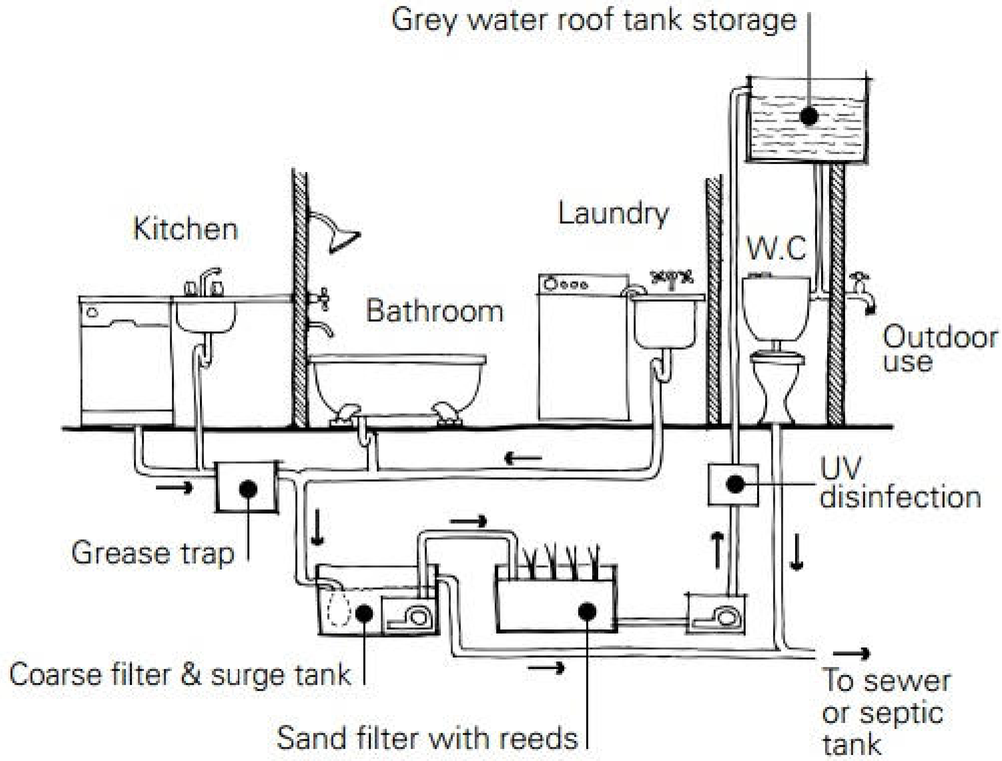


Image 1: Grey Water Collection, Treatment, and Re-use

Image 3: Grey Water Filtration

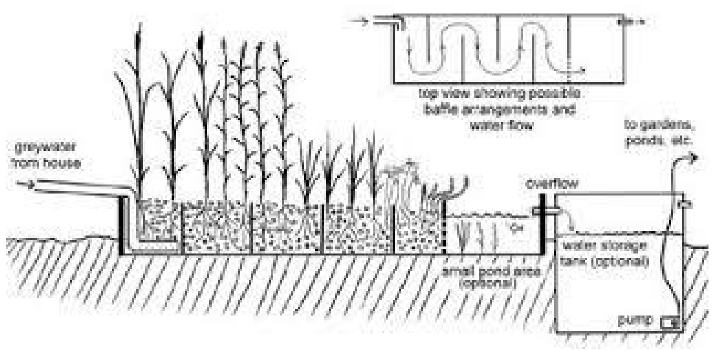
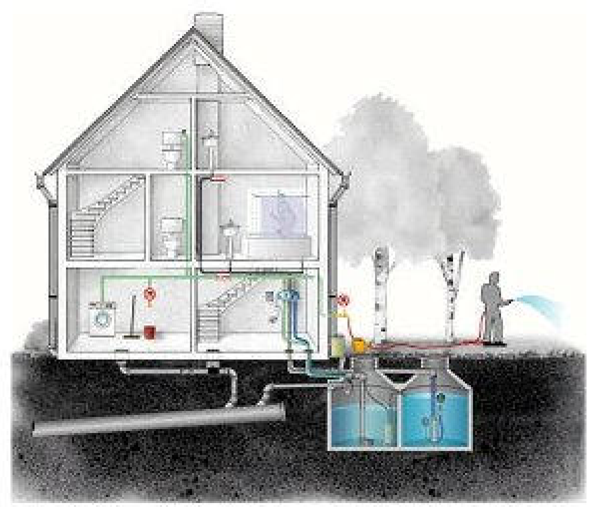


Image 2: Grey Water Irrigation



HARRISON HOT SPRINGS
Naturally Refreshed

CTQ

Greywater System Design Sheet
Liquid Waste Management Plan
12004-21

Appendix F – DCC Best Management

Development Cost Charge

BEST PRACTICES GUIDE

British Columbia
Ministry of Community Services

Acknowledgements

The *DCC Best Practices Guide* was initiated by the Development Finance Review Committee, which is made up of representatives from the province, local government and the development community. It was first published in 1997 and a second edition was published in 2000.

The following individuals have contributed their expertise to the guidebook. They are in alphabetical order and identified by the jurisdiction they represented at the time of their contribution.

Dan Bottril, City of Abbotsford
Jeff Day, City of Richmond
Murray Dinwoodie, Township of Langley
Maureen Enser, Urban Development Institute
Jeff Fisher, Urban Development Institute
Chuck Gale, City of Richmond
Brenda Gibson, Ministry of Community Services
Jim Godfrey, Resort Municipality of Whistler
Neil Goldie, Ministry of Municipal Affairs
Lois-Leah Goodwin, Ministry of Community Services
Sean Grant, Ministry of Community Services
Paul Ham, City of Surrey
Chris Hartman, Canadian Homebuilders Association
John Haythorne, Bull, Housser and Tupper
Robin Hicks, City of Coquitlam
Kenji Ito, City of Burnaby
Rod Kray, City of Richmond
Steve Kurrein, Canadian Home Builders Association
Jim Laughlin, City of North Vancouver
Paul Lee, City of Richmond
David Linton, Urban Development Institute
Paul Macklem, City of Kelowna
Alison McNeil, Union of British Columbia Municipalities
Michael Marson, Ministry of Community Services
Karen Monsarrat, BC Real Estate Association
Steve Olmstead, BC Real Estate Association
Alan Osborne, Ministry of Community Services
Doug Page, Ministry of Forests
Harriet Permut, Union of British Columbia Municipalities
Herman Rebneris, Canadian Home Building Association
Keith Sashaw, Canadian Home Builders Association
Bill Susak, Township of Langley
Cresswell Walker, City of Nanaimo
Dale Wall, Ministry of Community Services
Cathy Watson, Ministry of Community Services
MJ Whitemarsh, Canadian Home Builders Association
Colin Wright, Township of Langley
Igor Zahynacz, City of Port Coquitlam

Library and Archives Canada Cataloguing in Publication Data
Main entry under title:
Development cost charge best practices guide

"Third edition"—Preface.
Previously published 2000 by British Columbia Growth Strategies Office and Municipal Financial Services.
ISBN 0-7726-5452-2

1. Impact fees – British Columbia. 2. Municipal services - British Columbia - Finance. 3. Local finance - British Columbia. 4. Real estate development - British Columbia - Costs. I. British Columbia. Ministry of Community Services.

HJ9352B7D48 2005 336.1'6 C2005-960225-2

Preface

This is the third edition of the *DCC Best Practices Guide*. The feedback from local government and the development community has been complimentary and supportive of the material included in the guide. Each edition has provided additional information, which reflects changes to best practices and legislation.

The *DCC Best Practices Guide* has two primary objectives:

- to encourage local governments to standardize the establishment and administration of development cost charge programs; and
- to provide some flexibility to accommodate a municipality's specific circumstances.

The best practices outlined in the guide were developed in partnership between the province, local government and the development community. Local governments who choose to follow the recommended best practices can expect an expedited process for provincial approval of their development cost charge bylaws. Further, they may also receive the support of the development community, which advocates for more transparent and understandable DCC programs.

A companion document called the *Development Cost Charge Guide for Elected Officials* provides additional information.

Development cost charges are one method to fund the infrastructure associated with growth. For more information on other financing tools please consult the *Development Finance Choices Guide*. It outlines considerations in the choice of a particular tool and provides advice on the design and implementation of the various tools.

These guides are available electronically through the search function of the British Columbia Government website at: www.gov.bc.ca

Table of Contents

Table of Contents

Table of Contents

Introduction

Development Cost Charges (DCCs) are monies that are collected from land developers by a municipality, to offset some of the infrastructure expenditures incurred, to service the needs of new development. Imposed by bylaw pursuant to the *Local Government Act*, the charges are intended to facilitate development by providing a method to finance capital projects related to roads, drainage, sewers, water and parkland.

Many cities and towns in British Columbia face significant development pressure, which requires the expansion of existing or the installation of new infrastructure systems, to support new development and its demand on utilities and services. However, the costs associated with these infrastructure requirements create significant public sector burdens. Increasingly all governments are facing significant constraints in the use of general purpose taxation and have placed greater emphasis on the "user pay", or "benefiter pay", principle. In response to these pressures, DCCs have been utilized by local governments as a cost recovery mechanism for apportioning infrastructure project costs amongst developers of land.

DCCs allow monies to be pooled from many developers so that funds can be raised to construct the necessary services in an equitable manner. Simply, the municipality can be considered to be the co-ordinator of the capital program and administrator of the funds collected.

Objectives of this Guide

The objective of the *Development Cost Charge Best Practices Guide* is to encourage local governments to adopt standard practices for the formulation and administration of DCC bylaws, while recognizing some flexibility is necessary to accommodate unique local circumstances.

The guide builds on the general provisions of the *Local Government Act* (LGA) and encourages certainty and consistency in the development of DCC programs, especially in the areas of cost charge calculation and bylaw administration.

Ministry Support

Under the *Local Government Act,* DCC bylaws must be sent to the Ministry of Community Services to be approved by the Inspector of Municipalities before they may be legally adopted. Local governments following the guide in preparing a bylaw and the DCC calculations can expect to obtain an expedited approval. To assist in the approval review of a proposed DCC Bylaw, Appendix A contains a Submission Summary Checklist. A copy of this checklist should be completed by the local government and attached to the bylaw approval package being sent to the Inspector of Municipalities.

Background

In 1995, the province embarked on a comprehensive review of the systems used in British Columbia for financing the public costs of development. The Development Finance Review Committee (DFRC) was created and asked to examine a variety of issues, primarily related to the DCC mechanism. The DFRC membership represents the following principal stakeholders:

- Ministry of Community Services;
- Urban Development Institute;
- Canadian Home Builders' Association of B.C.;
- B.C. Real Estate Association;
- Planning Institute of B.C.; and,
- Union of B.C. Municipalities.

The DFRC initiated and participated in the preparation of the first edition of the *DCC Best Practices Guide,* and has reviewed and contributed to subsequent editions.

This edition incorporates legislative changes from 2004 that provide the ability to:

Local Government Act – s.932 (March 2004)

Community Charter – s. 189 (Sept 2004)

Local Government Act – s. 933 (4.1) (a) & (b) (Sept 2004)

- include interest charges in exceptional circumstances[1];
- borrow between DCC funds;
- charge DCCs at building permit stage on development of fewer than four units; and,
- set a threshold higher than $50,000 for the minimum value of work on which DCCs may be imposed.[2]

Guiding Principles

The guide is based on six significant principles, which should be followed in the development of a DCC bylaw.

INTEGRATION

A DCC program is subordinate to the broader goals of a community and therefore, should reflect other initiatives, such as the goals set out in the *Local Government Act* and other provincial legislation, Regional Growth Strategies, and Official Community Plans. The charges are only one element of a municipality's approach in dealing with issues of land efficiency, housing affordability, and community sustainability. Development of DCCs must be consistent with community plans, land use plans, and corporate financial and capital infrastructure strategies.

[1] Proclamation of section 173 of the *Local Government Statutes Amendment Act, 2000.*

[2] Sections 4, 15, 16 and 21 of the *Community, Aboriginal and Women's Services Statutes Amendment Act*, 2004 (Bill 36).

BENEFITER PAYS

Infrastructure costs should be paid by those who will use and benefit from the installation of such systems.

FAIRNESS AND EQUITY

Recognizing that costs should be shared in some way amongst benefiting parties, DCCs should employ mechanisms that distribute these costs between existing users and new development in a fair manner. Further, within the portion of costs that are attributable to new development, DCCs should be used to equitably distribute costs between the various land uses and different development projects.

ACCOUNTABILITY

The establishment of DCCs should be a transparent, local government process, and all information on which DCCs are based should be accessible and understandable by stakeholders.

CERTAINTY

DCCs are a co-ordinated effort, where the local government's role is to facilitate the level of development expected, based on regional and community planning; the local government simply acts as the administrator of the DCC program. Therefore, certainty should be built into the DCC process, both in terms of stable charges and orderly construction of infrastructure. Stability of DCC rates will assist the development industry in the planning of their projects.

At the same time, sufficient DCC funds must be collected to ensure that financing is available for construction of infrastructure in a timely manner. Inadequate planning may result in developments being deferred or even cancelled.

CONSULTATIVE INPUT

The development of DCCs must provide adequate opportunities for meaningful and informed input from the public and other interested parties.

Definition of Local Government

In the guide, both municipalities and regional districts are included in the term "local government." The local government references to municipalities and councillors apply equally, or are interchangeable, to regional districts and regional district boards.

Overview of Contents

The guide has two parts.

PART I

Part I describes the concept of DCCs and the broad policy issues which should be considered before the establishment of a DCC bylaw. This material will be of interest to municipal councillors, regional district board members and senior staff who have the responsibility of developing policy and establishing a local government's approach to DCCs. Further information is contained in the *Development Cost Charge Guide for Elected Officials*.

PART II

Part II is a technical manual detailing the procedures and calculations associated with developing a DCC bylaw. The range of practices related to each specific technical aspect is presented, along with a description of the rationale which lead to the use of a particular alternative. Where possible, a "recommended best practice" has been identified. This part of the guide is intended for technical staff who will be responsible for the development of the bylaw and the calculation of DCC rates.

Amendments

The *DCC Best Practices Guide* is the responsibility of the Ministry of Community Services. Enquiries regarding this material should be directed to:

Ministry of Community Services
P.O. Box 9841 Stn Prov Govt
Victoria B.C. V8W 9T2
Tel: (250) 387-3394
Fax: (250) 387-8720

Disclaimer

This document contains recommendations for a consistent approach to the preparation and use of DCC bylaws by local government in British Columbia. It is not intended to contain legal advice. While every care has been taken in the preparation of this document, none of the numerous contributors, nor the Ministry of Community Services, can accept any liability for any loss or damage which may be suffered by any person or organization as a result of its use. Users are encouraged to seek legal advice regarding the drafting and practical application of DCC bylaws.

This chapter of the guide presents an overview of DCCs including:

- a general definition;
- the legislative and regulatory background for the charges;
- the responsibilities of local government;
- specific exemptions from DCCs;
- the relationship between the DCC bylaw and other local government documents; and,
- the bylaw approval process.

General Definition

A development cost charge is a means provided by sections 932 through 937 of the *Local Government Act* to assist local governments in paying the capital costs of installing certain local government services, the installation of which is directly or indirectly affected by the development of lands and/or the alteration/extension of buildings (section 933(1) and (2)). DCCs can be specified according to different zones or specified areas as they relate to different classes and amount of development, but charges should be similar for all developments that impose similar capital cost burdens on a local government (section 934(2) and (3)). The *Local Government Act* permits DCCs to be established for providing, constructing, altering, or expanding facilities related only to the following local government services:

- roads, other than off-street parking;
- sewage;
- water;
- drainage; and,
- parkland acquisition and improvement (section 933 (2)).

DCCs are payable by parties obtaining an approval of subdivision or a building permit, as the case may be (section 933(1) and (5)).

Inclusion of soft services as a part of DCCs is not permissible under the *Local Government Act*. However, it is noted that the *Vancouver Charter* enables the City of Vancouver to collect DCCs for acquiring property for and establishing childcare facilities, and to create affordable replacement housing for people displaced by development. In addition the *Resort Municipality of Whistler Act* provides the authority to collect DCCs for employee housing in the municipality.

At the risk of oversimplifying a complex issue, DCCs are generally determined by dividing the net capital infrastructure costs attributable to new development over a certain time period, by the corresponding number of projected development units (or area) that will be developed in that same time period. DCC calculations typically coincide with the Financial Plans. DCCs are commonly imposed on a range of land uses, including both residential and non-residential.

History of DCCs in British Columbia

Prior to 1958, the costs of off-site municipal infrastructure services required for new development were typically paid for by the municipality, with no ability to recover the costs from the developer.

In 1958, the *Municipal Act* was amended to permit an Approving Officer to refuse approval of a subdivision plan, if he/she was of the opinion that the cost to the municipality of providing public utilities or other local government works and services would be excessive.

To mitigate the possible rejection of subdivisions, municipal councils began to enact Excessive Subdivision Cost Bylaws or Impost Fees to try to cover the infrastructure costs from new development. However, the courts ruled these bylaws were invalid because although the Approving Officer had the power to refuse subdivision approval, municipalities did not have the power to charge for any resulting infrastructure costs.

A series of *Municipal Act* amendments attempted to address the court ruling. In 1968, development permit powers were enacted which allowed municipalities to designate development areas and control the development of land in those areas. In 1971, this legislation was replaced with land use contract powers. Impost fees levied under a land use contract were found by the courts to be valid. In 1977, land use contract powers were eliminated, and the current authority to impose development cost charges was introduced.

Legislative and Regulatory Background

DCCs are established within a layered governance structure. At the most direct level, DCCs are subject to the policy and technical bulletins issued by the Ministry whose responsibility it is to review and approve the bylaws submitted by local government. This level lies under the legislative framework described by the sections of the *Local Government Act* (section 932 – 937) related to DCCs. The provincial legislation is enacted under the authority of the provincial government as set out in the Canadian Constitution.

The guide bridges the broad legislative framework with specific local government practice, clarifies Ministry policies and practices, and identifies best practices for establishing DCC programs and related bylaws.

Local Government Responsibilities

In the process of developing DCC bylaws, local governments must consider their responsibilities as outlined in the *Local Government Act*. Local governments have to take into account whether the proposed DCCs will:

- be excessive in relation to the capital cost of prevailing standards of service;
- deter development; or,
- discourage the development of reasonably priced housing or reasonably priced serviced land (section 934(4)(d)).

DCCs must be used to acquire or construct the works for which they were collected and cannot be used for any other purpose (section 935). Therefore, a local government should carefully consider broad policy matters and technical issues prior to establishing DCCs.

Relevant policy and technical issues include:

- level of service desired or required;
- impact on housing affordability;
- equity between existing taxpayers and developers or newcomers attracted by development;
- the municipal assist factor;
- the projected types and amount of new development; and,
- the utility services required to support that projected development.

Exemptions from DCCs

Local governments are provided considerable flexibility in establishing DCCs, but the *Local Government Act* does establish a few exemptions and choices to be made in the development of DCC programs. There are three distinctions outlined in the legislation based on type and materiality of the exemption, as well as ensuring equity in the payment of DCCs. Each is discussed below.

TYPE OF DEVELOPMENT

Section 933(4) describes the following circumstance when development is exempt from DCCs:

- where a building permit authorizes the construction, alteration, or extension of a building, or part of a building which is solely used for public worship, such as a church.

Section 933 (12) of the *Local Government Act* includes a permissive authority allowing local governments to provide assistance to non-profit rental housing developers by waiving or reducing DCCs. However, social housing units must still be considered a part of the total housing count.

Also, the intent of the legislation is that in cases where the DCC is waived or reduced, the amount waived is to be entirely supported by the existing development.

MATERIALITY OF THE EXEMPTION

Section 933(4) describes the following circumstances when development is exempt from DCCs:

- where a building permit is issued for the construction, alteration, or extension of a building that contains less than four dwelling units, and the building is exclusively for residential use; and,
- where the value of the work covered by the building permit does not exceed $50,000.

Local Government Act s. 933 (4) & (4.1) (Sept 2004)

In 2004, these exemptions were amended to provide more flexibility. Local governments now have the authority to amend their DCC bylaws to charge DCCs on developments of fewer than four dwelling units that are exclusively for residential use, and local governments can increase the $50,000 exemption threshold.

The first amendment provides local governments with an incentive to wait until the building permit stage to collect DCCs. At the building permit stage, local governments may impose DCCs on the basis of area (square metres or square footage), rather than number of units, which encourages the development of smaller, more affordable housing. This cannot be done at the subdivision stage. Delaying the collection of DCCs can also reduce carrying costs for developers, savings that can be passed on to the home purchaser. Currently, local governments tend to charge DCCs at subdivision, if a subdivision application is required, as there are no exemptions at this stage, rather than wait until an "under-4" developer applies for a building permit.

The second amendment gives local governments the authority to amend their DCC bylaws to set a threshold higher than $50,000 for the minimum value of work on which DCCs may be imposed.

This acknowledges variances in construction costs around the province by maintaining the current $50,000 threshold for charging DCCs, while providing flexibility for local governments to increase the threshold where appropriate. For example, in the Lower Mainland or Victoria, where charging DCCs on building costs of $50,000 could capture renovations that do not require improvements to infrastructure. The $50,000 threshold, however, may still be adequate for areas outside the Lower Mainland.

EQUITY IN EXEMPTION

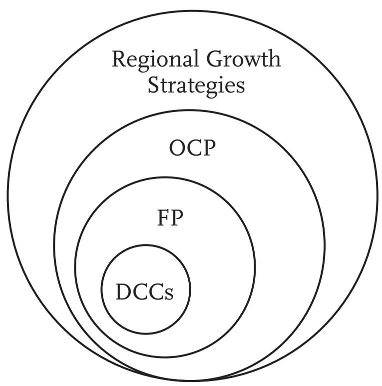
Section 933(3) states that DCCs are not payable if it can be proven that the development does not impose a new capital cost burden on the municipality, or if a DCC was previously paid for the same development.

For example, depending on the structure of a Land Use Contract, impost fees for services may exempt certain DCCs from having to be paid. Other provisions in the *Local Government Act*, such as Latecomer Agreements (section 939) might also exempt certain capital costs from being recovered through DCCs.

The point of section 933(3) is to prohibit developments from being charged twice. However, if new capital cost burdens will be placed on the local government as a result of further development, then DCCs can be collected on the additional increment of development.

DCC Programs and Other Local Government Planning

DCC programs should be integrated with other local government planning. This requirement is highlighted in the *Local Government Act* (section 934(4)) which requires local governments to take into consideration future land use patterns and development, the phasing of works and services, and the provision of parkland described in an Official Community Plan. Further, if the Inspector of Municipalities determines that a DCC bylaw is not related to capital costs attributable to projects included in a Financial Plan, approval of the DCC bylaw may be refused (section 937 (2))



The establishment of a DCC program to deal with land development infrastructure is based on the relationship and interaction between the Official Community Plan (OCP) and the Financial Plan.

An OCP contains the broad development objectives and policies of the local government. The OCP is often developed within the larger context of a Regional Growth Strategy. It is used as a basis to develop master servicing plans, in accordance with current design criteria and standards. Proposed projects arising out of the servicing plans are compiled in a local government Financial Plan.

The Financial Plan establishes the capital projects required by a municipality (such as roads, drainage, sanitary sewer, water, and parkland) over a certain time period, including projects needed to accommodate new development. The projects for which DCCs are established form a subset of the Financial Plan.

The OCP and Financial Plan are interrelated, and each plan may require adjustment through separate processes in response to the goals, constraints, and achievements of the other. The OCP outlines a community's long term policies and objectives for managing growth and land use. It provides a framework for making development decisions and should be reviewed on a regular basis.

The interaction between local government planning documents involves numerous assumptions and uncertainties, and should be reviewed on a regular basis. Changes made to OCPs or more detailed neighbourhood plans greatly affect development densities, which have a direct bearing on corresponding infrastructure requirements and can affect the Financial Plan.

The intent of developing DCCs is to ensure they appropriately reflect community plans and the costs of capital projects needed to service new development.

Bylaw Approval Process

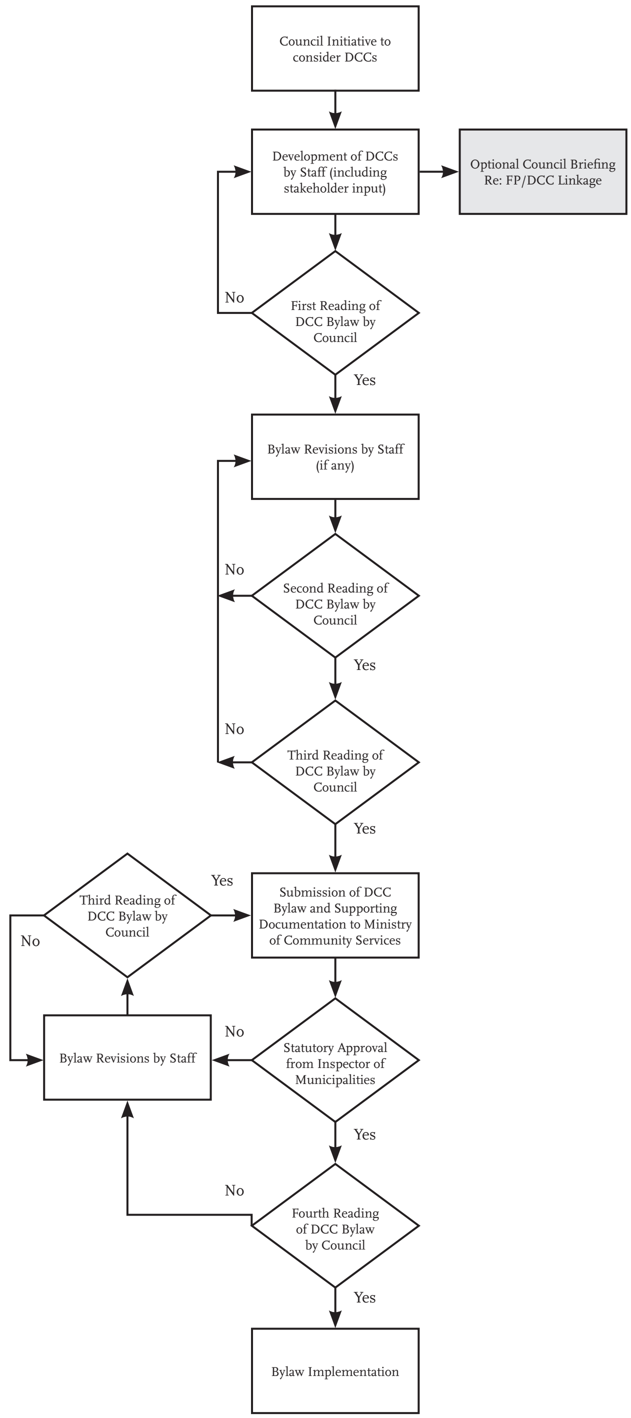
The *Local Government Act* (section 937(1)) requires the Inspector of Municipalities to approve local government DCC bylaws.

The following steps reflect a typical process for developing a DCC program.

- Council or the regional district board passes a motion to consider a DCC program and the development of a DCC bylaw based on the *DCC Best Practices Guide*.
- Local government staff, or a consultant, develop a bylaw and calculate the DCC rates.
- During the bylaw development phase, input is obtained from the public and interested parties.
- A proposed bylaw is presented to council or the regional district board for first reading.
- Elected officials may request additional public input or revisions prior to second and third reading.
- Following third reading the DCC bylaw and supporting documentation will be forwarded to the Inspector of Municipalities for review and approval.
- If no revisions are required, the bylaw will be returned to the local government for adoption. At this point the DCC bylaw takes effect.

This process is shown schematically in the following diagram.

Bylaw Approval Process



CHAPTER 2 – Bylaw Development

The policy considerations in developing a DCC bylaw include the following:

- an appropriate public process;
- the extent of application of the charges (municipal-wide or area-specific);
- the time frame for the DCC program (build out or revolving);
- the categories of land use to be charged;
- the appropriate units for the charges (a unit or area basis);
- the eligibility of projects;
- the recoverable DCC costs; and,
- the assist factor.

Public Process

Public/stakeholder participation and consultation is one of the guiding principles in establishing DCCs.

The authority to adopt a DCC bylaw rests with elected officials. There are no mandatory public consultation activities in the DCC legislation, such as the public hearing requirements for a rezoning application. However, the Inspector of Municipalities may refuse approval of a DCC bylaw under section 937(3)(b) of the *Local Government Act* if the DCCs are excessive, deter development or discourage construction of reasonably priced housing. Evidence of public/stakeholder consultation may address some of these issues.

The experiences of local governments indicate that a meaningful public process tends to generate DCC bylaws which are effective and accepted by stakeholders who have participated in the decision-making.

RECOMMENDED BEST PRACTICE

The development of a DCC bylaw should include a meaningful public process to obtain input from stakeholders prior to first and third readings.

In the case of a DCC bylaw, stakeholders are defined as all persons, groups or organizations that have a perceived, actual, or potential stake or interest in the results of the decision-making process. Public participation provides an opportunity for stakeholders to be heard and to influence the policies of decision-makers.

The level of input should be limited to DCC considerations, such as the use of municipal-wide or area-specific DCCs, benefit allocation, and a suitable grace period for changes to DCC bylaws. This is because consultations on the other relevant planning documents (e.g. OCPs) have their own consultation requirements.

At a minimum, consultation should include representation from residential and non-residential developers, the public, as well as local government staff from the planning, engineering and finance departments.

Other participants could include representatives from:

- the local chapter of the Urban Development Institute;
- the local chapter of Canadian Home Builders Association;
- the British Columbia Real Estate Association;
- local private sector developers;
- public sector developers such as the School District or Health Board;
- the Chamber of Commerce;
- the Ratepayers Associations; and,
- the general public.

Local governments can choose the most appropriate consultation approaches for their communities which could include:

- asking for comments on the DCC bylaw from selected stakeholders;
- scheduling public meetings with council present as a committee of the whole, or as a policy committee; and/or,
- setting up a liaison committee or an ad hoc task force to review and comment on the DCC bylaw.

Local government liaison committees or task forces have proven useful in facilitating communication between the local government and the development industry regarding proposed bylaws or policies and development approval processes. Typically these committees include representatives from the local government, and commercial and residential developers.

The Urban Development Institute has a history of co-ordinating the participation of its members on liaison committees. The Executive Director at the Institute can be reached at (604) 669-9585.

One Lower Mainland municipality has proposed the concept of a DCC Advisory Forum to provide ongoing public input into the DCC bylaw and future revisions. The forum would include significant stakeholders and, if appropriate, public input would be requested. Comments and advice from the DCC Advisory Forum would be made available to council, or their policy committee in association with any suggested future changes to the DCC bylaw. The Chair would be the person with the responsibility for bylaw development.

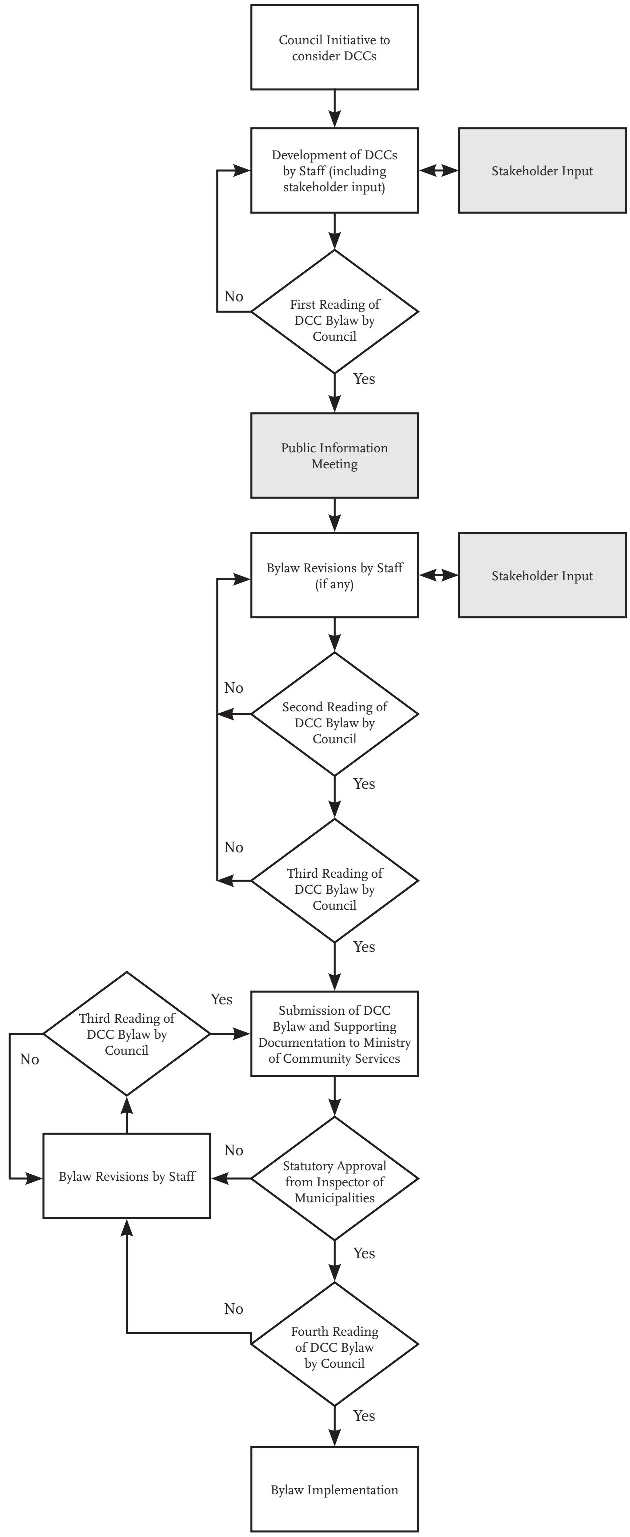
A public participation strategy related to DCCs could involve one or more of the above activities. The actual strategy would depend on a local government's specific circumstances, including the level of complexity involved with a particular set of charges and the level of participation desired by stakeholders.

The recommended best practices regarding a public participation strategy associated with DCCs involves the following minimum activities:

- stakeholder input during the development of the DCC bylaw before first reading;
- a public information meeting after first reading to obtain further input from stakeholders; and,
- additional input before third reading.

This strategy is illustrated in the following schematic.

Stakeholder Participation Strategy.



Extent of Application

The extent to which DCCs will be applied in a municipality or a regional district is an issue which should be considered when developing a DCC bylaw. Deciding whether the proposed DCC will be a "*municipal-wide*" or "*area-specific*" charge will influence the DCC program and the calculation of charges.

A MUNICIPAL-WIDE CHARGE

A municipal-wide DCC means that the same DCC rate is applied for a particular type of land use deemed to generate a similar or same capital cost burden, throughout the municipality regardless of the location of any specific development.

AN AREA-SPECIFIC CHARGE

An area-specific DCC divides the municipality into areas according to geography or any other distinctive quality (e.g. a vacuum sewer system) for the purpose of determining the DCC. As each area has its own set of DCC projects, this results in a distinct charge for a particular type of land use within the defined area. The charges may differ substantially between areas depending on respective servicing requirements and projected development.

CRITERIA FOR DECISION-MAKING

Whichever approach is taken, it should support the principle of fairness and equity. Some general considerations in choosing between the two options include:

- the relationship between those who pay the DCC and benefiting users;
- the complexity and costs of administration associated with numerous charges;
- "Keeping It Short and Simple" to avoid confusion;
- equitable and fair distribution of costs in relation to developing land in different areas of a municipality;
- cash flow considerations;
- funding flexibility associated with fewer but larger accounts; and,
- the desire to support growth in cost effective areas, assuming that the OCP identifies several neighbourhoods having equal development potential without giving any priority.

Given these considerations, a municipality may choose to prioritize or weight the criteria in order to arrive at a decision. The DCC calculation methodology makes every effort to be accurate and detailed; however a certain amount of "averaging" takes place when deriving the charges.

When the circumstances within a certain area (such as projected new development units or the capital cost requirements) deviate significantly from the average condition, consideration should be given to an area-specific charge. However, if new development is projected to occur fairly evenly throughout the municipality, and the capital cost burdens between neighbourhoods are similar, then consideration should be given to a municipal-wide charge. In this case, some fairness and equity is perceived to be "traded off" for simplicity and reduced administrative effort.

Identification of specific projects which are needed to accommodate new development can be a difficult task, when the projected development could take place in a variety of areas. The advantage of a municipal-wide DCC is the flexibility it offers to accommodate changes, when the pattern of development turns out to be significantly different than was projected at the time of establishing the DCC bylaw. However, there are cases where a municipal-wide DCC may not be appropriate, such as:

- areas where "greenfield" developments covered under a Land Use Contract may be excluded from DCCs; and,
- areas where utilities are organized into Local Area Services by bylaw under the *Community Charter* section 210 – 219.

Under a municipal-wide scenario, the monies can accumulate more quickly and provide sufficient funds to complete required capital projects. However, there are cases where a municipal-wide DCC is not appropriate. These include: "greenfield" developments covered under a Land Use Contract and when utilities are organized into Specified Areas by bylaw under Section 646 of the *Local Government Act*.

In both examples, the underlying principle is that developments cannot be "double charged."

OPTIONS FOR ROAD DCCS

Municipal-wide road DCCs

The foundation for a road DCC program is a municipality's Master Transportation Plan (or equivalent), often referenced in the OCP. The objective of a Transportation Plan is to provide an integrated network of arterial, collector, and local roads to enable the effective and efficient movement of people within a municipality.

Traffic from a new development in one area may contribute to the need for widening of an arterial road at the opposite end of the municipality. Thus, in addition to the general criteria, the nature of road usage is a specific consideration with respect to road DCCs. The recommended best practice for the extent of application for road charges is to establish road DCCs on a municipal-wide basis for the following reasons:

- the nature of road usage (i.e., a fair reflection of the relationship between those who pay the DCC and benefiting users);

- bylaw simplicity (therefore reducing the opportunity of errors when determining the amount payable);
- reduced administrative effort;
- facilitation of cash flow; and,
- funding flexibility.

RECOMMENDED BEST PRACTICE

Road DCCs should be established on a municipal-wide basis, unless a significant disparity exists between those who pay the DCC and benefiting users.

Area-specific road DCCs

In certain limited circumstances, an area-specific road DCC may be reasonable. One example is a truck route within a well defined, non-residential area exclusively utilized by industrial land uses. In this case, an argument could be made for an area-specific industrial DCC, as the project would be more equitably funded, assuming there was very limited benefit to broader areas.

Options for Storm Drainage DCCs

The challenge in implementing storm drainage DCCs on a municipal-wide or area-specific basis is to strike a balance between the simplicity of one common set of rates and fair distribution of costs amongst benefiting catchment basins.

Area-specific storm drainage DCCs

The nature of storm drainage is such that capital works are required in direct response to the needs of a particular drainage catchment area or basin. The foundation for the storm drainage DCC program is the municipality's Master Drainage Plan or Stormwater Management Plan for each drainage basin, and the drainage requirements of one basin might be very different from another. If this is the case, consideration should be given to imposing storm drainage DCCs on an area-specific basis. Another situation where an area-specific approach would be appropriate is when a municipality has organized the provision of storm drainage in specified service areas (e.g., drainage districts).

Municipal-wide storm drainage DCCs

If the topography of a municipality contains many drainage basins, a separate set of DCCs for each one may make calculation of charges complicated and future implementation of the bylaw very cumbersome. For example, an estimate of new development would be required for each drainage basin. Separate accounts would be required for each area DCC to track revenues and expenses. If the capital cost burdens for the drainage basins are similar, the recent trend has been to impose an equal charge over the entire municipality. In addition, drainage projects such as major trunk storm sewers and community stormwater detention facilities serving multiple drainage basins would be better suited to a municipal-wide DCC program.

RECOMMENDED BEST PRACTICE

Storm drainage DCCs should be established on a municipal-wide basis, unless a significant disparity exists between those who pay the DCC and benefiting users.

Rationale for recommended best practice for storm drainage DCCs

Unless there is a significant disparity in terms of either the projected new development units or the capital cost of providing storm drainage infrastructure between drainage basins, the recommended best practice for the extent of application related to storm drainage is to establish these DCCs on a municipal-wide basis for the following reasons:

- facilitation of cash flow;
- funding flexibility;
- bylaw simplicity; and,
- reduced administrative effort.

In other words, the benefits of these criteria outweigh consideration of the nature of storm drainage occurring in distinct basins, unless the principle of fairness and equity is significantly compromised. In particular, local government have found that collection of DCCs according to various drainage areas has resulted in an insufficient accumulation of funds to keep up with the need for drainage infrastructure.

OPTIONS FOR SANITARY DCCS

The arguments related to the options for storm drainage also apply to sanitary DCCs. While the nature of sanitary sewer systems is such that capital works are required in direct response to a particular catchment area, this feature must be balanced with other considerations.

Area-specific sanitary DCCs

An area-specific approach acknowledges the nature of sanitary sewer systems. If the sanitary requirements (from a municipality's Master Sewerage Plan or equivalent) between the various catchments differ greatly, imposing sanitary DCCs with this approach is appropriate.

Sanitary DCCs on an area-specific basis should also be considered, when the municipality has organized the provision of sanitary sewer in specified service areas (e.g., sewer districts)

Municipal-wide sanitary DCCs

Where the sewer subsystems of a municipality are well integrated with sewage lift stations discharging into one regional treatment facility, the sanitary projects may be better suited to a municipal-wide DCC program. In addition, where many catchment areas exist in the municipality with similar sewerage needs, the recent trend has been to impose a municipal-wide charge.

RECOMMENDED BEST PRACTICE

Sanitary DCCs should be established on a municipal-wide basis, unless a significant disparity exists between those who pay the DCC and benefiting users.

Rationale for recommended best practice for sanitary DCCs

The recommended best practice for the extent of application regarding sanitary sewer is to establish these DCCs on a municipal-wide basis. The rationale for this practice is similar to the considerations associated with storm drainage discussed previously.

OPTIONS FOR WATER DCCS

Area-specific water DCCs

Water DCCs on an area-specific basis may be reasonable in limited situations, depending on the circumstances. For example, if the provision of water is separated into various geographic service areas or special development areas (e.g., a specified water area), and these areas effectively behave as isolated systems, then area-specific water DCCs would be appropriate.

Municipal-wide water DCCs

Municipal water systems consist of interconnected grids throughout the municipality. The nature of water distribution networks is very similar to a road system. This feature of water systems is a specific consideration in addition to the general criteria presented at the beginning of this section. The recommended best practice for the extent of application for water DCCs is to establish them on a municipal-wide basis for the following reasons:

- the nature of water distribution networks (i.e., a fair reflection of the relationship between those who pay the DCC and benefiting users);
- bylaw simplicity (therefore reducing the opportunity for errors when determining the amount payable);

- reduced administrative effort;
- facilitation of cash flow; and,
- funding flexibility.

RECOMMENDED BEST PRACTICE

Water DCCs should be established on a municipal-wide basis, unless a significant disparity exists between those who pay and benefiting users.

OPTIONS FOR PARKLAND DCCS

The recommended best practice for the extent of application in the case of parkland charges is to establish parkland DCCs on a municipal-wide basis. The rationale for this practice includes the following considerations:

- new users in one neighbourhood are not prevented from frequenting park and recreational facilities elsewhere;
- bylaw simplicity (therefore reducing the opportunity for errors when determining the amount payable);
- reduced administrative effort;
- facilitation of cash flow; and,
- funding flexibility.

RECOMMENDED BEST PRACTICE

Parkland DCCs should be established on a municipal-wide basis, unless a significant disparity exists between those who pay the DCC and benefiting users.

It is conceivable that a park might serve a specific neighbourhood with little benefit to other neighbourhoods; however local parks may be acquired using means other than DCCs. Therefore, an area-specific approach to parkland DCCs would seldom be appropriate.

Program Time Frame

The appropriate time frame for the DCC program should be considered when developing a DCC bylaw. A certain time period is needed for looking at the estimation of new development and the capital projects required to service that new development. To this end, DCC programs can be established on either a "*build out*" or a "*revolving*" basis.

A BUILD OUT PROGRAM

A build out program, by definition, includes all the DCC projects which will need to be constructed to allow development to occur to the full extent and level defined by the OCP. The OCP usually involves a long time horizon, and the plan may not be fully realized for 20 or 25 years.

A REVOLVING PROGRAM

A revolving program is also consistent with the OCP, but consists of only those projects which are necessary to support development that is expected to occur in some defined time period such as five or ten years. In effect, a number of sequential revolving time windows together make up a build out program.

CRITERIA FOR DECISION-MAKING

Considerations regarding the decision to establish a build out or revolving program include:

- the type of capital projects in the DCC program (e.g., a sewage treatment plant would probably be constructed to build out service population);
- cash flow requirements for DCC project construction, as monies may be collected faster with a shorter term program;
- the availability of long range plans for municipal servicing and land use;
- cost-sharing equity between developers over time;
- DCC rate stability over time, as a revolving program may result in sharp increases/decreases;
- flexibility to use DCC funds for projects where the timing has been advanced;
- time and location sensitivity of development projections; and,
- co-coordinating the time frame of the DCC program with the interval of time between major reviews of the OCP or the time period for a major amendment of the DCC and Zoning Bylaws.

RECOMMENDED BEST PRACTICE

The time frame for a DCC program should be tied into the time frame of a Financial Plan.

Beyond these considerations, reference is made to two other DCC issues: DCC recoverable costs and future bylaw administration. With respect to the former, the capital cost component should be consistent with the DCC time period. For example, the full costs associated with and the ultimate standard of construction (e.g., a multi-phased arterial road project) to be achieved within the next 20 years should not be included in a five year revolving DCC program. In this case, only the interim standard envisioned to be constructed in the next five years should be included in the immediate revolving program. Regarding the future administration of the bylaw, the time frame of the DCC program may impact how the various projects are monitored and tracked.

The inability to estimate future project costs adequately often makes creation of a build out program difficult. For road DCCs, long range corridors have to be sufficiently defined in the Master Transportation Plan. The level of information available from background stormwater management plans and studies, from sanitary sewer modelling and master sewerage plans, from water modelling studies, and from the Parks Master Plan and park policies in the OCP will affect whether compiling a build out program is feasible. However, a build out approach offers the most flexibility in relation to development sequencing and project construction timing, since all the projects needed to support build out of the entire OCP are included in the DCC program.

Categories of Land Use to be Charged

Section 934 (3) of the *Local Government Act* provides the authorization for DCCs to be imposed according to:

- different zones or different defined or specified areas;
- different uses; and,
- different classes of development.

In response to this provision, another policy consideration involves establishing the types of development to be charged DCCs. Land uses can include both residential and non-residential development. Although the legislation permits different DCCs for different types of development, it is noted that charges cannot be differentiated by ownership. For example, a private school would be charged the same institutional DCC rate as a public school.

The categories of development to be charged may depend on the choice of a municipal-wide or area-specific DCC application, as charges cannot be imposed for land uses which do not benefit from the DCC program.

TYPES OF LAND USE

Residential uses commonly include single family and multi-family (such as duplex, townhouse, and apartment), while non-residential uses can typically include commercial, industrial, and institutional. "De-coupling" the categories of land use to be charged DCCs (e.g., residential) from an associated building form (e.g., single family residence, townhouse, apartment) has been suggested by some local governments. Instead, residential land use is only distinguished on the basis of unit density. Proponents argue that this approach results in fairer charges and may promote more efficient land development. A fuller discussion of the density approach is provided in the subsection on "Level of Category Breakdown."

While DCCs could potentially be imposed on all categories of development which benefit from the installation of roads, drainage, sanitary, and water services, the applicability of parkland DCCs to non-residential land uses is not as clear. Some have argued that only residential development creates a need for park and open space, therefore commercial, industrial, and institutional land uses should not be charged parkland DCCs. Others believe that parks and other amenities form part of the attractiveness that cause businesses to locate in a particular municipality, therefore non-residential land uses should contribute to the costs of these facilities.

In addition, employees can enjoy the use of parks during lunch hours and breaks. Sometimes, companies sponsor employee sports teams which utilize civic park facilities. Ultimately, the assessment of the need for and enjoyment of park and open space by the different land uses must be justified.

Imposing DCCs on institutional land use is also difficult. Often, information that would assist in the projection of institutional development does not exist. Most of the data have to be obtained from other agencies which may or may not have planning documents in place. In addition, the actual demand on services greatly varies, depending on the actual use. For example, a government office building may have sewer loadings very similar to commercial land use, while a school or hospital may have much greater loads.

The nature of institutional land use may be different from other types of development. For example, arrangements such as public/private partnerships for the provision of institutional facilities or co-operative relationships emerging between municipal parks departments and school boards were not originally envisioned when the DCC legislation was introduced.

Further, public sector developers feel that the need for institutional development is a consequence of population growth; new infrastructure required to service institutional land uses is in response to other types of development and therefore should be exempt from DCCs.

Conversely, it can be argued that institutional land uses do impact infrastructure systems, and despite the difficulties, it is possible to derive DCCs for institutional land use.

LEVEL OF CATEGORY BREAKDOWN

A DCC bylaw should include sufficient land use categories to reflect the development patterns for which the DCC servicing program is being provided, but should not be so detailed that the process of DCC preparation and administration becomes cumbersome. It is noted that as the number of categories increase, the complexity of the bylaw also increases, in terms of calculating the charges, continued administrative effort, and the opportunity for errors in determining the amount payable. Similar to the "averaging" discussion when referring to a municipal-wide or area-specific DCC program, the challenge in determining the degree to which land use categories should be broken down is to balance the principle of fairness and equity with the benefits of simplicity.

The decision as to how detailed the breakdown of the categories of development should be, for the purpose of setting a DCC, is essentially one that acknowledges "density" subsets within each basic land use category. The relative benefit received between various types of land use is directly related to the density of new development, whether it is expressed as persons per dwelling unit, a per capita demand, equivalent service population, or the size of the unit. For example, different types of residential land use impact the road network differently. To recognize the differences in relative impact, DCCs can be implemented for various residential uses such as rural, single family, low density multi-family, and high density multi-family. In the case of storm drainage, though not considered "density" per se, the amount of impervious area does indeed vary between different types of new development.

It is suggested that specification of land uses should be somewhat generalized, and DCC categories should not be directly referenced to zoning designations in the Zoning Bylaw. The reason for this is that these designations frequently change; DCC rates specified by land use zones would mean that a DCC bylaw amendment would be necessary with every additional zoning designation created. However, the Zoning Bylaw should provide the definition of what uses constitute "residential," "commercial," "industrial," and "institutional."

Residential land use categories

Historically, a strong connection existed between building form and the residential land uses for which DCCs were imposed. Therefore, building forms such as a single family residence, townhouse, and/or apartment were used to reflect the subset within the basic land use category of residential, and these building forms were an adequate proxy to reflect impact on infrastructure services. Recently, certain housing trends have been noticed; the size of single family residences appears to be decreasing in certain locales (sometimes referred to as "small lot development" or "compact housing"), while some very large multi-family units have shown up on the market. It is now possible to find townhouses and condominiums that match the size of smaller single family dwellings. Assuming that the demand on services from a large multi-family unit might be equal to that for a small single family dwelling, DCCs may not be the most equitably distributed, if imposed according to building type.

In response to the recent housing trends, two approaches are described in this subsection as matters of policy which should be considered when developing a DCC bylaw.

The traditional approach presumes that the strong tie between building form and impact on infrastructure continues to exist. As a result, a typical range of land use categories for the implementation of DCCs includes:

- Single Family Residential;
- Multi-family Residential;
- Townhouse;
- Low Rise Apartment; and,
- High Rise Apartment.

Additional land uses that are less common, but are potential DCC categories include: rural residential, duplex, mobile home pads, and secondary suites. Some guidance in the choice of development categories may be provided by the OCP, which defines generalized land use, and in the Zoning Bylaw, which describes more specific land use zone designations.

The main advantage of the traditional approach is that the data needed to make the unit projections corresponding to the land use categories are often readily available. For example, building statistics and Census information often track development trends on the basis of building form (e.g., ground oriented, single detached). Disadvantages of this approach include not recognizing recent development trends and the view that it may not encourage the building of smaller dwelling units.

Alternatively, an innovative approach reflects the recent housing trends that have seen the building of smaller single family dwellings and larger multi-family units. This approach suggests that the link between DCC categories and building form should be "de-coupled," and the subset within residential land use should be based on a density gradient.

The cutoff between the various density categories would be at the discretion of the municipality, but as an example, some potential ranges (as set out in the School Site Acquisition Charge Regulation) are suggested below:

- "low density" means up to 21 self-contained dwelling units on a gross hectare;
- "medium low density" means 21 to 50 self-contained dwelling units on a gross hectare;
- "medium density" means 51 to 125 self-contained dwelling units on a gross hectare;
- "medium high density" means 126 to 200 self-contained dwelling units on a gross hectare; and,
- "high density" means over 200 self-contained dwelling units on a gross hectare.

The main advantage of the alternative density gradient approach is that it may promote more efficient land development. Neo-traditional planning principles point out that compact forms and higher density contribute to sustainability, as these types of development reduce the amount of roads built, make transit more viable, and have smaller "ecological footprints." The disadvantage of being innovative is that data required to make development projections may not be easily available in the format desired. Therefore, building statistics and Census information may have to be used as a starting point with fine-tuning being done based on what is known about the trend for the number of units per hectare in specific areas in recent times.

As well, the lot size may be factored into DCC calculations. Lot size does contribute to housing affordability, but this saving might be partially offset if DCCs are not allocated equitably.

Certainly it can be shown that smaller lot sizes have less impact on storm drainage. It may be more difficult to produce definitive data that a smaller lot leads to trip reduction or reduced sewer and water usage, but logic would suggest there would sometimes be a reduced impact.

The Ministry's position is that existing legislation does not preclude factoring small lot size into DCC calculations.

The traditional building form approach, when coupled with DCC rates collected on the basis of floor area for multi-family units and DCC rates varying with lot size for single family units, can offer the majority of the advantages of a strict density gradient approach without the associated disadvantages of uncertainty and lack of development projection data.

Instead of a density gradient, the City of Richmond uses a "sliding scale." For further information, contact the Corporate Services Department, City of Richmond at (604) 276-4095. Another innovative alternative is charging DCCs based on floorspace, which is discussed later.

Non-residential land use categories

The degree that non-residential land uses are broken down in a DCC bylaw is rarely as great as for residential. Although the same general considerations apply, the typical types of non-residential land use categories for which DCCs are imposed include:

- Commercial (possibly broken down further into Service Commercial or Office Commercial);
- Industrial (possibly broken down further into Light Industrial and Heavy Industrial); and,
- Institutional.

Due to the wide range of demand on services that exists for various types of institutional development, fairer charges will result, if this land use is further broken down into the types of development that are projected to occur over the DCC time period. Depending on each municipality, the institutional uses may include:

- government offices;
- elementary schools;
- secondary schools;
- private schools;
- universities and colleges;
- hospitals, including private care facilities; and,
- senior or low cost housing (depending on the Zoning Bylaw).

However, due to the problems associated with institutional DCCs as previously discussed, it may be difficult to establish more than one institutional category.

Recommended best practice

The recommended best practice for determining the manner in which DCCs will be set for residential land use is to establish the charge categories according to a density gradient. In this case, the ease in which a DCC bylaw can be developed according to building forms is considered to be "traded off" for the principle of fairness and equity.

Regarding non-residential development, the breakdown of categories within a certain land use for which DCCs are payable should recognize major differences in relative impact, as determined by a municipality.

RECOMMENDED BEST PRACTICE

Residential DCC categories should be established according to a density gradient. The breakdown of categories within non-residential land uses for which DCCs are payable should recognize major differences in relative impact.

Appropriate Units for Charges

Section 934 (3) of the *Local Government Act* further states that a DCC bylaw may be imposed for different sizes or different numbers of lots or units in a development. In other words, the bylaw establishes DCC rates for representative units of development for each identified category of land use. Therefore, the representative unit should be an accepted measure of development. This choice will affect how development projections are made and what information is required in order to make reasonable projections.

UNITS FOR RESIDENTIAL LAND USES

Development unit option

In practice, frequently used units for residential DCCs include "lots" for single family and "dwelling units" for multi-family such as townhouses and apartments. The advantage of this option is that in many local governments, development projections are commonly expressed in these terms.

Floorspace option

DCCs on a floorspace basis for residential development are encouraged by the development industry. Although not as widely implemented as lots or dwelling units, DCCs based on square footage (or square metres) are an option and should be considered. Further, as multi-family DCCs are commonly collected at the time of building permit issuance, an area unit of measure is certainly compatible with this type of land use. "Habitable area" is defined as the area which can be lived in, but does not include patios, balconies, garages, parking stalls or storage areas other than closet space.

Local Government Act – s. 933 (4.1) (a) (Sept 2004)

With the additional authority for local governments to charge DCCs on under four units at building permit stage, charging DCCs based on area is a viable option and should also be considered.

Local governments which have implemented the floorspace option for multi-family units have found no significant difficulties with it and have remarked how easy it is to administer and understand. The square footage option has also proven to be a more accurate measure of "habitable area" and has led to a more useful and less complicated DCC calculation.

In recognition that the construction industry, construction material industry and the general public use imperial measurement, it is recommended that local government DCC bylaws contain an imperial to metric conversion table where bylaws use metric (i.e. floorspace in square metres; density in units per hectare).

UNITS FOR NON-RESIDENTIAL LAND USES

For non-residential land use, an area unit of measure is also often used. For commercial, industrial, and institutional uses, the applicable area can be expressed in square metres (or square footage) of gross building area or hectares (or acres) of gross site area. Typically, floorspace area is chosen for commercial and institutional (because these types of development are often multi-storied), while gross site area is more common for industrial (which is predominantly a single storey development).

OTHER OPTIONS

The number of bedrooms or the number of required parking spaces are much less common ways of levying DCCs. In very special circumstances, these unit measures may be appropriate. However, it is important for equity and ease of implementation that the unit of development be representative, an accepted unit of measure, and easily understood.

CRITERIA FOR DECISION-MAKING

So that the best choice overall to facilitate bylaw administration can be made, affected parties should be consulted regarding the representative unit, including:

- the development industry who will be paying the DCC; and,
- the municipality's "front line" staff that deal with subdivision and building permit applications and who will be determining the amount payable.

It is noted that different units can be applied to different charge categories. For example, single family DCCs could be charged on a lot basis, while multi-family DCCs could be imposed on the basis of floorspace.

Beyond administration issues, the appropriate unit for DCCs may affect housing affordability, a mandated consideration contained in the *Local Government Act* (section 934 (4) (d) (iii)). A 1995 study completed by the Urban Development Institute (UDI) in co-operation with the District of Maple Ridge argues that DCCs based on the size of the dwelling unit would encourage the construction of smaller homes to enhance housing choices and affordability.

If a DCC is levied on the number of lots or dwelling units, the total charge will increase as the number of units increase. This creates an economic incentive for developers to build larger and more expensive units, therefore making housing less affordable. To encourage the development of smaller homes, charging DCCs on a floorspace basis when issuing a building permit for a single-family, duplex and triplex construction should be considered.

The UDI study assumes a link between the size of the unit and the number of occupants. And by implication, a strong connection between unit size and overall service demand is also assumed. The study concludes that the prevailing practice of charges based on lots or dwelling units should be continued, but where feasible, DCCs on an area basis should be considered.

It is unclear whether the size of a dwelling unit is indeed directly proportional to the number of occupants, thereby affecting overall service demand. In particular with larger sized homes, these dwellings may simply be reflecting lifestyle preferences, and the demand on services may not necessarily increase in proportion to the size of the dwelling unit. DCCs must be based on direct or indirect provision of services, not on the ability to pay. While further research is required to determine how housing affordability is impacted by DCCs levied on an area basis, a contributing factor to the municipality's preference for a development unit based DCC is how the *Local Government Act* stipulates the collection of charges.

As most single family lots are created by subdivision (with the exception of areas experiencing redevelopment), single family DCCs are typically payable upon subdivision approval. At this point, the areas of the buildings are often unknown, so the number of lots is an easy way of assessing the total charge payable. Collection of DCCs at the building permit stage facilitates charges levied according to floorspace.

Recommended best practice

In consideration of the above criteria as well as the previous section on "Categories of Land Use to be Charged," the following are the recommended best practices related to the appropriate units for DCCs:

- to facilitate charges imposed on a density gradient, residential DCCs should be established on a development unit basis, although consideration should be given to charging on a floorspace basis if DCCs are charged at the building permit stage;
- for commercial and institutional land uses, DCCs should be established on a floorspace basis; and,
- for industrial land use, DCCs should be established on a gross site area basis.

RECOMMENDED BEST PRACTICE

To facilitate charges based on a density gradient, residential DCCs should be imposed on a development unit basis, unless DCCs are charged at building permit, where floorspace should be considered an option. For commercial and institutional DCCs, floorspace should be used as the representative unit, while for industrial land use DCCs should be established on a gross site area basis.

Project Eligibility

As mentioned in Chapter 1, section 933 (2) of the *Local Government Act* contains the provision that allows local government to use DCCs to assist in the payment of capital costs associated with:

- providing;
- constructing;
- altering; or,
- expanding sewage, water, drainage, and highway facilities.

The same section also allows for DCCs to assist in providing and improving parkland.

In all cases, the projects must directly or indirectly service new development. Infrastructure and park projects can be financed by various means such as:

- DCCs;
- general revenues;
- government grants;
- long-term debt through a borrowing bylaw;
- utility reserves;
- developer funded under a Servicing Agreement;
- Local Area Service Bylaw; or,
- Latecomer Agreements, as specified in section 939 of the *Local Government Act*.

These options are described in more depth in the *Development Finance Choices Guide*. These options are briefly mentioned here only as they relate to DCCs. Relevant points include:

- Local Improvement Projects are generally not included in a DCC program;
- projects constructed under a Latecomers Agreement are not DCC eligible, nor are DCC funded projects eligible for Latecomer Agreements;
- works constructed along the immediate frontage of land being developed to a "Local" standard are normally constructed (and paid for) by the developer of the land (section 938 of the *Local Government Act*); but any oversizing beyond the "Local" standard (i.e., the incremental capacity between local and trunk needs) can be included in a DCC program; and,
- projects which are related to the ongoing maintenance of existing infrastructure (such as a maintenance rehabilitation program, watermain flushing, street repairs, storm sewer cleaning, or replacement due to age) should not be included.

DCC programs generally consist of off-site, trunk or major services and utilities servicing neighbourhood or community-wide needs. As stated previously, DCC programs are based on master servicing plans for respective utilities, and DCC projects make up only part of the Financial Plan.

With the exceptions of parkland improvements and the exclusion of off street parking, the *Local Government Act* does not provide any further guidance as to the type of works that can be included in a DCC program. Therefore, some specific considerations for each particular utility are outlined in the following sections.

ROAD PROJECTS

With respect to road projects, only off-street parking facilities are specifically excluded from a road DCC program. However, in keeping with the intent of the charges, a road DCC program typically consists of transportation network elements such as Arterial and Major Collector Roads. Local and Minor Collector Roads are generally not included, as these roads are often constructed by frontage developments as a requirement of subdivision approval. The road DCC program is an outcome of master transportation planning, and "highway facilities" have been interpreted, in practice, to include projects such as:

- master transportation planning work;
- roads;
- sidewalks and pedestrian facilities;
- traffic signals and controls;
- boulevards and boulevard landscaping;
- noise attenuation structures;
- medians;
- curb and gutter;
- street lighting;
- underground wiring;
- drainage facilities within roadways;
- pedestrian and highway bridges;
- intersection channelization;
- transit provisions such as bus pull-ins; and,
- bicycle/pedestrian infrastructure.

A large road project may be broken down into sub-projects or phases to be carried out at different times or under different accounts. For example:

- design;
- road right-of-way acquisition;
- interim standard road;
- final widening; and,
- top lift pavement course.

In the case where a Major Collector Road provides the primary frontage for, and access to, a land development project, only the "oversizing" component of the road should be included in the DCC program, that is, the difference between the "Local" and "Collector" street standard. The developer is required to bear the cost of the "Local" road equivalent.

STORM DRAINAGE PROJECTS

Regarding a storm drainage DCC program, "drainage facilities" have been interpreted, in practice, to include projects such as:

- preparation of master stormwater management plans;
- drainage rights-of-way and easement acquisition;
- large diameter storm sewer;
- major culvert crossings;
- overland flow routing systems;
- community retention/detention facilities;
- watercourse erosion protection works;
- lowland drainage improvements (including dyking); and,
- pumping stations.

An oversizing component can also be included in a storm drainage DCC program as an alternative to a Latecomer Agreement. For example, if a trunk sewer required to serve new development runs along a street, and this sewer also provides service to a land development project along the frontage, the incremental cost between the local and trunk requirements known as "oversizing" may be included in a DCC program. Meanwhile, the local sewer requirement is borne by the developer of the land.

SANITARY PROJECTS

For a sanitary DCC program, "sewage facilities" have been interpreted, in practice, to include projects such as:

- master sewerage planning;
- sanitary rights-of-way and easement acquisition;
- trunk sanitary sewer;
- relief sewers;
- facility oversizing;
- sewage lift stations; and,
- sewage treatment facilities.

Facility "oversizing" means the incremental cost between local and trunk requirements. For example, if a trunk sewer required to serve new development runs along a street, and this sewer also provides service to a land development project along the frontage, the developer is responsible for the local need. Only the oversizing component should be included in the sanitary DCC program.

Wastewater treatment facilities may also be included, if not the separate mandate of a regional district or greater board. Where the jurisdiction for wastewater treatment lies outside the municipality, separate DCCs can be imposed by that jurisdiction. In that case, the municipality will be governed by the regional DCC bylaw and shall simply collect and remit the funds to the regional district or greater board.

WATER PROJECTS

With regard to "water facilities," the legislation has been commonly interpreted to mean that a water DCC program may consist of water supply and distribution projects including:

- water distribution modeling;
- water rights-of-way and easement acquisition;
- trunk or grid watermains;
- facility oversizing;
- booster pump stations;
- reservoirs;
- water treatment facilities; and,
- pressure reducing valve (PRV) stations.

Similar to storm drainage and sanitary sewer, facility oversizing is the difference between the local and trunk requirements. Where a large diameter grid watermain fronts a land development project, and the same watermain also provides local service, the oversizing component may be included in a water DCC program. It is assumed that the cost of providing the local servicing need is paid by the developer of the land.

Similar to wastewater treatment, water treatment facilities may also be included, if such services are the responsibility of the municipality. Where separate DCCs are imposed by another jurisdiction, the municipality will simply collect and remit the funds to that body, such as a regional district or greater board.

PARKLAND ACQUISITION AND IMPROVEMENT PROJECTS

While section 933 (2) (b) of the *Local Government Act* generally mentions "providing" and "improving" parkland, sections 935 (3) (b) and 936 provide some clarification to the conditions that make parkland acquisition and improvements eligible for a parkland DCC program.

Regarding parkland acquisition, the land must have:

- a location and character acceptable to local government; and,
- a market value that is at least equal to the amount of the charge (section 936 (2)).

Regarding parkland improvements, works are limited to:

- fencing;
- landscaping;
- drainage and irrigation;
- trails;
- restrooms;
- changing rooms;
- playground equipment; and,
- playing field equipment (section 935 (3) (b) (ii)).

In practice, a parkland acquisition and improvement program is required, before parkland DCCs can be calculated. Not unlike the DCC programs for roads, drainage, sewer, and water, a strong relationship exists between the DCC bylaw and other municipal documents such as the OCP.

Given this setting, guidance for compiling a parkland acquisition and improvement program can come from the OCP, the Parks Master Plan, and/or other provisions found in the *Local Government Act*. The OCP often broadly specifies park, recreation, and open space objectives. Sometimes, even certain park sites might be described. Acceptable standards for active park and passive open space are usually defined in a Parks Master Plan.

In the same manner that storm drainage, sewer, and water can be constructed under Latecomer Agreements, there are means of funding parkland and open space acquisition other than through the use of DCC funds. Though not intended to be a comprehensive discussion, each are briefly described below to help clarify how a park acquisition program could be created for DCC purposes.

Section 941 of the *Local Government Act* provides the authority for local government to require land being subdivided to dedicate up to 5% of the parcel for parkland, or gives the owner the option to make an equivalent cash-in-lieu payment. This provision is applicable to any subdivision which creates three or more additional lots. Thus, parkland acquired in this manner must be taken into account when evaluating parkland requirements. Although not mandated by the legislation, some local governments waive the dedication requirement, or a "credit" is given towards parkland DCCs in the case that a program exists for parkland acquisition.

Section 919.1 of the *Local Government Act* gives local government the authority in an OCP to designate areas within a Development Permit Area (DPA) for the protection of the natural environment and from hazardous conditions. This provision is generally used to preserve natural habitat and environmentally sensitive areas or to protect development from hazardous areas such as unstable slopes and flooding. Note that through the use of development permits, open space is protected from development and thus preserved, although not necessarily dedicated as municipal parkland. This method of parkland "acquisition" is most appropriate for unusable or undevelopable open space, rather than for active parkland space. Therefore, this type of land should not be included in a DCC program, as it could be obtained through DPAs or some other mechanism.

When compiling a parkland acquisition DCC program, DCCs should not be used to make up past deficiencies in parkland. For example, DCC funds should not be used to acquire parkland in an older area of the municipality which is not experiencing new development.
In the case where a parkland deficiency exists, parkland acquisition funding must come from general revenue or means other than DCCs.

DCC monies may be used to acquire parkland in older areas experiencing redevelopment, such as the conversion of single family dwellings to multi-family developments. A local government can buy back municipally owned properties as parkland, if these lands would have otherwise been sold for development. DCC funds may also be applied to parkland that provides municipality-wide benefit derived as a result of new development experienced throughout the municipality.

Parkland DCCs are discussed further in Part II of the guide.

Recoverable DCC Costs

Further to the types of projects that are eligible for DCC programs, the recoverable DCC costs for those projects must also be considered. There is a strong correlation between the capital projects in the DCC programs and the Financial Plan. Therefore, cost estimates should be consistent with these plans.

According to the *Local Government Act*, section 935(4), the recoverable capital costs associated with DCC projects include planning, engineering, and legal. In practice, this section has been interpreted by the Ministry to include any or all of the following scope of capitalized activities:

- planning;
- public consultation;
- engineering design;
- right-of-way or parkland acquisition;
- legal costs;
- interim financing;
- contract administration;
- construction; and,
- contingencies.

RECOMMENDED BEST PRACTICE

DCC recoverable costs should be clearly identified in the DCC documentation and must be consistent with Ministry provisions.

Interim financing is the short-term debt financed by the local government prior to the receipt of contributions from other sources, such as government grants, and this financing cost is recoverable through DCCs.

Large DCC projects involving more than one utility or service, multi-year funding, and/or various funding sources can be broken down into separate phases to simplify DCC administration and accounting. Projects may be entirely or partly funded through DCCs, however in a revolving DCC program, costs should be included only for the phase(s) which are proposed in that time period.

As a matter of Ministry policy, inflation and long-term debt financing are not considered eligible for DCC recovery. However, section 935 (3) (c) of the *Local Government Act* does allow funds in DCC reserve accounts to be used to pay for the interest and principal on a debt resulting from DCC project costs.

Interest for DCCs in Exceptional Cases

Local Government Act – s. 932 (March 2004)

In 2004, a legislative amendment changed the definition of eligible "capital costs" in Section 932 of the *Local Government Act,* to include interest costs that are approved by the Inspector of Municipalities and directly relate to eligible DCC costs.

The Inspector of Municipalities will consider allowing interest costs in exceptional circumstances only. Each of the three circumstances identified below necessitates the construction of specific infrastructure projects in advance of sufficient DCC cash flows in order to trigger investment in development.

- Fixed-capacity infrastructure, such as water treatment and/or sewage treatment plants. These facilities may need to be constructed before growth can occur, and before adequate development cost charges can be collected.
- Out-of-sequence projects, such as upgrading the main sewer or water trunk lines, where construction is brought forward from the timing set out in the DCC program.
- Greenfield, which is usually providing infrastructure to areas that have no services, so growth can occur.

In these exceptional circumstances, local governments or developers will need to front-end the cost of the specific growth-related projects, and recover their costs through DCCs as growth occurs.

The mechanism for the local government to forward collected DCCs to the front-ending developer is a "DCC Front-Ender Agreement." This agreement is a legal contract between the local government and the developer. It states that the local government will pass on all DCCs related to the specific works to the developer that front-ends the cost of those works. The allowable interest provision allows the local government to add an interest component to the DCC rates payable by the other developers. By including interest in the DCC calculations for the specific works, some of the debt servicing costs incurred by the front-ending developer are spread over all benefiting growth.

CONDITIONS WHICH APPLY

To include interest charges in exceptional circumstances the following is required:

- a council/board resolution to include allowable interest;
- amendment of the DCC bylaw to include the specific interest charges;
- confirmation that the interest rate applied to the DCCs does not exceed the MFA debenture rate (regardless of the amount of interest that developers pay on the front-ending);

- if borrowing is undertaken, the DCC should reflect the actual borrowing rate (not a projected rate) if this is less than the MFA rate;
- confirmation that the amortization period for the interest costs does not exceed the DCC program time frame (i.e., the period of time over which the DCCs for the specific projects are to be collected); and,
- approval of the bylaw amendment after third reading by the Inspector of Municipalities.

It should be clear to the public and to developers when interest charges are included in the calculation of a DCC. This interest should be disclosed in the DCC report required by section 934 of the *Local Government Act* and reflected in the local government's Financial Plan, long-term capital plans and the annual financial statements.

If a local government does include an interest component in the DCC calculation then it should be applied to all DCCs levied for that project. If development proceeds faster than planned and the borrowing is paid out early in relation to a project, the DCC should continue to include the interest element so as to ensure that all development, past and future, is charged on an equitable basis.

In order to review and approve the amended bylaw that includes interest costs, the Inspector of Municipalities will require the following information:

- a clear indication that the DCC reserve fund for the works in question is in a negative cash flow position and that borrowing is required;
- demonstration that this is an exceptional circumstance;
- details of the interest rate and amortization period; and,
- evidence that the amendment has been disclosed to the public in the government's Financial Plan, financial statements and DCC report.

A local government's DCC program should be established in a way that limits the need for borrowing to exceptional cases, where the application of interest may be contemplated. The ability to add interest in certain cases should not be the deciding factor in a local government's decision to agree to front-end out-of-sequence and greenfield infrastructure costs. A reliance on front-ending exposes the local government to financial risk. The application of interest mitigates this risk, but does not eliminate it altogether.

Local governments should consider creating DCC sectors and sector-specific DCC reserves to isolate projects to which interest has been applied. The use of such sectors and associated reserves will increase the overall transparency of the approach, and will promote equity among developers who benefit from, and contribute to, the specific works.

RECOMMENDED BEST PRACTICE

The allowable interest provision should be contemplated in exceptional cases only. The provision is not intended to be applied to the local government's entire DCC program.

The *Development Finance Choices Guide* (Chapter 4) discusses the full range of influencing factors when local governments consider whether or not to front-end DCC funded infrastructure works.

Assist Factor

Section 933 (2) of the *Local Government Act* states that the purpose of DCCs is to provide funds to "assist" the local government to pay the costs of municipal parks and infrastructure. By not allowing 100% of the development related costs to be charged to new development, the legislation implicitly requires an "assist factor." As a matter of Ministry policy, a requirement exists for local government to provide a level of financial assistance. The municipal assist factor is separate from any allocation of costs made between new development and existing users. No guidance is provided by the Ministry as to the magnitude of the assist factor; some local governments have set it as low as one percent (i.e., 99% of the development related capital costs are borne through DCCs), while others have set it as high as 50%. This factor reflects Council's desire to encourage development and is largely a political decision, which is further discussed in the *Development Cost Charges Guide for Elected Officials*.

RECOMMENDED BEST PRACTICE

The municipal assist factor should be a reflection of the community's support towards the financing of infrastructure required to serve development.

The municipal assist factor may be amended from time to time to ensure that the DCC program does not deter development, however each adjustment will require a bylaw amendment and approval from the Inspector of Municipalities.

Although council has the flexibility to use the municipal assist factor as a political instrument, Ministry policy does limit how the assist factor is to be applied in two ways. The factor can only be varied between different categories of infrastructure. For example, an assist factor of 10% could be applied to roads, while 5% could be applied to sanitary sewer. In addition, the factor must be consistent within that category of infrastructure or specified service area. As an illustration of this point, road DCCs for all land uses must have the same assist factor; for example, a municipality could not offer 10% assistance for single family lots and 25% assistance to commercial developments (nor 10% to Area A and 25% to Area B). These limitations have been placed on the assist factor, as it was not designed as a tool to encourage or discourage any category of development over another.

CRITERIA FOR DECISION-MAKING

While council is ultimately responsible for setting the municipal assist factor, the following points are suggested for consideration:

- Varying municipal assist factors between different types of infrastructure may complicate tracking and ensuring the municipal contribution at the accounting level.
- Although excessive DCCs are obviously of concern (section 934 (4) (d)), DCCs should be calculated using the best technical information possible. If as a consequence of this process, the resulting charges are deemed to be too high, the assist factor can then be applied by council to reduce the rates to a level that is politically acceptable.
- A high assist factor could be used to encourage housing affordability.
- The total municipal contribution to projects is the sum of the component not attributed to new development (amount representing benefit to existing users), the portion of costs associated with types of development which are exempt from DCCs, and the assist factor. Therefore, a high assist factor has direct impact on municipal finances, and the contribution must be made up by the existing tax base through general revenue as long-term debt, utility rates, etc.
- The municipality cannot afford its share of the costs, development may be delayed. If this scenario is anticipated over the long term, it should be used to inform a future review of the OCP.

CHAPTER 3 – Bylaw Administration

Once the Inspector of Municipalities has granted the DCC bylaw statutory approval and a council or regional district board has adopted the bylaw, ongoing administration will be required. This chapter describes a number of policy considerations associated with the continued use and maintenance of the DCC bylaw, namely the collection of charges (upon subdivision approval or building permit issuance), monitoring and accounting, grace periods and in-stream applications, credits and rebates, and the process for bylaw amendment.

Collection of Charges

Section 933 (5) of the *Local Government Act* states that DCCs are payable at the time of approval of subdivision or at the issuance of a building permit, as the case may be. In practice, DCCs are commonly collected:

- at the subdivision approval stage, or at the building permit stage for single family DCCs;
- upon issuance of a building permit for multi-family, commercial and institutional DCCs; and,
- at subdivision approval or building permit issuance for industrial DCCs.

Further, section 933(6) allows the Minister to authorize (by regulation) the payment of DCCs in instalments and prescribe conditions under which instalments may be paid. BC Regulation 166/84, Development Cost Charge (Instalments) Regulation outlines specific details of the timing of DCC payments by a developer based on three equal instalments (see Appendix B).

COLLECTION AT SUBDIVISION APPROVAL

As the required trunk services must be constructed before buildings are connected, local government would prefer to impose all DCCs at the time of subdivision approval. Payment at this time allows funds to accumulate earlier in the development process and supports the notion that local government should not have to front end the costs of installing infrastructure needed to service new development.

Levying DCCs at this point coincides with when funds are needed to install the required services, although in fact, a "flow through" of funds serves to offset this need somewhat.

In addition, the advantage of in-stream protection is provided to those paying DCCs at subdivision approval. When a DCC bylaw is adopted, section 943 of the *Local Government Act* offers a twelve month protection period for in-stream applications from the effects of the new bylaw. This provision is described later in this chapter.

Subdivision approval is typically a convenient stage for a municipality to collect the charges for single family development (and duplex).

Further, it is a logical time, if the lots are predominantly created by subdivision (e.g., greenfield developments). Frequently at this point in the development process, only the total area of the subdivision and the number of lots created are known. Most likely, the building areas of the units have not yet been finalized. Therefore, if single family DCCs are levied on a per lot or per lot area basis, the total DCCs can easily be levied at subdivision approval. If single family DCCs are levied according to floorspace, the total DCCs payable would be difficult to determine at subdivision, as the information would not be readily available.

Local governments now have the authority to charge DCCs at the building permit stage for projects with under four units. The following section on collection at building permit issuance discusses the benefits of charging DCCs at building permit stage for single family, duplex and triplex developments.

Despite the municipality's preference, collecting DCCs at the subdivision approval stage may not be possible for other land uses. Multi-family subdivisions do occur, but the actual yield of dwelling units may vary greatly, depending on zoning regulations. Thus, it may be impractical to assess multi-family DCCs at subdivision approval, regardless of whether the charges are based on dwelling units or building area.

Commercial and industrial subdivisions can also occur, and non-residential DCCs are commonly charged on an area basis. If these charges are based on gross site area, the total DCCs could be calculated at subdivision approval. If the charges are based on building area, it may be impractical to collect DCCs upon subdivision approval, as once again, the building area may not be known. Institutional subdivisions are very rare, and DCCs are unlikely to be charged at the subdivision point of the development process.

It is noted that non-residential developers often do not completely develop their sites all at once. Therefore, it may be unfair to require DCCs for the entire site to be paid at subdivision, when the first stage of site development is constructed. On the other hand, the required services may be installed several years before any building proceeds. Despite the flow through of funds, the municipality may be effectively front ending the capital improvements, if the charges are collected at building permit stage.

COLLECTION AT BUILDING PERMIT ISSUANCE

The development industry strongly supports deferral of all DCC payments to at least the building permit stage. The development industry believes that building permit issuance is a logical time for DCCs to be paid, as other fees are paid at this stage as well.

With the ability of local governments to charge DCCs at the time of building permit issuance for permits associated with construction of less than four dwelling units, payments of DCCs can be deferred from subdivision approval to building permit stage. This provides an opportunity to levy single family (duplex and triplex) DCCs at the issuance of a building permit.

RECOMMENDED BEST PRACTICE

DCCs for multi-family and non-residential land uses should be collected at the time of building permit issuance.

RECOMMENDED BEST PRACTICE

DCCs for single family developments should be collected at the time of subdivision approval, unless a local government chooses to charge projects with less than four units, and then consideration should be given to charging on the basis of floorspace at the building permit stage.

For non-residential land uses, the "less than four" exemption does not apply (section 933 (4) (b) (ii)). DCCs should be collected upon issuance of building permit, since the representative unit upon which DCCs are frequently levied (i.e., floorspace) allows the total charges to be easily calculated at this point in the development process.

Monitoring and Accounting

Section 937 (5) of the *Local Government Act* states that the Inspector of Municipalities may require local governments to provide a report on the status of DCC collections, expenditures, and proposed expenditures. Further, a transfer of funds from a DCC reserve fund to a capital works reserve fund may be ordered (section 937 (6)). In fact, the Inspector of Municipalities has the power to revoke statutory approval of the DCC bylaw, if things are not found to be in order.

Section 935 (1) of the Act stipulates that DCCs shall be deposited in a separate special DCC reserve fund established for each purpose, for which a local government imposes a charge. The monies collected (together with reserve fund interest) shall then be used to pay for the capital projects within a DCC program, with one minor exception. Section 936 (6) implies that the interest earned on parkland DCCs may be used for parkland improvements, not directly or indirectly related to new development.

In practice, ongoing administration of the DCC bylaw should be guided by the principles of transparency in the process and integrated implementation. Monitoring of DCC funds and accountability as to their use are largely achieved through good accounting and monitoring practices that are clear and understandable.

RECOMMENDED BEST PRACTICE

A DCC monitoring and accounting system should be set up such that tracking of projects and the financial status of DCC accounts can easily be facilitated.

DCC accounts should be set up in a manner that assists in tracking of projects, capital expenditures, sources of funding, and status of completion. Identification numbers given to each capital project in the DCC program may help facilitate ongoing administration of the bylaw. Tools such as spreadsheets are also helpful. The DCC accounting system should be able to report:

- how much money has been collected from DCCs;
- the amount of government grants received towards DCC projects;
- amounts designated as DCC "credits" or "rebates"; and,
- the amount of funds representing the local government share of project costs in the DCC program.

Thus, a good DCC accounting system will indicate whether sufficient DCC funds are being collected to complete the DCC program in accordance with development projections (and indeed to determine if the OCP is being achieved). Early indication of inadequate/ excess DCC funds will allow local governments to respond with adjustments to their servicing plans.

Thus, tracking and monitoring of DCCs should be facilitated by management and financial reports generated by the accounting system. These reports will be used as fundamental inputs to the bylaw amendment process (discussed further in this chapter) involving:

- identification of completed projects;
- addition of new projects;
- interest earned;
- variation between revised projections and earlier forecasts;
- reconciliation of figures; and,
- revision of project costs.

Use of Reserve Funds

Community Charter – s. 189 (Sept 2004)

Another 2004 legislative amendment authorizes local governments to lend available money in one DCC reserve fund to another DCC reserve fund on a temporary basis. This allows an alternative to external borrowing in circumstances where a reserve fund balance is not sufficient to finance a particular capital project but where there is sufficient money available in another reserve fund to finance the project.

DCC reserve funds are accounted for on a significantly different basis than are other reserve funds. Therefore, local governments need to ensure that the source of inter-fund borrowing for a DCC reserve fund is another DCC reserve fund and that DCC reserve funds are not used as a source of temporary financing for non-DCC reserves. Local governments also need to be cognizant of the temporary nature of these inter-fund transfers and the legislative requirement to ensure that the money, and appropriate interest, is returned to the original reserve fund before it is needed in that fund.

Grace Periods and In-stream Applications

When a municipality implements or amends a DCC bylaw, developers or those parties paying DCCs will be affected by the new charges. For a developer, project funding is usually arranged early in the development process (even before rezoning, if required). Therefore, stability of DCC rates and how projects in progress are affected have a great impact on the viability of land development. A valid subdivision or building permit application would pay the DCC rates applicable at the time of application.

Grace periods and in-stream applications are important policy issues which should be considered when administering a DCC bylaw. Since DCCs may be imposed upon approval of a subdivision or upon authorization of a building permit, guidelines should be established with respect to how grace periods and in-stream applications will be handled in each situation.

GRACE PERIODS

A grace period is a length of time offered as notification that new DCCs will be in effect. For example, the DCC bylaw may state that the effective date will be a time period (e.g. up to a year) from the date of DCC bylaw adoption. The grace period is granted by a municipality as an acknowledgement of the impact DCCs may have on the development industry.

RECOMMENDED BEST PRACTICE

A suitable period of notification before a new DCC bylaw is in effect, known as a grace period, should be considered when establishing DCC rates.

SUBDIVISION APPLICATIONS

Section 943 of the *Local Government Act* provides in-stream protection of one year from the proposed DCC rates for subdivision applications, provided that the application is complete and that subdivision application fees have been paid. In other words, given a scenario where the proposed DCCs have increased from the existing charges, an in-stream and active subdivision application will be exempted from the increased DCCs for one year from the date of adoption of the new bylaw. Although different local governments may have different requirements regarding what constitutes a complete application, one feature required to be eligible for the one year statutory exemption is that the application must be accepted for processing by the municipality's Approving Officer. If the developer has received a Letter of Conditional Approval of subdivision (or equivalent, such as "Preliminary Layout Approval"), section 943 also applies.

The proposed DCCs will apply to subdivisions under the following conditions:

- where an application has been denied;
- where Conditional Approval has lapsed during the one year exemption period; or,
- where final approval of subdivision has not been received prior to the anniversary date of the new bylaw.

It is noted that developers of multi-phased subdivisions should be especially aware of significant dates such as the date of DCC bylaw adoption, the bylaw's anniversary date, and the expiry date attached to the Letter of Conditional Approval.

BUILDING PERMIT APPLICATIONS

There are no *Local Government Act* provisions governing building permit applications similar to the in-stream protection offered to subdivision applications. Unless specified differently in a municipality's Building Permit Bylaw, the amount payable is determined in accordance with the rates applicable at the time of building permit application. Again, it is important for the applicant to note what constitutes a valid application, which may vary with different local governments.

As a result of recent legal case history, the in-stream protection policy for building permits is being reviewed by many local governments. Firstly, the courts have concluded that the date which the appropriate

DCCs should be calculated is the date that sufficient information is available to issue the permit and not necessarily the actual date of building permit issuance.[1] Secondly, there is legal precedent which indicates that exemption from the bylaw on an arbitrary basis (such as an in-stream application) is discriminatory to other developers who do not meet that criterion.[2]

Historically, some local governments have chosen to offer in-stream protection for building permits from increased DCC rates resulting from a new DCC bylaw or bylaw amendment. However, the ruling of Acamar v. City of Surrey (1997) confirms the view that section 943 only applies to subdivision applications.[3]

The grace period should not be confused with in-stream protection. The former only serves to allow enough time for people to be notified of the new DCC rates; as it relates to building permit applications, the latter seeks to provide preferential treatment to developers meeting a certain time criteria.

Credits and Rebates

There are no specific references to "DCC credits" or "DCC rebates" in the *Local Government Act*. However, the intent of Section 933 and specifically clause (8) is that developers providing trunk services beyond the development shall have those costs deducted from the applicable DCCs payable. To implement the provisions of the legislation, the concepts of a "DCC credit" and a "DCC rebate" are introduced. Policies regarding when a municipality should offer a credit versus a rebate should be carefully considered. In either case, the DCC accounting system should allow credits and rebates to be monitored and tracked.

RECOMMENDED BEST PRACTICE

A municipality should carefully consider the situations where a DCC credit or rebate will be given.

DCC CREDITS

As discussed in the previous chapter on bylaw development, DCC programs are established in support of broader community plans. New development projections should be made in relation to OCP objectives. The DCC program should be compiled to service the new development in an orderly manner, and the capital projects

[1] Coho Creek Estates Ltd. V. District of Maple Ridge, (Supreme Court of B.C., Vancouver Registry No. C9018001)

[2] 356226 British Columbia v. City of Vancouver, (Supreme Court of B.C., Vancouver Registry No. C920828.

[3] Acamar Stoney Creek Development Inc. v. Surrey (City), (Supreme Court of B.C., Vancouver Registry No. A950192)

should be a subset of the Financial Plan. Underlying the DCC calculations are various assumptions regarding the cost and timing of capital projects.

Despite the above, a situation may arise where a developer desires to proceed with a greenfield land development before the required trunk services are installed in that area. This type of development can be considered to be "out of sequence." An out of sequence development should be carefully weighed in light of growth management objectives in the OCP. If the development is contrary to the objectives in the OCP, or if the municipality cannot afford the financial burden of additional infrastructure requirements, the Approving Officer of the municipality may seriously consider declining that development for the present time. If it is deemed that the out of sequence development should proceed, some flexibility may be available to accommodate the capital costs, depending on whether the charges have been implemented on a municipal-wide or area-specific basis. Another means of facilitating the development would be to require the developer to construct the necessary trunk services. The burden imposed on the developer by front ending the capital costs of these services, is essentially the consequence of "advancing history."

In this case, the out of sequence development would be offered a DCC credit. In other words, the costs of constructing the required trunk works and services in advance of the proposed timing, would be deducted from what otherwise would have been the applicable respective DCCs payable, but the DCC credit could not exceed the applicable DCC payable. For example, if the developer constructed a section of trunk sewer, the associated costs would be deducted from his sanitary DCCs, to the maximum DCC amount payable.

DCC REBATES

In the previous chapter on project eligibility, it was noted that facility oversizing was eligible for DCC cost recovery. In other words, the component of the capital costs between local and trunk requirements can be included in the DCC program. It is expected that developers would be responsible for the costs of providing the services to a local standard.

In the case where a developer wishes to proceed with a development before the trunk services fronting his property are installed in that area, a municipality might allow the developer to construct the required works to a trunk standard. Then, the municipality would offer a DCC rebate for the incremental portion of costs beyond the local requirement. Thus, the *Local Government Act* provisions prohibiting double charging are honoured.

Process for Bylaw Amendment

The average cost of a typical unit of development should not change significantly over time except for the effects of inflation or changes in standards, if development projections are accurate. However, due to the periodic revision of the OCP, the municipality's financial situation, changing infrastructure needs, and a host of other factors affecting new development which are beyond local government control, the DCC bylaw will require amendment from time to time.

The process for bylaw amendment is essentially the same as initial bylaw development (as discussed in previous chapters). Amendments to a DCC bylaw are also governed by the procedures outlined in section 937 of the *Local Government Act,* including the requirement for approval from the Inspector of Municipalities.
In general, there are two levels of amendment - a minor adjustment to DCC rates to reflect inflation and a major DCC review.

MINOR DCC AMENDMENT

A minor amendment to the DCC bylaw is basically an adjustment to the charges to reflect current construction costs, fluctuations in land values, and the status of government grants. It is suggested that this type of amendment could be made annually following the annual review of the Financial Plan.

RECOMMENDED BEST PRACTICE

Minor amendments to the DCC bylaws should be made annually to reflect changes in construction costs, land values, and the status of government grants.

The following process has been used for minor update of DCCs to reflect inflation:

- prepare average unit rates from all the lowest bid construction tenders received during a calendar year;
- prepare year to year land price adjustments for parkland and road widening strips;
- apply these rates to a standardized generic construction project (e.g. an arterial road widening project);
- compare overall total costs between one year and the next to determine cost changes;
- apply appropriate cost change factors to the capital cost within the DCC calculation and recalculate the DCCs; and,
- submit revised bylaw to the Inspector of Municipalities for a minor bylaw amendment review.

Any proposed inflation adjustment methodologies must be pre-approved by the Ministry. The process outlined on the previous page would be deemed reasonable by the Ministry. Please note that the Consumer Price Index cannot be justified for use as an inflation adjustment factor. It is suggested that changes in construction costs could be reflected using a construction index such as the Composite Southam Construction Cost Index, the Engineering News Record Cost Indexes, or Statistics Canada Quarterly, Construction Price Statistics. This type of bylaw amendment would still require statutory approval. However, due to the nature of the adjustment, it is anticipated that approval of the bylaw amendment would be expedited.

MAJOR DCC AMENDMENT

A major bylaw amendment involves a full review of the DCC methodology including:

- underlying DCC assumptions;
- broad policy considerations;
- development projections;
- DCC program costs;
- timing of proposed capital projects;
- addition of new projects to the DCC program, where necessary; and,
- deletion from the DCC program of those capital projects that have been completed or are no longer required.

It is anticipated that a major DCC bylaw amendment is not required more often than once every five years, unless conditions which form the basis for the bylaw change. As DCCs are strongly linked to the OCP, a suitable opportunity for a full review of DCCs would be immediately following an OCP review. In fact, there is merit in building into a municipality's strategic planning process a framework for sequential review of the OCP, the capital planning process, and the DCC bylaw. Two events which may trigger the need for a major review are:

- when a major change in DCC assumptions has occurred; and,
- when DCC revenues/expenditures deviate from projections by a certain established percentage.

RECOMMENDED BEST PRACTICE

Major amendments to the DCC bylaws should be completed at least once every five years and involve a full review of DCC issues and methodology.

In a municipality where an ongoing public process has been established for addressing DCC issues, such as a DCC Advisory Forum, this group would provide valuable assistance in completing a comprehensive review.

DCCs are generally determined by dividing the net cost of capital expenditures attributable to new development over a certain time period, by the corresponding number of projected development units or area that will be developed in that same time period. Therefore, one of the key calculations in establishing DCCs is the estimation of new development. This chapter describes prerequisite policy decisions required and the information needed prior to the projection of new development units. Procedures are presented for estimation of residential and non-residential development. Where possible, alternative methods of calculation are presented, and a recommended best practice is suggested.

Prerequisite Policy Decisions

The calculation of new development units will depend on how the policy issues described in Part I have been considered. Before calculations can proceed, the following questions must first be answered satisfactorily.

- How extensively will DCCs be applied, on a municipal-wide basis or area-specific basis?
- What time frame will be established for the DCC program (i.e., on a revolving or buildout basis)?
- What categories of development will be charged (e.g., residential, non-residential)?
- How detailed will land uses be broken down (e.g., the range of residential and/or non-residential land uses)?
- What units will be used to calculate DCCs (e.g., lots, dwelling, units, floorspace)?

Sources of Background Information

Sources of data and background documents which provide information to determine development projections include:

- Official Community Plans (OCP);
- Zoning Bylaws;
- BC Stats;
- BC Assessment Authority (BCAA);
- Census information;
- Local Health Area data;
- information contained in Tax Rolls;
- Building Permit statistical information;
- municipal development statistics; and,
- Economic Development Reports or Retail Market Studies.

The background documents can yield information on demographic assumptions, projected number of residential units according to a certain housing stock mix, projections for non-residential development in terms of area absorbed per year, and areas designated for specific types of land use.

New Development Projections

Having made the prerequisite policy decisions and located the available background information, new development projections can be made for residential and non-residential land uses.

As a minimum, residential should include single family and multi-family, while non-residential should include commercial, industrial, and institutional.

The following sections present various methods of calculation to project new development. The approaches could also be adopted for a more detailed breakdown of land uses than what is shown. For example, development categories could include duplex or mobile home pads for residential, service commercial or office commercial, light industrial/warehousing or heavy industrial/manufacturing, and schools for non-residential.

PROJECTED RESIDENTIAL DEVELOPMENT

In the examples described below, the calculations are based on the following policy decisions having been made:

- municipal-wide application of DCCs;
- a revolving ten year time frame; and,
- residential DCCs according to dwelling units.

It is noted that the calculations could be adjusted for an area-specific DCC, a buildout time frame, and/or residential DCCs according to floorspace.

Further, residential land uses are expressed as a density gradient in the following ranges, as opposed to building forms (see Chapter 2 for fuller discussion of this recommended best practice). The density gradient below differs from that suggested in Chapter 2:

- less than 15 D.U. (dwelling units) per hectare (instead of single family);
- 15 up to 44 D.U. per hectare (instead of townhouse);
- 44 up to 74 D.U. per hectare (instead of low rise apartment); and,
- 74 or greater D.U. per hectare (instead of high rise apartment).

Of course, each municipality would determine the number of, and limits between, density categories appropriate to their community, and the above ranges are shown only to provide some basis for the following examples.

Two approaches to residential development projections are presented: the first involves modification of the population projection, while the latter does not directly consider population figures.

Modified population growth method

Where population is considered a proxy for the need for infrastructure improvements, this method seeks to determine how much population growth is a result of new development units, as provided by the OCP.

It is noted that "new development" is often incorrectly referred to as "growth." However, growth in population may not always result in additional residential units, and there are subtle distinctions between the two terms. Growth can occur in existing development due to:

- replacement housing (represented by building permits for less than four dwelling units and/or less than $50,000 in value) unless otherwise varied by local government bylaw or provincial regulation;
- occupancy of unaccounted "in-law" suites; and,
- occupancy of illegal secondary suites.

It has been argued that natural increase (i.e., births minus deaths) does not result in new developments either, but presumably the rate of natural increase is the same in existing dwellings as new housing units.

The portion of population increase that may not translate into new residential development could possibly be quite sizeable, depending on a municipality's circumstances. The significance of this factor could be determined by comparing building permit records and occupancy rates to population figures. Even if there is insufficient information to accurately determine the impact, this phenomenon should be acknowledged. Therefore, the "modified population growth" method for projecting residential development includes an allowance for the component of the total population growth that does not result in new development projections. This percentage is referred to, as "F" Example 4.1.

The following information is required from the background planning documents to project the amount of residential development units:

- the anticipated annual population growth rate;
- the housing stock composition; and,
- occupancy rates at different dwelling unit densities.

Based upon an anticipated annual growth rate, a population projection can be made for a specified time period (ten years, as shown in the example). The anticipated growth rate(s), is (are) commonly stated in the OCP. For the purposes of DCC calculations, a conservative projection of the population is desired. The impact of overestimating growth is that revenues will be overstated in comparison to the amounts actually received, and sufficient funds will not be realized to implement necessary projects. The challenge in making development projections in the case of a buildout program is how best to account for the fact that many areas do not develop to the full density permitted by the OCP or Zoning Bylaw.

Dwelling and household characteristics are often found in the OCP, Census data, or municipal development statistics. As occupancy rates may be sensitive to the actual neighbourhood, the use of local data should be employed in calculating DCCs. For illustrative purposes only, typical ranges of housing stock proportion are shown in Table 4.1, and typical ranges of occupancy rates are shown in Table 4.2.

TABLE 4.1 – Typical Ranges of Housing Stock Composition

Density Gradient	Proportion of Total Housing Stock
< 15 D.U./ha (similar to Single Family)	60% - 75%
15 up to 44 D.U./ha (similar to Townhouse)	10% - 30%
44 up to 74 D.U./ha (similar to Low Rise Apartment)	10% - 15%
74 and greater D.U/ha (similar to High Rise Apartment)	0% – 5%

TABLE 4.2 – Typical Ranges of Occupancy Rates

Density Gradient	Occupancy Rate
x < 15 D.U./ha (similar to Single Family)	3.2 – 3.5 persons per unit (ppdu)
15 < x < 44 D.U./ha (similar to Townhouse)	2.4 – 2.8 ppdu
44 < x < 74 D.U./ha (similar to Low Rise Apartment)	1.7 – 2.0 ppdu
74 < x D.U./ha (similar to High Rise Apartment)	1.4 – 1.7 ppdu

Thus the projected residential development units for four gross density ranges can be estimated as shown in Example 4.1 below.

EXAMPLE 4.1 – Projected Residential Development Units
Modified Population Growth Method

Year	Population
0	76,550
1	77,469
2	78,398
3	79,339
4	80,291
5	81,255
6	82,230
7	83,216
8	84,215
9	85,226
10	86,248
P=	9,698 persons

$P_{effective}$ = P x (1 - F)
= 9,698 x (1 - 0.05)
= 9,213 persons
U_{15} = 0.6U
U_{44} = 0.25U
U_{74} = 0.1U
U_{74+} = 0.05U

$P_{effective}$ = $(R_{15} \times U_{15}) + (R_{44} \times U_{44}) + (R_{74} \times U_{74}) + (R_{74+} \times U_{74+})$
= (3.2 x 0.6U) + (2.5 x 0.25U) + (1.7 x 0.1U) + (1.4 x 0.05U)
2.785U
9,213 = 2.785U
U = 3,308 units

Therefore:
# of units, $x < 15$ D.U/ha = 1,985
# of units, $15 < x < 44$ D.U./ha = 827
# of units, $44 < x < 74$ D.U./ha = 331
# of units, $74 < x$ D.U/ha = 165

GIVEN:

Ten Year Population Increase = P
% Growth Not Part of Development = F

Effective Population = $P_{effective}$
Total Residential Units = U
# of units, $x < 15$ D.U./ha = U_{15}
# of units, $15 < x < 44$ D.U./ha = U_{44}
# of units, $44 < x < 74$ D.U./ha = U_{74}
# of units, $74 < x$ D.U./ha = U_{74+}
Occupancy Rate for U_{15} = R_{15}
Occupancy Rate for U_{44} = R_{44}
Occupancy Rate for U_{74} = R_{74}
Occupancy Rate for U_{74+} = R_{74+}
Assumptions:
Time Period (yrs) = 10
Annual Growth Rate (%) = 1.2
Base Year Population = 76,550
F = 5%

Proportion of U_{15} = 60%
Proportion of U_{44} = 25%
Proportion of U_{74} = 10%
Proportion of U_{74+} = 5%

R_{15} (ppdu) = 3.2

R_{44} (ppdu) = 2.5

R_{74} (ppdu) = 1.7

R_{74+} (ppdu) = 1.4

Development Cost Charges According to Floor space

As stated in Part 1 of this guide, recent legislative amendments allow local governments to levy DCCs at the building permit phase of a development authorizing the construction, alteration or extension of fewer than four self-contained dwelling units. This change will allow residential DCCs to be levied on a floor space (square metre or square footage) basis at building permit stage; thus promoting more efficient land development through smaller and more affordable housing.

If the municipality wishes to levy the DCC at the building permit stage based on building floor space, the model can convert the number of units into the amount of estimated residential floor space based on a conversion formula.

It is important to note that a floor-space model is more appropriate for communities that are building a variety of types of units. This method is not recommended for communities that are primarily building low density single family dwellings. Also, this approach is not recommended for communities with limited new development because the sample for calculating or applying the average floor-space will be quite small. For the same reasons, the floor-space approach should not be used for area-wide DCCs unless the area represents a significant portion of the local government boundaries.

The range of floor-space for each type of residential development is listed as follows based on a sample of municipalities in British Columbia.

EXAMPLE 4.1A – An Addendum to EXAMPLE 4.1				
		Floor-space Range (Sq Meters per residential unit)		
Area Class — **A = Floor Space in Square Metres**	**Unit Type**	**Low**	**Medium**	**High**
A_{15}	Low Density (SFD)	140	205	280
A_{44}	Medium Density (Townhouse)	110	150	175
A_{74}	High Density (Low & Mid-Rise)	75	85	110
A_{74+}	High Density (High Rise)	55	70	85

The above table provides a range of conversion factors. These factors convert building units to square metres.

Typically, more urbanized communities reflect the low to medium range. Rural and lifestyle communities may use the higher range because these communities have fewer land constraints.

Given the variance that exists in floor-space, municipalities should consider sampling the average size of newly constructed units within their boundaries. This is especially important for resort communities because of the diverse range of developments within their boundaries. Representative figures may be ascertained from municipal building permit information. If this data is not available, the local government may attempt to develop representative figures through discussions with local builders, and the local chapter of the Canadian Home Builders Association.

Average floor-space in a community may fluctuate over time with changes in the market and building trends. Thus, the estimated conversion factors may require periodic review.

Area Conversion

$U_{15} \times A_{15}$	1,985 Units x	205 Sq M/Unit	=	406,925	Sq Metres
$U_{44} \times A_{44}$	827 Units x	150 Sq M/Unit	=	124,050	Sq Metres
$U_{74} \times A_{74}$	331 Units x	85 Sq M/Unit	=	28,135	Sq Metres
$U_{74+} \times A_{74+}$	165 Units x	70 Sq M/Unit	=	11,550	Sq Metres

Conversion of Population per Unit to Population per Square Metre

R_{15} / A_{15}	3.2 ppdu /	205 Sq M/Unit	=	0.0156	People per Sq M
R_{44} / A_{44}	2.5 ppdu /	150 Sq M/Unit	=	0.0167	People per Sq M
R_{74} / A_{74}	1.7 ppdu /	85 Sq M/Unit	=	0.0200	People per Sq M
R_{74+} / A_{74+}	1.4 ppdu /	70 Sq M/Unit	=	0.0200	People per Sq M

The development and population variables calculated above are applied in Example 7.5(A) Sewer DCC Calculation. Although not shown in the guide, the above factors can be applied to calculate floor-space DCCs for all types of infrastructure (roads, parks, water and drainage). Simply apply the above variables into Examples 7.2, 7.3, 7.7, and 7.8.

Development potential method

This method projects the amount of residential development on the basis of development potential. As a result, no direct link is made to a growth rate, and population is only implicitly considered in this approach.

This method is particularly suited to local governments where new development almost exclusively occurs in "greenfield" sites. In other words, this approach is difficult to apply in local governments experiencing significant redevelopment. For each of the gross density ranges being considered as a residential charge category, the total number of dwelling units can be determined from the Zoning Bylaw, given the total area for the respective density ranges, as designated in the OCP. Assuming that the OCP is to be achieved over some period of time greater than the DCC time period, the number of units can be prorated for the purposes of DCC calculations, as shown in Example 4.2.

EXAMPLE 4.2 – Projected Residential Development Units Development Potential Method	
Units = Area x Avg. gross density x (Time Period/OCP Buildout) Therefore, U_{15} = A_{15} x 10 x (10/25) = 496 x 10 x (10/25) = 1,984 U_{44} = A_{44} x 30 x (10/25) = 69 x 30 x (10/25) = 828 U_{74} = A_{74} x 60 x (10/25) = 14 x 60 x (10/25) = 336 U_{74+} = A_{74+} x 75 x (10/25) = 5.5 x 75 x (10/25) = 165 Summary: # of units, x < 15 D.U./ha = 1,984 # of units, 15 < x < 44 D.U./ha = 828 # of units, 44 < x < 74 D.U./ha = 336 # of units, 74 < x D.U./ha = 165	GIVEN: # of units, x < 15 D.U./ha = U_{15} # of units, 15 < x < 44 D.U./ha = U_{44} # of units, 44 < x < 74 D.U./ha = U_{74} # of units, 74 < x D.U./ha = U_{74+} Area in OCP/Zoning Bylaw designated < 15 D.U./ha = A_{15} Area in OCP/Zoning Bylaw designated 15 < x < 44 D.U./ha = A_{44} Area in OCP/Zoning Bylaw designated 44 < x < 74 D.U./ha = A_{74} Area in OCP/Zoning Bylaw designated 74 < x D.U./ha = A_{74+} Assumptions: Avg. gross density of A_{15} = 10 D.U./ha Avg. gross density of A_{44} = 30 D.U./ha Avg. gross density of A_{74} = 60 D.U./ha Avg. gross density of A_{74+} = 75 D.U./ha A_{15} = 496ha A_{44} = 69ha A_{74} = 14ha A_{74+} = 5.5ha Time Period (years) = 10 OCP Buildout (years) = 25

Projected Commercial and Industrial Development

In the following examples, calculations for commercial and industrial development, the required policy decisions have been presumed:

- municipal-wide application of DCCs;
- a revolving ten year time frame;
- commercial DCCs according to floorspace; and,
- industrial DCCs according to gross site area.

It is noted that the calculations could be adjusted for an area-specific DCC, a buildout time frame, and/or DCCs according to other area-based measures.

Two approaches to commercial and industrial development projections are presented: the first involves linkage to population growth, while the latter considers only development potential.

POPULATION GROWTH METHOD

This approach assumes a correlation between the need for commercial/industrial floorspace and population growth. This method uses the historical rate of commercial and industrial development as the basis for projection into the future. This approach is appropriate for isolated local governments where most commercial and industrial activity exists to service the community's population, given that the municipality has enough appropriately designated lands to accommodate future growth needs.

Past floorspace figures can be obtained from building permit records. For the corresponding population, a per capita floorspace can be calculated, and this figure can be multiplied by the DCC time period to obtain a projection of the estimated gross floor area.

For example, suppose a review of building permit records revealed total annual commercial floorspace developed, as shown in Table 4.3. The historical floorspace per capita can be calculated by dividing the total area by the corresponding population for those years (perhaps from Census data) which is also shown in Table 4.3.

TABLE 4.3 – Historical Commercial Per Capita Floorspace Example

Year	Total Floorspace (m^2)	Corresponding Population	Floorspace per Capita (m^2/capita)
1991	374,145	71,678	5.2
1995	416,562	76,550	5.4

Given the historical trend, it might be assumed that the per capita floor area for the DCC program would be an average of the figures, and the projected floor area over the DCC time period can be estimated. This calculation is shown in Example 4.3.

EXAMPLE 4.3 – Commercial Floorspace Projection Population Growth Method	
Use an average of the previous per capita gross floorspace figures as a basis for next ten year period. R = (5.2 + 5.4)/2 = 5.3m²/capita C = P x R = 9,698 x 5.3 = 51,399m² floorspace	GIVEN: Ten Year time Period for DCC Program Ten Year Population Increase = P Commercial Floorspace per Capita = R Ten Year Commercial Floorspace = C Assumptions: 1991 Gross Floorspace per Capita = 5.2m²/capita 1995 Gross Floorspace per Capita = 5.4m²/capita Projected Ten Year Population Increase = 9,698 persons

The same approach could be adopted for industrial development. If in this case, the DCC is based on gross site area, an average site coverage in percent can be assumed to convert building area, in square metres to gross site area, in hectares (Example 4.4).

EXAMPLE 4.4 – Industrial Site Area Projection Population Growth Method	
Use an average of the previous per capita gross floorspace figures as a basis for next ten year period. R = (5.2 + 5.4)/2 = 5.3m²/capita C = P x R = 9,698 x 5.3 = 51,399m² floorspace	GIVEN: Ten Year time Period for DCC Program Ten Year Population Increase = P Industrial Floorspace per Capita = R Ten Year Industrial Projection = I Assumptions: Industrial Gross Floor Area per Capita = 11.9 m²/capita Projected Ten Year Population Increase = 9,698 persons Average Site Coverage = 50%

DEVELOPMENT POTENTIAL METHOD

Some have argued that projecting commercial/industrial floorspace in relation to population growth is incomplete. In particular for urban regions, the demand for commercial and industrial developments may also be generated by customers from a neighbouring municipality, such as in the case of "big box" retailers.

The development potential method seeks to project the need for these types of land uses solely on the basis of development potential, without any linkage to a growth rate. Often this information exists in economic development reports or retail market needs assessment studies.

If these studies are unavailable, the total potential floorspace can be calculated for each of the commercial/industrial DCC categories by multiplying the floorspace ratios found in the Zoning Bylaw by the total areas designated for these land uses in the OCP. After deducting the amount built to date (as found in building permit records) from the total potential, the remaining floorspace results. Assuming that the remaining amount is to be achieved over the time period of the OCP, some proration can be made to determine the commercial and industrial projections for the purposes of DCC calculation. The adjustment may be made based on knowledge of local circumstances and good judgment.

In local governments where commercial/industrial development occurs predominantly in "greenfield" sites, the development potential can be obtained by simply totalling the amount of vacant commercial and industrial lands (Example 4.5).

EXAMPLE 4.5 – Commercial and Industrial Projections Development Potential Method	
C = A_c x (Time Period/OCP Buildout) x FSR = 18.35 x (10/25) x 0.7 = 5.138 ha = 51,380 m^2 floorspace I = A_i x (Time Period/OCP Buildout) = 57.7 x (10/25) = 23.08 ha	GIVEN: Total Vacant Commercial Land = Ac Total Vacant Industrial Land = A_i Ten Year Commercial Floorspace = C Ten Year Industrial Projection = I Assumptions: Commercial FSR = 0.7 A_c = 18.35 ha A_i = 57.7 ha Time Period (years) = 10 OCP Buildout (years) = 25

Projected Institutional Development

Establishment of institutional DCCs is difficult, for the reasons discussed in Chapter 2. Compounding the difficulty is the lack of predictability to institutional floorspace projections (e.g., private and public schools, hospitals, municipal buildings). Unlike commercial and industrial land uses which are based on the economic health of a community, institutional development is typically subject to various levels of government fiscal policy and tends to involve one or two large projects spread out over several years.

If DCCs are to be established for this land use, the best method of estimating institutional floorspace is to obtain the capital plans from major institutional developers. For example, the School and Health Boards may outline new facilities and additions in their capital project plans.

Alternatively, the two methods offered for the calculation of commercial/industrial floorspace can also be used to project institutional needs with some modifications. For the population growth method, a longer survey of building permit records is desirable, such as 20 or 25 years so that the effects of large, individual projects are averaged over the long term. For example, once a college has been built, another such facility might not be constructed for many years. The development potential approach could be used, if combined with good judgment and knowledge of local circumstances. The buildout of institutional floorspace would not likely be prorated in a linear fashion.

Chapter 5 – Compiling a DCC Program

To calculate DCCs, the proposed capital infrastructure program required to support new development must be identified. This chapter describes prerequisite policy decisions required and the sources of information needed to develop a DCC program. Some guidelines are suggested for estimating capital costs, and a format for presenting the summary DCC information is provided.

Prerequisite Policy Decisions

The development of a DCC program will depend in part, on how the policy issues described in Part I have been considered. Before a DCC program can be compiled, the following questions must be answered satisfactorily.

- How extensive will DCCs be applied, on a municipal-wide basis or area-specific basis?
- What time frame has been established for the DCC program (i.e. on a revolving or build-out basis)?
- What type of projects can be included in a DCC program?
- What project costs are DCC recoverable?

Source of Background Information

Sources of data and background documents which provide information to compile a DCC program include:

- Official Community Plan (OCP);
- Financial Plan;
- Master Transportation Plan;
- Master Drainage Plan (or Stormwater Management Plan);
- Master Sewerage Plan (or equivalent);
- Water Distribution Modeling Reports; and,
- Parks Master Plan.

On the basis of technical information contained in background reports together with suitable resolution of policy considerations, a DCC program can then be prepared.

Estimation of Capital Costs

As a DCC program is actually a subset of the Financial Plan, the purpose of this guide is not to describe how capital expenditures should be estimated. However, since the calculation of DCCs is directly tied to the costs of capital projects, some suggestions and guidelines are offered below regarding capital costs.

It is important that capital costs be properly estimated.
As mentioned previously, DCCs are generally determined by dividing the net cost of capital expenditures attributable to new development by the amount and types of various land uses expressed in common "development units."

The *Local Government Act* stipulates that the resulting charges cannot be excessive in relation to the capital cost of prevailing standards of service (section 934 (4) (d) (i)). On the other hand, if capital costs are underestimated, the resulting charge will be understated. If collected funds are insufficient to cover the costs of required infrastructure construction, development may be delayed as a consequence. Therefore, cost estimates should be as accurate as possible to ensure that sufficient funds are collected to meet project costs, yet the estimates should not be excessive relative to actual costs.

The level of detail to which cost estimates should be completed will depend on the level of technical information that exists at the time of preparing the DCC bylaw. Often, only a planning level of engineering analysis is available, especially when projects are projected many years into the future. As the time of construction becomes closer, the cost estimates should be refined to reflect the progress made in the design process. Those familiar with Ministry of Transportation (MOT) policies will be aware of the five classes of cost estimates used by that Ministry, as described below.

1. Class E:
    - accuracy level 20% to 25%;
    - used to establish global budgets for feasibility and cost analyses;
    - based on various planning studies to identify needs, corridors, routes, etc.; and,
    - estimates made using average road costs per kilometre, lump sums for structures, etc.
2. Class D:
    - accuracy level 15% to 20%;
    - used to establish a preliminary cost estimate in an elemental format for cost planning purposes, for determining costs by engineering discipline for preliminary fee purposes and to establish a preliminary project control budget;
    - based on selected routes resulting from detailed route studies; and,
    - estimates made using average unit costs for summary level activities.
3. Class C:
    - accuracy level 15%;
    - used to confirm the control budget costs and to formulate tender packages;
    - based on preliminary design drawings and outline specifications; and,
    - estimates made using average unit costs for detailed activities.

4. Class B:
   - accuracy level 10%;
   - used to review and confirm the construction contract package costs;
   - based on completed functional design documentation; and,
   - estimates made using site-specific unit costs for detailed activity levels.
5. Class A:
   - accuracy level 7.5%;
   - used to produce final cost estimates for construction tenders;
   - based on an Engineer's final quantity estimates; and,
   - estimates made using site and market specific unit costs for contract pay items.

These classes of cost estimates could be adapted for use in estimating the capital costs of the DCC projects. For items planned for construction in a revolving window of five or ten years, cost estimates should be completed to a Class B or C level of accuracy, if possible. For longer term items in a build out program, cost estimates should be to a Class D or E level, as a minimum.

Given the *Local Government Act* definition of capital costs (section 932 (4)), the various costs of project components related to planning, engineering, and legal aspects need to be estimated, including:

- local government administration costs;
- local government overhead charges;
- engineering design services;
- engineering services during construction;
- materials testing allowance;
- allowance for underground hydro and telephone and/or for environmental mitigation; and,
- contingencies.

Right-of-way acquisition is another component of the capital cost that is recoverable through DCCs, and typical land costs can be obtained from local real estate agents, the BC Assessment Authority, or even independent land appraisers, if necessary. With respect to arterial roads, a right-of-way to a local standard might have been dedicated at time of subdivision. If no further subdivision along the frontage is anticipated, the additional right-of-way involved with upgrading to an arterial standard might have to be purchased by the municipality, and these costs should be included. In other cases, it can be assumed that the widening would be dedicated through the subdivision process without cost implications. For storm and sanitary sewer and watermains, these utilities are usually constructed within the road allowance. However, for sewers and mains constructed outside the road allowance, right-of-way acquisition costs should be included as a capital cost for DCC calculation.

Capital costs may also include interest costs directly related to the works in exceptional circumstances where borrowing is required. The Inspector of Municipalities will consider allowing interest costs where it is necessary to construct specific infrastructure projects in advance of sufficient DCC cash flows in order to trigger investment in development. Example 5.2A shows how interest costs may be incorporated into the financial components of a DCC recoverable cost program.

Presentation of a DCC Program

To facilitate the calculation of DCCs during bylaw development, as well as monitoring and tracking of projects once the bylaw is in place, the DCC program should be compiled in a summary table. This table includes assigning a Project Reference Number to each capital project in the DCC program. For each capital project, a "Detail Sheet" should be appended to the supporting DCC documentation according to the Project Reference Number. The Detail Sheet is a standard form which itemizes all components of the cost estimate such as construction elements as well as planning, engineering, contingencies, etc.

Example 5.1 presents a suggested format for presenting the summary information for a list of all eligible projects for the community's DCC road program. Example 5.2 shows a typical Detail Sheet for one of these road DCC projects – "Road Project No. R001 - 16 Avenue." Example 5.2A is an addendum to Example 5.2, which calculates allowable interest for the DCC project.

EXAMPLE 5.1 – Suggested Format for DCC Program

Road DCC Program

Project No.	Location			Description	Cost Estimate	Year	Comment
	On	From	To				
R001	16 Ave.	Ironwood St.	Shoppers Row	Road reconstruction	$1,052,000	1998	Incl. R/W, 14m, C&G S/W
R002	88 Ave	212 St.	216 St.	Arterial Widening	$1,129,000	1998	Incl. Signals
R003	88 Ave.	202 St.		Signal	$97,000	1998	
R004	200 St.	26 Ave.		Bridge	$750,000	1999	As per traffic study
R005	Ospika Blvd.	Tyner Rd.	Hwy. 16	Arterial	$1,650,000	1999	Full arterial road
R006	S. Alder St.	Robron Rd.	Hilchey Rd.	Arterial	$8,559,000	1999	Full arterial road
R007	16 Ave.	248 St.	256 St.	Recap + Shoulders	$217,000	2000	
R008	16 Ave.	200 St.	208 St.	Major Collector	$2,632,000	2001+	Full urban standard
R009	30A Ave.	260 St.	264 St.	Top Lift	$53,000	2000	
R010	Austin Rd.	Poirier St.		Left Turn Bay	$280,000	1997	As per traffic study
R011	Clarke Rd.	Como Lake Rd.		Intersection Improve.	$800,000	1997	As per traffic study
R012	Mariner Way	Como Lake Rd.	Austin Rd.	Arterial Widening	$800,000	1997	Widening only
R013	1 St.	Arden Rd.	Willemar Ave.	Major Collector	$588,000	1997	Widening only
R014	10 St.	Willemar Ave.	McPhee Ave.	Top Lift	$192,000	2000	Incl. S/W
R015	Mission Rd.	Muir Rd.	Lerwick Rd.	Major Collector	$750,000	2000	Incl. R/W
R016	32 Ave.	256 St.	29 Ave.	ROW	$300,000	2001	R/W acquisition only
R017	88 Ave.	206 St.	207 St.	Median	$60,000	2001+	Incl. Landscaping
R018	62 Ave.	203 St.	204 St.	Half Road	$182,000	2001+	Incl. Road drains
			Total Road DDC Program		**$20,091,000**		

EXAMPLE 5.2 – Suggested Format for Detail Sheet					
16 Avenue				**Project:** R001	
From: Ironwood St.			**To:** Shoppers Row		
Description: Reconstruct existing road to full 14m standard c/w curb & gutter and sidewalks both sides.					
Length: 750m					
Notes: – will require some ROW acquisition – will require utility pole relocation – does not include watermain					
No.	**Item**	**Quantity**	**Unit**	**Unit Price**	**Total**
1	ROW acquisition	1	LS	$20,000	$20,000
2	Common excavation & disp. (0.30m)	4,450	m^3	$6	$26,700
3	Pit run gravel (0.30m)	4,450	m^3	$16	$71,200
4	20mm gravel (0.13m)	1,480	m^3	$32	$47,360
5	300 mm dia. storm sewer	210	m	$118	$24,780
6	1,050 mm dia. storm manholes	2	ea	$1,800	$3,600
7	Curb & gutter	1,500	m	$54	$81,000
8	Sidewalk (1.8m)	2,420	m	$40	$96,800
9	Asphalt (0.075m)	2,150	m^3	$56	$120,400
10	Boulevard restoration	1,500	m	$23	$34,500
11	Street lighting	22	ea	$3,500	$77,000
12	Relocate utility poles	3	ea	$2,000	$6,000
13	Signs and markings	750	ea	$5	$3,750
	Subtotal				**$613,090**
14	Engineering design				$42,916
15	Engineering field services				$30,655
16	Materials testing allowance				$3,065
17	City staff costs				$12,262
18	City overhead				$24,524
19	Hydro, tel, & envir. Allowance				$12,262
20	Contingencies				$61,309
	Total				**$800,082**

EXAMPLE 5.2A

Determination of Additional Interest Costs			
A	Total Costs from Example 5.2		800,082
B	Less amount funded by gifts, grants or other external contributions		-
C=A-B	Net amount Eligible for Interest Application		800,082
D	Percentage of debt to which interest will be applied	75%	
E=Cx(1-D)	Portion of Net amount that interest will **not** be applied to		200,021
F=CxD	Portion of Net amount that interest will be applied to		600,062
	Term of the Debt in Years (cannot exceed the DCC term)	10	
	Current MFA rate	7.00%	
G	Interest Rate Multiplier from Table 5.1	1.42	
H=FxG	Debt Financed Portion of the Project		852,087
I=B+E	Non Debt Financed Portion of the Project		200,021
J=H+I	Total Cost of the Project with Debt Financing Costs		1,052,108

Please note that interest is for exceptional circumstances only. Prior to Inspector's approval, the local government must provide extensive information including the following:

- a council/board resolution authorizing the use of interest;
- confirmation that the interest applied does not exceed the MFA rate **or** if borrowing has already been undertaken, the actual rate providing it does not exceed the MFA rate;
- confirmation that the amortization period does not exceed the DCC program time frame;
- evidence that the current DCC reserve fund balance is insufficient for the work in question;
- demonstration that the project is an exceptional circumstance (fixed capacity, out-of-sequence, or Greenfield); and,
- evidence of public consultation and disclosure in the financial plan and DCC report.

Table 5.1 calculates the total additional cost of debt servicing from a serial loan with payments at the end of each term (Based on a present value calculation). To Calculate the total debt servicing costs (interest and principal) simply multiply the initial principal of the debt by the multiplier E.G. the multiplier for a 10 year loan at 7% is 1.42. The total interest and principal payments on a $1 million loan would equal $1.42 million.

TABLE 5.1 – Length of the Debit in Years

Interest Rate	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3.50%	1.04	1.05	1.07	1.09	1.11	1.13	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.39	1.41
4.00%	1.04	1.06	1.08	1.10	1.12	1.14	1.17	1.19	1.21	1.23	1.26	1.28	1.30	1.33	1.35	1.37	1.40	1.42	1.45	1.47
4.25%	1.04	1.06	1.09	1.11	1.13	1.15	1.18	1.20	1.22	1.25	1.27	1.30	1.32	1.35	1.37	1.40	1.42	1.45	1.48	1.50
4.50%	1.05	1.07	1.09	1.11	1.14	1.16	1.19	1.21	1.24	1.26	1.29	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51	1.54
4.75%	1.05	1.07	1.10	1.12	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.36	1.39	1.42	1.45	1.48	1.51	1.54	1.57
5.00%	1.05	1.08	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.32	1.35	1.38	1.41	1.45	1.48	1.51	1.54	1.57	1.60
5.25%	1.05	1.08	1.11	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.34	1.37	1.40	1.44	1.47	1.50	1.54	1.57	1.60	1.64
5.50%	1.06	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.46	1.49	1.53	1.56	1.60	1.64	1.67
5.75%	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.28	1.31	1.34	1.38	1.41	1.45	1.48	1.52	1.56	1.59	1.63	1.67	1.71
6.00%	1.06	1.09	1.12	1.15	1.19	1.22	1.25	1.29	1.32	1.36	1.39	1.43	1.47	1.51	1.54	1.58	1.62	1.66	1.70	1.74
6.25%	1.06	1.09	1.13	1.16	1.20	1.23	1.27	1.30	1.34	1.37	1.41	1.45	1.49	1.53	1.57	1.61	1.65	1.69	1.74	1.78
6.50%	1.07	1.10	1.13	1.17	1.20	1.24	1.28	1.31	1.35	1.39	1.43	1.47	1.51	1.55	1.60	1.64	1.68	1.73	1.77	1.82
6.75%	1.07	1.10	1.14	1.17	1.21	1.25	1.29	1.33	1.37	1.41	1.45	1.49	1.53	1.58	1.62	1.67	1.71	1.76	1.80	1.85
7.00%	1.07	1.11	1.14	1.18	1.22	1.26	1.30	1.34	1.38	1.42	1.47	1.51	1.56	1.60	1.65	1.69	1.74	1.79	1.84	1.89
7.25%	1.07	1.11	1.15	1.19	1.23	1.27	1.31	1.35	1.40	1.44	1.49	1.53	1.58	1.62	1.67	1.72	1.77	1.82	1.87	1.92
7.50%	1.08	1.11	1.15	1.19	1.24	1.28	1.32	1.37	1.41	1.46	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.91	1.96
7.75%	1.08	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.43	1.47	1.52	1.57	1.62	1.67	1.73	1.78	1.83	1.89	1.94	2.00
8.00%	1.08	1.12	1.16	1.21	1.25	1.30	1.34	1.39	1.44	1.49	1.54	1.59	1.64	1.70	1.75	1.81	1.86	1.92	1.98	2.04
8.25%	1.08	1.13	1.17	1.21	1.26	1.31	1.36	1.41	1.46	1.51	1.56	1.61	1.67	1.72	1.78	1.84	1.89	1.95	2.01	2.08

TABLE 5.1 – Length of the Debit in Years (continued)																				
Interest Rate	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
8.50%	1.09	1.13	1.17	1.22	1.27	1.32	1.37	1.42	1.47	1.52	1.58	1.63	1.69	1.75	1.81	1.87	1.93	1.99	2.05	2.11
8.75%	1.09	1.13	1.18	1.23	1.28	1.33	1.38	1.43	1.49	1.54	1.60	1.65	1.71	1.77	1.83	1.90	1.96	2.02	2.09	2.15
9.00%	1.09	1.14	1.19	1.23	1.29	1.34	1.39	1.45	1.50	1.56	1.62	1.68	1.74	1.80	1.86	1.92	1.99	2.06	2.12	2.19
9.25%	1.09	1.14	1.19	1.24	1.29	1.35	1.40	1.46	1.52	1.58	1.64	1.70	1.76	1.82	1.89	1.95	2.02	2.09	2.16	2.23
9.50%	1.10	1.14	1.20	1.25	1.30	1.36	1.41	1.47	1.53	1.59	1.65	1.72	1.78	1.85	1.92	1.98	2.05	2.12	2.20	2.27
9.75%	1.10	1.15	1.20	1.26	1.31	1.37	1.43	1.49	1.55	1.61	1.67	1.74	1.81	1.87	1.94	2.01	2.09	2.16	2.23	2.31
10.00%	1.10	1.15	1.21	1.26	1.32	1.38	1.44	1.50	1.56	1.63	1.69	1.76	1.83	1.90	1.97	2.05	2.12	2.19	2.27	2.35
10.25%	1.10	1.16	1.21	1.27	1.33	1.39	1.45	1.51	1.58	1.64	1.71	1.78	1.85	1.93	2.00	2.08	2.15	2.23	2.31	2.39
10.50%	1.11	1.16	1.22	1.28	1.34	1.40	1.46	1.53	1.59	1.66	1.73	1.80	1.88	1.95	2.03	2.11	2.19	2.27	2.35	2.43
10.75%	1.11	1.16	1.22	1.28	1.34	1.41	1.47	1.54	1.61	1.68	1.75	1.83	1.90	1.98	2.06	2.14	2.22	2.30	2.39	2.47
11.00%	1.11	1.17	1.23	1.29	1.35	1.42	1.49	1.55	1.63	1.70	1.77	1.85	1.93	2.01	2.09	2.17	2.25	2.34	2.42	2.51
11.25%	1.11	1.17	1.23	1.30	1.36	1.43	1.50	1.57	1.64	1.72	1.79	1.87	1.95	2.03	2.11	2.20	2.29	2.37	2.46	2.55
11.50%	1.12	1.18	1.24	1.30	1.37	1.44	1.51	1.58	1.66	1.73	1.81	1.89	1.97	2.06	2.14	2.23	2.32	2.41	2.50	2.59
11.75%	1.12	1.18	1.24	1.31	1.38	1.45	1.52	1.60	1.67	1.75	1.83	1.91	2.00	2.09	2.17	2.26	2.35	2.45	2.54	2.64
12.00%	1.12	1.18	1.25	1.32	1.39	1.46	1.53	1.61	1.69	1.77	1.85	1.94	2.02	2.11	2.20	2.29	2.39	2.48	2.58	2.68

Chapter 6 – Determining the Net DCC Recoverable Amount

Once the projection of new development has been estimated, and a program of infrastructure projects required to support that new development has been compiled into a DCC program, the net amount to be paid by DCCs must be determined. The net DCC recoverable amount should not be confused with DCC recoverable cost components. While the latter pertains to the various aspects of a capital project that can be included as a capital cost for the purpose of DCC calculations (e.g., construction, planning, engineering, legal, etc.), the former is the net figure that is divided by the amount of new development to obtain the DCC rate. This chapter describes a number of considerations that should be taken into account to arrive at the net DCC recoverable amount: deducting grants and other funding sources, allocating the benefit to new development, applying the municipal assist factor, and deducting any existing DCC reserve monies.

Deducting Grants

The DCC recoverable portion of capital expenditures should be net costs attributable to new development. In other words, if funding contributions from other sources are associated with a capital project, these monies should be taken into account. Policies and legislation regarding grants change over time and grant programs can be over-subscribed, therefore, contributions from grant programs cannot be assured. Even if projects qualify, best practice suggests grant monies not be included until they are approved. If a grant is subsequently approved, the DCC bylaw should be amended accordingly.

Allocating Benefit

Similar to the issue of the municipal assist factor, no direct reference is provided in the *Local Government Act* which formally recognizes apportionment of benefit. Section 933 (2) states only that DCCs imposed by a local government for the construction of infrastructure must service new development either directly or indirectly. However, the guiding principle of fairness and equitable distribution of capital costs amongst those parties receiving benefit, suggests that certain DCC projects may benefit the population at large.

For example, existing users may receive some benefit from the construction of infrastructure, if the facilities are upgraded in response to pent up demand as well as new development. In this case, the capital costs (or some portion of them) should be shared by the entire community. Thus the allocation of capital costs that benefit existing users (versus capital costs attributable to new development) should be deducted from the difference between the total capital cost estimate and funds from other sources.

Benefit apportionment should also reflect the fact that not all growth translates to new development units. Just as this effect may be taken into account when making new development projections, it may also be incorporated into the consideration of benefit allocation.

ROADS

It is acknowledged that a good transportation network is beneficial to the entire community. In response, capital costs related to the road DCC program should be apportioned to existing users as well as to new development. Some apportionment is especially appropriate when a municipal-wide approach has been adopted in the calculation of road DCCs.

Generally, those aspects of the road DCC program which involve replacing existing components, such as road rehabilitation projects have a higher benefit to existing users than capital projects that provide increased capacity, such as new roads, additional lanes, new traffic control devices, and left turn bays. The existing and improved Levels of Service (LOS) should be considered. While it can be argued that new development does not cause all the new traffic demands (existing users may be travelling more), there is a link between new development and the need for additional road facilities.

STORM DRAINAGE, SANITARY, AND WATER

For storm drainage, sanitary, and water, new infrastructure systems or extensions into previously unserviced areas clearly have little benefit to existing users. However, for infrastructure components that are well integrated into existing systems, such as an interconnected watermain, allocating benefit may be more difficult. If existing residents are inadequately served by existing utilities, existing users may receive benefit in the form of improved service and should share in the capital costs.

SUGGESTIONS FOR APPORTIONMENT

It is acknowledged that the allocation of benefit may be difficult to quantify, especially if projects are being proposed for construction in ten or twenty years. Although an element of subjectivity will always exist, the rationale for apportionment of capital costs in the DCC bylaw should include supporting documentation, technically based where possible.

Two approaches to allocating benefit are suggested below: a general "rule of thumb" approach, and a method based on some technical means. Either approach could be applied on a project by project basis or on the total value of the DCC program, depending on the types and nature of the capital improvements.

One way is to use the following "rule of thumb." If construction of the proposed works would not proceed at all if there was no new development, then it would be fair to say that none of the costs should be paid by existing users. In other words, 100% of the costs would be attributable to new development and eligible for DCC recovery. In some cases, the marginal costs associated with "oversizing" may be assessed in this manner.

If it is evident that the existing public gains at least some benefit from new capital works and infrastructure improvements and that some benefit will be received by a component of growth that will not be reflected in new development units (and thus will not be subject to DCCs), then equitable assessment of that benefit is dependent upon selection of a suitable means for apportionment. For example, in the case of an arterial road, the capital costs could be apportioned according to traffic capacity, while for trunk sewers, costs could be split according to flow. Service population could also be a way of allocating benefit. If only a planning level of engineering analysis is available at the time of bylaw development, general ranges of benefit could be assigned based on technical data accompanied by good engineering judgement.

The following examples show the various means to apportion benefit and illustrate the subjectivity involved in justifying that apportionment.

Example 6.1 Allocating Benefit – Case 1A	
Using the "rule of thumb" rationale, project would not proceed if it was not for new development needs. Therefore, benefits to new development = 100%	GIVEN: Bridge project Assumptions • two lanes presently offer LOS "B" • proposed to be upgraded to four lanes to access greenfield site.

Example 6.2 Allocating Benefit – Case 1B	
Benefit can be apportioned according to the following rationale. The argument is that the bridge needs to be replaced anyway. 2 lanes existing = 50% benefit to existing users 4 lanes ultimate Therefore, benefit to new development = (100% - 50%) = 50%	GIVEN: Bridge project Assumptions: • two lanes presently offer LOS "B" • bridge currently at end of service life • proposed to be upgraded to four lanes to access greenfield site.

Example 6.3 Allocating Benefit – Case 1C	
Bridge is inadequate to service present needs. Upgrade to four lanes will improve LOS as well as accommodate new development. Rationale for apportionment as follows: 3 lanes needed to adequately service existing 1 lane to accommodate new development Therefore, benefits to new development = 25%	GIVEN: Bridge project Assumptions: • two lanes presently offer LOS “D” • bridge currently at end of service life • new development expected to add 1/3 more traffic.

Example 6.4 Allocating Benefit – Case 2	
$\frac{\text{700 vehicles}}{\text{2,000 vehicles}}$ = 35% benefit to existing users Therefore, benefits to new development = (100% - 35%) = 65%	GIVEN: Arterial Road Construction Assumptions: Total Estimated Current Peak Hour Traffic = 700 vehicles (e/w) Total Estimated Peak Hour Capacity of Future Road System = 2,000 vehicles (e/w)

Example 6.5 Allocating Benefit – Case 3A	
Using “rule of thumb” rationale, project would not proceed if it was not for new development needs. Therefore, benefit to new development = 100% and full cost for 300mm diameter sewer project are DCC recoverable.	GIVEN: Sanitary Sewer Project Assumptions: • 250mm diameter pipe presently 50% full • 300mm diameter pipe required for new development

Example 6.6 Allocating Benefit – Case 3B	
Allocating benefit according to the following rationale. The argument is that the sewer needs to be replaced anyway. Only apportion marginal cost between installation of 250mm diameter and 300mm diameter pipe to new development. Therefore, benefits to new development = $10,000/ $60,000 = 17%	GIVEN: Sanitary Sewer Project Assumptions: • 250mm diameter pipe presently leaking • Replace with 300mm diameter pipe required for new development • 250mm diameter pipe replacement to cost $50,000 • 300mm diameter pipe replacement to cost $60,000

Applying the Municipal Assist Factor

The municipal assist factor is another deduction which should be made in determining the net DCC recoverable amount. As discussed in Chapter 2, this factor is separate from any allocation of capital costs based on benefit.

As noted in Part 1, different infrastructure categories could have different municipal assist factors. For example, a road DCC could have an assist factor of 10%, while for sanitary DCCs, the assist factor could be 5%. However, all land uses within a particular category must have the same assist factor applied. For example, a 10% assist for residential and a 25% assist for commercial developments could not be provided.

The municipal assist factor should be applied to the portion of costs apportioned to new development. In other words, from the total capital costs, applicable funds from other sources should first be deducted. From the resulting amount, the benefit factor should be applied. Then, the assist factor should be calculated on the remaining amount.

Calculating the Net Recoverable Cost of the DCC Program

The net recoverable cost of the DCC program is determined by allowing for the following considerations:

- identification of government grants and other funding contributions;
- determination of the portion of costs applicable to new development; and,
- application of the municipal assist factor.

Compilation of the DCC recoverable amount for each project produces the net recoverable cost of the DCC program. Example 6.8 shows a suggested format for summarizing these various financial components of the DCC program. The columns identified in the table are explained as follows.

Column Explanation

(1) Total Capital Cost Estimate

(2) Grants and Funds from Other Sources

(3) Benefit Factor for New Development

(4) Benefit to New Development:
[(1)-(2)] x (3)

(5) Municipal Assist Factor Amount:
(4) x Assist %

(6) DCC Recoverable Amount: (4) - (5)

(7) Total Municipal Responsibility:
[(1) - (4)] + (5)

Deducting Existing DCC Reserves

If the proposed bylaw is an update of an existing DCC bylaw, some capital projects may be carried over to the updated DCC program, if they were not previously constructed. In this case, any monies in the existing DCC reserve account not yet expended should likewise be carried over into the new bylaw. Therefore, these funds should be applied to offset the net DCC program recoverable amount.

Calculating the Net DCC Recoverable Amount

The net DCC recoverable amount is obtained by deducting any existing DCC reserve monies from the net recoverable cost of the DCC program.

EXAMPLE 6.8 – Suggested Format for Recoverable DCC Program Costs										
Road DCC Program Recoverable Costs										
Project No.	**Column**			**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	Location			**Cost Estimate**	**Other Funding Sources**	**Benefit Factor (%)**	**Benefit to New Dev.**	**Municipal Assist Factor (1%)**	**DCC Recoverable**	**Total Municipal Responsibility**
	On	**From**	**To**							
R001	16 Ave.	Ironwood St.	Shoppers Row	$1,052,000		49	$520,000	$5,200	$514,800	$537,200
R002	88 Ave.	212 St.	216 St.	$1,129,000		100	$1,129,000	$11,290	$1,117,710	$11,290
R003	88 Ave.	202 St.		$97,000		65	$63,050	$631	$62,419	$34,581
R004	200 St.	26 Ave.		$750,000		50	$375,000	$3,750	$371,250	$378,750
R005	Ospika Blvd.	Tyner Rd.	Hwy. 16	$1,650,000		65	$1,072,500	$10,725	$1,061,775	$588,225
R006	S. Alder St.	Robron Rd.	Hilchey Rd.	$8,559,000	$4,279,500	100	$4,279,500	$42,795	$4,236,705	$42,795
R007	16 Ave.	248 St.	256 St.	$217,000		65	$141,050	$1,411	$139,639	$77,361
R008	16 Ave.	200 St.	208 St.	$2,632,000		100	$2,632,000	$26,320	$2,605,680	$26,320
R009	30A Ave.	260 St.	264 St.	$53,000		65	$34,450	$345	$34,105	$18,895
R010	Austin Rd.	Poirier St.		$280,000		65	$182,000	$1,820	$180,180	$99,820
R011	Clarke Rd.	Como Lake Rd.		$800,000		65	$520,000	$5,200	$514,800	$285,200
R012	Mariner Way	Como Lake Rd.	Austin Rd.	$800,000		100	$800,000	$8,000	$792,000	$8,000
R013	1 St.	Arden Rd.	Willemar Ave.	$588,000		100	$588,000	$5,880	$582,120	$5,880
R014	10 St.	Willemar Ave.	McPhee Ave.	$192,000		65	$124,800	$1,248	$123,552	$68,448
R015	Mission Rd.	Muir Rd.	Lerwick Rd.	$750,000		65	$487,500	$4,875	$482,625	$267,375
R016	32 Ave.	256 St.	29 Ave.	$300,000		100	$300,000	$3,000	$297,000	$3,000
R017	88 Ave.	206 St.	207 St.	$60,000		65	$39,000	$390	$38,610	$21,390
R018	62 Ave.	203 St.	204 St.	$182,000		65	$118,300	$1,183	$117,117	$64,883
			Totals	$20,091,000	$4,279,500		$13,406,150	$134,063	$13,272,087	$2,539,413

Example 6.9 below shows the deduction of existing DCC reserve monies.

If no DCC bylaw has ever been adopted in the municipality (i.e., there are no existing DCC reserves), the net amount to be paid by DCCs is simply the net DCC program recoverable cost.

In summary, the following deductions should be made to the total capital costs to arrive at the net DCC recoverable amount:

- government grants and other funding contributions;
- the portion of costs not attributable to new development;
- the amount representing the municipal assist factor contribution; and,
- any existing DCC reserve monies.

EXAMPLE 6.9 Net DCC Recoverable Calculation	
Net DCC Recoverable Amount = Net Recoverable DCC Program Cost – Existing DCC Reserve Account Monies $13,216,102 - $293,500 = $12,922,602	GIVEN: Net DCC program recoverable (1997-2006) = $13,216,102 Existing DCC Reserve Account (as at Dec. 31, 1996) = $293,500

Chapter 7 – Calculating DCCs

The technical procedure for calculating DCCs includes estimating new development (Chapter 4), compiling a DCC program (Chapter 5), and determining the net DCC recoverable amount (Chapter 6). This chapter discusses the last step to determining the charges: comparing the impact of different types of land use on each category of infrastructure in relation to the amount of new development. On the basis of the DCC inputs established in earlier chapters, various DCC calculation methodologies for roads, storm drainage, sanitary, water, and parkland are outlined in the following sections.

Approaches to DCC Calculation Methodology

The legislative basis for the various approaches to DCC calculation methodology is contained in the *Local Government Act*. Section 934 specifies that DCCs may be determined for different zones, uses, numbers of lots or units in a development, sizes, or capital costs as they relate to different classes of development. Therefore, some means for comparing the impact of different types of land use on each municipal service should be established. In general, for residential and institutional land use, the amount of new development is related to the population being served, such as residents, patients, or students. For commercial and industrial land uses, quantifying new development depends on the product and process involved, and the impact can vary significantly from building to building. However, unless the exact types of specific development are known in advance, the approach to the DCC calculation methodology has been to use broad averages for estimating impact. The disadvantage of broad averages is that industries such as water bottling and food processing operations may greatly exceed average demand/generation for water and sewer, so the figures should be applied cautiously. Regardless of the type of development, impact should be based on statistically significant information such as traffic generated, impervious surfaces, consumption, or flow. DCCs are not levies imposed on the basis of the ability to pay, property assessment values, retail sales, or the size of a company.

Road DCCs

For road charges, the net DCC recoverable amount can be distributed amongst new development in proportion to the traffic volume generated by the respective land uses using the road facilities.

Widely accepted by many local governments, the comparison of traffic generation rates for various land uses may be based on the Institute of Transportation Engineers (ITE) manual titled, *Trip Generation* (ITE, 1991). Trip rates are commonly measured in units known as "trip ends." ITE defines a "trip end" to mean a single or one-directional vehicle movement (i.e., either exiting or entering) a particular site. Although the ITE manual measures the trip rates for various conditions, the average trip rate for the afternoon (i.e., p.m.) peak hour of the generator is suggested as the common basis for comparing road impact for DCC calculation purposes. This is because road capacity is related to peak hour needs, rather than average traffic, and greater amounts of traffic are experienced during afternoons, as opposed to mornings.

More than 100 land use codes are classified by ITE in their manual. Further, the trip rates are expressed in various units including persons, dwelling units, gross floor area, and gross site area. Therefore, selection of the code that best corresponds to the DCC categories in the appropriate units for which the charges are being determined must be made. If a density gradient is the basis for how residential land uses will be charged, typical building forms that best correspond to the gross density ranges should be carefully chosen. Discretion should also be used when selecting codes for non-residential land uses. For example, the trip generation manual includes a variety of commercial uses with a wide range of trip rates such as "General Office Building" (Code 710), "Shopping Centre less than 10,000 square feet" (Code 820), and "Business Park" (Code 770). Sometimes, the distinction between codes is not clear, such as between "General Heavy Industrial" (Code 120) and "Manufacturing" (Code 140). And in other instances, very little information exists, such as institutional land uses. The rationale for selecting a particular trip rate to represent a certain DCC land use category should be documented.

The ITE manual does not provide information on the amount of truck traffic, as compared to passenger vehicles. However, trucks have a greater impact on roads than passenger vehicles, in terms of capacity, durability, and construction of roads. Some estimate of truck traffic in relation to the various land uses may be available in engineering documents, and the effect of trucks can be factored into traffic impact considerations. In some municipalities, one truck is estimated to be equivalent to three passenger vehicles.

Traffic generation can also be impacted by another effect known as "pass-by" trips. These trips are those made as intermediate stops on the way from an origin to a primary trip destination and apply especially to commercial developments. Although the ability to quantify pass-by trips may be complicated, the ITE manual suggests an estimate of 25% of all traffic volumes are trips of this type.

A weighted trip rate can be developed to take into account truck traffic and pass-by trips, as shown in Example 7.1.

Using the respective weighted trip rate for DCC categories, the total trip ends from all land uses projected from new development for either a fixed time period or to build out can be determined. Dividing the net amount to be paid by DCCs by the total trip ends results in a unit DCC per trip end. Multiplying the DCC per trip end by the trip rate for the respective land use yields a schedule of road DCCs. A sample calculation is provided in Example 7.2.

EXAMPLE 7.1 Weighted Trip Generation Rates	
R_C = (1.48/1000)/0.3048^2 = 0.016 AVTE per m^2 R_T = F x R_C = 3 x 0.016 = 0.048 AVTE per m^2 R_W = (1 – P) x [R_C x (1 – T)] + (R_T x T) = (1 – 0.25) x 0.016 x (1 – 0.05) + (0.048 x 0.05) = 0.014 AVTE per m^2 gross floor area	GIVEN: Commercial Trip Rate (AVTE, pm Pk Hr for car) = R_C Commercial Trip Rate (AVTE, pm Pk Hr for truck) = R_T Weighted Commercial Trip Rate (AVTE, pm Pk Hr) = R_W Pass-by Trips (%) = P Truck Traffic (%) = T Truck Impact Factor = F ASSUMPTIONS: Business Park (Code 770) = 1.48 AVTE per 1000 ft^2, pm Pk Hr for car 0.3048 = conversion from imperial (feet) to metric (meters) P = 25% T = 5% F = 3

EXAMPLE 7.2 – Road DCC Calculation			
A: Traffic Generation Calculation			
Land Use	**Col. (1) Estimated New Development**	**Col. (2) Wt. Trip Rate (AVTE, pm Pk Hr per unit)**	**Col. (3) = (1) x (2) Total Trip Ends**
Low Density Residential	1,985 dwelling units	1.02	2,025
Medium Density Residential	827 dwelling units	0.66	546
High Density Residential (1)	331 dwelling units	0.62	205
High Density Residential (2)	165 dwelling units	0.40	66
Commercial	51,380 m^2 gross floor area	0.014	706
Industrial	23.08 ha gross site area	27.75	641
Institutional	50,000 m^2 gross floor area	0.018	901
		Total Trip Ends	**5,089(a)**

B: Unit Road DCC Calculations		
Net Road DCC Program Recoverable	$13,272,089	(b)
Existing Road DCC Reserve Monies	$(293,500)	(c)
Net Amount to be Paid by DCCs	$12,978,588	(d) = (b) – (c)
DCC per Trip End	$2,550.42	(e) = (d) / (a)

C: Resulting Road DCCs		
Low Density Residential	$2,601 per dwelling units	(e) x Col. (2)
Medium Density Residential	$1,683 per dwelling units	(e) x Col. (2)
High Density Residential (1)	$1,581 per dwelling units	(e) x Col. (2)
High Density Residential (2)	$1,020 per dwelling units	(e) x Col. (2)
Commercial	$35.04 per m^2 gross floor area	(e) x Col. (2)
Industrial	$70,784 per ha gross site area	(e) x Col. (2)
Institutional	$45.93 per m^2 gross floor area	(e) x Col. (2)

Storm Drainage DCCs

The need for storm drainage works is directly related to the potential runoff generated by developments in different land use zones (and not population). Therefore, storm drainage DCCs should be based on the relative runoff potential for various land uses. The most significant factor that influences the amount of runoff produced is the imperviousness of the development site, and for all intents and purposes, the runoff coefficient is equal to the percentage of impervious area. Urban development increases the amount of impervious areas as a result of the construction of roads, driveways, parking lots, and rooftops. The more impervious surfaces in a watershed, the greater the increase in runoff peak and volume, in comparison to pre-development conditions. Drainage improvements are demanded in response to these impacts.

To determine the relative runoff potential between residential, commercial, industrial, and institutional categories, the total area accommodated by each land use should be calculated from the new development projections and respective gross unit densities. The minimum lot sizes and floorspace ratios are often found in background documents such as the Zoning Bylaw or other planning reports

Typically, 20% of a parcel's gross area is used for road and servicing rights-of-ways. As an example, average gross densities can be assumed for the residential DCC categories as shown in Table 7.1.

TABLE 7.1 – Average Gross Density For Residential DCC Categories

DCC Categories	Gross Unit Density
Low Density Residential	10 units per gross ha
Medium Density Residential	30 units per gross ha
High Density Residential (1)	60 units per gross ha
High Density Residential (2)	75 units per gross ha

Values for the runoff coefficient for various land uses may be found in engineering documents such as the Subdivision Control Bylaw or Engineering Design Criteria Manual. An example of typical runoff coefficients for various land uses is shown in Table 7.2.

TABLE 7.2 – Typical Runoff Coefficients for Various Land Uses	
Land Use	**Typical Runoff Coefficients**
Low Density Residential	0.40 (i.e., 40% of the site is impervious)
Medium Density Residential	0.65 (i.e., 65% of the site is impervious)
High Density Residential (1)	0.80 (i.e., 80% of the site is impervious)
High Density Residential (2)	0.80 (i.e., 80% of the site is impervious)
Commercial	0.90 (i.e., 90% of the site is impervious)
Industrial	0.90 (i.e., 90% of the site is impervious)
Institutional	0.85 (i.e., 85% of the site is impervious)

Using the runoff coefficients, the total amount of impervious surface area for each land use can be calculated. The total impervious area may be related to low density residential land use through the concept of "equivalent drainage units" (EDU's). An EDU is the amount of impervious area of a low-density residential unit.

For example, at a density of 10 units per hectare with a runoff coefficient of 0.40, one unit has an impervious area of 400 m^2. In comparison, medium density residential at density of 30 units per hectare with a runoff coefficient of 0.65 has an impervious area of 217 m^2. Thus in terms of imperviousness, one unit of medium density residential is equivalent to 217/400 or 0.54 of a low-density residential unit. This ratio is known as the "equivalence factor." In this manner, the total equivalent drainage units can be determined.

Dividing the net amount to be paid by DCCs by the total equivalent drainage units results in a DCC per EDU. The storm drainage DCC for each land use is calculated by multiplying the DCC per EDU by the equivalence factor. A sample calculation is provided in Example 7.3.

EXAMPLE 7.3 – Storm Drainage DCC Calculation							
A: Drainage Impact Calculation							
	Col. (1)	**Col. (2)**	**Col. (3)**	**Col. (4) = [(1) / (2)] x (3)**	**Col. (5)**	**Col. (6)**	**Col. (7) = (5) x (6)**
Land use	**Unit of Development**	**Density/FSR/Site Coverage**	**Runoff Coefficient**	**Impervious Area per Unit of Development (m^2)**	**Equivalence Factor**	**Estimated New Development**	**Equivalent Drainage Units**
Low Density Residential	I dwelling unit	10 lots per gross ha	0.40	400 (a)	1.00 (a) / (a)	1,985	1,985
Medium Density Residential	I dwelling unit	30 units per gross ha	0.65	217 (b)	0.54 (b) / (a)	827	448
High Density Residential (1)	I dwelling unit	60 units per gross ha	0.80	133 (c)	0.33 (c) / (a)	331	110
High Density Residential (2)	I dwelling unit	75 units per gross ha	0.80	107 (d)	0.27 (d) / (a)	165	44
Commercial	1 m^2 gross floor area	70% site coverage	0.90	1.3 (e)	0.0032 (e) / (a)	51,380	165
Industrial	1 ha gross site area		0.90	9,000 (f)	22.5 (f) / (a)	23.08	519
Institutional	1 m^2 gross floor area	70% site coverage	0.85	1.2 (g)	0.0030 (g) / (a)	50,000	152
						Total EDU's	**3,424 (h)**
B: Unit DCC Calculation							
Net Storm Drainage DCC Program Recoverable	$4,986,383		(i)				
Existing Storm Drainage DCC Reserve Monies	$(201,108)		(j)				
Net Amount to be Paid by DCCs	$4,785,275		(k) = (i) – (j)				
DCC per Equivalent Drainage Unit	$1,397.76		(l) = (k) / (h)				
C: Resulting Storm Drainage DCCs							
Low Density Residential	$1,398	per dwelling unit	(I) x Col. (5)				
Medium Density Residential	$757	per dwelling unit	(I) x Col. (5)				
High Density Residential (1)	$466	per dwelling unit	(I) x Col. (5)				
High Density Residential (2)	$373	per dwelling unit	(I) x Col. (5)				
Commercial	$4.49	/m^2 gross floor area	(I) x Col. (5)				
Industrial	$31,450	/ha gross site area	(I) x Col. (5)				
Institutional	$4.24/	m^2 gross floor area	(I) x Col. (5)				

Sanitary DCCs

Sanitary DCCs are based on the premise that expansion and upgrading of sewerage facilities are demanded by population growth. For residential land use, typical occupancy rates were discussed in Chapter 4 on projected residential development. The impact on the sanitary sewer system from non-residential land uses is commonly expressed as a population density or as an area based demand. For example, a typical range of equivalent density is 62 to 93 m^2 per person (1 to 1.5 persons per 1,000 $ft.^2$ gross floor area) for commercial and institutional land. An area based demand can be converted to an equivalent population demand. For example, a typical commercial or industrial flow is 22,500 L/day/ha of gross site area, while the typical average per capita flow is 350 L/day. Thus the equivalent population can be calculated, as shown in Example 7.4 below.

Based on the average population densities for the various land uses, the total equivalent service population can be calculated. Dividing the net amount to be paid by DCCs by the total equivalent service population results in a DCC per capita. The sanitary DCC for each land use is then established by multiplying the DCC per capita by the average population densities for the respective development units. An example of the sanitary DCC calculation is provided in Example 7.5 and Example 7.5A.

EXAMPLE 7.4 Equivalent population of Non-Residential Land Uses for Sanitary Impact	
PEQ = QN/QR = 22,500 L/day/ha 350/L/day = 64.3 pers/ha	GIVEN: Average generation (L/day/ha gross site area) = QN Average per capita flow (L/day/capita) = QR Equivalent Population = PEQ Assumptions: QN = 22,500 L/day/ha QR = 350/day/ha

EXAMPLE 7.5 – Sanitary DCC Calculation

A: Equivalent Population Calculation

Land Use	Col. (1) Estimated New Development	Units	Col. (2) Density or Equivalent Population Factor		Col. (3) = (1) x (2) Equivalent Population
Low Density Residential	1,985	dwelling units	3.2	persons per dwelling unit	6,352
Medium Density Residential	827	dwelling units	2.5	persons per dwelling unit	2,068
High Density Residential (1)	331	dwelling units	1.7	persons per dwelling unit	562
High Density Residential (2)	165	dwelling units	1.4	persons per dwelling unit	232
Commercial	51,380	m² gross floor area	0.013	persons per m² gross floor area	661
Industrial	23.08	ha gross site area	64.3	persons per ha gross site area	1,484
Institutional	50,000	m² gross floor area	0.011	persons per m² gross floor area	538
				Total Equivalent Population	11,896 (a)

B: Unit DCC Calculation

Net Sanitary DCC Program Recoverable		$7,650,473	(b)
Existing Sanitary DCC Reserve Monies		$(853,264)	(c)
Net Amount to be Paid by DCCs		$6,797,209	(d) = (b) – (c)
DCC per Equivalent Person		$571.39	(e) = (d) / (a)

C: Resulting Sanitary DCCS

Low Density Residential	$1,828	per dwelling unit	(e) x Col. (2)
Medium Density Residential	$1,428	per dwelling unit	(e) x Col. (2)
High Density Residential (1)	$971	per dwelling unit	(e) x Col. (2)
High Density Residential (2)	$800	per dwelling unit	(e) x Col. (2)
Commercial	$7.35	/m² gross floor area	(e) x Col. (2)
Industrial	$36,732	/ha gross site area	(e) x Col. (2)
Institutional	$6.15	/m² gross floor area	(e) x Col. (2)

EXAMPLE 7.5 A – Sanitary DCC Calculation Based on a residential floor space model from example 4.1A					
A: Equivalent Population Calculation					
Land Use	**Col. (1) Estimated New Development**	**Units**	**Col. (2) Density or Equivalent Population Factor**		**Col. (3) = (1) x (2) Equivalent Population**
Low Density Residential	406,925	m² gross floor area	0.0156	persons per m² gross floor area	6,352
Medium Density Residential	124,050	m² gross floor area	0.0167	persons per m² gross floor area	2,068
High Density Residential (1)	28,135	m² gross floor area	0.0200	persons per m² gross floor area	563
High Density Residential (2)	11,550	m² gross floor area	0.0200	persons per m² gross floor area	231
Commercial	51,380	m² gross floor area	0.013	persons per m² gross floor area	662
Industrial	23.08	ha gross site area	64.3	persons per ha gross site area	1,485
Institutional	50,000	m² gross floor area	0.011	persons per m² gross floor area	538
				Total Equivalent Population	11,899 (a)
B: Unit DCC Calculation					
Net Sanitary DCC Program Recoverable		$7,650,473	(b)		
Existing Sanitary DCC Reserve Monies		$(853,264)	(c)		
Net Amount to be Paid by DCCs		$6,797,209	(d) = (b) – (c)		
DCC per Equivalent Person		$571.39	(e) = (d) / (a)		
C: Resulting Sanitary DCCS					
Low Density Residential	$8.92	/m² gross floor area	(e) x Col. (2)		
Medium Density Residential	$9.52	/m² gross floor area	(e) x Col. (2)		
High Density Residential (1)	$11.42	/m² gross floor area	(e) x Col. (2)		
High Density Residential (2)	$11.42	/m² gross floor area	(e) x Col. (2)		
Commercial	$7.35	/m² gross floor area	(e) x Col. (2)		
Industrial	$36,732	/ha gross site area	(e) x Col. (2)		
Institutional	$6.15	/m² gross floor area	(e) x Col. (2)		

The same methodology can be applied to calculating DCCs for roads, parks, water and drainage.

Water DCCs

Impact on the water supply and distribution system arises from both domestic (peak day and peak hour) demand and the requirement to provide adequate flows for fire protection. Both domestic or daily flows and fire flows vary, but to differing extents, with land use. The sizing of overall facilities has been found to be primarily dependent on peak day and peak hour flows. Therefore, allocation of net DCC recoverable costs between land uses is dependent on their relative impacts on the water system. The comparative impact on the water system can be expressed in terms of domestic demand which in turn relates to population density or for non-residential development, equivalent population density. Typical population densities for residential land uses can be applied in a manner similar to that which is used for the sanitary DCC calculation. Similarly, an area based demand may be expressed as an equivalent population demand. A typical industrial or commercial demand is 22,500 L/day/ha of gross site area; in comparison, the typical average per capita flow is 500 L/day. The calculation of equivalent population for non-residential land uses is shown in Example 7.6.

EXAMPLE 7.6 Equivalent Population of Non-Residential Land Uses for Water Impact	
$P_{EQ} = Q_N / Q_R$ $= \dfrac{22{,}500 \text{ L/day/ha}}{500\text{/L/day}}$ $= 45$ pers/ha	GIVEN: Average demand (L/day/ha gross site area) = Q_N Average per capita demand (L/day/capita) = Q_R Equivalent Population = P_{EQ} Assumptions: Q_N = 22,500 L/day/ha Q_R = 500/L/day

With average population densities for the various land uses, the total equivalent population can be calculated. Dividing the net amount to be paid by DCCs by the total equivalent service population results in a DCC per EDU. The water DCC for each land use is established by multiplying the DCC per capita by the per person densities for the respective land use development unit. Example 7.7 shows the water DCC calculation.

EXAMPLE 7.7 – Water DCC Calculation

A: Equivalent Population Calculation

Land Use	Col. (1) Estimated New Development	Units	Col. (2) Density or Equivalent Population Factor		Col. (3) = (1) x (2) Equivalent Population
Low Density Residential	1,985	dwelling units	3.2	persons per dwelling unit	6,352
Medium Density Residential	827	dwelling units	2.5	persons per dwelling unit	2,068
High Density Residential (1)	331	dwelling units	1.7	persons per dwelling unit	562
High Density Residential (2)	165	dwelling units	1.4	persons per dwelling unit	232
Commercial	51,380	m^2 gross floor area	0.009	persons per m^2 gross floor area	462
Industrial	23.08	ha gross site area	45	persons per ha gross site area	1,039
Institutional	50,000	m^2 gross floor area	0.011	persons per m^2 gross floor area	538
				Total Equivalent Population	**11,253 (a)**

B: Unit DCC Calculation

Net Water DCC Program Recoverable	$5,186,905	(b)
Existing Water DCC Reserve Monies	$(734,583)	(c)
Net Amount to be Paid by DCCs	$4,452,322	(d) = (b) – (c)
DCC per Equivalent Person	$395.67	(e) = (d) / (a)

C: Resulting Parkland DCC

Low Density Residential	$1,266	per dwelling unit	(e) x Col. (2)
Medium Density Residential	$989	per dwelling unit	(e) x Col. (2)
High Density Residential (1)	$673	per dwelling unit	(e) x Col. (2)
High Density Residential (2)	$554	per dwelling unit	(e) x Col. (2)
Commercial	$3.56	/m^2 gross floor area	(e) x Col. (2)
Industrial	$17,805	/ha gross site area	(e) x Col. (2)
Institutional	$4.26	/m^2 gross floor area	(e) x Col. (2)

Parkland DCCs

Since people generate the need for park and open space, DCCs are based on the relative impact of each land use according to the same equivalent population factors that were used to derive sanitary and water DCCs. If non-residential land uses have been considered to benefit from the provision of parkland (discussion in Chapter 2) and thus will be charged DCCs, then equivalent populations for these uses must be determined as well.

To obtain a schedule of parkland DCCs, the following steps should be completed:

- determine the total equivalent population;
- divide the net DCC recoverable amount by the total equivalent population to obtain a per capita DCC; and,
- multiply the DCC per capita by the population density for the respective development unit.

For the collection of DCCs for improving parkland, the Inspector of Municipalities will be guided by the elements which are specifically listed in the legislation. The following comments are offered as an illustration of what will guide reviews of submissions to the Inspector of Municipalities.

- Landscaping includes the construction of playing fields (levelling ground, planting grass and other plant material), but does not include the construction of parking lots or access roads.
- Irrigation includes sprinkler systems.
- Playground and playing field equipment includes items normally classified as equipment such as swings and slides, but does not include buildings or structures such as dugouts, bleachers, or field houses. The term also does not include the construction of tennis or basketball courts, baseball diamonds, tracks or the installation of lighting systems.

A sample parkland DCC calculation is provided in Example 7.8.

EXAMPLE 7.8 – Parkland DCC Calculation

A: Equivalent Population Calculation

Land Use	Estimated New Development	Equivalent Population Factor		Equivalent Population
Low Density Residential	1,985 dwelling units	3.2	persons per dwelling unit	6,352
Medium Density Residential	827 dwelling units	2.5	persons per dwelling unit	2,068
High Density Residential (1)	331 dwelling units	1.7	persons per dwelling unit	562
High Density Residential (2)	165 dwelling units	1.4	persons per dwelling unit	232
			Total Equivalent Population	**9,213 (a)**

B: Unit DCC Calculation

Net Parkland DCC Program Recoverable	$6,627,922	(b)
Existing Parkland DCC Reserve Monies	$(362,706)	(c)
Net Amount to be Paid by DCCs	$6,265,216	(d) = (b) – (c)
DCC per Equivalent Person	$680.02	(e) = (d) / (a)

C: Resulting Parkland DCC

Low Density Residential	$2,176	per dwelling unit	(e) x Col. (2)
Medium Density Residential	$1,700	per dwelling unit	(e) x Col. (2)
High Density Residential (1)	$1,156	per dwelling unit	(e) x Col. (2)
High Density Residential (2)	$952	per dwelling unit	(e) x Col. (2)

Chapter 8 – Bylaw Presentation

This chapter outlines how the DCC bylaw and supporting documentation should be presented, once the charges have been determined using the appropriate DCC calculation methodology. A comprehensive but clear compilation of all data, assumptions, rationales, and calculations is important for three reasons:

- to assist in the Ministry's review of the bylaw;
- to facilitate monitoring and tracking of projects after the bylaw has been adopted; and,
- to serve as a good starting point for future bylaw amendments.

Legislative Basis

Section 934 (5) of the *Local Government Act* states that a local government must make available to the public the information used to formulate DCCs such as considerations, information, and calculations, with the exception of the contemplated acquisition costs of specific properties.

Further, the guiding principle of accountability requires that DCCs be developed through a transparent process. Therefore, all documentation related to the charges should be accessible as well as understandable to the stakeholders.

DCC Bylaw

A DCC bylaw is a relatively brief document with the standard preamble clauses and bylaw features. A section on definitions or calculation of area may be helpful.

The DCC rates for the various categories of infrastructure are usually presented in a series of Schedules that accompany the bylaw. The schedules should summarize the charges for the applicable land uses, based on the representative unit of development.

Supporting Documentation

All data, assumptions, and rationale used to develop DCCs should be included in a supporting document to the DCC bylaw. This background report, accompanied by the bylaw will be reviewed by the Ministry before statutory approval is granted. It will also be made available to the public, upon request.

The supporting documentation will allow the validity of the assumptions made in formulating the proposed DCCs to be monitored over time. As the need for revisions becomes evident, an update to the DCC program can easily be made, if the assumptions are clearly laid out.

The background report should be written in plain language so that it will be easily understood by all stakeholders. Information in the report should include a summary of capital cost and revenue assumptions as well as an outline of the various methodologies used to derive the charges.

A suggested table of contents for the DCC bylaw supporting documentation is presented in Table 8.1.

TABLE 8.1 – Suggested Table of Contents for DCC Background Report		
Executive summary		
1.0	Introduction	
	1.1	Objectives
	1.2	Background
	1.3	Guiding Principles
	1.4	Use of Best Practice Guides
2.0	General Considerations	
	2.1	Legislative and Regulatory Background
	2.2	Public Participation Process
	2.3	Bylaw Exemptions
	2.4	Collection Charges
	2.5	In-Stream Applications
	2.6	Municipal Assist Factor
3.0	Growth Projections and Planning Assumptions	
	3.1	Relationships to Other Municipal Documents
	3.2	Estimation of New Development
	3.3	Projected Residential Development Units
	3.4	Commercial Development Projection
	3.5	Institutional Development Projection
4.0	Road Development Cost Charges	
	4.1	Road DCC Program
	4.2	Traffic Generation and Calculation of Road Impact
	4.3	Development Cost Charge Calculation for Road
	4.4	Breakdown of Road DCC Burden and Projection of Yearly DCC Revenues
5.0	Storm Drainage Development Cost Charges	
	5.1	Storm Drainage DCC Program
	5.2	Imperviousness and Calculation of Equivalent Drainage Units
	5.3	Development Cost Charge Calculation for Storm Drainage
	5.4	Breakdown of Storm Drainage DCC Burden
6.0	Sanitary Development Cost Charges	
	6.1	Sanitary DCC Program

TABLE 8.1 – Suggested Table of Contents for DCC Background Report		
	6.2	Sewage Generation and Calculation of Equivalent Population
	6.3	Development Cost Charge Calculation for Sanitary
	6.4	Breakdown of Sanitary DCC Burden and Projection of Yearly DCC Revenues
7.0	Water Development Cost Charges	
	7.1	Water DCC Program
	7.2	Water Demand and Calculation of Equivalent Population
	7.3	Development Cost Charge Calculation for Water
	7.4	Breakdown of Water DCC Burden and Projection of Yearly DCC Revenues
8.0	Parkland Development Cost Charges	
	8.1	Parkland Acquisition and Improvement DCC Program
	8.2	Calculation of Equivalent Population
	8.3	Development Cost Charges for Parkland
	8.4	Breakdown of Parkland DCC Burden and Projection of Yearly DCC Revenues
9.0	Summary of Development Cost Charges	
	9.1	Summary of Proposed DCCs
	9.2	Comparison to Current DCCs
References		
Appendices		
	A	*Local Government Act* Excerpts
	B	Record of Public Correspondence Received
	C	Project Detail Sheets

Supporting documentation should also include a completed copy of the Ministry Submission Summary Checklist (Appendix A).

APPENDIX A

Ministry of Community Services Submission Requirements

The aim of *the Development Cost Charge Best Practices Guide* is to establish of a framework by which new capital cost burdens are distributed equitably between existing and future development.

The primary objective of the Ministry's review and approval process for DCC bylaws is to ensure that each bylaw is based on sound principles and facts supporting the "framework" set out in the Best Practices Guide.

If the bylaw is well structured and supporting documentation clearly referenced to the Best Practices Guide, the Ministry review time for approval will be expedited and future bylaw amendments should be easier.

The Ministry's review and approval process will examine the rationale for each component of a development cost charge (e.g. eligible projects, capital costs, benefit factors, assist factors, and equivalent population projections). Therefore, a DCC bylaw submission should outline the rationale used in determining each component, especially if the approach chosen does not conform to the Best Practices Guide. All communities have unique features - if the "best practice" does not fit, then an acceptable alternative may be chosen.

To assist the review process, please describe any additional steps or assumptions used beyond those in the Best Practices Guide.

Here are some key tips to help ensure the Ministry can easily assess your submission:

1. If some specific issue does not apply for your particular submission, please note why (this makes clear that a point was not missed by accident).
2. Where a "Best Practice" is not selected, it is useful to include as much explanatory material as possible. For example, the statement that "existing development is adequately serviced" should be supported with information that demonstrates why this is the case. (e.g., the local government has an annual capital program that systematically replaces existing infrastructure. In such a case, supporting documentation should reference the five-year financial plan.)
3. In the category of park land, please include in the submission an analysis, by class, of existing park land, current standards, and quantity expected to be funded by growth. In the category of park land improvements, please include a listing of the improvements to confirm that each item falls within the allowable categories (s. 935 (3)(b)(ii) *Local Government Act*).

The Ministry Submission Summary Checklist follows.

MUNICIPALITY/REGIONAL DISTRICT
MINISTRY OF COMMUNITY SERVICES
SUBMISSION SUMMARY CHECKLIST
(to be completed by local government)
DCC BYLAW(S) NO.(S)

Is this bylaw a ☐ **New DCC Bylaw**
☐ **Major DCC Bylaw Amendment**
☐ **Minor DCC Bylaw Amendment**

Please complete checklist by marking the appropriate boxes, and providing references to background material and other requested information. If DCCs are established on a basis other than the DCC Best Practices Guide, provide a brief explanation for the approach used. If space is insufficient, reference pages in submission where this is covered or append additional pages.

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
1.	Did the development of this DCC bylaw include: ☐ a full public process? ☐ input from stakeholders? ☐ Council input only?	
	Why?	
2.	Are the Road DCCs established: ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why?	
3.	Are the Storm drainage DCCs established: ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why?	
4.	Are the Sanitary sewer DCCs established: ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why?	

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
5.	Are Water DCCs established: ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why?	
6.	Are Parkland and parkland improvement DCCs established: ☐ on a municipal-wide basis? ☐ on an area specific basis?	
	Why?	
	Existing park standards/holdings Park standards for DCC purposes	
7.	Is the DCC time frame: ☐ a revolving program (_______ Years)? ☐ a build out program (_______ Years)? ☐ other?	
	Why?	
8.	Are residential DCC categories established on the basis of: ☐ density gradient? ☐ building form? ☐ other?	
	Why?	
9.(a)	Are residential DCCs imposed on the basis of: ☐ development units? ☐ floor space? ☐ other? If single-family residential DCCs are imposed on the basis of floor space, does the local government have a bylaw in place allowing DCCs to be levied at the building permit stage on fewer than 4 self-contained dwelling units?	
	Why?	

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
9.(b)	Are commercial and institutional DCCs imposed on the basis of: ☐ floor space? ☐ other?	
	Why?	
9.(c)	Are industrial DCCs imposed on the basis of: ☐ gross site area? ☐ other?	
	Why?	
10.	Is the DCC program consistent with: ☐ the *Local Government Act*? ☐ Regional Growth Strategy? ☐ Official Community Plan? ☐ Master Transportation Plan? ☐ Master Parks Plan? ☐ Liquid Waste Management Plan? ☐ Affordable Housing Policy? ☐ Five Year Financial Plan	
	Why not?	
11.	Are DCC recoverable costs, consistent with Ministry policy, clearly identified in the DCC documentation: ☐ Cost allocation between new and existing? ☐ Grant Assistance? ☐ Developer Contribution? ☐ Municipal Assist Factor? ☐ Interim Financing? ☐ Other	
	Why?	
	Is capital cost information provided for: ☐ Roads? ☐ Storm Drainage? ☐ Sanitary Sewer? ☐ Water? ☐ Parkland? ☐ Parkland improvements?	Ref.______ Ref.______ Ref.______ Ref.______ Ref.______ Ref.______

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
12.	Are DCC recoverable costs which include interest clearly identified in the DCC documentation as follows: ☐ Interest on long-term debt is *excluded*? ☐ For specific projects, interest on long-term debt is *included*? ☐ Other? If interest on long-term debt in included for specific projects, does the DCC submission include: ☐ A council/board resolution authorizing the use of interest? ☐ Confirmation that the interest applied does not exceed the MFA rate or if borrowing has already been undertaken, the actual rate providing it does not exceed the MFA rate? ☐ Confirmation that the amortization period does not exceed the DCC program time frame? ☐ Evidence that the current DCC reserve fund balance is insufficient for the work in question? ☐ Demonstration that the project is an exceptional circumstance (fixed capacity, out-of-sequence, or Greenfield)? ☐ Evidence of public consultation and disclosure in the financial plan and DCC report regarding inclusion of interest?	
13.	Does the municipal assist factor reflect: ☐ the communitys' financial support towards the financing of services for development? ☐ other?	
	Why?	
	Has a municipal assist factor been provided for: ☐ Roads? Assist factor ________% ☐ Storm Drainage? Assist factor ________% ☐ Sanitary Sewer? Assist factor ________% ☐ Water? Assist factor ________% ☐ Park land? Assist factor ________% ☐ Park land improvements? Assist factor ________%	
14.	Are DCCs for single family developments to be collected: ☐ at the time of subdivision approval? ☐ other?	
	Why?	

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
15.	Are DCCs for single-family land uses to be collected: ☐ at the time of subdivision? ☐ at the time of building permit issuance?	
	Why?	
16.	Is a DCC monitoring and accounting system to provide a clear basis for the tracking of projects and the financial status of DCC accounts: ☐ in place? ☐ to be set up?	
	Why not?	
17.	Is a suitable period of notification before a new DCC bylaw is in effect, known as a grace period: ☐ provided for? ☐ other?	
	Why not?	
18.(a)	Does the DCC bylaw set out the situations in which a DCC credit or rebate are to be given? ☐ Yes ☐ No	
18.(b)	If no, has Council adopted a policy statement that clearly identifies situations in which a DCC credit or rebate should be given or would be considered by Council? ☐ Yes ☐ No If yes, a copy of the policy statement is included with this submission.	Ref.______
	If no, why not?	

	DCC RECOMMENDED BEST PRACTICE	Submission Page reference
19.	Has a process to provide for minor routine amendments to the DCC bylaw to reflect changes in construction and other capital costs: ☐ been established? ☐ not considered necessary? ☐ other?	
	Why?	
20.	Has a process to provide for major amendments to the DCC bylaw, involving a full review of DCC issues and methodology, to be completed not more than once every five years: ☐ been established? ☐ not considered necessary? ☐ other?	
	Why?	
	Contact ________________ Position ________________ Phone __________ *Signed by ________________________ Position ________________________ (*Signature of the Head of engineering, finance or planning for the local government.) Signed by (second signature optional)________________________ Position ________________________ Date ______________	

MUNICIPALITY/REGIONAL DISTRICT

SUMMARY OF DCCs - BYLAW NO(S).

	Residential (per single family dwelling)	**Commercial** (per square metre)	**Industrial** (per hectare)	**Institutional** (per square metre)
Roads				
Storm Drainage				
Sanitary Sewer				
Water				
Park Land				
Park Land Improvements				
Total				

Note: If not on a municipal-wide basis, please indicate minimum and maximum charges.

For **amendment** bylaw, please indicate nature of change	Existing	Proposed
• New DCC service added		
• Time horizon		
• Capital costs		
• Weighting of types of development (residential, commercial, industrial, etc.)		
• Potential development		
• Allocation of benefit between existing and potential units of development		
• Assist factor		
• Inclusion of Specific Interest Charges		
• Provide that a charge is payable where there is fewer than 4 self-contained dwelling units		
• Establish an amount higher than the $50,000 minimum provided for in the *Local Government Act*.		
• Is a suitable period of notification before a new DCC bylaw in effect, known as a grace period?		
Other: (please list) • ____________ • ____________		

APPENDIX B

B.C. Reg.166/84
Regulation of the Minister | Deposited June 5, 1984

Local Government Act

DEVELOPMENT COST CHARGE (INSTALMENTS) REGULATION

[includes amendments up to B.C. Reg. 58/85]

Definitions

1 In this regulation:

"charge" means a development cost charge imposed under section 933 (6) of the *Local Government Act* for a subdivision approval or grant of a building permit;

"developer" means every person on whom a charge is imposed.

Payment may be by instalment

2 A developer liable to pay a charge may elect to pay it by instalments, subject always to the conditions set out in sections 3 to 7.

Exception

3 Section 2 does not apply where the charge is under $50 000 unless the council has by bylaw authorized that all charges under $50 000 imposed within its jurisdiction may be paid by instalments in accordance with this regulation.

Payment of charge in full

4 The developer shall pay the charge in full within 2 years after the date that the subdivision is approved or the building permit is granted by paying not less than

(a) 1/3 of the total charge at the time of the approval of the subdivision or granting of the permit, and

(b) 1/2 of the balance within one year after the date of the approval of the subdivision or granting of the permit.

Failure to pay

5 Where a developer elects to pay the charge by instalments and fails to pay an instalment within any time required for payment by section 4, the total balance of the charge becomes due and payable immediately.

Interest

6 No interest is payable on the unpaid balance of a charge until it becomes due and payable, but when it does, it is a condition of election under section 2 that interest is payable from that date until payment at the rate or rates prescribed under section 11 (3) of the *Taxation (Rural Area) Act* for the period of non-payment.

Surety for payment by instalment

7 A developer electing to pay a charge by instalments must deposit with the treasurer at the same time as he pays the first instalment

(a) an irrevocable letter of credit or undertaking from a bank, credit union or a trust company registered under the *Financial Institutions Act*, or

(b) a bond of a surety licensed under the *Insurance Act*, or

(c) a security duly assigned which ensures to the satisfaction of the treasurer that upon default the balance of the unpaid charge will be recoverable from the person, the bank, the surety or from the proceeds of the realization of the security, as the case may be.