

ENERGY MANAGEMENT PLAN

MAPLE RIDGE - PITT MEADOWS SCHOOL DISTRICT NO.42



EXECUTIVE SUMMARY

Maple Ridge – Pitt Meadows School District serves students in the municipalities of Maple Ridge, Pitt Meadows and both Langley and Katzie First Nations. With the population forecasted to increase and the number of children per family increasing, the number of students in the school district is also expected to rise.

In 2009, Maple Ridge – Pitt Meadows School District signed the *British Columbia Climate Action Charter* that committed the province and board of education to measure and report on their greenhouse gas (GHG) emissions, make plans and take actions to reduce GHG emissions, develop *Carbon Neutral Action Reports*, and become carbon neutral in respect of their operations by 2010.

In 2014, as part of the school district *Strategic Facilities Plan*, the school district engaged *Quantum Lighting Inc.* and *SES Consulting* to produce high level energy assessments for all 34 school district facilities including 20 elementary schools, 6 secondary schools and 8 other buildings. This study provided the *Maple Ridge – Pitt Meadows School District* with high level estimates of required one-time capital investments as well as estimated ongoing energy savings related to the creation and implementation of an energy management plan.

The overall goal of the energy management plan is to reduce the school district's utility costs by continuously improving the energy performance of its facilities, and to meet the goal of reducing electrical consumption by 30% from 2013 levels by the year 2019. The target electrical consumption saving is equivalent to providing enough energy to power 440 BC average homes for a year or powering a secondary school for two full years.

This energy management plan was prepared based on the information from the initial energy assessments, and will serve as a guiding document for achieving energy and cost savings, and for continuously improving the overall energy performance of school district buildings. The plan integrates both technical and organizational opportunities and actions.

The implementation of all lighting and heating, ventilation and air-conditioning (HVAC) upgrade opportunities identified in this report will result in estimated energy savings of 4.44 million kWh and estimated annual utilities cost savings of \$0.40 million. The one-time capital investment required to implement all opportunities identified is estimated at \$4.16 million with the upgrades being completed over four years (2015-2019). If the Board were to fully fund this program from local funds, the resulting simple payback period would be 10.4 years. The payback does not include natural gas savings, maintenance savings, any potential BC Hydro and Fortis BC incentive funding or *Ministry of Education Carbon Neutral Capital Program* funding, which will significantly improve the estimated payback period for local funds and strengthen the business case for the plan.

The proposed sources of funding for the energy management program are as follows:

Energy Management Program Funding by Source (\$ million)	
\$1.40	Annual Facilities Grant
\$0.46	Carbon Neutral Capital Program (Ministry of Education)
\$1.40	Capital Reserve (Ministry of Education)
\$0.90	Local Capital Reserve
\$4.16	Total Funding Required

Approval from the *Ministry of Education* is required to access capital reserve funding. Furthermore, the annual facilities grant funding amount assumes that AFG allocations will continue at current levels for the next four years. If the Minister of Education does not grant approval for the use of capital reserve funding, then alternate sources of funding would have to be identified for the program.

In conclusion, the *Maple Ridge - Pitt Meadows School District* is in a good position to save on its ongoing utility costs as well as make significant progress towards its GHG emission reduction efforts. With the support of its partners, *Ministry of Education*, *BC Hydro Power Smart* and *Fortis BC*, the school district can recover its investment in energy conservation measures in under 10 years and achieve ongoing operating savings of over \$0.40 million.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
1. Introduction	5
1.1 Background and Objectives	5
1.2 Scope of Energy Management Plan	6
1.3 Approach and Work Plan	7
2. Overall Assessment of Energy Baseline Performance - 2013	8
2.1 Baseline Energy Consumption and Costs	8
2.2 Baseline Energy Consumption and Student Enrolments - 2013	9
2.3 Baseline Energy Costs by Facility Type - 2013	11
2.4 Utility Rate Analysis	13
2.4.1 Electricity	13
2.4.2 Natural Gas	13
2.5 Energy Benchmarking - Building Energy Performance Index (BEPI) - 2013	14
2.6 Carbon Neutral Profile - 2013	16
3. Assessment of Energy Conservation Measures (ECM)	17
3.1 Lighting Upgrades	17
3.2 Heating, Ventilation and Air-Conditioning (HVAC) Upgrades	18
3.3 Financial Summary of Energy Conservation Measures	18
3.4 Energy Management Assessment (EMA) Results and Opportunities	19
4. Implementation Plan: 2015-2019	20
5. Energy Management Budget 2015-2019	22
6. Risk Management	23
7. Conclusions	24
Glossary of Terms	25
Appendix A	26
Appendix B	27

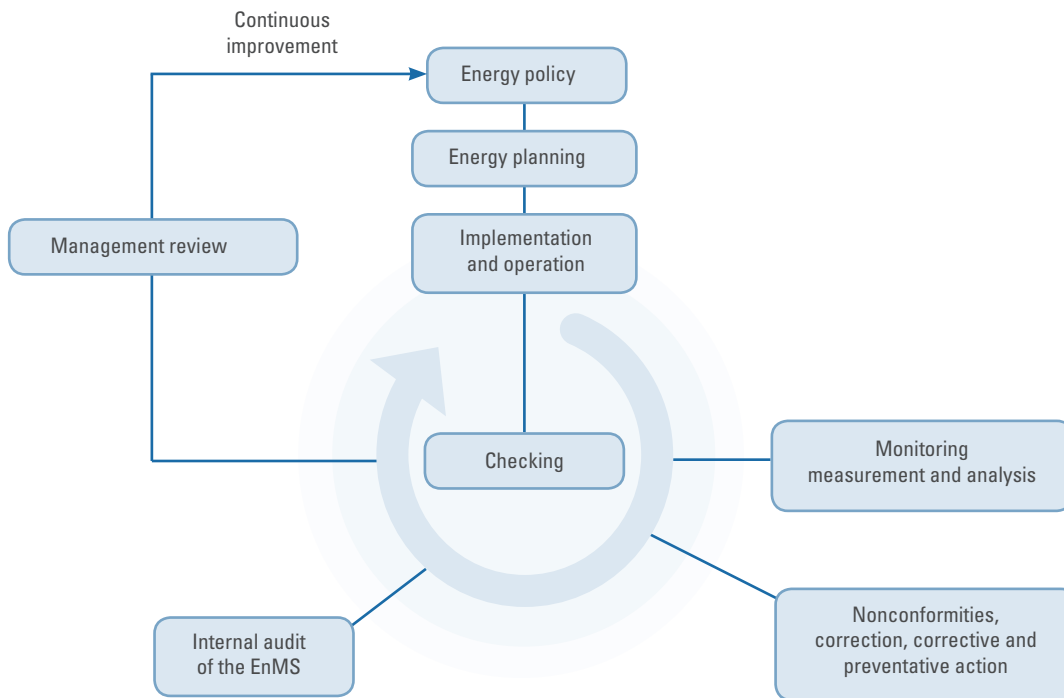
1. INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

The *Maple Ridge – Pitt Meadows School District* energy management plan is implemented in alignment with the school district’s strategic direction, commitment and budget priorities. The plan is created in accordance with ISO Standard 50001:2011, designed to provide management strategies and to imbed energy management within organizations.

The energy management plan aligns with the continuous improvement, effectiveness and sustainability priorities the school district has identified in its strategic review, *Roadmap to Excellence*. The plan provides an actionable and comprehensive roadmap for achieving energy and cost savings in the school district’s 34 buildings, and will serve as a framework for achieving continuous improvement of energy performance in support of long-term energy and cost reduction goals. The savings achieved through the implementation of this plan will be used to support our central purpose, student learning.

ISO Standard 50001:2011 outlines eight phases in the evolution of an energy plan, shown below. Each phase integrates both organizational and technical actions. The organizational actions include implementing the energy policy, energy planning, internal auditing of the energy plan, preventative action and management review; while the technical actions include implementation and operation, monitoring measurement and analysis. Together the two types of actions provide a continuous improvement approach to energy management that the school district will follow.



1.2 SCOPE OF ENERGY MANAGEMENT PLAN

The *Maple Ridge–Pitt Meadows School District* currently owns and operates 34 facilities. Over the years as the community demographic shifted, some schools were closed, some were renovated or added to, and new schools were constructed. The school district is currently working on creating a *School District Strategic Facilities Plan* that will include the energy management plan. The development of the energy management plan is based on an assessment of all 34 facilities. The list of facilities in alphabetical order and their floor area is listed below.

FACILITY NAME	FLOOR AREA (m ²)
ELEMENTARY SCHOOLS:	
ALBION ELEMENTARY	3,630
ALEXANDER ROBINSON ELEMENTARY	3,535
ALOUETTE ELEMENTARY	3,703
BLUE MOUNTAIN ELEMENTARY	2,540
DAVIE JONES ELEMENTARY	3,397
EDITH MCDERMOTT ELEMENTARY	3,269
ERIC LANGTON ELEMENTARY	3,830
FAIRVIEW ELEMENTARY	3,862
GLENWOOD ELEMENTARY	3,473
GOLDEN EARS ELEMENTARY	4,186
HAMMOND ELEMENTARY	3,535
HARRY HOOGE ELEMENTARY	3,691
HIGHLAND PARK ELEMENTARY	3,172
KANAKA CREEK ELEMENTARY	4,346
LAITY VIEW ELEMENTARY	4,794
MAPLE RIDGE ELEMENTARY	3,905
PITT MEADOWS ELEMENTARY	3,998
WEBSTER'S CORNERS ELEMENTARY	2,471
WHONNOCK ELEMENTARY	2,330
YENNADON ELEMENTARY	4,380
ALTERNATE PROGRAMS AND SECONDARY SCHOOLS:	
GARIBALDI SECONDARY	12,429
MAPLE RIDGE SECONDARY	13,793
PITT MEADOWS SECONDARY	13,276
SAMUEL ROBERTSON TECHNICAL	6,861
THOMAS HANEY CENTRE	12,736
WESTVIEW SECONDARY	12,369
MAPLE RIDGE SECONDARY ANNEX	3,552
SOUTH LILLOETTE	1,589
OTHER:	
ALOUETTE RIVER CAMPUS (CREW)	282
ARTHUR PEAKE CENTRE	539
DISTRICT EDUCATION OFFICE	1,540
MAINTENANCE FACILITY	1,080
JAMES BEST CENTRE	468
RIVERSIDE CENTRE	3,965
GRAD TOTAL	156,496

1.3 APPROACH AND WORK PLAN

The energy management plan is informed by high level energy assessments conducted by *Quantum Lighting Inc.* and *SES Consulting*, benchmarking results using *SmartTool* data downloads, *BC Hydro* workshops and the vision and leadership of the *Maple Ridge - Pitt Meadows School District*.

Maple Ridge – Pitt Meadows School District uses three types of energy: electricity, natural gas and propane. Generally, the school district facilities operate at higher load factors than similar facilities in other school districts. This indicates there is an opportunity to reduce energy consumption through energy conservation measurements (ECMs).

The high level energy assessments identified electrical conservation measures and the specific areas of focus are lighting and HVAC systems. The studies incorporated business case assessments that included savings and cost breakdowns as well as paybacks. The paybacks do not include natural gas and maintenance savings nor any potential *BC Hydro* and *Fortis BC* incentive funding which will make the business case even more financially attractive.

2. OVERALL ASSESSMENT OF ENERGY BASELINE PERFORMANCE 2013

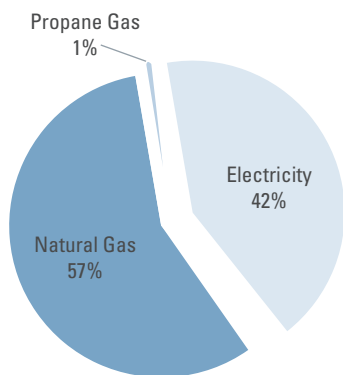
2.1 BASELINE ENERGY CONSUMPTION AND COSTS

The baseline period is January 2013 to December 2013 inclusive. The period was selected based on the availability of utility information and the need to generate a full baseline in a concurrent period. Furthermore, there were no major energy conservation measures undertaken in 2013. The baseline is used for benchmarking purposes and as a reference case for calculating energy savings.

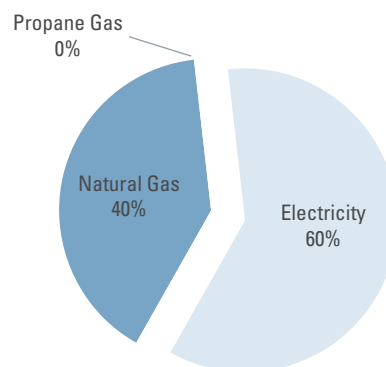
The detailed list of baseline energy consumption and cost, including all energy types (electricity, natural gas and propane), assessments for each facility can be found in *Appendix A*. Energy consumption is reported in eGJ or equivalent gigajoules using a conversion formula that compares all energy types in the same unit. The key findings are summarized as follows:

- The total energy use is approximately 104,395 gigajoules (eGJ). Electricity accounts for 43,474 eGJ or 42%; natural gas accounts for 60,089 GJ or 57%; propane comprises the remaining 1% at 862 eGJ.¹
- The total energy costs are approximately \$1.6 million. Electricity accounts for \$0.96 million or 60% of the total costs; natural gas accounts for \$0.65 million or 40% of total costs. Propane costs are insignificant at less than 0.5% of the total costs.²

BASELINE ENERGY USE BY FUEL TYPE



BASELINE ENERGY COST BY FUEL TYPE



¹ Source: SmartTool

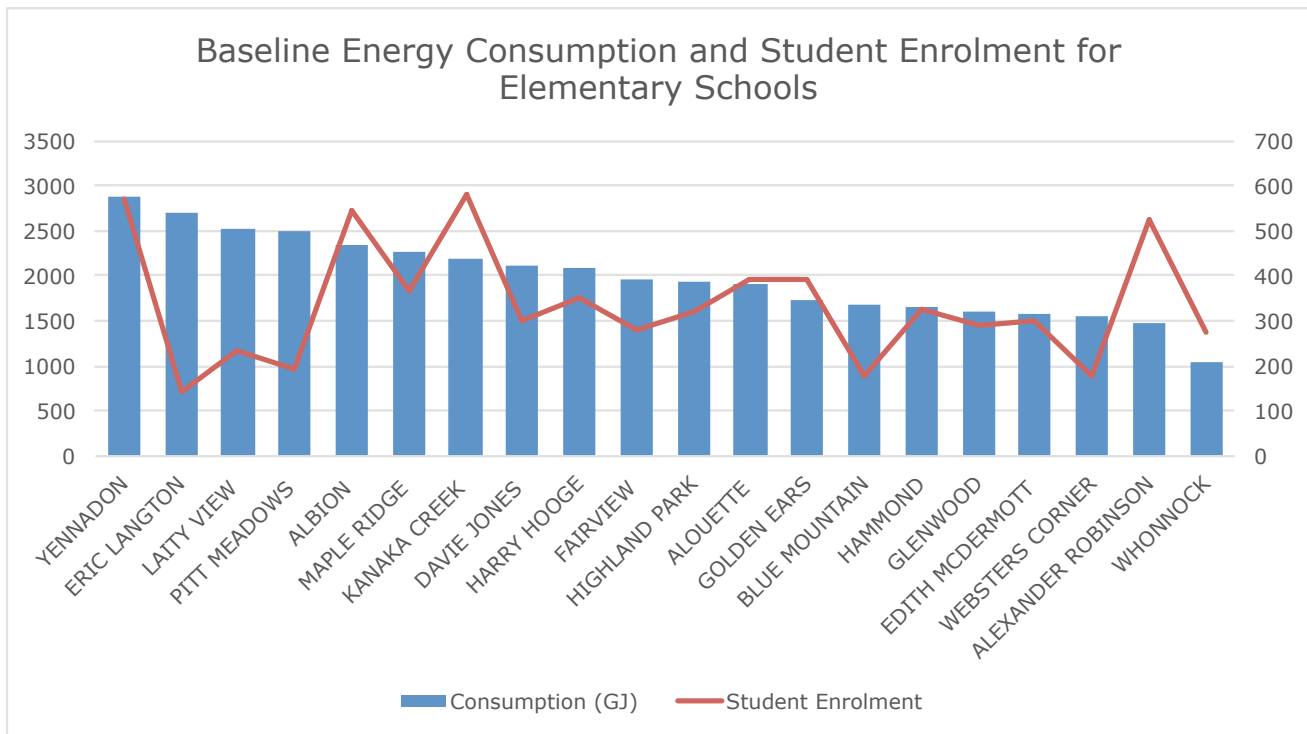
² Source: School District 42 Finance Department

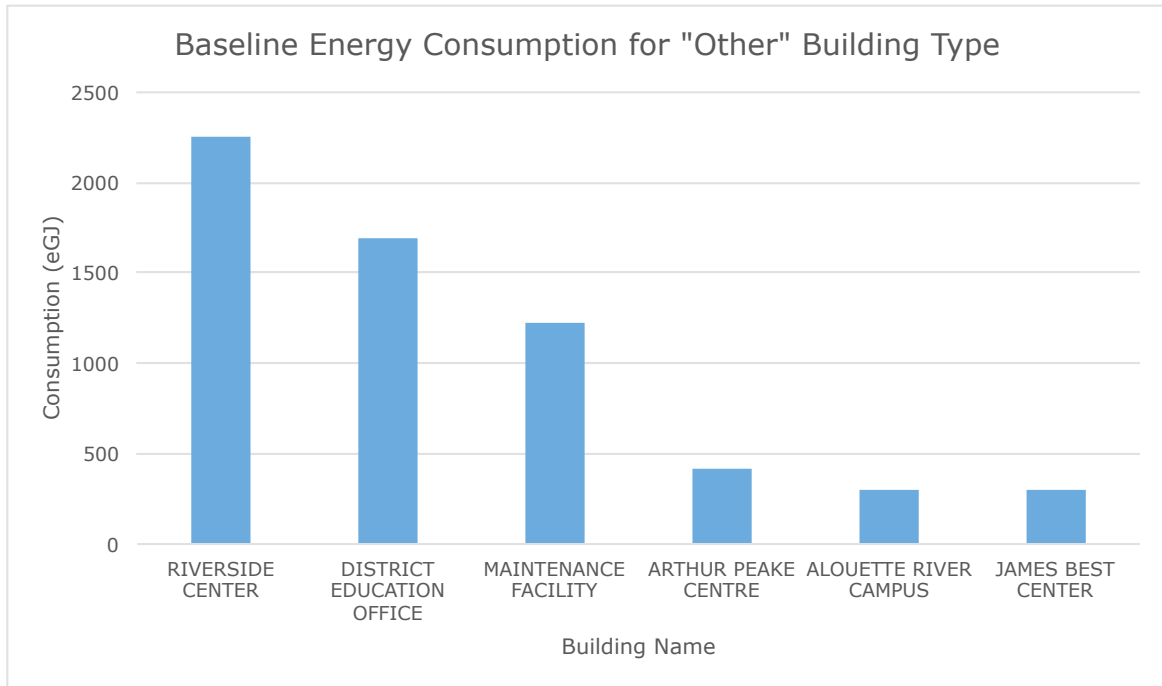
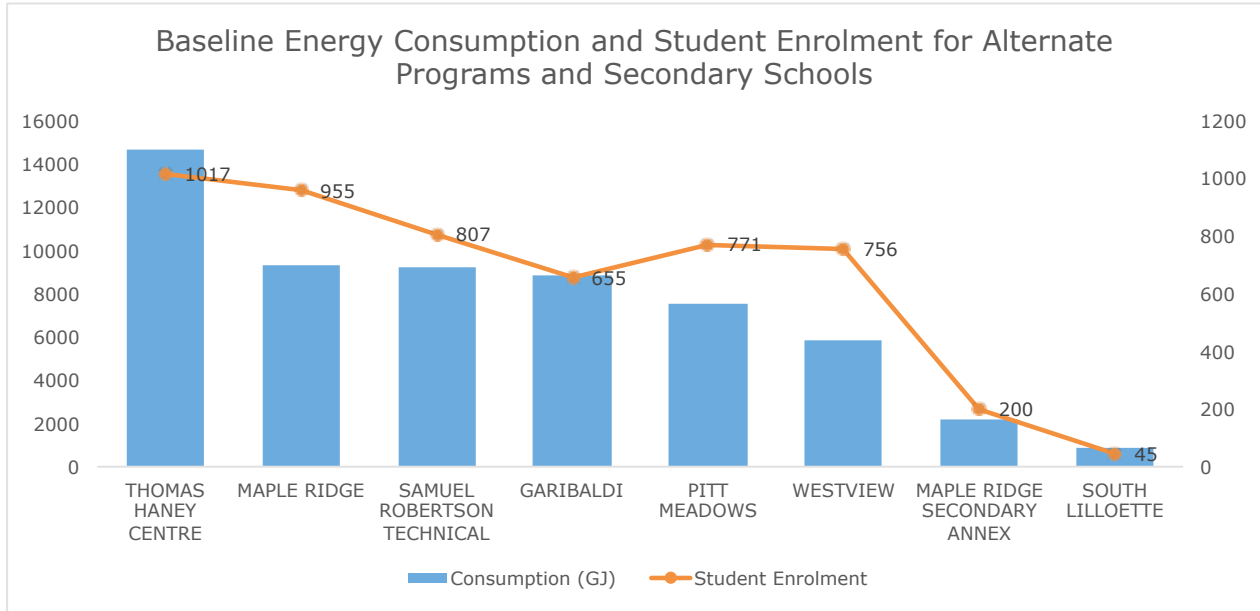
2.2 BASELINE ENERGY CONSUMPTION AND STUDENT ENROLMENTS - 2013

Information collected by measuring a building’s energy performance for 12 consecutive months, between the period of January 2013 and December 2013 inclusive, establishes a baseline for energy consumption. This baseline serves as a starting point for setting energy efficiency improvement goals as well as a comparison point for evaluating future energy conservation measures and trending overall performance. As the school district undertakes energy conservation measures, the consumption will decrease in comparison to this baseline analysis. This analysis will also show a positive correlation between energy consumption and the number of student enrolments. If the analysis shows otherwise, that will flag an area for further investigation and potential energy conservation measures.

For reporting purposes, facilities have been divided into three types of categories: elementary schools, alternate programs and secondary schools, and “other” building types. The key findings for analyzing the school district facilities’ baseline energy consumption are summarized as follows:

- Yennadon Elementary and Eric Langton Elementary both are the highest energy users when compared to all school district’s elementary schools. Yennadon Elementary has the second highest number of student enrolments of elementary schools. Eric Langton however has one of the lowest number of enrolments. This analysis flags Eric Langton as a potential area for further investigation and potential energy conservation measures.
- Thomas Haney Centre is the highest energy user, at approximately 26% of the total energy use of all alternate programs and secondary schools.
- Riverside Centre is the highest consuming building in the other category.



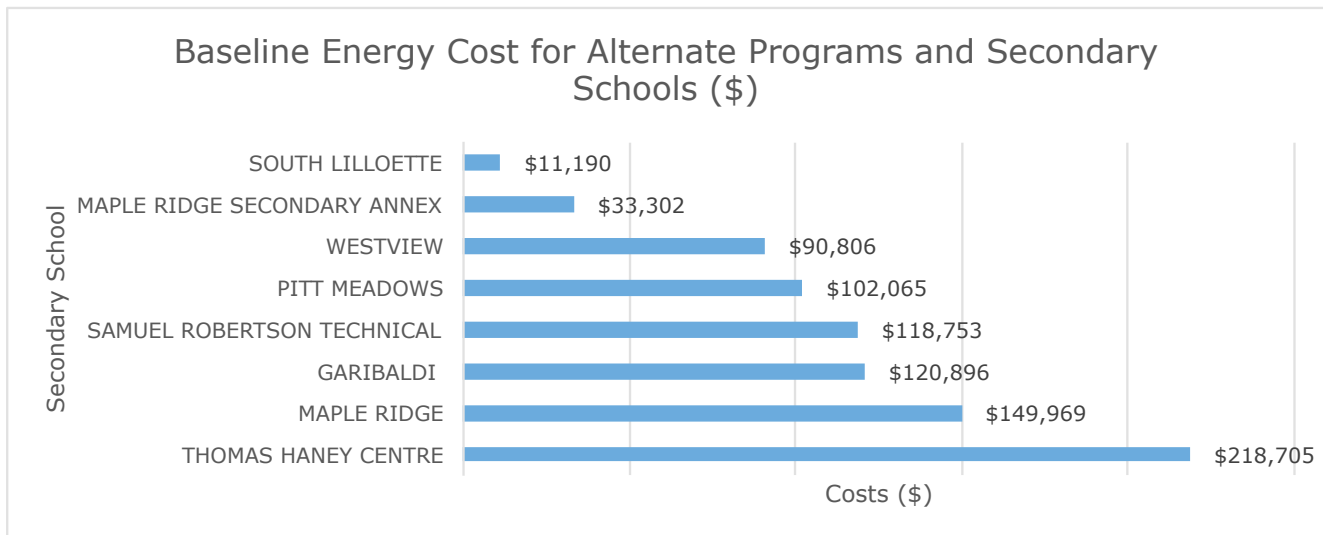


2.3 BASELINE ENERGY COSTS BY FACILITY TYPE - 2013

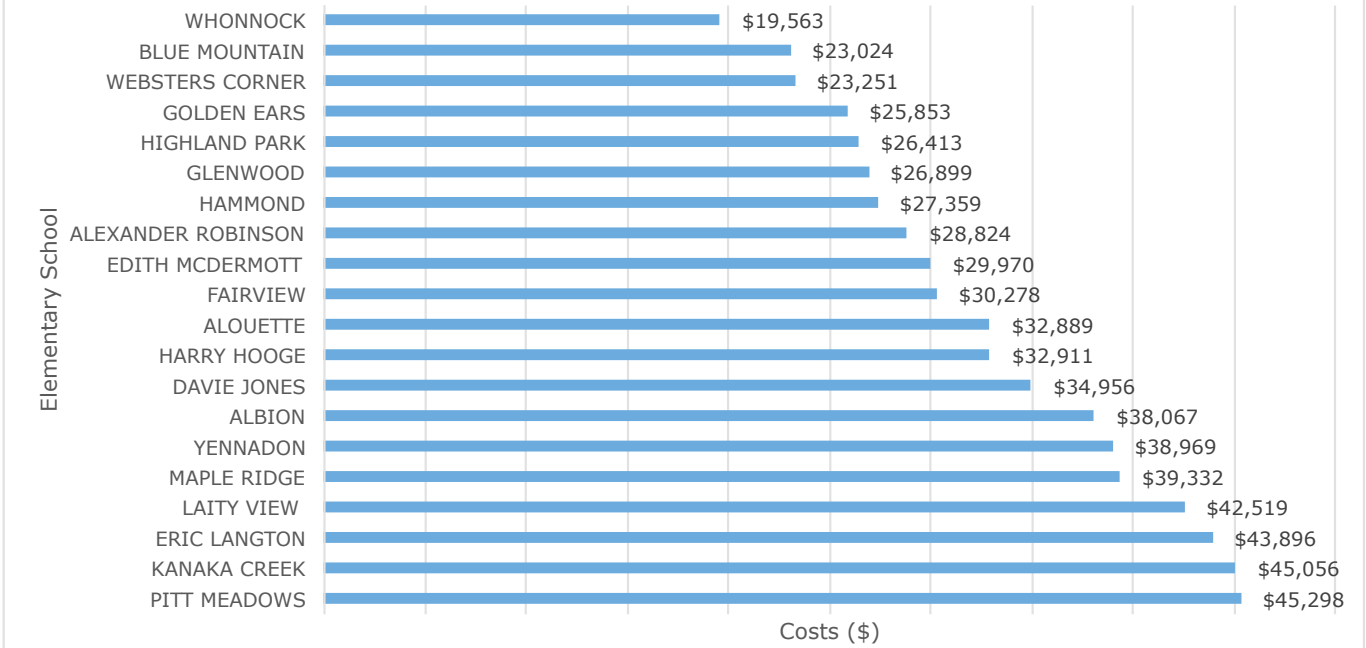
One of the overall goals of the energy management plan is to decrease utility costs. Understanding how much facilities cost in energy is the first step in understanding where the school district spends the majority of its utility costs. For example, it is no surprise to see some correlation between baseline energy consumption and baseline energy costs, especially for those facilities that have the highest number of students.

Facilities have been divided into three types of categories: elementary schools, alternate programs and secondary schools, and “other” building types. The key findings for analyzing the school district facilities’ baseline energy costs are summarized as follows:

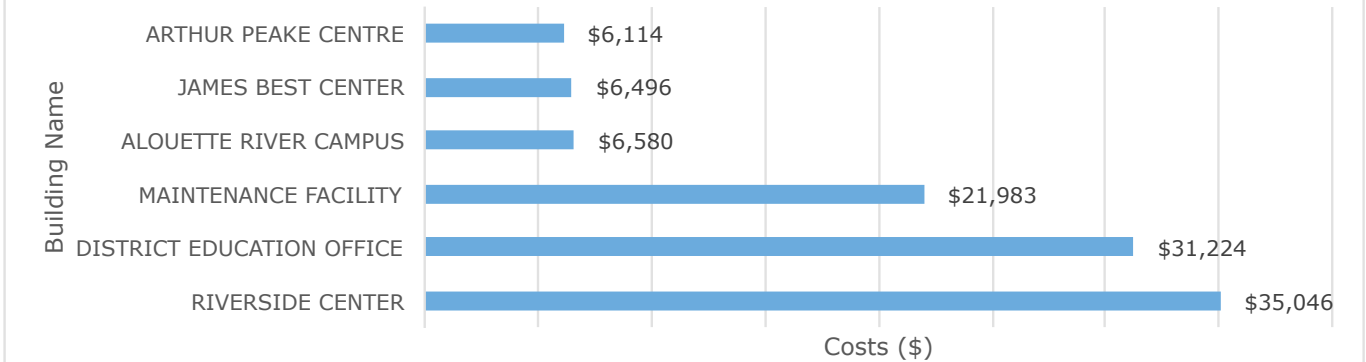
- The highest energy cost elementary schools are Pitt Meadows Elementary and Kanaka Creek Elementary. The lowest energy cost school is Whonnock Elementary.
- Thomas Haney Centre is the highest energy costing secondary school, at approximately 27% of the total energy cost of all secondary schools, similar to the energy consumption analysis in the previous section.
- The highest energy cost building in the “other” building type category is Riverside Centre, and the lowest is Arthur Peake Centre.



Baseline Energy Cost for Elementary Schools (\$)



Baseline Energy Cost for "Other" Building Type (\$)



2.4 UTILITY RATE ANALYSIS

2.4.1 Electricity

All of the facilities observed are subject to the *BC Hydro Large General Service Conservation Rate*, which encourages energy conservation. **For the purpose of calculating estimated savings from recommended retrofits outlined in this energy management plan, the 2013 marginal rate used is 9.0 cents/kWh.**

Rate increases for electricity have been approved for 2015 amounting to an estimated annual increase in the school district's cost of electricity of approximately \$86,000. If the school district does not undertake any of the energy conservation measures, it will incur an increase in utility costs over the next four years.

Below is the BC Hydro rate increase schedule. Each year's increase is a percentage of the previous year's rates:

2014/15:	9%
2015/16:	6%
2016/17:	4%
2017/18:	3.5%
2018/19:	3%

2.4.2 Natural Gas

The recent gas consumption rates are based on *Shell Energy* commodity rates and *Fortis BC* transportation charges, including the carbon tax. **For the purpose of calculating estimated savings from recommended upgrades outlined in this energy management plan, the total rate of \$8.13/GJ was used.** This rate includes the gas marketer charges, *Fortis BC* transportation charges, carbon tax, and other taxes.

2.5 ENERGY BENCHMARKING - BUILDING ENERGY PERFORMANCE INDEX (BEPI) - 2013

A building energy performance index (BEPI) is a form of normalizing energy data in a way that adjusts for the floor area of similar type buildings for the purpose of comparing similar type buildings in a more meaningful way. While the previous section provided a picture for the actual energy performance of similar type buildings in the baseline year, this section analyzes building energy intensity or BEPI rating, providing a more meaningful performance monitoring tool by analyzing the normalized energy performance (natural gas, electricity and propane) of similar buildings.

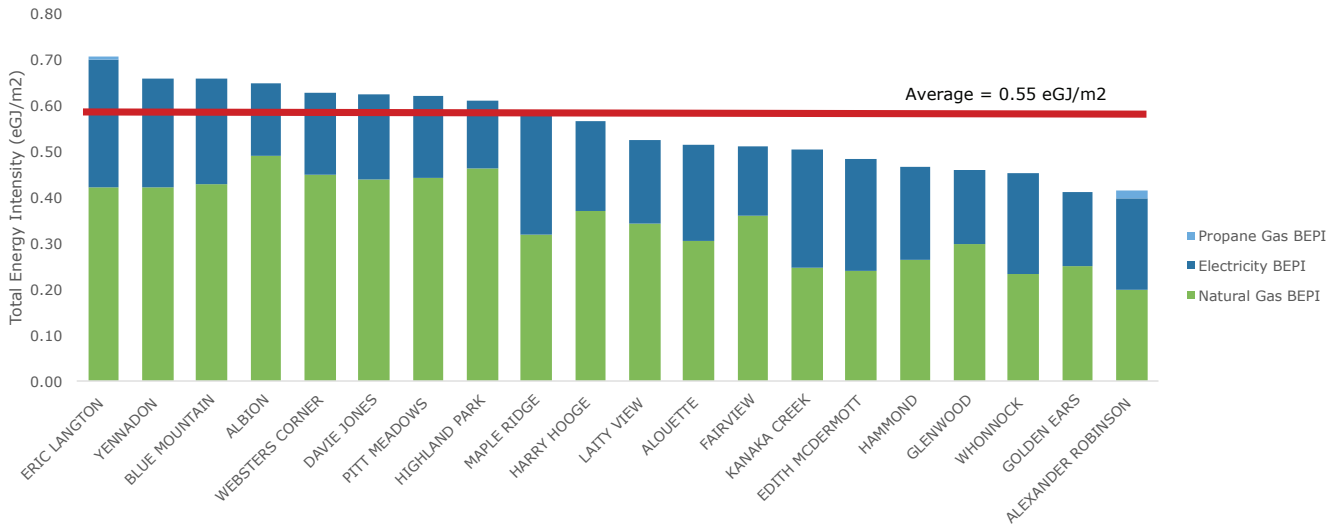
The BEPI analysis will help identify outliers and potential areas for improvement. As the school district undertakes energy conservation measures, the energy intensity of the outliers identified will be brought down towards the average BEPI. The average BEPI value will continuously reduce as more ECMs are undertaken, continuously improving the energy performance of the school district's facilities.

The Board office, maintenance office and Continuing Education facilities are excluded from the comparison since the unique nature of these buildings does not provide a useful benchmarking comparison.

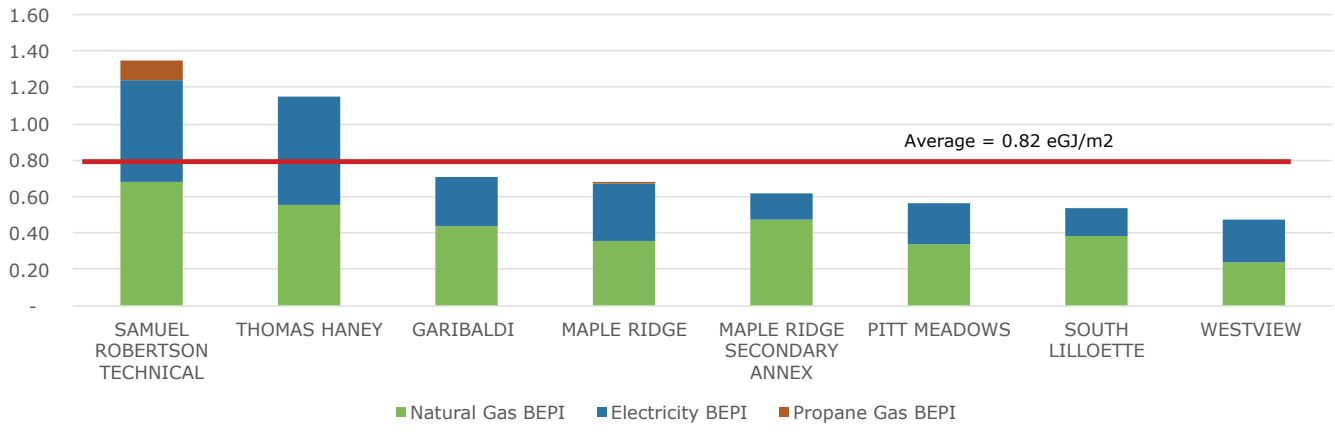
The key findings for analyzing the school district elementary and secondary school BEPIs are summarized as follows:

- The average school district energy intensity for elementary schools is 0.55 eGJ/m². The average school district energy intensity for alternate programs and secondary schools is 0.82 eGJ/m². As the school district undertakes energy conservation measures, this average will decrease, continuously improving the target energy intensity of similar buildings.
- Nine elementary schools show an above average energy intensity and indicate potential energy conservation projects to be investigated.
- Eric Langton Elementary School is an energy intensity outlier, being the highest energy intensity elementary school of the portfolio. This was also noted in the section 2.2 analysis.
- While opportunities still exist and have been identified in this plan, Alexander Robinson Elementary and Golden Ears Elementary have excellent energy performance.
- Two secondary schools show an above average energy intensity and indicate potential energy conservation projects to be investigated.
- While both Samuel Robertson Technical and Thomas Haney Centre are energy intensity outliers, Samuel Robertson Technical Secondary School, a school constructed in 2005 that has an excellent facilities condition index rating, uses more energy per unit floor area than Thomas Haney Centre, a school constructed in 1992 that has a poor to average facilities condition index rating. These schools have been flagged as areas for energy conservation measures.
- While opportunities still exist and have been identified in this report, Westview Secondary has excellent energy performance.

Elementary School Building Energy Performance Index (BEPI)



Alternate Programs and Secondary School Building Energy Performance Index (BEPI)

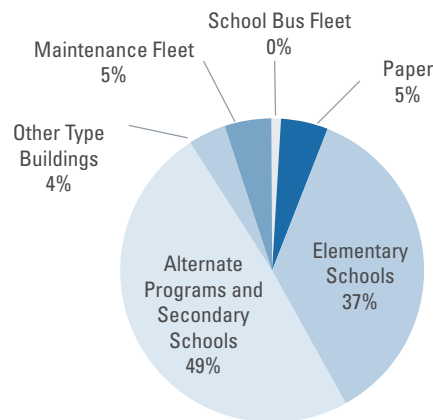


2.6 CARBON NEUTRAL PROFILE - 2013

In 2009, *Maple Ridge – Pitt Meadows School District* signed the *British Columbia Climate Action Charter* that committed the province and boards of education to measure and report on their greenhouse gas (GHG) emissions, make plans and take actions to reduce GHG emissions, develop *Carbon Neutral Action Reports* and become carbon neutral in respect of their operations by 2010. The goal of carbon neutrality is achieved through the payment of carbon offsets. An offset is a greenhouse gas emissions reduction tool used to compensate for emissions. Offsets, measured in terms of carbon dioxide equivalency, are purchased for \$25/tCO₂e.

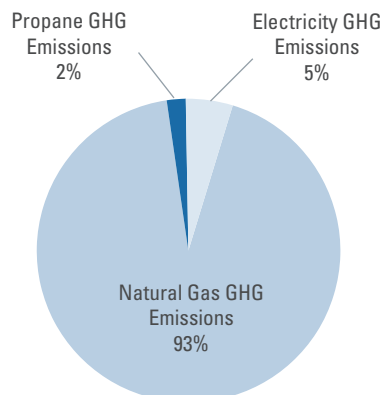
To become carbon neutral for the 2013 calendar year, *Maple Ridge – Pitt Meadows School District* applied carbon offsets of 3,589 tonnes of carbon dioxide equivalent (tCO₂e). The energy consumed by school district buildings contributed 3,209 tCO₂e or 90% of the total school district carbon dioxide emissions for 2013. The remainder of the emissions comprised of emissions from fleet (diesel and gasoline) and supplies (paper). The school district's total purchase of carbon offsets for 2013 was approximately \$89,725.

SCHOOL DISTRICT 42 GHG PROFILE - 2013



School district facilities emit 90% of the total school district emissions. Natural gas comprises 93% of the total GHG emissions in facilities. This highlights the need for the school district to focus on reducing natural gas consumption in its facilities in efforts to decrease its carbon footprint and make progress towards our commitment to the *British Columbia Climate Action Charter*.

GHG EMISSIONS FOR SCHOOL DISTRICT BUILDINGS BY ENERGY TYPE - 2013



3. ASSESSMENT OF ENERGY CONSERVATION MEASURES (ECM)

This section summarizes the business case assessments for the school district’s energy management plan opportunities and forms the basis of the implementation plan, section 4. The two major opportunity areas were identified:

- Lighting upgrades
- Heating, ventilation and air-conditioning (HVAC) upgrades

3.1 Lighting Upgrades

A wide variety of lighting exists in the school district building portfolio, from older T8 lighting to obsolete T12 technology to high intensity discharge (HID) lighting and compact fluorescent lighting (CFL). There is also an opportunity to reduce the number of fixtures as well as expand the existing dark school approach. Specific details related to the business case assessments for each facility can be found in *Appendix B*.

Energy Conservation Measures:

- Replace and retrofit existing T12 fixtures with T8 extended life lamps and electronic program start ballasts. The new ballasts will also be compatible with recently introduced T8 LED lamps for future additional energy saving opportunities.
- Retrofit existing T8 fixtures with new T8 extended life lamps and electronic program start ballasts.
- Add occupancy sensors to all areas as required (classrooms, gymnasiums, libraries).
- Replace and/or remove interior HID/CFL fixtures
- Replace and retrofit exterior lighting to LED technology
- Reduce the number of fixtures and lamps where appropriate
- Adopt a dark school approach: All interior lights, except that above the main entry alarm system, should be off when the school is unoccupied. Exterior lighting would operate during the early/morning and be off through the day/night.

Financial Summary of Lighting Upgrades:

LIGHTING UPGRADES		
Estimated Electrical Ongoing Savings (kWh)	Estimated One Time Capital Costs	Estimated Ongoing Savings
3,165,021	\$3,820,000	\$284,852

The estimated simple payback period is 13.4 years if the Board were to fund this program from local funds. The payback does not include natural gas savings, maintenance savings, any potential *BC Hydro* and *Fortis BC* incentive funding, or *Ministry of Education Carbon Neutral Capital Program* funding, which will make the business case even more financially attractive.

3.2 HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) UPGRADES

Heating for most facilities is provided by natural gas boilers. The boilers supply hot water to air handling units heating coils, unit ventilators and forced flow unit heaters. Ventilation to most buildings is provided by air handling units, unit ventilators and exhaust fans. A limited direct digital control (DDC) system controls most buildings' mechanical system.

Energy Conservation Measures:

- DDC upgrades for facilities that have no DDC system
- Scheduling and security integration – the existing schedule for the majority of HVAC systems equipment exceeds its need
- Occupancy sensor controls – to ensure that the air handling units are enabled only when spaces are occupied
- Heating plant optimization – enabling pumps based on space heating demand in order to reduce unnecessarily pumping hot water throughout the building
- Supply air pressure (SAP) reset – supply fans are working harder than necessary to over pressurize the ducts

Financial Summary of HVAC Upgrades (electrical only):

HVAC UPGRADES		
Estimated Electrical Ongoing Savings (kWh)	Estimated One Time Capital Costs	Estimated Ongoing Savings
1,270,848	\$340,000	\$114,376

The resulting simple payback period is 3.0 years if the Board were to fund this program from local funds. The payback does not include natural gas savings, maintenance savings, any potential *BC Hydro* and *Fortis BC* incentive funding, or *Ministry of Education Carbon Neutral Capital Program* funding, which will make the business case even more financially attractive. Furthermore, HVAC upgrades will result in natural gas energy consumption reductions and cost savings. The natural gas estimates will be determined in the Level II energy assessments and on a project by project basis.

3.3 FINANCIAL SUMMARY OF ENERGY CONSERVATION MEASURES

The below chart presents a summary of the business case justification for the two major energy management opportunities for all school district facilities and includes the kWh energy consumption reduction and associated energy cost savings, capital costs and simple payback in years. The information was provided by *Quantum Lighting Inc.* and *SES Consulting*, who were engaged in producing level I energy assessments for all school district buildings.

The savings and costs shown below are preliminary estimates only and more detailed design is required for each facility prior to implementation to determine actual cost and estimated savings. Additionally, paybacks do not include natural gas savings, maintenance cost savings nor any potential *BC Hydro* and *Fortis BC* incentive funding which will make the business case even more attractive.

ELECTRICAL CONSUMPTION (kWh)	LIGHTING UPGRADES			HVAC UPGRADES			TOTALS		
	Estimated Electrical Ongoing Savings (kWh)	Estimated One Time Capital Cost	Estimated Ongoing Savings	Estimated Electrical Ongoing Savings (kWh)	Estimated One Time Capital Cost	Estimated Ongoing Savings	Estimated Electrical Ongoing Savings (kWh)	Estimated One Time Capital Cost	Estimated Ongoing Savings
2013	3,165,021	\$3,820,000	\$284,852	1,270,848	\$340,000	\$114,376	4,435,869	\$4,160,000	\$399,228

3.4 ENERGY MANAGEMENT ASSESSMENT (EMA) RESULTS AND OPPORTUNITIES

In an effort to assist the Maple Ridge - Pitt Meadows School District in optimizing energy management, *BC Hydro Power Smart* has sponsored participation in the *Energy Management Assessment (EMA) Program* with the end goal of developing a strategic energy management long-term plan. In contribution towards this endeavour, Fabian Biagetti of *Strategic Energy Group*, in partnership with *BC Hydro Power Smart*, facilitated a workshop with the school district senior management team on February 13, 2015 for the purpose of conducting a holistic assessment of current energy-related practices and identifying opportunities for continuous improvement.

As a result of this initial EMA workshop session with the school district senior team, it is recommended that initial efforts to improve energy management business practices focus on the following areas:

- **Policy**
 - » Create a mission statement with a clear scope, charter and long-term goal for the energy management program sponsored by senior management and the Board of Education.
- **Targets and Reporting**
 - » Ensure collection of energy use data for the various key locations in a centralized application to enable the analysis required for sound management decisions.
 - » Identify appropriate metrics that utilize key factors to normalize energy consumption to standard operations.
 - » Set an overall annual energy intensity or consumption reduction target for each year of the long-term goal in the energy management program mission statement.
- **Plans and Actions**
 - » Improve the baseline understanding of energy consumption and opportunities for savings for each major utility system.
 - » Develop implementation plans that correlate potential savings to the established consumption reduction targets.
- **Teams and Committees**
 - » Proactively deliver regular energy intensity reports to departmental personnel for use in raising general awareness and examining variances from established targets.
- **Employee Awareness and Training**
 - » Improve communication of the energy conservation initiative to the broader organization to raise energy awareness in general.

The outcomes from this session will be used in subsequent series of planning exercises with the school district management team to update this energy management plan in a way that continuously aligns school district priorities with energy management goals. As the school district progresses through the energy management program, the energy management plan will serve as the implementation guide for the corrective actions and projects deemed to be of short-term priority to the organization.

4. IMPLEMENTATION PLAN: 2015-2019

When deciding which projects Maple Ridge – Pitt Meadows School District will pursue, the following criteria were considered:

1. Project costs – energy management opportunities with a sound return on investment and the lowest simple payback (capital costs/energy cost savings) are given priority.
2. Obsolete technology – any existing T12 lighting is obsolete and should be replaced as soon as possible.
3. Energy consumption – energy conservation measurements that decrease energy use in high energy intensity facilities are given priority.
4. 4BC Hydro Total Resource Cost (TRC) – in order to maximize *BC Hydro* incentive amounts, projects need to meet a minimum energy savings threshold of 50,000 kWh/year and maintain a one-to-one balance between capital costs and kWh savings. Energy saving upgrades with a lower kWh energy savings amount than capital cost investment amount are too expensive for *BC Hydro* and will need to be bundled with other projects that have a balanced TRC rating to maximize the incentive amounts.
5. BC Hydro Energy Management targets – year 1 target have been set at 1,000,000 kWh with further targets to be set on an annual basis.

When creating the implementation plan, all five criteria were kept in consideration. *Appendix B* shows the implementation analysis for all school district facilities, using conditional formatting to highlight the highest priority projects (green) versus lowest priority projects (red). As such a blend of the five above criteria yields the energy management implementation plan project bundles on page 21.

Work on Bundle A is underway and will be completed by March 31, 2015. The Level I energy assessments identified one facility that has the greatest potential energy savings and best return on investment: Thomas Haney Centre. The Thomas Haney upgrade has been split up into the HVAC upgrade and lighting upgrade components. Level II energy assessments were completed by *Quantum Lighting Inc.* and *SES Consulting*. *BC Hydro* incentive pre-approval has been received, tenders have been issued for both the lighting and HVAC upgrades. The project is funded from *Ministry of Education Carbon Neutral Capital Program* (\$461,330) and Board funds.

In order to maximize the potential incentive funding provided by *BC Hydro*, the Thomas Haney Centre upgrade was bundled with Webster's Corner Elementary lighting upgrades in Bundle B. This work will begin after April 1, 2015 and will be completed by July 31, 2015. Bundle B includes energy upgrades at six other school district facilities.

This Thomas Haney upgrade is the flagship of the energy management program because of its scope and good financial return on investment. The updated estimated cost for this project is \$0.53 million and the estimated ongoing annual electrical energy savings are 1.28 million kWh or approximately \$0.12 million. This project will also save 2,540 GJ of natural gas that will translate in additional ongoing savings of approximately \$37,000/year. The school district would therefore recuperate its investment in the project in approximately 5 years. Furthermore, the school district, in partnership with *BC Hydro Schools Program* will be hosting an energy conservation workshop for Thomas Haney teachers and students and turn the technical energy upgrades into teachable moments with the goal of creating a culture of conservation.

The table on the following page shows potential project bundles chosen based on the five criteria above. The project bundles will be evaluated every year and may not proceed in the groupings shown in this table. Furthermore, natural gas energy cost savings are not included and will be analyzed through the Level II assessments and on a project-by-project basis.

	Estimated Electrical Ongoing Savings (kWh)	Estimated Ongoing Savings (\$)	Estimated One Time Capital Cost (\$)
BUNDLE A			
Thomas Haney Secondary (HVAC + VFDs)	787,548	\$70,879	\$70,000
Consulting and Management Fees			\$50,000
Totals	787,548	\$70,879	\$120,000
BUNDLE B			
Thomas Haney Secondary (lighting)	489,768	\$44,079	\$460,000
Webster's Corners Elementary	42,137	\$3,792	\$56,000
Samuel Robertson Technical	214,186	\$19,277	\$103,000
Harry Hooze Elementary	89,855	\$8,087	\$124,000
Yennadon Elementary	144,407	\$12,997	\$120,000
Maple Ridge Annex	66,651	\$5,999	\$92,000
District Education Office	97,485	\$8,774	\$97,500
Glenwood Elementary	79,272	\$7,134	\$89,500
Consulting and Management Fees			\$85,000
Totals	1,223,761	\$110,138	\$1,227,000
BUNDLE C			
Edith McDermott Elementary	82,072	\$7,386	\$60,000
Albion Elementary	103,747	\$9,337	\$131,500
Laity View Elementary	97,798	\$8,802	\$110,000
Maple Ridge Elementary	120,238	\$10,821	\$111,500
Maple Ridge Secondary	251,086	\$22,598	\$299,000
Davie Jones Elementary	52,524	\$4,727	\$38,000
Eric Langton Elementary	87,190	\$7,847	\$88,000
Alouette Elementary	97,399	\$8,766	\$95,000
Riverside Centre	99,579	\$8,962	\$115,000
Pitt Meadows Elementary	90,675	\$8,161	\$92,000
Pitt Meadows Secondary	279,370	\$25,143	\$287,500
Consulting and Management Fees			\$85,000
Totals	1,361,678	\$122,551	\$1,512,500
BUNDLE D			
Westview Secondary	243,297	\$21,897	\$220,000
Fairview Elementary	80,110	\$7,210	\$105,000
Arthur Peake Centre	21,161	\$1,904	\$20,000
Hammond Elementary	69,261	\$6,233	\$69,000
Highland Park Elementary	47,256	\$4,253	\$51,000
Blue Mountain Elementary	58,362	\$5,253	\$58,000
Golden Ears Elementary	67,657	\$6,089	\$75,500
District Maintenance Building	33,548	\$3,019	\$35,500
Garibaldi Secondary	195,749	\$17,617	\$208,000
Whonnock Elementary	51,093	\$4,598	\$56,500
Alexander Robison Elementary	60,219	\$5,420	\$63,500
Kanaka Creek Elementary	113,414	\$10,207	\$125,000
South Lillooet Centre	14,604	\$1,314	\$21,000
Alouette River Campus	5,247	\$472	\$22,000
James Best Centre	1,904	\$171	\$15,000
Consulting and Management Fees			\$90,000
Totals	1,062,882	\$95,659	\$1,235,000
GST @ 5%			\$204,747
32% of GST non-recoverable			\$65,500
Project Bundles Totals	4,435,869	\$399,228	\$4,160,000

Source: Quantum Lighting Level I Energy Studies

5. ENERGY MANAGEMENT BUDGET 2015-2019

The implementation of all opportunities identified in this report will result in estimated energy savings of 4.44 million kWh and estimated annual utilities cost savings of \$0.40 million. The one-time capital investment required to implement all opportunities identified is estimated at \$4.16 million with the upgrades being completed over four years. If the Board were to fully fund this program from local funds, the resulting simple payback period would be 10.4 years.

The proposed sources of funding for the energy management program are as follows:

ENERGY MANAGEMENT PROGRAM FUNDING BY SOURCE (\$ million)	
\$1.40	Annual Facilities Grant
\$0.46	Carbon Neutral Capital Program (Ministry of Education)
\$1.40	Capital Reserve (Ministry of Education)
\$0.90	Local Capital Reserve
\$4.16	Total Funding Required

Approval from the *Ministry of Education* is required to access capital reserve funding. Furthermore, the annual facilities grant funding amount assumes that AFG allocations will continue at current levels for the next four years. If the Minister of Education does not grant approval for the use of capital reserve funding, then alternate sources of funding would have to be identified for the program.

Completing the energy management implementation plan will save the school district an estimated \$0.40 million in ongoing utility costs that will help the school district mitigate the ongoing increase in utility costs and use the savings to support and enhance the student learning environment.

6. RISK MANAGEMENT

There are risks inherent in any program. Typically, risks affect the project scope, schedule and/or cost. Below is a list of outlined risks, and a description to better define the specifics in these risks:

- Obsolete technology much be replaced and needs to be given a priority; the cost of waiting to replace the technology may therefore result in higher than expected operating costs
- Program completion is dependent on funding approval and access to funding from the *Ministry of Education*
- *BC Hydro* and *Fortis BC* incentives may change or be discontinued in the future
- Project capital cost and energy saving estimates may change and so would the business case analysis
- Project bundles may not be completed in time due to unforeseen delays
- Energy conservation measures may sometimes result in unforeseen mechanical upgrades for which funds will need to be allocated

7. CONCLUSIONS

In 2009, *Maple Ridge – Pitt Meadows School District* signed the *British Columbia Climate Action Charter* that committed the province and boards of education to measure and report on their greenhouse gas (GHG) emissions, make plans and take actions to reduce GHG emissions, develop *Carbon Neutral Action Reports* and become carbon neutral in respect of their operations by 2010.

In 2014, as part of the school district *Strategic Facilities Plan*, the school district engaged *Quantum Lighting Inc.* and *SES Consulting* to produce high level energy assessments for all 34 school district facilities including 20 elementary schools, 6 secondary schools and 8 other buildings. Following that the school district obtained funding from *BC Hydro* that enabled the creation of an Energy Manager position in 2015. The Energy Manager will create and implement the *Energy Management Plan* that will serve as a guiding document for achieving energy and cost savings and continuously improve the overall energy performance of school district buildings. The plan integrates both technical and organizational opportunities and actions.

Maple Ridge - Pitt Meadows School District is in a good position to save on its ongoing utility costs as well as make significant progress towards its GHG emission reduction efforts. With the support of its partners, *Ministry of Education*, *BC Hydro Power Smart* and *Fortis BC*, the school district will recover its investment in energy conservation measures in under 10 years. Furthermore, the savings achieved through the implementation of this plan will be used to support our central purpose: student learning.

GLOSSARY OF TERMS

WORD	DEFINITION
BEPI	Building energy performance index represents the energy consumed by a building relative to its size and is expressed in gigajoules per square metre per year
DDC	Direct digital control is the automated control of an HVAC system by a computer
CFL	Compact fluorescent lamp is a more energy efficient lamp than an incandescent lamp
EUI	Energy use intensity is the measurement used to size up a building's energy performance
ECM	Energy conservation measure is any type of project conducted, or technology implemented, to reduce the consumption of energy in a building
eGJ	Equivalent gigajoule is a standard unit of energy consumption used to compare energy sources
EMA	Energy management assessment is a workshop sponsored by BC Hydro that help organizations take steps towards improving their organization's energy management practices
GHG	Greenhouse gas is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range which is the fundamental cause of the greenhouse effect. This gas is measured in tonnes of carbon dioxide emitted.
GJ	One gigajoule of natural gas is approximately equivalent to 39 litres of propane or 277 kilowatt hours of electricity.
HID	High intensity discharge lamp
HVAC	Heating ventilation and air conditioning
ISO Standard 50001	The International Organization for Standardization has developed standard 50001; this standard is a proven framework for industrial facilities, commercial facilities, or entire organizations to manage energy.
kWh	Kilowatt hour is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour
LED	Light-emitting diode lamp is a more energy efficient lamp than a compact fluorescent or incandescent lamp
SAP	Supply air temperature is generally set at a optimal temperature to control the air quality of a space
SmartTool	Software tool developed by the Government of British Columbia to measure, aggregate and report on greenhouse gas emissions
tCO2e	Tonnes carbon dioxide equivalent Each greenhouse gas has been converted to a standard measurement (tCO2e) by multiplying its emissions by its global warming potential (GWP). The Totals for tCO2e are shown here rounded to the nearest whole metric tonne as only whole tonnes of tCO2e can be purchased for offsets

APPENDIX A

Baseline Energy Consumption, Cost Assessments and Building Energy Performance Intensity – January – December 2013. (Source: SmartTool and SD42 Finance Department)

Facility Name	Floor Area (m2)	Electricity (eGJ*)			Natural Gas			Propane			Total		
		Consumption (eGJ)	Intensity (eGJ/m2)	GHG Emissions (tonnes CO2e)	Consumption (GJ)	Intensity (GJ/m2)	GHG Emissions (tonnes CO2e)	Consumption (eGJ)	Cost (\$)	Consumption (GJ)	Intensity (GJ/m2)	GHG Emissions (tonnes CO2e)	Cost (\$)
Elementary Schools													
ALBION ELEMENTARY	3,630	571	0.16	2.3	1,777	0.49	88.3	\$20,326	2,349	0.65	90.6	\$38,067	
ALEXANDER ROBINSON ELEMENTARY	3,535	713	0.20	2.9	697	0.20	34.7	\$10,603	54	0.41	40.7	\$28,824	
ALOUETTE ELEMENTARY	3,703	773	0.21	3.1	1,131	0.31	56.2	\$13,262	1,904	0.51	59.3	\$32,889	
BLUE MOUNTAIN ELEMENTARY	2,540	583	0.23	2.3	1,091	0.43	54.2	\$9,341	1,674	0.66	56.5	\$23,024	
DAVIE JONES ELEMENTARY	3,397	632	0.19	2.5	1,493	0.44	74.2	\$16,108	2,126	0.63	76.7	\$34,956	
EDITH WOODMOTT ELEMENTARY	3,269	804	0.25	3.2	81	0.24	38.8	\$8,407	1,985	0.48	42.0	\$29,970	
ERIC LANGTON ELEMENTARY	3,830	1,066	0.28	4.3	1,611	0.42	80.1	\$18,575	2,705	0.71	86.0	\$43,896	
FAIRVIEW ELEMENTARY	3,862	583	0.15	2.3	1,387	0.36	68.9	\$14,478	1,970	0.51	71.2	\$30,278	
GLENWOOD ELEMENTARY	3,473	555	0.16	2.2	1,037	0.30	51.5	\$11,581	1,933	0.46	53.8	\$26,899	
GOLDEN EARS ELEMENTARY	4,186	679	0.16	2.7	1,040	0.25	51.7	\$12,684	1,719	0.41	54.4	\$25,953	
HAMMOND ELEMENTARY	3,535	712	0.20	2.8	934	0.26	46.4	\$8,914	1,646	0.47	49.2	\$27,359	
HARRY HOOGE ELEMENTARY	3,691	716	0.19	2.9	1,366	0.37	67.9	\$15,677	2,083	0.56	70.8	\$32,911	
HIGHLAND PARK ELEMENTARY	3,172	469	0.15	1.9	1,466	0.46	72.8	\$14,177	1,935	0.61	74.7	\$26,413	
KANAKA CREEK ELEMENTARY	4,946	1,110	0.26	4.4	1,079	0.25	53.6	\$12,438	2,189	0.50	58.0	\$45,056	
LAITY VIEW ELEMENTARY	4,794	880	0.18	3.5	1,636	0.34	81.3	\$19,775	2,516	0.52	84.8	\$42,519	
MAPLE RIDGE ELEMENTARY	3,905	1,015	0.26	4.1	1,247	0.32	62.0	\$13,582	2,262	0.58	66.0	\$39,332	
PITT MEADOWS ELEMENTARY	3,998	713	0.18	2.9	1,770	0.44	88.0	\$18,456	2,483	0.62	90.8	\$45,298	
WEBSTERS CORNER ELEMENTARY	2,471	442	0.18	1.8	1,112	0.45	55.2	\$12,588	1,554	0.63	57.0	\$23,251	
WHONNOCK ELEMENTARY	2,330	506	0.22	2.0	549	0.24	27.3	\$4,732	1,055	0.45	29.3	\$19,563	
YENNADON ELEMENTARY	4,380	1,035	0.24	4.1	1,855	0.42	92.2	\$21,670	2,890	0.66	96.3	\$38,969	
Alternate Programs and Secondary Schools:													
GARIBALDI SECONDARY	12,429	3,399	0.27	14	5,401	0.43	268	\$53,663	8,900	0.71	282	\$120,996	
MAPLE RIDGE SECONDARY	13,793	4,387	0.32	18	4,907	0.36	244	\$48,122	51	0.68	264	\$149,969	
PITT MEADOWS SECONDARY	13,276	3,064	0.23	12	4,482	0.34	223	\$46,134	7,546	0.57	235	\$102,065	
SAMUEL ROBERTSON TECHNICAL	6,861	3,820	0.56	15	4,700	0.69	234	\$66,814	700	1.34	290	\$118,753	
THOMAS HANEY CENTRE	12,736	7,566	0.59	30	7,119	0.56	354	\$71,057	14,885	1.15	384	\$218,705	
WESTVIEW SECONDARY	12,369	2,952	0.24	12	2,932	0.24	146	\$30,565	5,884	0.48	157	\$90,806	
MAPLE RIDGE SECONDARY ANNEX	3,522	507	0.14	2	1,674	0.48	83	\$20,046	2,181	0.62	85	\$33,302	
SOUTH LILLOETTE	1,589	241	0.15	1	607	0.38	30	\$7,097	848	0.53	31	\$11,190	
Other:													
ALOUETTE RIVER CAMPUS (CREW)	282	78	0.28	0	225	0.80	11	\$4,045	303	1.07	11	\$6,580	
ARTHUR PEAKE CENTRE	539	193	0.36	1	220	0.41	11	\$1,396	413	0.77	12	\$6,114	
DISTRICT EDUCATION OFFICE	1,540	1,263	0.82	5	430	0.28	21	\$5,246	1,653	1.10	26	\$31,224	
MAINTENANCE FACILITY	1,080	510	0.47	2	717	0.66	36	\$9,234	1,227	1.14	38	\$21,983	
JAMES BEST CENTER	468	48	0.10	0	251	0.54	12	\$5,123	299	0.64	13	\$6,496	
RIVERSIDE CENTER	3,965	886	0.22	4	1,365	0.34	68	\$14,505	2,251	0.57	71	\$35,046	
Grand Total	156,496	43,474	0.28	174	60,089	0.38	2,986	\$650,401	832	0.67	3,209	\$1,608,456	

* eGJ is the equivalent GJ energy use when 1 kWh is converted to GJ

** Propane is only used in the schools that have portables

APPENDIX B

Implementation Analysis (green = high priority; red = low priority)

(Source: Level I Energy Assessments and energy management plan analysis data)

Facility Name	BEPI	Energy reduction (kWh)	Estimated capital cost	Estimated Energy Savings	Simple payback in years	T12 analysis	Total Resource Cost Test (kWh/capital cost)
THOMAS HANEY SECONDARY	1.15	1,277,316	\$530,079	\$114,958	4.6	0%	2.55
SAMUEL ROBERTSON TECHNICAL	1.34	214,186	\$103,621	\$19,277	5.4	0%	2.07
DAVIE JONES ELEMENTARY	0.63	52,524	\$37,973	\$4,727	8.0	0%	1.38
EDITH MCDERMOTT ELEMENTARY	0.48	82,072	\$59,988	\$7,386	8.1	0%	1.37
YENNADON ELEMENTARY	0.66	144,407	\$119,739	\$12,997	9.2	65%	1.21
WESTVIEW SECONDARY	0.48	243,297	\$219,967	\$21,897	10.0	0%	1.11
MAPLE RIDGE ELEMENTARY	0.58	120,238	\$111,548	\$10,821	10.3	75%	1.08
ARTHUR PEAKE CENTRE	0.77	21,161	\$19,797	\$1,904	10.4	100%	1.07
ALOUETTE ELEMENTARY	0.51	97,399	\$94,866	\$8,766	10.8	90%	1.03
BLUE MOUNTAIN ELEMENTARY	0.66	58,362	\$57,668	\$5,253	11.0	0%	1.01
HAMMOND ELEMENTARY	0.47	69,261	\$69,142	\$6,233	11.1	0%	1.00
DEO (District Education Office)	1.1	97,485	\$97,397	\$8,774	11.1	85%	1.00
ERIC LANGTON ELEMENTARY	0.71	87,190	\$88,108	\$7,847	11.2	85%	0.99
PITT MEADOWS ELEMENTARY	0.62	90,675	\$92,357	\$8,161	11.3	95%	0.98
PITT MEADOWS SECONDARY	0.57	279,370	\$287,463	\$25,143	11.4	85%	0.97
DISTRICT MAINTENANCE BUILDING	1.14	33,548	\$35,399	\$3,019	11.7	0%	0.95
ALEXANDER ROBINSON ELEMENTARY	0.41	60,219	\$63,727	\$5,420	11.8	0%	0.94
GARIBALDI SECONDARY	0.71	195,749	\$208,545	\$17,617	11.8	0%	0.94
HIGHLAND PARK ELEMENTARY	0.61	47,256	\$51,278	\$4,253	12.1	0%	0.92
WHONNOCK ELEMENTARY	0.45	51,093	\$56,282	\$4,598	12.2	0%	0.91
KANAKA CREEK ELEMENTARY	0.5	113,414	\$125,084	\$10,207	12.3	0%	0.91
GOLDEN EARS ELEMENTARY	0.41	67,657	\$75,595	\$6,089	12.4	0%	0.89
LAITY VIEW ELEMENTARY	0.52	97,798	\$110,365	\$8,802	12.5	80%	0.89
GLENWOOD ELEMENTARY	0.46	79,272	\$89,600	\$7,134	12.6	40%	0.88
RIVERSIDE CENTRE	0.57	99,579	\$115,430	\$8,962	12.9	80%	0.86
MAPLE RIDGE SECONDARY	0.68	251,086	\$298,368	\$22,598	13.2	15%	0.84
ALBION ELEMENTARY	0.65	103,747	\$131,422	\$9,337	14.1	80%	0.79
FAIRVIEW ELEMENTARY	0.51	80,110	\$104,939	\$7,210	14.6	90%	0.76
MAPLE RIDGE ANNEX	0.62	66,651	\$91,757	\$5,999	15.3	85%	0.73
HARRY HOOGE ELEMENTARY	0.56	89,855	\$123,777	\$8,087	15.3	95%	0.73
WEBSTER'S CORNER ELEMENTARY	0.63	42,137	\$55,611	\$3,792	14.7	0%	0.76
SOUTH LILLOOFT CENTRE (Est. sq.ft)		14,604	\$21,258	\$1,314	16.2	100%	0.69
ALOUETTE RIVER CAMPUS	1.07	5,247	\$21,854	\$472	46.3	0%	0.24
JAMES BEST CENTRE (Maint. Shop Old)	0.64	1,904	\$14,943	\$171	87.2	95%	0.13



Maple Ridge - Pitt Meadows School District No. 42

22225 Brown Avenue
Maple Ridge, BC
V2X 8N6