University of Toronto

OFFICE OF THE VICE PRESIDENT BUSINESS AFFAIRS

TO: Business Board

SPONSOR: Catherine Riggall

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DATE: February 15 for February 27, 2006

AGENDA ITEM: 5(b)

ITEM IDENTIFICATION:
Energy Efficiency Project on Lighting Retrofit and Chiller Replacement

JURISDICTIONAL INFORMATION:
Pursuant to Section 5.2. (b) of its Terms of Reference, the Business Board approves expenditures for, and the execution of, approved Capital Projects.

PREVIOUS ACTION TAKEN:
The terms of reference for the project planning committee were submitted to the Planning and Budget Committee on December 6, 2005 for information.

HIGHLIGHTS:
Eighteen large water chillers using ozone layer damaging chlorofluorocarbon refrigerant remain in use on campus. Some exceed their rated service life by 20 years and have experienced an increasing frequency of breakdowns in the past three years. Failure of these primary components of the air conditioning system would disrupt the teaching and research activities in many buildings and could lead to large fines in the event of a discharge of refrigerant to the atmosphere while modern replacement equipment would be environmentally-friendly and would use 30% less electricity.

At the same time, three major buildings still use inefficient T-12 fluorescent lights, many of which have ballasts containing PCBs. Retrofitting the lights with T-8 technology would improve reliability and safety and would result in substantial energy savings. Moreover, if the lighting and chiller projects are combined, significant government incentives can be obtained in addition to the cost savings from lowered electricity use.

FINANCIAL AND/OR PLANNING IMPLICATIONS:
In order to avert failure of elements of the campus infrastructure critical to the ongoing academic mission, a substantial capital investment is required now. Energy savings associated with the renewal allow the structuring of a sustainable funding plan.

RECOMMENDATION:

Be it resolved

Subject to Governing Council approval of the project,

(a) THAT the Vice President Business Affairs be authorized to execute the Lighting Retrofit and Chiller Replacement Project, encompassing a renewal of the cooling infrastructure and a major retrofit of lighting on the St. George Campus, at a total cost not to exceed $19.87 million using the following sources of funds:

NRCan Grant	$ 0.250 million
Toronto Hydro Grant	0.680 million
Facilities Renewal Funds	2.000 million
Interest-free loan from the City of Toronto Better Buildings Partnership to be repaid by the operating budget from energy savings	2.740-million
Debt financing to be repaid by the operating budget from energy savings	14.200-million

(b) THAT the Vice President, Business Affairs be authorized to arrange such interim and long term financing as required from either internal or external sources.

(c) THAT the authorized external borrowing be increased by $2.74-million to reflect the amount of the interest-free loan from the City of Toronto Better Buildings Partnership for the St. George Campus Lighting Retrofit and Chiller Replacement project. (With this addition, approved borrowing would remain within the maximum external borrowing capacity defined within the Borrowing Strategy as approved by the Governing Council on June 24, 2004.)

A Combined Proposal for a Cooling Infrastructure Upgrade and Major Lighting Retrofit

Facilities and Services

Office of the Vice-President, Business Affairs
January 2006

Executive Summary

The University is faced with mounting challenges in the years ahead due to a large deferred renewal backlog that threatens its teaching and research activities, increases operating costs and new legislation that defines new liabilities. There are opportunities to deal with these challenges in a socially responsible yet cost-effective manner.

There is an urgent need for renewal of the primary infrastructure used to air condition buildings on the St. George campus if the normal functioning of the University of Toronto is to continue without interruption. This report outlines a proposal to combine this renewal, which involves eighteen sets of chillers serving 21 buildings, with an imminent major lighting retrofit in three buildings (Robarts Library, Medical Sciences Building and the Ontario Institute for Studies in Education). The project will place the University in an advantageous position to attract several large external low-interest loans and grants, offsetting unavoidable costs to the University.

In addition to the financial benefit of combining these projects, there are a number of other reasons why a renewal of the cooling infrastructure is imperative and the lighting retrofit is necessary. These relate to reliability and maintenance costs, environmental liability, health and safety, energy and financial viability, as outlined in Table 1.

First, the reliability of both the cooling infrastructure and the lighting is becoming increasingly problematic, making maintenance extremely expensive. Many of the chillers and a large number of the lighting fixtures have exceeded their expected lifetimes by over a decade. For example, in 2005 the Ontario Institute for Studies in Education (OISE) was closed briefly due to the failure of the cooling system.

Second, the technologies on which portions of the existing cooling infrastructure and the lighting depend are out of date and contain substances that have been highly regulated, including polycarbonate biphenyls (PCB's) and chlorofluorocarbons (CFC's). It is expected that in the near future there will be a lack of service providers or materials available to correct or maintain infrastructure that is deemed in non-compliance.

Third, the fluctuation of energy prices due to the deregulation of the electricity market increases financial risk to the University, which spends on the order of $17 million on electricity annually. It is expected that electricity prices will continue to rise into the future, and it would be prudent of the University to shield itself as much as possible from these effects by reducing electricity consumption. The proposed project would reduce energy use by approximately 12 GWh per year and reduce cost by over $1.3 million per year, and at the same time reduce the demand on the University's near-capacity electrical distribution system by 4.2 MW. Furthermore, this project will reduce greenhouse gas emissions from the University by 3,100 tonnes of CO_2 per year (the equivalent of permanently removing 600 cars from the road).

Table 1. Summary of project proposal benefits, costs and justifications.

Issue	Cooling Infrastructure	Lighting	Combined
Reliability and Maintenance Costs	Replacement now required due to extreme age of equipment. Expected increase in disruptive failures.	Due to much longer lifetime of the proposed lighting retrofits, lamp replacement would be less frequent.	Increased reliability and reduced maintenance costs, especially with respect to the cooling infrastructure.
Environmental Liability, Health and Safety	Fines are possible if CFC's are inadvertently released into environment.	Replacement of lighting fixtures and removal of PCB's. Current lighting is a fire hazard in some locations.	Legislated removal of CFC's and PCB's is beneficial environmentally and fiscally for the university. Reduction of 3,100 tonnes CO_{2E}/year.
Energy * Based on 20% increase in electricity cost in 2006, 2% per annum thereafter.	Reduction in energy consumption of 3 GWh/year, saving approximately $0.33 million per year.	Reduction in energy consumption of 9 GWh/year, saving approximately $0.97 million per year.	Reduction in energy consumption of 12 GWh/year, saving approximately $1.3 million per year.
Financial Viability	Long payback period of 42 years. Total cost of approximately $13.9 million.	Short payback of 4.3 years. Total cost approximately $4.4 million.	Access to low-interest loans and grants. Combined payback period of 14 years.
Summary	Essential renewal of infrastructure for St. George Campus.	Required for safety, liability and energy reasons.	Allows the project to attract greater low-interest loans and grants, resulting in acceptable ROI.

Finally, these projects have been combined to enable major financial benefits. To date, the University has qualified for grants totaling $2.93 million. Furthermore, while the cooling infrastructure project has a long payback period, the lighting retrofit has a short payback period which helps offset the cost of the cooling infrastructure renewal over time.

This project will require the University to initially allocate $16.94 million of its borrowing capacity. This loan would be repaid through energy savings of approximately $1.3 million per year. A portion of the debt could be supplied by a zero-interest loan of $2.74 million expected from the City of Toronto Better Buildings Partnership. A summary of the costs and financing for the proposed project is shown in Table 2.

Overall, this proposal leverages an essential and expensive cooling infrastructure renewal with a financially attractive lighting retrofit that will become necessary within a short time frame. This strategic combination allows the University to take advantage of external project financing, reducing the capital costs and payback periods of the overall project. As a result, a major deferred maintenance project with a value of almost twenty million dollars will be accomplished with virtually no overall long-term cost to the

University's cash reserves, while providing a continuing positive cash flow to the operating budget. In addition, it is recommended that staff from the Sustainability Office and Facilities and Services continue to work together to develop a comprehensive Energy Infrastructure Renewal Plan for the entire University.

Table 2. Summary of costs and funding sources.

COSTS		
Cooling Infrastructure Sub-project Descriptions		**(millions)**
I	*OISE Chiller*	*$ 1.72*
II	*Northwest Chiller Plant*	*1.91*
III	*Lash Miller Interconnect*	*2.41*
IV	*Ramsay Wright Interconnect*	*3.60*
V	*Warren Stevens Chillers*	*1.24*
VI	*Earth Sciences Centre Chillers*	*1.47*
VII	*Bora Laskin Chiller*	*0.57*
VIII	*Dentistry Chiller*	*1.00*
	Cooling Infrastructure Sub-total	**$ 13.92**
Lighting Retrofit Sub-project Descriptions		
I	*Robarts Library Lighting Retrofit*	*$ 2.31*
II	*Medical Sciences Building Lighting Retrofit*	*1.23*
III	*OISE Building Lighting Retrofit*	*0.83*
	Lighting Retrofit Sub-total	**$ 4.37**
	Operating Shortfall [1]	**$ 0.66**
	Total Construction Financing Costs [2]	**$ 0.92**
	Total Project Construction Cost	**$ 19.87**
FUNDING		
Funding Sources		
NRCan [3] (confirmed)		*$ 0.25*
Toronto Hydro [3] (confirmed)		*0.68*
Ministry of Training, Colleges and Universities (Facilities Renewal Program) [3]		*2.00*
	Total Funding Available	**$ 2.93**
	Total Required Funding [4]	**$ 16.94**
Energy Savings During Construction [5]		*$ 3.05*
University Long-Term Loan [6]		*13.89*
	Payment Plan	**$ 16.94**

[1] After completion of the project there will be a cash shortfall from years 4 to 10, as shown in Appendix C.

[2] Construction cost financing at 4% required to complete the project over three years.

[3] Grants have been successfully awarded based on the terms and conditions of this proposal.

[4] This is the Total Project Construction Cost ($ 19.68 million) minus the Total External Funding Available ($ 2.93 million).

[5] Immediate savings over the three year construction phase due to the lower demand on energy.

[6] 15 year term mortgage to be paid by the annual energy savings of approximately $1.3 million based on an 8% interest rate used for modeling. This assumes there is available funding of $2.74 million from the City of Toronto Better Building Partnership at an interest free rate to be repaid over 10 years subsequent to completion of the full project.

Recommendations:

1. It is recommended that the proposed project encompassing a renewal of the cooling infrastructure and a major retrofit of lighting on the St. George campus with a total project cost estimate of $19.87 million, and an allocation of borrowing capacity of $16.94 million be approved.

2. It is recommended that the Sustainability Office and staff of Facilities and Services continue to work to harmonize and expand existing initiatives addressing energy consumption, supply and energy reduction to create a comprehensive energy plan for all three campuses that will address the long range requirements of the University, resulting in an Energy Infrastructure Renewal Plan.

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Appendices:

I. Membership

Mr. Ron Swail (Chair), Assistant Vice-President, Facilities and Services
Mr. Julian Binks, Manager, Project Planning, Capital Projects
Professor Phil Byer, Faculty of Applied Science and Engineering
Mr. Chris Caners, Sustainability Office
Mr. Bruce Dodds, Director, Utilities and Building Operations, Facilities and Services
Professor Beth Savan, Director, Sustainability Office
Mr. Farouk Kothdiwala, Project Manager, Facilities and Services
Mr. Demetrios Voudouris, Manager, Accounting Services
Ms. Elizabeth Sisam, Assistant Vice-President, Space and Facilities Planning
Mr. Matto Mildenberger, Student Member, Academic Board
Ms. Coralie D'Souza, Student Member, Governing Council

II. Terms of Reference

The Project Committee must address the following terms:

1. Review the existing situation and identify a program of renewal projects that will eliminate the liability associated with operating the St. George Campus' CFC chillers and remaining low-efficiency T-12 fluorescent lights.
2. Identify a schedule for the renewal projects.
3. Identify all resource implications, including a preliminary estimate of capital costs, and projected costs and savings to the annual operating budget.
4. Identify available sources of incentive funding from external governmental agencies.
5. Identify a funding plan for the capital costs.
6. Report by February, 2006.

III. Background Information

This section contains information on the cooling infrastructure and lighting at the St. George Campus, as well as an outline of the numerous justifications for the proposed project.

3.1. History

Cooling Infrastructure

Cooling for most buildings on the St. George Campus in the spring, summer and fall is provided via chilled water produced by either a central or local refrigeration plant to the air conditioning systems of the buildings. The majority of these refrigeration plants consist of electrically powered chillers, which may provide cooled water to several buildings connected by distribution piping, or else provide the cooling requirements for one building alone. Buildings without access to chilled water from this source either do not have air conditioning capability, or, in some cases, utilize less efficient localized air

conditioning units.

Many of the chillers at the St. George Campus were installed in the 1960's, with a life expectancy of 25 to 35 years. Many are now 10 or 20 years beyond their expected lifetime and contain CFC refrigerants; a substance legislated out of production in 1996, because of damages this group of substances cause to the ozone layer. Failure of the equipment has in some cases led to major disruptions of normal University functions.

Lighting

During the 1990's, a major lighting retrofit was undertaken for nearly the entire St. George campus. This retrofit converted the older, less efficient T-12 lamps and ballasts, many containing the hazardous material polychloride biphenyl (PCB), to more efficient T-8 lighting. Three major buildings, including the Ontario Institute for Studies in Education (OISE), Robarts Library and the Medical Sciences Building (MSB) were not included in this retrofit because those buildings distribute a different voltage to lighting fixtures, and the appropriate technology was not available in the mid-nineties to perform the upgrade.

Fluorescent ballasts have a life expectancy of approximately 25 years. Many of those still in use at Robarts Library, MSB and OISE are original equipment and may contain PCB's, while others have failed over the years, leaking oil and posing a fire hazard.

3.2. Project Justification

This section outlines the justifications for the cooling infrastructure renewal project, the lighting retrofit project and their combination, with respect to four areas: reliability and maintenance costs; environmental liability, health and safety; energy and financial viability. It is recommended that while each of these projects can be justified in its own right, the projects should be combined into one package in order to take advantage of available funding opportunities.

3.2.1. Reliability and Maintenance Costs

The deferred renewal needs of the St. George campus now stand at a projected $264 million over the next 5 years. Increased reliability is essential for the University to continue functioning effectively, without disruption.

Cooling Infrastructure

An ongoing audit of buildings and infrastructure by external consultants on the St. George Campus will be completed in 2006. The consultants have already determined that the renewal of the cooling infrastructure should be considered one of the highest priorities for the University.

As the cooling infrastructure equipment has aged, there have been frequent failures. Sudden breakdowns have occurred at Sidney Smith Hall and the Ramsay Wright

Zoological Laboratories. The 36 year old chiller located in OISE has failed several times over the past three years, at times resulting in the evacuation of the building. This situation is becoming more common, and these malfunctions and breakdowns require expensive and time-consuming repairs.

Lighting Retrofit

While there are many other reasons to replace the lighting fixtures of Robarts Library, MSB and OISE, there are also valid reliability concerns for replacing the existing T-12 ballasts and lamps with the more efficient T-8 model. First, the T-8 has a significantly higher lifetime than their T-12 counterparts, which reduces the replacement costs, especially due to the difficult to reach locations that exist in buildings such as Robarts. Currently, up to $80,000 is spent annually in that building alone to replace the existing T-12 lamps and ballasts on an ad hoc basis, often requiring a hydraulic boom or scaffolding to gain access. Second, utilizing the T-8 ballasts and lights will standardize the lighting in all of the major buildings on the St. George campus, increasing the efficiency and effectiveness of the maintenance staff and purchasing.

3.2.2. Environmental Liability, Health and Safety

This section deals with the benefits and justifications for removing and retrofitting infrastructure that contains and uses hazardous materials on the St. George campus.

Cooling Infrastructure

There are several concerns regarding the cooling infrastructure with respect to the environment, health and safety of the students, staff and faculty at the University. First, hazardous materials in the form of ozone-depleting chlorofluorocarbons (CFC'S), a regulated substance under the Canadian Environmental Protection Act (Ozone Depleting Substance Regulations (ODSR) 1998), are still being used in the existing chillers. The St. George campus has 18 remaining chillers in this category, some of which are over 40 years old. This proposal would remove all of the CFC containing chillers from the St. George campus.

Lighting Retrofit

Under the Canadian Environmental Protection Act (CEPA), all equipment containing polycarbonate biphenyls (PCB's) in concentrations greater than 500 ppm must be removed by the end of 2007, and the storage of PCB-containing equipment is prohibited after the end of 2009. Combined, Robarts Library, MSB and OISE have approximately 34,000 fluorescent lighting ballasts which may contain PCB's. The new T-8 lighting ballasts do not include PCB's or other highly regulated materials, and will not present any foreseeable environmental, health and safety concerns.

3.2.3. Energy

There are three main issues relevant to energy use on campus: electricity price volatility, international agreements and the capacity of the electrical grid. Effective electricity rates have increased by more than 30% since deregulation in 2002. Projections of shortfalls in supply due to the decommissioning of coal-fired generation plants in Ontario and protracted periods for refurbishing existing or building new nuclear facilities threaten to push rates even higher. Market consultants have forecast a possible increase of 20% in effective rates in 2006 alone. Meanwhile, in the same period, the floor space at the St. George campus has increased by more than 20% and normal electrical load growth is estimated at 1.3% per year. As a result, the electricity budget for the St. George Campus is expected to increase to $23.0 million in 2006.

The Kyoto Protocol has recently been ratified, requiring Canada to reduce its overall level of emissions of greenhouse gases to 6% below levels recorded in 1990. There is a direct correlation between the amounts of electricity we use and the levels of carbon dioxide released in the electrical generation process. As with the price of electricity, reductions of these levels to those prescribed is doubly difficult for the U of T: not only has electricity use actually increased on a unit of floor area basis as equipment has aged, but the total building area has increased as well.

Due to the rapid expansion of the campus over the past decade with new buildings and increased research energy requirements, the capacity of the electrical grid operated by Facilities and Services is approaching its maximum limit. This project will reduce peak electrical demand on the electrical grid of the University by 4.2 MW, or approximately 10% of the maximum grid capacity, and will allow the University to continue to grow into the near future without any complications arising due to limited grid capacity. While every effort will be made to monitor the effect of these retrofits on energy consumption, it is expected that due to a variety of factors including campus expansion and measurement limitations, exact data will be difficult to obtain.

Cooling Infrastructure

While it is imperative at this point to replace and refurbish the cooling infrastructure at the St. George campus, there are also benefits of this renewal in terms of reduced overall electrical energy use. In 2005, the University of Toronto St. George campus consumed electricity worth $17.4 million. Of this, the electrical consumption of the cooling infrastructure in the buildings affected by this proposal costs approximately $1.0 million per year.

The electricity consumption of the cooling infrastructure will be improved through the increased efficiency of the installed chillers. The proposed replacement chillers are approximately 30% more efficient than their predecessors. This efficiency has three positive effects. First, annual electricity consumption and costs to the University will decrease by over 3 GWh and $0.33 million respectively upon completion of the project. Second, reduced electricity consumption will offset greenhouse gas emissions by approximately 800 tonnes CO_{2E}/year. Finally, the reduced energy consumption of the

cooling infrastructure provides significant opportunities to pursue funding avenues as discussed in the next section.

Lighting Retrofit

Through the retrofit of over 72,000 bulbs and 34,000 ballasts, the University will reduce its energy consumption by almost 9 GWh per year, with annual cost savings upon project completion of approximately $0.97 million. Furthermore, greenhouse gas emissions from the University will be reduced by approximately 2,300 tonnes of CO_{2E} per year.

3.2.4. Financial Viability

The return on investment of each project is extremely different. In combination, these two projects can prove to be complimentary. The current annual operating costs and the expected annual savings are shown in Table 3. A more detailed summary of the energy and cost savings is included in Appendix A.

Table 3. Context and benefits of energy efficiency aspect of proposed project.

	Annual Operating Cost of Infrastructure (millions)	**Annual Savings from Project (millions)**
Cooling Infrastructure	*$ 1.03*	*$0.33*
Lighting Retrofit	*$ 2.47*	*$ 0.97*
Total	**$ 3.50**	**$ 1.30**

Cooling Infrastructure

Due to the nature and the necessity of the cooling infrastructure renewal, the University will need to spend significant capital (see Table 5) in order to ensure the continued operation of programs and facilities. Regardless, there are two factors that work to the University's advantage with respect to financing, both owing to the fact that the new cooling infrastructure will be significantly more energy efficient. First, reduced electricity costs to the University will result in a modest payback for the equipment of 42 years. Second, and more significantly, this reduction in energy use allows the University to gain access to significant low-interest loan and granting financing opportunities from external agencies that are designed to encourage energy conservation and demand-side management projects.

Lighting Retrofit

The payback period for the lighting retrofit is excellent at approximately 4.3 years. Each T-8 lamp uses approximately 30% less electricity than its T-12 counterpart. In addition, the proposed T-8 lighting has a much longer lifespan than the existing T-12 lighting. The overall capital costs for this project are shown in Table 6.

3.2.5. Motivation for Combined Project

The present popular wisdom, promoted by many government funding agencies at every level, is to bundle the good and the poor return on investment (ROI) projects together into a package of work that can provide an acceptable overall return. At present, there are a number of opportunities to reduce energy consumption at the St. George campus while at the same time reducing the backlog of renewal needs for outdated equipment and systems. Some of these projects have extremely attractive paybacks, such as the lighting project, while others cannot be justified simply for their ROI, such as the cooling infrastructure upgrade. A project of this scope has not been attempted previously by the Facilities and Services Department of the University. However, very similar bundling methods have precedent at Universities such as McMaster, York, Western and British Columbia, to name a few.

In summary:

- The chiller project is extremely critical if the air conditioning systems of several of the older buildings are to remain in operation in the coming years. On its own, the capital cost would be $13.9 million but would be eligible for a total of $0.5 million in grants from THESL and NRCan. The balance would have to be financed from the utilities budget at $1.48 million of debt service each year assuming a maximum of $1.8 million zero-interest loan from the City of Toronto Better Buildings Partnership. This would represent a 2.4% increase to the net utilities budget after completion of the project.

- The lighting project has a capital cost of $4.4 million and would be eligible for a total of $0.46 million in grants from THESL and NRCan. The balance would be financed from the utilities budget at $0.45 million of debt service each year assuming a maximum $0.65 million zero-interest loan from the City of Toronto Better Buildings Partnership. This would represent a 1.1% reduction to the net utilities budget after completion of the project.

- If the two projects are financed together as in the Base Case, the effect on the utilities budget would begin at a maximum of $0.175 million annually or a 0.36% increase to the net utilities budget after completion of the project, decreasing with time.

IV. Environmental Impact

The proposed project is beneficial to the environment in two main ways: reduction of greenhouse gas emissions and the proper disposal of regulated materials. Reductions in the emission of greenhouse gases from the University are outlined in Table 4 below.

Table 4. Reduction of electricity use and greenhouse gas emissions.

	Annual Energy Savings from Project (MWh)	Reduction in GHG Emissions (tonnes CO_{2E}/year)
Cooling Infrastructure	*3,054*	*794*
Lighting Retrofit	*8,922*	*2,318*
Total	**11,976**	**3,112**

V. Resource Implications

This section outlines in more detail the various projects for each of the cooling infrastructure and lighting retrofit, and presents a cost estimate for each individual project. The construction costs are summarized in Tables 5 and 6, with the Total Project Costs sheets included in Appendix B.

5.1. Construction Costs

Total project cost sheets are attached in Appendix B.

Cooling Infrastructure

Table 5. Sub-project descriptions of the cooling infrastructure renewal, in priority order.

Sub-project		Age	Description	Cost (millions)
I	*Replace the 35 year old chiller in OISE*	36	This replacement is extremely challenging because of access issues to the building.	*$ 1.72*
II	*Replace two remaining 35 year old CFC chillers in Northwest Chiller Plant*	34	Serving the Robarts / Bissell / Fisher complex, Innis College and Residence, Rotman Centre and Graduate House.	*1.91*
III	*Connect the Lash Miller and McLennan buildings to the Bahen Chiller Plant*	38-42	Decommissioning of four 40-year old CFC chillers and installation of a new 2,000 Rton chiller in the space in the Bahen Centre left for that purpose.	*2.41*
IV	*Interconnect the Ramsay Wright and Sidney Smith buildings*	40-44	Instead of replacing the CFC chillers in each building separately, it is more efficient to interconnect the two buildings and use the same system.	*3.60*
V	*Replace CFC chillers in the Warrens Stevens Building*	25	Installation of two chillers to replace the two CFC chillers being used currently.	*1.24*
VI	*Replace CFC chillers in the Earth Sciences Centre*	16	Although younger, these chillers utilize CFC refrigerant and must be removed.	*1.47*
VII	*Replace CFC chiller in the Bora Laskin Library*	15	Replacement of existing 300 Rton R-11 chiller	*0.57*
VIII	*Replace CFC chillers in the Faculty of Dentistry Building*	22	Replacement of two existing 387 Rton R-11 chillers	*1.00*
			Sub-total	**$ 13.92**
			Operational Shortfall	**$ 0.41**
			Finance Cost	**$ 0.57**
			Total Cost	**$ 14.90**

It is important to note that the normal life expectancy of a chiller is 23 years, and that it is essential that each project be undertaken in the very near future, due to the age of the equipment and the presence of CFC's, which were legislated out of production in 1996.

Lighting Retrofit

The lighting retrofit concerns three main buildings on the St. George campus, and features a capital cost significantly less than that of the cooling infrastructure renewal.

Table 6. Description of each lighting retrofit sub-project, in order of priority.

Sub-project		Description	Cost (millions)
I	*Replace fixtures and lamps in Robarts Library/Bissell Building/Fisher Complex*	Replacement of 18,500 fixtures and 42,000 lamps from T-12 to T-8 model.	*$ 2.31*
II	*Replacement of fixtures and lamps in Medical Sciences Building*	Replacement of 10,500 fixtures and 25,000 lamps from T-12 to T-8 model.	*1.23*
III	*Replacement of fixtures and lamps in OISE Building*	Replacement of 5,500 fixtures and 19,000 lamps from T-12 to T-8 model.	*0.83*
		Sub-total	**$ 4.37**
		Operational Shortfall	**$ 0.25**
		Finance Cost	**$ 0.35**
		Total Cost	**$ 4.97**

VI. Funding Sources and Cash Flow Analysis

Table 7. Proposed sources of financing for the project.

Funding Sources	(millions)
Natural Resources Canada **(confirmed)**	*$ 0.25*
Toronto Hydro Energy Services Limited **(confirmed)**	*0.68*
Ministry of Training, Colleges and Universities Facilities Renewal Program	*2.00*
Energy Savings During Construction	*3.05*
Total Required Funding	*13.89*
Total	**$ 19.87**

6.1. External Funding Sources

This section outlines in greater detail the amounts of funding available from external agencies that have an interest in funding the project.

6.1.1. City of Toronto Better Buildings Partnership

This fund provides financial assistance for conservation projects in the form of an interest free loan up to a maximum of 15% of the total project cost. A loan of approximately $2.74 million would be expected from the Better Buildings Partnership, to

be paid back over a period of 10 years. This would result in total interest savings of $1.25 million at 8% over a ten year period.

6.1.2. Toronto Hydro Energy Services Limited

Through the Conservation and Demand Management Initiative, Toronto Hydro is required by the Ontario Energy Board to invest a total of $40 million to reduce demand in the City of Toronto by 250 MW. A grant of $0.68 million has been approved, at an incentive rate of $160 per kW saved.

6.1.3. Natural Resources Canada

A grant of $0.25 million from NRCan through the Energy Retrofit Assistance Program has recently been approved at an incentive rate set of $7.50 per GJ ($2.08 per MWh) saved.

6.2. Internal Funding Sources

This section outlines sources of funding internal to the University.

6.2.1. Ministry of Training, Colleges and Universities Facilities Renewal Program

Due to the fact that this proposal contains a substantial renewal component, a portion of this funding can be used to offset the capital costs of the project. Part of the annual allocation in the amount of $2.0 million from the 2005/06 and 2006/07 Facilities Renewal Program has been directed to this project.

6.2.2. Avoided Energy Costs

During the three year construction period, it is estimated that energy savings of $3.05 million will accrue. It is estimated that after construction is complete the energy expenses to the campus will be reduced by approximately $1.3 million annually.

6.2.3. University of Toronto

It is proposed that approximately $13.89 million be borrowed from the University and paid back from the realized energy savings over a period of 15 years, with an IRR of 7.52%.

6.3. Cash Flow Analysis

A financial projection for the base scenario is attached in Appendix C. Key assumptions include securing applicable external grants and interest free loans and their associated cash flow streams, an annual interest rate of 8% and an escalating electricity inflation rate of 2% after an initial increase of 20% in 2006. Based on the annual projected cash flow analysis, a 15 year internal loan repayment is most financially manageable.

6.4. Financial Risk Assessment

Financial risk to the success of the program is from three possible sources:

- *The actual project costs could vary from the estimate.*
  The project costs have been estimated conservatively, using the best advice from consultants experienced in this field. In any event, this program would be subject to the same rules for additional or re-approvals as any other capital project.

- *The external funding sources may not materialize.*
  Again, the amounts used in the calculations representing expected financial contributions from outside the University are conservative. Both NRCan and THESL have committed to providing grants in the amounts of $0.25 million and $0.68 million respectively.

- *Electricity rates may change from those in the base case.*
  The base case assumes a modest annual electricity rate increase of 2% after an initial 20% increase in 2006. An analysis of the sensitivity of the rate of return to the annual electricity rate of escalation shows:

Table 8. Comparison of financial models for the project.

	Base Case	**Case #1**	**Case #2**
Financing	Secured	Not secured	Secured
Rate increase	2%*	2%*	2%
Total Funding (incl. energy savings)	*$ 5.98 M*	*$ 5.05 M***	*$ 5.98 M*
Financing required ***	*$ 16.94 M*	*$ 17.86 M*	*$ 16.94 M*
Simple Payback (in years)	14	14	16.5
IRR	7.52%	7.03%	6.02%
NPV	*($0.7) M*	*($1.4) M*	*($2.7) M*

* The rate increase expected for 2006 is 20.2%, per external consultant experts

** Assumes no energy incentive grants from government bodies

*** Interest free loan of $2.74 million included as part of financing

Each of the cases present a variety of costs, benefits and energy outcomes. While there are anticipated to be positive cash flows after the projects are completed and achieve their energy saving, the negative net present value (NPV) in each of the three cases is the result of negative cash flows in the initial years during project implementation. In terms of the 'base case', there is no financial viability to proceed with the overall project given the negative slightly NPV, unless rates rise faster than are anticipated by the base case. Financial figures aside, this proposal addresses the important demands being placed on the University to provide efficient, cost effective and environmentally friendly infrastructure as outlined by legislation. The following is a recap of the cases highlighted above, which are shown in more detail in Appendix C

- Base Case – Funding in the amount of $2.93 million from various agencies has already been confirmed for this project. A further zero-interest loan in the amount of $2.74 million is also expected. These funds are timely in that they have been made available to reduce the consumption demand by large entities such as the University. Any dramatic increase in rates (as noted by the expected rate spike of 20% in 2006) would strengthen this case. The long-term benefit of this project is a total cash flow savings of $22.6 million between years 10 to 28, as shown in Appendix C.

- Case #1 – Assuming the government agencies do not provide funding, there still remains a reasonably sound basis to proceed as both the IRR and NPV show a marginally lower return. Again, this assumes a rate increase of 20% in 2006.

- Case #2 - Assuming the energy rate increase follows a standard inflationary pattern of 2%, with all funding sources in place, the overall project becomes financially difficult to support as evidenced by the NPV of negative $2.4 million.

The Base Case can be summarized as follows: During the construction phase of the project (between years 1 to 3), $13.70 million in debt capacity will be required. Upon completion of the project, the annual cash flow will result in mildly lower cash outflows totaling $0.5 million (between years 4 to 9). This takes into account the repayment of the interest free loan, included in Table 2 under short-term financing. Ultimately, the University will need to draw on $16.75 million of its borrowing capacity to achieve the objectives of the overall project. On a positive note, the long-term benefit of this project is a total cash flow savings of $22.6 million between years 10 to 28, as shown in Appendix C.

The utilities budget is not expected to be reduced from the above savings, but rather will result in tempering the rise in demand in future years for increased financial resources with respect to both maintenance and energy related costs.

VII. Schedule

The following schedule is proposed for the approval, implementation and completion of this project:

Planning and Budget Project Committee Established:	December 6, 2005
Governing Council Approval:	March 23, 2006
Commencement of Cooling Infrastructure Renewal:	April 1, 2006
Commencement of Lighting Retrofit:	June 23, 2006
Completion of Cooling Infrastructure Renewal:	August 1, 2007
Completion of Lighting Retrofit:	August 1, 2007

Due to the urgency to replace the OISE chiller prior to the 2006 cooling season, this project has been approved through the Accommodations and Facilities Directorate (AFD), funded totally as part of the Facilities Renewal Program for 2005/06.

VIII. Next Steps

Directed by the Environmental Protection Advisory Committee and funded through a three year grant from the Toronto Atmospheric Fund, the goal of the Sustainability Office is to reduce energy consumption and greenhouse gas emissions from the St. George campus. The projects proposed here will have significant financial, environmental and social benefits for the St. George campus. However, they should be viewed as the first phase in a broader energy plan to be developed for the entire University.

The development of a comprehensive energy plan for the University is strategically desirable for several reasons. First, energy prices are likely to increase and become more volatile in the near future, which could have a significant financial impact on the University. Second, environmental issues such as climate change have become increasingly pressing over the past decade, and it is important for the University to show leadership with respect to energy conservation, and sustainability more generally. Finally, the strategy of offsetting expensive deferred maintenance projects against energy efficient retrofits with short payback periods can be reproduced in the future, and can continue to attract external funding for these projects, achieving financially attractive packages for long overdue and urgently required infrastructure renewal.

An energy plan would provide the framework within which the University can continue to expand and deliver high quality education and research. The plan should address the following: an energy and greenhouse gas inventory; energy consumption and potential savings from retrofits and new buildings; building/occupant relationships; energy supply; alternative methods to finance energy reduction initiatives; and related University policies and guidelines. The energy plan will provide the framework within which the University can continue to expand and deliver high quality education and research well into the future. In order to develop the plan, the capacity of the Sustainability Office will need to be secured into the future, an issue which is addressed in their Annual Report, currently moving through the governance structure.

IX. Recommendations

1. It is recommended that the proposed project encompassing a renewal of the cooling infrastructure and a major retrofit of lighting on the St. George campus with a total project cost estimate of $19.87 million, and an allocation of borrowing capacity of $16.94 million be approved.

2. It is recommended that the Sustainability Office and staff of Facilities and Services continue to work to harmonize and expand existing initiatives addressing energy consumption, supply and energy reduction to create a comprehensive energy plan for all three campuses that will address the long range requirements of the University, resulting in an Energy Infrastructure Renewal Plan.

X. Glossary

AFD: Accommodations and Facilities Directorate
Ballasts: This is a part is a component of the fluorescent lighting fixture. The purpose of the ballast is to regulate the charge to the lamp. This is the component of the lighting fixtures which contains PCB's. New ballasts are electronic, and do not contain PCB's.
CEPA: Canadian Environmental Protection Act.
CFC: Chlorofluorocarbons, which are known to cause degradation of the ozone layer.
Chillers: Device that uses input electricity to generate cooled water for air conditioning purposes.
Chilled water: Generated by the chillers, this is the medium though which air-conditioning is distributed in many of the St. George campus buildings.
CO_{2E}: Carbon-dioxide equivalent. A standard benchmark for the measurement of greenhouse gas emissions.
GWh; MWh; kWh: Gigawatt, Megawatt and Kilowatt hours. A measure of the amount of energy consumed over a given period of time.
IRR: Internal rate of return.
Lamp: The name for a fluorescent light bulb.
MSB: Medical Sciences Building.
MTCU: Ontario Ministry of Training, Colleges and Universities.
MW: Megawatt. A measure of the rate of energy being used at any given point in time.
NPV: Net present value.
NRCan: Natural Resources Canada.
OISE: Ontario Institute for Studies in Education
PCB: Polycarbonate biphenyl. Potentially present in lighting ballasts.
ppm: Parts per million. A measure of the concentration of a particular component of a mixture.
ROI: Return on investment.
R-11; R-122: Types of fluid containing CFC's commonly used in the chillers on the St. George campus.
Sustainability Office: Launched through the Environmental Protection Advisory Committee in February 2005, the role of the Office is to facilitate energy and resource conservation and greenhouse gas reduction on the St. George Campus, under the direction of Dr. Beth Savan.
T-12: Current type of lighting in use at Robarts, OISE and MSB. Inefficient compared with T-8.
T-8: Type of light bulb proposed to replace the older, and less efficient T-12.
THESL: Toronto Hydro Energy Services Limited.

Appendix A: Summary of financial and environmental benefits of project

UNIVERSITY OF TORONTO
St. George Campus

PROPOSED ENERGY EFFICIENCY RETROFIT PROGRAM (2005 - 2007)

		Savings [$]	Payback	Energy & Environmental Benefits					
Energy Efficiency Retrofit Projects	**Capital Cost [$]**	**Energy Savings**	**Simple Individual Payback [Years]**	**Lighting or Chiller Existing Energy Usage [kWh]**	**Avoided Energy Usage [kWh]**	**Avoided Energy Usage [GJ]**	**Reduction of Lighting or Chiller Energy Usage [%]**	**Avoided Demand [kW]**	**Equivalent Avoided CO2 [kg]**
Lighting Retrofit									
Robarts Library	2,307,951	510,781	4.3	13,971,540	4,698,844	16,916	33.6	536	1,221,230
Medical Sciences Building	1,230,903	233,889	5.0	4,828,772	2,151,622	7,746	44.6	431	559,207
OISE	825,536	225,211	3.5	3,930,321	2,071,795	7,458	52.7	415	538,460
SUB-TOTAL #1 = Lighting Retrofit Projects	**4,364,390**	**969,881**	**4.3**	**22,730,633**	**8,922,261**	**32,120**	**39.3**	**1,382**	**2,318,896**
Chilled Water System Upgrade									
Replace OISE Chiller	1,716,517	39,133	43.9	1,123,200	360,000	1,296	32.1	360	93,564
Replace NWCP Chillers	1,909,263	78,267	24.4	2,160,000	720,000	2,592	33.3	480	187,128
Interconnect L.Miller/McLennan Physics to BCIT Chiller	2,412,668	64,896	37.2	1,860,768	597,000	2,149	32.1	660	155,160
Combine R. Wright Zoo./S. Smith Chiller Systems	3,601,649	40,112	89.8	1,204,200	369,000	1,328	30.6	890	95,903
Replace Warren Stevens Chillers	1,236,912	22,828	54.2	637,092	210,000	756	33.0	135	54,579
Replace Earth Sciences Chillers	1,474,109	52,178	28.3	1,272,960	480,000	1,728	37.7	180	124,752
Replace Bora Laskin Chiller	570,362	18,262	31.2	528,000	168,000	605	31.8	84	43,663
Replace Dentistry Chillers	1,000,000	16,306	61.3	700,000	150,000	540	21.4	100	38,985
SUB-TOTAL #2 = Chiller Upgrade Projects	**13,921,480**	**331,981**	**41.9**	**9,486,220**	**3,054,000**	**10,994**	**32.2**	**2,889**	**793,735**
TOTAL ESTIMATED (LIGHTING AND CHILLER PROJECTS)	**18,285,870**	**1,301,862**	**14.0**	**32,216,853**	**11,976,261**	**43,115**	**37.2**	**4,271**	**3,112,630**

Revised January 05, 2006

Appendix B: Total project cost sheets

PROJECT COST ESTIMATE **PROJECT: Lighting Retrofit Robarts Library**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$1,811,078	$41,836	$1,852,914
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal	PCB ballast removal	$100,000	$2,310	$102,310
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$1,955,224
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$71,925	$1,661	$73,586
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$63,388	$0	$63,388
	Total Professional fees				$136,974
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per lighting project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$2,122,660
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$181,108	$4,184	$185,291
	Total Project Contingency				$185,291
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$2,307,951

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Lighting Retrofit OISE**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$562,746	$12,999	$575,745
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal	Asbestos in OISE Ceiling/PCB ballast removal	$100,000	$2,310	$102,310
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$678,055
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$38,850	$897	$39,747
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$19,696	$0	$19,696
	Total Professional fees				$59,444
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per lighting project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$767,961
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$56,275	$1,300	$57,575
	Total Project Contingency				$57,575
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$825,536

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Lighting Retrofit MSB**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$911,306	$21,051	$932,357
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal	Asbestos in MSB Ceiling/PCB ballast removal	$100,000	$2,310	$102,310
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$1,034,667
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$39,725	$918	$40,643
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$31,896	$0	$31,896
	Total Professional fees				$72,538
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per lighting project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$1,137,668
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$91,131	$2,105	$93,236
	Total Project Contingency				$93,236
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$1,230,903

Prepared by: Recommended by: Approved by:

Date: Date: Date:

Capital Projects Department	PROJECT NUMBER:	PROJECT MANAGER: Seng Kho			
TOTAL PROJECT COST (TPC)	PROJECT NAME: OISE Chiller Replacement	CAMPUS: St. George			
"Preliminary"					

Number	Item	Remarks	Base Coat	GST (2.31%)	Cost
CONSTRUCTION					
835730	Construction: Main Contract	LKM estimate	1,200,000	27,720	1,227,720
835752	Construction: Other Contract		-	-	-
835754	Secondary Effects		-	-	-
835757	Construction Contingency	10%	120,000	2,772	122,772
835762	Hazardous Waste Removal	Asbestos allowance	35,000	809	35,809
835765	Demolition Services	Allowance	20,000	462	20,462
835768	Site Preparation	Allowance	50,000	1,155	51,155
				Total Construction	***$1,457,918***
LANDSCAPING					
835755	Landscaping Services		-	-	-
				Total Landscaping	***$0***
PERMITS, INSURANCE					
835400	Licences / Permits		-	-	-
836700	Insurance	Calculated at 0.30% of Main Contract	3,765	87	3,852
				Total Permits, Insurance	***$3,852***
PROFESSIONAL FEES					
835200	Consulting	LKM as Main Consultant	50,500	1,167	51,667
835201	Consultants: Disbursements		-	-	-
835204	Construction Management Fees		-	-	-
835206	Other Consultants	Allowance Structural, asbestos inspection and tender	18,000	416	18,416
835210	Legal Services		-	-	-
835721	External Project Manager		-	-	-
895720	Design Fees: In House		-	-	-
895721	Design: Disbursements	Meals, parking, mileage, printing	-	-	-
835723	Project Disbursements	Meals, parking, mileage, printing	-	-	-
895725	Project Management: Fees	3.50%	50,645	-	50,645
				Total Professional Fees	***$120,727***
SERVICES TO SITE					
835700	Site Services and Infrastructure	City charges	-	-	-
				Total Site Services	***$0***
COMPUTER WIRING AND TELEPHONES					
821110	Equipment: Computing: Purchase	Computing & Network Services	2,000	46	2,046
835010	Telephone Line Service		-	-	-
				Total Computer Wiring & Telephones	***$2,046***
MOVING AND STAGING					
837100	Moving		-	-	-
837101	Staging		-	-	-
				Total Moving and Staging	***$0***
FURNISHINGS AND EQUIPMENT					
820010	Furniture: Purchase		-	-	-
821010	Equipment: Purchase		-	-	-
821510	Equipment: Audio / Visual: Purchase		-	-	-
821610	Equipment: Research: Purchase	PST is not applicable	-	-	-
				Total Furnishings and Equipment	***$0***
OTHERS					
820011	Interior Signage: Purchase / Design	Included in Main Contract	-	-	-
821325	Security and Access Systems	Included in Main Contract	-	-	-
835070	Courier		500	12	512
835756	Exterior Signage: Purchase / Design	Included in Main Contract	-	-	-
835764	Client Construction Expenses		20,000	462	20,462
835766	Ceremonies	Ground breaking, top off, grand opening	-	-	-
835900	Advertising / Marketing		-	-	-
836430	Donor Recognition	Plaques	-	-	-
890670	Facilities Repair/ Renovation: Internal	trades	15,000	-	15,000
				Total Others	***$35,974***
				SUB TOTAL:	$1,620,517
PROJECT CONTINGENCY					
835758	Project Contingency	allow 8%	96,000	-	96,000
				Total Project Contingency	***$96,000***
FINANCE COSTS					
835305	Interest Charges	FRP funded	-	-	-
				Total Finance Costs	***$0***
				TOTAL PROJECT COST:	**$1,716,517**

Project Management Fees		**Recommended by: Seng Kho**	**Approved by:**		
$50,645		**1/9/2006 16:55**	**Date:**		

PROJECT COST ESTIMATE **PROJECT: Ramsay Wright/Sidney Smith Combined Chilled Water System Upgrade**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$3,030,000	$69,993	$3,099,993
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$3,099,993
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$53,900	$1,245	$55,145
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$106,050	$0	$106,050
	Total Professional fees				$161,195
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$3,291,650
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$303,000	$6,999	$309,999
	Total Project Contingency				$309,999
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$3,601,649

Prepared by:
Date:

Recommended by:
Date:

Approved by:
Date:

PROJECT COST ESTIMATE **PROJECT: NWCP Chilled Water System Upgrade (XXXXXXX Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$1,575,000	$36,383	$1,611,383
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$1,611,383
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$50,000	$1,155	$51,155
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$55,125	$0	$55,125
	Total Professional fees				$106,280
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$1,748,125
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$157,500	$3,638	$161,138
	Total Project Contingency				$161,138
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$1,909,263

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Lash Miller/McLennan/Bahen Centre Chilled Water System Upgrade (2000 ton Bahen Chiller Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$2,600,000	$60,060	$2,660,060
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$2,660,060
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$60,000	$1,386	$61,386
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$91,000	$0	$91,000
	Total Professional fees				$152,386
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$2,842,908
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$260,000	$6,006	$266,006
	Total Project Contingency				$266,006
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$3,108,914

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Warren Stevens Chilled Water System Upgrade (XXXXXXX Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$1,000,000	$23,100	$1,023,100
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$1,023,100
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$45,000	$1,040	$46,040
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$35,000	$0	$35,000
	Total Professional fees				$81,040
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$1,134,602
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$100,000	$2,310	$102,310
	Total Project Contingency				$102,310
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$1,236,912

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Earth Sciences Centre Chilled Water System Upgrade (XXXXXXX Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$1,200,000	$27,720	$1,227,720
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$1,227,720
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$50,000	$1,155	$51,155
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$42,000	$0	$42,000
	Total Professional fees				$93,155
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$1,351,337
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$120,000	$2,772	$122,772
	Total Project Contingency				$122,772
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$1,474,109

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Bora Laskin Chilled Water System Upgrade (200 Ton System Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$430,000	$9,933	$439,933
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$439,933
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$40,000	$924	$40,924
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$15,050	$0	$15,050
	Total Professional fees				$55,974
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$526,369
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$43,000	$993	$43,993
	Total Project Contingency				$43,993
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$570,362

Prepared by: Recommended by: Approved by:

Date: Date: Date:

PROJECT COST ESTIMATE **PROJECT: Dentistry Building Chilled Water System Upgrade (xxxx Option)**

PROJECT MGR: **U OF T PROJECT NO:**

NO	ITEM	REMARKS	BASE COST	GST(2.31%)	COST
CONSTRUCTION					
835730	Main contract		$795,838	$18,384	$814,222
835752	Other contract		$0	$0	$0
835754	Secondary effects		$0	$0	$0
835757	Construction Contingency		$0	$0	$0
835762	Hazardous materials removal		$0	$0	$0
835765	Demolition		$0	$0	$0
835768	Site preparation		$0	$0	$0
	Total Construction				$814,222
LANDSCAPING					
835755	Landscaping		$0	$0	$0
	Total Landscaping				$0
PERMITS, INSURANCE					
835400	Permits		$0	$0	$0
836700	Insurance		$0	$0	$0
	Total Permits, Insurance				$0
PROFESSIONAL FEES					
835200	Consultants: -Architects, Engineers		$45,000	$1,040	$46,040
835201	Consultants - disbursements		$0	$0	$0
835204	Construction management fees		$0	$0	$0
835206	Other consultants		$0	$0	$0
835210	Legal fees		$0	$0	$0
835720	Design fees-In House		$0	$0	$0
835721	External Project Manager		$0	$0	$0
835725	Management fees-Capital Project	3.5% Project Management fee	$27,854	$0	$27,854
	Total Professional fees				$73,894
SERVICES TO SITE					
835700	Site services & infrastructure		$0	$0	$0
	Total Site Services				$0
COMPUTER WIRING AND TELEPHONES					
821110	Computer infrastructure		$0	$0	$0
835010	Telephone		$0	$0	$0
	Total Computer Wiring & Telephones				$0
MOVING AND STAGING					
837100	Moving		$0	$0	$0
837101	Staging		$0	$0	$0
	Total Moving and Staging				$0
FURNISHINGS AND EQUIPMENT					
820010	Furnishings		$0	$0	$0
821010	Equipment		$0	$0	$0
821510	AV for classrooms		$0	$0	$0
821610	Scientific Equipment	GST is not applicable	$0	$0	$0
	Total Furnishings and Equipment				$0
OTHER					
820011	Signage-Interior		$0	$0	$0
821325	Security & Access systems		$0	$0	$0
835070	Courier, misc.		$0	$0	$0
835756	Signage-Exterior		$0	$0	$0
835764	Client Construction expenses	Not-in-contract expenses	$20,000	$462	$20,462
835766	Ceremonies	Ground breaking, Top off, Grand opening	$0	$0	$0
835900	Advertising		$0	$0	$0
836430	Donor recognition		$0	$0	$0
890670	U of T Trades	$10,000 per chiller project	$10,000	$0	$10,000
	Total Other				$30,462
		SUB TOTAL			$918,578
PROJECT CONTINGENCY					
835758	Project Contingency	10%	$79,584	$1,838	$81,422
	Total Project Contingency				$81,422
FINANCE COSTS					
835300	Finance Costs		$0	$0	$0
	Total Finance Costs				$0
		TOTAL PROJECT COST:			$1,000,000

Prepared by: Recommended by: Approved by:

Date: Date: Date:

Appendix C: Financial forecasts for three cases

January 5, 2005

T-8 Lighting Retrofit and Chiller Replacement Financial Projection - BASE CASE

Loan Amount	**10,484,387**	18,285,870	Total Capital Cost
Annual Interest Rate	8.0%	923,844	Total T-Bill Financing Charges
Loan Period in Years	15	(3,049,086)	Energy Savings Years 1 - 3
Number of Payments	180	(5,676,241)	Total Funding and Grants
Monthly Payment	100,194	**10,484,387**	**Total Loan Amount**
Annual Payment	1,202,331		
Total Interest	7,550,580		
Total Cost of Loan	18,034,967		

	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014	10 2015	11 2016	12 2017	13 2018	14 2019	15 2020	16 2021	17 2022	18 2023	19 2024	20 2025	21 2026	22 2027	23 2028	24 2029	25 2030	26 2031	27 2032	28 2033
Electricity Rate Inflation	-	20.2%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
SOURCES and ENERGY SAVINGS																												
Funding and Grants																												
FRP Contribution	2,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
City of Toronto BBP Loan Contribution 3	2,742,881	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toronto Hydro Funding Grant 1	341,680	-	341,680	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NRCan Funding Incentive 1	125,000	-	125,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Funding and Grants	**5,209,561**	**-**	**466,680**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy Cost Savings																												
Annual T-8 Lighting Retrofit Energy Savings kWh	-	-	-	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,262	8,922,262	8,922,262	8,922,262
Annual Chilled Water Upgrade Energy Savings kWh	-	-	-	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000
Total Energy Savings kWh 2	**-**	**-**	**-**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,262**	**11,976,262**	**11,976,262**	**11,976,262**
Forecasted Average CED Rate $/kWh	0.087	0.104	0.107	0.109	0.111	0.113	0.115	0.118	0.120	0.122	0.125	0.127	0.130	0.133	0.135	0.138	0.141	0.143	0.146	0.149	0.152	0.155	0.158	0.162	0.165	0.168	0.171	0.175
Annual T-8 Lighting Retrofit Energy Cost Savings	-	-	-	969,881	989,279	1,009,064	1,029,246	1,049,830	1,070,827	1,092,244	1,114,088	1,136,370	1,159,098	1,182,280	1,205,925	1,230,044	1,254,645	1,279,737	1,305,332	1,331,439	1,358,068	1,385,229	1,412,934	1,441,192	1,470,016	1,499,417	1,529,405	1,559,993
Annual Chilled Water Upgrade Energy Cost Savings	-	-	-	331,981	338,620	345,393	352,300	359,346	366,533	373,864	381,341	388,968	396,747	404,682	412,776	421,032	429,452	438,041	446,802	455,738	464,853	474,150	483,633	493,306	503,172	513,235	523,500	533,970
Total Energy Cost Savings	**-**	**-**	**-**	**1,301,862**	**1,327,899**	**1,354,457**	**1,381,546**	**1,409,177**	**1,437,360**	**1,466,108**	**1,495,430**	**1,525,338**	**1,555,845**	**1,586,962**	**1,618,701**	**1,651,075**	**1,684,097**	**1,717,779**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
TOTAL SOURCES AND ENERGY SAVINGS	**5,209,561**	**-**	**466,680**	**1,301,862**	**1,327,899**	**1,354,457**	**1,381,546**	**1,409,177**	**1,437,360**	**1,466,108**	**1,495,430**	**1,525,338**	**1,555,845**	**1,586,962**	**1,618,701**	**1,651,075**	**1,684,097**	**1,717,779**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
EXPENSES																												
Annual Loan Payments																												
Annual Principal	-	-	-	377,212	408,521	442,428	479,149	518,918	561,988	608,633	659,149	713,858	773,108	837,275	906,769	982,030	1,063,538	1,151,811	-	-	-	-	-	-	-	-	-	-
Annual Interest	-	-	-	825,119	793,811	759,903	723,182	683,413	640,343	593,698	543,182	488,473	429,223	365,056	295,562	220,301	138,793	50,520	-	-	-	-	-	-	-	-	-	-
Total Annual Internal Loan Payment	**-**	**-**	**-**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Annual City of Toronto BBP Loan Payment 3	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	-	-	-	-	-	-	-	-	-	-	-	-	-					
TOTAL ANNUAL LOAN PAYMENT	**274,288**	**274,288**	**274,288**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
T-8 Lighting Retrofit Capital Costs																												
Robarts T-8	2,307,951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medical Sciences T-8	1,230,903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OISE T-8	-	825,536	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal T-8 Capital Costs	**3,538,854**	**825,536**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Chilled Water Systems Capital Costs																												
OISE Chiller Replacement	1,716,517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RWright / Ssmith Interconnect	-	3,601,649	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NWCP Chiller Replacements	-	1,909,263	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lmiller / Physics to BCIT New Chiller/Interconnect	-	2,412,668	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W. Stevens Chiller Replacement	-	-	1,236,912	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ESC Chiller Replacement	-	-	1,474,109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bora Laskin Chiller Replacement	-	-	570,362																									
Dentistry	-	-	1,000,000																									
Subtotal Chilled Water Capital Costs	**1,716,517**	**7,923,580**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL CAPITAL COSTS	**5,255,371**	**8,749,116**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL EXPENSES	**5,529,659**	**9,023,404**	**4,555,671**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CASHFLOW	**(320,099)**	**(9,023,404)**	**(4,088,991)**	**(174,758)**	**(148,720)**	**(122,162)**	**(95,073)**	**(67,442)**	**(39,259)**	**(10,512)**	**293,099**	**323,007**	**353,514**	**384,631**	**416,370**	**448,744**	**481,766**	**515,448**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
Cumulative Cashflow	**(320,099)**	**(9,343,503)**	**(13,432,494)**	**(174,758)**	**(323,478)**	**(445,641)**	**(540,714)**	**(608,156)**	**(647,415)**	**(657,927)**	**(364,828)**	**(41,821)**	**311,693**	**696,324**	**1,112,694**	**1,561,438**	**2,043,203**	**2,558,651**	**4,310,785**	**6,097,962**	**7,920,883**	**9,780,261**	**11,676,828**	**13,611,326**	**15,584,513**	**17,597,165**	**19,650,070**	**21,744,033**
T-Bill Financing Charges @ 4.0%	**12,804**	**373,740**	**537,300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

TOTAL PROJECTS IRR	**7.52%**	Note 4
TOTAL PROJECTS NPV	**-675,124**	Note 4
T-8 PROJECTS IRR	**24.19%**	Note 4
T-8 PROJECTS NPV	**6,997,770**	Note 4
CHILLER PROJECTS IRR	**-1.27%**	Note 4
CHILLER PROJECTS NPV	**-7,672,894**	Note 4

NOTE 1:
Toronto Hydro Funding Grant and NRCan Incentive Funding based on 50% funded at project completion and 50% after verified results.

NOTE 2:
Annual energy savings based on revised October implementation project schedule.

NOTE 3:
BBP Loan Repayment based on 15% of total project cost repaid over 10 years with no interest.

NOTE 4:
All IRR and NPV calculations based on first year 2006 going forward for 25 years. Cashflow includes non-return funding grants, FRP and electrical cost savings. In the case for the T-8 and Chiller Projects, the non-return funding for each project is prorated by capital cost.

Annual T-8 Lighting Retrofit Energy Savings kWh	6,850,466	8,922,261	8,922,261
Annual Chilled Water Upgrade Energy Savings kWh	360,000	2,046,000	3,054,000
Total Energy Savings kWh 2	**7,210,466**	**10,968,261**	**11,976,261**
Forecasted Average CED Rate $/kWh	0.087	0.104	0.107
Annual T-8 Lighting Retrofit Energy Cost Savings	595,469	932,219	950,864
Annual Chilled Water Upgrade Energy Cost Savings	31,293	213,771	325,471
Total Energy Cost Savings	**626,761**	**1,145,990**	**1,276,335**
Cumulative Energy Cost Savings	**626,761**	**1,772,752**	**3,049,086**

January 5, 2005

T-8 Lighting Retrofit and Chiller Replacement Financial Projection - CASE #1

Loan Amount	**14,564,442**	18,285,870	Total Capital Cost
Annual Interest Rate	8.0%	1,327,658	Total T-Bill Financing Charges
Loan Period in Years	15	(3,049,086)	Energy Savings Years 1 - 3
Number of Payments	180	(2,000,000)	Total Funding and Grants
Monthly Payment	100,194	**14,564,442**	**Total Loan Amount**
Annual Payment	1,202,331		
Total Interest	7,550,580		
Total Cost of Loan	18,034,967		

	1 2006	2 2007	3 2008	4 2009	5 2010	6 2011	7 2012	8 2013	9 2014	10 2015	11 2016	12 2017	13 2018	14 2019	15 2020	16 2021	17 2022	18 2023	19 2024	20 2025	21 2026	22 2027	23 2028	24 2029	25 2030	26 2031	27 2032	28 2033
Electricity Rate Inflation	-	20.2%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
SOURCES and ENERGY SAVINGS																												
Funding and Grants																												
FRP Contribution	2,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
City of Toronto BBP Loan Contribution 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toronto Hydro Funding Grant 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NRCan Funding Incentive 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Funding and Grants	**2,000,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy Cost Savings																												
Annual T-8 Lighting Retrofit Energy Savings kWh	-	-	-	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,262	8,922,262	8,922,262	8,922,262
Annual Chilled Water Upgrade Energy Savings kWh	-	-	-	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000
Total Energy Savings kWh 2	**-**	**-**	**-**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,262**	**11,976,262**	**11,976,262**	**11,976,262**
Forecasted Average CED Rate $/kWh	0.087	0.104	0.107	0.109	0.111	0.113	0.115	0.118	0.120	0.122	0.125	0.127	0.130	0.133	0.135	0.138	0.141	0.143	0.146	0.149	0.152	0.155	0.158	0.162	0.165	0.168	0.171	0.175
Annual T-8 Lighting Retrofit Energy Cost Savings	-	-	-	969,881	989,279	1,009,064	1,029,246	1,049,830	1,070,827	1,092,244	1,114,088	1,136,370	1,159,098	1,182,280	1,205,925	1,230,044	1,254,645	1,279,737	1,305,332	1,331,439	1,358,068	1,385,229	1,412,934	1,441,192	1,470,016	1,499,417	1,529,405	1,559,993
Annual Chilled Water Upgrade Energy Cost Savings	-	-	-	331,981	338,620	345,393	352,300	359,346	366,533	373,864	381,341	388,968	396,747	404,682	412,776	421,032	429,452	438,041	446,802	455,738	464,853	474,150	483,633	493,306	503,172	513,235	523,500	533,970
Total Energy Cost Savings	**-**	**-**	**-**	**1,301,862**	**1,327,899**	**1,354,457**	**1,381,546**	**1,409,177**	**1,437,360**	**1,466,108**	**1,495,430**	**1,525,338**	**1,555,845**	**1,586,962**	**1,618,701**	**1,651,075**	**1,684,097**	**1,717,779**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
TOTAL SOURCES AND ENERGY SAVINGS	**2,000,000**	**-**	**-**	**1,301,862**	**1,327,899**	**1,354,457**	**1,381,546**	**1,409,177**	**1,437,360**	**1,466,108**	**1,495,430**	**1,525,338**	**1,555,845**	**1,586,962**	**1,618,701**	**1,651,075**	**1,684,097**	**1,717,779**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
EXPENSES																												
Annual Loan Payments																												
Annual Principal	-	-	-	377,212	408,521	442,428	479,149	518,918	561,988	608,633	659,149	713,858	773,108	837,275	906,769	982,030	1,063,538	1,151,811	-	-	-	-	-	-	-	-	-	-
Annual Interest	-	-	-	825,119	793,811	759,903	723,182	683,413	640,343	593,698	543,182	488,473	429,223	365,056	295,562	220,301	138,793	50,520	-	-	-	-	-	-	-	-	-	-
Total Annual Internal Loan Payment	**-**	**-**	**-**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Annual City of Toronto BBP Loan Payment 3	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	-	-	-	-	-	-	-	-	-	-	-	-	-					
TOTAL ANNUAL LOAN PAYMENT	**274,288**	**274,288**	**274,288**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
T-8 Lighting Retrofit Capital Costs																												
Robarts T-8	2,307,951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medical Sciences T-8	1,230,903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OISE T-8	-	825,536	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal T-8 Capital Costs	**3,538,854**	**825,536**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Chilled Water Systems Capital Costs																												
OISE Chiller Replacement	1,716,517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RWright / Ssmith Interconnect	-	3,601,649	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NWCP Chiller Replacements	-	1,909,263	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lmiller / Physics to BCIT New Chiller/Interconnect	-	2,412,668	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W. Stevens Chiller Replacement	-	-	1,236,912	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ESC Chiller Replacement	-	-	1,474,109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bora Laskin Chiller Replacement	-	-	570,362																									
Dentistry	-	-	1,000,000																									
Subtotal Chilled Water Capital Costs	1,716,517	**7,923,580**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL CAPITAL COSTS	**5,255,371**	**8,749,116**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL EXPENSES	**5,529,659**	**9,023,404**	**4,555,671**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CASHFLOW	**(3,529,659)**	**(9,023,404)**	**(4,555,671)**	**(174,758)**	**(148,720)**	**(122,162)**	**(95,073)**	**(67,442)**	**(39,259)**	**(10,512)**	**293,099**	**323,007**	**353,514**	**384,631**	**416,370**	**448,744**	**481,766**	**515,448**	**1,752,134**	**1,787,177**	**1,822,920**	**1,859,379**	**1,896,566**	**1,934,498**	**1,973,188**	**2,012,652**	**2,052,905**	**2,093,963**
Cumulative Cashflow	**(3,529,659)**	**(12,553,063)**	**(17,108,734)**	**(174,758)**	**(323,478)**	**(445,641)**	**(540,714)**	**(608,156)**	**(647,415)**	**(657,927)**	**(364,828)**	**(41,821)**	**311,693**	**696,324**	**1,112,694**	**1,561,438**	**2,043,203**	**2,558,651**	**4,310,785**	**6,097,962**	**7,920,883**	**9,780,261**	**11,676,828**	**13,611,326**	**15,584,513**	**17,597,165**	**19,650,070**	**21,744,033**
T-Bill Financing Charges @ 4.0%	**141,186**	**502,123**	**684,349**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

TOTAL PROJECTS IRR	**7.03%**	Note 4
TOTAL PROJECTS NPV	**-1,418,251**	Note 4
T-8 PROJECTS IRR	**23.39%**	Note 4
T-8 PROJECTS NPV	**6,820,404**	Note 4
CHILLER PROJECTS IRR	**-1.66%**	Note 4
CHILLER PROJECTS NPV	**-8,238,654**	Note 4

NOTE 1:
Toronto Hydro Funding Grant and NRCan Incentive Funding based on 50% funded at project completion and 50% after verified results.

NOTE 2:
Annual energy savings based on revised October implementation project schedule.

NOTE 3:
BBP Loan Repayment based on 15% of total project cost repaid over 10 years with no interest.

NOTE 4:
All IRR and NPV calculations based on first year 2006 going forward for 25 years. Cashflow includes non-return funding grants, FRP and electrical cost savings. In the case for the T-8 and Chiller Projects, the non-return funding for each project is prorated by capital cost.

Annual T-8 Lighting Retrofit Energy Savings kWh	6,850,466	8,922,261	8,922,261
Annual Chilled Water Upgrade Energy Savings kWh	360,000	2,046,000	3,054,000
Total Energy Savings kWh 2	**7,210,466**	**10,968,261**	**11,976,261**
Forecasted Average CED Rate $/kWh	0.087	0.104	0.107
Annual T-8 Lighting Retrofit Energy Cost Savings	595,469	932,219	950,864
Annual Chilled Water Upgrade Energy Cost Savings	31,293	213,771	325,471
Total Energy Cost Savings	**626,761**	**1,145,990**	**1,276,335**
Cumulative Energy Cost Savings	**626,761**	**1,772,752**	**3,049,086**

January 5, 2005

T-8 Lighting Retrofit and Chiller Replacement Financial Projection - CASE #2

Loan Amount	**10,851,162**	18,285,870	Total Capital Cost
Annual Interest Rate	8.0%	923,844	Total T-Bill Financing Charges
Loan Period in Years	15	(2,682,312)	Energy Savings Years 1 - 3
Number of Payments	180	(5,676,241)	Total Funding and Grants
Monthly Payment	100,194	**10,851,162**	**Total Loan Amount**
Annual Payment	1,202,331		
Total Interest	7,550,580		
Total Cost of Loan	18,034,967		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
Electricity Rate Inflation	-	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
SOURCES and ENERGY SAVINGS																												
Funding and Grants																												
FRP Contribution	2,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
City of Toronto BBP Loan Contribution 3	2,742,881	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toronto Hydro Funding Grant 1	341,680	-	341,680	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NRCan Funding Incentive 1	125,000	-	125,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Funding and Grants	**5,209,561**	**-**	**466,680**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy Cost Savings																												
Annual T-8 Lighting Retrofit Energy Savings kWh	-	-	-	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,261	8,922,262	8,922,262	8,922,262	8,922,262
Annual Chilled Water Upgrade Energy Savings kWh	-	-	-	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000	3,054,000
Total Energy Savings kWh 2	**-**	**-**	**-**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,261**	**11,976,262**	**11,976,262**	**11,976,262**	**11,976,262**
Forecasted Average CED Rate $/kWh	0.087	0.089	0.090	0.092	0.094	0.096	0.098	0.100	0.102	0.104	0.106	0.108	0.110	0.112	0.115	0.117	0.119	0.122	0.124	0.127	0.129	0.132	0.134	0.137	0.140	0.143	0.145	0.148
Annual T-8 Lighting Retrofit Energy Cost Savings	-	-	-	823,027	839,488	856,277	873,403	890,871	908,689	926,862	945,400	964,308	983,594	1,003,266	1,023,331	1,043,797	1,064,673	1,085,967	1,107,686	1,129,840	1,152,437	1,175,485	1,198,995	1,222,975	1,247,435	1,272,383	1,297,831	1,323,788
Annual Chilled Water Upgrade Energy Cost Savings	-	-	-	281,714	287,348	293,095	298,957	304,936	311,035	317,256	323,601	330,073	336,674	343,408	350,276	357,281	364,427	371,716	379,150	386,733	394,467	402,357	410,404	418,612	426,984	435,524	444,234	453,119
Total Energy Cost Savings	**-**	**-**	**-**	**1,104,741**	**1,126,836**	**1,149,373**	**1,172,360**	**1,195,807**	**1,219,723**	**1,244,118**	**1,269,000**	**1,294,380**	**1,320,268**	**1,346,673**	**1,373,607**	**1,401,079**	**1,429,100**	**1,457,682**	**1,486,836**	**1,516,573**	**1,546,904**	**1,577,842**	**1,609,399**	**1,641,587**	**1,674,419**	**1,707,907**	**1,742,066**	**1,776,907**
TOTAL SOURCES AND ENERGY SAVINGS	**5,209,561**	**-**	**466,680**	**1,104,741**	**1,126,836**	**1,149,373**	**1,172,360**	**1,195,807**	**1,219,723**	**1,244,118**	**1,269,000**	**1,294,380**	**1,320,268**	**1,346,673**	**1,373,607**	**1,401,079**	**1,429,100**	**1,457,682**	**1,486,836**	**1,516,573**	**1,546,904**	**1,577,842**	**1,609,399**	**1,641,587**	**1,674,419**	**1,707,907**	**1,742,066**	**1,776,907**
EXPENSES																												
Annual Loan Payments																												
Annual Principal	-	-	-	377,212	408,521	442,428	479,149	518,918	561,988	608,633	659,149	713,858	773,108	837,275	906,769	982,030	1,063,538	1,151,811	-	-	-	-	-	-	-	-	-	-
Annual Interest	-	-	-	825,119	793,811	759,903	723,182	683,413	640,343	593,698	543,182	488,473	429,223	365,056	295,562	220,301	138,793	50,520	-	-	-	-	-	-	-	-	-	-
Total Annual Internal Loan Payment	**-**	**-**	**-**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Annual City of Toronto BBP Loan Payment 3	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	274,288	-	-	-	-	-	-	-	-	-	-	-	-	-					
TOTAL ANNUAL LOAN PAYMENT	**274,288**	**274,288**	**274,288**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
T-8 Lighting Retrofit Capital Costs																												
Robarts T-8	2,307,951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medical Sciences T-8	1,230,903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OISE T-8	-	825,536	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal T-8 Capital Costs	**3,538,854**	**825,536**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Chilled Water Systems Capital Costs																												
OISE Chiller Replacement	1,716,517	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RWright / Ssmith Interconnect	-	3,601,649	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NWCP Chiller Replacements	-	1,909,263	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lmiller / Physics to BCIT New Chiller/Interconnect	-	2,412,668	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W. Stevens Chiller Replacement	-	-	1,236,912	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ESC Chiller Replacement	-	-	1,474,109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bora Laskin Chiller Replacement	-	-	570,362																									
Dentistry	-	-	1,000,000																									
Subtotal Chilled Water Capital Costs	1,716,517	**7,923,580**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL CAPITAL COSTS	**5,255,371**	**8,749,116**	**4,281,383**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL EXPENSES	**5,529,659**	**9,023,404**	**4,555,671**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,476,619**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**1,202,331**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CASHFLOW	**(320,099)**	**(9,023,404)**	**(4,088,991)**	**(371,878)**	**(349,783)**	**(327,247)**	**(304,259)**	**(280,812)**	**(256,896)**	**(232,501)**	**66,669**	**92,049**	**117,937**	**144,342**	**171,276**	**198,748**	**226,769**	**255,351**	**1,486,836**	**1,516,573**	**1,546,904**	**1,577,842**	**1,609,399**	**1,641,587**	**1,674,419**	**1,707,907**	**1,742,066**	**1,776,907**
Cumulative Cashflow	**(320,099)**	**(9,343,503)**	**(13,432,494)**	**(371,878)**	**(721,661)**	**(1,048,908)**	**(1,353,167)**	**(1,633,979)**	**(1,890,875)**	**(2,123,376)**	**(2,056,707)**	**(1,964,658)**	**(1,846,721)**	**(1,702,379)**	**(1,531,104)**	**(1,332,356)**	**(1,105,587)**	**(850,235)**	**636,601**	**2,153,173**	**3,700,078**	**5,277,920**	**6,887,319**	**8,528,906**	**10,203,325**	**11,911,232**	**13,653,298**	**15,430,205**
T-Bill Financing Charges @ 4.0%	**12,804**	**373,740**	**537,300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

TOTAL PROJECTS IRR	**6.02%**	Note 4
TOTAL PROJECTS NPV	**-2,683,042**	Note 4
T-8 PROJECTS IRR	**21.30%**	Note 4
T-8 PROJECTS NPV	**5,492,449**	Note 4
CHILLER PROJECTS IRR	**-2.30%**	Note 4
CHILLER PROJECTS NPV	**-8,175,491**	Note 4

NOTE 1:
Toronto Hydro Funding Grant and NRCan Incentive Funding based on 50% funded at project completion and 50% after verified results.

NOTE 2:
Annual energy savings based on revised October implementation project schedule.

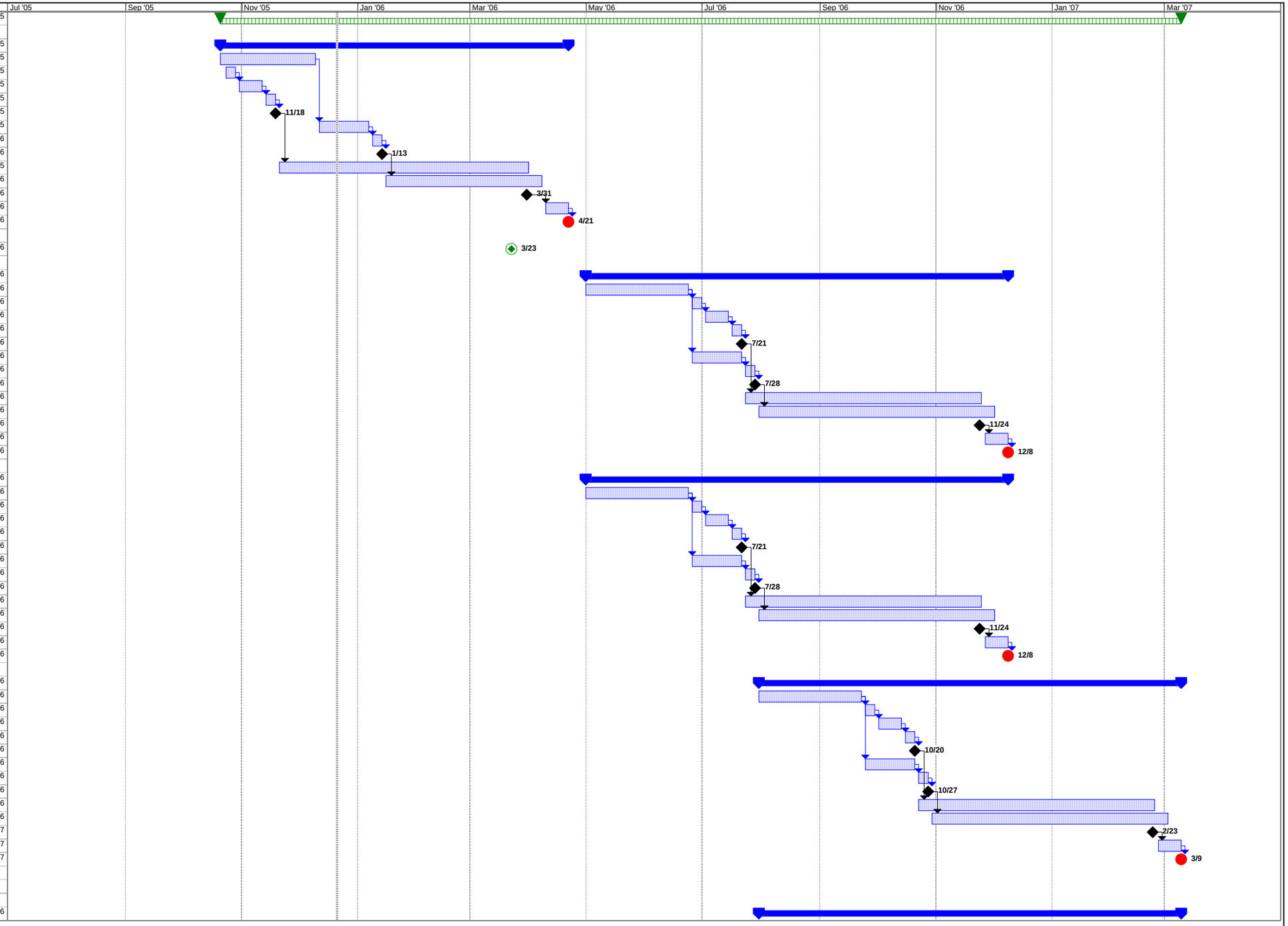
NOTE 3:
BBP Loan Repayment based on 15% of total project cost repaid over 10 years with no interest.

NOTE 4:
All IRR and NPV calculations based on first year 2006 going forward for 25 years. Cashflow includes non-return funding grants, FRP and electrical cost savings. In the case for the T-8 and Chiller Projects, the non-return funding for each project is prorated by capital cost.

Annual T-8 Lighting Retrofit Energy Savings kWh	6,850,466	8,922,261	8,922,261
Annual Chilled Water Upgrade Energy Savings kWh	360,000	2,046,000	3,054,000
Total Energy Savings kWh 2	**7,210,466**	**10,968,261**	**11,976,261**
Forecasted Average CED Rate $/kWh	0.087	0.089	0.090
Annual T-8 Lighting Retrofit Energy Cost Savings	595,469	791,068	806,889
Annual Chilled Water Upgrade Energy Cost Savings	31,293	181,403	276,190
Total Energy Cost Savings	**626,761**	**972,471**	**1,083,079**
Cumulative Energy Cost Savings	**626,761**	**1,599,232**	**2,682,312**

Appendix D: Project work plan

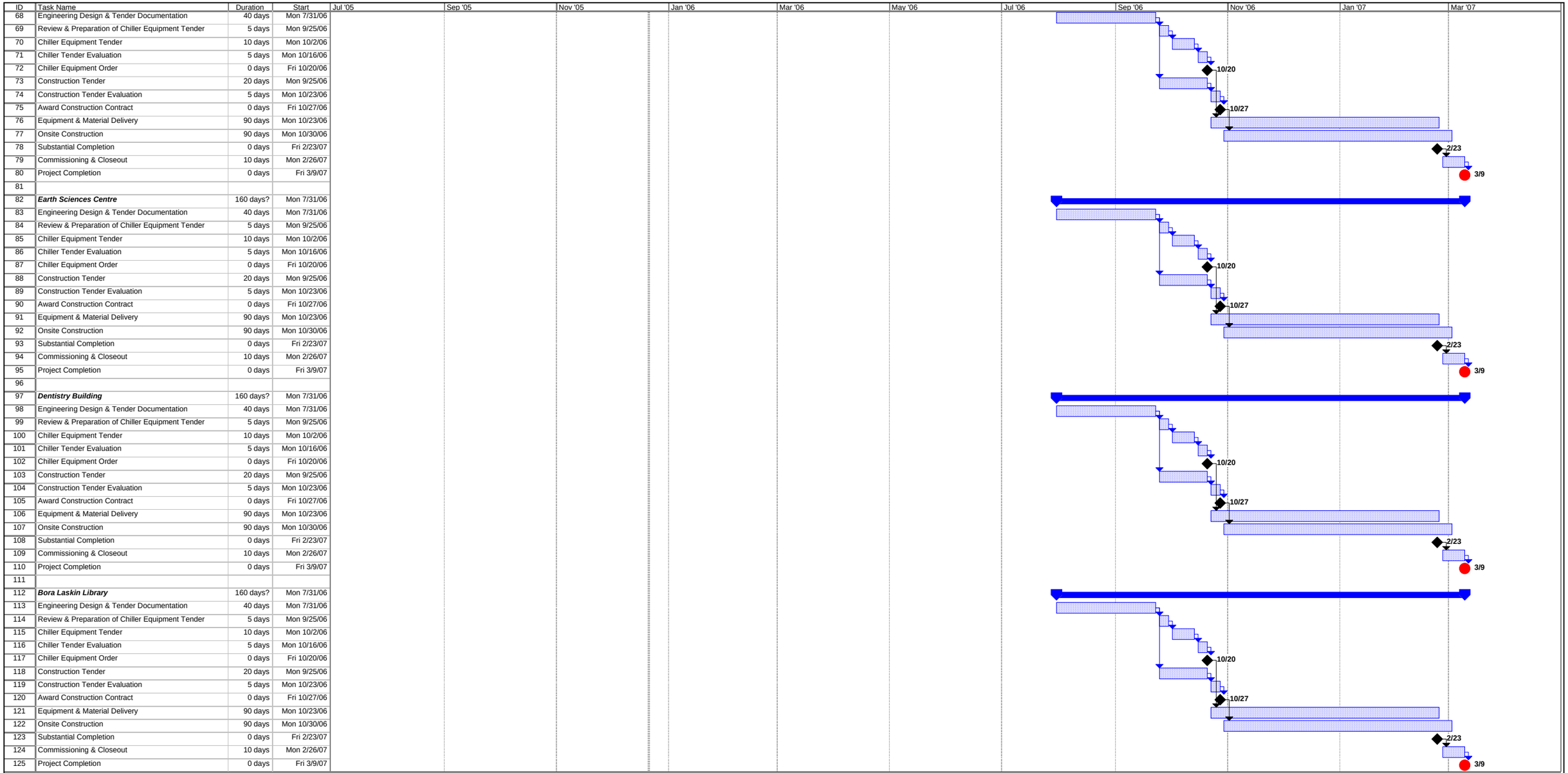
ID	Task Name	Duration	Start
1	**CHILLER PROJECT IMPLEMENTATION**	361 days?	Fri 10/21/05
2			
3	***OISE***	131 days	Fri 10/21/05
4	Engineering Design & Tender Documentation	36 days	Fri 10/21/05
5	Review & Preparation of Chiller Equipment Tender	5 days	Mon 10/24/05
6	Chiller Equipment Tender	10 days	Mon 10/31/05
7	Chiller Tender Evaluation	5 days	Mon 11/14/05
8	Chiller Equipment Order	0 days	Fri 11/18/05
9	Construction Tender	20 days	Mon 12/12/05
10	Construction Tender Evaluation	5 days	Mon 1/9/06
11	Award Construction Contract	0 days	Fri 1/13/06
12	Equipment & Material Delivery	95 days	Mon 11/21/05
13	Onsite Construction (Areawell by Mid-March 06)	60 days	Mon 1/16/06
14	Substantial Completion	0 days	Fri 3/31/06
15	Commissioning & Closeout	10 days	Mon 4/10/06
16	Project Completion	0 days	Fri 4/21/06
17			
18	***University Governing Council Approval***	0 days	Thu 3/23/06
19			
20	***Ramsay Wright/Sidney Smith***	160 days?	Mon 5/1/06
21	Engineering Design & Tender Documentation	40 days	Mon 5/1/06
22	Review & Preparation of Chiller Equipment Tender	5 days	Mon 6/26/06
23	Chiller Equipment Tender	10 days	Mon 7/3/06
24	Chiller Tender Evaluation	5 days	Mon 7/17/06
25	Chiller Equipment Order	0 days	Fri 7/21/06
26	Construction Tender	20 days	Mon 6/26/06
27	Construction Tender Evaluation	5 days	Mon 7/24/06
28	Award Construction Contract	0 days	Fri 7/28/06
29	Equipment & Material Delivery	90 days	Mon 7/24/06
30	Onsite Construction	90 days	Mon 7/31/06
31	Substantial Completion	0 days	Fri 11/24/06
32	Commissioning & Closeout	10 days	Mon 11/27/06
33	Project Completion	0 days	Fri 12/8/06
34			
35	***Lash Miller/McLennan/Bahen***	160 days?	Mon 5/1/06
36	Engineering Design & Tender Documentation	40 days	Mon 5/1/06
37	Review & Preparation of Chiller Equipment Tender	5 days	Mon 6/26/06
38	Chiller Equipment Tender	10 days	Mon 7/3/06
39	Chiller Tender Evaluation	5 days	Mon 7/17/06
40	Chiller Equipment Order	0 days	Fri 7/21/06
41	Construction Tender	20 days	Mon 6/26/06
42	Construction Tender Evaluation	5 days	Mon 7/24/06
43	Award Construction Contract	0 days	Fri 7/28/06
44	Equipment & Material Delivery	90 days	Mon 7/24/06
45	Onsite Construction	90 days	Mon 7/31/06
46	Substantial Completion	0 days	Fri 11/24/06
47	Commissioning & Closeout	10 days	Mon 11/27/06
48	Project Completion	0 days	Fri 12/8/06
49			
50	***Northwest Chiller Plant***	160 days?	Mon 7/31/06
51	Engineering Design & Tender Documentation	40 days	Mon 7/31/06
52	Review & Preparation of Chiller Equipment Tender	5 days	Mon 9/25/06
53	Chiller Equipment Tender	10 days	Mon 10/2/06
54	Chiller Tender Evaluation	5 days	Mon 10/16/06
55	Chiller Equipment Order	0 days	Fri 10/20/06
56	Construction Tender	20 days	Mon 9/25/06
57	Construction Tender Evaluation	5 days	Mon 10/23/06
58	Award Construction Contract	0 days	Fri 10/27/06
59	Equipment & Material Delivery	90 days	Mon 10/23/06
60	Onsite Construction	90 days	Mon 10/30/06
61	Substantial Completion	0 days	Fri 2/23/07
62	Commissioning & Closeout	10 days	Mon 2/26/07
63	Project Completion	0 days	Fri 3/9/07
64			
65			
66			
67	***Warren Stevens***	160 days?	Mon 7/31/06



Project: Business Board Chiller Projec
Date: Wed 12/21/05

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

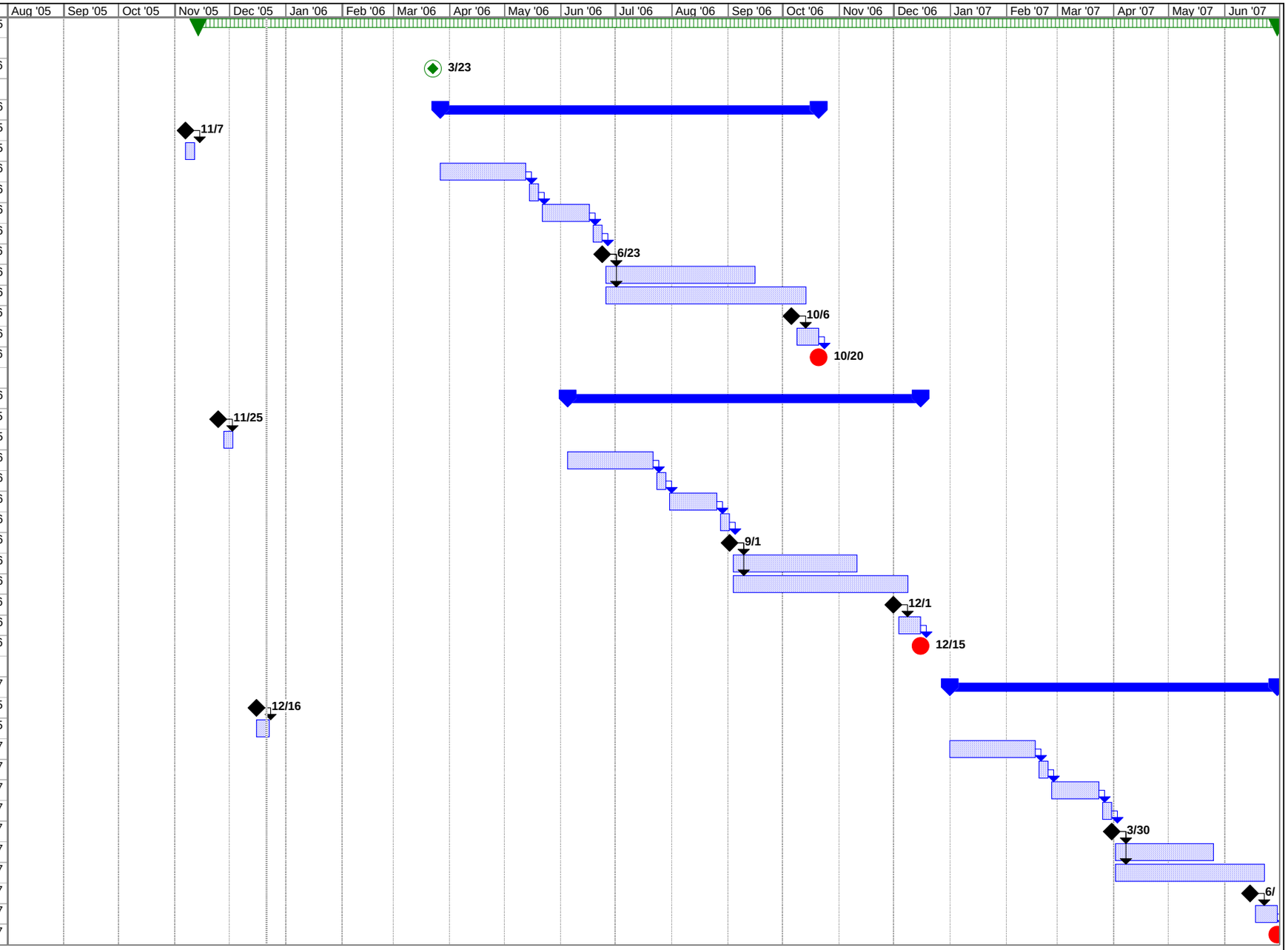
ID	Task Name	Duration	Start
68	Engineering Design & Tender Documentation	40 days	Mon 7/31/06
69	Review & Preparation of Chiller Equipment Tender	5 days	Mon 9/25/06
70	Chiller Equipment Tender	10 days	Mon 10/2/06
71	Chiller Tender Evaluation	5 days	Mon 10/16/06
72	Chiller Equipment Order	0 days	Fri 10/20/06
73	Construction Tender	20 days	Mon 9/25/06
74	Construction Tender Evaluation	5 days	Mon 10/23/06
75	Award Construction Contract	0 days	Fri 10/27/06
76	Equipment & Material Delivery	90 days	Mon 10/23/06
77	Onsite Construction	90 days	Mon 10/30/06
78	Substantial Completion	0 days	Fri 2/23/07
79	Commissioning & Closeout	10 days	Mon 2/26/07
80	Project Completion	0 days	Fri 3/9/07
81			
82	***Earth Sciences Centre***	160 days?	Mon 7/31/06
83	Engineering Design & Tender Documentation	40 days	Mon 7/31/06
84	Review & Preparation of Chiller Equipment Tender	5 days	Mon 9/25/06
85	Chiller Equipment Tender	10 days	Mon 10/2/06
86	Chiller Tender Evaluation	5 days	Mon 10/16/06
87	Chiller Equipment Order	0 days	Fri 10/20/06
88	Construction Tender	20 days	Mon 9/25/06
89	Construction Tender Evaluation	5 days	Mon 10/23/06
90	Award Construction Contract	0 days	Fri 10/27/06
91	Equipment & Material Delivery	90 days	Mon 10/23/06
92	Onsite Construction	90 days	Mon 10/30/06
93	Substantial Completion	0 days	Fri 2/23/07
94	Commissioning & Closeout	10 days	Mon 2/26/07
95	Project Completion	0 days	Fri 3/9/07
96			
97	***Dentistry Building***	160 days?	Mon 7/31/06
98	Engineering Design & Tender Documentation	40 days	Mon 7/31/06
99	Review & Preparation of Chiller Equipment Tender	5 days	Mon 9/25/06
100	Chiller Equipment Tender	10 days	Mon 10/2/06
101	Chiller Tender Evaluation	5 days	Mon 10/16/06
102	Chiller Equipment Order	0 days	Fri 10/20/06
103	Construction Tender	20 days	Mon 9/25/06
104	Construction Tender Evaluation	5 days	Mon 10/23/06
105	Award Construction Contract	0 days	Fri 10/27/06
106	Equipment & Material Delivery	90 days	Mon 10/23/06
107	Onsite Construction	90 days	Mon 10/30/06
108	Substantial Completion	0 days	Fri 2/23/07
109	Commissioning & Closeout	10 days	Mon 2/26/07
110	Project Completion	0 days	Fri 3/9/07
111			
112	***Bora Laskin Library***	160 days?	Mon 7/31/06
113	Engineering Design & Tender Documentation	40 days	Mon 7/31/06
114	Review & Preparation of Chiller Equipment Tender	5 days	Mon 9/25/06
115	Chiller Equipment Tender	10 days	Mon 10/2/06
116	Chiller Tender Evaluation	5 days	Mon 10/16/06
117	Chiller Equipment Order	0 days	Fri 10/20/06
118	Construction Tender	20 days	Mon 9/25/06
119	Construction Tender Evaluation	5 days	Mon 10/23/06
120	Award Construction Contract	0 days	Fri 10/27/06
121	Equipment & Material Delivery	90 days	Mon 10/23/06
122	Onsite Construction	90 days	Mon 10/30/06
123	Substantial Completion	0 days	Fri 2/23/07
124	Commissioning & Closeout	10 days	Mon 2/26/07
125	Project Completion	0 days	Fri 3/9/07



Project: Business Board Chiller Projec
Date: Wed 12/21/05

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

ID	Task Name	Duration	Start
1	**LIGHTING RETROFIT IMPLEMENTATION**	425 days?	Mon 11/14/05
2			
3	***University Governing Council Approval***	0 days	Thu 3/23/06
4			
5	***ROBARTS LIBRARY***	150 days	Mon 3/27/06
6	Feasibility Study Received	0 days	Mon 11/7/05
7	University Review	5 days	Mon 11/7/05
8	Engineering Design & Tender Documentation	35 days	Mon 3/27/06
9	University Review	5 days	Mon 5/15/06
10	Tender (Lighting Equipment & Implementation)	20 days	Mon 5/22/06
11	Tender Evaluation	5 days	Mon 6/19/06
12	Award Implementation Contract	0 days	Fri 6/23/06
13	Equipment & Material Delivery	60 days	Mon 6/26/06
14	Onsite Construction	80 days	Mon 6/26/06
15	Substantial Completion	0 days	Fri 10/6/06
16	Commissioning & Closeout	10 days	Mon 10/9/06
17	Project Completion	0 days	Fri 10/20/06
18			
19	***MEDICAL SCIENCES BUILDING***	140 days	Mon 6/5/06
20	Feasibility Study Received	0 days	Fri 11/25/05
21	University Review	5 days	Mon 11/28/05
22	Engineering Design & Tender Documentation	35 days	Mon 6/5/06
23	University Review	5 days	Mon 7/24/06
24	Tender (Lighting Equipment & Implementation)	20 days	Mon 7/31/06
25	Tender Evaluation	5 days	Mon 8/28/06
26	Award Implementation Contract	0 days	Fri 9/1/06
27	Equipment & Material Delivery	50 days	Mon 9/4/06
28	Onsite Construction	70 days	Mon 9/4/06
29	Substantial Completion	0 days	Fri 12/1/06
30	Commissioning & Closeout	10 days	Mon 12/4/06
31	Project Completion	0 days	Fri 12/15/06
32			
33	***OISE***	130 days	Mon 1/1/07
34	Feasibility Study Received	0 days	Fri 12/16/05
35	University Review	5 days	Fri 12/16/05
36	Engineering Design & Tender Documentation	35 days	Mon 1/1/07
37	University Review	5 days	Mon 2/19/07
38	Tender (Lighting Equipment & Implementation)	20 days	Mon 2/26/07
39	Tender Evaluation	5 days	Mon 3/26/07
40	Award Implementation Contract	0 days	Fri 3/30/07
41	Equipment & Material Delivery	40 days	Mon 4/2/07
42	Onsite Construction	60 days	Mon 4/2/07
43	Substantial Completion	0 days	Fri 6/15/07
44	Commissioning & Closeout	10 days	Mon 6/18/07
45	Project Completion	0 days	Fri 6/29/07



Project: Lighting Project Timeline
Date: Wed 12/21/05

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Appendix E: Listing of buildings affected by cooling infrastructure upgrade

North West Chiller Plant:

- Robarts/Bissell/Fisher
- Rotman School
- Innis Residence
- Innis College
- Massey College
- Graduate House

Bahen Centre for Information Technology:

- Bahen Centre
- Koffler Student Services
- Hughes Pharmacy Building
- 215 Huron Street

Stand Alone Systems:

- Lash Miller Chemical Labs
- McLennan Physical Labs
- Ramsay Wright Zoological Labs
- Sidney Smith Hall
- Warren Stevens Building
- Earth Sciences Centre
- Bora Laskin Law Library
- Dental Building
- OISE