March 4, 2016

File: 1692.0037.01

Capital Regional District (CRD)
625 Fisgard Street, PO Box 1000
Victoria, BC V8W 2S6

Attention: **Larisa Hutcheson; GM Parks and Environmental Services**

RE: **Core Area Wastewater - Analysis Summary for Motions of February 26 and March 2, 2016: Cost and Option Set Alternatives**

The *Core Area Liquid Waste Management Committee* (the Committee) is considering multiple option sets for wastewater treatment and resource recovery. Phase 2 comprises technical and financial analysis as well as public consultation to provide foundational information to the Committee to set levels of service, identify facility locations and define amendments to the Liquid Waste Management Plan.

Phase 2 analysis and findings encompass seven option sets ranging from centralized to distributed, secondary to tertiary, and solids recovery technologies and locations. While continuing to consider these seven option sets, the Committee would like to explore options to reduce conveyance costs at already proposed and new locations. This technical letter summarizes analysis stemming from motions of the February 26 and March 2 meetings which is to study elements of preliminary *value engineering*, including contracting levels of service for key elements and to study costing at alternative treatment locations: the information provided in this memo supports Committee is making a decision on a new plan for Core Area liquid waste management.

Motions and Staff direction arising from the February 26 and March 2 meetings include the following cost and option set alternatives:

1. **Costing and feasibility information to reduce the overall costs for a central, tertiary plant at Rock Bay** (i.e. cost saving potential for Option 1b Rock Bay tertiary, at the conceptual planning stage).

2. **3 Plant Tertiary Option:** *two tertiary plants and 1 primary plant to serve two catchments to reduce conveyance costs.*

    a) Costing and feasibility information for two tertiary plants at McLoughlin/Macaulay and Rock Bay with consideration to a primary plant at Clover Point to reduce the scope of conveyance infrastructure through urban areas of Victoria.
        - Flows from the East Coast Interceptor undergo primary treatment at Clover Point (maximizing known available land of <0.5ha at Clover Point) with 0x to 2x dry weather flows conveyed to Rock Bay for tertiary treatment
        - Flows from the Macaulay catchment treated to a tertiary level at McLoughlin (where suitable land space exists)

- Provision for a future plant in Colwood/Langford to accommodate flows for the Westshore beyond 2030
- All solids conveyed to Hartland Landfill for processing and potential integrated resource recovery

3. **2 Plant Configuration at Sites Adjacent the Outfalls:** *two plants to serve two existing catchments with new facilities located at sites adjacent the outfalls to largely eliminate conveyance costs.*

   b) Costing and feasibility information for two tertiary treatment plants for flows from the two existing sewer catchments (Clover Point and Macaulay Point) at McLoughlin/Macaulay and Clover Point sites.
      - Flows from the East Coast Interceptor would be treated to tertiary level at Clover Point, by means of an ultra-compact facility, with site feasibility confirmed by CRD Staff
      - Flows from the Macaulay catchment treated to a tertiary level at McLoughlin (where suitable land exists)
      - Provision for a future plant in Colwood/Langford to accommodate flows for the Westshore beyond 2030
      - All solids conveyed to Hartland Landfill for processing and potential integrated resource recovery

Analysis Summary

Overall Cost Alternative Considerations

The Committee's interest in cost reductions and cost alternatives at the planning-comparison stage is best met by contracting, eliminating or deferring select infrastructure. Future value-engineering exercises will uncover more detailed information which will inform contingencies and likely reduce overall costs, however those decisions are based on the results of subsequent design phases. Cost-alternatives and reductions for select infrastructure based on the motions arising from February 26 and March 2, include:

a) **Defer the installation of water reuse systems** to save initial capital costs and allow for gradual installation of reuse systems as warranted. There are no water reuse systems in any of the three option set alternatives.

b) **Defer upgrades to the existing long outfalls** (>1,500m) because their condition is likely adequate to carry beyond the 2030 design scenario.

c) **Install moderate-length outfalls (250m) for tertiary quality water** at Clover and/or Macaulay Points to avoid upsizing the long outfalls for future flows.

d) **Eliminate the Barnhard Pump Station** in option sets with 2 or more plants to eliminate the cost of conveying flows from the Macaulay catchment (flows from West Saanich and Vic West) back to eastside plants (previously included to respect municipal service governance)

e) Include the costs to convey solids to Hartland Landfill however these costs are separated from the base total to allow for a straight-line comparison to the costs of the option sets previously presented to the Committed (which accounted for a solids recovery plant in Rock Bay)

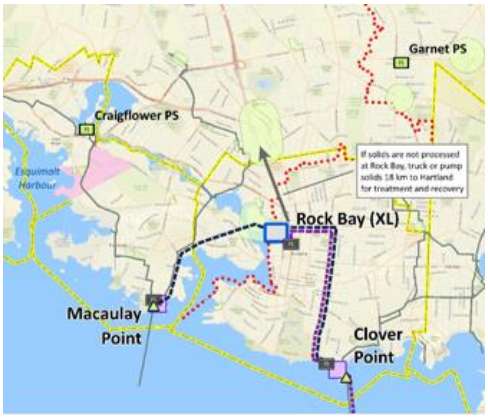
Considerations for a Westshore Plant (e.g. Colwood, Langford) for 2030

Each of the two new option set alternatives that include the McLoughlin site also include the provision for a Westshore plant serving Colwood and or Langford. Multiple option sets prepared for both the *Westside Select Committe*e and the *Core Area Committee* during Phase 2 provide key insights into the cost feasibility of a plant there.

A Westshore plant is considered suitable and more cost-effective for the future, toward 2045, so as to locate additional treatment capacity for growth, near the actual location of growth. Including a plant in the option set alternatives for the 2030 scenario would increase overall costs because of the loss in economies of scale for smaller plants and more significantly, due to the need for additional infrastructure to convey treated effluent to either Macaulay Point or a new outfall.

Cost and Technical Feasibility Results for Three Option Set Alternatives

Results summaries per option set outline the considerations and cost reductions with each of the three option set alternatives. Overall considerations follow the technical results table, to support upcoming Committee dialogue.

Map	Description + Cost Alternatives
	**1 Plant Rock Bay Tertiary** Central, tertiary plant at Rock Bay. ***Cost Management*** • Defer water reuse until there are sufficient connections for a system • Defer upsize to existing outfalls; instead install 250m outfalls for higher quality effluent • Although not reflected in costs in this letter, further optimization could reduce costs through conveyance • Cost reduced by $54M Capital 2030 Cost: **$1,077M**

Map	Description + Cost Alternatives
	**3 Plant: Clover Pt., McLoughlin and Rock Bay Tertiary** 2 tertiary plants and 1 primary plant to serve both catchments and to reduce conveyance costs. ***Cost Management*** • Reduce size of pipes and pumps from Clover to Rock Bay by up to 45%; • Eliminate Barnhard PS and provide adequate capacity for each existing catchment • Defer water reuse until there are sufficient connections for a system • Defer upsize to existing outfalls; instead install 250m outfalls for higher quality effluent • Suitable land exists at all locations; primary treatment at Clover has a projected footprint of 0.4ha Capital 2030 Cost: **$1,089M**
	**2 Plant: Clover Pt. and McLoughlin Tertiary** Two plants to serve the existing catchments with new facilities located at sites adjacent the outfalls to largely eliminate conveyance costs. ***Cost Management*** • Eliminate conveyance infrastructure from Clover or Macaulay points through urban areas • Defer water reuse until there are sufficient connections for a system • Defer upsize to existing outfalls; instead install 250m outfalls for higher quality effluent • A tertiary plant Clover point requires 1.25ha of land, yet further site analysis and design work is needed to potentially reduce this footprint further. Capital 2030 Cost: **$1,052M**

Overall Cost Considerations for Committee

The results of recent analysis suggest that key cost elements can be eliminated or deferred to manage overall costs. And further, that locating two plants at each outfall is a key strategy to reduce the cost of conveyance and this approach enables greater levels of treatment at similar or less cost to a centralized

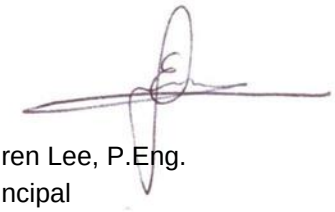
option. However, land availability at Clover Point must be determined if a tertiary plant is to be considered at this location.

Further consideration to the three plant configuration with primary treatment at Clover maximizes the land and sites available as part of the Committee's motion, and reduces the size of conveyance infrastructure, and offers treatment plants at sites with confirmed land areas. Further route optimization through urban areas (a standard but important optimization exercise) is a fundamental need for subsequent design phases, to both lower costs and to minimize impacts to neighborhoods.

Thank you for the opportunity to provide ongoing services to the Committee.

Sincerely,

URBAN SYSTEMS LTD.



Ehren Lee, P.Eng.
Principal

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Cc: Dan Telford, Senior Manager Environmental Services, CRD

Encl: Cost Breakdowns for Three Alternatives

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Cost Components for Option 1b - One Tertiary Plant (x 1000)

Cost Component	Capital Cost Incurred [1]	
	2015	2030
1. Conveyance		
(a) Clover Pt PS and Forcemain to Rock Bay	$ 51,400	N/A
(b) Macaulay Pt PS and Forcemain to Rock Bay	$ 65,400	N/A
(c) Effluent PS and Forcemain to Clover Point	$ 83,900	N/A
(d) Tertiary Outfall Clover	$ 6,500	N/A
Conveyance Subtotal:	$ 207,200	$ -
2. Liquid Treatment (Tertiary)	$ 500,000	$ 220,000
3. Solids Treatment - AD	$ 258,000	$ 90,600
4. Existing System Capacity Upgrades		
(a) Craigflower PS - Constructed	$ 12,100	N/A
(b) Arbutus Attenuation Tank- incl land	$ 20,000	N/A
(c) Siphon Extension (1600 m)	$ 7,500	N/A
(d) Upgrade Currie St PS	$ 2,300	N/A
(e) Upgrade East Coast Interceptor (1400 m)	$ 3,100	N/A
Existing System Subtotal:	$ 45,000	$ -
5. Land Costs*	$ 67,200	N/A
Total:	**$ 1,077,400**	**$ 310,600**
6. Solids Conveyance - All to Hartland	$ 36,400	

[1] Includes all contingencies, engineering, etc. outlined in TM #1

* Land costs include raw land, site development, contingencies and pro-rated mitigation sum; all data sourced by CRD Real Estate.

Cost Components for 3 Plants: Clover-Rock Bay - McLoughlin (x 1000)

Cost Component			Capital Cost Incurred [1] 2015	Capital Cost Incurred [1] 2030
1.	Conveyance - Rock Bay & Clover			
	(a)	Clover Pt PS and Forcemain to Rock Bay	$ 29,600	*TBD*
	(b)	Effluent PS and Forcemain to Clover Point	$ 29,600	*TBD*
	(c)	Clover Pt Primary + Outfall Pumpstations	$ 41,100	*TBD*
	(d)	New Tertiary Only Outfall	$ 4,200	*TBD*
		Conveyance - Rock Bay Subtotal:	$ 104,500	$ -
2.	Liquid Treatment - Rock Bay (Tertiary)		$ 180,700	*TBD*
3.	Liquid Treatment - Clover Point (Primary)		$ 38,700	*TBD*
4.	Conveyance - McLoughlin			
	(a)	Macaulay Pt PS and Forcemain to McLoughlin	$ 54,700	*TBD*
	(b)	Effluent PS to Outfall	$ 44,900	*TBD*
	(c)	New Tertiary Only Outfall	$ 5,700	*TBD*
		Conveyance - McLoughlin Subtotal:	$ 105,300	$ -
5.	Liquid Treatment - McLoughlin (Tertiary)		$ 293,100	*TBD*
6.	Solids Treatment - AD at Hartland		$ 258,000	*TBD*
7.	Existing System Capacity Upgrades			
	(a)	Craigflower PS - Constructed	$ 12,100	N/A
	(b)	Arbutus Attenuation Tank- incl land	$ 20,000	N/A
	(c)	Siphon Extension (1600 m)	$ 7,500	N/A
	(d)	Upgrade Currie St PS	$ 2,300	N/A
	(e)	Upgrade East Coast Interceptor (1400 m)	$ 3,100	N/A
		Existing System Subtotal:	$ 45,000	$ -
8.	Land Costs*		$ 63,500	N/A
		SubTotal	**$ 1,088,800**	*TBD*
9.	Solids Conveyance - All to Hartland		$ 47,800	*TBD*

[1] Includes all contingencies, engineering, etc. outlined in TM #1

* Land costs include raw land, site development, contingencies and pro-rated mitigation sum; all data sourced by CRD Real Estate.

Cost Components for 2 Plants: Clover - McLoughlin (x 1000)

Cost Component			Capital Cost Incurred [1]	
			2015	2030
1.	Conveyance - Clover			
	(a)	Clover Pt RS + TE Pumpstations	$ 54,500	*TBD*
	(b)	New Tertiary Only Outfall	$ 4,200	*TBD*
		Conveyance - Clover Subtotal:	$ 58,700	$ -
2.	Liquid Treatment - Clover Point (Tertiary)		$ 219,400	*TBD*
3.	Conveyance - McLoughlin			
	(a)	Macaulay Pt PS and Forcemain to McLoughlin	$ 54,700	*TBD*
	(b)	Effluent PS to Outfall	$ 44,900	*TBD*
	(c)	New Tertiary Only Outfall	$ 5,700	*TBD*
		Conveyance - McLoughlin Subtotal:	$ 105,300	$ -
4.	Liquid Treatment - McLoughlin (Tertiary)		$ 293,100	*TBD*
5.	Solids Treatment - AD at Hartland		$ 258,000	*TBD*
6.	Existing System Capacity Upgrades			
	(a)	Craigflower PS - Constructed	$ 12,100	N/A
	(b)	Arbutus Attenuation Tank- incl land	$ 20,000	N/A
	(c)	Siphon Extension (1600 m)	$ 7,500	N/A
	(d)	Upgrade Currie St PS	$ 2,300	N/A
	(e)	Upgrade East Coast Interceptor (1400 m)	$ 3,100	N/A
		Existing System Subtotal:	$ 45,000	$ -
7.	Land Costs*		$ 72,000	N/A
		SubTotal	**$ 1,051,500**	*TBD*
8.	*Solids Conveyance - All to Hartland*		*$ 48,300*	

[1] Includes all contingencies, engineering, etc. outlined in TM #1

* Land costs include raw land, site development, contingencies and pro-rated mitigation sum; all data sourced by CRD Real Estate.