APPENDIX 15

Capacity Planning

The core area wastewater system will be designed to deal with wastewater from the following sources:

- Residential populations
- Industrial, commercial and institutional (ICI) sources
- Infiltration and inflow (I&I)

Information regarding each of these contributors is provided in the following sections, along with discussion of how appropriate I&I reduction and water conservation programs can reduce these flows. Appendix 14 deals in more detail with I&I reduction strategies.

The design flows listed in this section will serve existing populations, businesses and institutions, with a modest allowance for growth, and will reflect commitments to effective water conservation and I&I reduction programs.

Residential Populations

A number of information sources were used to estimate existing and future populations. These include municipal Official Community Plans and CRD regional planning population projections.

The following table provides a summary of populations and projected populations from the Official Community Plans of the seven participating municipalities.

Table 15.1
Official Community Plan Populations and Projected Populations

Municipality	OCP Adopted	Population @ OCP adoption	Projected Population
Oak Bay	1997	19,900	--
Victoria	1995	71,200	87,000 (2020)
Esquimalt	2007	17,100	21,000 (2026)
Saanich	2008	113,500	119,300 (2026)
View Royal	1999	6,500	10,800 (build-out)
Colwood	2008	15,500	32,480 (2028)
Langford	2008	24,900	27,244 (2028)

CRD Regional Planning, using a variety of sources, estimates that future populations in the Plan area will be as indicated in Table 15.2. This table was reproduced as Table 2 in Discussion Paper 033-DP1 (available on the CRD website www.WastewaterMadeClear.com).

Table 15.2
CRD Total (Sewered and Unsewered) Population Estimates
(From Table 2 of Discussion Paper 033-DP-1)

	2006 Population	Avg. Annual Growth Rate (2006-2015)	2015 Population	Avg. Annual Growth Rate (2015-	2045 Population	Avg. Annual Growth Rate (2045-2065)	2065 Population
Oak Bay	18,059	0.1%	18,222	0.1%	18,777	0.1%	19,175
Victoria	78,659	1.0%	86,028	0.5%	99,913	0.1%	102,032
Esquimalt	17,407	0.5%	18,206	0.5%	21,145	0.1%	21,593
Saanich	110,737	0.5%	115,821	0.5%	134,515	0.1%	137,368
View Royal	8,375	2.0%	10,009	1.5%	15,645	1.0%	19,280
Colwood	15,470	2.0%	18,488	1.5%	28,698	1.5%	39,506
Langford	22,229	5.1%	32,462	2.9%	60,851	1.5%	81,958
Total	**270,936**		**299,236**		**379,544**		**420,912**

The populations indicated in the above table are total estimated populations, not sewered populations. In Oak Bay, Victoria and Esquimalt the total and sewered populations are essentially the same. Colwood, Langford, View Royal and Saanich have substantial unsewered populations, but with the exception of Saanich, these are expected to be mainly serviced by 2030.

The following table provides information on the number of dwellings per municipality currently connected to onsite systems with an estimate of the populations using these systems.

Table 15.3
Estimated Current Populations Using Onsite Systems

Municipality	Dwelling Count	Estimate Population
Colwood	3,860	2.7 x 3,860 = 10,422
Langford	4,109	2.6 x 4,109 = 10,683
Saanich	2,524	2.6 x 2,524 = 6,562
View Royal	99	2.7 x 99 = 267
Totals	**10,592**	**27,934**

The Dockside Green development in Victoria is served by its own wastewater treatment and disposal system. Its Operating Certificate from the Ministry of Environment permits a maximum rate of discharge to Victoria Harbour of 380 m^3/day, but under non-compliant operating conditions, the development is required to discharge to Victoria's sewer system.

Industrial, Commercial and Institutional (ICI) Equivalents

Discussion paper 033-DP-1 (Kerr Wood Leidal, January 2009) provides estimates for the population equivalents, from a wastewater generation perspective, of industrial, commercial and institutional development in the Plan area. The consultant relied on nine reports prepared on the CRD's trunk sewer systems between 1994 and 2008, as listed in Table 1 of discussion paper 033-DP-1. Typical ICI population equivalents resulting from these studies is shown in Table 15.4

Table 15.4
Typical ICI Parameters
(from Table 3 of Discussion Paper 033-DP-1)

Land Use	Population Equivalent per Hectare
Industrial	25
Commercial	90
Institutional	50

Tables 15.5 and 15.6 summarize data taken from discussion paper 033-DP-1 on residential, ICI and total equivalent populations served by municipal sewer systems in the Plan area.

Table 15.5
Sewered Residential and ICI Estimates by Municipality 2005 – 2030
(From Table 4 of Discussion Paper 033-DP-1)

	2005			2015			2030		
	Residential	ICI	Total PE	Residential	ICI	Total PE	Residential	ICI	Total PE
Saanich	110,730	31,860	142,590	115,944	35,368	151,312	126,393	40,120	166,513
Victoria	78,658	37,341	115,999	86,057	46,115	132,172	92,566	49,168	141,735
Esquimalt	17,412	6,773	24,185	18,206	7,411	25,617	18,667	8,199	26,866
Langford	8,547	4,542	13,089	24,988	13,279	38,267	48,672	25,865	74,537
Colwood	5,389	3,010	8,400	9,779	7,137	16,916	24,942	9,606	34,548
View Royal	8,372	4,693	13,065	10,009	4,693	14,702	12,512	10,460	22,972
Oak Bay	18,075	6,033	24,108	18,237	6,899	25,135	18,514	7,790	26,304

Table 15.6
Sewered Residential and ICI Estimates by Municipality 2030 – 2065
(From Table 4 of Discussion Paper 033-DP-1)

	2030			2045			2065		
	Residential	ICI	Total PE	Residential	ICI	Total PE	Residential	ICI	Total PE
Saanich	126,393	40,120	166,513	134,773	49,651	184,424	137,614	50,693	188,307
Victoria	92,566	49,168	141,735	99,239	52,350	151,589	101,216	53,397	154,612
Esquimalt	18,667	8,199	26,866	21,153	8,987	30,140	21,581	17,991	39,572
Langford	48,672	25,865	74,537	60,852	32,337	93,189	81,958	43,554	125,512
Colwood	24,942	9,606	34,548	40,623	12,075	52,697	57,278	17,019	74,297
View Royal	12,512	10,460	22,972	15,640	16,226	31,867	19,276	19,991	39,267
Oak Bay	18,514	7,790	26,304	18,816	7,854	26,670	19,183	8,003	27,187

Inflow and Infiltration

The third contributor to wastewater quantities, in addition to flows from residential populations and industrial, commercial and institutional sources, is flow resulting from infiltration and inflow (I&I) of stormwater into sanitary sewer systems. I&I becomes particularly significant during wet weather and tends to increase as systems age. In addition, as indicated in discussion paper 033-DP-1, climate change is expected to result in increased winter rainfall, with a related potential increase in I&I rates.

The design flow tables provided in discussion paper 033-DP-2 assume that the municipalities and the CRD will invest sufficiently in aging systems to fully compensate for the effects of infrastructure decay and climate change. It is estimated that about 1% of the replacement cost of existing systems will need to be invested annually to achieve this goal.

The I&I estimates used in the design flow tables are based on extensive flow monitoring carried out over more than a decade on the CRD and municipal collection systems.

The proposed I&I reduction program is described in Appendix 14.

Water Conservation

Nearly 30% of municipal water in Greater Victoria is used by ICI sectors. Since water conservation programs were introduced by the CRD in the mid 1990s, the total annual water consumption per capita has decreased by about 8% as a result of a variety of initiatives (see Appendix 13 for details).

In addition to CRD water conservation programs, some municipalities have implemented charging for sewer system costs based on metered water use (usually winter water use). This provides an additional incentive to reduce indoor water use.

Several fact sheets, manuals and brochures and a website (www.crd.bc.ca/water/conservation) have been developed to support the CRD water conservation programs.

Design Capacity Planning for Wastewater

Design wastewater flows are derived from flows from residential populations, industrial, commercial and institutional sources and flows resulting from infiltration and inflow of surface water and ground water into the sanitary sewer systems. Schedule 3 of the BC Municipal Sewage Regulation (MSR) requires that, for discharges to open marine waters, secondary treatment be provided for daily flows up to 2 times the average dry weather flow (ADWF) and primary treatment for flows greater than this. ADWF is defined in the MSR as “the daily municipal sewage flow to a sewage facility that occurs after an extended period of dry weather such that the inflow and infiltration has been minimized to the greatest extent practicable.”

Based on the above, the following tables indicate the proposed level of treatment for dry weather and wet weather flows at the various treatment plant locations.

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Table 15.7
Saanich East Design Hydraulic Flows
(applies to Option 1a as described in the Stantec report listed at the end of this section)

Item	2030		2065	
	Flow (ML/d)	Treatment	Flow (ML/d)	Treatment
ADWF	16.6		17.2	
1.75 ADWF	29.0[1]	Secondary	30.1	Secondary (MBR)
1.75 ADWF – 4 ADWF	37.4	Primary	43.0	Primary
Filtration for Reuse	29.0	≈12 ML/d guaranteed[2]	30.1	≈12 ML/d guaranteed
Biosolids		Discharge to downstream treatment		Discharge to downstream treatment

[1] By combining the 1.75 ADWF of high quality MBR effluent with 0.25 ADWF of primary effluent, the secondary treatment requirement for 2 ADWF can be easily met.
[2] The amount of highly treated reuse water that can be always available is something less than the ADWF.

Table 15.8
Clover Point Design Hydraulic Flows
(applies to Option 1a as described in the Stantec report)

Item	2030		2065	
	Flow (ML/d)	Treatment	Flow (ML/d)	Treatment
ADWF	37.8		37.1	
2 ADWF	75.6	Transfer to downstream for secondary treatment	74.2	Transfer to downstream for secondary treatment
2 ADWF – 4 ADWF	75.6	Primary	74.2	Primary
>4 ADWF	≈40	Screening	≈40	Screening
Biosolids		Discharge to downstream treatment		Discharge to downstream treatment

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Table 15.9
McLoughlin Point Design Hydraulic Flows
(applies to Option 1a in the Stantec report)

Item	2030		2065	
	Flow (ML/d)	Treatment	Flow (ML/d)	Treatment
ADWF (tributary)	46.4		50.4	
2 x ADWF (tributary)	92.8	Secondary	100.8	Transfer to downstream for secondary treatment
2 x ADWF (from Clover)	75.6	Secondary	74.1	
Total design flow of 2 x ADWF	168.4	Secondary	174.9	Primary
2 x ADWF – 4 x ADWF (tributary)	92.8	Primary	100.8	Primary
>4 ADWF (tributary)	≈50	Screening	≈55	Screening
Filtration for Reuse	12		24	
Biosolids		To separate site		To separate site

Table 15.10
West Shore Design Hydraulic Flows
(applies to Option 1a in the Stantec report)

Item	2030		2065	
	Flow (ML/d)	Treatment	Flow (ML/d)	Treatment
ADWF	24.1		38.3	
2 x ADWF	48.2	Secondary	76.6	Secondary
4x ADWF –2 x ADWF	48.2	Primary	76.6	Primary
Filtration for Reuse	6	Post-filtration	18	Post-filtration
Biosolids		Onsite treatment		Onsite treatment

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