

HALIFAX

P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Item No. 11.2.3
Halifax Regional Council
November 10, 2015

TO: Mayor Savage and Members of Halifax Regional Council

Original Signed

SUBMITTED BY: _____
Councillor Bill Karsten, Chair, Audit & Finance Standing Committee

DATE: October 26, 2015

SUBJECT: Mini-Hybrid Thermal System for Halifax Transit Buses — Project Review

ORIGIN

October 21, 2015 meeting of the Audit & Finance Standing Committee, Item No. 9.1.2.

LEGISLATIVE AUTHORITY

Audit & Finance Standing Committee Terms of Reference section 3.8, which states "to review and make recommendations on proposals coming to Halifax Regional Council outside of the annual budget or tender process including but not limited to:

- New Programs or services not yet approved
- Programs or services that are being substantially altered
- Proposed changes in operating or budget items
- Committing of funds where there is insufficient approved budget, or,
- New or increased capital projects not included in the approved budget
- Increases in project budget due to cost sharing
- Creation or modification of reserves and withdrawals not approved in the approved budget

RECOMMENDATION

It is recommended by the Audit & Finance Standing Committee that Halifax Regional Council:

1. Terminate the Installation of Mini-Hybrid Thermal Systems on Halifax Transit buses manufactured between 2005 and 2007; a total of forty-three vehicles; of which fifteen have been budgeted for;
2. Reduce Project Account CM020006, Emission Reduction — Public Transit Buses for the installation of the Mini-Hybrid Thermal Systems on these buses as outlined in the Financial Implications Section of the staff report dated July 22, 2015; and
3. Continue the Installation of Mini-Hybrid Thermal Systems on nineteen (19) Halifax Transit buses manufactured between 2008 and 2009.

BACKGROUND

A staff report dated July 22, 2015 pertaining to the project review of the Mini-Hybrid Thermal System for Halifax Transit Buses was before the Audit & Finance Standing Committee at its meeting held on October 21, 2015.

For further information please refer to the attached staff report dated July 22, 2015.

DISCUSSION

The Audit & Finance Standing Committee received the staff report dated July 22, 2015 at its meeting held on October 21, 2015 and forwarded the recommendation to Halifax Regional Council as outlined in this report.

FINANCIAL IMPLICATIONS

As outlined in the attached staff report dated July 22, 2015.

COMMUNITY ENGAGEMENT

All meetings of the Audit & Finance Standing Committee are open to the public. The agenda and reports are provided online in advance of the meeting.

ENVIRONMENTAL IMPLICATIONS

As outlined in the attached staff report dated July 22, 2015.

ALTERNATIVES

The Audit & Finance Standing Committee did not discuss alternatives.

ATTACHMENTS

1. Staff report dated July 22, 2015.

A copy of this report can be obtained online at <http://www.halifax.ca/council/agendasc/cagenda.php> then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 902.490.4210, or Fax 902.490.4208.

Report Prepared by: Liam MacSween, Legislative Assistant, 902.490.6521



P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Item No. 9.1.2
Audit & Finance Standing Committee
October 21, 2015

TO: Chair and Members of Audit & Finance Standing Committee
Original Signed

SUBMITTED BY:
Richard Butts, Chief Administrative Officer
Original Signed

Eddie Robar, Director Halifax Transit

DATE: July 22, 2015

SUBJECT: Mini-Hybrid Thermal System for Halifax Transit Buses – Project Review

ORIGIN

Item 11.1.2 Award – Tender No 13-128, Mini-Thermal Hybrid Systems

LEGISLATIVE AUTHORITY

Halifax Regional Municipality Council approved, Dec 11, 2012, that all budget increases are to be presented to the Audit and Finance Standing Committee, prior to submission to Council.

Halifax Charter, section 93(1) - The Council shall make estimates of the sums that are required by the Municipality for the fiscal year; Halifax Charter, section 79(1) - Specifies areas that the Council may expend money required by the Municipality; Halifax Charter, section 35(2)(d)(i) - The CAO can only authorize budgeted expenditures or within the amount determined by Council by policy; Halifax Charter, section 120(6) - The Municipality may maintain other reserve funds for such purposes as the Council may determine; Halifax Regional Municipality policy on Changes to Cost Sharing for Capital Projects - Changes requiring Council approval; and the Halifax Regional Municipality Reserve Policy - No reserve funds will be expended without the CAO's recommendation and Council approval.

RECOMMENDATION

It is recommended that Chair and Members of Audit & Finance Standing Committee:

1. Terminate the Installation of Mini-Hybrid Thermal Systems on Halifax Transit buses manufactured between 2005 and 2007; a total of forty-three vehicles; of which fifteen have been budgeted for;
2. Reduce Project Account CM020006, Emission Reduction – Public Transit Buses for the installation of the Mini-Hybrid Thermal Systems on these buses as outlined in the Financial Implications Section; and
3. Continue the Installation of Mini-Hybrid Thermal Systems on nineteen (19) Halifax Transit buses manufactured between 2008 and 2009.

BACKGROUND

During January 2010, HRM conducted a feasibility study on the installation of Mini-Hybrid Thermal Systems on Halifax Transit buses. The mini hybrid system replaces a traditional hydraulic fan system with a slide-in, controllable electric fan package. The study concluded that the Mini-Hybrid Thermal System provided the following benefits:

- Reduced emissions resulting in contribution to greenhouse gas (GHG) reduction commitment of 9% per bus.
- A Return on Investment (ROI) of 5 years
- An annual per vehicle fuel reduction of 3,800 litres (approximately \$3,500 in cost)
- An annual per vehicle reduction in maintenance costs of approximately \$2,000.00

Past staff reports, including detailed information on the equipment technology and consequent purchases can be found on the following webpages:

- <http://www.halifax.ca/council/agendasc/documents/100112ca1111.pdf>
- <http://www.halifax.ca/council/agendasc/documents/100126ca10111.pdf>
- <http://www.halifax.ca/Council/agendasc/documents/101207ca1112.pdf>

Tender No. 13-128 for up to one-hundred (100) Mini Hybrid Thermal Systems was publically advertised on the Province of Nova Scotia website starting on July 15, 2013, and closed on August 1, 2013.

As an outcome of the Halifax Regional Council meeting held September 11, 2013 the Award of Tender No. 13-128, Mini-Hybrid Thermal Systems was approved and awarded to Cummins Eastern Canada for a total Tender Price of \$2,580,562.71 (net HST included). The project scope included funding to install Mini-Hybrid Thermal Systems on ninety-nine (99) buses over the course of a three year period.

DISCUSSION

To date, the Mini-Hybrid Thermal System has been installed on fifty (50) buses (5 of which were test buses and not part of Tender No. 13-128). Data was collected and analyzed for 27 of the 50 buses to measure the performance of the project. The results indicated the following:

- Reduced emissions resulting in contribution to greenhouse gas (GHG) reduction commitment of 8% per bus
- A Return on Investment (ROI) of 7.5 years
- An annual per vehicle fuel reduction of 3,067 litres (approximately \$3,000 in cost)
- An annual per vehicle reduction in maintenance costs of approximately \$668.00

The scope of the 13-128 was to install the Mini-Hybrid Systems on vehicles manufactured between 2005 and 2009, so ROI was achieved when the vehicle reached its Economic Replacement Point (ERP) of 18 years.

In the 2014/15 fiscal year, based on financial benefits, the Economic Replacement Point (ERP) for Halifax Transit buses was changed to (15) years. As a result, the service life of a bus will be reduced by three (3) years and buses manufactured between 2005 and 2007 will not reach the seven and one-half (7.5) year return on investment required for the Mini-Hybrid Thermal System Project. Please see the logic below for the cut-off point for the project.

Cut-off Point by vehicle year for Mini-Hybrid Thermal System Installations on 40' Conventional Buses:

Installation year: 2015 (after July)

Return on investment: 7.5 years

Return on Investment Point: 2023

Economic Replacement Point of bus: 15 years

Cut-off Point for Mini-Hybrid Thermal System Installation: 2023 – 15 years = 2008

Therefore, it is recommended to not install Mini-Hybrid Thermal Systems on buses manufactured prior to 2008 based on failure to produce sufficient return on investment.

FINANCIAL IMPLICATIONS

By removing buses manufactured between 2005 and 2007 from the scope of the project, only nineteen (19) buses remain to be retro-fitted with the new thermal system. Each installation costs \$26,066.00 (net HST included), rendering a total required amount of \$495,254.00 for the remaining installations on 2008/2009 buses; 2008 vehicles, because of the current 15 year ERP, are removed from the financials detailed below. There is no impact to the operating or project budget in 2015/16 as remaining project needs will come from account CM020006. Additionally, excess funds will be un-committed in Capital Surplus Reserve Q103, pending ratification from Council.

Funds to Reallocate from Project Account CM020006

Total Budget – Project Account CM020006	\$ 1,862,331.43
Less: Total Expenditures – Project Account CM020006	\$ 912,320.15
Less: Total Commitments – Project Account CM020006	\$ 52,132.57
Less: Remaining Installations with new ERP of 15 years (19 buses)	\$ 495,254.00
Reduction of Project Budget (funding from Q103 will be uncommitted)	\$ 402,624.71

COMMUNITY ENGAGEMENT

N/A

ENVIRONMENTAL IMPLICATIONS

The Mini-Hybrid Thermal Systems installed will continue to lower HRM corporate GHG emissions as per the Corporate GHG Emissions Reduction Plan. Fifty (50) Halifax Transit buses with Mini-Hybrid Thermal Systems have saved approximately 313,000 Litres of Diesel Fuel to date and it is expected that the remaining nineteen (19) buses will save another 3,067 Litres per bus per year. It is important to note that any new vehicles since 2013 have been outfitted with the EMP Mini-Hybrid Thermal System and the overall GHG Emissions of Halifax Transit's Fleet will reduce over time.

ALTERNATIVES

The Chair and Members of Audit & Finance Standing Committee may choose to continue the installation of all Mini-Hybrid Thermal Systems on the remaining Halifax Transit buses within the initial scope of the project (forty-three buses in total remaining). This option will result in a loss of approximately \$346,562.00 in non-recoverable funds if all buses are retired at fifteen (15) years in service. Also, the Chair and Members of Audit & Finance Standing Committee may choose to continue the installation of Mini-Hybrid Thermal Systems on only the fifteen buses budgeted for in Project Account CM020006, resulting in a loss of \$110,458.00.

ATTACHMENTS

Attachment 1 - Supporting Data – Fuel Savings Mini-Hybrid Thermal System

Attachment 2 - Fuel Comparative Data – Buses with EMP unit vs without EMP unit

Attachment 3 -Supporting Data – Maintenance Savings Mini-Hybrid Thermal System (Cost of Hydraulic Fan System)

A copy of this report can be obtained online at <http://www.halifax.ca/boardscom/SCfinance/index.php> then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 902.490.4210, or Fax 902.490.4208.

Report Prepared by: Jacqueline Niklas, Business Analyst, Halifax Transit Bus Maintenance, 902.490.8669

Original Signed

Report Approved by:

Eddie Robar, Director, Halifax Transit, 902.490.6720

Original Signed

Financial Approval by:

Amanda Whitewood, Director of Finance & ICT/CFO, 902.490.6308

Attachment 1

EMP INSTALLED PRIOR TO CURRENT CONTRACT

LOCATION	Unit #	Yr Installed	YRS W EMP	LITRE/KM					
				2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
BTC	1042	2010	5	0.635	0.675	0.549	0.759	0.879	0.583
RLTC	1131	2010	5	0.632	0.608	0.603	0.628	0.632	0.574
BTC	1031	2010	5	0.637	0.970	0.545	0.515	0.562	0.477
BTC	614	2010	5	0.570	0.537	0.543	0.497	0.196	0.492
BTC	1083	2010	5	0.645	0.554	0.567	0.541	0.537	0.532
BTC	1113	2011	4	0.620	0.638	0.580	0.566	0.590	0.592
BTC	1116	2011	4	0.678	0.630	0.599	0.598	0.546	0.541
BTC	1059	2011	4	0.600	0.644	0.648	0.454		0.543
BTC	1108	2011	4	0.647	0.543	0.590	0.375	0.533	0.554
BTC	1119	2011	4	0.664	0.635	0.586	0.626	0.583	0.583
BTC	1120	2011	4	0.639	0.640	0.591	0.612	0.607	0.633
BTC	1121	2011	4	0.737	0.654	0.603	0.611	0.600	0.576
BTC	1093	2011	4	0.615	0.610	0.550	0.530	0.557	0.538
BTC	1117	2012	3	0.659	0.665	0.616	0.555	0.589	0.573
BTC	1118	2012	3	0.667	0.664	0.627	0.590	0.540	0.536
BTC	1111	2012	3	0.677	0.667	0.608	0.584	0.597	0.574
BTC	615	2013	2	0.585	0.526	0.502	ERROR	0.365	0.477
BTC	616	2013	2	0.497	0.532	0.539	0.500	0.514	0.499
BTC	617	2013	2	0.603	0.545	0.606	0.797	0.499	0.514
BTC	618	2013	2	0.577	0.554	0.489	0.498	0.577	0.467
BTC	619	2013	2	0.582	0.454	ERROR	0.388	0.367	0.378

EMP INSTALLED UNDER CURRENT CONTRACT

LOCATION	UNIT#	INSTALLED	YEARS W EMP	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
BTC	1110	Jan-14	1.5	0.656	0.635	0.720	0.421	1.134	0.438
RLTC	1123	Feb-14	1.5	0.660	0.664	0.684	0.605	0.644	0.719
RLTC	1124	Feb-14	1.5	0.728	0.710	0.590	0.651	0.650	0.495
RLTC	1137	Mar-14	1.4	0.660	0.644	0.607	0.620	0.482	ERROR
BTC	1045	Mar-14	1.4	0.585	0.806	0.628	0.607	0.578	0.539
BTC	1109	Apr-14	1.3	0.661	0.656	0.621	0.620	0.732	0.760
RLTC	1125	09-Jun-14	1.1						
BTC	1060	03-Jul-14	1.0						
RLTC	1126	03-Jul-14	1.0						
RLTC	1130	8-Jul-14	1.0						
BTC	1096	23-Jul-14	1.0						
BTC	1053	19-Aug-14	0.9						
RLTC	1129	26-Aug-14	0.9						
RLTC	1153	10-Sep-14	0.9						
BTC	1104	19-Sep-14	0.8						
BTC	1065	11-Oct-14	0.8						
BTC	1097	24-Jan-15	0.5						
BTC	1055	25-Feb-15	0.4						
BTC	1018	13/04/2015	0.3						
BTC	1039	23-Apr-14	1.2						
BTC	1098	21-Jul-14	1.0						
BTC	1112	09-Sep-14	0.9						
RLTC	1132	01-Jul-14	1.0						
RLTC	1140	08-Jul-15	0.0						
RLTC	1142	30-Mar-15	0.3						
RLTC	1156	16-Mar-15	0.3						
BTC	1056	Jun-14	1.1						
BTC	1088	Apr-15	0.3						
RLTC	1122	Oct-14	0.79						

BEST CASE	WORST CASE	AVG
BEFORE L/KM	0.62	0.58
AFTER L/KM	0.56	0.54
Per Bus Calculation		
AVG L/KM SAVED	0.06	0.04
AVG % SAVED	9%	8.0%
AVG KM/YEAR	63,485	63,684
AVG SAVED LITRES/YR	3,550.25	\$ 2,583.69
\$ Savings per year:	\$ 3,337.24	\$ 2,428.67
Initial Investment	\$ 26,066.00	\$ 26,066.00
Maint. Savings/yr	\$ 668.08	\$ 668.08
Total Savings/yr	\$ 4,005.32	\$ 3,096.75
ROI	6.5	8.4
AVERAGE ROI:	7	

Attachment 2

KM per Litre Analysis 2014/2015

Bus #	1-Apr-14	1-May-14	1-Jun-14	1-Jul-14	1-Aug-14	1-Sep-14	1-Oct-14	1-Nov-14	1-Dec-14	1-Jan-15	1-Feb-15	1-Mar-15	Avg bus with EMP	Avg bus w/o EMP
600	1.05		1.94	1.55	1.59	1.53	1.64	1.20		1.38	1.25	1.27		1.44
601	1.75	2.88	2.00	2.18	2.25	2.47	2.23	1.82	1.98	2.04	1.85	1.48		2.08
602	1.59	2.23	1.99	2.18	2.24	2.11	1.97	1.66	2.13	2.16	1.36	1.50		1.93
603	1.17	2.33	1.95	1.90	1.97	2.08	2.16	1.96	2.09	1.71	1.70	1.91		1.91
604	2.22	2.16	1.93	1.98	1.79	1.31	2.15	1.89	1.48	1.88	1.83	1.87		1.88
605	1.96	2.53	2.10	1.87	2.00	2.28	2.07	1.75	1.73	1.64	1.22			1.92
606	1.93	2.48	1.85	2.24	1.97	1.92	1.75	2.03	1.89	1.71	1.28	1.67		1.89
607	1.46		2.87	2.00	2.34	2.19	1.82	1.74	1.90	1.53	1.98			1.98
608	1.86	2.17		1.77	3.19	3.63	1.91	2.24	2.22	1.66	1.51			2.22
609	1.84	2.15	1.62	2.05	1.94	2.02	2.04		1.74	1.76	1.59	1.71		1.86
610	1.98	1.78	2.24	2.04	1.99	1.95			2.24	2.17	2.29	1.74		2.04
611	1.33	2.26	1.93	1.94	2.03	1.82	1.71	1.93	2.04	2.11	1.55	1.43		1.84
612	1.90		2.84	1.89	1.92	1.88	2.03	1.72	1.96	2.03	1.55	1.69		1.95
613	1.65	2.36		3.92			2.00	1.67	1.92	1.92	1.47	1.57		2.05
614	1.90	2.25	1.92	2.08	2.08	2.24	2.32	1.83	2.15	2.17	1.66	1.74	2.03	.
615	1.62	2.28	1.91	2.10	2.18	2.09	2.41	2.07	2.64	2.05	1.33	1.89	2.05	
616	1.57	2.35	1.98	2.28	2.04		2.28	1.98	2.04	1.69	1.22	1.75	1.93	
617	2.22	1.96			2.07	1.99	2.16	2.11	1.95	1.87	1.73	1.74	1.98	
618	2.01	2.19	2.42	2.17	1.89	2.09	3.25	1.87			3.13	1.43	2.25	
619	1.99	2.92	2.94			3.22	2.19		2.22	2.36	2.28	1.60	2.41	
1033	1.74	2.21	1.81	1.41		1.61	1.71	1.59	1.43	1.50	1.35	1.74		1.64
1034	1.10	3.75	1.74	2.06	2.18	2.43	2.22	2.04	2.16	1.77	1.83			2.12
1035	1.38	2.35	1.91	1.88	1.98	1.30	3.99	1.72	1.75	1.65	2.00	1.15		1.92
1036	1.67	2.01	1.70	1.71	2.19	1.71	1.73	1.71	1.80	3.29				1.95
1037	2.29	1.74	1.84	2.19	1.52	2.06	2.03	1.94	1.86	1.65	1.38	1.99		1.87
1038	1.22	3.80	1.14	2.26	1.76	1.82	2.16	1.47	1.73	1.49	1.78	1.13		1.81
1039	1.91		2.45	2.08	2.09	1.76	1.61	1.27	2.06	2.01	1.57	1.31		
1040	1.73	1.86	1.90	1.87	1.69	1.81	2.12	2.04	1.74	1.75	1.47	1.49		1.79
1041	1.63			2.10	1.73	1.76	2.06	1.78	1.87	2.04	1.26	1.91		1.81
1042	1.83	2.27	1.76	2.23	2.05	2.11	1.93		1.47		1.12	1.26	1.80	
1043	1.64	1.97	1.89	2.24	1.90	1.93	1.60	1.76	1.72	1.83	1.29	1.83		1.80
1044	1.51	2.69	1.79	1.75	1.68	1.46	1.37			1.41	1.43	2.00		1.71
1045	1.80	2.06	1.57	2.00	1.83	1.81	2.11	1.74	1.93	1.81	1.61	1.84	1.84	
1046	1.86	1.91	1.76	1.76	1.68	1.68	1.71	1.71	1.77	1.54	1.35	1.40		1.68
1047	1.58	2.20	1.81	2.02	1.86	1.91	1.93	1.67	1.50			1.62		1.81
1048	1.96	1.73	1.57	2.08	1.74	1.77	1.82	2.22	1.49			1.78		1.82
1049	1.85	1.60	1.49		2.18	1.87	1.71	1.73	1.67	1.78	1.33	1.59		1.71
1050	2.05	2.24	2.09	1.98	2.00	1.84	2.02	1.94	2.10	2.51	1.34	1.35		1.95
1051	1.39	1.83	1.34	1.39				1.13	1.58	1.58		1.63		1.48
1052	1.73	2.09	1.71	1.81	3.01	1.85	2.26	1.76	1.74	1.93				1.99
1053	1.17	1.84	1.47	1.54	2.57	1.79	2.29	1.76	2.10	1.82	1.87	1.05		
1054														
1055	1.86	2.25	1.93	1.84	1.68	1.84	1.92	1.65	2.05	1.95	1.45	1.88		
1056	1.16	1.49	2.09	1.11		1.82	1.59	0.00	2.85	2.15	1.50	1.55		
1057														1.64
1058	1.80	1.87	1.55	1.54	1.75	1.57	1.69	1.47	1.71		1.88	1.76		1.69
1059	1.86	2.20	1.30	2.21	1.72	1.76	1.75	1.74	1.99	1.79		2.02	1.85	
1060	1.35	2.20	1.90	1.60	1.93	1.63	1.90	1.96	1.83	1.82	1.26	1.75		
1061	1.00	1.23	1.29	2.55	1.67	1.44	1.83	1.60	1.54	1.77	1.73	1.44		1.59
1062	1.68	1.89	1.96	1.73	1.47	2.08	1.78	1.45	1.75	1.84		1.69		1.76
1063	1.57	1.90	1.79	2.10	1.80	1.54	2.00	1.83	1.66	1.64		1.79		1.78
1064	1.85	1.65	1.74	1.65				1.45	1.60	1.51	1.55	1.74		1.64
1065	1.01	1.79	1.70	1.64	1.72	1.85	1.91	1.57	1.77	1.63	1.55			
1066	1.09	1.62	1.19	1.62	1.47	1.42	1.38	1.24	1.44	1.60	1.85	1.53		1.45
1067	1.67			1.54	3.71	1.64	1.97	1.57	1.83	1.50	1.29	1.53		1.82
1068	1.55	1.60	1.58	1.67	1.51	1.56		1.41	1.48	1.49	1.74	1.20		1.53
1069		1.34						1.49	1.45	1.65	1.76	1.56	1.62	
1070	1.86	1.82		1.89	1.85	1.75	1.92	1.52	1.88	2.07	1.49	1.65		1.79
1071	1.71	1.96	1.61	1.97	1.83	1.67	1.80	1.68	1.77	1.46	2.28	1.64		1.78
1072	1.72	1.68	1.79	2.02	2.26					1.93	1.43	1.57		1.80
1073	1.41	1.99	1.60	2.54	1.71	1.54	1.78	1.55	1.75	2.01	1.01	1.59		1.71
1074	1.34	1.66	1.58	1.83	1.87	1.91	1.79	1.65	1.54	1.79	1.40	1.84		1.68
1075	1.41	1.87	1.47	1.92	1.73	1.59	1.60	1.62	1.83	2.02	1.35	1.38		1.65
1076	1.81	1.74	1.88	1.61	1.63	1.50	1.63	1.51	1.84	1.69	1.29	1.06		1.60
1077	1.55	2.00	1.71	1.62	1.60	1.74	1.45			1.20	1.60	1.73		1.62
1078	1.57	1.70	1.67	1.77	1.62		1.81	1.60	1.55	1.44	1.54	1.51		1.62
1079	1.08	2.00	1.41	1.62	1.69	1.62	1.54		1.46	1.37	1.74	1.68		1.56
1080	1.96	1.93	1.54	1.51			1.80		2.04	1.32	1.71	1.54		1.70
1081	1.53	1.60	1.76	1.95	1.80	1.77	1.70	1.60	1.87	1.73	1.74	1.35		1.70
1082	1.46	1.87		1.60	1.81	1.51	1.95	1.77	1.79	1.61	1.33	1.62		1.67
1083	2.22	1.93	1.81	1.92	2.00	1.98	1.86	1.92	1.86	1.78	1.62	1.72	1.88	
1084		2.28	1.77	1.87	1.65	1.62	1.61	1.77	1.92	1.84	1.02	1.64		1.73
1085	1.67	1.62	1.68	1.76	2.11	1.59	1.96	1.66	1.65	1.80	1.35	2.05		1.74
1086	1.67	2.30	1.20	2.22	1.79	1.61	1.70	1.43	1.63	1.71	1.36	1.58		1.68
1087	1.15	1.51	1.01	1.36	1.42			1.34	1.81	1.46	1.80	1.65		1.45
1088	1.88	1.79	1.67	1.74	1.56	1.76	1.86	1.21	2.13	1.13	1.69			1.68
1089	1.56	2.12	1.76	2.49	1.28	1.73	1.73	1.71	1.75	1.40	1.52	1.70		1.73
1090	1.53	2.02	1.85	1.73	1.28		1.66	1.64	1.87	1.93	1.42	2.12		1.73
1091	1.49	1.99	1.49	1.88	1.77	1.71	1.80	1.62	1.96	1.99	1.41	1.69		1.73
1092	1.72	1.44	1.47	1.89	1.61	1.45	1.79	1.73	1.73	1.91	1.28	1.65		1.64

KM per Litre Analysis 2014/2015

Bus #	1-Apr-14	1-May-14	1-Jun-14	1-Jul-14	1-Aug-14	1-Sep-14	1-Oct-14	1-Nov-14	1-Dec-14	1-Jan-15	1-Feb-15	1-Mar-15	Avg bus w/EMP	Avg bus w/o EMP
1093	1.97	2.20	1.88	1.88	1.74	1.70	1.94	1.73	1.97	1.85	1.49	2.00	1.86	1.73
1094	1.76	1.84	1.71	1.76	1.67	1.70	1.88	1.66	1.62	1.69	1.84	1.63		1.59
1095	1.71	1.79	1.39	1.50	2.01	1.66	1.66	1.47	1.73	1.65	1.32	1.20		1.74
1096	1.45	1.83	1.15	1.95	1.66	1.70	1.89	1.77			1.47	2.10		
1097	1.54		2.13	1.48	1.58	1.73	1.72	1.32	1.71	1.47	2.29	1.86		
1098	1.45	2.47	1.35	2.33	1.98	1.89	1.70	1.80	1.86	1.70	1.85	1.61		
1099	1.53	2.11	1.61	1.69	1.58	1.60	1.80	1.69		2.13	1.38	1.59		1.70
1100	2.18	1.76	1.76	1.74	1.84	1.77	1.67	1.71	1.66	1.60	1.51	1.73		1.74
1101	2.07		1.63	1.84	1.82	1.63	2.24	1.77	1.79	1.65	1.55	1.30		1.75
1102	1.53	2.12	1.46	2.21			1.79	1.70	1.77	1.88	1.64	1.83		1.79
1103	1.11	2.03	1.68	1.89	1.73	1.63	1.86	1.52	1.87	1.64	1.62			1.69
1104	1.50	1.93	1.73	1.95	1.72	1.40	1.87	1.89	1.70	1.71	1.70	1.95		
1105	1.48	2.38	1.57	2.06	1.82	1.84	2.02	1.54	1.65	1.87	1.35	1.63		1.77
1106	1.73		1.51	1.68	1.69	1.51	1.76		1.91	1.63	1.36	1.26		1.60
1107	1.51	1.90	1.71	1.46	1.89	1.83	1.83	1.79	1.66	1.80	1.10	1.89		1.70
1108	1.72	2.04	1.65	1.84	1.96	1.75	2.47	1.40	1.86	1.62	1.68	1.42		1.78
1109	1.15	1.47	1.33	1.31	1.37	1.20	1.37		1.34	2.09	1.06			1.37
1110		1.05						1.52	1.71	1.91	1.35	2.03		1.60
1111	1.85	1.66	1.78	1.65	1.69	1.70	1.88	1.83	1.70	1.76	1.39	2.19	1.76	
1112	1.58	1.85	1.63	1.56	1.54	1.60	1.66	1.67	1.43	2.16	1.31	1.76		
1113		1.87	1.62	1.84	1.76	1.46	1.78	1.66	2.06	1.43	1.81	1.23	1.68	
1114	1.66	1.14	1.57	1.78	1.56	1.84	1.39	1.65	1.53	1.67	1.48	1.63		1.58
1115	1.32	2.20	1.51	1.81	1.60	1.63	1.61	1.19		1.26	2.61	1.17		1.63
1116	1.59	1.98	1.71	1.52	2.68	1.70	2.13	1.68	1.96	1.73	1.82	1.91		1.87
1117	1.61	2.01	1.83	1.64	1.75	1.80	1.61	1.59	1.67	1.59	1.76	1.88		1.73
1118	2.03	1.87	1.90	1.80	1.82	1.53	2.01	1.94	1.86	1.92	1.38	1.58		1.80
1119	1.79	1.67	1.58	1.93	1.59	1.79	1.95	1.66	1.87	1.52	1.63	1.46		1.70
1120	1.42	2.20	1.68	1.52	1.46	1.48	1.64	1.34	1.49	1.71	1.54	1.74		1.60
1121	1.36	2.25	1.77	2.81	1.63	1.66	1.72	1.75	1.65	1.55				1.81
1122	1.77	1.95	1.84	1.72	1.20	1.56	1.77	1.87	1.85	1.55	3.33	1.42		
1123	1.47	1.83	1.70	1.74	1.69	1.54	1.79	1.66	1.71	1.72	1.43	1.90	1.68	
1124	1.54	2.93	1.57	1.76	1.71	1.75	1.76	1.84	3.71	1.49	1.76	1.66	1.96	
1125	1.52	1.79	1.71	1.71	1.65	1.61	1.84	1.76	1.86	1.68	1.84	1.61		
1126	1.61	1.80	1.48	1.41		1.39	1.77	1.70	2.15	1.79	1.75	1.78		
1127	1.68	1.80	1.71	1.72	1.76	1.74	1.80	1.65	1.80	1.73	1.50	1.72		1.72
1128	1.36	1.90	1.63	1.79	1.68	1.58	1.61	1.82	1.96	1.63	1.37	1.63		1.66
1129	1.51	1.82	1.61	1.70	1.83	1.73	1.96	1.72	1.65					1.54
1130	1.72	1.80	1.76	1.81	1.92	1.50	1.91	1.67	1.70	1.87	1.66	1.70		
1131	1.71	1.77	1.67	1.61	1.71	1.69	1.84	1.74	1.88	1.71	1.48	1.75	1.71	
1132	1.52	3.67	1.82	1.67	1.74	1.63	1.83	1.80	1.64	1.82	1.64	1.73		
1133	1.36	1.65	1.50	1.58	1.55	1.43	1.54	1.43	1.72	1.45	1.57	1.44		1.52
1134	1.19	1.74	1.61	1.66	1.66	1.65	1.82	1.66	1.73	1.52	1.69	1.60		1.63
1135	1.55	1.12	1.69	1.52	1.62	1.47	1.67	2.03	1.65	1.62	1.64	1.70		1.61
1136	1.60	1.77	1.75	1.58	1.54	1.64	1.85	1.69		1.73	1.79	1.73		1.70
1137	1.43	2.22	2.06	1.73	1.94	1.72	1.90	1.80	1.93	1.70	1.65	1.79	1.82	
1138	1.60	1.92	1.72	1.68	1.66	1.65	1.71	1.79	1.50	1.80	1.73	1.59		1.70
1139	1.59	1.82	1.47	1.77	1.60	1.55	1.50	1.47	1.78	1.56	1.40	1.44		1.58
1140	1.27	3.42	1.41	1.97	1.84	1.68	1.75	1.71	1.89	1.81	1.74	1.72		
1141	1.40	1.72	1.51	1.56	1.61	1.57		1.35	1.56	1.56	1.49	1.42		1.52
1142	1.37	1.95	1.57	1.85	1.63	1.48	1.71	1.70	1.82	1.64	1.70	1.53		
1143	1.65	1.74	1.86	1.63	1.63	1.49	1.76	1.58	1.84	1.62	1.79	1.68		1.69
1144	1.46	1.61	1.68	1.60	1.62	1.54	1.73	1.58	1.67	1.59	1.40	1.75		1.60
1145	1.43	1.80	1.55	1.78	1.67	1.62	1.88	1.56	1.81	1.82	1.48	1.56		1.66
1146	1.56	1.92	1.83	1.64	1.63	1.56	1.81	1.56	1.88	1.48				1.69
1147	1.59	1.86	1.73	1.56	1.65	1.67	1.69	1.80	1.95	1.87	1.66	1.71		1.73
1148	1.52	1.86	1.47	1.79	1.71	1.65	1.70	1.75	1.82	1.64	1.14	1.62		1.64
1149	1.60	1.87	1.75	1.44	1.67	1.62	1.72	1.74	1.71	1.70	1.55	1.69		1.67
1150	1.49	1.96	1.44	1.89	1.55	1.57	1.69	1.53	1.63	1.70	1.58	1.35		1.62
1151	1.55	1.88	1.72	1.73	1.67	1.64	1.77	1.66	1.75	1.70	1.76	1.73		1.71
1152	1.36	1.58	1.45	1.52	1.33	1.22	1.53	1.30	1.49	1.55	1.26	1.43		1.42
1153	1.63	2.02	1.68	1.83	1.70	1.61	1.89	1.84	1.48	1.73	1.79	1.76		
1154	1.30	1.80	1.54	1.43	1.41	1.37	1.55	1.40	1.45	1.53	1.23	1.75		1.48
1155	1.42	1.68	1.59	1.50	1.46	1.55	1.69	1.40	1.33	1.75	1.90	1.48		1.56
1156	1.44	1.62	1.56	1.19	1.66	1.13	1.66	1.30	1.93	1.50	1.44	1.39		
1157	1.54	1.81	1.65	1.71	1.55	1.57	1.60	1.55	2.00	1.40	1.43	1.61		1.62
1158	1.57	1.91	1.72	1.71	1.69	1.72	1.28	1.64	1.90	1.74	1.53	1.63		1.67
1159	1.57	2.07	1.40	1.57	2.00	1.61	1.72	1.61	1.78	1.63	1.32	2.15		1.70
1160	1.62	2.21	1.92	1.77	1.76	1.62	1.77	1.72	1.88	1.60	1.59	1.76		1.77
1161	1.87	2.08	1.89	1.70	1.72	1.72	1.80	1.76	1.79	1.78	1.59	1.75		1.79

Avg KM/L:	1.85	1.72
Avg L/KM:	0.54	0.58
Saved L/KM:	0.04	

Attachment 3

Description	Order	Description	Bas. start date	Created on	Actual release	System status	Total act.costs	MaintActivType	MaintenancePlan	Entered by	
1111	45133222	45000 Km Hydraulic Fan Filter	27/11/2009	19/11/2009	10/12/2009	CLSD PRT GMPS NMAT PRC SETC	118.14 002	17283		IP1020091119	
1111	40678770	MDR HYD FAN RUNNING		10/06/2010	10/06/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	56.99 003			ZWICKED	
1111	45144123	45000 Km Hydraulic Fan Filter	18/07/2010	13/07/2010	07/10/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	56.59 002	17283		IP1020100713	
1111	40701567	DDR HYD LEAK	07/10/2010	07/10/2010	07/10/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	181.59 003			GOODIE	
1111	45159694	45000 Km Hydraulic Fan Filter	23/05/2011	12/05/2011	17/05/2011	CLSD PRT GMPS NMAT PRC SETC	110.64 002	17283		IP1020110512	
1111	40777739	URB MAINT Insulate hyd lines, located be		27/10/2011	27/10/2011	CLSD PCNF PRT NMAT PRC SETC	25.00 003			TERRIOM	
1111	40782086	DDR ENG FAN FAULT LIGHT ON		17/11/2011	17/11/2011	CLSD PCNF PRT NMAT PRC SETC	50.00 003			GOODIE	
1111	45172764	45000 Km Hydraulic Fan Filter	19/01/2012	05/01/2012	09/01/2012	CLSD PCNF PRT GMPS NMAT PRC SETC	44.18 002	17283		IP1020120105	
1117	40596094	DDR ENG FAN LIGHT ON		07/04/2009	07/04/2009	CLSD PCNF PRT NMAT PRC SETC	50.00 003			GALLANB	
1117	45131944	45000 Km Hydraulic Fan Filter	30/10/2009	22/10/2009	05/11/2009	CLSD PRT GMPS MANC NMAT PRC SETC	108.70 002	17371		IP1020091022	
1117	40643726	TRR REPAIR FOR HYDRAULIC LEAKS		15/12/2009	15/12/2009	CLSD PCNF PRT NMAT PRC SETC	200.00 003			MCR0BER	
1117	40643978	DDR Engine fan fault		15/12/2009	15/12/2009	CLSD PCNF PRT NMAT PRC SETC	75.00 003			GOLDSMD	
1117	40670026	URB MAINT Repair leak at hyd tank		23/04/2010	23/04/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	95.46 003			TERRIOM	
1117	45142917	45000 Km Hydraulic Fan Filter	14/06/2010	10/06/2010	08/09/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	83.56 002	17371		IP1020100610	
1117	45158124	45000 Km Hydraulic Fan Filter	23/04/2011	11/04/2011	18/04/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	71.43 002	17371		IP1020110411	
1117	45169942	45000 Km Hydraulic Fan Filter	20/11/2011	10/11/2011	30/11/2011	CLSD PRT GMPS NMAT PRC SETC	94.23 002	17371		IP1020111110	
1117	40792203	MDR HYD FAN OIL BLACK		04/01/2012	04/01/2012	CLSD PCNF PRT GMPS NMAT PRC SETC	69.19 003			MORRISR	
1118	45123794	45000 Km Hydraulic Fan filter		05/05/2009	29/04/2009	02/05/2009	CLSD PCNF PRT GMPS NMAT PRC SETC	60.85 002	17385		IP1020090429
1118	40637144	HLD HYD FAN RUNNING ALL THE TIME		15/11/2009	15/11/2009	CLSD PCNF PRT NMAT PRC SETC	37.50 003			ZWICKED	
1118	45133845	45000 Km Hydraulic Fan Filter		14/12/2009	04/12/2009	30/12/2009	CLSD PCNF PRT GMPS NMAT PRC SETC	57.06 002	17385		IP1020091204
1118	45137360	45000 Km Hydraulic Fan Filter		17/09/2010	11/02/2010	11/02/2010	CLSD PCNF PRT CSER GMPS NMAT PRC SETC	118.99 002	17385		GALLANB
1118	40678951	DDR CK FAN HOUSING		10/06/2010	10/06/2010	10/06/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	677.42 003			GOODIE
1118	40690023	SFR HYD FAN RUNNING ALL THE TIME		11/08/2010	11/08/2010	11/08/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	32.05 003			ZWICKED
1118	40717153	MDR FAN LIGHT ON		17/12/2010	17/12/2010	17/12/2010	CLSD PCNF PRT NMAT PRC SETC	56.50 003			GOODIE
1118	40744114	DDR Repair dash fans		25/04/2011	25/04/2011	25/04/2011	CLSD PCNF PRT NMAT PRC SETC	50.00 003			GOLDSMD
1118	40745149	DDR Fan fault light on		01/05/2011	01/05/2011	01/05/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	93.61 003			GOLDSMD
1118	45162734	45000 Km Hydraulic Fan Filter		23/07/2011	14/07/2011	10/08/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	102.24 002	17385		IP1020110714
1118	40762189	DDR Repair hyd. oil leak		05/08/2011	05/08/2011	05/08/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	433.82 003			GOLDSMD
615	45122957	45000 KM HYDRAULIC FAN FILTER		16/04/2009	09/04/2009	04/05/2009	CLSD PRT GMPS NMAT PRC SETC	146.47 002	14089		IP1020090409
615	45137127	45000 Km Hydraulic Fan Filter		10/02/2010	04/02/2010	11/02/2010	CLSD PCNF PRT NMAT PRC SETC	25.00 002	14089		IP1020100204
615	40687023	DDR REPAIR HYDRAULIC LEAK		23/07/2010	23/07/2010	23/07/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	521.74 003			DOREYC
615	45150184	45000 Km Hydraulic Fan Filter		08/11/2010	28/10/2010	03/11/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	58.74 002	14089		IP1020101028
615	40724642	MDR REPAIR ENG FAN		25/01/2011	25/01/2011	25/01/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	877.68 003			ZWICKED
615	40729973	URB MAINT HYD LEAK IN STEERING COMPART		15/02/2011	15/02/2011	15/02/2011	CLSD PCNF PRT NMAT PRC SETC	100.00 003			WALTERM
615	45167882	45000 Km Hydraulic Fan Filter		11/10/2011	06/10/2011	28/10/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	73.75 002	14089		IP1020111006
616	45129292	45000 Km Hydraulic Fan Filter		24/08/2009	13/08/2009	26/08/2009	CLSD PCNF PRT GMPS NMAT PRC SETC	58.61 002	14093		IP1020090813
616	45104949	45000 Km Hydraulic Fan Filter		29/04/2010	22/04/2010	26/04/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	65.36 002	14093		IP1020100422
616	40698141	URB MAINT Hydraulic line leaking und		21/09/2010	21/09/2010	21/09/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	136.16 003			TURPLELE
616	45153571	45000 Km Hydraulic Fan Filter		07/01/2011	06/01/2011	25/01/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	60.70 002	14093		IP1020110106
616	40769707	MDR REPAIR ENG FAN		20/09/2011	20/09/2011	20/09/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	552.66 003			ZWICKED
616	45171630	45000 Km Hydraulic Fan Filter		29/12/2011	15/12/2011	21/12/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	86.26 002	14093		IP1020111215
617	40602076	MDR CK HYDRAULIC RESOVIEW FULL		11/05/2009	11/05/2009	11/05/2009	CLSD PCNF PRT NMAT PRC SETC	37.50 003			BHATHES
617	45127284	45000 KM HYDRAULIC FAN FILTER		28/06/2009	25/06/2009	20/07/2009	CLSD PRT GMPS NMAT PRC SETC	237.89 002	14097		IP1020090625
617	45140333	45000 Km Hydraulic Fan Filter		27/04/2010	15/04/2010	29/04/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	58.44 002	14097		IP1020100415
617	40681544	DDR REPAIR HYDRAULIC LEAK		23/06/2010	23/06/2010	23/06/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	1,243.58 003			DOREYC
617	40681638	TRR BLOWN HYD LINE		24/06/2010	24/06/2010	24/06/2010	CLSD PCNF NMAT PRC SETC	25.00 003			MCR0BER
617	40708401	MDR Repair engine fan		09/11/2010	09/11/2010	09/11/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	855.25 003			GOLDSMD
617	45154220	45000 Km Hydraulic Fan Filter		02/02/2011	20/01/2011	15/02/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	73.43 002	14097		IP1020110120
617	40765237	DDR REPAIR HYD LEAK		23/08/2011	23/08/2011	23/08/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	133.40 003			GULLIVT
617	40765302	TRR Hyd oil leak		24/08/2011	24/08/2011	24/08/2011	CLSD PCNF NMAT PRC SETC	50.00 003			BRIGLEA
618	45124602	45000 KM HYDRAULIC FAN FILTER		05/06/2009	21/05/2009	24/06/2009	CLSD PCNF PRT GMPS NMAT PRC SETC	58.61 002	14101		IP1020090521
618	45138811	45000 Km Hydraulic Fan Filter		24/03/2010	11/03/2010	22/03/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	70.95 002	14101		IP1020100311
618	40714204	MDR FAN RUNNING ALL THE TIME		06/12/2010	06/12/2010	06/12/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	776.16 003			WALTERM
618	45152184	45000 Km Hydraulic Fan Filter		19/12/2010	09/12/2010	04/02/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	73.20 002	14101		IP1020101209
618	40769573	MDR Repair hyd leak		19/09/2011	19/09/2011	19/09/2011	CLSD PCNF PRT NMAT PRC SETC	50.00 003			GALLANB
618	45169704	45000 Km Hydraulic Fan Filter		14/11/2011	03/11/2011	15/11/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	61.26 002	14101		IP1020111103
618	40786310	URB MAINT Repair hydraulic leak @ eng fl		06/12/2011	06/12/2011	06/12/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	1,760.61 003			TERRIOM
619	45124175	45000 KM HYDRAULIC FAN FILTER		15/05/2009	07/05/2009	11/05/2009	CLSD PCNF PRT GMPS NMAT PRC SETC	63.40 002	14105		IP1020090507
619	40609036	OSS SUPPLY HYD COMPONENTS TO CUMMINS		15/06/2009	15/06/2009	15/06/2009	CLSD PRT GMPS NMAT PRC SETC	1,364.82 003			RADKEYW
619	45139546	45000 Km Hydraulic Fan Filter		07/04/2010	25/03/2010	23/04/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	76.34 002	14105		IP1020100325
619	40679943	URB Maint Rep leak at fluid fan motor		16/06/2010	16/06/2010	16/06/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	1,391.93 003			BRIGLEA
619	45150187	45000 Km Hydraulic Fan Filter		28/10/2010	28/10/2010	17/11/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	116.30 002	14105		IP1020101028
619	40716026	URB MAINT Secure hydraulic lines by l/r		13/12/2010	13/12/2010	13/12/2010	CLSD PCNF PRT GMPS NMAT PRC SETC	604.69 003	14105		TURPLELE
619	45161716	45000 Km Hydraulic Fan Filter		23/06/2011	23/06/2011	06/07/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	60.93 002	14105		IP1020110623
619	40755522	MDR REPAIR HYD FAN		28/06/2011	28/06/2011	28/06/2011	CLSD PCNF PRT GMPS NMAT PRC SETC	755.04 003			ZWICKED
619	45172766	45000 Km Hydraulic Fan Filter		14/01/2012	05/01/2012	18/01/2012	CLSD PCNF PRT GMPS NMAT PRC SETC	61.27 002	14105		IP1020120105

\$ 16,034 TOTAL SAMPLE

\$ 5,345 TOTAL PER YEAR SAMPLE

\$ 668 TOTAL PER YEAR PER BUS