global environmental solutions

Organic Waste Management Strategy
Regional District of Okanagan Similkameen

TASK 8 - TRIPLE BOTTOM LINE ANALYSIS MEMO

September 2016
SLR Project No.: 209.40329.00000

The preparation of this feasibility study was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them."

ORGANIC WASTE MANAGEMENT STRATEGY

TASK 8 - TRIPLE BOTTOM LINE ANALYSIS MEMO

SLR Project No.: 209.40517.00000

Prepared by
SLR Consulting (Canada) Ltd.
200 – 1620 West 8th Avenue
Vancouver, BC V6J 1V4

for

REGIONAL DISTRICT OF OKANAGAN SIMILKAMEEN
PUBLIC WORKS DEPT
101, MARTIN ST
PENTICTON, BC V2A 5J9

FINAL – September 7 2016

Prepared by:

Ben Arnold, M.Sc, B.Sc, MCIWM
Technical Director

Reviewed by:

Mark Sungaila, M.A.Sc., P.Eng., PMP
Principal Engineer

CONFIDENTIAL

Distribution: 1 copy –RDOS
1 copy – SLR Consulting (Canada) Ltd.

TABLE OF CONTENTS

TABLES

1.0 INTRODUCTION

This Memo is part of a series of assignments commissioned by the Regional District of Okanagan Similkameen (RDOS) from SLR, in connection with the development and implementation planning of a strategy for the management and diversion from landfill of the organic fraction of municipal solid waste (MSW).

1.1 Objective

The objective of this Triple Bottom Line Analysis Memo is to analyze the combined effects of a number of defined parameters which will assist in the selection of preferred options for managing organic waste generated in RDOS. This Memo provides the following:

- An overview of the TBL process;
- Derivation of input parameters;
- The results of the analysis; and
- A discussion of the results.

2.0 OVERVIEW

Triple Bottom Line is a generic description for any analysis of options which involves a selection of criteria which comprise financial, environmental and social parameters. The scope and detail of analysis is highly variable between different projects and is dependent upon the nature and extent of available source data and the ultimate objectives of the project Proponent.

The RDOS is engaged in a process of exploring and weighing a range of different options for the management of organic waste in the RD. There are a very wide range of variables to be considered in concluding an optimum approach and this is made more complex by the following factors;

- The RD is at this stage undecided as to whether new processing facilities will be developed in-house, developed on a public-controlled site through RfP by a private contractor, or procured by direct contract with a private sector provider;
- While there are some preferred technologies for organic waste processing, it is not appropriate for this to be finalised at this stage;
- The management of biosolids is a critical issue in the RD and the options for combining treatment of food scraps need to be fully considered, not least in terms of the potential financial benefits for the relevant Municipalities.

A Lifecycle Costing Analysis has been carried out by SLR on the basis of an agreed set of scenarios, which are described in our Task 7 Lifecycle Costing Memo, dated Aug 2016. These scenarios include a series of assumptions regarding possible approaches to organic waste collection, transfer, processing and product sale. These derive from dialogue with RDOS regarding the exclusion of other options, which for financial or operational reasons are considered less likely to offer overall benefits to the RD at this time and in recognition of the difficulty of fully considering all possible options, due to budgetary constraints.

3.0 INPUT PARAMETERS

In discussion with RDOS it has been recognized that there is a wide range of potential TBL criteria which are not yet relevant for consideration in the analysis. This is due to the various complexities

outlined above and the fact that it is still too early in the decision making process to develop a consensus view on the significance of some of the possible criteria.

For this reason the TBL analysis has focussed down onto the four main parameters which are recognized to be the primary influencers of the decision making process, at this stage. These are described below together with the derivation of the data used in the TBL analysis.

3.1 Greenhouse Gas Impacts

A reversal in the long term upward trend of carbon impacts on climate change has been a feature of government policy at all levels for some time. Indeed, a reduction in greenhouse gas (GHG) emissions is one of the primary purposes of seeking to divert organic waste away from landfill.

As part of SLR's Task 7 Lifecycle Costing work we have also prepared a GHG Memo (Aug 2016) which looks at the net cumulative impacts of each of the modelled scenarios in terms of the avoided carbon emissions. These are achieved primarily by the diversion of organic waste from landfill, against which must be set the emissions relating to:

- transporting organic waste to a processing facility;
- constructing the processing facility, and
- operating the processing facility.

Full details of the derivation of net avoided carbon emissions are described in the GHG Memo. **Table 2-5** of the memo sets out the calculated net carbon emissions savings, as tonnes of CO_2 equivalent per annum and it is these figure that are used in the TBL analysis.

3.2 Transport Impacts

There is a recognition that an increase in truck traffic relating to hauling waste materials can have a disproportionately high impact on community perceptions of the impacts of waste management. In order to try and account for this effect we have assumed that segregated organic waste will drive from a defined point in each Municipality (typically the local landfill, where garbage will be deposited from split-packer trucks).

The weekly vehicle-kilometres travelled on non-provincial highways through residential areas were then measured in order to represent a proxy for potential transport impacts. Distance travelled on provincial highways was excluded from consideration, as these roads are recognized as the primary distributor network for truck traffic within the Okanagan.

3.3 Odour Impacts

As part of the Organics Study, RDOS has commissioned the modelling of potential odour impacts from various potential locations for an organic waste processing facility. These include all of the locations considered in the various LCA scenarios, with the exception of the possible Anaerobic Digestion facility to be located at the City of Penticton WWTP. Potential odour impacts have been measured in terms of the number of homes in the vicinity of the study sites which are on average likely to experience an odour level of 5 or 10 Odour Units (OU) over a 10 minute period in any year.

The odour modelling process is reasonably robust and repeatable so should form a good basis for defining relative impacts. The number of homes which could be subject to a 5OU impact for 10 mins in any year appeared to be a reasonable proxy for the likelihood of odour complaints. This therefore forms the basis of the raw data column in the TBL analysis table.

For the Penticton WWTP facility, we have assumed that a) odour management from the AD plant will be at least as good if not better than the best of the aerobic composting processes and b) odour perception in the vicinity of the plant is starting from a different (i.e. higher) base than would be the case with a new in-vessel composting facility, located on a new site. The WWTP scenario has therefore been given a nominal raw data figure of zero homes experiencing a 5OU odour level (i.e. the same as for Summerland, the best performing host site for a central composting facility), in the absence of any specific modelling data.

3.4 Lifecycle Costs

The Lifecycle Costing Memo (Aug 2016) sets out full details of the basis upon which costs have been estimated for the collection, transfer, processing and end product sales of organic wastes. Table A1 of this memo sets out the calculated total costs of each scenario and these have been used directly in the TBL analysis.

3.5 Scaling the Data

The TBL analysis involves the comparison of a variety of data sources which use different units of measurement. In order to achieve a standard measure of significance, the scenario(s) which generate the most positive benefit, or least impact, have been allocated a score of 3 and those with least positive benefit, or greatest impact, have been allocated a score of 1. All other scores between these two end points are then calculated on a linear pro-rata basis, by interpolation.

3.6 Weighting

An important part of the TBL process is the opportunity to apply weightings to each of the financial, environmental or social parameters considered, in order to reflect the local circumstances and aspirations in the RD. While the derivation of raw data is usually a fairly rigorous technical process the determination of weighting factors is however a more subjective process.

In discussion with RDOS, weighting has been deferred until further discussion with the project Steering Committee, Board and Councils and Public Consultation.

4.0 RESULTS OF ANALYSIS

Results of the analysis are set out in **Table 1** below, which includes the raw data for each of the parameters, the scaled scores from 1 to 3, together with the relative ranking of each of the scenarios for each parameter.

Table 1 - Triple Bottom Line Analysis

RDOS - Organics Study V5

Triple Bottom Line Analysis

Organics management option				GHG Impacts[1]			Transport Impacts[2]			Odour Impacts[3]			Life Cycle Costs[4]		
Biosolids treatment	Organics collection system	Option number	Treatment facility	Raw data (Net t CO_2e yr)	Scaled Score	Relative Ranking	Raw data (Vehicle-Km)	Scaled Score	Relative Ranking	Raw data (No. of homes)	Scaled Score	Relative Ranking	Raw data ($/t)	Scaled Score	Relative Ranking
Existing biosolids arrangements	Separate yard and food	1	PIB Locatee IVC	3,955	1.93	7	6	2.25	18	31	2.38	18	136	2.08	26
		2	Golden Mile IVC	3,924	1.87	8	8	2.00	22	100	1.00	26	141	1.96	30
		3	Summerland IVC	3,958	1.93	6	16	1.00	30	0	3.00	1	137	2.05	27
		4	Oliver IVC	3,916	1.86	9	8	2.00	22	5	2.90	10	143	1.92	32
		5	PIB Locatee IVC + local OW	4,019	2.04	2	1	2.88	2	31	2.38	18	133	2.14	25
		6	Golden Mile IVC + local OW	3,985	1.98	4	3	2.63	10	100	1.00	26	139	2.01	29
		7	Summerland IVC + local OW	3,999	2.00	3	5	2.38	14	0	3.00	1	138	2.04	28
		8	Oliver IVC + local OW	3,975	1.96	5	2	2.75	6	5	2.90	10	142	1.95	31
	Mixed yard and food	9	PIB Locatee IVC	3,714	1.50	21	6	2.25	18	31	2.38	18	104	2.77	10
		10	Golden Mile IVC	3,685	1.45	23	8	2.00	22	100	1.00	26	109	2.66	14
		11	Summerland IVC	3,716	1.51	20	16	1.00	30	0	3.00	1	105	2.74	11
		12	Oliver IVC	3,677	1.44	24	8	2.00	22	5	2.90	10	111	2.62	16
		13	PIB Locatee IVC + local OW	3,774	1.61	12	1	2.88	2	31	2.38	18	101	2.83	9
		14	Golden Mile IVC + local OW	3,743	1.55	17	3	2.63	10	100	1.00	26	107	2.71	13
		15	Summerland IVC + local OW	3,754	1.57	15	5	2.38	14	0	3.00	1	106	2.73	12
		16	Oliver IVC + local OW	3,733	1.53	18	2	2.75	6	5	2.90	10	109	2.65	15
Biosolids treated with food	Separate yard and food	17	PIB Locatee IVC	3,753	1.57	16	6	2.25	18	31	2.38	18	116	2.51	17
		18	Golden Mile IVC	3,700	1.48	22	8	2.00	22	100	1.00	26	119	2.45	20
		19	Summerland IVC	3,756	1.58	14	16	1.00	30	0	3.00	1	118	2.47	19
		20	Oliver IVC	3,668	1.42	25	8	2.00	22	5	2.90	10	120	2.42	21
		21	PIB Locatee IVC + local OW	3,817	1.68	10	1	2.88	2	31	2.38	18	118	2.47	18
		22	Golden Mile IVC + local OW	3,762	1.59	13	3	2.63	10	100	1.00	26	121	2.40	23
		23	Summerland IVC + local OW	3,797	1.65	11	5	2.38	14	0	3.00	1	120	2.41	22
		24	Oliver IVC + local OW	3,727	1.52	19	2	2.75	6	5	2.90	10	123	2.36	24
		25	Penticton WWTP + local OW[5]	4,564	3.00	1	0	3.00	1	0	3.00	1	186	1.00	33
	Mixed yard and food	26	PIB Locatee IVC	3,511	1.14	30	6	2.25	18	31	2.38	18	93	3.00	1
		27	Golden Mile IVC	3,461	1.06	32	8	2.00	22	100	1.00	26	96	2.94	4
		28	Summerland IVC	3,514	1.15	29	16	1.00	30	0	3.00	1	95	2.96	3
		29	Oliver IVC	3,430	1.00	33	8	2.00	22	5	2.90	10	97	2.91	5
		30	PIB Locatee IVC + local OW	3,572	1.25	26	1	2.88	2	31	2.38	18	95	2.96	2
		31	Golden Mile IVC + local OW	3,520	1.16	28	3	2.63	10	100	1.00	26	98	2.89	7
		32	Summerland IVC + local OW	3,552	1.22	27	5	2.38	14	0	3.00	1	98	2.90	6
		33	Oliver IVC + local OW	3,485	1.10	31	2	2.75	6	5	2.90	10	100	2.86	8

See below for Notes to the Table.

NOTES:

1. Net GHG emissions savings; tonnes CO_2e per annum, from Task 7 GHG Memo.
2. Estimated using a proxy of total vehicle-kilometres on haul routes which pass residential property on municipal roads, from segregation points to processing facility, for each scenario .
3. Measured as the number of homes which modelling has indicated may reach an odour level of 5OU over a 10 minute period in 1 year.
4. Costs per tonne data, from Task 7 LCA Memo.
5. In the absence of odour modelling for combined food & biosolids AD at Penticton WWTP, we assume 0 homes exceeding 5OU, as odour perception starts from higher baseline & odour is better contained in AD plant.
6. IVC = In-vessel Composting Facility; OW = Open Windrow Composting facility.

5.0 DISCUSSION OF RESULTS

It can be seen that the GHG emissions benefits of scenarios where biosolids are kept separate from other organic wastes are consistently better than when they are combined. For the scenarios which assume existing (separate) biosolids arrangements, we have applied a carbon factor for Open Windrow (OW) composting. In carbon terms, this performs slightly better than In-Vessel Composting (IVC), largely due to:

1. lower fuel costs, and
2. lower embedded capital burdens (i.e. GHG impacts of infrastructure).

The WRATE GHG modelling tool, from which we have derived our carbon factors, includes factors for various aerobic organic waste processes. While there are factors for a variety of different types of IVC process, there is only one for a non-IVC scenario, which is an ASP, so we have used this as the closest available proxy. We believe that in practice, it is likely that the carbon performance of the ASP operation may be relatively good (i.e. close to OW) – in particular because power required for pumps will have relatively low impact given the low carbon intensity of BC electricity.

6.0 CONCLUSIONS

Looking across the range of parameters considered, it is clear that for any given set of assumptions regarding the variables used in the Lifecycle Cost Analysis there are relatively modest differences between the scenarios.

Development of an AD facility at the City of Penticton WWTP for co-processing of biosolids and food scraps is an attractive proposition in principle and shows strong scores in respect of GHG and transport impacts, but it is the least favourable option from an LCA perspective unless alternative cost apportionment can be considered.

If the RD considers that odour control is the primary concern in the site selection process, then the TBL analysis suggests that development of a new regional processing facility at Summerland would be the marginally preferable option. Odour modelling has shown that there are slightly higher risks associated with a facility located at the PIB Locatee site at Marron Valley. However, if through stringent land tenure and contractual means, the RD believes that it can create a strong regime of controlling any identifiable odour impacts, then the PIB Locatee site may offer benefits in terms of reduced costs.

Given the high level of sensitivity around the potential for odour impacts from a new processing facility we believe it is premature to make any direct recommendation regarding a preferred site location. The RDOS will make its final selection on the basis of further stakeholder consultation and subject to more in-depth site surveys in respect of other potential environmental impacts.

7.0 STATEMENT OF LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by SLR Consulting (Canada) Ltd. (SLR) for the Regional District of Okanagan Similkameen, hereafter referred to as the "Client". It is intended for the sole and exclusive use of the Client. The report has been prepared in accordance with the Scope of Work and agreement between SLR and the Client. Other than by the Client and as set out herein, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted unless payment for the work has been made in full and express written permission has been obtained from SLR.

This report has been prepared in a manner generally accepted by professional consulting principles and practices for the same locality and under similar conditions. No other representations or warranties, expressed or implied, are made.

Opinions and recommendations contained in this report are based on conditions that existed at the time the services were performed and are intended only for the Client, purposes, locations, time frames and project parameters as outlined in the Scope or Work and agreement between SLR and the Client. The data reported, findings, observations and conclusions expressed are limited by the Scope of Work. SLR is not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. SLR does not warranty the accuracy of information provided by third party sources.

Calgary, AB
1185-10201 Southport Rd SW
Calgary, AB T2W 4X9
Canada
Tel: (403) 266-2030
Fax: (403) 263-7906

Edmonton, AB
6940 Roper Road
Edmonton, AB T6B 3H9
Canada
Tel: (780) 490-7893
Fax: (780) 490-7819

Grande Prairie, AB
10015 102 Street
Grande Prairie, AB T8V 2V5
Canada
Tel: (780) 513-6819
Fax: (780) 513-6821

Kamloops, BC
8 West St. Paul Street
Kamloops, BC V2C 1G1
Canada
Tel: (250) 374-8749
Fax: (250) 374-8656

Kelowna, BC
200-1475 Ellis Street
Kelowna, BC V1Y 2A3
Canada
Tel: (250) 762-7202
Fax: (250) 763-7303

Markham, ON
200 - 300 Town Centre Blvd
Markham, ON L3R 5Z6
Canada
Tel: (905) 415-7248
Fax: (905) 415-1019

Nanaimo, BC
9-6421 Applecross Road
Nanaimo, BC V9V 1N1
Canada
Tel: (250) 390-5050
Fax: (250) 390-5042

Prince George, BC
1586 Ogilvie Street
Prince George, BC V2N 1W9
Canada
Tel: (250) 562-4452
Fax: (250) 562-4458

Regina, SK
1048 Winnipeg Street
Regina, SK S4R 8P8
Canada
Tel: (306) 525-4690
Fax (306) 525-4691

Saskatoon, SK
620-3530 Millar Avenue
Saskatoon, SK S7P 0B6
Canada
Tel: (306) 374-6800
Fax: (306) 374-6077

Vancouver, BC (Head Office)
200-1620 West 8th Avenue
Vancouver, BC V6J 1V4
Canada
Tel: (604) 738-2500
Fax: (604) 738-2508

Victoria, BC
6-40 Cadillac Avenue
Victoria, BC V8Z 1T2
Canada
Tel: (250) 475-9595
Fax: (250) 475-9596

Winnipeg, MB
1353 Kenaston Boulevard
Winnipeg, MB R3P 2P2
Canada
Tel: (204) 477-1848
Fax: (204) 475-1649

Whitehorse, YT
6131 6th Avenue
Whitehorse, YT Y1A 1N2
Canada

Yellowknife, NT
Unit 44, 5022 49 Street
Yellowknife, NT X1A 3R8
Canada
Tel: (867) 765-5695