Report No. 060516.04

Prepared for:

Halifax Regional Municipality

Community Energy Plan

Task 4 – Implementation Plan

Final Report

November 2007

HALIFAX REGIONAL MUNICIPALITY

Naturally GREEN

CBCL LIMITED
Consulting Engineers

Jacques Whitford

The Sheltair Group

ISO 9001
Registered Company

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Implementation of the Community Energy Plan is not the first time HRM has begun to consider energy efficiency and sustainability in its planning strategies. HRM was among the first large urban centres in Canada to compile an emissions inventory in 1997 and was an early member of the Federation of Canadian Municipalities' Partners for Climate Protection Program. Activities supported by this program include an updated emissions inventory, setting of an emissions reduction target, and development of greenhouse gas emission reduction plans for both HRM corporately and the wider community. Many of the actions recommended in these plans have already begun to be implemented or have been incorporated into the recommended actions of this Community Energy Plan.

In addition to specific emission reduction activities, HRM has also been very committed to the concept of sustainable planning strategies. Some examples of current or completed sustainable planning strategies include:

Regional Plan – An all encompassing plan to guide development in HRM in the next twenty-five (25) years. Approved by council in 2006.

Community Visioning Program – A process to allow local communities to determine their own development priorities within the overall framework of the regional plan. Pilot projects are currently underway in Bedford, Musquodoboit Harbour, and Fall River.

Community Energy Plan Template – A framework template for community energy planning in large urban municipalities. Following this framework, the HRM CEP is intended to be a model for similar municipalities across the country.

Atlantic Sustainability Initiative – HRM is a founding partner and participant in this regional initiative to better understand the challenges and opportunities of sustainable development and to build capacity and momentum in the region toward sustainable solutions.

Wind Energy Master Plan – A comprehensive planning guide outlining the best opportunity sites in HRM for wind development from considering technical, zoning, and environmental considerations.

Transportation Master Plan – An integrated region wide approach to transportation issues being developed as a key functional plan of the Regional Plan. The five main aspects of transportation being reviewed for the plan are:

- Roads and road networks – pending;
- Public Transit – in progress;
- Regional Parking Strategy – in progress;
- Active Transportation – complete; and

- Transportation Demand Management – in progress.

Urban Forest Master Plan – Council has approved funding for the development of this plan to deal with the long term growth and maintenance of the urban forest. Preliminary work has begun on the development of the plan.

HRM by Design - A study of urban design issues, intended to produce a set of urban design guidelines to be used to guide development in the urban core. Though not exclusively connected with energy, most of the issues surrounding sustainability have a common theme around energy use.

In addition to the previous initiatives examples of HRM's progressive position regarding sustainability can be clearly seen each day by community residents in examples such as:

Metro Transit Rapidlink System – A very successful express bus service from suburban centres to the urban core.

HRM Vehicle Fleet – Increasing the number of fuel efficient and alternative fuel vehicles on the road.

Alderney 5 Project – Recently announced project to utilize high efficiency natural gas boilers, seawater cooling, and in ground thermal storage to significantly reduce the annual energy costs and carbon footprint of a complex of HRM owned building on the Dartmouth waterfront.

1.2 Approach

The HRM CEP uses an Adaptive Management Framework for setting and justifying specific recommendations. Everyone involved in the planning can follow the logical connections between the intended goals and overall vision, on the one hand, and the detailed actions and results on the other. If the vision changes over time, then all subsequent layers of the framework can be adjusted accordingly. Or if the implementation actions encounter surprises, or produce inappropriate results, then corrective changes can be made to the strategies.

The framework used in this CEP clarifies the *vision*, and defines the *goals*, *targets*, and *strategies* required to achieve the vision. A specific set of actions then forms the base of the plan. The following outlines the definitions used in the CEP for these key terms:

A *Vision* establishes broad value-based statements that are intended to set the direction for all activities and define the priorities. The vision describes the desired outcomes of the CEP.

Goals are general statements about the direction in which you want to move or the state you wish to achieve, e.g. increase renewable energy use. Goals are much more descriptive and concrete than the Vision, pointing to where you want to go.

Targets are established for critical path planning, as well as for setting an ideal or maximum achievement. Targets help define the objectives and boundaries of a proposed plan. They are especially useful tools for stimulating creative out-of-the-box thinking, and for establishing a pace of change. An example target might be to *achieve a 5% renewable fuel content in the municipal vehicle fleet*.

Strategies identify the basic approaches that can be implemented in order to achieve a goal or a set of objectives. *Create a Green Fleet Procurement Policy*, is an example of a strategy.

Actions provide a range of specific activities that can be implemented in order to fulfill the key strategies. By virtue of the clear link between key strategies, objectives, goals and the vision, it is also clear how the specific actions address the higher layers of the framework. *Implement Active Transportation Plan* is an example of an action. More detailed guidelines and specifications describe how to implement specific actions.

1.3 Partnerships

The goals and objectives of the CEP are not unique to HRM. Many public and private companies, organizations, other levels of government, and other municipalities have developed or are in the process of developing plans to reduce emissions, improve efficiency, and promote sustainability. HRM is an active partner on such current initiatives as the Atlantic Sustainability Initiative and the Union of Nova Scotia Municipalities office of Municipal Sustainability. In addition HRM has been a key stakeholder in Nova Scotia Power's Integrated Resource Planning process that is currently underway and in the redevelopment of the Nova Scotia government's energy strategy. In addition, HRM has been the recipient of federal government program funding to support sustainable initiatives such as the Metro transit Rapidlink bus service and the Alderney 5 project. These projects, although beneficial to HRM and the environment, could not have proceeded as quickly as they did without the support provided through partnering with other levels of government.

When several organizations are all striving for roughly the same objective it makes perfect sense for those organizations to explore means to work together to achieve their common objectives more efficiently and quickly. Nova Scotia Power's Integrated Resource Plan includes two components, demand side management and renewable energy, that fit very well with at least five of the eight goals of the CEP. Similarly, the Nova Scotia Energy Strategy includes components that fit well with at least six of the goals. The fit between the CEP goals and these other programs is as follows:

Table 1.

CEP GOAL	NSPI IRP	NS ENERGY STRATEGY
Improve Energy Efficiency of Buildings	Demand Side Management Program	All new government buildings must exceed MNECB by 25%.
Increase Industrial Energy Efficiency	Demand Side Management Program	Promote use of ESCO's to improve efficiency for large energy users. Promote energy audits for industry.
Increase Efficiency of Infrastructure	Demand Side Management Program	
Increase Energy Security and diversify supply	Increase the renewables content in the generation mix	
Demonstrate local government leadership		Government house in order program to improve efficiency in existing government buildings.

2 PROJECT VISION

The purpose of a project vision statement is to set a direction that the project is to take. The vision statement must clearly and concisely spell out the purpose for the project in a manner that allows for an easy transition to more detailed downstream project planning.

HRM's Regional Plan, of which this Community Energy Plan is one of its functional plans, has the following project vision statement; *'HRM's vision for the future is to maintain and enhance our quality of life by fostering the growth of healthy and vibrant communities, a strong and diverse economy, and sustainable environment'*.

One of the Regional Plan's seven (7) guiding principles discusses the management of development to make the most effective use of land, energy, infrastructure, public services, and facilities while another discusses the development of integrated transportation systems. Both of these guiding principles reference areas of influence where a community energy plan can play a role.

From the very outset of this process it was clear that HRM wants to be a leader in the sustainability movement among municipalities in Canada. Its previous successes with solid waste management and being an early participant in FCM's Partners for Climate Protection have definitely placed HRM in a leadership position among urban municipalities in Canada.

In searching for a vision, the discussions among the CEP consultant team and HRM senior staff focused on relative change in energy sustainability over the next decade and being seen as the municipality that achieves the greatest progress. In this way HRM could still achieve some degree of national prominence while not competing directly with larger municipalities with better public transit infrastructure and access to investment capital. It was decided that the vision statement should reference the considerable work done to date in the area of sustainability and highlight the excellent relationships and partnering opportunities HRM has with other levels of government, NGO's, and the corporate world in order to achieve the goals of the Community Energy Plan.

The vision statement ultimately decided upon was the following:

'In partnership with other agencies, HRM intends to achieve the most significant improvement to energy sustainability, security, renewable technology, and environmental emissions among similar sized cities in Canada over the next 10 years.'

3 PROJECT GOALS

Drawing from the Regional Municipal Planning Strategy, the Request for Proposal, Local Action Plans, stakeholder interviews and our review of CEPs from other municipalities, eight goal areas were identified by the consulting team and revised with the client to produce this final set of goals:

.1 Improve the energy efficiency of buildings.
.2 Increase transportation choice and efficiency.
.3 Increase industrial energy efficiency.
.4 Encourage energy efficient land use planning and neighbourhood site planning.
.5 Increase efficiency of infrastructure.
.6 Ensure energy security while diversifying supply of renewable energy.
.7 Educate and engage residents and businesses.
.8 Demonstrate local government leadership.

Development of action items that could meet the objectives of these goals was the next step after establishment of the project goals.

3.1 Scope

The CEP provides a strategy to manage the energy consumption and greenhouse gas emissions throughout the region. The CEP builds on the HRM *Local Action Plans to Reduce Greenhouse Gas Emissions.*

The CEP is divided into corporate and community energy use. It distinguishes between the two because the municipality has direct control over corporate energy use and therefore more tools available at their disposal than for addressing community energy use. Initiating corporate strategies is also an excellent way to lead by example.

Corporate Energy Use refers to the energy used in municipal operations through the construction, management and delivery of municipal services and operation of facilities. For example, the HRM owns and operates facilities, including City Hall, Dartmouth Sportsplex, Metro Transit Facility, various public works buildings, municipal vehicle fleet, and streetlights.

Community Energy Use refers to the consumption of energy in the HRM by residents, businesses, institutions, and industry. The HRM's community energy use is shaped by land use practices, transportation systems, the energy efficiency of building stock and the sources of energy.

4 STRATEGY DEVELOPMENT

4.1 Long List

Development of the long list of potential action items for the Community Energy Plan involved several steps, including:

- review of existing and planned HRM programs that fit with the Goals of the CEP;
- review of existing and planned programs of other levels of government or corporations that fit with the goals of the CEP;
- consult with HRM staff to determine what issues they feel must be addressed in the CEP;
- consult with key stakeholders including government, NGO's, institutions, utilities, and large energy users, to determine what issues they would like to see addressed in the CEP;
- consult with the public to determine what their concerns are regarding energy use in HRM and what issues they feel are important; and
- review work conducted in other municipalities to determine what items were considered of importance.

This extensive consultation, described in greater detail in the Task 2 report, was used by the CEP team to develop the long list. This list was modified several times due to further discussions among the CEP team and with HRM staff. Following these discussions, the finalized Long List is shown in Appendix A. This is the list that was used with the evaluation criteria to develop the first draft short list.

4.2 Evaluation Criteria

4.2.1 Criteria Selection

The purpose of the evaluation criteria was to assist the consultant team and the client with the task of identifying which action items from the long list were considered suitable for consideration for implementation. Stakeholders were asked for suggestions for evaluation criteria and a master list was presented to HRM staff at an April 20th meeting. That meeting narrowed the list to a final group of seven criteria which were subsequently presented to and accepted by the HRM EUGS committee on May 18.

When first developed, the criteria consisted of fourteen items in three categories as follows:

.1 Environmental Criteria Characteristics

- GHG emission reduction potential;
- Co-benefits of actions (water use reduction, less noise, less light pollution, etc.); and
- Health benefits – better air quality, improved community fitness.

.2 Economic/Financial Characteristics

- Cost effectiveness – cost per unit of improvement (kW, CO_2e);
- Payback;
- Technological Feasibility – does the action require unproven technology;
- Resource Potential – is resource supply sustainable; and
- Security versus Risk

.3 Social Criteria Characteristics

- Equity – no one group targeted unfairly;
- Municipal Governance – within control or influence;
- Potential for partnership with other organizations/stakeholders;
- Local job creation;
- Consistency with existing/ongoing programs; and
- Implementability – are the resources likely to be available to implement the action.

In order to effectively evaluate the long list of over 110 actions, an optimal number of criteria was judged to be five to six. At a meeting with the CEP consultant team and HRM staff, the criteria were narrowed to seven. The final criteria list used to evaluate the long list was as follows:

.1 Environmental Criteria

- GHG Reduction; and
- Health benefits.

.2 Economic/Financial Criteria

- Cost effectiveness; and
- Feasibility – financial, technical, resource potential, safety.

.3 Social Criteria

- Local job creation potential – direct or indirect; and
- Positive visibility.

.4 Jurisdiction Criteria

- Action is within the control or influence of HRM.

4.2.2 Criteria Descriptions

GHG Reduction – This examines the potential of an action to lead, directly or indirectly, to reductions in greenhouse gas emissions. A subjective estimate of the potential reductions attributable to each measure could be used to rank measures using these criteria.

Health Benefits – This examines the potential direct and indirect health benefits associated with the action. Actions leading to reduced electrical consumption would have only a minor health benefit improvement through reduced power plant emissions while actions to encourage active transportation could have a more significant health benefit.

Cost Effectiveness – This examines the economic cost of an action compared to its potential for a measurable change in energy consumption or emissions. The evaluation will be subjective based upon knowledge of similar actions.

Feasibility – This examines the potential of an action to be implemented based on its cost. Expensive actions are more difficult to implement; technology, unproven technology is difficult to implement without expending more resources to 'fine tune' it; resource potential, an action that requires a resource supply (e.g. wood waste, process waste heat, landfill gas) must be assessed based on the security of that supply; and safety, does the action increase or decrease the safety for HRM citizens and the environment.

Local Job Creation – This looks at the potential for an action to create employment in the local area. Direct employment can be created to construct and operate some actions while other could create the conditions necessary for new or existing businesses to expand and increase employment. New companies are attracted to cities by things other than money such as a high quality of life and commitment to sustainability.

Positive Visibility – Actions that have high degree of visibility tend to inspire more action among the community. Daily reminders of the changes HRM is instituting as part of the CEP can help to convince people to make more sustainable chores in their own lives. Solar panels, wind turbines, hybrid vehicles, and bicycle paths are visible reminders to people of what the CEP is doing. Just as visible, however, is an effective media campaign highlighting less visible changes that are just as important (e.g. building insulation, high efficiency boilers, etc.)

HRM Control or Influence – Managing the implementation of an action is easier when you have direct control over the process. The further removed you are from the process, the more difficult it becomes to ensure that implementation happens. In order for the CEP to be judged a success, a large number of the action items in the plan must be implemented successfully. Those that can be managed directly by HRM will be easier to implement since they will not involve as much negotiation and partnership with other organizations in order for implementation to occur.

4.2.3 Evaluation Procedure

Three members of the consultant team with different background expertise representing many of the categories of actions in the long list assembled to evaluate each item on the long list. A scoring matrix was developed where each criterion could be scored between 0 and 5. Each item was discussed in order to arrive at a consensus regarding the correct score for each criterion. Given the large number of items, over 100, and seven criteria to evaluate each against, the process was time consuming. This was despite the fact that it was accomplished with a high degree of subjectivity and without much quantification or analysis. The team was relying upon its experience and judgement in order to score each item.

The action items on the long list were evaluated against the criteria elements previously described. Under each attribute, actions were awarded a score ranging from 0 to 5 – "0" being the least favourable, while "5" represented a very favourable item – and the scores were summed up for each action item. For example, an action item that was determined to be very favourable across all elements would score a total of 35 (before weights are applied), while that which is least favourable all across would come out with a total score of 0.

To evaluate the impact of placing emphasis on any specific category, different categories then received differential weights. For instance, to see which actions scored higher when emphasizing environmental concerns of the CEP approach, a weighting of 2 would be assigned to 'Environmental' while the remaining categories were assigned a weighting of 1. The Jurisdiction category was initially assigned a weighting of '1' at all times during the weighting iterations.

On the basis of where the heavier weight was placed, three different lists were produced for corporate actions, and three for community actions. Each list identified the top two to five action items under each Goal, based on a cut off threshold score of twenty-five (25) or better. Under these conditions, the short list contained roughly thirty (30) action items. The items under Goal 7 – Educate and engage residents and businesses"; and Goal 8 – "Demonstrate local government leadership", were not evaluated under the criteria, because they did not lend themselves well to the analysis. They were considered necessary recommendations which should be implemented anyway. All actions under these two goals were included in the short list.

A first draft of the short list was created, drawing on those items that performed well under the three different weightings and therefore appeared on all three corporate shortlists or all three community shortlists. As it turned out, roughly 80% of the items fell in this category. The initial list was vetted by the project team in consultation with HRM. To strengthen and agree on a final short list, input from other HRM stakeholders and the larger community was sought, including a large stakeholder workshop held on June 11. The result of the initial evaluation process and follow-up discussions and consultation was the final short list upon which the implementation plan will be developed.

4.3 Short List

The final short list developed from the original long list and the evaluation process contains the actions upon which the implementation plan will be developed. All the items have been categorized according to the project goals and by the HRM Clean, Green, and Lean rating system. The actions have also been categorized between corporate actions and community actions. Corporate actions are those that are primarily controlled by and for the benefit of HRM's corporate operations. Community actions, whether influenced primarily by HRM or not, are intended to benefit the broader community.

The list includes suggested measures within some actions. These are meant to illustrate possibilities only and are not intended to be a complete listing. For each goal, we have also identified policy and legislative measures at other levels of government which would support the actions listed.

Table 2. The Short List of Actions for Implementation

GOAL 1: IMPROVE THE ENERGY EFFICIENCY OF BUILDINGS		
Policy and Legislative Priorities: .1 Modifications to the Provincial Building Code, including EnerGuide building energy efficiency requirements for new construction. .2 Remove the current provincial financial ceiling for allowable spending by municipalities, regardless of size. .3 Introduction of a provincial rebate on a portion of the HST, based on energy efficiency in buildings.		
Corporate Actions		
Action 1: Retrofit existing HRM buildings for energy efficiency improvements and the use of renewable energy technologies such as solar water heating. Focus on large energy users: arenas, community centres, libraries, etc. Develop an energy use benchmark database for existing HRM buildings. • Utilize demand side management (DSM) programs as a resource tool to reducing energy consumption. • Create a capital reserve fund for energy efficiency projects, replenished by part of savings from retrofit projects.		Lean and Green
Action 2: Require higher standards of energy efficiency and environmental design in new HRM buildings: • Make LEED Silver the standard for new HRM buildings by 2010, and LEED Gold by 2020. • Encourage innovative and visible technologies such as green roofs and solar demonstration projects on new HRM buildings.		Lean and/or Green
Community Actions		
Action 1: Support existing programs to increase energy efficiency and consumption reduction in the residential sector: • EnerGuide for Houses. • R-2000 Home by NS Home Builders Association.		Lean

Action 2: Adjust the building permit fee structure to provide incentives for new high efficiency homes based on achieving an EnerGuide 77 and/or R-2000 standard.		Lean
Action 3: Promote incentives currently available to support energy efficiency in buildings, in particular: • DOE's 10% rebate on solar water heating systems. • CMHC's10% premium refund on its mortgage loan insurance premiums. • Federal Eco Energy Retrofit Program and the associated provincial program. • Utilize existing Conserve Nova Scotia energy efficiency programs.		Lean or Green
Action 4: Use municipal code by-law changes as lever to require EnerGuide ratings on all existing homes at time of sale, with involvement from the realtors association and the Province.		Lean
GOAL 2: INCREASE TRANSPORTATION CHOICE AND EFFICIENCY		
Legislative Priorities: .1 Provincial emissions legislation. .2 Changes to the standards for Provincial roadways, to include for example active transportation capacity.		
Corporate Actions		
Action 1: Right-size the municipal fleet, assign vehicle use appropriately and designate more vehicles for multi-use.		Lean
Action 2: Continue and support HRM's Commuter Trip Reduction program.		Lean
Action 3: Implement driver training for HRM's fleet drivers.		Lean
Action 4: Purchase and showcase alternative fuel vehicles, e.g. CNG, Propane, Electric or Hybrid.		Green and/or Clean
Community Actions		
Action 1: Expand public transit services, in particular: • Ferry service to Bedford. • Rapid bus transit to suburban areas. • Neighbourhood shuttle buses connecting to rapid transit network.	Regional Plan	Lean
Action 2: Encourage implementation of the Active Transportation Plan.	Regional Plan	Lean
Action 3: Look into the possibility of restructuring HRM's taxi zoning for greater energy efficiency (e.g. fewer taxis having to leave the airport without passengers).		Lean
GOAL 3: INCREASE INDUSTRIAL ENERGY EFFICIENCY		
Legislative Priorities: .1 Federal Industrial Emission Management Regulations and Enforcement. .2 Federal Emissions Caps for Large Final Emitters. .3 Provincial comprehensive airshed management approach. .4 Provincial independent, third party qualified energy efficiency utility.		

Community Actions		
Action 1: Encourage industrial process heat recovery in industries such as breweries; dairies; and others.		Clean
Action 2: Encourage activities to focus improvement on efficiencies in HRM based industrial processes, and for businesses in partnership with organizations such as the Eco-efficiency Centre and CIPEC.		Lean
Action 3: Conduct an inventory of sources of industrial waste heat that can be used by others (e.g. cooling water from Tuft's Cove). • Encourage the development of new buildings that can be heated using low grade thermal energy. • Explore feasibility for district cooling opportunities		Clean
GOAL 4: ENCOURAGE ENERGY EFFICIENT LAND USE PLANNING AND NEIGHBOURHOOD SITE PLANNING		
Community Actions		
Action 1: Include energy considerations in the Urban Design Guidelines as a mechanism for leading development within the Capital District toward more sustainable models.	Regional Plan	Green
Action 2: Influence the community visioning exercises and the resulting guidelines for community development to include energy considerations.		Lean, Green or Clean
Action 3: Provide an inventory and plan for opportunity sites within HRM including brownfields and under-utilized areas within Business Parks.		Lean
Action 4: Provide opportunities for local food production and small scale food retail through urban agriculture and preservation of agricultural land within rural areas of HRM.		Lean, Green or Clean
GOAL 5: INCREASE EFFICIENCY OF INFRASTRUCTURE		
Legislative Priorities: .1 Municipal eco-procurement policy .2 Provincial street lighting standards. .3 Municipal street lighting standard		
Corporate Actions		
Action 1: Create a Street Lights Efficiency Strategy including standards, inventory, energy reduction action plan, and partnerships. Work toward bringing all streetlights in HRM under municipal control.		Lean
Action 2: Restore the commitment to LED Traffic Signals Program and set a program completion date.		Lean
Action 3: Ensure implementation of the greenhouse gas emission reduction plan for pumping stations including items such as energy consumption monitoring, regularly scheduled maintenance, end of life motor upgrades to high efficiency units, and variable frequency drives on pumps with high flow variability.		Lean

Action 4: Explore options to encourage additional water consumption efficiency and conservation among water consumers. E.g. Price municipally supplied water in blocks with lower prices for first blocks and higher prices for subsequent blocks to encourage water use efficiency and conservation.		Lean
GOAL 6: INCREASE ENERGY SECURITY AND DIVERSIFY ENERGY SUPPLY		
Legislative Priorities: .1 An open access electricity market including renewables. .2 An enhanced robust integrated regional electrical grid and selling/purchasing opportunities from other Atlantic provinces. .3 Federal large final emitter (LFE) emission caps.		
Corporate Actions		
Action 1: Participate in expanding natural gas availability in HRM.		Green
Action 2: Pursue Green Power Purchasing opportunities for HRM.		Clean
Action 3: Assess the risk of setting up a municipally owned energy utility with authority over power generation and/or energy purchase.		Green
Action 4: Consider co-sponsoring renewable energy projects with other NS Municipalities that have better access to renewable resource (e.g. tidal projects in West Hants, Kings, Colchester).		Green or Clean
Community Actions		
Action 1: Explore the feasibility of biomass or MSW for cogeneration plants or for district heating.		Green
Action 2: Explore the feasibility of an anaerobic digester (AD) plant for processing of organic ICI and septage waste.		Clean
Action 3: Encourage development of utility size wind turbines independently or in cluster approach – and continue with the Wind Energy Master Plan process.		Green
Action 4: Encourage installation of solar panels to heat process water in industrial processes such as breweries and dairies.		Green
Action 5: Assess feasibility of mini (run-of-the-river) hydroelectric plants on Musquodoboit River at Crawford Falls, Middle and Upper Musquodoboit, Sheet Harbour River at Malay Falls, Half Way Brook and Little West River.		Green
Action 6: Encourage natural gas conversion of industrial boiler plants including Capital District Health Authority, Dalhousie, SMU, DND, Olands.		Clean
Action 7: Assess potential for Harbour water cooling for buildings near the harbour.		Clean
Action 8: Increase the allowable NSPI net-metering limit to 800 kW		Green or Clean

GOAL 7: EDUCATE AND ENGAGE THE COMMUNITY		
Community Actions		
Action 1: Create recognition of the CEP by: • Well planned and timed launch campaign, website and opportunities for engagement throughout the process. • Maintaining the CEP brand in future energy programs resulting from the CEP. • Promoting the CEP and its concepts to Nova Scotia at large.		Lean, Green, Clean
Action 2: Work with the development and construction sectors to identify target markets for new education programs.		Lean, Green, Clean
Action 3: Work with local industrial and institutional large consumers of energy to expand their commitment to reduce energy use, for example through: • An industrial energy conservation pledge; • A coalition-building session organized by the Mayor and involving CEOs and top managers.		Lean, Green, Clean
Action 4: Work with local NGOs in promoting their educational programs, especially within schools.		Lean, Green, Clean
Action 5: Encourage implementation of public awareness programs using creative strategies such as: • Displaying the "carbon footprint" of moving treated water to the users on their civic water bills. • Neighbourhood canvassing program to promote EnerGuide. • A large ad campaign on carpooling.		Lean, Green, Clean
GOAL 8: DEMONSTRATE LOCAL GOVERNMENT LEADERSHIP		
Corporate Actions		
Action 1: Implement all other Corporate actions under the previous 7 goals to clearly demonstrate HRM's commitment to "walk the talk".		Lean, Green, Clean
Action 2: Use HRM's influence to lobby for all legislative priorities identified in the shortlist of actions, thus getting "our own house in order".		Lean, Green, Clean
Action 3: Push for the municipal voice at the table in reformulating Nova Scotia's Energy Strategy, particularly the formation of an Energy Advisory Committee.		Lean, Green, Clean

5 ANALYSIS OF SHORT LIST OF ACTIONS

5.1 Goal 1 – Improve the Energy Efficiency of Buildings

Corporate Action 1: Retrofit existing HRM buildings for energy efficiency improvements and the use of renewable energy technologies such as solar water heating. Focus on large energy users: arenas, community centres, libraries, etc.

- Utilize demand side management (DSM) programs as a resource tool to reducing energy consumption.
- Create a capital reserve fund for energy efficiency projects, replenished by part of savings from retrofit projects.

Type of Action: Project

Target Outcomes: Reduction of Energy Consumption – Energy reductions are realized through building envelope and systems upgrades and operational changes at HRM owned or managed facilities. Buildings represent close to 60% of total corporate energy consumption. Potential reductions of 40% are considered possible, which would yield an overall corporate consumption reduction of approximately 25% or 180,000 GJ. This equates to annual cost savings of approximately $3,000,000.

Energy savings are demonstrated using baseline information for each facility, compared to project operating costs post-retrofit. These calculations can be completed and presented to HRM prior to any capital expenditures.

Lead/Partners: Municipal Government

Indicator: % reduction in energy use compared with pre-retrofit projections.

Inputs: Capital budget, Project Scope, Building Audits, Architects and Engineers specializing in buildings and energy management.

Activities:

- Create a capital reserve fund or other means of funding retrofits- possibly through accessing funding programs.
- Provide training and education to municipal staff on energy efficiency and alternative technologies.
- Develop a detailed energy use benchmark database for existing HRM buildings.
- Compare benchmarks with national database for comparable buildings.
- Prioritize retrofit projects based on performance against national standards.
- RFP for Architectural & Engineering Services.
- Complete the necessary Building Audits on selected facilities.
- Compile a Priority List of Projects based upon information provided from the Facility Audits.
- Implementation of the Project (or Projects) with Tender, Project Award, and Construction.
- Complete retrofits and begin paying savings into the capital reserve fund.

Outputs: Energy efficient facilities.

Time Frame: Short term – initiation
Long term – implementation
Implementation can begin in the short term – but will be an ongoing project until all buildings have been retrofitted. Phasing and time frame will depend on budgets available and whether the retrofits can be accomplished as part of the regular maintenance and upgrading schedule.

Budget/Resources: > $5 million capital investments – (likely paid back through energy savings).
A Transportation and Public Works staff would administer the retrofit program. The time requirement depends in part on the pace of implementation. Initial baseline and benchmark studies would take about 3- 6 months full time if done in house. The actual retrofits would occur over a period of several years and would require oversight by staff – possibly integrated into current duties. Total costs of retrofits are difficult to estimate without baseline date- but they will likely be substantial. Retrofits may have 3-5 year payback times in terms of reduced operating costs.

Corporate Action 2: Require higher standards of energy efficiency and environmental design in new HRM buildings.

Type of Action: Policy

Target Outcomes: Reduction of Energy Consumption and Emissions – Energy reductions are realized through better selection of building systems, materials, and maintenance programs. The policy could use pre-existing building ratings systems (e.g. LEED), be performance based (e.g. compared with Model National Energy Code for Building) or specifically mandate the intent of efficient design (such as building orientation to maximize the use of natural lighting, passive solar heating, or the use of renewable building materials). The Policy shows municipal leadership which is one of the other CEP goals. New buildings should exceed industry norms for energy efficiency by at least $40. For a typical office building, energy costs should be lower by $8–$10/ft^2/year.

Lead/Partners: Municipal Government, Canada Green Building Council

Indicator: % reduction in energy use projected in construction of new buildings.
% reduction in energy use projected in operation of new buildings.
Energy savings are demonstrated using published data on products or systems (most typically confirmed by an independent testing authority) such as lighting or insulation. Reduction in emissions can be demonstrated by the use of recycled materials (such as flooring manufactured from recycled materials, or products produced in an environmentally conscious manner).

Inputs: Draft a policy. For example; Make LEED Silver the minimum standard for all new HRM buildings by 2007.

Activities:
- Investigate costs/benefits of current LEED building projects for HRM.
- Prepare council report.
- Research other Municipalities for similar progressive strategies for efficiency and environmental design.

- Collaborate with technical professionals and draft a framework for the Policy.
- Engage local architects and Engineers who have demonstrated experience and success in similar Projects employing energy efficient building methods and strategies.
- Implement Policy and raise awareness of the intent of the new Policy through marketing (this action will likely inspire institutional and business facilities to adopt a similar standard).

Outputs: The result is an energy efficient facility with lower operating costs than conventional buildings.

Time Frame: Short term to initiate.
Medium term to implement.
Considered 'Short Term' – Due to the extent of current research and existing energy efficient building projects, it is anticipated a Policy framework could be completed in 3 to 6 months.

Budget/Resources: $50,000 to develop and implement.
Incremental costs associated with LEED silver, offset by operating costs.
It is anticipated one HRM staff would be tasked with policy development. Once the policy is in place, it is the responsibility of contractors to ensure that requirements are met. A part time staff person would be required to track projects. LEED Silver is estimated to have an additional cost of about 2% depending on the building. However, this often has a rate of return of about 3 years. LEED certification costs on the order of $60,000 per building but these costs would be borne be the developers/builders.

Note: the first building constructed to LEED standards may have a higher incremental cost associated with it if builders are unfamiliar with LEED, but as more buildings are constructed, and design teams and trades become familiar with the LEED system, this cost will be negligible.

Community Action 1: Support existing programs to increase energy efficiency and consumption reduction in the residential sector.

Type of Action: Program support

Target Outcomes: Reduction of Energy Consumption through increased uptake of EnerGuide, R2000 and the EcoEnergy Retrofit Program. This should reduce annual energy cost by approximately $500 or 30% per residence per year in residences participating in the programs.

Lead/Partners: Municipal Government, Conserve N.S., NRCAN, NSPI

Indicator: Rate of uptake of associated programs.
Track the rate of applications for assistance from EnerGuide, R-2000, and the EcoEnergy Retrofit Program and compile results from follow up audits.

Inputs: This action refers to supporting pre-existing programs. Develop a marketing program to raise awareness and encourage the use of the energy efficient programs such as EnerGuide and R-2000. Market the policy through common

media with easy internet links. Consult partners to ensure campaign compliments their own campaigns. Current average residential EnerGuide rating in Nova Scotia is 53 before retrofit and 64 following retrofit. Approximately 5800 residences in HRM have been audited up to 2006 (65% of provincial total).

Activities:
- Review current promotion and marketing initiatives by partners.
- Determine whether to support pre-existing programs or to develop a new marketing campaign.
- Implement.

Outputs: Marketing program and materials.

Time Frame: Short term to initiate and implement.
Considered 'Short Term' – Particularly if the decision is made to support pre-existing programs.

Budget/Resources: < $50,000 per year for marketing. This is anticipated to require minimal staff time and possible a marketing firm to implement a marketing campaign if the HRM decided to have a stand alone campaign.

Community Action 2: Adjust the building permit fee structure to provide incentives for high efficiency homes based on achieving an EnerGuide 77 and/or R-2000 standard.

Type of Action: Policy

Target Outcomes: Increased awareness of EnerGuide/R2000 programs, by approximately 7% above current new home average, leading to more energy efficient homes and more energy efficient housing stock. This should equate to annual energy costs that are $200 lower than current new home average.

Lead/Partners: Municipal Government. The Nova Scotia Homebuilders Association would be a very important partner in making builders and homeowners aware of energy efficiency programs and probably should be involved along with other key stakeholders in determining the new fee structure.

Indicator: Number of permits granted for energy efficient homes.
% improvement in energy efficiency of new homes.

Inputs: A revised building permit fee structure. Consider supplementing the action with a marketing effort to raise awareness about the Program.

Activities:
- Review and determine the appropriate level of incentive credited back to a developer of a home meeting the criteria outlined in EnerGuide 77 or R-2000.
- Implement the revised fee structure.

Outputs: Differential building permit fee structure to promote energy efficient housing.

Time Frame: Medium term – implementation
Considered Medium term for implementation. It is anticipated the Policy may take in the order of 4 weeks to develop. This time requirement may be spread out over a longer time frame to include consultation with key stakeholders like the NS Homebuilders Association. A lead up time of at least a year would likely be required before implementation depending on the size of the differential fees.

Budget/Resources: < $50,000 initially
$50,000-$500,000 lost revenues and education program.
This initiative could likely be performed by current staff following the development of criteria for energy efficiency and the new permit fee structure (about 1 month of staff time). HRM should also invest in some education for builders and developers re the incentives program before it is implemented. Depending upon how the program is structured- there may be lost revenues to the HRM (if permit fees become lower for energy efficient buildings) but this may be offset if permit fees are raised for non- efficient buildings, or through increased tax revenues for higher value properties. Note: the disincentive provided by higher taxes for energy efficient homes (because of increased value) is seen as an important barrier for building these homes. HRM may want to address this through other means.

Community Action 3: Promote incentives available to support energy efficiency in non- residential buildings.

Type of Action: Information

Target Outcomes: Participation, Awareness

Lead/Partners: Municipal Government, Building Owners, NSPI, NRCAN, Conserve NS

Indicator: Rate of uptake of incentives programs by HRM building owners.

Inputs: Develop marketing materials to raise awareness and encourage energy conservation through the use of the incentives and rebates offered by government agencies and utilities. Market through common media with easy internet links. Building owners can be provided with specific information to disseminate to their tenants to promote energy conservation. As a further measures, building owners can be encouraged to reward tenants who adopt energy conservation initiatives by considering adjustments to rents in those buildings where utilities are included as part of the rent.

Activities:

- Develop and distribute marketing materials through a marketing campaign to raise awareness among building owners, and to promote participation in the programs offered by NRCAN, NSPI, and others.
- Provide materials for building owners to customize and implement, to facilitate the promotion of energy conservation from their tenants.

Outputs: Heightened awareness of the programs available to commercial building owners (and tenants), and increased participation in energy conservation.

Time Frame: Short term to initiate.
Medium to Long term implementation ongoing.
Considered 'Short Term' – It is anticipated the Program may take in the order of 4 to 6 weeks to complete and begin distribution of materials. However, it would be an ongoing program, particularly if HRM wanted to offer outreach or information sessions directly to building owners as well.

Budget/Resources: < $50,000 initially and per year
It is anticipated an HRM staff member would be assigned full-time to oversee the development of the marketing and information materials with some part time ongoing support. Existing marketing media such as the Naturally Green newsletters can be a low cost delivery mechanism for the campaign.

Community Action 4: Use municipal code by-law changes as lever to require EnerGuide ratings on all existing homes at the time of sale, with involvement from the realtors association and the Province.

Type of Action: Regulatory

Target Outcomes: Much higher proportion of homes receiving an EnerGuide rating. Energy use in the home is one of the criteria for home purchase and homes with higher EnerGuide ratings increase in value.

Lead/Partners: Municipal Government, NSRA

Indicator: NA

Inputs: Develop and introduce a by-law.

Activities:

- Research to determine amount of housing sales every year – to identify how many EnerGuides would need to be performed and whether the current supply of EnerGuide assessors is sufficient
- Develop and implement the Bylaw
- Education and outreach for homeowners, and particularly realtors on the new Bylaw and how to interpret the EnerGuide rating.

Outputs: Individual Ratings for each Residence.

Time Frame: Medium term – to develop policy and implement.
Considered 'Medium Term' – It is anticipated the Policy may take in the order of 12 to 18 months to complete and implement.

Budget/Resources: < $50,000 to develop Bylaw.
< $50,000 per year for education and outreach.
Development of the Bylaw would be fairly short term. However, it is important for HRM to determine whether the current EnerGuide assessors could meet the demand for EnerGuides for all home sales. At least a one year lead time would be required to make the Bylaw effective. One the Bylaw has been developed, an education and outreach program for home buyers and realtors should be implemented and carried out for at least 3 years. This could be done by HRM staff or contracted out. An increase in the number of certified Energuide Auditors will be required to handle the increase in business.

5.2 Goal 2 – Increase Transportation Choice and Efficiency

Corporate Action 1: Right size the municipal fleet, assign vehicles use appropriately and designate more vehicles for multi use.

Type of Action: Policy

Target Outcomes: To have an efficient corporate vehicle fleet that is able to meet HRM's needs on a daily basis while consuming less energy and requiring less maintenance than at present. Vehicle fleet currently represents approximately 16% of the total corporate energy consumption or 123,000 GJ. Policy should aim for an overall fleet consumption reduction of 5% or 6000 GJ per year. This equates to approximately $400,000 per year.

Lead/Partners: HRM can control and implement this policy on its own.

Indicator: % reduction in the overall fleet energy consumption.
% reduction in fleet maintenance costs.

Inputs: A fleet inventory and usage database is required in order to develop the policy. A draft policy entitled "Municipal Vehicles and Equipment Management and Coordination Policy" has been developed by HRM staff but not yet formally approved. Modification of this draft to include energy efficiency considerations in procurement will be required.

Activities:

- Review current fleet inventory uses, costs, and current procurement criteria.
- Consult with vehicle fleet users, maintenance personnel, and procurement staff.
- Develop new procurement policy and operations policy.
- Provide training in operations policy (Note driver training is dealt with separately in Action 3 below).
- Develop fleet operating cost and energy consumption database for monitoring purposes.

Outputs: Fleet policy that covers procurement as well as operations.

Time Frame: Medium term – implementation
Research and inventory of current fleet would take about 30 days full time and could be done in house or contracted out. Policy development based on the research and inventory would require 2 – 3 months to ensure that staff are consulted. Once the policy has been developed – it can be implemented immediately with training on an ongoing basis. In terms of procurement, it is anticipated that vehicles will be replaced with more energy efficient vehicles according to regular replacement schedules.

Budget/Resources: $50,000 incremental procurement costs.
( ) reduced operating costs.
There may also be incremental procurement costs associated with more energy efficient vehicles, but the rate of return on the investment is expected to be very short (will vary with type of vehicle and use).

Corporate Action 2: Continue and support HRM's Commuter Trip Reduction program.

Type of Action: Program

Target Outcomes: More HRM employees carpooling, working from home or using alternative modes of transportation leading to reduced traffic volumes at peak commuter times.

Lead/Partners: HRM

Indicator: Number of commuting vehicle trips by HRM staff

Inputs: Program exists, additional support and promotion is required to increase participation rates.

Activities:
- Conduct staff polls to find out how people get to work now.
- Obtain input on their awareness and opinions on the commuter trip reduction program.
- Make improvements to the program based on input.
- Increase funding as required.
- Monitor program success.

Outputs: Enhanced program that can be used as a model for the larger community.

Time Frame: Short term – initiation can begin immediately.
Long term – implementation requires an ongoing program.

Budget/Resources: < $50,000 initial costs.
< $50,000 per year for monitoring.
1 full time equivalent for 1 – 2 months to research and recommend enhancements. Program promotion and monitoring will require one staff member for 2 days per month.

Corporate Action 3: Implement driver training for HRM's fleet drivers.

Type of Action: Policy

Target Outcomes: Improved fuel efficiency and reduced vehicle maintenance costs. Proper vehicle operation can reduce annual operating costs by 5 – 10%. This equates to annual cost savings of $400,000 – $800,000.

Lead/Partners: HRM

Indicator: Increased fuel efficiency in current vehicles.
% Reduction in vehicle maintenance costs.

Inputs: Research on current operations, input from drivers union.

Activities:
- Research current operations.
- Identify energy savings practices related to fleet operations.
- Consult with unions.
- Finalize energy saving driving practices and develop training materials.
- Implement the training – preferably as an add on to existing training (e.g. safety).
- Monitor results through surveys of drivers and analysis of fuel use.

Outputs: Improved driving techniques that lead to improved fuel efficiency and reduced vehicle wear thus reducing maintenance costs and emissions.

Time Frame: Short term to initiate research and develop policy.
Medium term to implement policy and training.
Allow 6 – 12 months to have a policy in place and training program developed.

Budget/Resources: < $50,000 initially and per year.
Research, identification of energy savings, consultation with drivers and development of materials would take about 4 – 6 months full time. Training could be added to pre-existing training programs with minimal additional time required. Follow up with drivers should be done a year after training was

received, and energy usage tracked. This will take a few weeks full time every year.

Corporate Action 4: Purchase and showcase alternative fuel vehicles, such as CNG, Propane, Electric, Biodiesel or Hybrid.

Type of Action: Project

Target Outcomes: Familiarize HRM staff and the broader community with alternative vehicle fuel technologies and environmental benefits they can bring.

Lead/Partners: HRM corporate leads by purchasing vehicles for their corporate fleet; partnering with other government programs or energy supply companies such as Irving, Heritage, NSPI, may be possible. Sponsorship from vehicle manufacturers interested in promoting some new technologies may also be possible. This is a demonstration project in addition to the fleet procurement program described above.

Indicator: Number of alternative fuel vehicles in the corporate fleet.

Inputs: Support and funding from council, solicit support from other potential partners, and end users within HRM staff.

Activities:

- Identify potential partners and demonstration vehicles that would be suitable.
- Secure funding or sponsorship for demonstration vehicles.
- Create an education and outreach/promotions program to let people know about the benefits of these vehicles.

Outputs: Reduced operating costs for new vehicles compared to conventional vehicles, greater visibility of alternative fuel vehicles to HRM staff and community.

Time Frame: M to identify sponsors and options, and to purchase vehicles

Budget/Resources: $50 - $100,000 capital costs (offset by partners).
( ) lower operating costs.
Ideally, most of the funding would come through partners or sponsors with joint promotion of the demonstration vehicles. These vehicles can also replace non alternative energy vehicles as they need replacement- reducing the additional investment to incremental costs only. There would not be significant staff time required to implement this project.

Additional capital cost per vehicle for alternative fuel vehicles can be as little as $5,000 for a biodiesel vehicle to as much as several hundred thousand dollars for a hybrid bus. In order to maximize exposure of the technologies, larger numbers of smaller, lower cost vehicles may be more effective.

Community Action 1: Expand public transit services such as:

- Bedford Ferry;
- suburban rapid bus service; and
- neighbourhood shuttle buses connecting to rapid transit network.

Type of Action: Program

Target Outcomes: Increase ridership on public transit, reduce traffic and congestion on HRM streets, reduced air emissions.

Lead/Partners: HRM's Metro Transit must lead this program as the regional public transit provider. Additional funding should be sought from other levels of government.

Indicator: Metro Transit annual passenger volumes
HRM traffic counts

Inputs: Funding for new equipment, operators, advertising. Design of new equipment and service support systems, operator training, advertising campaign.

Activities:
- Secure funding for each aspect of the program.
- Design facilities needed to utilize new equipment here and train new operators, obtain all required operating permits, advertise new services in advance.

Outputs: Additional transit options for passengers.

Time Frame: Medium term for initiation.
Long term for full implementation.
Funding approval applications for new services are ongoing, uncertain as to length of time required for approval. Once approval is given, timeframe for a new rapid bus service if usually 12 – 18 months, for a neighbourhood shuttle it is roughly the same, while the Bedford Ferry would require 24 – 30 months due to additional shore based construction.

Budget/Resources: $30 million capital investment.
$500,000 - $1 million per year staffing, maintenance and operations (note, this would be partially offset by revenues from fares).
Metro Transit would require 3 – 4 additional personnel per additional rapid transit bus added. Each bus costs approximately $300,000. Establishing a rapid bus terminal can cost between $1 – 3M depending upon land costs and terminal design. The Bedford Ferry project capital cost estimate is approximately $20M.

Community Action 2: Encourage implementation of the Active Transportation Plan

Type of Action: Policy

Target Outcomes: Connect and expand existing multi use trail system,. improved health and increased safety among HRM citizens, reduced motorized vehicle traffic, reduced vehicle emissions.

Lead/Partners: HRM are leaders, provincial government, private developers.

Indicator: Greater use of multi use trail network,
Increase the number of person trips by active transportation modes
Increased connectedness of trails

Inputs: Funding for planning and construction, publicity.

Activities:
- Develop a prioritized plan to link existing trails and expand the network.
- Design initial priority projects and manage construction.
- Develop a monitoring program to gauge trail use and transport mode.

Outputs: Enhanced trail system

Time Frame: Short term – initiation
Long term – full implementation
Implementation can occur rapidly, but is expected to occur over 20 years.
Active Transportation Plan looks to complete the current proposed network within 20 years and to ensure that active transportation components are incorporated into all new developments.

Budget/Resources: >$ 100 million over 20 years
$5 million per year
The estimated implementation plan cost is $100 M over 20 years plus annual maintenance costs that will increase from $200 K in year 6 to $2.4 M by year 20 as the network expands.

Community Action 3: Look into the possibility of restructuring HRM's taxi zoning for greater energy efficiency.

Type of Action: Regulatory

Target Outcomes: Improved efficiency of taxi service.

Lead/Partners: HRM, taxi commission, taxi companies

Indicator: Fuel consumption of taxi fleet
Net revenue per taxi (ensure it is not reduced)

Inputs: Consultation with the taxi industry, research on feasibility.

Activities:
- Research the amount of empty backhauling by taxis.
- Conduct some test trials of modified taxi zones.
- Determine if there is a measurable improvement in efficiency.
- Develop draft zoning.
- Test draft zoning with Taxi drivers.
- Implement.
- Monitor.

Outputs: Revised Taxi zoning

Time Frame: Medium term – to research and implement
6 – 12 months to develop and implement a new policy.

Budget/Resources: <$50,000 for implementation.
1 full time equivalent position for 6 months to research, consult, and recommend new policy.

5.3 Goal 3 – Increase Industrial Energy Efficiency

Community Action 1: Encourage industrial process heat recovery in industries such as breweries, dairies and others.

Type of Action: Program

Target Outcomes: Reduce energy consumption of industries, improve industrial efficiency, productivity, and profitability. Possible thermal energy exports via district heating.

Lead/Partners: Individual industries will lead each project. Other partners to provide incentives and advice, include: Natural Resources Canada, NSPI and Eco Efficiency Centre. Energy service companies may also implement projects.

Indicator: Total Industrial energy consumption.
Energy consumption per unit of production (Note: this information is often considered confidential).

Inputs: Feasibility analyses and design of each heat recovery project. Establishment of energy use baseline. Funding approval to implement.

Activities:
- Identify industry partners interested in improving energy efficiency.
- Identify potential projects.
- Assist with the implementation of projects (through funding or technical support).
- Monitor energy consumption to determine actual savings.

Outputs: Program for industrial users to reduce energy use

Time Frame: Medium term – to identify partners and begin to implement.
Industries can apply for funding assistance through the Eco Efficiency Centre to conduct project feasibility studies. Time frame from funding approval and completion of studies is 3 – 6 months. Funding assistance with the capital costs of the projects is available from NRCan and generally takes 2 – 3 months for approval. All projects must be completed within 12 months in order to access complete funding. This program is called the Eco Energy Retrofit Incentive for Industry and is intended to help small and medium sized industrial facilities. In order to qualify for all potential funding assistance, an industry should consider a time frame of 18 – 21 months until project completion.

Budget/Resources: $50, 000 - $100,000
HRM can provide technical support or co-funding for these projects. It is recommended that HRM focus on promotion of pre-existing programs and some technical support as the industries will benefit from lower operating costs.

Each industry should appoint one technical staff member to serve as client liaison with auditors, designers, constructors, and funding agencies. Maximum funding assistance is $4,500 for audits and $50,000 for projects.

Community Action 2: Encourage activities to focus improvement on efficiencies in HRM based industrial processes, and for businesses in partnership with organizations such as the Eco-efficiency Centre and CIPEC.

Type of Action: Program

Target Outcomes: Greater awareness of programs to improve efficiency among industries in HRM, greater levels of involvement in these programs.

Lead/Partners: Municipal Government, Federal Government (CIPEC), Eco Efficiency Centre

Indicator: Industrial participation rates in existing programs

Inputs: Consultation with representatives of existing programs to discuss problems with increasing participation rates

Activities:
- Identify potential industries with an interest in energy efficiency through outreach activities.
- Co-promote pre-existing programs.
- Track participation.

Outputs: Co-promotional materials

Time Frame: Short term – initiation
Medium term – implementation
This initiative focuses on promoting participation in pre-existing programs. The industries themselves will identify and implement the projects.

Budget/Resources: < $50,000
It is anticipated an HRM staff member would be assigned to consult with representatives of the existing programs and with industries for 3 – 6 months.

Community Action 3: Conduct an inventory of sources of industrial waste heat in HRM that could potentially be used by others.
- Encourage the development of new buildings that can be heated using low grade thermal energy
- Explore feasibility of district cooling opportunities

Type of Action: Project

Target Outcomes: Enhanced knowledge of the size of an indigenous energy source within HRM, a potentially new source of revenue for a current waste product, or new low cost energy source to attract new businesses. Industries that are more aware of the amount and value of industrial waste heat are more likely to explore ways to utilize it themselves or export it. Greater activity among the industrial sector in this regard will be a good indicator. The Eco Efficiency Centre supports initiatives such as this.

Lead/Partners: Conserve Nova Scotia, Eco Efficiency Centre, CIPEC, NSPI, Other Industries

Indicator: NA

Inputs: Compile existing data from Eco Efficiency Audits, expand data set as new audit information is received. Follow-up with industry to find out the level if implementation of waste heat recovery projects.

Activities:
- Review Eco Efficiency Centre data on industrial waste heat; identify gaps and complete the inventory.
- Determine if retrofit projects have been implemented to utilize waste heat.
- Contact industry with available waste heat for permission to include a description of the energy type and quantity in an inventory without disclosing the source.
- Identify adjacent businesses that may be able to utilize waste heat and determine the level of interest on both sides.
- Facilitate project development.

Outputs: Inventory of waste heat sources, greater cooperation among adjacent businesses.

Time Frame: Short term – to initiate
Medium term – to implement
3 – 6 months to compile database and contact industries. Simple projects could be implemented within 3 months, more complicated projects could require 1 – 2 years.

Budget/Resources: $50, 000 - $100,000 to develop inventory and perform outreach
1 full time CNS staff person for 3 months, 1 part time Eco Efficiency staff person for 3 months.

5.4 Goal 4 - Encourage Energy Efficient Land Use Planning and Neighbourhood Site Planning

Community Action 1: Include energy considerations in the Urban Design Guidelines as a mechanism for leading development within the Capital District toward more sustainable models.

Type of Action: Policy/Guideline

Target Outcomes: New development is more energy efficient than pre-existing development. Greater awareness of sustainable and efficient energy considerations when applying the guidelines to development projects. Note: BC had just announced that all Official Community Plans in BC will have to include energy considerations.

Lead/Partners: Municipal Government

Indicator: Number of development permit applications that include energy considerations.

Inputs: Consult with Capital District regarding policy.

Activities: HRM Energy planning staff need to meet with Capital District staff to develop a set of energy considerations for inclusion in the Urban Design Guidelines. Such considerations should include:

- Encouraging overall higher density to reduce the overall per capita carbon footprint.
- Ensuring all developments are true mixed use developments.
- Ensuring the development of walkable neighbourhoods with street facing buildings, rear parking, curb and median trees, public benches.
- Potential for utilizing district energy.

Outputs: Inclusion of complete community concepts in the Urban Design Guidelines.

Time Frame: Medium term – to develop and implement
Considered 'Medium Term' – there are existing municipal policies to this effect – notable in the form of Design Guidelines Checklists. A pre-existing Guidelines could be modified to be suitable in HRM quickly, but implementation would require some lead up time.

Budget/Resources: <$ 50,000
3 – 6 weeks FTE for one member of HRM staff to develop the list of considerations for inclusion in the guidelines and subsequent follow-up.

Community Action 2: Influence the community visioning exercises and the resulting guidelines for community development to include energy considerations.

Type of Action: Information and outreach program

Target Outcomes: More energy efficient development patterns in HRM communities.

Lead/Partners: HRM Energy planning staff.

Indicator: Increased number of community visions including energy considerations.

Inputs: Consult with community visioning project staff about the importance and compatibility of energy planning.

Activities: Develop and submit to the community visioning staff a set of considerations for inclusion in the community visioning process. This should be in the form of a handout or presentation that can be given to each community visioning committee and to the public in these communities to assist with the process of including energy considerations in their community development guidelines. These considerations could include:

- Lot orientation to maximize solar potential.
- Solar access protection bylaws.
- Public infrastructure for community energy projects.
- Greater adaptation of natural features into development.
- Minimizing the transport of bulk materials to development sites by using local materials.
- Encouraging overall higher densities.
- Ensure all development is true mixed use.
- Ensure the development of walkable neighbourhoods.

Outputs: Community visions with energy considerations

Time Frame: Short term – considerations should be developed quickly.

There are currently three visioning exercises under way. The energy considerations need to be developed and provided to these communities in the next three months.

Budget/Resources: < $50,000 one time

It is anticipated an HRM Energy planning staff member would be assigned to develop the communication and energy considerations and provide to each community. 2 – 4 weeks FTE is anticipated for this work plus follow-up.

Community Action 3: Provide an inventory and plan for opportunity sites within HRM including brownfields and under-utilized areas within Business Parks.

Type of Action: Plan

Target Outcomes: Increased use of currently serviced land lessening the need for costly expansion to existing infrastructure.

Lead/Partners: HRM Business Park sales staff and Capital District staff.

Indicator: Development activity within areas identified by this program.

Inputs: Consult with Business Parks Staff and HRM by Design personnel to determine the extent of the site availability and of anticipated demand.

Activities:
- Identify, locate, and categorize all opportunity sites.
- Develop regional map showing all opportunity sites along with information about each site detailing size, zoning, servicing, existing facilities on the site, and contamination level.
- Provide this information to developers

Outputs: A detailed map of opportunity sites for development

Time Frame: Short term – for map development

Long term – for implementation of development projects

Portions of the program are already underway through the HRM by design project and a current study of HRM business parks.

Budget/Resources: < $50,000 to develop inventory

The existing projects could be expanded to cover this program with no additional resources anticipated.

Community Action 4: Provide opportunities for local food production and small scale food retail through urban agriculture and preservation of agricultural land within rural areas of HRM.

Type of Action: Program

Target Outcomes: Increased productive use of land, less transportation requirements to move food to local markets.

Lead/Partners: HRM Planning staff or Capital District staff.

Indicator: Increased local food production sites

Inputs: Consult with planning and capital district staff to identify existing and potential agricultural lands. Explore costs associated with land improvements required to make it agriculturally productive.

Activities:
- Identify surplus or underutilized land for use as community gardens.
- Initiate a buy local campaign for fresh produce to encourage growers in HRM to produce food.
- Give preference to vendors who stock local produce.
- Provide funding for community gardens.

Outputs: Identification of opportunity sites for urban agriculture

Time Frame: Medium term – Long term for implementation

Considered 'medium to long term with initial development in the next 2 – 3 years and full development over 10 years.

Budget/Resources: > $100,000 if land is procured, < $50,000 with no procurement

Land development and procurement incentives could cost up to $100,000 per year although some cost recovery is possible through renting of garden plots and additional assessments due to new businesses setting up. The inventory of surplus or underutilized land will cost < $ 10,000

5.5 Goal 5 – Increase Efficiency Of Infrastructure

Corporate Action 1: Create a Streetlight Efficiency Strategy including standards, inventory, energy reduction action plan, and partnerships. Work toward bringing all streetlights in HRM under municipal control.

Type of Action: Policy

Target Outcomes: Reduced annual operating costs for streetlighting, reduced energy consumption due to streetlighting, reduced light pollution, improved streetlight maintenance, new streetlighting technology demonstrations.

Lead/Partners: HRM leads initiative, UNSM, Nova Scotia Department of Energy, NSPI. HRM is currently co-sponsoring a streetlighting study in Nova Scotia to look at the best practices, available technologies, and recommended improvements. HRM is a study participant.

Indicator: Energy use for streetlighting,

Inputs: Funding to increase streetlight maintenance budget.

Activities:

- Use latest study to determine what best practices and new technologies are available.
- Develop standards for streetlighting based on transportation engineering guidelines and provide to developers for all new developments that will have HRM owned and maintained streetlights.
- Develop energy saving standards for streetlights based upon the time of day, traffic counts, pedestrian counts, and the type of street, trial different technologies to achieve energy savings to determine which are most applicable.

Outputs: A consistent lighting standard for all roadways and municipal property, municipal ownership and maintenance of all streetlights in HRM. Consistency of light levels on similar service streets throughout HRM.

Time Frame: Medium term – for implementation

Current streetlighting study will last 3 months. Development of a consistent standard for streetlighting across HRM could take 2 – 3 months. Implementing the standard will take several years.

Budget/Resources: <$50,000 for policy development and standards

> $100,000 for streetlight retrofits but should be offset by reduced operating costs.

Initial study funded through UNSM, HRM, and Conserve NS. Policy development and standards development will require 1 FTE for 6 – 12 months.

Corporate Action 2: Restore the commitment to the LED Traffic Signals Program and set a program completion date.

Type of Action: Program

Target Outcomes: Reduced energy consumption, maintenance, and costs for operating traffic signals. Improved signal visibility and safety. Reduced annual operating costs for traffic signals, less maintenance of lights due to much longer lamp life, improved signal visibility and safety for motorists and pedestrians.

Lead/Partners: HRM along with partner funding from Conserve Nova Scotia.

Indicator: Energy consumption by traffic lights

Inputs: Funding to install more new signal devices each year, more HRM employees and equipment designated to this work.

Activities:
- Complete installations of all existing stockpiled signals.
- Apply for funding for new signal equipment.
- Purchase new signals and install.
- Continue the process until all intersections are completed.

Outputs: Completion of the conversion of all traffic signal lights in HRM to LED fixtures.

Time Frame: Medium term – for implementation

HRM should commit to complete all signalized intersections in HRM within 3 years.

Budget/Resources: $50,000- $100,000 for implementation, but should be recovered from reduced operating costs and maintenance costs.

HRM estimates $3,500 per intersection for installation costs only of new LED signals. Over 100 intersections remain to be completed. Total estimated cost for materials and installation, less the provincial grant, is $850,000.

Corporate Action 3: Ensure implementation of the Greenhouse Gas Emission Reduction Plan for pumping stations.

Type of Action: Policy

Target Outcomes: Reduced energy consumption and maintenance costs at sewage and water pumping stations, longer pump service life, reduced pump motor maintenance costs, fewer unscheduled station shutdowns.

Lead/Partners: HRM and HR Water Commission

Indicator: Energy use at pumping stations, operation and maintenance costs, and equipment reliability records.

Inputs: Funding to assess current consumption and condition of each station, funding to install energy monitoring equipment, equipment upgrades, and enhanced inspections.

Activities:
- Detailed assessment of each station listing all motors by age, size, condition, efficiency, and drive type.
- Monitor energy consumption in each station to determine base conditions.
- Develop a plan to regularly monitor consumption, upgrade motors to high efficiency as they require replacement, install variable frequency drives on pumps with high flow variability, regular equipment maintenance.
- Monitor liquid flow rates and temperatures in sewage pumping stations to determine the feasibility of waste heat recovery from the sewage.

Outputs: Assessment of energy use in pumping stations, baseline energy use and plan to reduce energy use.

Time Frame: Short term – initiation of study
Medium term – implementation
Development of the policy is expected to require 1 – 2 months. Training of maintenance and procurement staff is expected to require 3 – 6 months.

Budget/Resources: $50,000 - $100,000 to conduct assessment and develop plan
> $1 million to implement retrofits but this should be recovered by reduced operational costs.
1 FTE for 1 month for policy development, 2 FTE for 1 – 2 months for training.

Corporate Action 4: Explore options to encourage additional water conservation among water consumers.

Type of Action: Research

Target Outcomes: Reduced water consumption for residential and commercial customers, reduced energy consumption treating and pumping water and wastewater.

Lead/Partners: Halifax Regional Water Commission

Indicator: Water consumption per capita
Overall water consumption

Inputs: Research funding and show conservation development progress.

Activities:
- Research other municipal water utilities for water use reduction programs.
- Identify most effective means to reduce water use- incentives, education and outreach, stepped billing, etc. Consult with major users and citizens groups to get feedback.
- Implement and monitor.

Outputs: Water conservation program.

Time Frame: Short term – initiation
Medium term – implementation
The research and consultation can be initiated and completed within 6 – 12 months. Implementation will likely occur over several years.

Budget/Resources: $50,000 - $100,000 for research and program development.
>$ 500,000 if an incentives program is developed.
Several cities across Canada have developed water conservation programs including Ottawa, Toronto, Calgary and Victoria. Most include incentives for retrofitting appliances and fixtures.

5.6 Goal 6 – Increase Energy Security and Diversify Energy Supply

Corporate Action 1: Participate in expanding natural gas availability in HRM.

Type of Action: Policy/Projects

Target Outcomes: Greater availability of natural gas as a fuel choice for HRM residents, greater competition in the heating fuel market. Reduced emissions of CO_2, N_2O, SO_2, and particulate from heating systems, larger number of HRM buildings heated with natural gas, reduced heating costs for HRM buildings.

Lead/Partners: HRM/Heritage Gas

Indicator: Number of natural gas customers in HRM.
Size of distribution network

Inputs: Business case studies for natural gas heating at all HRM facilities, modify trenching policy to allow natural gas piping in common trench with sewer and water.

Activities:
- Meet with Heritage Gas to hear their concerns regarding expansion of their gas distribution network, work to alleviate or lessen those concerns.
- Study the business case for converting HRM facilities to natural gas when it becomes available in the area.
- Promote natural gas as a clean burning fuel in HRM newsletters.

Outputs: Business case for conversion, promotional materials.

Time Frame: Medium term – for implementation
Heritage plans to have primary distribution service to HRM peninsula by December 2007. Remaining build out of local distribution system is planned over the next 3 – 5 years. Additional build out will be market driven by demand.

Budget/Resources: < $50,000- $100,000 for business case
> $100,000 for conversions (only conducted if business case warranted).
Assessing the business case for natural gas conversion in HRM buildings and in residential buildings will likely require the services of an outside consultant. Modification of the trenching policy may also be required. Cost of building conversions vary depending upon size and type of heating system. An oil heated arena with 2 – 3 appliances would cost $5 - $10,000, while a large office building with commercial boilers could cost $25,000.

Corporate Action 2: Pursue Green Power Purchasing opportunities for HRM.

Type of Action: Policy

Target Outcomes: Increase the amount of electricity used by HRM corporate that is produced from green sources. Reduced corporate GHG emissions, achievement of GHG emission reduction target for HRM corporate operations, improvement of the HRM 'Green' image.

Lead/Partners: HRM, NSPI, and private green power producers.

Indicator: Greater number of green power producers in Nova Scotia, availability of offset credits for use by HRM, reduction in corporate HRM GHG emissions.

Inputs: Funding for green power premiums.

Activities:
- Discuss options with NSPI to allow green power procurement.
- Lobby the provincial government for legislative changes to allow direct green power purchase.

Outputs: Green Power Purchasing Policy.

Time Frame: Medium term – Long term to negotiate with NSPI and achieve legislative changes required.
Once enabling legislation is in place, negotiation of a power purchase agreement with a green power producer will take 3 – 6 months if previous

	agreements are used as a model. NSPI negotiations could take 6 – 12 months. Revised legislation may be 2 – 5 years away.
Budget/Resources:	$50,000 for staff Negotiating with green power producers and NSPI will require 1 FTE for 3 – 6 months. No premium for power purchase is expected.
Corporate Action 3:	Assess the risk of setting up a municipally owned energy utility with authority over power generation and/or energy purchase.
Type of Action:	Project
Target Outcomes:	Understanding of the costs and benefits of increased municipal control over energy.
Lead/Partners:	HRM
Indicator:	Report can be used to determine future relationship with NSPI and HRM's future commitment to green power.
Inputs:	Council agreement and funding of the report.
Activities:	• Engage a consultant to write the report.
Outputs:	Report on the risks and benefits of a municipal utility. Report can lead to a staff recommendation to council to continue further exploration of the utility option or to not pursue it.
Time Frame:	Short term – Medium term to prepare report. Report will require 3 – 6 months for consultant and HRM staff input prior to a council presentation. A recommendation on whether to implement or not depends on the report findings.
Budget/Resources:	$ 50,000 - $100,000 for report HRM will assign one part time staff person to develop report terms of reference and engage and manage consultant throughout the 6 month study period.
Corporate Action 4:	Consider co-sponsoring renewable energy projects with other Nova Scotia Municipalities that have better access to renewable resources.
Type of Action:	Policy/Project
Target Outcomes:	Increased green energy purchases from Nova Scotia based projects, support for smaller municipalities to develop their energy resources.
Lead/Partners:	HRM, UNSM, other municipalities.
Indicator:	Larger number of municipally led renewable energy projects.
Inputs:	Council approval to proceed.
Activities:	• Investigate interest among other municipalities. • Identify potential projects and assess feasibility • Identify HRM role in co-sponsoring and develop business case. • Implement.
Outputs:	Memorandum of understanding with other municipalities to develop renewable energy projects.

Time Frame:	Medium to Long term to study and implement. Medium to long-term projects would require 12-24 months to study and an additional 24 – 48 months to develop.
Budget/Resources:	<$50,000 for study and staff time > $10 million for co-sponsoring renewable energy. 1 part time staff person to begin discussions with other municipalities. Actual project study will require 1 – 2 part time staff for up to 12 months. Staff may require training in project analysis tools such as RETScreen.

Community Action 1:	Further investigation of Biomass or MSW cogeneration plants or district energy plants.
Type of Action:	Research
Target Outcomes:	Understanding of potential for greater amounts of Biomass or MSW cogeneration plants or district energy plants in HRM.
Lead/Partners:	HRM, NS Energy
Indicator:	NA
Inputs:	Council approval, biomass availability estimates, existing reports.
Activities:	• Determine interest in biomass among utility, industrial, and institutional customers. • Identify feasibility of Biomass or MSW cogeneration plants or district energy plants • Look at zoning restrictions, potential noise and emissions issues.
Outputs:	Staff report to council.
Time Frame:	Medium term for report. 12 – 24 months to complete report.
Budget/Resources:	$50,000 - $100,000 2 part time staff for 6 – 12 months to complete report.

Community Action 2:	Encourage an Anaerobic Digester Plant for the processing of organic ICI and septage wastes.
Type of Action:	Research/ Project
Target Outcomes:	Reduce environmental pollution and methane escape to the atmosphere caused by the current disposal practices for organic ICI and septage wastes, reduction in reliance on septage lagoons for dispersal of septage waste.
Lead/Partners:	HRM, Nova Scotia Department of Environment, private septage haulers.
Indicator:	Reduction in methane off gassing from Otter Lake landfill.
Inputs:	Funding from HRM, Nova Scotia government, and other sources to allow for construction and operation of the facility. Tipping fees from ICI waste and septage haulers will subsidize operating costs.

Activities:
- Obtain funding, design system based upon current and anticipated waste volumes.
- determine if energy production from facility can be used at Otter Lake facility with the remainder to NSPI under net metering arrangement.
- Construct facility adjacent to Otter Lake and operate both facilities in tandem.

Outputs: Feasibility study; Anaerobic Digester Plant
Facility will yield two products, methane gas which can be burned in a cogeneration plant to produce heat to sustain the digester reaction and electricity to power some of the Otter Lake loads and surplus electricity will be sent to NSPI under a net metering arrangement, and digested effluent which when dewatered and dried can be used as ground cover or can be landfilled as an inert product.

Time Frame: Medium term – Long term to initiate and implement
Funding approval could require 12 – 24 months, design will require 6 months, construction will require 6 – 9 months.

Budget/Resources: >$5 million for study and construction costs, will be offset by availability of methane and tipping fees from septage haulers.
Funding application process will require 2 FTE HRM staff for 1 month, design will require the services of a consultant at a cost of $500,000 - $700,000. Construction costs will be $4 – 6 million.

Community Action 3: Encourage developments of utility-size wind turbines independently or in cluster approach – and continue with the Wind Energy Master Plan process.

Type of Action: Policy

Target Outcomes: Greater utilization of wind energy and greater degree of public acceptance of wind energy projects near populated areas.

Lead/Partners: HRM will continue as lead of the process in partnership with the wind industry, Nova Scotia Department of Energy, NSPI, and private citizens.

Indicator: Greater use of wind generation within HRM

Inputs: Staff resources to develop the policies and bylaws to allow further development of the process.

Activities:
- Continued staff consultation with public and stakeholder groups, policy development, bylaw enactment, public education.
- Integrate new Provincial initiatives into the process such as the new environmental assessment guidelines for wind turbines and the provincial wind atlas.
- Work with UNSM to create a model land use bylaw for wind energy.

Outputs: Educational and outreach program and materials, new land use bylaw.

Time Frame: Short term to Medium term.
New bylaw to council by late 2007, regulations and policies within 1 year.

Budget/Resources: Bylaw work mostly complete, 1 FTE for 6 months to complete regulations. Allow $20,000 for outreach program.

Community Action 4: Encourage installation of solar panels to heat process water for industrial processes such as breweries and dairies.

Type of Action: Project

Target Outcomes: Reduced consumption of fossil fuels to produce hot process water, support for the solar industry in Nova Scotia, reduced production costs, enhanced visibility of industrial green projects, support for the solar industry.

Lead/Partners: Individual industries, Conserve Nova Scotia, HRM, Eco Efficiency Centre

Indicator: Installations of solar panels.

Inputs: Government incentive programs to industry, enhanced solar marketing campaign, industrial green campaigns.

Activities:

- HRM promotes solar and current funding programs.
- Industries have energy audits conducted and implement solar technologies.

Outputs: HRM output is a promotional program to encourage uptake of solar technologies.

Time Frame: Short term – for HRM to initiate program.

All incentive programs and technologies exist now. Audit and funding application requires 1 – 2 months, design and construction requires 6 – 12 months.

Budget/Resources: $< 50,000 for promotion of pre-existing programs.

Incentives can cover 50% of audit costs and 25% of capital costs. Costs to industry will be approximately $3,000 – $5,000 for audits and $10,000 – $50,000 depending upon the size of industry and process water demand.

Community Action 5: Assess potential for run-of-the- river mini hydroelectric plants within HRM.

Type of Action: Project

Target Outcomes: Increased use of renewable energy in HRM.

Lead/Partners: Private developers, NSPI, HRM. NSPI has expressed interest in purchasing power from a hydro plant. Flow data exists for several rivers. Feasibility analysis will determine investment interest from the private sector.

Indicator: N/A

Inputs: NSPI has issued calls for expressions of interest from private developers for renewable energy projects. A special emphasis on hydro power with added incentives for capacity could assist potential hydro developers to make a business case, a feasibility analysis will be needed to attract additional investment if the analysis is positive.

Activities:

- Determine potential feasibility at all proposed rates.
- Develop concept level design and cost estimate for those sites that show possible feasibility.
- Estimate annual operating costs and revenue streams based on discussions with NSPI.
- Solicit project investment if analysis suggests a business case.
- Once funding is in place proceed to preliminary design and permitting then detailed design and construction.

Outputs: Working small hydro plants, highly visible demonstration of ecologically sustainable power generation, excellent educational opportunities for promoting green energy and sustainability.

Time Frame: Medium term – Long term for studies and construction.
6 months for pre-feasibility assessments, feasibility study and fundraising will require 12 months, design permitting and construction will require 18 – 24 months.

Budget/Resources: $50,000 - $100,000 for studies
> $2 million if HRM is owner of facility- this investment should be recouped by electricity sales.
A basic 500 kW run of river project is estimated to cost anywhere between $2,000,000 and $5,000,000 depending upon the site. For example, preliminary assessment shows that based on the NRCan hydrometric flow data, a 2.1-MW plant at Crawford Falls on Musquodoboit River would require about $10,192,000 in initial capital, without factoring in any incentives. This initiative would lead to GHG reduction of about 6,800 tonnes per year, while delivering over 10,880 GJ or (3,000 MWh) of electrical energy on the annual basis.

Community Action 6: Encourage natural gas conversion of industrial boiler plants including Capital District Health Authority, Dalhousie, SMU, DND and Oland's Brewery.

Type of Action: PROJECT

Target Outcomes: Immediate reduction of GHG by 30%, SO_2 by 99.9%, NOx by 75% and particulate by 90%. Improved local air quality, reduction in truck traffic for fuel deliveries.

Lead/Partners: NS Energy, Capital Health, Heritage Gas, Nova Scotia Environment

Indicator: Stack emission reductions
Reduction in GHGs

Inputs: Current air quality measurements near boiler plants, funding for retrofits

Activities:

- Conversion of existing boilers from oil to natural gas is normally a simple exercise. The local gas company will provide underground gas piping and a metering station to the owner's location. The client will work with an engineering consultant to size and specify the required equipment and modifications needed. The project will involve a new burner, burner valve arrangement, burner safety control system, gas piping within the building, possibly increased ventilation requirements and new or modified stack. Many plants will take this opportunity to replace older boilers with new higher efficiency models. Also plant sometimes like to piggy-back a complete new plant computer control system with the gas conversion project. All the work is done to a nationally recognized safety code, in this case Canadian Standards Association Code B149. The completed project is usually inspected by a representative of CSA to ensure. The owner's consultant will generally prepare the drawings and specifications required for the owner to tender the project to qualified contractors. The consultant

will work with the owner to evaluate the bids to get the best possible value. The contractor will be responsible for obtaining all required permits from the Office of the Fire Marshall. The owner's consultant will generally provide services during construction to deal with any issues or concerns that arise during the construction phase.

- HRMs role in these projects would be to promote them to the respective organizations.

Outputs: Converted boilers

Time Frame: Medium term – Long term for implementing conversions

The time frame to complete the gas conversion of an existing plant is dependent on the scope of the work. If a conversion project is a simple burner replacement with new controls, it can be accomplished in 8 to 12 months. If the scope of work involves installation of a new boiler the time frame would be in the order of 12 to 18 months.

Budget/Resources: No costs for HRM.

For the organizations involved, there are two components to the budget; capital and operating. The capital budget will be determined at the beginning of the project. The cost will be a function of the scope involved. For a simple conversion of packaged boiler of say 50,000 lb/hr steam capacity the cost would be in the order of $200,000 to $300,000. Each plant is unique and needs to be thoroughly examined to determine extent of the scope. The operating budget will greatly affected by the conversion. In a typical heating plant over 2/3 of the operating budget is fuel cost. It is very difficult to predict long term future prices of various fuels, but based on information from sources such as National Energy Board (NEB) US Dept of Energy and various private research companies we see natural gas prices being 15% to 20% higher than Bunker C. However compared to No. 2 Furnace oil the long term future price of natural gas is lower by 33%. No additional personnel resources will be required for the operation of the plants due to gas conversion.

Community Action 7: Assess potential and feasibility for harbour water cooling of buildings near the harbour.

Type of Action: Project

Target Outcomes: Use of harbour cooling can reduce the energy consumption for building cooling by 60 – 70%. Other buildings currently using harbour cooling report that it can provide full cooling requirements for 9 – 10 months per year. Reductions in energy consumption, steam use (for absorption chiller), and GHG emissions

Lead/Partners: Nova Scotia Department of Health

Indicator: Building energy consumption.

Inputs: Nova Scotia Department of Health has already commissioned a feasibility study of the project. The project results in significant energy savings and GHG reductions. Return on investment is positive but not great.

Activities:
- Update existing feasibility study, looking at ways to reduce capital cost, obtain project funding,
- proceed with detailed design and permitting followed by construction and operation (this would be the responsibility of the organization).

Outputs: Installed harbour water cooling.

Time Frame: Medium term – Long term study and implementation
Update to existing feasibility study and funding approvals could require 12 – 18 months, detailed design, permitting, and construction will require 24 months.

Budget/Resources: Estimated project cost is between $1.7 M and $2.2 M for the NS Department of Health. HRM can promote this project with the Department at no cost to HRM.

Community Action 8: Increase the allowable NSPI metering limit to 800 kW.

Type of Action: Policy

Target Outcomes: Increased net metering leads to an increase in self generation projects in businesses and small industries and reduced demand on current NSPI system, lower emissions.

Lead/Partners: NSPI

Indicator: New NSPI rate class, more customer self generation.

Inputs: Demonstrate to NSPI that there will be demand for this new rate. UARB will need assurance that a new rate will not cause financial harm to other ratepayers.

Activities:
- Feasibility analysis for small self generation plants or cogeneration plants that can operate more efficiently than current means of providing heat and electricity to businesses or small industries.
- Use analysis to request NSPI to increase net metering limit.

Outputs: A larger number of self generation or cogeneration plants.

Time Frame: Medium term to Long term.
6 – 12 months to UARB approval.

Budget/Resources: No costs to HRM.
1 FTE NSPI staff person for 1 month to draft new rate and UARB application.

5.7 Goal 7 - Educate and Engage the Community

Community Action 1: Create recognition of the Community Energy Plan by:
- Well planned and timed launch campaign, website and opportunities for engagement throughout the process
- Maintain the CEP brand in future energy programs resulting from the CEP
- Promoting the CEP and its concepts to Nova Scotia at large.

Type of Action: Program

Target Outcomes: Participation, awareness of energy issues in HRM

Lead/Partners: Municipal Government, Conserve Nova Scotia

Indicator: Tracking 'hits' on HRM web-site links to the CEP.

Inputs: Funding for staff, consult with Conserve NS regarding common approaches

Activities:
- Develop a marketing plan to highlight the CEP.
- Implement the plan using common media methods, with easy on-line links.

Outputs: Marketing program.

Time Frame: Short term – to initiate and implement

Considered 'Short Term' – It is anticipated this Activity may take in the order of 4 to 6 weeks to complete and implement.

Budget/Resources: <$50,000

It is anticipated an HRM staff member would be assigned full-time to oversee the development of the Marketing Campaign.

Community Action 2: Work with the development and construction sectors to identify target markets for new education programs.

Type of Action: Program

Target Outcomes: Number of new developments that self identify as incorporating sustainable building practices and energy efficiency.

Lead/Partners: Municipal Government, Developers, NS Home Builders Association, NS Construction Association

Indicator: NA

Inputs: Funding for educational materials, partnerships with Development Community.

Activities:
- Coordinate with Development Services at HRM to work with development and construction companies prior to the Development Agreement. This interaction will highlight the CEP and the various other Programs and Policies in place, and allow the development and construction companies to convey other opportunities for energy conservation in future developments.

Outputs: Heightened awareness of the CEP.

Time Frame: Medium term – Long term

Considered 'Medium to Long Term' – It is suggested this Activity would become a component of the existing services provided by Development Services, and be discussed with proponents prior to and during the Development Agreement process.

Budget/Resources: <$50,000

This Activity should have little impact on budget or resources as this information would be included in the overall services provided by HRM. Some training of building officials and development staff may be required.

Community Action 3: Work with local industrial and institutional large consumers of energy to expand their commitment to reduce energy use through:
- An industrial energy conservation pledge
- A coalition-building session organized by the Mayor and involving CEOs and top managers

Type of Action:	Program
Target Outcomes:	Reduction in energy consumption
Lead/Partners:	Municipal Government, Large Power Consumers
Indicator:	NA
Inputs:	Develop a program and information to raise awareness and encourage energy conservation for energy intensive consumers. Coordinate with energy consultants and engineering professional for the development of an audit strategy and recommendations for large energy consumers to consider.
Activities:	• Develop and promote the need for energy audits at these large consumers to determine if these facilities are operating at peak efficiency. This should include promoting the need for assessment of electrical systems (power factor), and the use of energy efficient devices in all facets of the facility.
Outputs:	
Time Frame:	Considered 'Short Term' – It is anticipated the Program may take in the order of 3 to 6 months to complete and implement.
Budget/Resources:	It is anticipated an HRM staff member would be assigned to oversee the development of the Program for 1.5 to 3 months (assuming a participation level of 50% of their time for the duration of the development of the Program).

Community Action 4:	Work with local NGOs in promoting their educational programs, especially within schools.
Type of Action:	Program
Target Outcomes:	Heightened awareness in schools
Lead/Partners:	Non-profits (e.g. Clean Nova Scotia)
Indicator:	Awareness of local children.
Inputs:	Surveys and marketing/promotional materials (can also fund pre-existing programs and materials).
Activities:	• Survey children about awareness of energy issues. • Develop awareness education to highlight the energy issues. • Implement the education program. • Follow up surveys of awareness.
Outputs:	Energy awareness education.
Time Frame:	Short term – initiation Medium term – implementation If these educational materials and programs are pre-existing, HRM can fund them.
Budget/Resources:	< $50,000 total It is anticipated an HRM staff member would be assigned full-time to oversee the development of the Marketing Campaign and the presentation of the information for the duration of the Activity.

Community Action 5: Encourage implementation a public awareness program using creative strategies such as:

- Displaying the "carbon-footprint" of moving treated water to the users on their civic water bills.
- Neighbourhood canvassing program to promote EnerGuide.
- A large ad campaign on carpooling.

Type of Action: Program

Target Outcomes: Heightened awareness of energy issues in the HRM

Lead/Partners: HRM or non- profit partners

Indicator: Increased awareness of energy issues in residents

Inputs: Information and education program and surveys

Activities:

- Survey residents about awareness of energy issues.
- Develop an Awareness Campaign to highlight the CEP.
- Implement the program.
- Follow up surveys of awareness.

Outputs: Information and educational materials.

Time Frame: Short term – to initiate

Medium term – implementation (follow up survey 6 month to one year after program initiated).

Considered 'Short Term' – It is anticipated this Activity may take in the order of 3 to 6 months to complete and implement.

Budget/Resources: < $50,000 to develop and administer surveys.

< $50,000 ongoing and for follow up surveys.

It is anticipated an HRM staff member would be assigned full-time to oversee the development of the Marketing Campaign and the presentation of the information for the duration of the Activity.

5.8 Goal 8 - Demonstrate Local Government Leadership

The Actions under this goal are specific to HRM and will occur as a part of HRM Staff and Council fulfilling the other Goals of the CEP. These actions are listed below:

Corporate Action 1: Implement all other corporate actions under the previous 7 goals to clearly demonstrate HRM's commitment to "walk the talk".

Corporate Action 2: Use HRM's influence to lobby for all legislative priorities identified in the shortlist.

Corporate Action 3: Push for the municipal voice at the table in reformulating Nova Scotia's Energy Strategy, particularly the formation of an Energy Advisory Committee.

6 ADDITIONAL ANALYSES

6.1 Staff Resource and Training Matrix

The following matrix looks at the anticipated HRM staff resources and suggested staff training requirements for implementing the recommended actions. Although primarily associated with the corporate actions, the matrix includes suggested staff resource allocation and training for some community actions where HRM can play a leading role.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Goal 1: Improve the Energy Efficiency of Buildings				
Action 1: Retrofit existing HRM buildings for energy efficiency improvements and the use of renewable energy technologies such as solar water heating. Focus on large energy users: arenas, community centres, libraries, etc.: • Utilize demand side management (DSM) programs as a resource tool to reducing energy consumption • Create a capital reserve fund for energy efficiency projects, replenished by part of savings from retrofit projects.	$5,000,000/ 3 – 5 years Payback of capital investment	6 months FTE	5 years	NRCAN Energy Audit Training for lead staff members – Dollars to Sense Series
Action 2: Require higher standards of energy efficiency and environmental design in new HRM buildings: • Make LEED Silver the standard for new HRM buildings by 2010, and LEED Gold by 2020. • Encourage innovative and visible technologies such as green roofs and solar demonstration projects on new HRM buildings.	$50,000/ 2% premium on new building construction	6 months FTE	6 months	LEED training and certification for staff developing and implementing policy.
Community Actions				
Action 1: Support existing programs to increase energy efficiency and consumption reduction in the residential sector: • EnerGuide for Houses. • R-2000 Home by NS Home Builders Association.	$10,000/ $30,000/yr for marketing	1 month FTE	6 months	Staff familiarization with current and proposed funding programs

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Action 2: Adjust the building permit fee structure to provide incentives for new high efficiency homes based on achieving an EnerGuide 77 and/or R-2000 standard.	$25,000/ $100,000/yr for continuing education and reduced fee revenue.	3 months FTE	1 year	Staff familiarization with Energuide and R2000 programs.
Action 3: Promote incentives currently available to support energy efficiency in non residential buildings, in particular: • DOE's 10% rebate on solar water heating systems. • CMHC's 10% premium refund on its mortgage loan insurance premiums. • Federal Eco Energy Retrofit Program and the associated provincial program. • Utilize existing Conserve Nova Scotia energy efficiency programs.	$20,000/ $20,000/yr for marketing	2 months FTE	6 months	Staff familiarization with current and proposed funding programs
Action 4: Use municipal code by-law changes as lever to require EnerGuide ratings on all existing homes, residential and commercial buildings at time of sale, with involvement from the realtors association and the province.	$40,000/ $40,000/yr for outreach, marketing, and training	3 months FTE	12 to 18 months	Staff familiarization with bylaw and Energuide rating system
Goal 2: Increase Transportation Choice and Efficiency				
Corporate Actions				
Action 1: Right-size the municipal fleet, assign vehicle use appropriately and designate more vehicles for multi-use.	$50,000/ $400,000/YR consumption savings	1 month FTE	3 months before starting then ongoing	Staff familiarization with new policy and with new energy efficient vehicle technologies.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Action 2: Continue and support HRM's Commuter Trip Reduction program.	$15,000/ $10,000/yr for promotion and monitoring	2 months FTE	ongoing	Staff consultation to determine interest in program and potential problems.
Action 3: Implement driver training for HRM's fleet drivers.	$40,000/ $10,000/yr for promotion and monitoring. Annual energy savings could be as much as $500,000/yr	4 months FTE	12 months	Research safety and driver training programs elsewhere before developing policy and training materials.
Action 4: Purchase and showcase alternative fuel vehicles, e.g. CNG, Propane, Electric or Hybrid.	$50,000/ $5,000/yr for monitoring and promotion	2 weeks FTE	6 months	Research alternative fuel vehicle technologies, suitability for HRM roads, service requirements and local capacity, partnership potential.
Community Actions				
Action 1: Expand public transit services, in particular: • Ferry service to Bedford. • Rapid bus transit to suburban areas. • Neighbourhood shuttle buses connecting to rapid transit network.	$30,000,000/ $250,000/yr in additional operating expenditures. Expenditure previously approved by council but not yet budgeted.	3 – 4 FTE for each new bus added. 8 – 10 FTE for a new ferry service.	24 to 30 months	Training for new staff hires for operation and maintenance of new equipment.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Action 2: Encourage implementation of the Active Transportation Plan.	$100,000,000/ $2,000,000/yr for maintenance once trail network is completed. Expenditure previously approved by council but not yet budgeted.	2 FTE during initial plan development	20 years	Ongoing stakeholder consultation as network planning proceeds.
Action 3: Look into the possibility of restructuring HRM's taxi zoning for greater efficiency (e.g. fewer taxi's having to leave the airport without passengers).	$30,000/ $2000/yr for monitoring	6 months FTE	12 months	Research other jurisdictions with modified bylaws, consult stakeholders
Goal 3: Increase Industrial Energy Efficiency				
Community Actions				
Action 1: Initiate industrial process heat recovery in industries.	$10,000/ $5,000/yr for promotion	1 month FTE per industry	18 to 21 months	Staff familiarization with industrial energy efficiency programs
Action 2: Initiate activities and action to focus improvement on efficiencies in HRM based industrial processes, and businesses in partnership with organizations such as the Eco-efficiency centre and CIPEC.	$20,000/ $5,000/yr for promotion and monitoring	3 months FTE	3 to 12 months	Familiarization and consultation with HRM based industries. Familiarization with incentive programs.
Action 3: Conduct an inventory of sources of industrial waste heat that can be used by others (e.g. cooling water from Tuft's Cove).	$5,000/ $0	1 month FTE	12 months	Staff to become familiar with other program funding

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
• Encourage the development of new buildings that can be heated using low grade thermal energy. • Explore feasibility for district cooling opportunities.				sources and work to develop a partnership funding arrangement to complete the project.
Goal 4: Encourage Energy Efficient Land Use Planning and Neighbourhood Site Planning				
Community Actions				
Action 1: Include energy considerations in the Urban Design Guidelines as a mechanism for leading development within the Capital District toward more sustainable models.	$3,000/ $0	1 month FTE	6 months	Research considerations for inclusion in the guidelines.
Action 2: Influence the community visioning exercises and the resulting guidelines for community development to include energy considerations.	$3,000/ $500/yr for monitoring	1 month FTE	3 months	Review current community visioning initiatives.
Action 3: Provide an inventory and plan for opportunity sites within HRM including brownfields and under-utilized areas within Business Parks.	$30,000/ $3,000/yr for updates	No additional resources required	Pending HRM by Design recommendations	Additional tasking for HRM by Design staff to identify opportunity sites.
Action 4: Provide opportunities for local food production and small scale food retail through urban agriculture and preservation of agricultural land within rural areas of HRM.	$40,000/ $10,000/yr for administration of land management	1 year FTE	Over 10 years	Staff training in urban agricultural principles.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Goal 5: Increase Efficiency of Infrastructure				
Corporate Actions				
Action 1: Create a Street Lights Efficiency Strategy including Standards, inventory, energy reduction action plan, and partnerships. Work toward bringing all streetlights in HRM under municipal control.	$30,000/ $10,000/yr reduction in operating costs	6 months FTE	3 – 5 years	Staff training in energy efficient streetlighting technologies and best practices from other municipalities.
Action 2: Restore the commitment to LED Traffic Signals Program and set a program completion date.	$850,000/ $100,000/yr savings in energy and maintenance	5 years FTE	2 years	Installation training for new crews assigned to the program.
Action 3: Ensure implementation of the greenhouse gas emission reduction plan for pumping stations including items such as energy consumption monitoring, regularly scheduled maintenance, end of life motor upgrades to high efficiency units, and variable frequency drives on pumps with high flow variability.	$1,000,000/ $200,000/yr in energy and maintenance savings	1 FTE for policy development for 1 month 2 FTE for 2 months of training	1 year	Staff training for energy auditing of pumping stations, equipment maintenance, and operation of energy efficient equipment.
Action 4: Explore options to encourage additional water conservation among water consumers.	$100,000/ $0	1 FTE for research for 2 weeks 2 FTE to consult for 3 months	12 months	Research incentives and conservation programs in other municipalities.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Goal 6: Increase Energy Security and Diversify Energy Supply				
Corporate Actions				
Action 1: Participate in expanding natural gas availability in HRM.	$25,000/ $10,000/yr for promotion	3 months FTE for policy development 1 month FTE for promotion	5 years	Staff awareness training regarding the benefits of natural gas and the most efficient technologies for using it.
Action 2: Pursue Green Power Purchasing opportunities for HRM.	$50,000/ $0	6 months FTE	2 – 5 years For provincial legislation	Staff familiarization with green power purchases and with required legislative changes.
Action 3: Assess the risk of setting up a municipally owned energy utility with authority over power generation and/or energy purchase.	$100,000/ $0	3 months FTE	6 months to complete study	Staff familiarization with other municipal utilities in similar sized municipalities.
Action 4: Consider co-sponsoring renewable energy projects with other NS Municipalities that have better access to renewable resource (e.g. tidal projects in West Hants, Kings, Colchester).	$25,000/ $0	6 months FTE	3 to 6 yrs for studies and development	Staff training in project evaluation tools such as RETScreen. Familiarization with all potential renewable technologies.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Community Actions				
Action 1: Biomass or MSW residuals for cogeneration plants or district heating.	$50,000/ $0	6 months FTE	2 years	Staff familiarization with potential technologies.
Action 2: Anaerobic digester (AD) plant for processing of organic ICI and septage waste.	$6,000,000/ $100,000/yr net operational cost	2 months FTE for funding application. 6 months FTE for development.	3 years	Staff familiarization with AD technologies, funding programs.
Action 3: Utility size wind turbines independently or in cluster approach – continue with the Wind Energy Master Plan process.	$25,000/ $5,000/yr for promotion	6 months FTE	1 to 2 years	Staff to continue with current process of bylaw development and drafting of regulations.
Action 4: Encourage installation of solar panels to heat process water in industrial processes.	$10,000/ $2,000/yr for promotion	1 month FTE	7 to 14 months	Staff familiarization with industrial energy efficiency incentive programs
Action 5: Assess feasibility for mini (run-of-the-river) hydroelectric plants on Musquodoboit River at Crawford Falls, Middle and Upper Musquodoboit, Sheet Harbour River at Malay Falls, Half Way Brook and Little West River.	$0/ $0	1 month FTE For a staff member to liaise with potential developers	- 18 months for pre and feasibility studies - 18 to 24 months for permitting and construction process	Staff familiarity with the regulatory permitting process for projects of this type.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
Action 6: Encourage natural gas conversion of industrial boiler plants including Capital District Health Authority, Dalhousie, SMU, DND, Olands.	$0/ $0	2 weeks FTE for a staff member to liaise with gas customers and Heritage Gas.	12 to 18 months	Staff familiarization with gas distribution plans and schedule.
Action 7: Assess potential for Harbour water cooling for buildings near the harbour.	$0/ $0	2 weeks FTE for a staff member to promote the technology to building owners and developers.	- 12 to 18 months for design and permitting - 24 months for construction	Staff familiarization with harbour water cooling technology. Tours of Purdy's Wharf and the Casino suggested.
Action 8: Increase the allowable NSPI net-metering limit to 800kW.	$0/ $0	3 days FTE to liaise with NSPI staff developing new rate structure	6 to 12 months for UARB approval	Staff familiarization with net metering and current NSPI regulations regarding it.
Goal 7: Educate and Engage the Community				
Community Actions				
Action 1: Create recognition of the CEP by: • Well planned and timed launch campaign, website and opportunities for engagement throughout the process. • Maintaining the CEP brand in future energy programs resulting from the CEP.	$10,000/ $1,000/yr	6 weeks FTE to develop a marketing campaign	6 weeks	Staff familiarization with the major CEP goals, vision, and objectives.

Corporate Actions	HRM Costs Capital/ Operating	HRM Staff Resources	Time Frame	Staff Training
• Promoting the CEP and its concepts to NS at large. • Continued support and promotion of the Naturally Green campaign.				
Action 2: Work with the development and construction sectors to identify target markets for new education programs.	$0/ $0	No additional staff resources required	3 years	HRM development staff need training in aspects of sustainable development in order to discuss issues during the development agreement process.
Action 3: Work with local industrial and institutional large consumers of energy to expand their commitment to reduce energy use, for example through: • An industrial energy conservation pledge. • A coalition-building session organized by the Mayor and involving CEOs and top managers.	$10,000/ $0	3 Months FTE to develop a promotional program.	6 months	Staff familiarization with the principles of energy auditing and of best practices in energy efficiency in industry. Use NRCAN Dollars to Sense workshop series and CIPEC reports as training materials.
Action 4: Work with local NGOs in promoting their educational programs, especially within schools.	$10,000/ $0	2 months FTE	6 months	Staff familiarization with educational programs for sustainability that are delivered in schools.

CORPORATE ACTIONS	HRM COSTS CAPITAL/ OPERATING	HRM STAFF RESOURCES	TIME FRAME	STAFF TRAINING
Action 5: Encourage implementation of public awareness programs using creative strategies such as: • Displaying the "carbon footprint" of moving treated water to the users on their civic water bills. • Neighbourhood canvassing program to promote Energuide. • A large ad campaign on carpooling.	$30,000/ $10,000/yr for program updates	4 months FTE	6 months	Staff training in marketing, sustainability programs, existing energy efficiency incentive programs.

6.2 Financing Options

The municipality has a few different means available to it for raising funds to implement the actions recommended by the CEP. It may be able to tap into existing internal funds through an allocation by Council as part of the budgeting process. It can rely in third party financing through performance contracting and borrowing for capital purposes. Under the Municipal Government Act, it also has the power to charge a special purpose tax and to create a capital reserve fund. Tapping into grants and loans from senior levels of government or organizations like FCM is also a possibility.

Many of the actions recommended by the CEP necessitate the raising of funds by HRM. This is particularly true of corporate actions. On the other hand, there are a number of community actions that may be able to be funded through other sources. Funding mechanisms for these actions may include loans, grants or other innovative financing options available to individuals or organizations from other levels of government. Public-private partnerships may be another way to go. HRM may have to play the role of educator or facilitator in order for the community to realize the full benefits of these other financing mechanisms. Discussions with funding program administrators have indicated that program participation has been slower to grow than anticipated and that public awareness campaigns about the programs don't produce many results. The best program publicity seems to be by referral from people that have had positive experiences with the programs.

6.2.1 Existing Funding Programs

Below is a list of existing funding programs and financial mechanisms that HRM may wish to use to assist with the implementation of the CEP. This list includes both sources of funding available to HRM and to members of the community.

.1 **Federal Buildings Initiative (FBI)**

Natural Resources Canada's Office of Energy Efficiency offers the FBI to help federal organizations reduce energy and water consumption and greenhouse gas emissions.

.2 **Municipal Building Retrofit Program (MBRP) Guide**

Federation of Canadian Municipalities' (FCM's) Municipal Building Retrofits process assists municipal governments in developing comprehensive retrofit programs for their buildings and supports municipal staff by providing customized tools and services throughout the design and implementation process.

.3 **Green Municipal Fund**

The Government of Canada has endowed the Federation of Canadian Municipalities with $550 million to establish and manage the Green Municipal Fund (GMF). The 2005 federal budget added $300 million to the existing $250 million fund, of which $150 million is earmarked for brownfield redevelopment. GMF funding supports a range of activities related to municipal

environmental projects, from the early stages of project design unto and including the physical implementation of capital projects.

.4 ecoEnergy Renewable Initiative

On January 19, 2007 the Government of Canada announced the ecoEnergy Renewable Initiative, an investment of more than $1.5 billion by the Government of Canada in two programs to make clean, low-impact renewable energy more available in Canada and less expensive. The two programs are ecoEnergy for Renewable Power and ecoEnergy for Renewable Heat.

.5 Natural Gas Equipment Rebate Program

The Nova Scotia Department of Energy is providing incentives to Nova Scotia homeowners and businesses for conversion to natural gas. This program is in effect from April 1, 2007 and will expire on March 31, 2008. It was designed with advice from the Nova Scotia Natural Gas Association (NSNGA) and will be administered by Heritage Gas Limited. The program requires all residential conversions to utilize Energy Star rated equipment while commercial conversions will require the use of the highest efficiency equipment to qualify for the maximum rebate. The large commercial program will be on a case by case basis regarding eligible funding. Applications and rebates are processed by Heritage Gas. Maximum rebates by category are as follows:

- Residential - $2000
- Small Commercial (up to 15000 GJ/yr) - $11,000
- Medium Commercial (up to 50000 GJ/yr) - $50,000
- Large Commercial – up to 50% of conversion costs

.6 ecoEnergy Retrofit Incentive for Buildings

Owners of small and medium-sized buildings in the commercial and institutional sectors often lack the financial and technical resources to make energy improvements. Natural Resources Canada's Office of Energy Efficiency now offers the ecoEnergy Retrofit Incentive for Buildings, a component of the ecoEnergy Retrofit financial incentives for homes, buildings and industrial processes. If you have not yet started a new energy efficiency project, you could receive $10 per gigajoule of energy saved, up to 25 percent of eligible project costs. The next call for proposals will start on October 15 with a deadline of December 14, 2007.

.7 ecoEnergy Retrofit Incentive for Industry

Natural Resources Canada's (NRCan's) ecoEnergy Retrofit program provides a financial incentive of up to 25 percent of project costs to a maximum of $50,000 per application and $250,000 per corporate entity to help small- and medium-sized industrial facilities implement energy-saving projects. This helps to improve industrial energy efficiency and contributes to reducing energy-related greenhouse gas (GHG) emissions and air pollution.

.8 **ecoEnergy Renewable Initiative**

On January 19, 2007 the Government of Canada announced the ecoEnergy Renewable Initiative, an investment of more than $1.5 billion by the Government of Canada in two programs to make clean, low-impact renewable energy more available in Canada and less expensive. The two programs are ecoEnergy for Renewable Power and ecoEnergy for Renewable Heat.

.9 **The Kresge Foundation's Green Building Initiative**

The Foundation's Green Building Initiative, launched in 2003, is intended to increase the awareness of sustainable or green building practices among nonprofits and encourage them to consider building green. Upfront planning and an integrated design process are necessary to achieve the full benefits of a green building. The Initiative offers educational resources and special grants to help nonprofits during this planning phase.

The Initiative's Planning Grant program encourages nonprofits working in the arts, health, and human service areas to consider green for the first time. Grant guidelines in this program encourage environmentally-focused organizations to innovate, creating new models of sustainable design. Planning grants are available in amounts from $25,000 to $100,000.

As of February 2006, The Kresge Foundation has awarded 64 planning grants totalling $4,146,000 since the Initiative's launch.

.10 **CMHC**

A 10% CMHC mortgage loan insurance premium refund may be available when home purchasers use CMHC insured financing to purchase an energy-efficient home or make energy-saving renovations. Such purchases or retrofits may also have the added flexibility of longer amortization (the period of time required to repay a mortgage) from 25 years to a maximum of 40 years, significantly reducing the monthly payments.

.11 **CMHC – Eligible Energy Efficient Building Programs**

CMHC encourages the development of more energy-efficient homes by making eligible a broader range of home building programs. Effective July 27th, 2005, homes built under the R-2000 programs will qualify for the 10% premium refund without the requirement for an individual EnerGuide evaluation.

.12 **Nova Scotia Commercial Solar Water Heater Rebate Program**

Provides a rebate of 10% of the installed cost of a solar water heating system for commercial or industrial use to a maximum of $500. Program deadline is Dec 31, 2007. Program funding can be combined with federal eco energy program funding. A similar program also exists for

homeowners and residential building owners and it can also be combined with other program funding.

.13 **Residential Energy Affordability Program (REAP)**

Under this program 105 low income households in Nova Scotia, including 30 in HRM, will be selected to undergo energy efficiency improvements with program funding to top up funding from other programs such as the Energuide for Homes program. No cost is incurred by the household. Eligible households are submitted by the Department of Community Services. HRM should be able to publicize the efficiency improvements as part of its public education and awareness campaign.

7 CONCLUSION

In addition to following the previously developed Community Energy Planning templates, it was important that the implementation plan should reflect, wherever possible, the expectations of the stakeholders and citizens who generously offered their ideas and opinions during the consultation process. In order to have the support of the entire HRM community for the specific actions recommended in this plan, the community needs to understand that this is their plan and its success ultimately depends upon their willingness to accept and embrace the changes this plan will bring.

During the course of the plans consultation phase the term 'transformational' was used by several stakeholders to describe the lifestyle changes necessary to achieve the level of greenhouse gas emission reductions necessary for Canada to meet its international obligations. Transformational does not need to have a negative connotation since the overall objectives of sustainability include the benefits of a cleaner environment and better health for all of HRM's citizens.

With the increasing costs of conventional energy sources, an added benefit of enhanced sustainability practices is reduced energy consumption and a resultant reduction in costs. Many of the corporate actions recommended will result in significant energy consumption reductions and cost savings for HRM. This makes many of these actions a win-win for HRM, good for the environment and good for the corporate bottom line.

Appendix A

The Long List of Corporate and Community Actions

Table A-1: The Long List of Actions - Corporate Goals, Objectives, and Strategies

GOALS		CORPORATE TARGET	CORPORATE STRATEGIES	ACTIONS
Goal 1: Improve the energy efficiency of buildings[1]				
	Require energy efficient building design and practices for all New Buildings.	All new HRM buildings constructed to LEED Gold standard, with a minimum 45% reduction in energy use, relative to MNECB	Initiate new building design standards and targets.	Council Directive
	Retrofit all existing buildings to become more energy efficient	Reduce average energy use in pre-existing buildings to the LEED Standard for existing buildings	1. Conduct Building Energy Audits (Energy Performance Contracting) on all municipal buildings ▪ Identify priorities ▪ Create retrofit plan ▪ Finance retrofits	a) Retrofit municipal buildings for energy efficiency improvements, with the recapitalization being paid from guaranteed energy savings. b) Allow departments to retain a percentage of their energy savings while the remainder is used to replenish a capital reserve fund for energy efficiency projects. c) Buildings Rationalization Program – Identifying buildings not under HRM's mandate or responsibility and sell or lease buildings. d) Recover condenser heat from ice plants in HRM owned arenas
	Increase deployment of innovative technologies		Design and build Demonstration Projects	a) Harbour cooling for new buildings near waterfront b) Green roofs program c) Solar power/heat demo projects
Goal 2: Increase transportation choice and efficiency				
	Improve transportation options and choices	50% SOV driver mode share	Examine operations for efficiencies related to SOV travel	a) Create corporate car pooling initiative
	Promote efficient transportation		Design and implement program to reduce vehicle use	a) Right size fleet, assign vehicle use appropriately and designate more vehicles for multi-use. b) Improve efficiency of municipal fleet (reduce unnecessary vehicle use): – e.g. Streamline solid waste truck routes c) Create a driver training program for municipal fleet and employees (based on NRCan's Fleet SMART Program)

[1] For supply side objectives, strategies and actions related to buildings see Goal #6: Increase energy security and diversify energy supply.

Goals		Corporate Target	Corporate Strategies	Actions
				d) Expand the Anti-idling program ▪ Reduce bus and ferry idling e) Initiate a Commuter Trip Reduction program, Encourage walking, cycling, tele-commuting, compressed workweek and use of public transit
	Encourage the use of fuel efficient vehicles	Reduce fuel use	1. Incorporate fuel efficiency standards into the corporate fleet purchasing program 2. Design and implement parking management program 3. Design and implement vehicle replacement program	a) Replace LDGV with LDDV to increase efficiency while reducing C02 emissions b) Use preferential parking for employees that use alternative fuel/vehicles c) Use fleet management software program (e.g. Fleet Focus) to track vehicle age and optimize when to replace vehicles
	Use alternative and renewable fuel for transportation	15% renewable fuel content in fleet	Create a Green Fleet Procurement Policy – Purchase vehicles and fuels with renewable component for all fleet vehicles	a) Implement Biodiesel Fuel Initiative - use biodiesel blend in diesel vehicles b) Use ethanol blend in gasoline vehicles c) Purchase alternative fuels and vehicles: CNG, Propane, Electric, Hybrid and Hydrogen Fuel Cells
Goal 3: Increase industrial energy efficiency				
N/A for Corporate emissions				
Goal 4: Encourage energy efficient land use planning and neighbourhood site planning				
N/A for Corporate emissions				
Goal 5: Increase efficiency of infrastructure				
	Reduce energy used for street and traffic lighting	25% reduction in costs	Continue the implementation of the street and traffic lighting energy saver programs	a) Reduce the number of streetlights in Halifax peninsula, new subdivisions b) Negotiate with NSPI and developers to acquire control of all street lighting in HRM (currently, HRM just has control of peninsula, NSPI and developers control the remaining) c) Improve inventory of the number of streetlights ▪ Employ advanced GIS tools to get an accurate inventory d) Explore the possibility of installing a street light dimmer and timer project ▪ Decrease hours of operation by 15 minutes per day e) Continue LED Traffic Signal Program f) Investigate i-STOP Solar Powered Bus Stop Lighting g) Investigate i-SHELTER solar Powered Transit Shelter h) Investigate Solar LED lights

Goals		Corporate Target	Corporate Strategies	Actions
				i) Reducing light pollution and wasted energy through directional lighting, full cut-off lights, reducing the number of street lights, and motion censored security lights j) Purchase remaining streetlights from NSPI in HRM core area. Standardize streetlighting service levels depending upon street traffic levels k) Work with NSPI and other municipalities to develop new streetlighting service rates that reflect new energy efficient technologies and operational techniques
	Increase efficiency of infrastructure corridors		Establish policies to permit the environmental enhancement of traditional municipal infrastructure such as multi-use trenches for municipal services, especially in new developments.	
	Reduce energy use by water and sewage infrastructure		a) Initiate a program that audits equipment to determine whether to retrofit, optimize or upgrade. b) Enhance Stormwater Management c) Establish alternative energy generation at plants.	HRM's Inflow/Infiltration Program HRWC's Water Accountability Project – implemented the International Water Association's international water loss reduction strategies Ensure pipe maintenance, rehabilitation and source Separation Install Variable Frequency Drives Ensure pump control balancing and adjustment Install heat recovery units Install power factor controllers and corrections Procurement of energy efficient equipment Cogeneration of the WWTP (Eastern Passage Plant) Install booster pumps (to decrease run time and operating costs) Initiate pumping station energy SMART Program
Goal 6: Increase energy security and diversify energy supply				
	Higher proportion of renewable energy used in buildings	30% renewable energy	Create policy for all new corporate buildings to explore use of renewables in planning and design stage Establish a Green Power Purchasing Program	a) Investigate biofuels in buildings (B20 –B100) b) Investigate the potential for waste oil recovery from vehicle fleet and reuse as heating fuel for HRM owned buildings c) Small wind turbines for HRM buildings d) Solar water heating panels on HRM Buildings e) Use ground source heat pumps (GSHP) for Alderney 5 complex and new HRM buildings.

Goals		Corporate Target	Corporate Strategies	Actions
	Increase use of Renewable and Alternative Energy Technologies in Buildings (cleaner- i.e. alternative to oil/electricity)		1. Identify specific projects for retrofitting 2. Support Natural Gas Distribution in HRM (in progress)	a) Collect and use restaurant grease to produce biofuels for generating heat and power for wastewater plants b) Reconsider producing energy (electricity, steam, and heat) from municipal solid waste (MSW) using the residual refuse derived fuels (RDF) and solid derived fuels (SDF) after organics separation and recyclables removal. c) Use heat pumps to recover heat from wet wells in sewage treatment plants and use to heat and cool the conditioned parts of the buildings. d) Convert a block of municipal buildings in Dartmouth to NG
	Increase renewable and alternative electricity generation within the region		1. Develop a long term renewable strategy for the region 2. Develop a strategy for natural gas supply to the peninsula 3. Investigate other alternatives	a) Work with partners to identify opportunities for renewable energy pilot projects. - Community Energy Project - Small District Heating (natural gas) project in Dartmouth b) Evaluate the potential for generating hydro electricity c) Contribute to evaluation processes for other renewable electricity generation capacity within the region. d) Create a network of individual energy contributors within HRM: e.g. using biomass, biogas, small wind turbines. e) Develop pilot projects within HRM either as a municipality or in partnership with other sectors (e.g. wind) f) Explore energy from waste options from Harbour Solutions Project g) Develop systems to use biomass (wood pellets) for district heating multiple houses in new rural developments
	Set up a municipal utility/restructure water utility			Setting up a municipally owned energy utility which has authority over power generation and rents the distribution system. Price municipally supplied water in blocks with lower prices for first blocks and higher prices for subsequent blocks. Use different block thresholds for different customer classes, residential, commercial, industrial.

Goals		Corporate Target	Corporate Strategies	Actions
Goal 7: Educate and engage residents and businesses				
N/A				
Goal 8: Demonstrate local government leadership				
	Be a catalyst for Demonstration and Innovation Projects		1. Allow access to municipal property or in-kind resources for demonstration projects. Initiate pilot projects for new approaches where identified Implement a Green Office/ Employee Policy	a) Examples of demo projects: ▪ geo-exchange, solar hot water heating, green roofs, biofuel programs, etc b) Example of pilot projects: ▪ Reserved parking spaces for car-sharing c) Develop a policy that encourages user energy efficient practices within corporate properties and buildings. ▪ Energy initiatives for lighting, energy save mode on equipment, water conservation ▪ Paper: reduce paper consumption ▪ Transport: see section on vehicle fleet ▪ Disposal: recycle all suitable paper, containers and minimize non-recyclable waste. ▪ Procurement: purchase energy efficient equipment and consumables; maintain equipment to optimize performance
	Build Partnerships for Long term Program Delivery		1. Develop joint proposal submissions with municipalities and stakeholders for future funding programs, such as the "New Deal for Cities" program. 2. Work with NSPI and Clean Nova Scotia to deliver consistent commercial building audit and education programs. 3. Establish new arrangements for electricity supply	a) – b) - c) Establish a municipal utility and/or purchasing of renewable energy d) Work with the province to provide legislation and related regulations in the near future relative to opening up more of the electricity market to IPPs. These regulations should include the introduction of Standard Offer Contracts (SOCs) as the norm for power purchase agreements (PPA), and the carbon credits from renewable and alternative energy projects should remain the property of the owners of these projects.

Table A-2. Community Goals, Objectives, and Strategies

GOALS		COMMUNITY TARGET	COMMUNITY STRATEGIES	ACTIONS
Goal 1: Improve the energy efficiency of buildings[2]				
	Promote energy efficient building design and practices for all New Buildings.	Residential: All new residential buildings constructed to EnerGuide for Houses rating 80. Commercial/Institutional: All new commercial and institutional buildings constructed to LEED Silver standard, with CBIP compliance	1. Initiate new building design standards and targets. 2. Create a Green Building Incentive Program to supplement federal/provincial programs 3. Encourage energy efficiency in development and rezoning processes through building permits and codes	a) Council Directive b) Support for EnerGuide for new Houses Program c) Minimum EHG to get occupancy permit ▪ 2008 provincial initiative will require EHG on all new homes d) Ensure public housing units are built to high energy efficiency standard e) Support promotion of R-2000 homes by NS Home Builders Association f) Promote CMHC 10% refund on its mortgage loan insurance premiums for homeowners who borrow money to build or buy an energy efficient home or renovate an existing one.
	Retrofit all existing buildings to become more energy efficient	Reduce average energy use in pre-existing buildings by 10%	1. Support and Promote EnerGuide for Existing Houses Programs 2. Develop an incentive program for commercial and other buildings	a) Promote building energy efficiency through incentives: ▪ Commercial: Work with partners (e.g. property owner association) to create incentives program for commercial building energy efficiency ▪ Residential: Evaluate opportunities for new household appliance incentive programs that can be offered through local delivery agents- – Reduce building permit fee for high efficiency home (Potential rebate of $250-$1000, based on range from 77 to R2000) – Evaluate possibility of setting up mortgage contributions based on home energy efficiency b) Evaluate the potential to provide property tax incentives for energy efficiency improvements. c) Promote CMHC 10% refund on its mortgage loan insurance premiums for homeowners who borrow money to renovate an existing one. d) Require that all apartments in apartment buildings

[2] For supply side objectives, strategies and actions related to buildings see Goal #6: Increase energy security and diversify energy supply.

Goals		Community Target	Community Strategies	Actions
				be installed with energy meters – to ensure user pays
	Increase deployment of innovative technologies		Create and promote incentive programs incorporating innovative technologies into residential and commercial buildings.	a) Promote Solar water heating rebate ▪ The DOE offers a 10% rebate on domestic and commercial water systems to a maximum $5,000, of the installed cost. Valid until August 31, 2007.
	Incorporate energy labelling into buildings		Implement EnerGuide Rating Policy for all homes	a) Use municipal code by-law changes as lever to require EnerGuide rating on all existing homes, at time of sale- ▪ Work with realtors associations
Goal 2: Increase transportation choice and efficiency				
	Improve transportation options and choices (including transit)	50% SOV driver mode share	1. Design and implement a transportation strategy to reduce SOVs	a) Promote ridesharing programs. ▪ High occupancy vehicle incentives - Carpool lots, shopper coupons or rebates, web-based carpool network system b) Implement Active Transportation Plan ▪ Work with trails group towards more active transport, emphasizing common user non-motorized trails. 'Redbook' standards on new developments ▪ Bike amenities: Bike lockers at transit terminals, bike racks at municipal facilities and all new buses, bike racks with new commercial development, require shower facilities, lockable inside storage ▪ Replace curbs, widen multi-user lanes, where possible ▪ Separate budget for bike routes – grade replacement, trail connectors c) Encourage commercial establishments to give credits on merchandise for transit use d) Expand the bus rapid transit network to other suburban areas.
	Promote efficient transportation		1. Design and implement TDM Functional Plan 2. Develop Parking Management Program	a) Improve efficiency at intersections b) Promote trip reduction programs c) Investigate opportunities for innovative incentives to reduce vehicle use:

Goals		Community Target	Community Strategies	Actions
				• Pool cars (e.g. car coop), smart cars, taxi chits, flex time, discount transit passes, earned day off (e.g. 8-4 earns a day off), bus passes deduct off marginal tax rate • subsidized parking spots downtown for car pooling • online registration service for car pooling
	Encourage the use of fuel efficient vehicles	Reduce fuel use by a specified reduction target (e.g. 20%)	Develop incentive programs to increase the use of fuel efficient vehicles	a) Investigate the opportunities for incentives for businesses that use smaller and more fuel efficient vehicles. E.g. Provide preferential parking spots for selected vehicles based on fuel efficiency, size, or fuel type. b) Encourage the Provincial Government to provide tax rebates for energy efficient vehicles.
	Use of alternative renewable fuel for transportation			Work with fuel providers to promote renewable and alternative fuels
Goal 3: Increase industrial energy efficiency				
	Reduce energy used by industry		Encourage industrial consumers to set targets for energy conservation Energy pricing	A joint effort between HRM and NS Energy to agree on a fuel/energy pricing structure for industry that helps change current consumption behaviour. Initiate industrial process heat recovery in breweries for bottle washers, other industrial drains and refrigeration condenser heat recovery Initiate a condenser heat recovery system at the Tuft's Cove generating station Add combined cycle operation natural gas turbine plants at Tuft's Cove
Goal #4: Encourage energy efficient land use planning and neighbourhood site planning				
	Define Criteria for Evaluating the Energy Impact of Land Use Decisions		Create a definition and attribute description of a successful community (e.g., an urban village, or a 'complete community') from an energy perspective – to support incorporation of energy efficiency into Land Use Planning	Use modeling tools to evaluate the energy impacts of developments (examples include CommunityViz, INDEX, or PLACE3S

Goals		Community Target	Community Strategies	Actions
	Incorporate Energy Efficiency into Planning Documents and Processes		1. Incorporate energy efficiency principles into municipal planning documents through regular review cycles. 2. Support the principles of "Smart Growth" and the building of "Complete Communities". 3. Develop policies that would allow planning departments to provide preferential or accelerated review for development permit process for projects that meet the energy efficient criteria for developments and/or other green criteria. 4. Require energy efficient or Green Development for large property developments where the municipalities (or other governments) have an interest	
	Encourage Energy Efficient Land Use and neighbourhood site design		a) Investigate whether property tax incentives, local improvement charges, or variable DCCs can be offered to desired energy efficient developments b) Develop Information and Education campaign around the benefits energy efficiency and neighbourhood design for developers	a) Solar Access Protection Bylaws (e.g. California) b) Prohibit restrictive covenants that discourage energy efficiency e.g. clotheslines, house orientation, minimum house sizes, external fixtures (e.g. solar panels).
	Incorporate consideration of site options into planning new subdivisions and business/ retail parks		Assess energy supply options at the pre-development stage.	Create a checklist for developers to ensure they have considered energy efficiency in planning.
Goal #5: Increase efficiency of infrastructure				
N/A				
Goal #6: Increase energy security and diversify energy supply				
	Higher proportion of renewable energy used in buildings	10% more renewable energy	1. Ensure regulations and codes allow implementation of renewable energy projects 2. Develop an information and education program for BOMA and developers	

GOALS		COMMUNITY TARGET	COMMUNITY STRATEGIES	ACTIONS
	Increased use of Alternative Energy Technologies in Buildings(cleaner- i.e. alternative to oil/electricity)		Encourage developers of residential and commercial developments to incorporate renewable energy technologies.	
	Increase renewable and alternative electricity generation within the region		Create Community Energy Projects: in partnership with private sector	Biomass: a) Biomass cogeneration plants at sawmills (6 so far looking attractive). b) Beetle infested wood for biomass cogeneration and/or district energy. c) MSW residuals for cogeneration or district energy potential. d) Anaerobic digester (AD) plant for processing of organic ICI and septage waste e) C and D waste combustion for cogeneration or district energy potential. Wind: f) Utility size wind turbines independently or in cluster approach. Natural Gas g) NG fired cogeneration on the peninsula Halifax (One large Plant). h) Smaller distributed NG fired cogeneration plants on the peninsula. i) NG conversion of industrial boiler plants. j) Make a request to NSPI to change net metering regulations in terms of capacity limitation. E.g. increase this limit from 100 kW to say, 500 – 800 kW Solar k) Install solar panels to heat process water in industrial processes such as breweries and dairies. l) Install solar air heating systems for industrial,

Goals		Community Target	Community Strategies	Actions
				institutional and municipal buildings (examples: Burnside park, community recreational centres). m) In August 2005, Dalhousie, SMU and Capital District Health Authority agreed to move forward with the next phase of a Community Energy Project: The construction of natural gas-fired combined heat and electrical power plant on peninsula Halifax. (will provide 15MW of heat and hot water) GSHP, WSHP and Harbour Water n) Use GSHPs for private and institutional buildings. o) Harbour water cooling project for downtown core. p) Harbour water cooling for Nova Scotia and Dartmouth Hospitals. q) Water source heat pumps (WSHP) for heating and cooling loads in downtown. r) Water source heat pumps for heating and cooling at the NS and Dartmouth Hospitals Hydro s) Mini (run-of-the-river) hydroelectric plants on Musquodoboit River at Crawford Falls, Middle and Upper Musquodoboit. t) Mini hydro on Sheet Harbour River at Malay Falls, Half Way Brook and Little West River
Goal #7: Educate and engage residents and businesses				
	Promote Energy Efficiency and Green Practices to Identified Target Markets		1. Implement a Public Outreach Campaign 2. Implement an Energy Awareness Program for Schools	a) Conduct a well-planned and timed CEP launch campaign b) Develop and outreach materials to highlight energy efficiency in the community. c) Implement an energy or climate change recognition program. d) Encourage the local NGO community to provide input and opportunities to assist with outreach.

Goals		Community Target	Community Strategies	Actions
				e) Maintain the brand presence in all other incentive programs developed through CEP. f) Promote the CEP and concepts to Nova Scotia at large also. g) Promote and offer support to existing education presentations delivered by CNS. h) Partner with a local NGO to organise school events such as energy efficiency challenges at the school and classroom level. i) Work with local industrial consumers to expand their commitment to the community to reduce energy. (e.g. an industrial energy conservation pledge) j) Work with the development and construction sectors to identify target markets and new avenues to reach program participants. k) Create a car pool culture with large ad campaign l) Day long coalition building session organized by Mayor and involving CEOs and top managers of energy users to build a movement to get projects off the ground. m) Conduct a focussed neighbourhood canvassing program to promote EnerGuide n) On civic water bills show the amount of "carbon" required for the electrical power to move treated water to the user (including waste water treatment) with the purpose to build the link between water consumption/energy used/carbon produced and encourage "water" conservation
Goal #8: Demonstrate local government leadership				
	Build Partnerships for Long term Program Delivery		Partner with non-governmental organizations to deliver education and outreach activities.	

Appendix B

Nova Scotia Hospital Seawater Cooling Feasibility Study Final Report

CAPITAL DISTRICT HEALTH AUTHORITY

Nova Scotia Hospital
Seawater Cooling Feasibility Study
Final Report

August 14, 2006

Lewis Engineering Inc.

CAPITAL DISTRICT HEALTH AUTHORITY
NOVA SCOTIA HOSPITAL
SEAWATER COOLING FEASIBILITY STUDY
FINAL REPORT

TABLE OF CONTENTS

Page

1.0 INTRODUCTION

Capital District Health Authority (CDHA) contracted Lewis Engineering Inc. (LEI) to conduct a preliminary assessment of the feasibility of utilizing seawater cooling to supplement or replace the existing reciprocating and absorption type chillers serving the Dartmouth General and Nova Scotia Hospitals.

The current chiller capacity at the two hospitals is approximately 1,126 tons, of which approximately 900 tons is at Dartmouth General. Only two buildings at the Nova Scotia Hospital site utilize chillers, Mt. Hope and Hugh Bell. Both of these buildings are included in future plans for the site.

Two single effect absorption chillers are utilized at Dartmouth General. They are supplied with 15 psig steam from the central plant. The remaining chillers are electric reciprocating type except for one air source heat pump at Dartmouth General.

The chillers are operated seasonally from early May to late October each year. There are no chilled water requirements at present or anticipated outside of this season.

Extensive records of harbour water temperatures exist, most having been recorded in the past few years as part of the harbour solutions project. Bathymetric data of the harbour is also extensive. This data shows that the harbour immediately offshore from the Nova Scotia Hospital site is relatively shallow, necessitating a long seawater intake pipe to reach a sufficient water depth to maintain adequate cooling throughout the majority of the cooling season.

Existing building cooling systems that utilize Halifax Harbour water are located at Purdy's Wharf, Casino Nova Scotia, and the Bedford Institute of Oceanography. These systems were reviewed as part of this study.

2.0 PROPOSED SYSTEM

2.1 BACKGROUND

Investigation of existing seawater cooling systems in Halifax and elsewhere was of assistance in determining the optimum system design to serve the Nova Scotia Hospital site. Other considerations were the availability of land within 2 m elevation of the median harbour high tide level. This was necessary due to the inability of most high volume circulating pumps to handle a higher suction lift. Pumps typically can produce ample discharge head but have difficulty with negative suction head. Existing infrastructure on the Nova Scotia Hospital site was examined to determine if it could be utilized to reduce the cost and complexity of the seawater cooling system. Some key elements of the existing infrastructure that could be utilized are the steam tunnel distribution network and the sewage treatment plant. Running chilled water supply and return lines within the existing tunnels reduced installation costs by eliminating additional excavation, backfill, and reinstatement costs. Currently all sanitary sewage on the site drains by gravity to an onsite aerated lagoon treatment plant. Treated effluent from this plant flows into the harbour via a 30" concrete sewage outfall. Upon completion of the Dartmouth Sewage Treatment Plant in the fall of 2007, it is currently planned to install a sewage lift station at the point where the current gravity sanitary sewers converge just upstream of the treatment plant. Collected sanitary sewage will be pumped via a new buried forcemain to connect to existing gravity sewers running along Pleasant Street. The excavation for the new forcemain wall follow a portion of the route of the new chilled water supply and return lines so additional excavation costs for that portion of the route could be eliminated. Upon completion of the lift station and forcemain, the sewage treatment plant will become redundant. The existing 30" concrete outfall, however, could then be utilized in two ways:

- As a conduit to allow the 12" seawater suction line to pass under the rail line and out into deep water without additional excavation requirements.
- As a sewage discharge pipe.

Sleeving the plastic inlet line inside a concrete discharge line is the same approach utilized at Purdy's Wharf where it has worked successfully for twenty (20) years.

Utilization of the existing tunnel network will allow the new chilled water piping to reach Mt. Hope and Hugh Bell buildings on the Nova Scotia Hospital site and as far as the Laundry building where

the tunnels end. A proposed routing along the west and north walls of the laundry building will avoid the congestion of the steam plant and have the new lines exit the laundry building underground to the north of the existing Pleasant Street pipe bridge. This bridge is at capacity with its current pipe load and is not being considered as a right of way for the new lines to get across Pleasant Street. Instead, we favour boring under the street and sleeving the supply and return lines through a casing pipe to reach Dartmouth General Hospital. The new lines would then follow the existing steam and condensate lines into the main mechanical room containing the four existing absorption chillers and tie into the existing chilled water distribution system. Branch lines would extend to the other chiller systems elsewhere in the building.

Investigation of the site along the harbour fielded only one potential site for a building to house the seawater pumps, plant heat exchanger, and chilled water pumps. The site criteria were contiguous to the Nova Scotia Hospital site, no more than 2 m elevation above the medium harbour high tide level, accessible for construction crews, and serviceable with electricity, water, and sewer, if required. The site is immediately north of the existing sewage treatment plant, making utilization of existing piping infrastructure in the vicinity easier.

Bathymetric charts and depth charts of the harbour suggest that a water depth of 20 - 22 m below high tide level is available between 200 - 300 m offshore of the existing sewage outfall pipe that is proposed to be re-used as a casing pipe for the new seawater intake pipe.

2.2 CONCEPT DESIGN

As stated earlier, the maximum cooling demand at the Mt. Hope, Hugh Bell, and Dartmouth general buildings is 1,126 tons. New construction and renovation is expected to add 200 tons to this total within the next five (5) years. Demolition of existing buildings on the Nova Scotia Hospital site will not reduce the cooling load since no buildings currently scheduled for demolition utilize chilled water-cooling.

The design will be similar to the system currently in use at Purdy's Wharf. A seawater intake pipe will extend out into the harbour and be affixed to a concrete or steel intake structure mounted on the harbour bottom. This structure will be located in approximately 22 m water depth. The intake pipe itself will be approximately 2 m above the bottom to prevent ingestion of bottom silt. The intake

pipe will run along the harbour bottom in a shallow trench and be protected by rock ballast. Upon approaching the shoreline, it will run through the abandoned sewage outfall pipe to a point on the land side of the CNR line where it will turn north and enter the new pumping station.

The pumping station will house three or four duplex sets of seawater pumps and chilled water pumps as well as a seawater to freshwater heat exchanger. The multiple pump sets will allow for redundancy as well as variable rate pumping to match cooling load demand. The plant will also house biofouling control equipment and automated control systems and alarm systems. The plant will normally be remotely operated and will only require periodic inspection by maintenance personnel.

The current chiller season at the Nova Scotia Hospital site runs from May to October. Seawater temperatures at the proposed intake location should be sufficiently cold to meet the extra chiller load for all but September and October. Higher seawater temperatures in these months will result in higher chilled water temperatures leaving the heat exchanger and less cooling capacity. The cooling load in these months, however, is usually considerably lower than in the summer so the extent of the need to run some of the existing chillers to provide supplemental cooling will be weather dependent but is not expected to amount to more than 80 - 100 operating hours per year. Seawater temperatures and recording location are illustrated in Appendix A and B.

Chilled water supply will be pumped from the new plant via a combination of direct buried and in existing tunnel piping to each existing chilled water distribution system and then returned to the plant to create a closed chilled water loop. The schematic system flow diagram is as follows.

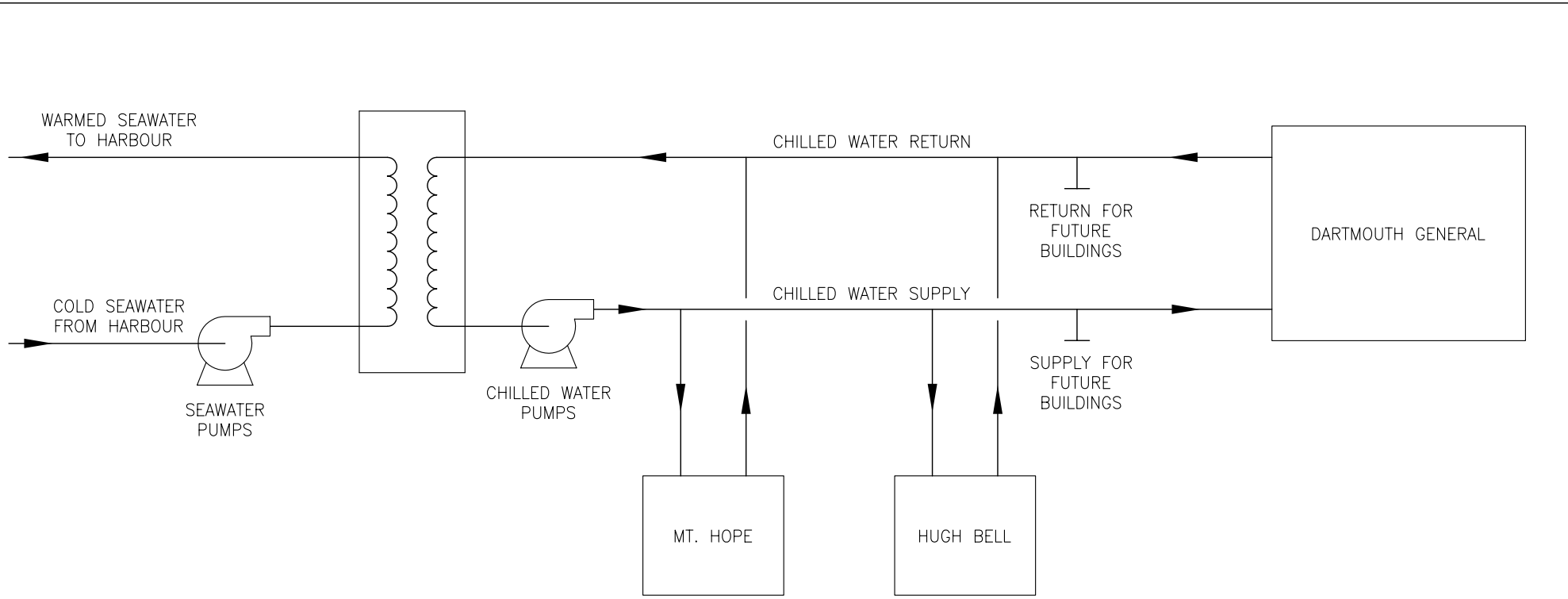


FIG. 1 SCHEMATIC FLOW DIAGRAM

2.3 CAPITAL COST ESTIMATE

Seawater Piping	$40,000
Harbour Bottom Intake Structure	$100,000
Rock Ballast	$50,000
Direct Buried Chilled Water Piping	$261,000
Chilled Water Piping In Tunnels	$284,500
Marine Crane	$10,000
Pleasant Street Bore and Case	$20,000
Seawater Pumps	$40,000
Chilled Water Pumps	$28,000
Heat Exchanger	$370,000
Valves	$50,000
Controls	$25,000
Biofouling Prevention System	$30,000
Pumphouse Building	$90,000
Vibration Dampeners	$10,000
Connections to Existing Chilled Water Systems	$50,000
Electrical Supply to Pumphouse	$60,000
Environmental Permitting	$25,000
Engineering	$100,000
Construction Management	$50,000
Sub-Total	**$1,693,500**
25% Contingency	$423,375
TOTAL	**$2,116,875**

2.4 ENERGY SAVINGS

Current Electrical Energy Use				Proposed Electrical Energy Use			
Month	**Demand (kW)**	**Energy (kWh)**	**Cost**	**Month**	**Demand (kW)**	**Energy (kWh)**	**Cost**
May	1,775	949,138	$73,149	May	1,775 [1]	880,420	$69,225
June	1,936	1,019,899	$78,908	June	1,775	951,181	$73,265
July	2.044	1,142,942	$87,621	July	1,775	1,074,224	$80,291
August	2.078	1,191,000	$90,194	August	1,775	1,122,282	$83,035
September	2.074	1,081,000	$83,871	September	1,850 [2]	1,012,282	$77,555
October	1,903	1,024,000	$78,790	October	1,775	955,282	$73,500
TOTALS			**$492,533**				**$456,871**

Current Steam Use:

Absorber #1 5,545 lbs/hr x 1,235 hrs/yr = 6,848,075 lbs/yr x $14.80/1000 lbs [3] = $101,352/yr
Absorber #2 4,000 lbs/hr x 1,235 hrs/yr = 4,940,000 lbs/yr x $14.80/1000 lbs = $ 73,112/yr
TOTAL = $174,464

Proposed Steam Use:

There is no anticipated steam use required for cooling.

ˆ Total Annual Savings

Current	492,533 + 174,464	=	$666,997/yr
Proposed		=	$456,871/yr
Savings		=	$210,126/yr

Notes:

[1] Demand is calculated as the greater of the current month or the maximum demand in either December, January, or February within the previous 12 months.

[2] The use of supplemental electric chillers is anticipated to be needed in September.

[3] Based upon 2005 fuel and operator cost data provided.

2.5 EMISSION SAVINGS

Electricity produced in Nova Scotia results in the emission of approximately 800 kg of carbon dioxide and equivalents per megawatt hour of produced energy. [4]

Production of steam at the Nova Scotia Hospital central heating plant results in the emission of 95 kg of carbon dioxide and equivalents per 1,000 lbs of produced steam. [5]

Current Emissions:

Electricity	6,408 MWh x 0.8 tonnes/MWh	=	5,126 tonnes
Steam	11,788,000 lbs/yr x 0.095 tonnes/1000 lbs	=	1,112 tonnes
	TOTAL	=	6,328 tonnes

Proposed Emissions:

Electricity	5,996 MWh x 0.8 tonnes/MWh	=	4,796 tonnes
Steam		=	0 tonnes
	TOTAL	=	4,796 tonnes

^ Emission Savings are 6,238 - 4,796 = 1,442 tonnes CO_{2e}/yr

Notes:

[4] Based upon RETScreen analysis of current NSPI generation mix.

[5] Based upon Environment Canada figures.

3.0 CONCLUSIONS

The predicted annual savings of over $210,000 result in a simple payback of between eight (8) and ten (10) years depending upon actual capital cost. The relatively high capital cost of the proposed system is primarily due to the large distances that must be covered to convey chilled water from the harbour to the buildings to be cooled. Other seawater cooling installations around Halifax harbour are much closer to the harbour such as Purdy's Wharf and Casino Nova Scotia.

Operating cost savings of this proposed system are diminished due to the fact that none of the buildings to be cooled have a year round cooling load. The infrastructure investment is therefore required to pay for itself with only a six month operating season. Future building expansions, operational changes to the buildings, and a gradually warming climate may eventually extend the cooling season for these buildings.

Other potential changes that could have a positive impact upon project economics are as follows:

.1 Conversion of the central boiler plant to natural gas - this change would increase the plant's steam production costs and also increase the potential operational savings associated with this project.

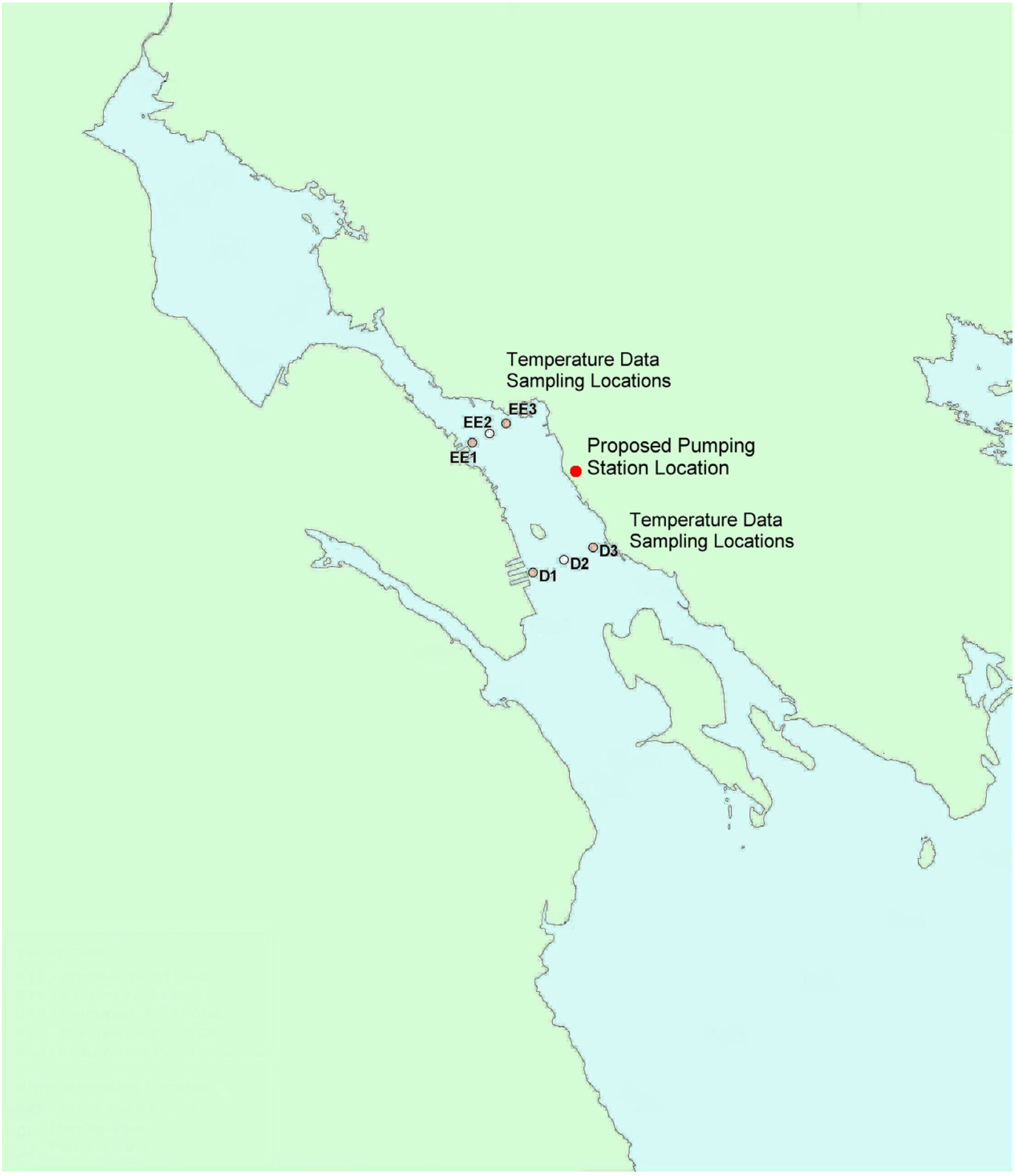
.2 Alternatives to the expensive, but durable, titanium plate heat exchanger proposed for this project could result in a capital cost reduction of up to 10%. Most of the alternatives examined utilize aluminium alloys.

.3 An existing aluminium alloy plate type heat exchanger sits unused in the basement of Purdy's Wharf adjacent to the operational seawater heat exchanger. This exchanger was apparently used by Alcan aluminium several years ago to prove the technical viability of this type of heat exchanger using seawater. Ownership of the unit is unclear since the Alcan research group that ran the trials no longer exists and none of the personnel involved are still with the company. If this exchanger could be obtained and proves to be usable, it could reduce the capital cost by up to 20%.

.4 Utilization of water source heat pumps. Future buildings or expansions could be supplied with chilled water that could, via the use of water source heat pumps, be a source of cooling

and heating depending upon the time of year. This would reduce the steam requirements from the central plant. Water source heat pumps are at least two (2) to three (3) times more efficient in heating mode than the current steam plant so this may be a feasible option.

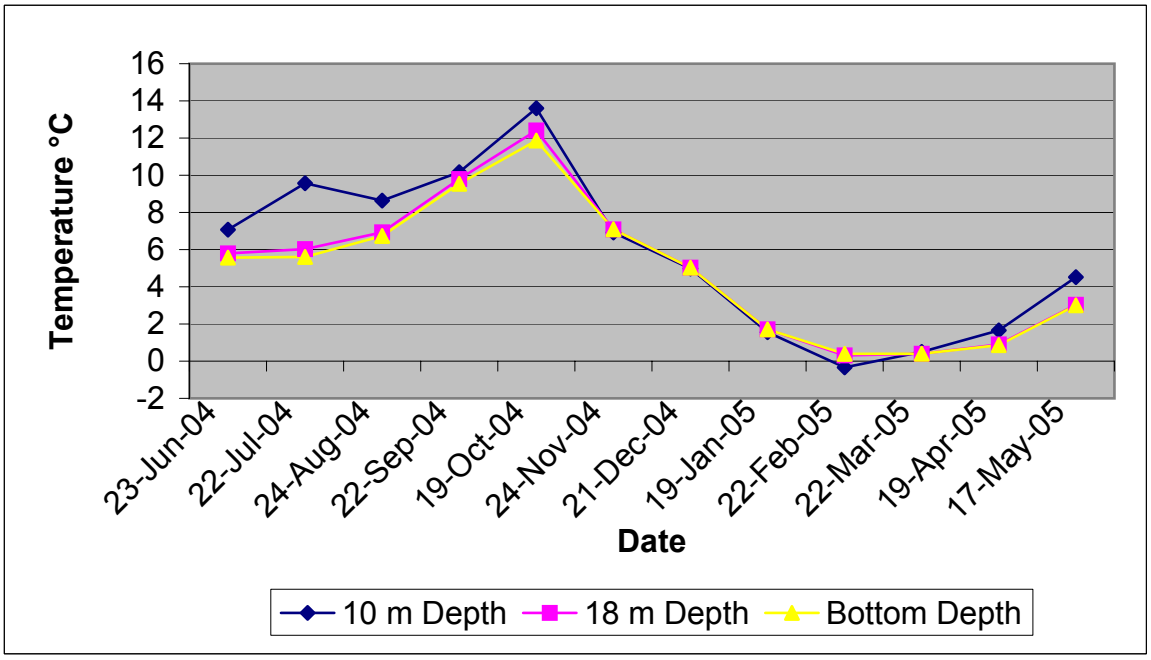
APPENDIX A
Harbour Map with Sampling Locations


Temperature Data
Sampling Locations
EE3
EE2
EE1
Proposed Pumping
Station Location
Temperature Data
Sampling Locations
D3
D2
D1

APPENDIX B
Harbour Water Temperature Profiles

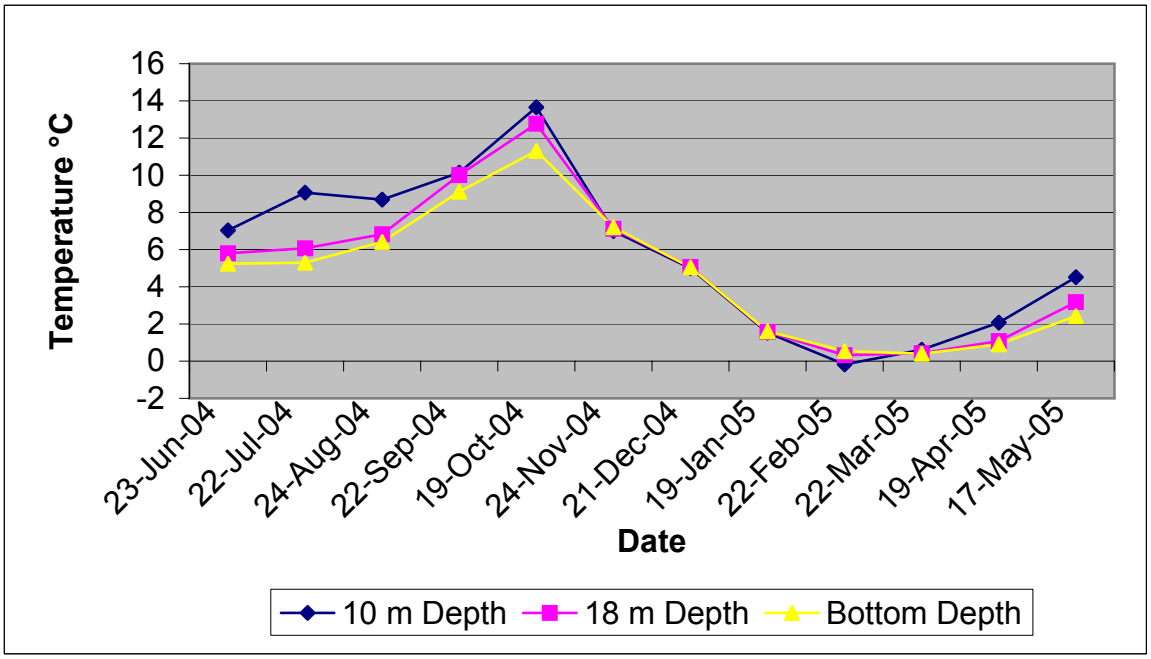
D1

Date	Temperature °C			Depth		
23-Jun-04	7.072	5.796	5.57	10.01	18.13	20.22
22-Jul-04	9.5694	6.0267	5.607	10.175	18.371	19.909
24-Aug-04	8.6379	6.9301	6.7345	10.265	18.047	19.619
22-Sep-04	10.1657	9.7973	9.5394	10.119	18.333	20.021
19-Oct-04	13.6017	12.4094	11.8676	10.067	18.28	19.927
24-Nov-04	6.9199	7.0873	7.0922	10.047	18.025	19.755
21-Dec-04	4.9804	5.0299	5.0311	10.05	18.276	20.56
19-Jan-05	1.5564	1.7122	1.7091	10.279	18.175	19.739
22-Feb-05	-0.334	0.31	0.3942	10.16	18.096	19.57
22-Mar-05	0.4985	0.3981	0.3989	10.028	18.008	20.453
19-Apr-05	1.6561	0.9016	0.8628	10.044	18.154	19.837
17-May-05	4.5189	3.0321	3.0065	10.026	18.112	18.421



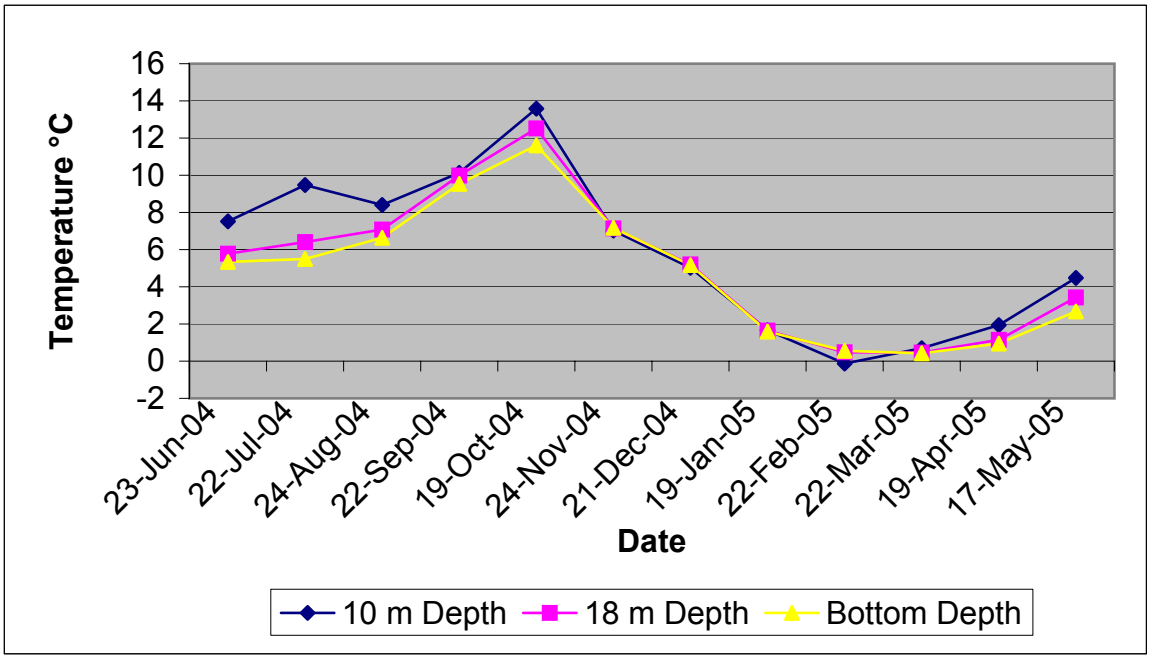
D2

Date	Temperature °C			Depth		
23-Jun-04	7.033	5.805	5.242	10.01	18.02	23.75
22-Jul-04	9.0643	6.0715	5.298	10.199	18.409	23.562
24-Aug-04	8.6872	6.8283	6.4133	10.063	18.332	23.828
22-Sep-04	10.139	10.0104	9.1115	10.256	18.241	23.956
19-Oct-04	13.6555	12.771	11.3107	10.212	18.118	24.657
24-Nov-04	7.0008	7.1187	7.2043	10.159	18.147	23.467
21-Dec-04	5.0007	5.07	5.0502	10.184	18.188	23.68
19-Jan-05	1.5313	1.5735	1.6055	10.133	18.204	24.064
22-Feb-05	-0.1753	0.3222	0.5342	10.07	18.076	23.047
22-Mar-05	0.6152	0.43	0.4022	10.15	18.009	24.002
19-Apr-05	2.0749	1.0794	0.9048	10.118	18.244	25.625
17-May-05	4.5162	3.1762	2.424	10.169	18.016	24.687



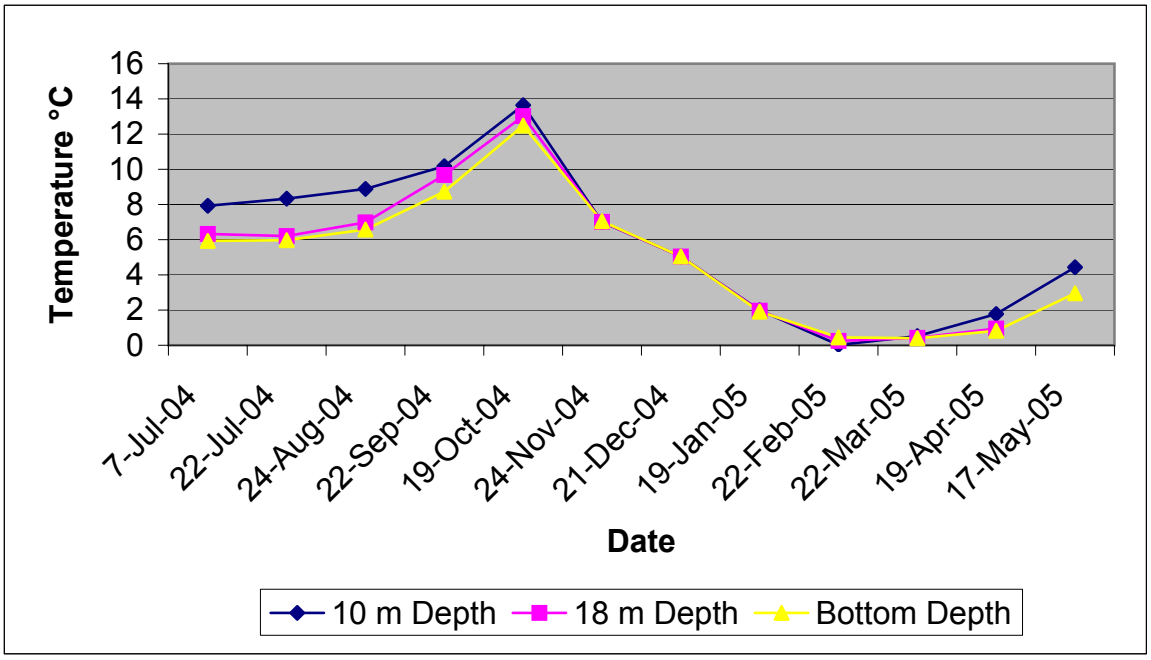
D3

Date	Temperature °C			Depth		
23-Jun-04	7.52	5.781	5.337	10.17	18.07	22.95
22-Jul-04	9.4743	6.4067	5.4971	10.113	18.378	23.227
24-Aug-04	8.4022	7.0812	6.6368	10.069	18.263	22.121
22-Sep-04	10.1301	9.985	9.5341	10.337	18.005	22.633
19-Oct-04	13.5798	12.5192	11.6063	10.136	18.286	23.106
24-Nov-04	7.0237	7.1415	7.1725	10.16	18.083	22.439
21-Dec-04	5.0229	5.202	5.1705	10.228	18.168	22.06
19-Jan-05	1.6657	1.6441	1.5904	10.089	18.083	22.231
22-Feb-05	-0.1285	0.4797	0.5552	10.105	18.113	22.353
22-Mar-05	0.6957	0.4632	0.4247	10.192	18.042	21.722
19-Apr-05	1.9393	1.1476	0.9464	10.148	18.337	22.378
17-May-05	4.4773	3.4306	2.6742	10.238	18.268	22.104



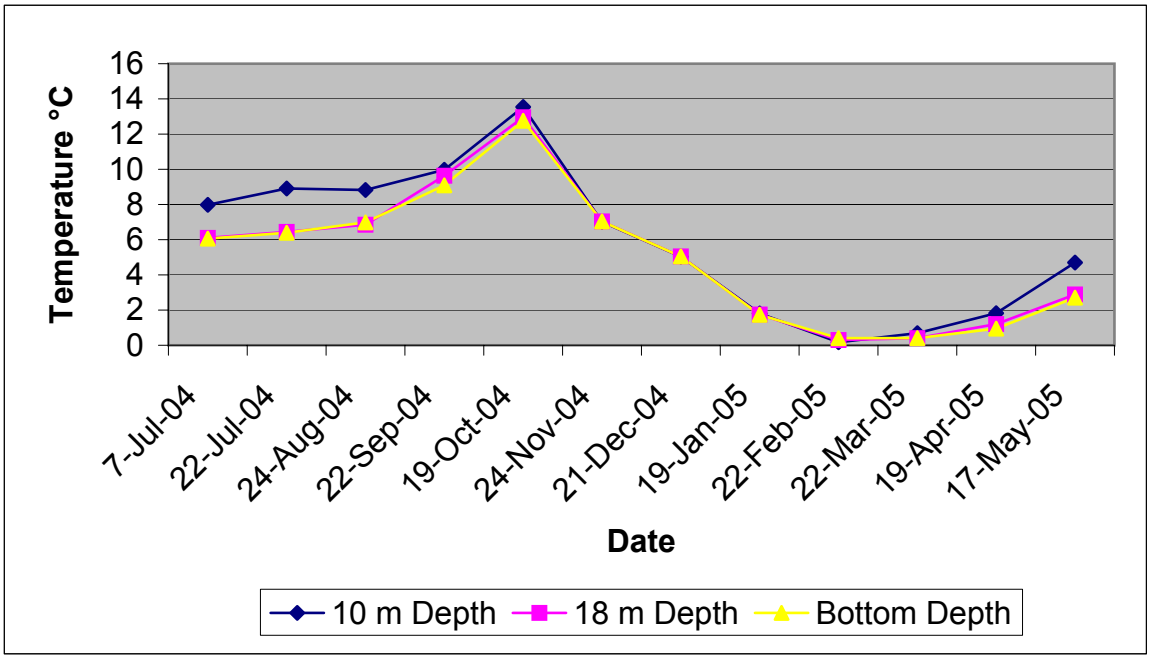
EE1

Date	Temperature °C			Depth		
7-Jul-04	7.9251	6.3248	5.9301	10.247	18.001	25.178
22-Jul-04	8.3312	6.2049	5.9713	10.067	18.053	23.38
24-Aug-04	8.8849	6.9828	6.5772	10.343	18.109	22.94
22-Sep-04	10.1743	9.6766	8.7271	10.204	18.058	24.616
19-Oct-04	13.6428	13.0223	12.485	10.025	18.01	25.138
24-Nov-04	7.0047	7.0113	7.0488	10.131	18.19	23.51
21-Dec-04	5.047	5.0433	5.0492	10.305	18.159	24.174
19-Jan-05	1.9891	1.964	1.9115	10.109	18.042	23.389
22-Feb-05	0.0192	0.2478	0.447	10.02	18.364	23.687
22-Mar-05	0.5218	0.4213	0.3995	10.102	18.159	21.151
19-Apr-05	1.7744	0.949	0.8205	10.074	18.127	20.999
17-May-05	4.4335		2.9541	10.212		16.45



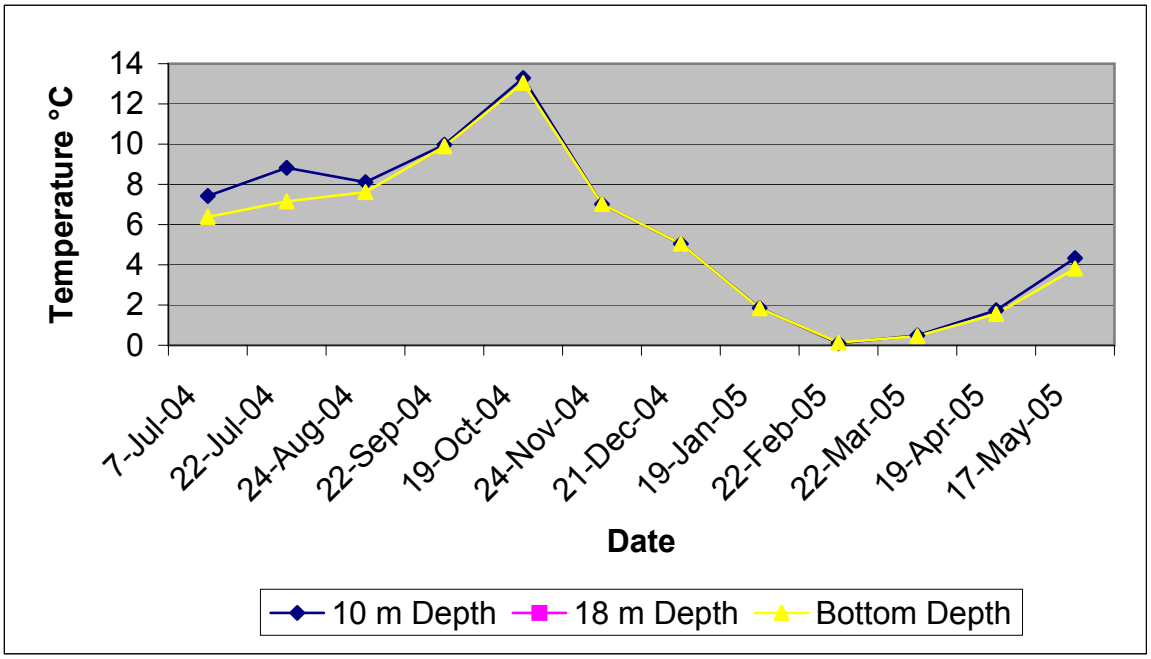
EE2

Date	Temperature °C			Depth		
7-Jul-04	7.9806	6.1024	6.0597	10.082	18.106	21.081
22-Jul-04	8.907	6.4435	6.3947	10.267	18.15	19.826
24-Aug-04	8.8237	6.8482	6.9816	10.057	18.179	18.743
22-Sep-04	9.9731	9.6345	9.0889	10.15	18.113	19.908
19-Oct-04	13.5402	12.9566	12.758	10.086	18.09	20.106
24-Nov-04	7.0146	7.0378	7.0383	10.018	18.078	18.853
21-Dec-04	5.0346	5.0482	5.0482	10.308	18.195	19.183
19-Jan-05	1.809	1.7448	1.7289	10.253	18.064	20.722
22-Feb-05	0.1727	0.2961	0.4026	10.211	18.091	20.165
22-Mar-05	0.6864	0.4043	0.4052	10.139	18.17	20.824
19-Apr-05	1.821	1.2019	0.9472	10.209	18.067	20.309
17-May-05	4.7001	2.8854	2.7063	10.008	18.263	20.305

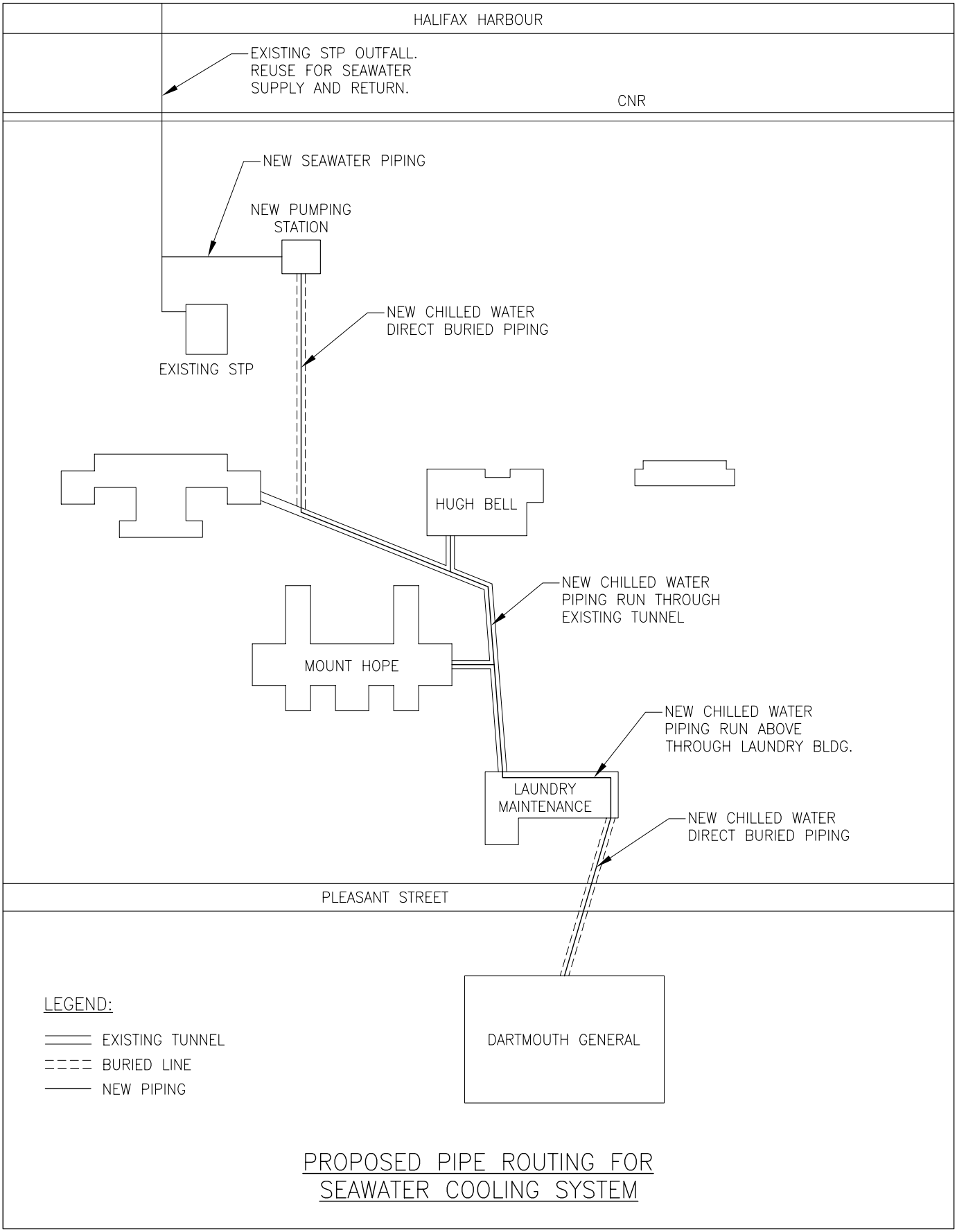


EE3

Date	Temperature °C		Depth	
7-Jul-04	7.4225	6.3803	10.08	16.21
22-Jul-04	8.8232	7.1563	10.185	13.195
24-Aug-04	8.1108	7.6141	10.237	13.766
22-Sep-04	9.9683	9.8893	10.031	13.375
19-Oct-04	13.2887	13.041	10.208	13.503
24-Nov-04	7.0153	7.0218	10.006	10.764
21-Dec-04	5.0433	5.0447	10.126	11.402
19-Jan-05	1.8552	1.8378	10.203	11.237
22-Feb-05	0.1005	0.1364	10.091	13.327
22-Mar-05	0.4882	0.4551	10.113	15.377
19-Apr-05	1.7403	1.5569	10.05	15.018
17-May-05	4.3326	3.8151	10.128	12.206



APPENDIX C
Proposed Cooling Water Routing



PROPOSED PIPE ROUTING FOR SEAWATER COOLING SYSTEM

APPENDIX D
Vendor Equipment Quotations

Diamond Mechanical Distributors Limited

109 Williams Ave. Suite 5, Dartmouth, NS. B3B 2E3 Tel: (902) 835-7359 Fax: (902) 835-0484

Fax Message

To: Lewis Engineering

Date: May 19, 2006

Attn: David Lea

From: Daniel Berlemont

Re: District Cooling Project
Number of Pages Including Cover Sheet: 2

Dave, please find preliminary selection for plate based on 2 deg. Approach for 1000 tons and a limit of 5 psi PD.

Price for this unit is $ 369,892.00 Canadian HST Extra

Due to world demands on S/S and titanium this quote is good for 5 business days only.

Lead time is estimated at 28 months to exit factory.

If any other questions please call.

Regards, Dan

Alfa Laval Plate Heat Exchanger Specification

Model : **MX25-BFG**
AL reference : **ERC06-0524-R0**
Project : **Halifax Seawater District Cooling**
Item : **HE-1**
Date : **5/18/2006**

		Hot side	***Cold side***
Fluid		Water	Sea Water
Density	lb/ft³	62.41	63.98
Specific heat capacity	Btu/lb,°F	1.00	0.98
Thermal conductivity	Btu/ft,h,°F	0.340	0.332
Viscosity,inlet	cP	1.18	1.47
Viscosity,outlet	cP	1.38	1.26
Volume flow rate	GPM	2390.1	2375.7
Inlet temperature	°F	57.0	45.0
Outlet temperature	°F	47.0	55.0
Pressure drop	psi	4.99	5.09
Heat exchanged	kBtu/h	12000	
L.M.T.D.	°F	2.0	
Rel. directions of fluids		Countercurrent	
Number of passes		1	1
Plate material / thickness		Ti / 0.50 mm	
Sealing material		NBRP CLIP-AD	NBRP CLIP-AD
Connection material		Unlined	Titanium
Connection diameter		10"	10"
Nozzle orientation		S1 -> S2	S4 <- S3
Pressure vessel code		ASME	
Design pressure	psig	150.0	150.0
Test pressure	psig	195.0	195.0
Design temperature	°F	59.0/41.0	59.0/41.0
Overall length x width x height	in	133 x 36 x 114	
Net weight	lb	9420	

National
Process Equipment
PUMPS & COMPRESSORS

QUOTATION

Unit 111-11 Morris Dr
Burnside Industrial Park
Dartmouth, NS B3B 1K1
Phone (902) 468-7890
FAX (902) 468-3011
Toll Free 1-800-992-5588
WEB www.natpro.com

Quoted To: **LEWIS ENG.**

DAVID LEA

PHONE #:
FAX #:

Date: **June 1, 2006**
PAGE: **1 OF 1**
NPE Quote #: **HFX2006-217**
Delivery Estimate: 10 – 12 wks.
Taxes: **HST @ 15% Extra**
Payment Terms: **Net 30 Days**
FOB: **NPE Montreal**
Quote Expires: **30 Days**

ATTACHED COPY OF TERMS AND CONDITIONS ARE AN INTEGRAL PART OF THIS QUOTE

Project Title **VARIOUS PUMPS FOR NS HOSPITAL**

Design flow: 2390 usgpm at 138'TDH, chilled water

1 only **Dean 6x8x13.5 Model pH ANSI centrifugal pump**
- all ductile iron wetted parts construction
- approx. 98 bhp at design flow (1.0SG fluid)
- 19' NPSHR
- single JC Type 1 mech seal, 316SS with Plan 11 seal flush system
- steel baseplate, cplg. and guard
- 125hp 1750rpm 575/3/60 444T frame TEFC motor prem. eff.

Budget PRICE.....$22,000.00ea.

Design flow: 2376 usgpm at 69'TDH, seawater

1 only **Fybroc 6x8x13 1500 Series centrifugal pump**
- all EV-1 vinyl ester resin wetted parts construction
- approx. 58 bhp at design flow (1.0SG fluid)
- 16.7' NPSHR
- single JC Type 8B2 mech seal, 316SS with internal seal flush system
- steel baseplate, cplg. and guard
- 75hp 1750rpm 575/3/60 365T frame TEFC motor prem. eff.

Budget PRICE.....$26,000.00ea.

Design flow: 30 usgpm at 28'TDH, wastewater

2 only **Hydromatic SK75 solids-handling pump**
- cast iron construction
- 2" solids-handling capability
- 3/4hp 208v 1ph 60Hz motor

1 only **Tornatech DS2 duplex pump controller** (select options desired)
- standard construction as described oin attached brochure
- Option 9: high level alarm relay to be activated from secondary sump loaction
- Option 4: high level alarm light
- Option 12: anti-condensation heater

Budget PRICE.....$4000.00 lot

Standard NPE Terms & Conditions apply.

We trust that this quote will meet with your approval. Should you have any further questions please do not hesitate to contact this office at any time.

Appendix C

Additional Information

From: Dyck, Tyler
Sent: Monday, July 16, 2007 11:44 AM
To: Lea, David
Subject: FW: Fwd: CEP Research

David,

Below is the fuel used.

Tyler,

I do have that information, the total fuel used was 7,829,504 litres. 143,034 of that was bio-diesel, the rest was diesel. These figures (and the last ones) are for ferry, conventional transit, and community transit, and do not include Access-A-Bus.

Please let me know if you need anything else.

Patricia Hughes
Transit Planning Technician
Metro Transit
Halifax Regional Municipality
Telephone (902) 490-6689
Fax (902) 490-6688

From: Dyck, Tyler
Sent: Monday, July 16, 2007 11:10 AM
To: Lea, David
Subject: CEP Research

David:

Below is the information for (I've included the numbers up here, more info in email to me included below):

Metro Transit Ridership - 18,133,2211 riders, 238,619,779 kilometers
MetroLink - predicted: 750,000 kg reduction in greenhouse gases
325,000 liters reduction in fuel consumption
75,000 kg reduction in carbon monoxide
7,500 kg reduction in nitrous oxide
- follow up study: incomplete at this time

Tyler

EMAIL SENT TO ME:

Tyler,

Metro Transit Ridership for the 2006/07 fiscal year was 18,133,221 riders. This includes riders on the conventional transit system, ferry, and community transit. The total passenger kilometres travelled were 238,619,779 kilometres. If you need more details please let me know.

The follow up study for the MetroLink has not been completed yet, so I do not have figures as to how much energy has been saved. I expect that report will be worked on over the next few months. The preliminary targets set were to reduce greenhouse gases by 750,000 kg, fuel consumption by 325,000 litres, carbon monoxide by 75,000 kg, and nitrous oxide by 7,500 kg.

Please let me know if you need any further information or details,

Patricia Hughes
Transit Planning Technician
Metro Transit
Halifax Regional Municipality
Telephone (902) 490-6689
Fax (902) 490-6688

Bedford Fast Ferry: Projected Annual Energy Savings?

Ferry: recommended 2 fairy system (350 passengers vessels)

Assumptions:

-Fuel consumption ratio at various speeds* – idling = 0.2
15 knots = 0.2
20 knots = 0.3
35 knots = 1.0

*obtained from similar Caterpillar engines running at various speeds

-Following values obtained from Bedford/Halifax Cultivation Study
-Fuel Consumption (full speed) = 0.7 Tons/hour
-Number of round trips per week = 186
-One way distance (Bedford to Halifax) = 7 nautical miles

-Vessels only running during trip outlined in Cultivation Study

-Conversions
-1 ton = 1016 kg
-1 nautical mile = 1.853 km

Calculations:

- Y Tons/hour x 1 hour/60 minutes x 1016 kg/ Ton = kg/minute
-idling = 2.37 kg/minute
-15 knots = 2.37 kg/minute
-20 knots = 3.56 kg/minute
-35 knots = 11.85 kg/minute

-1 WAY TRIP
- 0.5 minutes idling = 1.185 kg
- 1 minute @ 15 knots = 2.37 kg
- 1 minute @ 20 knots = 3.56 kg
- 10 minutes@ 35 knots = 118.5 kg
- 1 minute @ 20 knots = 3.56 kg
- 1 minute @ 15 knots = 2.37 kg
- 0.5 minutes idling = 1.185 kg
- 5 minutes idling = 11.85 kg

TOTAL = 144.58 kg

-2 WAY TROP = 289.16 kg
-1 WEEK TOTAL = 289.16 kg x 186 = 53,783 kg/week

= (approx.) 54,000 kg/week Biodiesel

Cars: Equivalent travel by would be ferry riders.

Assumptions:

-One passenger per trip

-Number of trips obtained from Bedford/Halifax Cultivation Study

-Number of trips is for $5 fair, as recommended, and is directly related to the percentage, of the studied population, who indicated they would ride the ferry

-25% at $4, 12.5% at $5

-47,279 x 0.125/0.25 = 23,640 trips/week

= *(approx.) 24,000 trips/week*

-Fuel consumption used is for mid sized cars (value obtained from Transport Canada – average for mid sized cars from 2000-2008) = 11.2 L/100 km

-Distance of round trip obtained from Cultivation Study = 22.6 km/trip

-Density of gasoline obtained from http://www.simetric.co.uk/si_liquids.htm

= 737.22 kg/m^3

Calculations:

-24,000 trips/week x 22.6 km/trip = 542,400 km/week

-542,400 km/week x 11.2 L/100km = 60748.8 L/week

-60748.8 L/week x 737.22 kg/m^3 x 1m^3/1000L = 44,785.2 kg/week

= (approx) 45,000 kg/week Gasoline

Halifax Dartmouth Bridge Commission

Monthly Traffic Statistics

December, 2006

Days in December, 2006:	**W/D 19 , Sat 5 , Sun 5, Holiday 2 = 31**		
Days in December, 2005:	**W/D 21, Sat 4 , Sun 4, Holiday 2 = 31**		

Description	ALM	AMM	Both Bridges
Daily Average	36,021	47,755	83,776
Workday Average	41,895	58,637	100,532
Workday 7 a.m. to 9 a.m. Average	5,842	9,390	15,232
Workday 4 p.m. to 6 p.m. Average	6,533	9,570	16,103
Monthly Traffic Volume	1,116,649	1,480,402	2,597,051
Monthly % of Total	43.00%	57.00%	100.00%
Monthly Traffic Increase / Decrease	**(8,416)**	**20,282**	**11,866**
Increase / Decrease 2005	-0.75%	1.39%	0.46%
Monthly ETC Traffic Volume	548,306	770,767	1,319,073
ETC % of Monthly Traffic Volume	49.10%	52.06%	50.79%
Highest ETC Traffic Day		Friday, December 15, 2006	60,951
Highest Traffic Day		Friday, December 15, 2006	115,448
No. of Days Traffic Exceeding 100,000	2006		14
YTD			169
No. of Days Traffic Exceeding 100,000	2005		13
YTD			150
YTD Traffic Volume Change	14,027,738	18,373,115	32,400,853
YTD % of Total	43.29%	56.71%	100.00%
YTD Traffic Increase / Decrease	258,691	249,504	508,195

Increase / Decrease 2005	1.88%	1.38%	1.59%
Statistics 2005			
Daily Average	36,292	47,101	83,393
Workday Average	42,502	57,329	99,831
Monthly Traffic Volume	1,125,065	1,460,120	2,585,185
Monthly ETC Traffic Volume	537,919	736,020	1,273,939
YTD Traffic Volume	13,769,047	18,123,611	31,892,658
Highest Traffic Day on Record	**December 15, 2003**		**115,448**

Basic Volume Report: 06WST105

Station ID : 06WST105

Info Line 1 : BEDFORD HIGHWAY
Info Line 2 : JUST NORTH OF KEARNEY LAKE RD

AAWT : 18911 two way ,9589 southbound

DB File : 06WST105.DB

Last Connected Device Type : Apollo
Version Number : 1.41
Serial Number : 91964

Number of Lanes : 2
Posted Speed Limit : 50.0 kph

Lane #1 Southbound Configuration

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
1.			Normal	Axle	Yes	

Lane #1 Basic Volume Data From: 12:00 - 08/23/2006 To: 11:59 - 08/28/2006

Date	DW	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total
082306	W													677	617	621	627	612	607	572	562	502	338	229	144	6108
082406	T	81	36	24	31	38	97	434	765	796	625	534	608	588	491	533	535	574	573	629	618	489	372	241	141	9853
082506	F	61	39	26	15	39	92	404	709	749	532	560	679	661	648	659	610	692	657	644	581	445	357	256	195	10310
082606	S	119	65	53	50	25	52	142	220	412	511	637	631	628	649	615	663	588	559	555	511	429	333	257	202	8906
082706	S	138	88	66	42	34	31	110	126	228	368	506	523	630	708	683	700	601	613	483	516	399	271	179	92	8135
082806	M	61	35	21	22	30	95	436	720	738	580	581	560													3879
Month Total :		460	263	190	160	166	367	1526	2540	2923	2616	2818	3001	3184	3113	3111	3135	3067	3009	2883	2788	2264	1671	1162	774	47191
Percent :		1%	1%	0%	0%	0%	1%	3%	5%	6%	6%	6%	6%	7%	7%	7%	7%	6%	6%	6%	6%	5%	4%	2%	2%	
ADT :		92	53	38	32	33	73	305	508	585	523	564	600	637	623	622	627	613	602	577	558	453	334	232	155	9439

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
DW Totals :	8135	3879	0	6108	9853	10310	8906
# Days :	1.0	0.5	0.0	0.5	1.0	1.0	1.0
ADT :	8135	7758	0	12216	9853	10310	8906
Percent :	17%	8%	0%	13%	21%	22%	19%

	Total	Percent
Weekday (Mon-Fri) :	30150	64%
ADT :	10050	
Weekend (Sat-Sun)	17041	36%
ADT :	8521	

Lane #2 two way ,Configuration all lanes

#	Dir.	Information	Volume Mode	Volume Sensors	Divide By 2	Comment
2.			Normal	Axle	Yes	

Lane #2 Basic Volume Data From: 12:00 - 08/23/2006 To: 11:59 - 08/28/2006

Date	DW	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Total
082306	W													1232	1175	1220	1382	1464	1422	1226	1154	985	801	509	358	12928
082406	T	191	84	67	63	77	134	533	1067	1202	989	942	1276	1903	1490	1046	1103	1403	1379	1232	1192	1000	812	559	323	20067
082506	F	186	90	73	37	72	139	517	960	1150	903	967	1200	1227	1257	1342	1358	1516	1455	1296	1130	947	797	590	468	19677
082606	S	298	157	125	98	63	85	202	373	607	834	1079	1111	1202	1248	1222	1314	1212	1132	1075	978	864	784	528	459	17050
082706	S	288	207	172	108	91	58	161	242	395	587	862	1027	1219	1313	1320	1363	1168	1112	934	995	826	585	389	222	15644
082806	M	135	81	51	50	59	121	557	974	1141	930	1017	1074													6190
Month Total :		1098	619	488	356	362	537	1970	3616	4495	4243	4867	5688	6783	6483	6150	6520	6763	6500	5763	5449	4622	3779	2575	1830	91556
Percent :		1%	1%	1%	0%	0%	1%	2%	4%	5%	5%	5%	6%	7%	7%	7%	7%	7%	7%	6%	6%	5%	4%	3%	2%	
ADT :		220	124	98	71	72	107	394	723	899	849	973	1138	1357	1297	1230	1304	1353	1300	1153	1090	924	756	515	366	18313

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
DW Totals :	15644	6190	0	12928	20067	19677	17050
# Days :	1.0	0.5	0.0	0.5	1.0	1.0	1.0
ADT :	15644	12380	0	25856	20067	19677	17050
Percent :	17%	7%	0%	14%	22%	21%	19%

	Total	Percent
Weekday (Mon-Fri) :	58862	64%
ADT :	19621	
Weekend (Sat-Sun)	32694	36%
ADT :	16347	

Appendix D

Annual Energy Consumption of HRSB and EnerGuide Audits

Annual Energy Consumption of Halifax Regional School Board

Notes:

- Directly from HRSB (April 1/06 – March 31/07)

Electricity

- 42 092 056 kWh = $4 907 854.25

Fuel Oil

- 8 801 483 L = $4 909 027.67

Natural Gas

- 49 863 m^3 = $40 593.39

Water

- 1) 11 218 413 m^3 = $755 677.28

Energuide Audits

Source: Donald Dodge (Conserve Nova Scotia): 424-4305

- Statistics for Nova Scotia (they don't have HRM stats, but he said approx. 65% are from HRM)
    - 1998 – May 12, 2006

Energuide audits	9006
Average "A" score	53 (275 GJ/house/year)
Predicted achievable score	70
Average "B" score	64 (185 GJ/house/year)
Carbon Dioxide Reduction	7.26 tonnes/house/year

Appendix E

Biomass Feasibility Analysis

1 FINANCIAL FEASIBILITY ANALYSIS – 30 MW BIOMASS FIRED POWER PLANT

1.1 Introduction

There are several aspects of a project that must be analysed in order to make a sound investment decision.

.1 The project must be technically feasible. In this case the technology is existing and proven.

.2 Funding for the project must exist - there is no point in analysing a project for which funds will run out half way through, since this will prejudice the outcome and render the initial appraisal invalid.

.3 The technical capacity to carry out the project must exist.

.4 Return on Investment. (ROI) is a financial ratio that compares the amount of income derived from an investment with the cost of the investment. ROI is known as a profitability ratio, because it provides information about management's performance in using the resources of the small business to generate income. ROI and other financial ratios can provide small business owners and managers with a valuable tool to measure their progress against predetermined internal goals, a certain competitor, or the overall industry. ROI is also used by bankers, investors, and business analysts to assess a company's use of resources and financial strength. The general formula for computing ROI is income/invested capital. ROI can be computed by dividing net income by owners' equity. This measure indicates how well the overall company is utilizing its equity investment. Calculated in this way, ROI provides a good indicator of profitability that can be compared against competitors or an industry average.

.5 Threshold values - In economics, as in other disciplines, it is often useful for the decision-maker to be able to define threshold values or cut-off points, above which a certain decision is appropriate and below which another becomes valid. In economic and financial decision-making these are often referred to as break-even points. They define the point at which a project “breaks even”, meaning that above this point the benefits exceed the costs; below this point the costs exceed the benefits. In the same way that the cut-off point for a diagnostic test can be adjusted to make it either more specific or more sensitive, in economics, the cut-off discount rate chosen can make it possible to give different weights to long-term benefits as against current costs.

.6 The inherent risks associated with this type of project are construction cost overruns, fuel cost and availability, labour cost and availability and interest rate fluctuations. In this type of project an investor would expect as a minimum to see 20% to 25% ROI.

Table 1. 30 MW Cogeneration Plant Capital Cost Summary

30 MW Cogeneration Plant Capital Cost Summary	
Boiler 300,000 lb/hr cap.	
Steam Turbine Generator	
Water Treatment	
Powerhouse Building	
Condenser	
Mechanical BOP	
Electrical	
Construction	
Engineering and Project Management	
TOTAL	**60,000,000**

1.2 Financial Analysis Results

The financial analysis indicates that at current and projected fuel and electricity costs a biomass fired cogeneration plant is a marginal investment.

The assumptions for the financial analysis are:

- Plant First Year Operation – 2009;
- Annual Output – 245,626,020 kWh;
- Base Year Electrical Price – 0.0748 $/kWhr;
- Plant Life – 25 Years;
- Capital costs do not include cost of land; and
- Inflation Rate – 2%.
- Fuel Cost – Delivered to plant – 30$/Green Tonne

Table 2. Financial Summary

Financial Summary		
Annual Electricity Exported	245.6	10^6 kWh
Annual Fuel Consumed	360,000	Tonne (Green)
Total Investment	60,000	k CDN
Initial Equity (30%)	18,000	k CDN
Internal Rate of Return on Investment (ROI)	10	%

1.3 Sensitivity Analysis

The financial model was run by varying the fuel costs, power sales rate costs to see what impacts they had on Return on Investments.

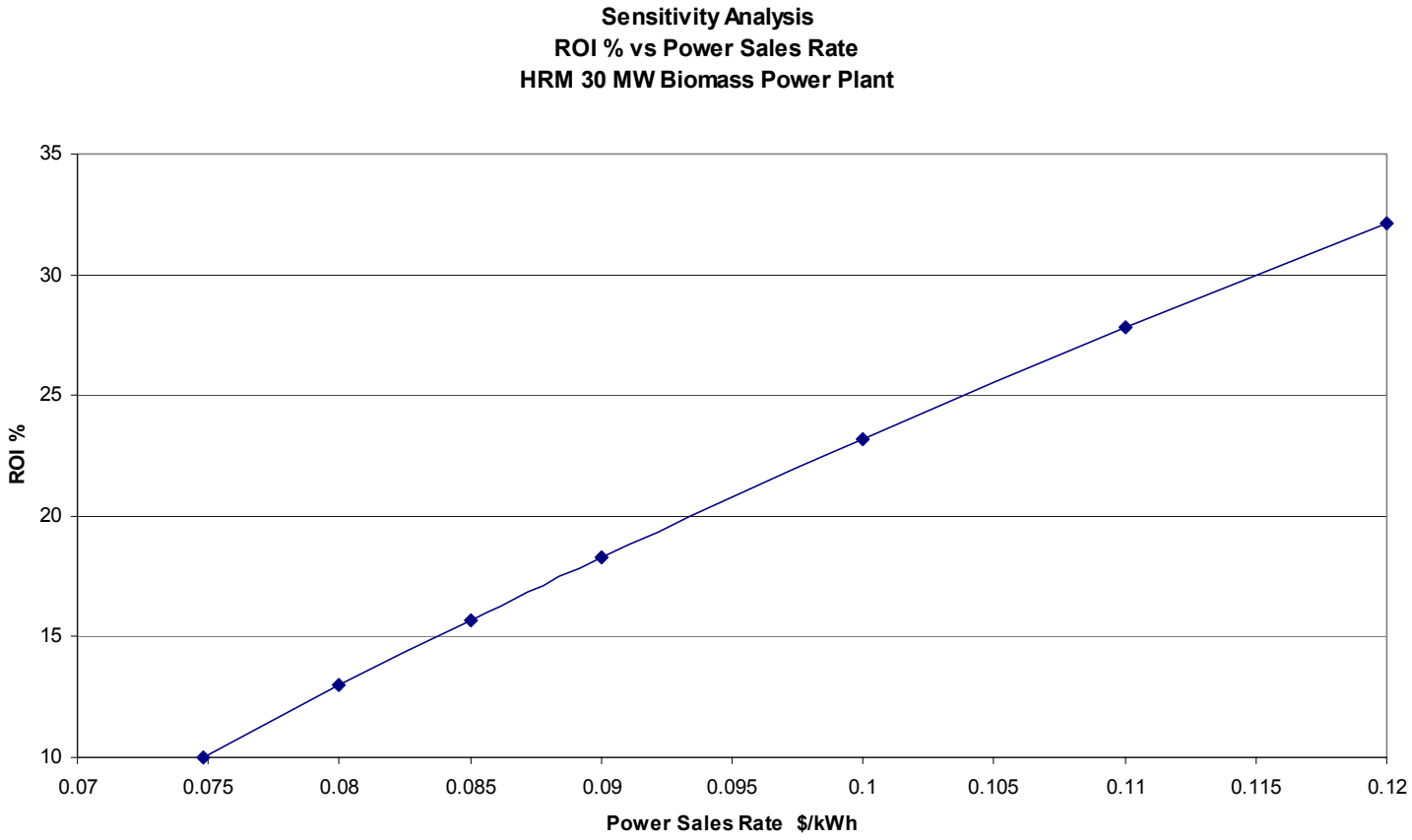


Figure 1. Sensitivity Analysis – Return on Investment vs. Power Sales Rate

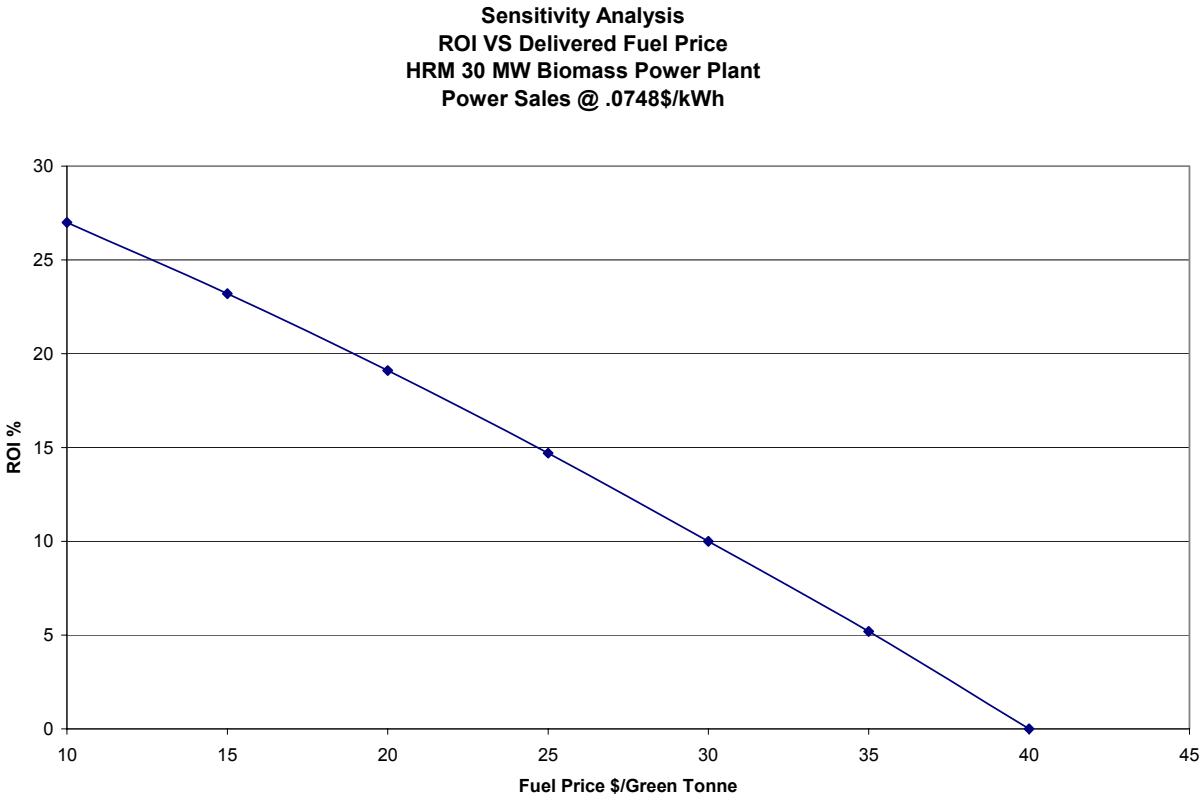


Figure 2. Sensitivity Analysis – Return on Investment vs. Fuel Price

2 CONCLUSIONS AND RECOMMENDATIONS

Biomass cogeneration is a well established technology that is widely used in industrial applications such as pulp and paper mills and sawmills where an abundant and cheap source of biomass is available as a by-product of mill operations. Other areas where biomass cogeneration is sometimes feasible are remote areas that have adequate fibre resources and expensive imported fuel. The benefits of using locally harvested wood biomass for electrical and thermal energy production are numerous.

- The local economy benefits by providing jobs in the construction, operation and maintenance of the biomass cogeneration systems. The money stays in the local economy. We would expect the plant to employ as a minimum 20 to 25 people.
- Will provide opportunities in the forestry sector for harvesting, processing and transporting the biomass. We would expect these activities to employ up to 30 to 40 people on a seasonal basis.
- Local energy costs are less dependent on world prices for fossil fuels.

This report looks at the technical concepts of a biomass plant as well as a preliminary business model.

After reviewing the economics of this project we have determined it is not feasible. The Return on Investment (ROI) of 10% is well below the threshold level for a project of this type. For the risks associates with this project, the minimum ROI would need to be 20% to 25%.

We have not looked at the long term sustainability of a 30 MW biomass power plant. The plant will use 360,000 tonnes/year of biomass.

Appendix F

Natural Gas Conversion Costs

APPENDIX F – Natural Gas Conversion Costs

The following tables represent the capital cost of converting the boilers to dual fuel natural gas/oil. Also the expected additional fuel costs and emission reductions are considered. There is no escaping the fact that Bunker C is a cheap fuel. Converting to natural gas has many positive benefits from an environmental and operational perspective, but it is going to cost more than the current operation.

Note: Numbers used in this analysis are from 2006 and reflect an average unit cost differential of 25% between Bunker C fuel oil and natural gas. Current November 2007 costs suggest a cost reversal with natural gas now having a lower cost than Bunker C by approximately 20%. This current price is inconsistent with historical pricing patterns for both fuels and is considered an anomaly caused by recent speculation in the oil markets driving up the world oil price. Long term price forecasts consistently show the price of natural gas tracking between the prices of Bunker C and No. 2 fuel oil.

Table 1. V.G. Hospital Gas Conversion Capital Cost

OPTION 1A - REPLACE BURNERS ON BOILERS 1 AND 2 VICTORIA GENERAL SITE	COST (+/- 20%)
Burner Package Supply– Including BMS and Fuel Skids	$500,000
New Burner Installation	$100,000
Piping	$80,000
Commissioning	$40,000
New Plant Control System	$520,000
Supply and Install New 200 ft. Steel Stack	$600,000
Engineering and Project Management	$160,000
TOTAL	**$2,000,000**

Table 2. Fuel Cost Comparison – V.G. Hospital Business as Usual versus Natural Gas Conversion

YEAR	OIL COST $ CDN	GAS COST $ CDN	ADDITIONAL COST $ CDN
2009	$3,405,521	$4,373,830	$968,309
2010	$3,286,867	$4,140,217	$853,350
2011	$3,332,914	$4,214,806	$881,892
2012	$3,381,113	$4,292,028	$910,915
2013	$3,429,821	$4,370,984	$941,163
2014	$3,479,573	$4,452,389	$972,816
2015	$3,529,855	$4,110,840	$580,985
2016	$3,629,265	$4,235,977	$606,711

Year	Oil Cost $ CDN	Gas Cost $ CDN	Additional Cost $ CDN
2017	$3,753,205	$4,391,734	$638,529
2018	$3,882,138	$4,554,270	$672,132
2019	$4,014,081	$4,723,878	$709,797
2020	$4,151,312	$4,804,643	$653,331
2021	$4,310,079	$4,985,145	$675,067
2022	$4,475,363	$5,173,502	$698,139
2023	$4,646,218	$5,370,056	$723,838
2024	$4,821,585	$5,575,162	$753,577
2025	$5,004,081	$5,771,341	$767,260
2026	$5,170,655	$5,993,909	$823,254
2027	$5,274,068	$6,113,787	$839,719
2028	$5,379,550	$6,236,063	$856,513
	$82,357,263	**$97,884,560**	**$15,527,297**

Table 3. V.G. Hospital Boiler Gas Conversion Emission Reduction

Pollutant	Oil Firing	Gas Firing	Reduction
CO2 tonne/yr	35,330	23,325	12,005
SO2 tonne/yr	267	0.12	267
NOx tonne/yr	77.1	15.9	61.2
Particulate tonne/yr	13.9	1.5	12.4

Table 4. Halifax Infirmary Gas Conversion Capital Cost

Option 2 - Replace Burners on Boilers 1, 2 and 3 Halifax Infirmary Site	Cost (+/- 20%)
Burner Package Supply– Including BMS and Fuel Skids	450,000
New Burner Installation	100,000
Piping	90,000
Commissioning	45,000
New Plant Control System	520,000
Engineering and Project Management	90,000
TOTAL	**$1,295,000**

Table 5. Fuel Cost Comparison – Halifax Infirmary Business as Usual versus Natural Gas Conversion

Year	Oil Cost $ CDN	Gas Cost $ CDN	Additional $ CDN
2009	$2,025,446	$2,601,683	$576,238
2010	$1,954,876	$2,462,723	$507,847
2011	$1,982,262	$2,507,091	$524,829
2012	$2,010,929	$2,553,025	$542,096
2013	$2,039,898	$2,599,990	$560,092
2014	$2,069,488	$2,648,412	$578,924
2015	$2,099,394	$2,445,249	$345,855
2016	$2,158,518	$2,519,684	$361,166
2017	$2,232,232	$2,612,333	$380,101
2018	$2,308,915	$2,709,014	$400,099
2019	$2,387,389	$2,809,902	$422,513
2020	$2,469,008	$2,857,943	$388,936
2021	$2,563,435	$2,965,312	$401,877
2022	$2,661,738	$3,077,352	$415,614
2023	$2,763,355	$3,194,268	$430,913
2024	$2,867,655	$3,316,271	$448,616
2025	$2,976,195	$3,432,964	$456,770
2026	$3,075,266	$3,565,354	$490,089
2027	$3,136,771	$3,636,661	$499,891
2028	$3,199,506	$3,709,395	$509,888
	$48,982,275	**$58,224,630**	**$9,242,354**

Table 6. Halifax Infirmary Boiler Gas Conversion Emission Reduction

Pollutant	Oil Firing	Gas Firing	Reduction
CO2 tonne/yr	20,844	13,761	7.083
SO2 tonne/yr	157	0.07	157
NOx tonne/yr	45	9.4	35
Particulate tonne/yr	8.3	.9	7.4

Appendix G

Solar and Hydro Feasibility Analysis

1 BRIEF COST-BENEFIT ANALYSIS FOR SOLAR AND HYDRO

1.1 Improve Energy Efficiency of Buildings

Improvements to energy efficiency are achievable from several municipal buildings through several approaches as discussed below:

1.1.1 Envelope

Due to some buildings' old age and often failing fixtures, excessive infiltrations in some of the largest buildings are eminent. Failure to address unwanted infiltration from a building significantly reduces the building's ability to conserve heat. As a result, additional space heating is required not to improve occupants' comfort, but to make up for lost heat through infiltration. To remediate this problem in buildings such as the City Hall, the following actions are required:

- Fill in all cracks on the outside walls and in the exterior of the building;
- Replace all weather stripping that is in disrepair on the main doors around the building; and
- As a minimum, window panes should be double-glazing and all ineffective caulking around windows should be replaced.

Envelope improvements should be assessed on each building's merits. Necessary repairs should be carried out collectively for buildings that have been found to have substandard performance. Quotes for supply of materials and labour should be obtained from envelope improvement specialists. It is important that this work be done under one contract or energy performance contract (EPC) for a collection of buildings to benefit from scale economies as well as for maximized benefit in savings. Effective insulation levels in the roofs and walls must also be verified and improved if inadequate. If HRM introduces Energy Efficient Standards for buildings, insulation levels will have to be upgraded to match or exceed those stipulated in the corporate Standard. Insulation levels lower than R-25 and R-40 for walls and roof respectively are no longer acceptable if meaningful energy efficiency and conservation programs are being pursued. Our simulation software shows that on any given building orientation, the next most critical aspects of energy efficiency are the envelope tightness, insulation levels and type of glazing.

1.1.2 Equipment and Controls

The type of equipment and how such equipment is controlled are of great importance to energy efficiency. For all heated and mechanically-ventilated municipal buildings, energy efficient motors, integrated in variable frequency drive relays have deep impact on how efficiently energy is utilized by a building. Controls must allow for setbacks during unoccupied periods. Several HRM recreational facilities are often observed to have heating baseboards throwing in heat while doors and windows are wide open. Doors and windows are ajar often because staff cannot turn off the heat even when it is unbearably hot indoors. This lack of appropriate equipment control erodes all obtainable energy efficiencies from efficient electronic ballasts and T8 bulbs for lighting.

- In this area, through the municipality's Green Procurement Strategy, energy-rated equipment and appliances should receive preference when equipment is due for replacement; and
- HRM should seek to engage in EPCs focussing primarily on Controls for municipal buildings that are large energy consumers. Programmable thermostats and other controls are widely available and should be used to avoid the waste that results from simultaneous heating and cooling of the same space.

EPCs have been used successfully by HRM to initiate improvements to energy efficiency when funds are not readily available. The example of the Metro Garage in Burnside has demonstrated positive results from these types of contracts and this approach should be pursued for other facilities and buildings. Also, just recently approved by Council, the energy efficiency improvements planned for Alderney 5 show encouraging progress by HRM to live by example.

1.2 Renewable Energy Systems for Buildings

HRM corporate is making very little use of renewable energy resource despite a significant uptake in the community by the commercial and residential sectors. As part of the CEP, the team assessed a few prominent areas within which HRM could obtain significant savings through use of renewable energy.

1.2.1 Solar Water Heating for Indoor Swimming Pools

Hot water solar heating panels show very attractive results for HRM's recreational facilities. For instance, current annual swimming pool heating energy requirements, costs and emissions (2006) are reported to be as follows:

Table 1.

FACILITY	OIL USAGE (L)	ENERGY (GJ)	OIL COST ($)	GHG EMISSIONS (TONNES)
Northcliffe	95,420	3,691	52,481	270
Needham	91,644	3,545	50,404	259
Wave Pool	216,394	8,370	119,016	612

Provision of domestic hot water for showers and other facility uses have not been included in the table. Inclusion of DHW services in this measure represents opportunities to increase energy savings further as demonstrated in Table 3. Software was used to analyse the impact of solar water heating panels for the three pools, assuming an average of forty (40) panels per pool. The analysis is summarized in the following table:

Table 2.

Facility	Renewable Energy (GJ)	Fuel Oil Displaced (L)	GHG Emissions Reduction (T)	Capital Cost ($)	Payback (Years)
Northcliffe	332	8,572	31	66,985	8
Needham	332	8,572	31	66,985	8
Wave Pool	332	8,572	31	66,985	8

The number of panels in the calculations was arbitrarily chosen to approximate about 15% of total energy use for pool water heating. More benefits are available as the panels are usually setup to pick up domestic hot water loads for showers in the summer time. Also, the capital cost shown in the table did not take into account the 10% incentive ($7,000 per facility) from Conserve Nova Scotia, and the 25% up to $50,000 per project from the Federal Eco-Energy Retrofits program (approximately $17,000 per project at this level of investment). Assuming a fuel escalation rate of 3% annually, payback is about eight (8) years with a positive net present value of $30,400 if projects were carried out in isolation from other ongoing initiatives. Use of the solar pool water heating panels is an unquestionably attractive and economically sound proposition.

1.2.2 Solar Domestic Water Heating for Recreational Facility Showers

Hot water solar panels are also a worthwhile investment in the provision of domestic hot water at main facilities. Hot water demand for showers and other uses is greater than the demand for pool water at the HRM indoor swimming pools all year round. Preliminary feasibility analysis for this application has shown the results summarized in Table 3 below for one swimming pool. The results would be similar for all HRM pools:

Table 3:

No. of Solar Collectors	Renewable Energy Delivered (GJ/yr)	Fuel Oil Displaced (Litres/yr)	GHG Emission Reduction (tonnes)	Initial Capital ($)	Simple Payback (years)
50	270	7,290	28	81,500	10.1
70	401	10,426	37.5	105,600	10.1
100	527	13,700	50.0	142,000	10.5

1.2.3 Solar Air Heating for Metro Transit Garage/Building

As a minimum, the Metro Transit garage in Burnside requires about 27,000 cfm of ventilation air. The ventilation preheat requirements for this amount of outdoor air in the winter time can be prohibitive considering the building's function and occupancy. At present, the building is described to have been retrofitted with equipment to burn natural gas. From the pollution perspective, this is commendable. However, HRM could go a step further and benefit from utilizing a renewable resource (solar) while

minimizing the operation costs and bringing the GHG emissions further down. A preliminary modeling of the possibilities for this building using a solar air heating technology revealed the following:

- Over 1,400 GJ (390 MWh) of renewable energy would displace natural gas annually – this corresponds to approximately $16,800 savings on energy in 2008 assuming natural gas at a rate of $12/GJ and the system efficiency of only 60%.
- About 105 tonnes of GHG emissions would be eliminated.
- The project equity requirements (2008) are about $94,500 with a payback of 4.2 years and a project net present value of about $147,000 over 20 years of project life (the Solarwall system comes with a 20-year warranty). Assuming a natural gas price escalation rate of 3%.
- This project is also eligible for the Federal Eco-Efficiency program funding which would be estimated at $9,600, thus bringing the simple payback down to 3.8 years and lift the net present value to near $157,000 analysed over 20 years from 2008.

While there are several municipal-owned buildings that are suitable candidates to the solar air heating technology, the example given in this example serves only to demonstrate the benefits versus approximate capital requirements for projects of this nature. Taken at a larger scale, the project cost-benefit analysis would be even more favourable as the marginal increase in additional capital requirements are diminishing compared to the exponential increase in additional savings due to scale economies.

1.3 Small and Mini Hydroelectric Generation

Hydroelectric generation is being considered as an energy supply option under HRM's CEP. Possible reliable sources of this form of energy included the following:

- Musquodoboit River
- Sheet Harbour
- Ecum Secum
- Mosher River

Of the four potential streams above, only some points on Musquodoboit River and Sheet Harbour River seemed to have any potential. There was no flow data or records for Ecum Secum and Mosher River. Annual flow data were obtained from Environment Canada's Hydrometric Database although it appears that flow monitoring has been discontinued. Key areas of interest obtained from feasibility analysis are summarized in Table 4. Analysis assumes that the hydro plants will be part of the centralized distribution system, (i.e. NSPI T&D system).

Table 4.

Station	Annual Mean Flow (m3/s) (Period)	Mean Generation Capacity (kW)	Annual Energy Deliv'd (GJ)	Annual GHG Reduction (tonnes)	Initial Capital ($ Million)	Simple Payback (Years)
Musquodoboit Crawford Falls	20 (1915-1995)	2.1 MW	29,200	8,200	10.2	15.3
Malay Falls	17 (1915-1923)	1.8	24,860	5,340	8.8	16.1
Middle Musquodoboit	9.9 (1974-1983)	1.0	14,270	3,060	6.1	24
Upper Musquodoboit	4.5 (1974-1983)	0.4	6,250	1,340	3.7	103
HalfWay Brook	0.6 (1988-1995)	0.06	765	164	1.5	Infinite
Little West River	2.2 (1988-1991)	0.21	2,980	640	2.5	Infinite