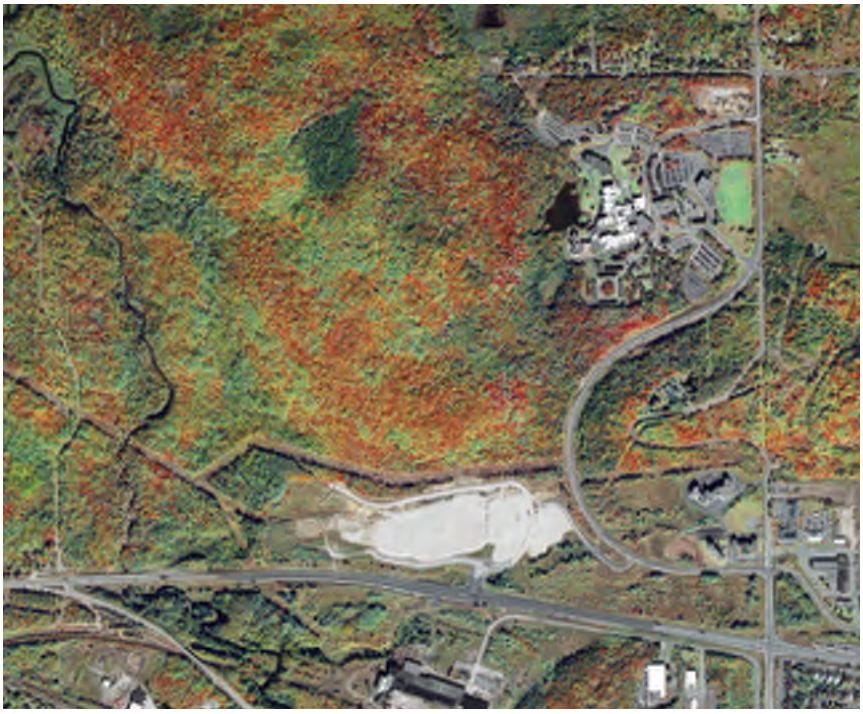
Canadore College + Nipissing University _ Master Plan



January 11, 2007

Stantec

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Vision

The Master Plan aspires to develop the education centre campus as a unique academic development integrated with its natural setting, encouraging academic endeavor and interaction among the students, faculty, and staff of Canadore College and Nipissing University. The plan emphasizes promoting the shared resources of the institutions and the bucolic surroundings as key differentiators to attract quality students and staff who will continue to strengthen and develop the reputation of both institutions.

Background

BACKGROUND

Stantec Architecture Ltd./Stantec Consulting was retained by Canadore College + Nipissing University in December 2005 to revise the 2001 Master Plan in order to direct future development for the next 10 to 20 years.

The need for revision to the Master Plan is driven by many factors which include:

- The Institutions require a better understanding of the capacity, condition, and location of their existing infrastructure;
- Recent growth outside of the previous Master Plan has resulted in tension between the neighboring community;
- The building stock is aging and requires strategies for rejuvenation;
- Moderate academic growth is predicted and selecting appropriate and economical building sites is difficult.

The following is a summary of the preceding master plans.

1968 Master Plan

The first master plan for the Education Centre was produced in 1968 and has resulted in an exceptionally pleasant and well-designed site and buildings. Many of the design principles articulated in this initial document are still valid and have been repeated here.

1992 Master Plan

The 1992 Master Plan introduced a substantial framework for new planning directions to assist in the continuing development of the Campus. Major components of the 1992 Master Plan continue to inform the current Master Plan update.

1995 Eloy/Lowlands Update Study

This study focused on potential uses for parcels of land located south of the existing educational precinct (below the cliff). Information with respect to these parcels has been incorporated into this Master Plan update.

2001 Master Plan Update

The 2001 Master Plan includes a focused study of the expansion of the academic space of both Nipissing University and Canadore College. Also addressed is the addition of Canadore College Residence buildings on the Eloy Farm Site, and future buildings sites on the Education Centre Campus.

PUBLIC AND COMMUNITY USE

The planning principles established in this section assume use of the Education Centre activities by the general public as well as the students of the College and University. It is important that a friendly and accessible image be presented to the community in order to promote use of all the Education Centre's physical resources. The importance of ease of access to the site, buildings and trails should be recognized in any planning decisions. It should also be recognized that a major role of the Education Centre is to

protect its facilities for public and community use.

MAJOR CHANGES TO CAMPUS

Added Student Residence Buildings

Since the 2001 Master Plan Update 3 additional student residence buildings have been added to the campus. 2 have been added on the Eloy Farm site at the bottom of the hill, 1 for each institution. An additional residence has been added on the plateau for Nipissing University and the North East corner of the campus.

The development of the North East corner of the campus with a residence building has created tension between the Institution and the surrounding community, and created an isolated residence building. The use of this site for this purpose was not identified by the previous master plan.

Land Acquisition

Nipissing University is in the process of acquiring the former Precious Blood Monastery site.

Development of the Hospital

The development of the hospital is moving forward. This will be the impetus for significant development and change in the immediate community. The possibility for synergistic relationships between Campus programs and the Hospital should be explored.

PLANNED PROJECTS

Science Addition to H-Wing – Nipissing University

The working drawings are complete for a 36,000 sf addition to H-wing. This addition will add science related space to Nipissing University. This project is awaiting tender, pending the approval of funding.

Greenhouse Addition to H-Wing – Nipissing University

A fourth floor greenhouse is planned to be added to H-Wing. This addition is currently under construction.

Media Arts Addition – Canadore College

A planned 37,000 sf extension to Canadore College. Schematic Design has been completed. Fundraising is underway.

Addition to the Student Centre – Shared Project

Pending the support of this Master Plan, a significant addition to the current student centre will proceed. A schematic design exercise has been completed.

Science Addition and Media Arts Addition Locations

E-Learning Centre – Shared Project

A new library is planned in the near future for Canadore College and Nipissing Univeristy. It is anticipated that the new facility will be between 50,000 and 80,000 square feet.

Student Residence – Canadore College

When it becomes financially feasible Canadore College will add another student residence on the Eloy Farm Site.

MASTER PLAN GOALS

Establish a new core of shared resources, to promote the strengths of the multiple institution campus, and to develop the circulation infrastructure to support the continuing development of the campus.

Enhance the appearance and image of the institutions through the refinement and development of the entry sequence to campus.

Establish Canadore College and Nipissing University as community leaders in environmental stewardship, providing opportunities for future academic program development, increasing student and staff attraction, and further integrating the campus with its natural setting.

Provide direction for future development that promotes a strong presence and image for both institutions on the Education Centre Campus, and addresses the considerable space constraints due to the geography and topology of the site.

Understand the condition and capacity of the education campus service infrastructure and the future needs to support the continuing development of campus.

Master Plan Issues

The Master Plan Issues identify the Campus issues that need to be addressed in order to attain the Master Plan Vision. The Master Plan Issues are the primary guiding principles for the development of campus for the next 10 to 20 years.

The Master Plan Issues have been presented to the Master Plan Steering Committee, the staff, faculty, students, and the community for comment. They have been refined based on those discussions.

1. MAINTAIN AND ENHANCE THE SCENIC BEAUTY OF THE CAMPUS

The most treasured and unique feature of the Education Centre is its setting. The rugged Canadian Shield landscape offers visual inspiration that few other Colleges and Universities can match. It is a differentiating asset for both the College and the University for attraction and retention of staff, faculty, and students.

The entry roads provide the introductory impressions of the campus, and first impressions are lasting. Unfortunately the entrance road into campus is lined with some of the less pleasing landscapes and views to loading areas for both Canadore and Nipissing. The best views and landscapes spaces on the Education Centre campus are only experienced once you are on the campus, with the most scenic views on the back side of the buildings and between the front parking lots.

It is important to the future of the campus to use capital projects to improve the scenic beauty of the campus on the east side, along with potential landscape projects that can provide screening for less pleasing service areas.

- Major capital projects should contribute to upgrading the entry sequence into the campus.
- The space between buildings needs to be seen as an opportunity to improve the image and variety of outdoor space on campus.
- The scenic beauty from the West side of campus needs to be more present on the East side of campus, and particularly along the entry sequence.
- Existing service areas need to be screened by either new landscaping, or physical barriers, or the placement of new capital projects.
- Parking should not dominate the visual field of the campus. Natural landscaping should be used to keep parking in the woods as much as possible.
- New projects need to screen their service areas from the entry roads to campus and any major pedestrian thoroughfares.


Campus Entry Sequence


Campus Landscape Approach


Areas that require screening

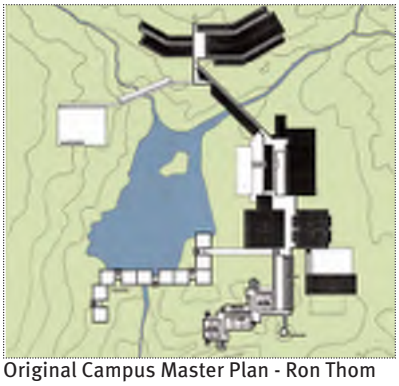
2. CONNECTION TO THE LANDSCAPE

The original Master Plan envisioned a contiguous collection of buildings focused around the Pond, intently integrated with the surrounding woodlands. The intent of many of the buildings is to provide beautiful views to the pond and the woodlands. This is best seen in some of the classrooms with their long views through the horizontal windows.

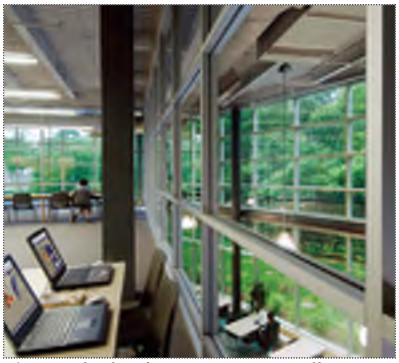
This spirit needs to permeate new buildings on campus, and when possible in renovations, visually open up public and student spaces to the landscape. Not only will this strengthen the image of the campus, but will provide better way finding through the large complex of academic buildings.

- Encourage the placement of public and student and staff amenities close to the visual assets of the campus, with expansive views to the exterior.

- Encourage views to the exterior from interior corridors to bring the landscape in, and aid in wayfinding.


Original Campus Master Plan - Ron Thom


Bridge to Hewgill Hall


View to the landscape - Bronte College

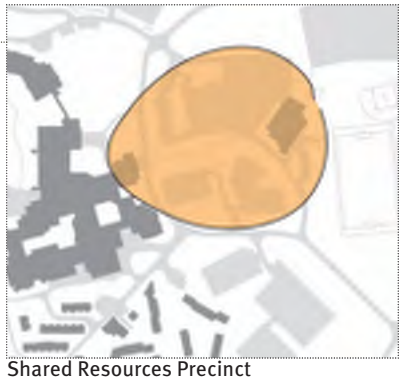
3. INSTITUTION IDENTITY

The Canadore College and Nipissing University campus has a unique heritage as a multiple institution campus. This has created a beneficial relationship where Canadore and Nipissing offer the educational advantages of a smaller post secondary institution, while offering the resources, such as the library and athletic facilities, of a larger institution. The shared resources are a positive contribution to the outward image of both institutions. In the future vision of the campus the shared resources should take a prominent position within the heart of campus.

Further, it is imperative that both institutions maintain equal visual presence on campus, promoting their own academic assets and identity.

- Maintain the academic zones on the Education Centre Campus of both Canadore College and Nipissing University
- Establish a new zone for shared Canadore and Nipissing services that is centrally located for campus convenience, and visually prominent for promoting the synergies of the shared campus.
- Provide identity and presence opportunities along the entry sequence for Canadore College, Nipissing University and the Shared Resources.
- Future academic expansion of Canadore College should gain presence on the entry sequence to the campus.
- The entry signage to campus should be upgraded to provide a dignified entry at both ends that provides equal presence for both institutions.

Academic Precincts



Shared Resources Precinct

Canadore College Entry Sequence Presence

4. RESIDENTIAL COMMUNITIES

The student residences form an integral part of student life and are crucial in the attraction and retention of students to the institutions. The quality of the residences is important, but of even greater importance is the development of a strong student community within the residences. This is a quality that is inherent in the oldest residence buildings on the campus that have been designed around pockets of exterior space.

Currently there are two student residence communities that have been established on campus, the southern residences on the education centre campus, and the Eloy farm site residences. Each functions relatively well.

The Eloy Farm residences would benefit from the improvement of the spaces between the buildings, giving the students a greater sense of exterior community and recluse from the traffic intense nature surrounding the site. This should be a component of the addition of further development on this site.

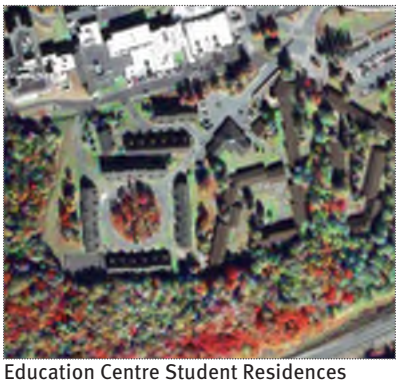
The older residences have the reality of impeding the inevitable expansion of Nipissing University. Due to their age and lack of density, the oldest residences are a reasonable expansion option for Nipissing University, an option that is fully in compliance with intent of the Master Plan and the best interest of the campus.

There is also the recently added governor's house residence building. It is unfortunate that this residence was not located in a way that enhances the current residence communities, and has been located in an incompatible zone on the campus.

Recommendations for future development:

- Complete the development of the Eloy Farm Student residence community. Look to develop meaningful outdoor space between the buildings.

- Develop a new student residence community on the West side of the pond. It should be developed as an environmentally sustainable development to provide another key differentiator from other educational institutions.



Education Centre Student Residences

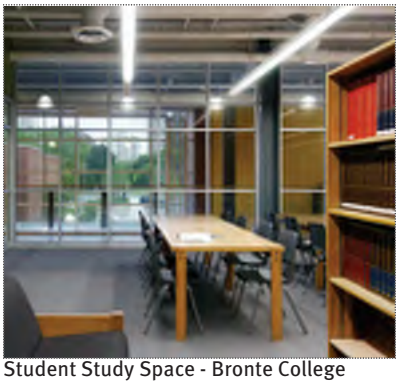
Eloy Farm Student Residences

Carleton University Student Residence Village

5. ENHANCE THE STUDENT EXPERIENCE

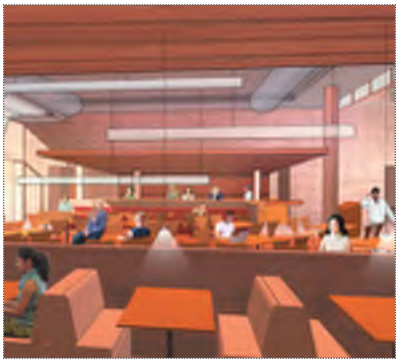
Currently the campus does not provide enough quality student space on campus, including study space, lounge space, and library space. It has been noted by the Council of Ontario Universities that the student space for Nipissing University is below Ontario averages. As providing an excellent student experience is key to attracting and retaining students it is equally important to focus on improving student spaces on campus.

- Expand the existing student centre with more study and lounge space for students.
- Expand the library and provide the framework to adapt to changing means of information collection and searching.
- Increase the amount and quality of student space scattered throughout the Education Centre.
- Expand the athletics centre and make it a joint Canadore College and Nipissing University facility.
- Provide centrally located convenient students services.



Student Study Space - Bronte College

Student Lounge Space - University of Toronto Scarborough Student Centre



6. ENVIRONMENTAL SUSTAINABILITY

Environmental Sustainability is one of the most pressing issues in our society. Through the intelligent use of resources and selection of building systems Post Secondary Institutions will reduce ongoing operating costs and reduce long term maintenance costs on their Capital Investments. In addition, a commitment to Environmental Stewardship will benefit student recruitment and retention, and provide future environmental program development opportunities.

This campus, with its location and inherent beauty, is a natural fit for establishing a strong sustainability program.

The implementation of environmentally sustainable practices within the institutions should extend beyond capital projects and become intertwined with all activities on campus, from administrative polices to food services.

- Establish base goals for future capital projects. LEED Silver is an excellent starting goal for the currently planned campus additions. This will facilitate a transition in building resource management that will allow future projects to attain LEED Gold or Platinum targets.

- Develop Sustainable Residence Village on the west side of the pond.

- Develop a campus wide sustainability plan within 2 years.


The Pond


The Natural Setting


The Natural Setting

7. CAMPUS DENSITY AND PROXIMITY

The smaller size of the College and the University, coupled with the cold northern climate, has informed the development of a compact campus of contiguous buildings. This promotes social and academic interaction between faculty, staff, and students, and between the two institutions, and improves the viability of food services and other campus amenities.

The Education Centre campus should continue to develop all academic and shared resources within a 10 minute walk diameter, with these programs focused towards the heart of campus.

Building density needs to balance the efficiencies of compact design with the spatial goals of the campus. The Education Centre is primarily comprised of 3 storey academic buildings. They establish a roof line that is just below the surrounding tree line. This should remain the goal of future campus development. Master Plan recommendations are:

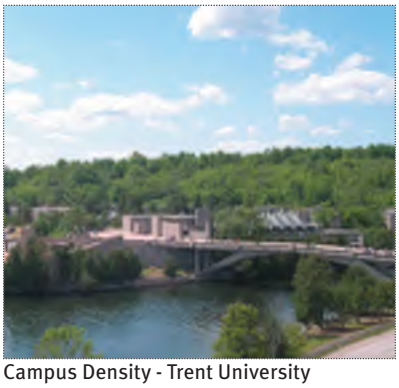
- Building heights should remain at or below the tree line to maintain strong connections within the natural landscape. This is discussed further in the Planning Guidelines section.

- Academic building should be developed as contiguous additions to the existing Education Centre. However, future additions should be connected via bridge or tunnel in order to maintain reasonable wayfinding, avoid site service lines, and maintain strong connections to the landscape.

- Shared Resources and food services must be in the centre of campus to maintain easy access from all parts of campus.

10 minute walk radius

Campus density - Trent University



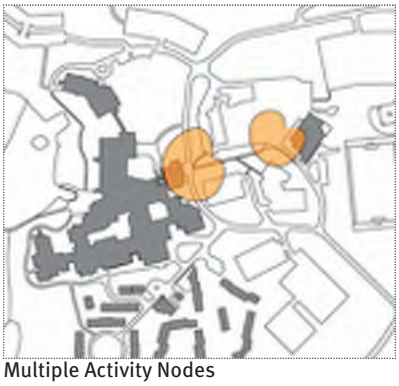
Campus Density - Trent University

8. MULTIPLE ACTIVITY NODES

Currently the Education Centre is serviced by one primary entry area that provides passenger pick up and drop off, public transit, and pedestrian access to the athletic centre and high demand parking lots. This is focused around the original entry to campus, the foot of the Ron Thom Bridge.

As the campus expands the focus of activity at a single location exceeds it threshold, and there is the need to develop other activity nodes to meet the needs of a large campus. The transportation review has indicated that the use of one way roads and/or segregated traffic, and an additional active drop off area will increase campus safety for pedestrians and vehicles and will be necessary for the expansion of campus. Recommendations are as follow:

- Create a secondary centre of activity with a new drop off and pick up location.
- Locate active new capital shared projects at the new activity node to ensure success.
- A significant density of program and activity need to be developed in the new central area. The new Library and added Student Centre provide the opportunity to quickly establish new use and traffic patterns on campus.
- The segregation of public transit and vehicular traffic to separate activity nodes will improve pedestrian safety and distribute both pedestrian and vehicular traffic patterns.



Multiple Activity Nodes

Hard Surfaced Collegiate Plaza
Yale University

Public Transit Interface
Carelton University

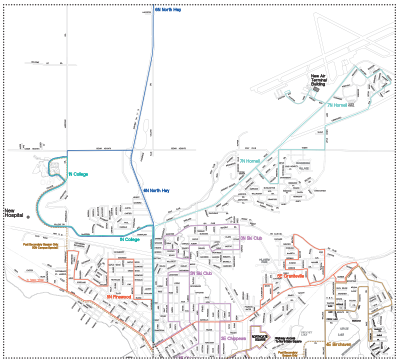
9. THE CITY AND THE CAMPUS

The relationships between a post-secondary campus and the surrounding community are key to the success of both. Canadore College and Nipissing University are significant community assets, bringing employment, economic opportunity, and publicly accessible spaces to the community.

As the Campus continues to grow, there may be impacts (positive and negative) on the surrounding neighborhoods and the City as a whole. Close collaboration between the Campus and the City is needed to ensure that any future City planning initiatives will ensure appropriate integration of campus lands and facilities as well as consideration of the needs and aspirations of the College and University. Regular updates to the Campus Master Plan, and sharing the Master with the City, will further aid in accomplishing these goals.


Campus and the City

Local community relations have been strained by the recent construction of the Governors' House Student Residence. One of the goals of a master plan is to provide guidelines for land use planning, including appropriate program placement and community buffers, to mitigate community tension.


North Bay Transit

Another key issue that requires cooperation between campus and city is traffic, parking, and public transit. This is an issue on every post-secondary campus. It is important for Canadore College and Nipissing University to encourage the use of public transit by faculty, staff and students. The master plan team has been informed that North Bay transit is willing and able to increase service as required to ensure that convenient transportation is available as demand increases. This will limit the aesthetic impact of parking on the campus, contribute to environmental goals, and improve safety on campus. This will also contribute to traffic reduction which will benefit community relations. Recommendations are as follow:


Campus Transit Node

- Maintain a landscape buffer zone of approximately 100ft between cedar heights and Campus development.
- Continue to communicate with the City of North Bay.
- Reconsider parking fees and polices, and consider incentives to promote the use of public transit.
- Establish a review schedule with the City of North Bay transit officials.

10. RENOVATION AND CAMPUS UPGRADES

A significant portion of the Campus building stock is aging, with many building systems nearing or exceeding their life expectancy. Additionally, some of the building systems use excessive amounts of energy to maintain occupant comfort, with rising energy costs this is a growing concern for the future of the Institutions.

In the coming 10-15 years significant investment will be required to revitalize the existing buildings and systems, increase energy efficiency, increase the overall quality space, while reinforcing the goals of the Master Plan.

Current post-secondary education parameters have increased demand on the larger classrooms. The Education Centre can see improved space utilization through renovations in classrooms areas, decreasing the number of smaller classrooms, and adding to the stock of larger classrooms. This will also open up opportunities to increase student lounge and study space through the complex. Recommendations are as follow:

- Phasing and Renovation Strategies based on projected growth, and current building conditions.
- Building Systems strategies for future consideration - central plant vs localized - emergency power, etc.
- Infrastructure Upgrades to maintain and improve existing services while providing for future expansion.
- Consider the renovation of aging classroom areas, find opportunities to combine smaller classrooms into larger teaching spaces, this will improve space campus space utilization.

Aging Rooftop Units

Infrastructure

SURFACE WATER DRAINAGE

The Education Centre does not have a Storm Water Drainage Plan. Changing Provincial environmental regulations will result in the need to ensure that the management of surface water flows and quality parameters are maintained pre and post development. The existing surface water drainage is best described by dividing the Education Centre into the main campus complex and the student residence complexes to the north and south.

Campus Complex _ Existing Condition:

The Cedar Heights Road site, northeast section, flows in a westerly direction along the road via swales, ditches, asphalt spillways and culverts. Parking lots are drained on the surface by normal gradient. Swales and ditches around parking lot perimeters carry the flow westerly. This site outlets into College Creek upstream of the dam.

Nipissing University, Canadore College and residences adjacent to the pond and College Creek flow overland to the creek. The remainder of the site (parking lots, athletic complex, playing fields, student center, Canadore College and Nipissing University buildings, and student residences) drains via surface, paved parking, asphalt spillway, swales, ditches, culverts under the road, and small (300 mm to 450 mm diameter) storm sewers. The flow runs southerly into the drainage ditch of College Road, then to College Creek where it crosses College Road through a culvert, continuing south where it meets a tributary of Duchesnay Creek. The flow then crosses College Road again in a southwesterly direction, crosses Highway No. 17, and then into Duchesnay Creek before outletting into Lake Nipissing. There is an existing small retention pond south of the Athletic Complex.

Residence Complexes _ Existing Condition:

The east southerly student residence and parking lot storm flows are running via surface swales, ditches, and a 250 mm storm sewer. The outlets are the Gormanville Road and College Drive road ditches flowing in a westerly direction crossing under College Road through a 2100 mm CSP culvert, under Highway No. 17 and then into Duchesnay Creek before outletting into Lake Nipissing. No storm sewer detention pond exists for this site.

The northern student residence and parking lot storm flows are running via surface swales, ditches and small storm sewers into an existing creek (a small tributary of Duchesnay Creek) that crosses the site in a westerly direction. The outlet is the same as previously described (College Road, Hwy 17, Duchesnay Creek, Lake Nipissing). No storm sewer detention pond exists for this site.

The southern student residences and parking lot storm flows travel via surface swales and small (250 mm to 450 mm) storm sewers. The outlet is an existing “Storm Sceptor” and a storm sewer detention pond. The pond outlets into an existing tributary of the Duchesnay Creek.

Future Capacity/Recommendations:

Any expansions to the campus complex will require the development of stormwater management solutions. A campus wide stormwater management plan should be designed to ensure conformity with Ministry of the Environment guidelines. A new campus stormwater management plan would take approximately 2 months, and cost approximately $20,000.

The institutions should also consider re-routing the storm water line between the athletic centre and the education centre to permit tunnel access to the new library and student centre addition.

Missing Information:

Outline of the storm water retention pond for the Governors House Student Residence.

WATER SERVICE INFRASTRUCTURE

Existing Conditon:

The Canadore/Nipissing facility is serviced with potable water by the City of North Bay. The following provides a summary of the conditions and constraints at the campus with respect to potable water distribution.

The City's water distribution system is currently divided into 4 distinct pressure zones, Zones 1, 2, 3 and 4 (not including Zone 1A). The campus is located within Zone 2 at the most northwestern boundary of the distribution system. Water is boosted into Zone 2 through the Canadore Pumping Station located on Gormanville Road just North of Highway 17.

The Canadore Pumping Station is located at the bottom of the escarpment and is situated at an elevation of approximately 225m above datum. The highest ground elevation serviced within Zone 2 is approximately 305m. Therefore, in order to maintain a minimum of 40 psi (275kPa) in Zone 2, the Canadore pumping station would have to boost water to a hydraulic gradeline (HGL) of at least 333m (without considering headloss in the pipes).

An HGL of 333m at the discharge side of the Canadore Pumping Station corresponds to an extremely high pressure of 154 psi (1060kPa). Services in Zone 2 situated at a ground elevation less than 293m can expect pressures greater than 100psi under these conditions and should be designed accordingly (i.e. appropriate pressure reducing valves).
The size of the watermain between the pumping station and the campus network loop is 300mm in diameter and approximately 665m in length.

The estimated existing peak hour demand for the campus is 18 Litres/second (L/s). This is based upon a student, faculty and support staff equivalent population of 6558 (full and part time equivalency). The average per capita demand used to determine domestic flow is 60 L/person/day and the peak hour factor is assumed to be 4.0. These values are considered reasonable according to the Building Code and Ministry of the Environment design guidelines for water distribution systems. The demands also correspond to the demands that were included in the City's hydraulic model. The 300mm diameter watermain is sufficient to meet these current capacity requirements (i.e. with minimal headloss).

Future Capacity:

Based on current strategic plan projections the increase in campus population to 2008 will generate an additional water demand of 1.7L/s. Based on hydraulic modeling of the municipal water distribution network, it has been determined that there is adequate water supply for the immediate expansions plans for the campus.

The City of North Bay is proceeding with the engineering design and plans to construct the infrastructure works along Goremanville road in 2007/2008. This project is in the preliminary stages, it is anticipated that once commissioned the increased capacity will accommodate future development of the Campus, the Hospital, and beyond Cedar Heights Road.

Recommendations:

Validate the provided assumptions with a water pressure test by qualified professionals.
Establish 10-20 year growth projections to establish talks with the City of North Bay to ensure that sufficient capacity is planned to facilitate the future of the Education Centre Campus.

The institutions should also consider re-routing the water main between the athletic centre and the education centre to permit tunnel access to the new library and student centre addition.

Missing Information:

On-site fire hydrant pressure test results.
Service entry points to the older student residence buildings and Governors House Student Residence.

WASTE WATER SERVICE INFRASTRUCTURE

Existing Condition:

The Education Centre sanitary system is serviced by an existing 450 mm diameter trunk sanitary sewer. The sewer runs along Goremanville Road, east of the former site of Eloy Farm, (Canadore and Nipissing Residences) then northwesterly towards the campus. The location of the line is indicated on the site services plan. The theoretical maximum flow for the entire facility is 168 L/s. Sewage generation usually corresponds closely to potable water usage. Given that the peak hour water usage is estimated at 18.0 L/s, there appears to be more than enough capacity for the existing loads.

Future Capacity/Recommendations:

The sanitary sewage flows through the City of North Bay sanitary sewer system in a southerly direction, then in an easterly direction to the existing treatment plant. The City of North Bay has previously identified capacity problems along Main Street. The City of North Bay is currently acquiring an Infrastructure Background study which will, amongst other issues, define the residual capacity in the Canadore Trunk Sewer. In the mean time, the City has been proactive in implementing corrective measure along Main and it is currently understood that the works are to be implemented this year. This is being verified with the City of North Bay as information becomes available.

The City of North Bay is proceeding with the engineering design and plans to construct the infrastructure works along Goremanville road in 2007/2008. This project is in the preliminary stages, it is anticipated that once commissioned the increased capacity will accommodate future development of the Campus, the Hospital, and beyond Cedar Heights Road.

Depending on the site locations and elevations of future projects sanitary pumps may be required, but in most instances should be avoidable.

The institutions should also consider re-routing the waste water line between the athletic centre and the education centre to permit tunnel access to the new library and student centre addition.

Missing Information:

Locations where services enter the older student residence buildings.

ELECTRICAL SYSTEM

Electrical System _ Existing Condition:

The Education Centre Campus electrical system has issues that impact its ability to provide reliable electricity delivery to the campus. The existing condition and detailed recommendations are included in appendix A. The following is an executive summary of the primary issues of concern:

Potential single point equipment failures exist from the 44kV main utility service entrance, through to the 13.8kV cable plant, down to the main low voltage substations in each main campus building.

The main 44kV substation is not properly grounded.

The Canadore Nipissing 15kV Main Indoor Substation operates at its rated load during the late summer and early fall months and has no available future growth capacity.

There are inherent equipment reliability issues with the Canadore Nipissing 15kV Main Indoor Substation low voltage air circuit breakers.

There is no Transient Voltage Surge Suppressions (TVSS) connected to any of the low voltage switchboard in the main buildings.

There are over current protective device coordination issues throughout the distribution system.

There are no available maintenance and testing records available for review. Regardless of the existing distribution system problems, electrical testing should be performed on an annual or semi-annual basis to ensure that the existing electrical equipment is in the best functioning order as possible.

Future Capacity:

The main electrical transformer can be readily upgraded with fan cooling to increase the overall campus electrical capacity by 33%. This will allow for significant future growth to the campus. However, the electrical system has many issues that challenge its ability to provide reliable and safe power to the campus. The appendix to this report provides a detailed breakdown of electrical upgrades and revisions that should be considered and budgeted to improve the electrical system. Please refer to appendix A.

Further, the institutions should also consider re-routing the hydro line between the athletic centre and the education centre to permit tunnel access to the new library and student centre addition.

Recommendations:

Upgrade the main campus Transformer with fan cooling in order to facilitate the planned Campus expansion.

Refer to Appendix A for a complete list of recommendations.

Missing Information:

Service entry location to Governors House Student Residence.

NATURAL GAS

Existing Condition:

The campus is fully serviced by natural gas. The current on-site main supply line is running near capacity. The maximum capacity of the existing service is reported by Union Gas to be 1115 m3/hr. The current peak load is reported to be 1000 m3/hr leaving very little room for future expansion capacity requirements. There is a nearby main natural gas line that can be used to add any future required capacity to the Education Centre.

Future Capacity:

Future increases on natural gas demands on the Education Centre Campus will require an application for service to the utility. It is likely that the proposed Nipissing Science Addition can be serviced with the existing line, but an application for service may be required to confirm this with Union Gas. An expectation of capacity requirements based on newly constructed facilities would be in the neighborhood of 1.25 cubic meters per hour per 1000 square feet of building area. Accordingly 115 m3/hr could service up to 92,000 square feet of additional building area. A significant portion of the current gas is consumed by old and relatively inefficient roof top HAVC equipment. A 20% increase in efficiency in the existing gas consuming equipment would theoretically provide sufficient additional spare gas capacity to construct 1,784,000 square feet of building over the current peak demand for gas.

Should the existing gas service need upgrading, the utility has indicated they would upgrade the service up to the point of the existing meter. The cost for all modified or newly install gas piping down stream of the existing meter station would be the responsibility of the user. The approximate cost for buried gas piping is $100 per meter. There are many factors impacting this cost so the level of accuracy is order of magnitude only.

Recommendations:

As part of the planning process for future building projects submit an application for service to the gas utility in a timely manner.
Any additional gas lines added to the campus should be coordinated with the land use plan component of the master plan.
Maximizing the operating efficiency of all gas consuming equipment will both reduce operating costs and generate potential cost avoidance for the future expansion of the existing system.

Missing information:

Service entry point for the Governors House Student Residence.

HVAC

Existing Condition:

The campus is serviced by local HVAC units. There campus does not utilize a central plant to distributed heating or cooling. The existing systems consist of primarily unitary roof top air heating and air conditioning units. These units provide space heating and cooling in conjunction with various concentrations of electric baseboard heaters. Information from the building condition assessment is required to complete this review.

There are wider distributed systems for domestic hot water heating.

There is a central building automation system that may or may not be suitable to extend and expand to pick up future campus building expansions to facilitate a common front end. This system has not been well supported in the past by outside service providers and requires a campus wide evaluation and strategy to determine whether expansion or replacement would serve the campus best over the long term.

Future Capacity:

HVAC systems and domestic hotwater system designs for new facilities will need to be evaluated independently for future development.

However, if an alternate replacement strategy of the existing aging equipment is, it would be beneficial to harmonize the system throughout the Education Centre, and possibly to other buildings on campus. This could for example include an integrated heat pump system over stand alone roof top units which are relatively inefficient.

To move from rooftop to centralized systems would most certainly be cost prohibitive and is not recommended.

Recommendations:

An evaluation of the central building automation system to determine if replacement or expansion is appropriate for the future of the campus.

A review of options for the replacement of the aging local HVAC units to determine and appropriate strategy as the require replacement. Many factors need to be evaluated in determining the best alternative to straight replacement of the existing roof top units. This should be carried out under a separate feasibility study on a life cycle economic analysis bases. This is beyond the scope of the master plan, but below is an outline of some of the available options.

Alternative solutions include:

Replacement of constant volume gas fired rooftop units to VAV roof top units with fan assisted exhaust and integral air to air heat recovery. The heating systems in these units have very poor operating efficiencies. At a minimum they should have fully modulating burner technologies with at least 8 to 1 turn down.

A preliminary analysis of the utility rates indicates that cost of electricity is somewhere between 7 and 9 cents per kWh. The equivalent cost of natural gas is 3.7 cents per kWh which when converted to deliverable heat is closer to 5.4 cents per equivalent kWh. The use of heat pumps for heating has a COP of between 2.5 and 3.0 depending on the temperature of the condensing water. If you reduce the cost of electricity to account for a COP of 2,75 using an electrical rate of 7 cent per kWh, the cost of electricity is effectively reduced to 2.5 cents per kWh which is approximately half the end use cost of gas.

What all of this indicates is that heat pumps may be less costly to operate (between 25% and 50%) if a balanced heating and cooling load exists during the winter months. The extent to which this is not the case and the heating demand exceeds the cooling demand, the condenser loop must be supplemented with a boiler to add heat to the loop. This will dilute the savings offered by the use of heat pumps over that of gas burners in the air handling units. When considering a heat pump system alternative, pumps, and a set of condenser pipes routed across the roof will need to be added connecting all of the roof top units together. A supplemental boiler and closed circuit cooler may also be required.

A third option is to replace the gas fired burners in the roof top units with hot water boiler connected to condensing boiler operating at over 90% thermal efficiency.

Missing Information:

None

TRANSPORTATION

Roads - Regional Context _ Existing Condition:

The campus is served by the City of North Bay's collector road system which provides direct links to the Provincial highway network (see Figure #1). Access from points north is provided by Highway 11 which connects to Cedar Heights Road through to the intersection with the College Drive. The total distance from Highway 11 to the campus is approximately 1.7 km. Access from points east, west and south is primarily from Highway 17 to the intersection of Goremanville Road, McKeown Avenue and College Drive. The campus is located approximately 1.5 km north of this intersection.

There is a fairly steep grade on the section of College Drive south of the existing campus facilities, where the road ascends the escarpment. The Capacity of College Drive is estimated at 750 vehicles per hour. A traffic study conducted in 1997 determined that the peak hour volume on this road was 395 vehicles, which is considerably less than the estimated capacity of the road. The study found that no improvements appear to be required at the intersection of the North Access Road and College Drive. The intersection of the South Access Road and College Drive, however, was assessed with respect to the need for measures such as traffic signals and turning lanes. It was concluded that the current volumes do not warrant the installation of traffic signals, but a left turn storage lane of 300 metres (1 00 feet) for northbound vehicles approaching the campus is necessary, which is now in place. Another suggestion was that while the level of traffic does not meet the normal standards for installing traffic signals, the traffic patterns at this location are so unique that they would merit further discussions with the City about "installing traffic signals designed for the special need, or multi-way stop signs, or other such measures."

College Drive connects to Cedar Heights Road, a two-lane rural arterial road running east- west along the northern border of the College property. Cedar Heights Road, which connects College Drive to Highway 11 to the east, is structurally inadequate and in need of rehabilitation. The intersection at College Drive is stop-controlled at Cedar Heights Road.

Highway 17, to the south, is a four-lane provincial highway, with a signalized intersection at Gormanville Road, where it becomes a four-lane arterial. (Gormanville Road was the access up the escarpment to the campus, prior to the construction of College Drive. Gormanville Road leads to College Drive). The Ontario Ministry of Transportation has renewed property for a future grade-separated interchange of College Drive at Highway 17. This would involve extending College Drive south directly to Highway 17. No timing for this project has yet been established, however, the construction of the Regional Hospital will likely trigger the development of the interchange in the near future.

The Class Environmental Study Report for the North Bay Regional Health Centre, October 2003, reports as follows:

"The intersection of McKeown Avenue, College Drive, and Gormanville Road is currently operating at a poor level of service as an unsignalized intersection. The vehicles approaching from the east along McKeown Avenue experience long queues and extensive delays at peak times, and on occasion, the

approach from the south during the morning peak is queued back onto Highway 17. Traffic signals are on the verge of being warranted at the intersection and signals appear to be the most practical solution to the congestion and delays. With traffic signals, the intersection would operate at a good Level of Service."

Roads - Regional Context _ Future Capacity/Recommendations:

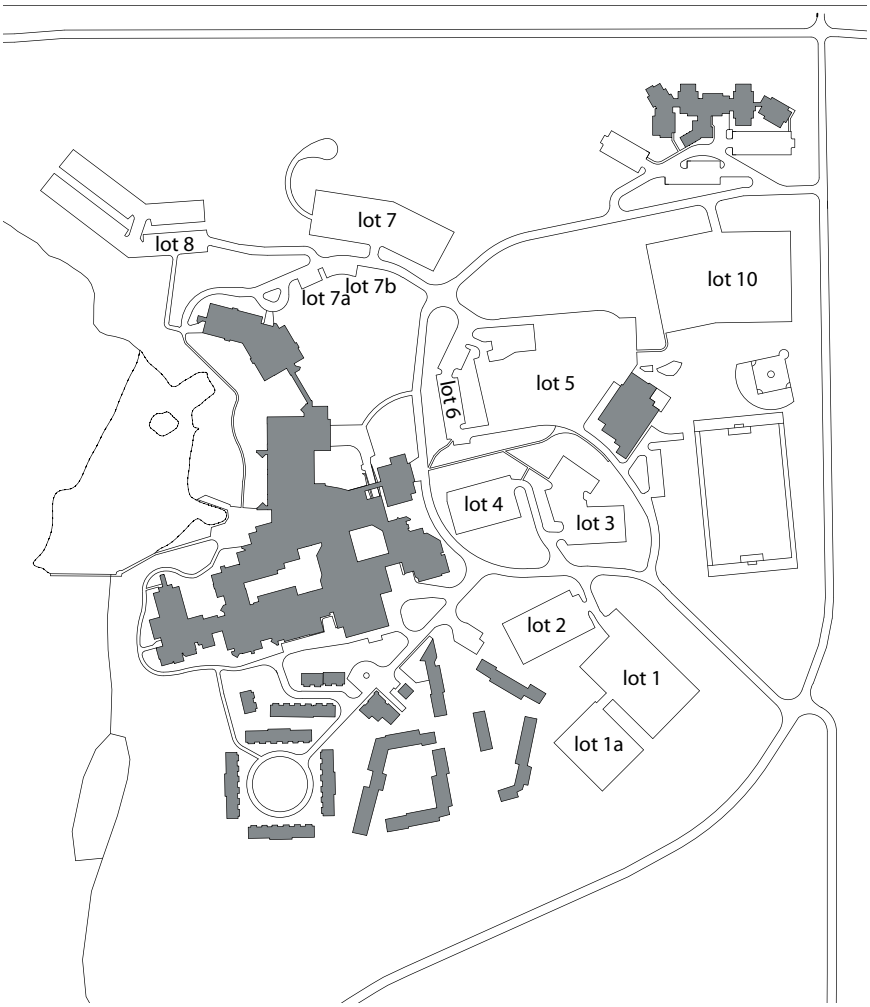
The intersection of Highway 17 and Gormanville Road is currently operating at a satisfactory Level of Service ("C"), although queues do back up onto Highway 17 from Gormanville Road northbound during some morning peaks. Traffic volumes along Highway 17 west of Gormanville Road are modest, with the operating Level of Service in the "B" – "C" range. College Drive carries higher volumes during peak periods and is operating at Level of Service "C" – "D"."

Roads - Access Points _ Existing Condition:

The site is served by a 2-lane roadway which forms a half loop on the west side of College Drive intersecting College Drive at two locations (see Figure #2).

The most northerly access is a simple T intersection with 1-lane approaches in three directions and no auxiliary lanes. The approach to College Drive is controlled by a stop sign. The intersection appears adequate and no operational difficulties have been noted.

The southerly access has four approaches. College Drive northbound and southbound is free flowing while the approaches to College Drive are controlled by stop signs. The March 22, 2001 Master Land Use Plan Update cited operational difficulties at this intersection due to "unique traffic patterns".



Roads - Access Points _ Future Capacity/Recommendations:

Upgrades to the intersection have occurred since 2001, which include a northbound left turn lane. The remainder of the approaches are single lane only. Since these improvements were implemented the intersection has been functioning adequately.

Roads - Internal Roads _ Existing Conditions:

Internally, the campus is served by a two-lane road of rural cross-section, which forms a half loop between two stop- controlled intersections at College Drive. Access roads connecting to this road lead to the residences and the north parking areas. There are

ten access points to parking lots, residences and other buildings located on the campus loop, which is approximately 850 m long.

Discussions with campus staff and observations of traffic conditions indicate that traffic on- campus is not a significant issue. However, congestion at the front entrance of the Education Centre is a concern. This is the location of the North Bay Transit bus stop, the pedestrian crosswalk to the parking areas, and the drop-off/pick-up circle for vehicles on the main campus road. Vehicular volumes include a large proportion of cars that are stopping to pick up or drop off passengers, resulting in more congestion than the numbers would indicate. This may become a point of conflict if vehicular or pedestrian volumes increase significantly, especially due to the impact of the new Student Centre and Nipissing University Entrance.

Suggestions in the 2001 Master Plan to improve safety in front of the Student Centre have been carried out. They have improved the situation, but congestion still exists at certain times of day. Further, delivery traffic continues to cause safety and traffic issues while delivering to the convenience store.

Roads - Internal Roads _ Future Capacity/Recommendations:

Although improvements have been made, site visits conducted in March 2006 reveal continued use of the main access by delivery vehicles, inadequate snow removal which reduces the functionality of recent improvements and poorly maintained pavement markings for the pedestrians' crossing.

It is also recommended that the convenience store in the existing student centre is relocated to the addition to the student centre, and there is an appropriate loading area provided for the building.

As the Education Centre continues to grow greater measures will need to be taken to alleviate congestion at the Student Centre entrance, and provide support for further development. The recommendations for this are found within the Master Plan Issues and the Master Plan segment of this report.

Parking _ Existing Condition:

Parking areas are depicted on Figure #2. A site visit on March 6, 2006 found the parking to be at approximately 80% capacity. Most parking areas were snow covered with no pavement markings showing. Visual assessment confirms that parking areas were arranged in an orderly fashion with functional aisles and consistently sized parking stalls.

Campus representatives have reported 1,427 spaces at the Education Centre, 85 at the Canadore lower residence, 150 at the Nipissing lower residence and 65 at Nipissing Governor's House for a total of 1,727. For the 1,427 spaces, the campus sells 2,100 parking permits. Costs for parking range from $395 (reserved) to $130 annually. Hourly visitor parking is $1.25 per hour.

Overselling the parking spaces is possible due to substantial turnover during the day. However the current level of overselling is close to functional capacity.

Parking is not formally segregated into staff and student areas, but this does occur informally, via the timing of permit.

Parking is not permitted along the campus access road or along Gormanville Road at College Drive.

Parking _ Future Capacity and Recommendations:

Parking is an issue at every post-secondary campus, and there are no hard and fast rules to determine the right quantity of parking spaces. However, the development of parking lots, particularily the extent of open asphalt and the relationship to the buildings and campus open spaces, heavily impacts the vision of the campus. The more parking that is provided, the more the campus resembles a shopping mall, and there is increased traffic congestion in the community. The less parking there is, the more natural landscape there is on campus, and a greater dependence on Public Transit. The downside to less parking is a potential increase in illegal parking in the community and reduced convenience may negatively effect the decision of some students to attend Canadore or Nipissing. Of particular concern would be mature students with parental responsibilities, an increasing population in both institutions.

The parking recommendations are linked to the Master Plan Issues and the Campus Vision, which aims for a balance between a campus in the landscape and the convenience of close proximity parking providing a reasonable quantity.

It is unlikely that structured parking will become an economically viable option for the Education Center Campus. The parking fees required to recoup the capital cost would be far in excess of what staff and students are willing to pay for parking. And, with current funding policies, the entire cost of structured parking would have to be covered by Canadore and Nipissing. Future expansion for the next 10-20 years will be most feasible as surface lots. In correlation to the Master Plan issues, it is recommended that parking lot sizes are minimized, and divided with naturalized landscape. A separate pedestrian pathway, that is maintained in the winter, should be included to provide safe access to the buildings.

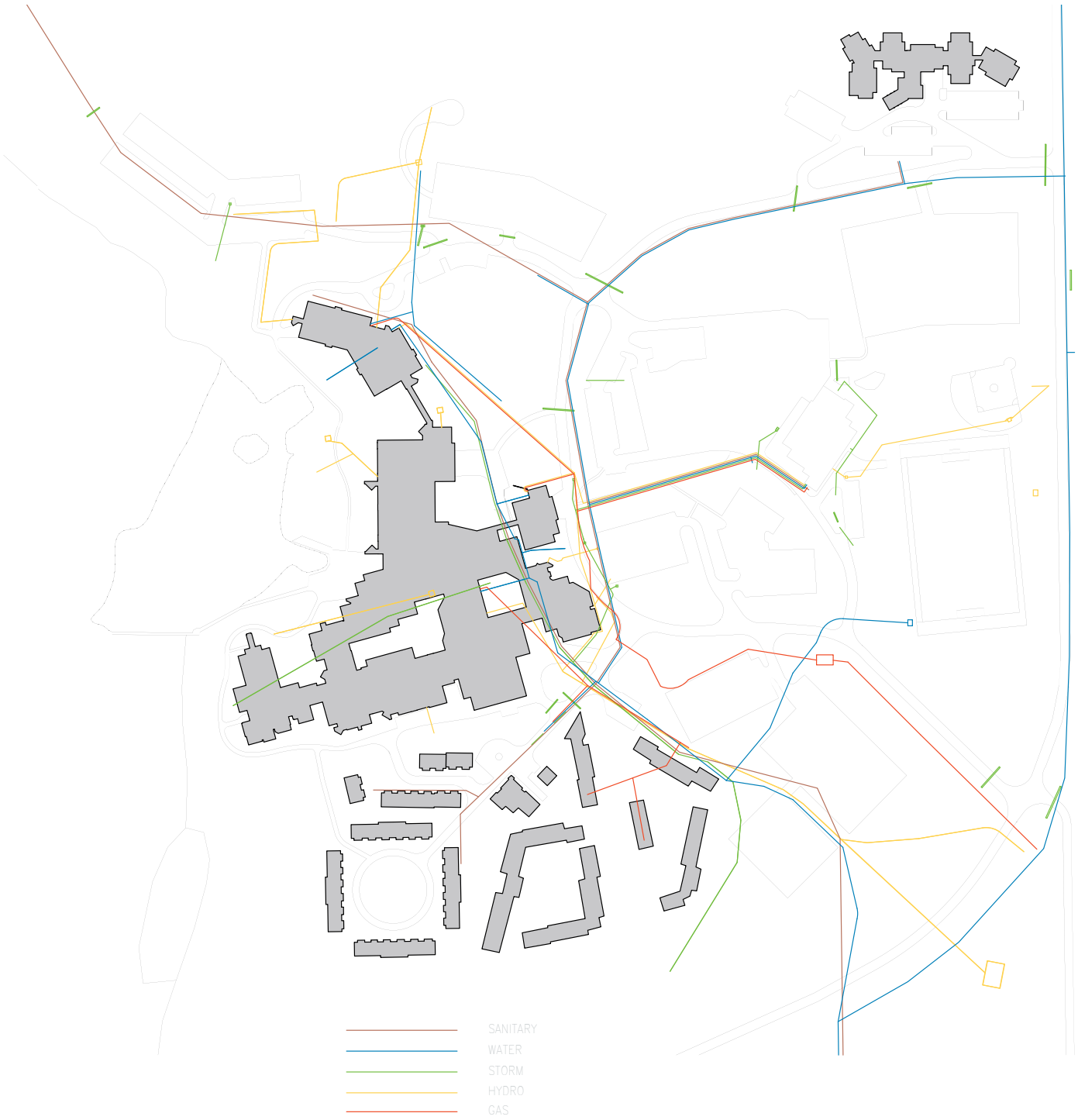
There is space to expand campus parking lot on the north end of campus. The topography of the site will require some blasting or retention. With current enrollment projections the campus would be looking for an additional 380 spots by the 2010-12 to maintain the current parking spot/FTE ratio of 23%. Coupled with the loss of approximately 300 parking spots in the central area of campus 680 parking spots will need to be added.

Canadore College and Nipissing University have the choice to set goals to increase public transit use. This can be possible through a number of incentives, including increasing parking fees and/or issuing transit passes as a component of tuition. It is also recommended that the policy of providing 2 for 1 parking passes to student residents on the Eloy Farm Site is revisited. A goal of 21%, for instance, would mean a reduction of 220 parking spots. It is recommended that the campus targets 580 new parking spots for 2010 if enrollment increases meet current projections. This would see a slight reduction in parking spots/ FTE ratio.

The 2010 Parking lot projection plan indicates new lots to provide an additional 580 parking spaces. With current Master Plan projections the East side of the pond maximimum parking capacity will be approximately 750 parking spots. However, the majority of building development past 2010 will require the loss of parking spots. Once this threshold is reached reliance will be on increased public transit or structured parking.

Transportation _ Missing information:

Location of drop off areas and sidewalks along the internal road system. Site plan drawing with all parking spots differentiated.



Campus Infrastructure Plan
locations are approximate as sources contain conflicting information

Site Analysis

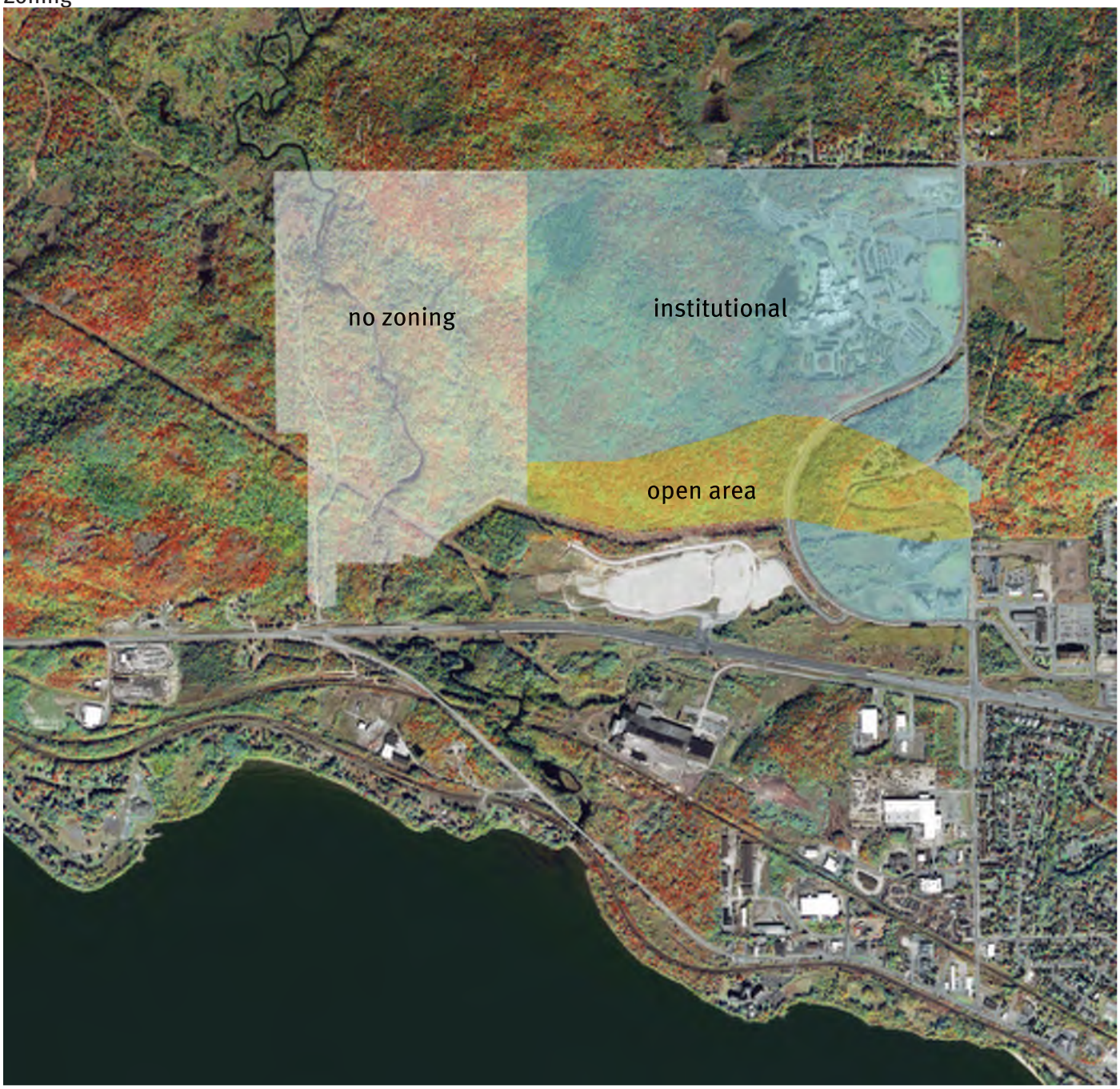
Site Analysis

Land Holdings

The land holdings of Canadore College and Nipissing University are indicate in yellow on the land holdings diagram. Nipissing University has recently acquired the Precious Blood Monastery land for future consideration. Approximately one third of the campus land holdings are located outside of the City of

North Bay in the unincorporated Township of Commanda.

Zoning



The majority of the education centre land located within the City of North Bay is zoned Institutional (N) in the municipality's comprehensive zoning by-law. Lands along the escarpment are zoned Open Space (O) and cannot be developed. There are no zoning controls on those lands located outside of the City of North Bay.

The "Pork Chop"

The Campus owns land on the Highway 17 corridor at the intersection of Gormanville Road. The parcel,

commonly known as the 'pork chop' due to its configuration, is located in the north east quadrant of the intersection. Unfortunately its value for future development purposes is significantly diminished due to the Ministry of Transportation's future highway widening and intersection improvement plans. Ministry right-of-way controls severely diminish the development envelope on this parcel.

Based on anticipated campus growth, the 'pork chop' is not seen as a viable site for the expansion of either Canadore College or Nipissing University. However, the parcel, which has high visibility from Highway 17, easy access from the new hospital and from the student residence complex, is a valuable piece of real estate with strong development potential. The value of the property will grow as hospital construction progresses. The most recent Ministry of Transportation intersection improvement designs indicate that after required highway right-of-ways are obtained, the parcel will have a remaining area of approximately 0.8 hectares (2 acres). Although the configuration of the property presents some challenges there appears to be sufficient land area to provide for a sufficient building envelope.

Given the location and size of the parcel it is feasible to expect that there will be significant interest for commercial development of these lands. Anticipated uses could include service commercial uses such as a restaurant, convenience store etc or health related commercial uses such as physician's offices, laboratories, dental clinic etc. or a combination of service and health related uses. As with any planned development on campus, close coordination with the City of North Bay to ensure appropriate Official Plan and Zoning designations is strongly recommended.

Visual Character

The most treasured and unique feature of the Education Centre is its setting. The rugged shield landscape offers visual inspiration that few other Colleges and Universities can match. Dramatic climbs and drops in the land provide views of the surrounding landscape and the great variety of colour throughout the seasons. A transformation from the lush green and blue of the summer to the brilliant oranges and reds of autumn to the subtle brown, grey, forest green, and white of winter. The campus takes advantage of this visual character through the integration of built form and woodland, as intended by Ron Thom, the original campus architect. The intent of the original Master Plan was the development of the campus focused around the pond, establishing a campus within the Ontario woodlands.

Considering the importance of the setting to the campus, future development should look for a stronger visual tie to the landscape, larger windows, and terminating significant corridors and activity spaces with views to the landscape and the pond.

Topography

The major topographical feature of is an escarpment that rises sharply over 200 feet from its lowest elevation. The escarpment sweeps across the site beginning in the Northwest corner running South, parallel to the Duchesnany River and gradually turns East parallel to Highway 17. The College Valley breaks the escarpment perpendicular to its East-West alignment. This valley runs North of the pond created by the man made damn, which is the focus for the present campus.

At the Southwest corner of the site, there is a relatively flat area, site of the former Eloy Farm. This area is served by Gormanville Road and College Drive, and is at an average elevation of 715 feet.

Also below the escarpment to the West of the lowlands are is a region, which has become known as the Bowl Valley, though it is no longer Education Centre land. The name derives from its shape, which is the result of the intersection of the escarpment with the north-south ridge. This ridge forms a bank of the

Duchesnay River. The Bowl Valley ranged in elevation from 690 to 770 feet.

Above the banks of the Duchesnay River are some large and relatively flat areas both to the immediate east and west of the river. However, the banks of the river and the river by itself have some small but dramatic drops in elevation. This results in rapids and waterfalls in the southern part of the river.

Along the upper edge of the escarpment are some hilltops, which climb another 50 or 60 feet above the escarpment providing dramatic views of Lake Nipissing to the south and the city of North Bay to the Southeast. A large plateau exists north of the escarpment, which has an average elevation of 1, 010 feet. The eastern border of this plateau is in the form of a downward slope. The northern portion of this hill leads down to the college pond and feeder stream while the southern portion forms the College Valley.

The existing campus buildings are located on a relatively flat piece of land above the escarpment with an average elevation of 900 feet. This area is Northeast of College Valley and the pond, extending to the property boundaries and sloping upward to the north along Cedar Heights Road.

Soil and Geography

A detailed soils survey of the Education Centre campus area was carried out for the 1968 Master Plan. It is assumed that the duplication of this survey should not be necessary since the results remain relevant for this Master Plan Update. A more detailed engineering survey should be completed for specific building sites in the future to determine soil conditions and bearing capacity.

The 1968 soils survey identifies two main areas of rock outcrops. Construction in these areas, including a region along Cedar Heights Road, was not recommended due to high cost. However, this recommendation should now be reconsidered since the rock offers a very high load bearing capacity and, while it may imply some added cost during excavation, costly pile construction would not be necessary as it has been for buildings near the pond. Furthermore, the Cedar Heights Road site is close to the existing service lines and the buildings can be designed so that rock excavation is minimized.

Surface Water Features and Fisheries

An important surface water feature on the Education Centre site is the Duchesnay River. Located along the west boundary of the property, this small river drains into Lake Nipissing approximately 1 kilometre downstream of the Education Centre lands. The Duchesnay River is a cold water stream, which supports a resident brook trout fishery throughout most of its length. The area towards the mouth of the river between the railway tracks provides important spawning habitat for a variety of species including walleye, white bass, smelt and suckers which migrate upstream from Lake Nipissing to spawn. Maintenance of the stream cover and protection of both the cold water resident habitat and the warm water spawning habitat is important due to their sensitivity to siltation and other disturbances.

The existing campus is located on a smaller drainage system located in the eastern portion of the Education Centre lands. This system also drains north to south and down the escarpment faces where it joins an east-west flowing tributary. The campus stream system is referred to locally as Canadore Creek.

The upper reaches of Canadore Creek, upstream of the Education Centre lands, have been dammed to form a series of small beaver ponds. Below Cedar Heights Road, the stream gradient remains flat for approximately 400 feet at which point the gradient increase towards the campus pond.

The pond was artificially created from an older beaver pond in 1969. It was originally dredged to a depth of 8.5 feet, though it has become silted several times in the past and the present depth is unknown.

Rainbow trout were stocked in the pond when it was initially created, and again in the summer of 1989 for a fish derby. The persistence of the trout in the pond for 10 years more suggests some groundwater discharge occurs to keep the pond temperatures cool and with enough flow-through to avoid stagnant conditions. However, the rainbow trout fishery was not self-sustaining since there does not appear to be suitable spawning habitat available. A variety of forage species (minnows etc.) as well as frogs probably inhabit the pond and provide food for blue heron and other bird and mammal species.

The pond is an attractive feature and serves as a focal point for the existing campus site. The wooded island and the woodland backdrop on the opposite side of the pond are important visual components contributing to the overall aesthetic character of the campus. Any development on the western edge of the pond should account for the views and vistas already established and recognized as important by campus users. There has been no suggestion to date of the occurrence of any water quality problem indicators such as algae, but excessive densities of aquatic weeds at the edge of the pond are considered problematic. Education Centre staff are currently seeking solutions to the problem. As noted previously, the persistence of rainbow trout following stocking indicates healthy groundwater contribution and flow-through. However, the present flow-through from the pond is still relatively small and the system is sensitive to increased loading of nutrients and other contaminants associated with developed conditions. Siltation problems associated with construction activities have occurred in the past, damaging pond and stream biota by smothering, clogging gills and depressing dissolve oxygen levels due to attached organic materials. The Education Centre possesses a permit from the Ministry of the Environment to hold the water behind the dam.

The stream below the pond is usually permanent although it may dry up for short periods during unusually dry summers as the water table recedes below the stream's invert. The stream permanence is further evidence that groundwater discharge feeds the system. As well, the limited fisheries sampling data that could be located indicates several minnow species and brook stickleback inhabit the stream below the dam.

The east-west flowing stream below the escarpment into which the College Creek drains, flows into the Duchesnay River. This stream supports forage species including various minnows and brook stickleback. The forage fishery and habitat was degraded significantly by past construction activities associated with the building of College Drive.

A series of other small tributaries drain the escarpment between the Duchesnay River and Canadore Creek and across the flat low lands below the escarpment toward Lake Nipissing. Stream flows are probably seasonal over the steep escarpment gradients but may be permanent through the base-of-escarpment lands. Fisheries potential in these stream is not known, however forage species are probably present and seasonal use of the lower portions of the larger streams by Lake Nipissing fisheries may occur.

Vegetation and Terrestrial Habitat

The Education Centre lands are located within the Great Lakes St. Lawrence Forest Region. As is typical of the Sudbury - North Bay sub-area of this forest region, the area was disturbed in the past, by fire. However, the fire was approximately two hundred years ago so that instead of the successional/ pioneering species such as aspen and birch, which are typical of recently disturbed portions of the sub-area, the Education Centre woodlands support a diverse mixed woodland assemblage, which includes sub-mature to mature upland and lowland components.

The more level portions of the lands were cleared in the past for agriculture. The campus site was built on an essentially open portion of the property, which may have been pastured and allowed to succeed in the recent past. The lands below the escarpment were also cleared and used for agricultural activities.

In addition to human activities, topography, soil type, drainage conditions and overburden depth also influence the vegetation pattern. Typical upland tree species include sugar maple, red oak, butternut, black walnut, hop hornbeam, American beech, white ash, yellow birch, white cedar, eastern hemlock, white spruce, balsam fir and white pine. These species occupy the slopes and well drained areas which dominate the site. The deciduous component tends to be dominant on the areas with better soil cover. Conifer (white cedar) and stunted red oak predominate on the escarpment face where soil cover is sparse.

Woodland edge areas, utility corridors, scattered clearings and recently disturbed pockets support balsam fir, poplar, trembling aspen, white birch and a variety of shrubs which are typical pioneering species. These species are shade intolerant and invade recently disturbed cleared areas.

Although none of the vegetation communities, habitat or species on the Education Centre lands have been identified as being significant or particularly unique, various interests and functions should be noted. The vegetation along the far shore of the pond shows several distinct community types within a small area in proximity to the campus thereby sewing as a useful and accessible outdoor laboratory for ecology courses. The pond margin, littoral zone, stream, wetland (beaver meadow, marsh, thicket swamp, treed swamp), maple dominant deciduous, lowland conifer, mixed forest and early successional forest community types are all found within a short distance of the campus.

The vegetation across the pond also provides an aesthetic function as noted in the previous section. As well, it serves as an important riparian buffer, providing cover for wildlife along the pond margins, a corridor for wildlife moving along the stream system and a filtering, cleansing system for runoff moving down the slope to the pond. Any future development of the campus on the western edge of the pond should recognize these attributes. The landscaping of that portion of the site should provide a buffer of natural features, thus ensuring that this body of water consists of a diversity of habitats along its banks.

Finally, the vegetation on the slopes provides an important soil retention/binding function. In general, vegetation on sloped areas is also somewhat more susceptible to clearing impacts, as the soils tend to be thinner over the bedrock. Soil overburden overlying the bedrock is relatively thin on the slopes along the pond and particularly thin with frequent bedrock exposures on the escarpment slopes. Thinner soil cover precludes deep rooting and shallow-rooted trees are more susceptible to wind and runoff impacts, as well as to fill impacts, following opening of woodland areas and construction disturbances.

Impact of the North Bay Airport

North Bay's Jack Garland Airport is located approximately 4 kilometres from the Education Centre, which is directly in the flight-path of the airport's main southwest-northeast runway. The runway approach also extends 4 kilometres from the centre of the airport. As such, lighting requirements and height restrictions are in effect as per Transport Canada regulations; however, the building height limit at the campus has been determined to be about 445 feet, due to the airport altitude being 3 15 feet higher than the campus.

Natural Features

The most striking feature of the Education Centre is its natural setting. The vegetation, watercourses, geological features and topography all create a character unique to these institutions. The natural setting was preserved as much as possible in the original design and in the construction of buildings, services, roads and parking lots. This setting has continued to be preserved in the expansion of the buildings and the parking lots.

There are limits that are prescribed by planning authorities and thresholds of development, which should not be passed in order to maintain the character of the site. These constraints and guidelines will be the

major determinants in the building and site design.

It has already been demonstrated that any development foreseen for the next decades can be accommodated on the Education Centre site or on the land below the escarpment. The principles outlined here will guide the development of these sites. Should it be necessary to move to other parts of the site in the future, these principles will also apply.

Vegetation Clearing

The clearing of vegetation should be minimized, particularly in the more mature interior woodland areas and in sensitive areas such as slopes, shallow soil areas, and wetlands.

In general, opening mature woodland areas while retaining small clusters or single trees may cause problems. The removal of surrounding vegetation, leaves the retained trees susceptible to wind and sun exposure, from which they have previously been protected. This sensitivity is further enhanced on slope and shallow or wet soil areas. . The requirement for significant grading to construct on sloping areas further reduces opportunities for vegetation retention since mature trees will tolerate only small amounts of cutting and filling over their rooting zone.

Vegetation in the poorly drained wetland and floodplain areas is shallow rooted due to a generally high water table and saturated soil conditions. Therefore, this vegetation is also sensitive to clearing and filling activities, and susceptible to wind throw and drainage changes.

The contribution of vegetation to the recreational trails and the campus environment in general is important.

For these reasons, the type and location, maturity and particularly the amount of vegetation which must be cleared for parking, building and facility construction should be considered during site selection and planning activities.

Neither the Ministry of Natural Resources (MNR) nor North Bay and Mattawa Conservation Authority (NBMCA) staff have indicated any particular interest in any of the small wetlands on the Education Centre lands. None of the wetlands have been evaluated, probably due to their relatively small size. It is possible that the Conservation Authority might request evaluation of the wetlands to identify any significant functions or values should they be slated for removal. The NBMCA is responsible for enforcing wetland protection policies, which apply to wetlands designated classes 1-3.

As much vegetation as possible should remain on the site. The impact of removal of vegetation should be examined on a case-by-case basis in each area. Any removal beyond what is shown in the plan requires very careful consideration

Educational Value of Ecology

Vegetation plays an important role in our environment and provides amenity space and pleasure to all site users. The institutions also currently use the natural woodlands as an outdoor laboratory.

It is important to identify and minimize the disturbance of good, representative examples of vegetation communities close to campus that are used as educational tools by the institutions.

Vistas and Trails

Vistas from the buildings and vantage points throughout the site are important features which must be

preserved. Of particular importance are the views towards the west of the pond. Inward views on campus, such as those from the access roads, should also be noted and preserved.

The pathway system and trails are also unique and desirable features of the site. The vegetation and clearings have been carefully created for maximum preservation and enjoyment of the users.

The protection of vistas seen from and within the campus should be considered during any expansion of the buildings or creation of man-made site elements. Similarly, the vegetation adjacent to the trail system should also be protected. The cutting of any new trails should be carefully planned to minimize disruption to the natural elements and to maintain the beauty of the site.

Surface Water Features

Surface water in the form of creeks, rivers and ponds is sensitive to development. General storm water runoff into watercourses must also be accommodated in such a way as to ensure that no damage occurs

Policies and guidelines relevant to construction near watercourses or water bodies include the following:
- Federal Fisheries Act and more specifically the Policy for the Management of Fish Habitat (Department of Fisheries and Oceans, 1986).
- Lakes and Rivers Improvement Act.
- Construction, fill and alteration to waterways approval required under the Conservation Authorities Act.

The first of these Acts prohibits any destruction, alterations, or introduction of deleterious substances which negatively affect fish habitat. Approval from the Department of Fisheries and Oceans (DFO) is ultimately required for any such activities, subject to significant fines and penalties for non-compliance. The North Bay Mattawa Conservation Authority (NBMCA) has an agreement with the DFO to review compliance with the policy at the local level, though the DFO has authority to make the final decision on the permitting of activities, which may impact fish habitat. The Ontario Ministry of Natural Resources (OMNR) also requires a permit for any alteration to lakes or streams under the second act noted above.

The third policy noted requires a permit for any construction or alteration activity near watercourses. Flood and fill regulation lines are in place for the Duchesnay River and for downstream portions of College Creek. The campus portion of the creek is not regulated at present. A permit is required for any filling or development in floodplain areas within the regulated areas. However, the Conservation Authority has an interest in construction and alteration activities anywhere in proximity to watercourses. Although filling in floodplain areas, which are non-regulated, may not be prohibited absolutely, consultation with the Conservation Authority is desirable to ensure the minimizing of environmental impacts.

The Conservation Authority and OMNR have other guidelines related to development setbacks from streams and water bodies. Typically a 100-foot setback is requested for waters, which support cold-water fisheries such as the Duchesnay River while a 50-foot setback is usually adequate for warm water streams and lakes. These distances may be reduced, should a floodplain study determine that such a buffer is not required. Slope, soil type and other factors should be considered in the establishment of setbacks to protect water quality.

It is important to provide a setback of 100 feet from the Duchesnay River and a minimum of 50 feet from all other surface water features to any developed surfaces including manicured lawns and parking area. This setback should be increased where site conditions are more sensitive such as on areas of thin, erodible or organic soils and slopes.

Buffer Zones

Buffer zones beside surface water features are important preservation and ecological protection features. Buffer zones are areas, which remain in their natural state. They also maintain the aesthetic value of the site.

It is important to provide natural state buffer zones beside surface water features to create a run off filtering function to protect surface water quality and to maintain a water edge/riparian corridor for wildlife and for aquatic habitat protection.

Impermeable Surfaces

In addition to accelerating runoff and altering the flooding pattern, impermeable surfaces reduce infiltration and re-charge of precipitation, which becomes groundwater. Steps should be taken to maintain groundwater flow to streams and pond. Summer water levels should be supported as these, in turn, support the pond biota and the downstream ecosystem and provide flow-through and turnover in the pond. This helps to maintain water quality.

Steps should be taken to minimize the increases in the area of impermeable surfaces through the concentration of development.

Planning Context

By Educational Consulting Services Corporation

Introduction

Nipissing University and Canadore College occupy the Education Centre; a 720-acre campus situated on an escarpment site overlooking the city of North Bay, Ontario. The institutions have jointly retained the services of Stantec to update the Education Centre Master Plan. This document will serve as a resource and reference to guide the development of the campus, with a primary focus on land-use issues, infrastructure development and building design.

Educational Consulting Services (ECS) Corp. is assisting Stantec in this task in its capacity as a specialist in planning services for colleges and universities. ECS has a long history with the academic and operational trends, issues and opportunities that influence Ontario College and University campuses. This includes an appreciation for the unique challenges facing Canadore and Nipissing, which ECS gained from working with both institutions in 2000.

The following section presents the findings and observations of ECS regarding the Education Centre Master Plan and the directions adopted by both institutions. These were formulated based on the following input:

Regular briefing from the Stantec planning team

A round of interviews with key College and University staff in June, 2006

A review of pertinent room inventory and instructional space utilization data

Nipissing University

The following synopsis describes aspects of Nipissing-driven activities and plans that may potentially influence the development and direction(s) of the Education Centre Master Plan.

Overview

Formed in 1967, Nipissing University College was an affiliate of Laurentian University and received its charter as an independent University in 1992. Nipissing is a primarily undergraduate university with 3,600 full-time equivalent (FTE) students and a reputation for excellence in teacher education, arts, science, business and nursing. The high-quality academic environment is student-focused and based on personal teaching practices, innovative approaches to learning, and a growing research culture. Nipissing is committed to playing a positive role in the educational, social, cultural and economic life of North Bay and Northeastern Ontario.

Enrolment

Nipissing plans to grow from 3,850 to 4,500-5,000 students by 2010, but remain a primarily undergraduate institution. There are also modest plans for the expansion of its graduate student population: it has been indicated that the graduate student population will grow from 60 Masters and 10 Doctorate students to 300 graduate students on a long term basis. Among the many benefits of cultivating the graduate student population is to keep Nipissing's professoriate engaged and motivated in both scholarly and research endeavours.

One notable challenge in such growth will be to maintain the "personal and friendly" reputation that the institution already fosters. It is important to Nipissing to maintain the exceptional rapport between faculty and students, which has contributed to what has been described as a "communal" environment.

Programmes

Nipissing recently completed their Strategic Plan and is currently undertaking Academic Master Planning that will describe the optimal mix of undergraduate and graduate programmes to a four-year horizon. This has contributed to their policy to review programmes on a four-year cycle, and their plan to make changes to their course offerings. Nipissing plans to introduce new undergraduate programmes in Physical Education and Political Science and to phase-out others that are yet to be identified. Further, graduate programmes will be introduced in Education (MA), in history (MA), in Environmental Science (MSc) and in Psychological Systems (MSc).

Research

The Nipissing research programme is fast gaining recognition: sponsored research has grown from $30,000 to $1,400,000 with seven faculty NSERC's, five faculty SSHRC's and two Faculty CFI's. A unique research opportunity exists with Nipissing's access to the nearby Nipissing University-Alcan Research Preserve that contains 375 hectares of pristine wilderness.
The university is actively seeking funding support for the construction of a 25,000 ft^2 research building at a cost of $10,400 000. The building will support research in biology, life sciences, environmental sciences, geography and psychology. This structure is pivotal in Nipissing plans to grow and gain strength in the following research themes:

Humanities and Social Science
Education
Environmental Science
Psychology

The footprint of the building, site and basic design are still in the conceptual stage of planning, and are contingent on CFI funding.
Council of Ontario Universities Space Standards
The Inventory of Physical Facilities of Ontario Universities 2004-05 compiled by the Council on Ontario Universities (COU) indicates that Nipissing is operating with only 47.8% of the instructional, research, academic office, administrative and learner support facilities it should have. By comparison, Ontario universities are operating at an average 77.4 percent of COU standards.
Based on a population of 3,831 full-time equivalent (FTE) students, Nipissing would require an additional 6,500 net assignable square meters (NASM) to reach the provincial average. In order to achieve COU standards, the University would require an additional 15,000 NASM. There is also a 2,900 NASM shortage of recreational, student services and central services space in relation to the provincial averages, and 8,400 NASM compared to COU standards.
It is important to note that these figures do not reflect the co-location arrangement with Canadore College. As such, the aforementioned figures must be reduced to account for the space efficiencies this arrangement allows. These figures have been provided to convey the need to increase the campus footprint and to justify planning for new buildings in the context of the Master Plan. This pressure to expand will be further exacerbated by the University's intention to increase its student population from approximately 3,800 to 5,000 FTE.

Canadore College

The following is a broad description of Canadore College regarding aspects of its activities and plans could potentially shape the development and directions of the Education Centre Master Plan.

A Multi-Campus Institution

Canadore College traces its origins to 1967, when Cambrian College began serving the population of Nipissing County by establishing a presence in North Bay. The campus separated from Cambrian in 1972 to become Canadore College - the same year it jointly occupied the Education Centre with Nipissing University.

	A	B	C A/B	D	E (B*E)-A	F	G (((B*H)+B)*D)-B
	Current Inventory (NASM)	Generated Space at 3,831 FTE (NASM)	Current Inventory / Generated Space	System Average	Additional Space to Reach System Average for 3,831 FTE (NASM)	Multiplier Applied to Reflect Growth from 3,831 to 5,000 FTE	Additional Space to Reach System Average for 5,000 FTE (NASM)
Classroom	3,627	4,712	77.0%	77.9%	44	20.0%	778
Class Lab	3,375	11,774	28.7%	68.0%	4,631	20.0%	6,233
Research	597	1,295	46.1%	77.3%	404	20.0%	604
Office Academic	2,223	4,469	49.7%	84.0%	1,531	20.0%	2,282
Sub-Total					***6,610***		***9,896***
Rec / Athletics	2,549	5,448	46.8%	63.1%	889	20.0%	1,576
Student and Central Services	2,834	7,662	37.0%	57.8%	1,595	20.0%	2,480
Sub-Total					***2,483***		***4,057***
Office Adminstrative	4,028	6,146	65.5%	88.5%	1,411	0.0%	1,411
Campus Study and Library	2,200	4,986	44.1%	67.2%	1,151	20.0%	1,821
Sub-Total					***2,562***		***3,232***
Total					**11,655**		**17,185**

Nipissing University Space Analysis and Projection

Historically, Canadore has always been a multi-campus institution. In the past, circumstances required the College to lease a relatively large number of buildings in North Bay to house its different programmes and services. Through concerted consolidation efforts in the 80's and 90's, Canadore has reduced its occupancy to three campuses. Each enjoys a unique identity and purpose within the College:

The Education Centre, the core subject of the Master Plan, is the College's main campus and is where the majority of its programmes, its administrative services and its residences are located.

The Commerce Court Campus is located at 80 Commerce Court and houses Information Technology, Skilled Trades, Law and Justice and Communication Arts programmes. Recent efforts were made to relocate Commerce Court activities to the Education Centre in order to satisfy a number of qualitative and efficiency considerations. This proved financially untenable due to the difference between the replacement costs for Commerce Court infrastructure (176,000 gross square feet valued at $25,000,000) and the estimated market value of the College Court property.

The Aviation Campus, located at North Bay's Jack Garland Airport, is a specialized complex catering to aerospace technologies and trades on the basis of state-of-the-art classrooms, laboratories, workshops and hangars. The $12,000,000, 82,000 square foot campus opened in 2002.

Enrolment

It is Canadore's intention to enter an enrolment corridor between 3,500 and 4,000 FTE by 2012. It is anticipated that the population of the Education Centre will increase from 2,100 to 2,500 FTE, the Aviation Campus will grow from 200 to 300 FTE (due predominantly to more international students) and the Commerce Campus would accommodate growth up to 1,200 FTE.
In 2004, Canadore experienced a record 7% increase in student enrolment, which contributed to its current total of approximately 2,500 FTE. The increase was a remarkable achievement given that Canadore has the smallest regional catchments area of any Ontario College. Currently, more than 56% of the student body originates from outside Nipissing.

Planned Programme Changes at the Education Centre

Canadore is fully engaged in the planning and funding of a Media & Arts Addition at the Education Centre. The project is sized to accommodate 300 additional FTE from an existing base of 300 FTE in a new building of 37,000 sft^2, valued at $12,500,000. The facility will be showcased as a new wing articulating onto Hewgill Hall and will allow the revitalization of existing programmes and the introduction of new ones, including but not limited to:

Journalism
Radio Broadcasting
Interactive Media (post-diploma)
Theatre Arts
Arts & Craft Design
Sound Technician

The BScN programme (not listed) also has the potential for growth, but may require additional space to do so. This creates an opportunity for collaboration with Nipissing Universities Bachelor of Nursing programme. This may further serve to establish clinical placement protocols with the new hospital in an effort to introduce Co-op and collaborative learning.

Instructional Facilities

The quantity, quality and availability of classroom and laboratory space were recurring themes during interviews with Canadore stakeholders. Each point is discussed, respectively.

Quantity

Reportedly, the classroom pool is comprised predominantly of low-capacity, underutilized spaces. Conversely, the few large-capacity classrooms have utilization rates approaching 90% (see Tables 1 and 2). This demonstrates a need for additional, high-capacity space which could be accommodated by combining the existing low-capacity spaces. The number of science and computer laboratories was reportedly acceptable.

Quality

Canadore wishes to deliver “blended” learning, which requires classrooms, and to a lesser degree, science laboratories, to be both flexible and adaptable. This can be achieved using loose furnishing, which can be readily re-arranged to support either student-centred or instructor-centred delivery. In respect to classrooms, a nearby suite of small, conference-style rooms can be scheduled as break-out rooms, or used for non-structured group study. Finally, “Smart” teaching aides such as overhead projection, internet access and digital whiteboards are vectors for modern and flexible instruction.

Availability

Formal instruction is scheduled from 8h30 to 17h30, Monday to Friday on all three campuses. Stakeholders have suggested that the College does not adhere to formal space management policies and procedures, which results in sporadic underutilization during certain months of the year. By adopting global scheduling and booking protocols, space use becomes more efficient and consistent for all three campuses.

Student Service

Canadore is committed to serving the “whole” student. In adopting this philosophy the College recognizes that changes must be made to the way current services are organized and accessed by students, and how the College interacts with its students as learners, clients and individuals. This requires Canadore to adjust and/or reshape its infrastructure, including service models, college organization, IT systems and the access points to the College’s resources and physical space.

Other Campus Development Objectives

Above and beyond the planning of major new buildings, Canadore wishes to re-organize existing buildings to make its campus more cohesive, more legible and more welcoming. In particular, the College wishes to increase visibility to its academic units through the consolidation of specialized academic facilities and faculty offices. There are many positive reasons for such changes to the existing infrastructure of the College:

Fostering interaction between colleagues
Increasing operational efficiencies
Showcasing prominent departments enhances the reputation of the entire College
Enhancing student satisfaction; students identify with the stature of their chosen field of study.

To ensure that the correct quantity and type of space is made available to each department as their needs evolve, campus-wide space management policies and mechanisms are essential. However, as noted previously, these have been described as currently lacking.

Canadore Residences

Canadore has recently performed a campus life study soliciting opinions in areas of student retention, residence issues, recreational issues, student services, etc. One outcome was the decision to construct a new 150-bed residence. The College is planning to construct this new facility in 2011, when the debt accrued from previous construction is eliminated.

Choices will have to be made, in the context of the Master Plan, regarding this project. While the College is keen to maintain and even augment the capacity of its residences, a portion of the inventory nears the end of its useful life. The buildings in question are situated in a prime campus location. Careful evaluation will be required to optimize the residential needs of College in light of the potential for other academic uses benefiting both institutions.

Recreational Facilities

Campus recreational facilities are at a premium for Canadore College students, particularly as they cannot access the Nipissing University Athletics Building. This limitation is not favourable to Canadore's image nor is it conducive to the quality of the "whole" student experience. Further, the anticipated increase in the number of residents will put additional pressure on the already over-subscribed recreational infrastructure.

Accordingly, the College wishes to increase its access to recreational amenities, likely through a joint project with Nipissing University, whereby the existing Athletic Centre would be expanded within the

next five years. This would have the secondary effect of facilitating the creation of a Physical Education programme at Nipissing University. The expansion would likely take the form of gymnasia, fitness facilities, racquet courts, team facilities, lounges, etc.

Utilization of Instructional Space

ECS has reviewed the fall 2005 and winter 2006 classroom timetables for Canadore College and Nipissing University in order to quantify the utilization of all instructional spaces (e.g. classrooms, labs, etc.). The classroom utilization rate represents the amount of time the spaces are used divided by the time they are available for instruction during the scheduling grid. The two capacity ranges with the highest average utilizations have been highlighted in bold type.

Table 1 - Fall 2005 Utilization - Canadore

Capacity Range	Room Count	Total Seat Capacity	Daytime Hours Available / Week	Evening Hours Available / Week	Daytime Hours Scheduled / Week	Evening Hours Scheduled / Week	Average % Utilization Daytime	Average % Utilization Evening
1 to 16	17	216	680	255	199	45	29%	18%
17 to 24	20	384	800	300	424	15	53%	5%
25 to 32	42	1,218	1,680	630	878	51	52%	8%
33 to 40	17	635	680	255	396	62	58%	**24%**
41 to 48	7	315	280	105	218	7	78%	7%
49 to 60	11	585	440	165	337	16	77%	10%
61 to 80	6	407	240	90	153	13	64%	14%
81 to 100	2	188	80	30	44	0	55%	0%
121 to 140	1	122	40	15	39	2	**98%**	13%
201+	1	236	40	15	32	6	**80%**	**40%**
not specified	3	0	120	45	69	3	58%	7%
Grand Total	**127**	**4,306**	**5,080**	**1,905**	**2,789**	**220**	**55%**	**12%**

Table 2 - Winter 2006 Utilization - Canadore

Capacity Range	Room Count	Total Seat Capacity	Daytime Hours Available / Week	Evening Hours Available / Week	Daytime Hours Scheduled / Week	Evening Hours Scheduled / Week	Average % Utilization Daytime	Average % Utilization Evening
1 to 16	19	217	760	285	227	26	30%	9%
17 to 24	21	402	840	315	451	7	54%	2%
25 to 32	40	1,160	1,600	600	811	39	51%	7%
33 to 40	18	675	720	270	452	41	63%	**15%**
41 to 48	7	315	280	105	213	10	76%	10%
49 to 60	11	585	440	165	336	0	76%	0%
61 to 80	6	407	240	90	139	11	58%	12%
81 to 100	2	188	80	30	49	0	61%	0%
121 to 140	1	122	40	15	34	3	**85%**	20%
201+	1	236	40	15	36	6	**90%**	**40%**
not specified	4	0	160	60	46	6	29%	10%
Grand Total	**130**	**4,307**	**5,200**	**1,950**	**2,794**	**149**	**54%**	**8%**

Table 3 - Fall 2005 Utilization – Nipissing

Capacity Range	Room Count	Daytime Hours Avaliable / Week	Evening Hours Available / Week	Daytime Hours Scheduled / Week	Evening Hours Scheduled / Week	Average % Utilization Daytime	Average % Utilization Evening
1 to 24	4	160	60	113	14	71%	23%
25 to 32	9	360	135	229	37	63%	27%
33 to 40	11	440	165	201	39	46%	24%
41 to 48	1	40	15	24	0	60%	0%
49 to 60	6	240	90	172	27	71%	30%
61 to 80	3	120	45	104	38	87%	84%
141 +	3	120	45	82	30	68%	66%
Grand Total	37	1,480	555	923	185	62%	33%

N.B. Room capacities not specified for Nipissing

Table 4 - Winter 2006 Utilization – Nipissing

Capacity Range	Room Count	Daytime Hours Avaliable / Week	Evening Hours Available / Week	Daytime Hours Scheduled / Week	Evening Hours Scheduled / Week	Average % Utilization Daytime	Average % Utilization Evening
1 to 24	4	160	60	101	17	63%	28%
25 to 32	8	320	120	214	49	67%	41%
33 to 40	11	440	165	213	49	48%	30%
41 to 48	1	40	15	6	0	15%	0%
49 to 60	5	200	75	181	36	91%	48%
61 to 80	3	120	45	105	43	88%	96%
141 +	3	120	45	78	31	65%	68%
Grand Total	35	1,400	525	898	225	64%	43%

N.B. Room capacities not specified for Nipissing

The analysis indicates that both institutions are fairly consistent with scheduling Fall and Winter semesters. However, both are scheduling their daytime instructional spaces at rates that are lower than the rates adopted and achieved by similar provincial institutions. It is also apparent that Canadore and Nipissing utilize large capacity (i.e. <80 seat) classrooms more than the smaller classes. This may indicate a requirement for larger classrooms, which could be satisfied by new construction or the consolidation of small classrooms. In either scenario, improving the utilization of these classroom spaces represents an opportunity to create "new" space at low cost, and to potentially address a number of functional issues such as the growth of the student population.

Unique Elements of the Education Centre Master Plan

Nipissing and Canadore have jointly or separately described to Stantec and ECS capital projects defined in response to the broad directions, plans and pressures previously described. The projects that potentially shape and change the Education Centre building and land use are listed below. Their orchestration and their physical implication for the Education Centre essentially define the scope and purpose of the Master Plan.

Canadore College and Nipissing University	New Learning Commons
	New Student Centre and Additional Student
	Recreation and Sports Facilities
Canadore College	Consolidated and Streamlined Student Services Cluster
	Media Arts Building Addition
	Additional Student Residence Capacity in 2011
	Revitalization of Programme Identity / Improvement of campus cohesiveness
Nipissing University	General Growth of University Footprint (as per COU Standards)
	Science Wing and Greenhouse Addition
	Provision of larger classrooms / auditoria

The projects that concern only Canadore College or only Nipissing University have been defined

in response to circumstances and priorities are typical of mature Canadian institutions operating in constrained fiscal environments. A major challenge facing most institutions is the renewal and repurposing of existing facilities in response to changing delivery models and programme offerings. Another challenge they face is overcoming chronic space shortages as a result of growth in the student population. The individual projects listed above address these concerns, and will hopefully be implemented within the planning horizon of the Master Plan if funding becomes available through grants, financing or partnerships.

The two projects that are jointly planned by the College and the University are, on the other hand, less common and worthy of special mention herein. They are further discussed below.

New Learning Commons

Canadore and Nipissing recognize the need to have a campus Learning Commons to support the emergence of a more integrated learning and teaching paradigm. This cannot be achieved within existing space. A new facility of 50,000 ft^2 is thus proposed as one of the major elements of the Education Centre Master Plan.

The concept of "integrated learning" challenges traditional teacher-centred paradigms, where information is disseminated in classrooms and labs that are grouped by discrete disciplines. In the past, tertiary education institutions have been referred to as teaching institutions, but the shift in emphasis increasingly redefines universities and colleges as learning institutions. The distinction hinges on collaborative learning which emphasizes peer-to-peer in addition to student-teacher interaction, and on project-based learning which crosses formal discipline boundaries.

Integrated learning environments such as the Learning Commons combine virtual and physical learning modalities. Learning can take place anywhere, everywhere, and anytime within IT rich settings that provide flexible and blended learning opportunities by combining online and campus-based activities.

Further, integrated learning more closely resembles real-world working environments and responds to the changing profile of adult learners, which includes a natural level of comfort with information technologies. Competencies that are developed in integrated learning environments include critical thinking, teamwork as well as self-directed learning, problem-solving, interpersonal and inter-discipline communication, organization of learning tasks, and project management skills.

Faculty members are encouraged to refine their roles to respond to the growing awareness of the importance of facilitating the transfer of knowledge within a learning community. Summarily, as facilitators of learning experiences, professors need to challenge traditional pedagogical methods and re-consider the teacher-learner relationship. This approach to teaching would be well-supported by the Learning Commons.

This open-concept facility is envisioned as a welcoming, state-of-the-art study area to house services and functions that might include, but are not limited to:

Library stacks / videos	Peer Tutoring
Open-access computing facilities	Counselling
Quiet and group study facilities	Special Needs Services
Learning Centres	etc.

Once established, the Learning Commons would redefine how the Institutions serve and supports their

clients.

New Student Centre and Additional Student Recreation & Sports Facilities
Many Canadian tertiary institutions operating outside large metropolitan centres face the challenge of declining demographics in their region. Canadore and Nipissing have fared relatively well when facing this challenge, and recognize the need to competitively position themselves to attract students. In order to achieve this, both the College and the University have leveraged the following attributes:

Reputation and vitality of the programmes offered
Convenience, cost-saving and familiarity for students originating from within the region in which the institution is located
Personable, student-centred learning experience and support services
Quality of student and campus life

The last point, the quality of student and campus life, is the product of institutional culture and tradition. This is generally nurtured by a combination of the administration and size of the institution's infrastructure and the involvement of the student government(s). The joint Nipissing / Canadore Student Centre project described to Stantec and ECS in the context of the Master Plan has the potential to improve aspects of student and campus life.

New Student Centre

Having reviewed the design parameters proposed for the new Student Centre, ECS has identified a number concerns regarding the services, the space allocated to these services, and their interpolation with infrastructure already in place in the Education Centre.

According to the summary of area and costs, approximately 40% of the space allocated in the new Student Centre will be dedicated to a flexible banquet hall / cinema. It has been suggested that the banquet hall would fulfill multiple functions. However, banquet halls are not generally considered flexible or even readily adaptable spaces and require considerable time, effort and storage space to convert them between events. As for the functions themselves, other academic institutions that have attempted to use banquet hall space for didactic purposes and have reported unsatisfactory results. ECS also questions whether a cinema is an effective use of the space in light of the relatively small student population and the nearby commercial movie theatres in the city.

Even the primary function of the banquet hall falls into question considering the current state of funding and the considerable expense associated with relocating the food services complex. Approximately 23% of the new Student Centre will be allocated to the new food court and kitchen. It would fall within a 10 minute walking radius of any point on the Education Centre, but the existing food court is already centrally located and features a wonderful view of the pond. Finally, the existing Student Centre building would remain open as a renovated casual meeting space featuring a potentially competing mini-food court.

Taken collectively, the aforementioned points concern more than 60% of the space allocated to the new Student Centre and warrant reconsideration of the services that could be housed by the new Student Centre, particularly in light of the prime location being proposed.

As a possible alternative, ECS proposes renovating the existing food court and updating the eating area to expand services and selections. The Graduate Lounge already proposed for the Student Centre could be conceptually expanded to include complementary, albeit limited food services. The new Student Centre could feature a large, tiered auditorium to serve as lecture space, act as a venue for public speakers, and still serve potential secondary functions such as a cinema or rental space. In addition to the dedicated club space already proposed, small rental (or bookable) spaces could be included to serve a variety of informal or infrequent groups or activities, including rentals by outside businesses and associations.

New Recreation and Sports Facility

As previously noted a new shared recreational facility would serve the growing student population of both institutions as well as facilitate the creation of a Physical Education programme at Nipissing University. In regards to the later point, the new facility could accommodate limited classroom and auditoria space meeting the latest needs of either institutions.

This facility also represents an opportunity to consider a more unique design, such as a large field house featuring for example a 200 metre indoor running multi-lane track, and capable of accommodating, on a multi-purpose rubberized floor, activities such as indoor soccer, track and field event practice, indoor tennis, golf swing clinics, etc. Such a large space could also be used as an impromptu banquet and convocation hall in lieu of setting a permanent site in the Student Centre. The entire facility, thus defined, could appeal to a greater number of community users given its all-season capabilities and its unique character in the North Bay region.

Planning Guidelines

Building Design Guidelines

The Master plan issues are the primary guidelines for campus development and provide the base building design guidelines. Connection to the Landscape, Campus Density and Proximity, Maintain and Enhance the Scenic Beauty of Campus, and Institution Identity, all inform the placement, scale and relationship of new buildings to the existing campus. Buildings that respect these guidelines will also provide access to daylight on the interior, and have excellent way finding. These Master Plan Issues also inform the direction of the landscaping around buildings.

Residential Communities informs the development of the Eloy Farm Site Residence Community, and the future residences on the west side of the pond, recommending the development of appropriately scaled open courtyards (spaces between buildings that are connected to the surrounding landscape).

Through respecting the Master Plan Issues, new contributions to campus will improve the campus and strengthen the outward image of both Canadore College and Nipissing University.

This section will add some additional good practice guidelines that will assist the Master Plan Issues in achieving the master plan vision.

Building Materiality

There has been a consistent attempt at repeating the architectural materiality and detailing of the original Ron Thom buildings on campus. However, due to material availability, and the visually apparent differences between the various vintages of metal cladding on the Education Centre, it is time for the evolution of the Education Centre materiality.

The selection of materials should be directly informed by the Master Plan Issues. The evolution of building materials on campus should look to establish a harmonious relationship with the natural setting of the campus. Preference should be given to natural materials such as wood and stone, although they may be restricted by project budgets. Consideration should also be given to the use of a dark brick within the value range of the original metal siding. Respecting goals of environmental sustainability will recommend good quality building products with a long service life.

Building additions, connected buildings and new buildings should be designed to follow the natural grades and contours of the site so that existing building planning principles are maintained.

Building Height

The intention of the original master plan was that buildings should remain at or below the height of the surrounding trees. This remains the primary intention of the Master Plan.

The Education Centre campus has significant variations in the topography of the site, with the most significant development occurring on lower ground, and the athletic centre and the student centre addressing a higher elevation. This does need to be taken into consideration as the campus develops.

The roof of the Education Centre is a collection of rooftop HVAC units of varying ages, as such its scenery does not equal the surrounding natural setting. Because of this it is recommended that any development on the higher elevations on the east side of the campus is limited to two stories. This will still permit visibility on all sides, while limiting views to the rooftops of the main education centre. If development in these areas grows to 3 stories the view corridors should be carefully examined to promote the natural settings and avoid significant views to the campus roofscape.

As a general rule campus development on the lower elevations should be limited to three stories, and development on the upper elevation within the shared resources precinct should be limited to two stories.

An additional storey can be considered in both locations with the following conditions. Taller buildings in the Shared Resource Precinct need to encourage views to the natural surroundings and limit views to the roofscape of the education centre. Any increase to 4 stories within the Academic Precincts should be set back from the edge of the third floor, such as the recently constructed greenhouse.

Use of Light

The Master Plan Issues set the basic building design parameters that will aid in providing access to daylight within the Education Centre Complex. The importance of light to the academic experience cannot be understated, below is further emphasis to that end.

It is important that any new designs make use of natural light to create enjoyable and livable interior space in a manner consistent with the existing architectural detailing.

A section of the original 1968 master plan draws attention to the importance of natural light:
"Life in the artificial environment within a building, especially in the north where the climate is severe, can be monotonous and depressing. A conscious attempt has therefore been made to introduce natural light into the building wherever possible, and especially into the movement spaces, by means of skylights, clerestory windows and the like. As they move through the building in corridors and the main gallery, all users of the Centre will be made aware of the changing day outside, and their response to the tasks that bring them to the building will be made that much more acute."

This original planning premise remains prudent and should be adhered to over the foreseeable future. The only minor exception would relate to the use of skylights: the experience in North Bay is similar to that of other institutions in that most skylights have suffered from practical problems such as snow build-up and leakage. This is the only feature, which should not be repeated.

The plan should make maximum use of natural light to create enjoyable and useful interior spaces consistent with existing building planning and architectural details.

Landscaping

The natural landscape is the setting for the campus. The Master Plan Issues illustrate the relationships between building and landscape, and identifies two primary landscape types on the campus, naturalized and hard surfaced.

The hard surfaces that are proposed in the Master Plan related directly to the development of the new Student Centre, the Library, and the new drop-off and pick-up roadway. These areas are the pedestrian thoroughfares that link the academic precinct to the shared resources precinct, and further link the Athletic Centre to the Library and the Student Centre. These areas need to provide a combination of hard surfaces that are chosen to be in harmony with the natural setting, with intermittent trees and planting. These areas will also require seating to be fully activated and successful.

It is also suggested that a similar strategy could be used to alleviate issues with the enclosed courtyard beside the existing library space.

The Master Plan Issues recommends the propagation of naturalized landscape on the east side of campus. Within the Site Analysis section of the Master Plan document is an inventory of existing plant types and vegetation communities. The increased use of naturalized landscape on the east side of campus will

significantly contribute to enhancing the scenic beauty of the campus, and provide a low maintenance solution. New additions of naturalized areas are suggested to provide screening to existing service areas, and along the entry sequence to campus.

Courtyards

The previous Education Centre Master Plans have identified courtyards as important components in the development of Campus. Key design elements for the success of the courtyards included proximity to activity and circulation and contiguity with the Education Centre landscape. A successful courtyard brings light and view further into large building complexes, and can successfully connect interior spaces to the surrounding campus. They can contribute to campus life providing both activity and aesthetic value.

The courtyards that have developed on the Education Centre Campus find themselves mostly removed from major circulation routes and interior activities. And the largest courtyard has been cut off from access from the surrounding campus, which has resulted in maintenance issues. There are concerns about their limited use, maintenance issues and costs, and their current lack of contribution to the campus.

There are currently three courtyards on the Education Centre campus, one within the H-wing expansion, one that is used as a parking lot, and the courtyard close to the Library.

The parking courtyard has functioned as a well used prime location parking lot. This courtyard does provide light to some offices and interior spaces, but is not a great space. There is currently no intention to change the function of this space. This space does have vehicle access for maintenance. As this space is not very visible from within the education there are no improvements beyond continuing maintenance that will be recommended in the Master Plan.

The Library Courtyard has been identified as an area of concern. This courtyard is challenged in many aspects, it has no exterior access, it lacks optimized solar orientation, and it has limited interior activity surrounding it. The result is a courtyard that not very active and, without the benefit of the sun, does not extend its usable season well into the academic year. This also makes the growth and maintenance of turf grass difficult.

This space will always have challenges, but can be significantly improved with the introduction of a combination of hard and soft surfaces. The introduction of properly selected indigenous plants by a landscape architect will minimize maintenance costs and improve the aesthetic contribution to the campus. To further revitalize the space the redevelopment of the existing library space can hopefully provide the opportunity to introduce glazing and active circulation along the north wall of the courtyard. Access into the courtyard from the North wall should also be considered.

With the current challenges with way finding through the Nipissing Academic precinct it is not recommended that the Library Courtyard is used as infill space.

The current H-Wing extension will create another enclosed courtyard. This space will have similar issues to the current Library Courtyard. This courtyard does have a reduced size and a location with less surrounding activity. Because of this a mostly hard surface, with at least %50 permeability, would be encouraged with smaller planted areas of suitably selected plants.

The Master Plan continues to encourage the development of courtyards that are open to the surrounding

campus and focused around areas of activity. Courtyards with excellent South orientation can establish a micro-climate that will extend their comfort into the academic year and serve as social and aesthetic activators. The Demonstration plans illustrate a new courtyard formed between the new 3 story Nipissing Academic building and the existing student residence buildings. This is the type of courtyard that is appropriate for the climate and the campus.

Service Screening

Provision of proper service areas for delivery traffic, maintenance use, and storage of recycling and waste between pickups is critical for the proper functioning of any campus. These areas are also busy and messy, as such they should be removed from main campus spaces, and preferably screened from view.

Currently there are two delivery/service areas at the Education Centre Campus that are in plain view from the main entry sequence to campus. Further service areas will be added to the campus as it develops.

For the Education Centre campus the ideal way to screen services is through the use of indigenous planted areas that provide a natural visual filter to the clutter of service areas. Successful screening with planting does require a reasonable thickness which will vary on the type of plants and trees that have been selected.

For solutions that require less space they should be integrated with the design of a building. A solid or partially open enclosure can be used as a screen. The use of an outdoor suitable natural wood screen, such as eastern white cedar, would be appropriate for the Education Centre campus. Other materials should be selected in conjunction with the building that is being serviced, using masonry or metal that is in harmony with the adjacent mass.

For the two existing service areas of concern the demonstration plans identify areas that could be planted to provide some screening. The current loading area on the Nipissing University side is difficult to fully screen due to its configuration, however, the planting of the current traffic island will make a significant contribution. The service are near Media Arts on the Canadore College side creates difficulty in the near term as it is on the wall that will be public face of Canadore College towards the Shared Resource Precinct until the Hewgill Hall Addition. Once this addition is built the planting of the space between the service doors and the main road will provide adequate screening.

Sustainability


Masonry screening - Carelton University


Wood screening - Bloorview McMillan Kids Rehab

One of the Master Plan Issues is addressing issues of Sustainability as Canadore College and Nipissing University move forward. The comprehensive nature of this issue will benefit from the elaboration of potential goals and objectives for the planning of the campus.

The institutions should seriously consider the development of a comprehensive sustainability plan that should include new construction, renovations, and campus improvements and upgrades. The plan should also include a look at all aspects of operation on campus, from administration to food services to student life. Initiatives have already been undertaken on the campus including recycling programs and lighting upgrades.

Such a comprehensive plan touches on all aspects of the operation of post-secondary institutions and will require internal support from faculty, staff, and students, along with studies and advice from professional consultants.

Suggested initiatives within the scope of the Campus Master Plan are as follow:

Use LEED Silver as a base requirement for new construction on campus. LEED (Leadership in Energy and Environmental Design) is an industry accepted standard for the design and evaluation of buildings with then intent of constructing environmentally responsible buildings that deliver excellent living, working, and teaching environments. Additional capital costs to achieve LEED Silver are often negligible, as costs associated with appropriate materials, processes, and technologies have decreased over recent years. Many initiatives within LEED lead to cost savings rather then additions.

Procure and implement a campus wide stormwater management plan. The appropriate Treatment of water to prevent contamination and siltation of rivers and streams is very important to the ecosystem. Upon review of the Education Center campus there are drainage patterns that do not channel and treat stormwater in an appropriate manner at this time.

Naturalization of the appropriate areas of landscape. The re-introduction of indigenous plant species and naturalized landscaping between buildings and around the pond will reduce energy and water use for maintenance of manicured turf grass. As identified within the Master Plan Issues this is within the aesthetic of the campus and its setting, and will increase natural habitats for indigenous animals. This may also contribute to a reduction in the Canada Goose population of the Pond, which is currently an issue.

Establish further goals for improving the energy performance of the existing buildings. The first step in this process is a study of the mechanical systems and the building envelope to investigate options for system upgrades. The Education Centre Campus has a significant number of aging rooftop units, the timing is excellent to evaluate appropriate systems for the future. This is discussed in further detail within the infrastructure portion of the Master Plan.

Establish an agreement with a tree salvage company to remove deadfall from the trail system.

In addition, Canadore College and Nipissing University have the ability to internally reviews methods, systems, and processes that can be refined to reduce waste, increase energy efficiency, and improve the contributions of the Campus to the community. Reducing paper, increasing recycling, continuing lighting upgrades, public transit incentives, etc.

Master Plan

Vision_ restated:

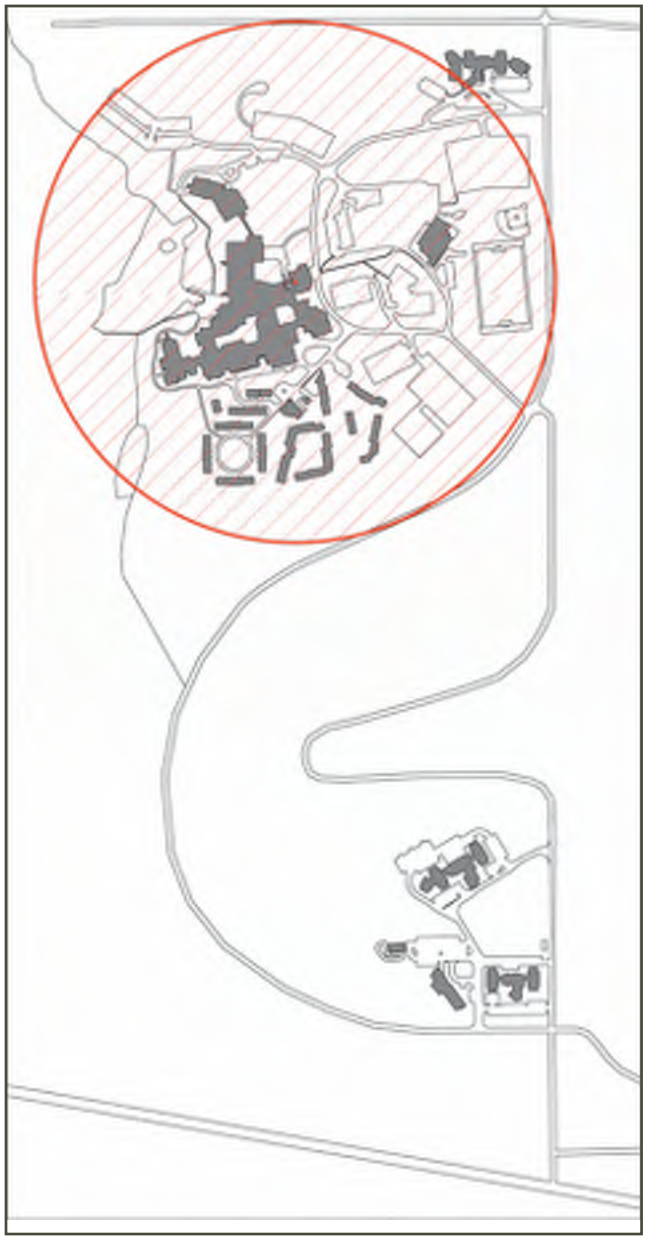
The Master Plan aspires to develop the education centre campus as a unique academic development integrated with its natural setting, encouraging academic endeavor and interaction among the students, faculty, and staff of Canadore College and Nipissing University. The plan emphasizes promoting the shared resources of the institutions and the bucolic surroundings as key differentiators to attract quality students and staff who will continue to strengthen and develop the reputation of both institutions.

CAMPUS PRECINCTS

The Education Centre campus has a legible existing organization (existing campus precincts diagram below) with Canadore College to the North, Nipissing University to the South, with the Shared Resources in between. This has served the campus well, the organization is clear, and the active heart of campus is readily accessible in a prime central location.

With the current planned projects the campus is significantly expanding, and the current precincts require refinement to provide a future framework for a well organized campus. The 2001 Master Plan already directed the appropriate framework based on the projected expansion of Shared Resources.

The Master Plan divides the campus into 4 precincts, Academic, Student Residence Communities, Shared Resources, and Parking. It is key to the success of the campus to keep the Academic and Shared Resource



10 minute walk radius

Existing Campus Precincts

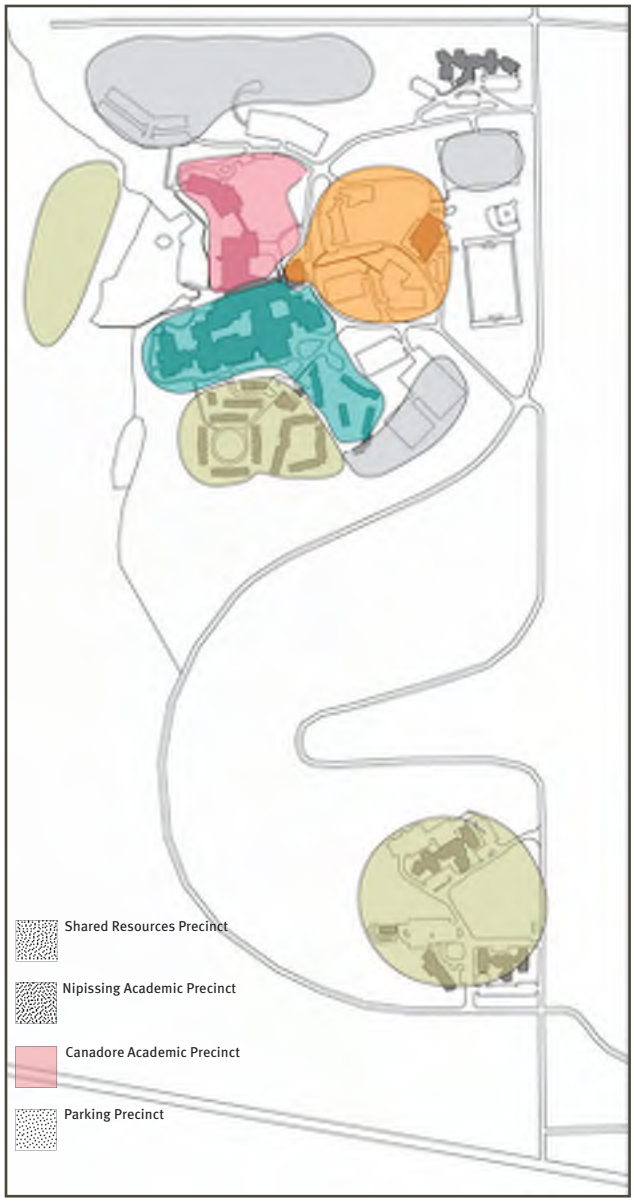
Precincts within the 10 minute walking radius, along with convenient parking.

Academic Precincts

The academic precincts are comprised of classrooms, academic offices, staff offices, and academic support spaces. They should have intermittently scattered student space and food services to provide necessary services and activity.

One of the challenges of the Master Plan is proposing methods to expand the Nipissing University Academic precinct while maintaining the overall Master Plan Vision. Expansion of the Education Centre on the Nipissing side is difficult due to the existing student residences and geographic constraints. Within the 10 year window the College and University should consider the use of 30% of the existing (oldest) student housing as the best site to expand Nipissing University.

Expanding Nipissing University in this direction will maintain short distance access to the heart of campus and all academic resources. This will prevent scheduling issues due to distance, and promote a compact, but permeable campus. The 20 year Academic Precinct map shows moderate possible expansion to Nipissing. If there is continued expansion beyond 20 years other options will require exploration.



10 Year Campus Precincts

20 Year Campus Precincts

In contrast, Canadore College has ample room for expansion, based on 10 year growth projections to the Education Centre Campus. The primary goal of the next phase of Canadore College Academic expansion is to reach for the entry sequence road, establishing a stronger presence closer to the heart of campus. It is important that additions to Canadore College are designed in the same manner as Hewgill Hall, maintain strong connections to the landscape and not simply appending to an existing block of the Education Centre. The 20 year Canadore precinct demonstrates that even with greater then expected growth the College has efficient options for growth, using bridges to maintain contiguity.

Student Residence Communities

Student residence communities are comprised of multiple student residences and corresponding communal space. There are currently two existing student residence communities, and the master plan indicates a location for the development of a third.

The Governor's house is considered an inappropriate location for a student residence on campus, and no further residence development should be undertaken in the north east quadrant of the campus. This has caused tension with the community and was not supported by a Campus Master Plan.

The Eloy Farm Residence Community will continue to develop with the addition of another Canadore College Student Residence.

A future student residence community should be considered on the east side of the pond. This will be an incredible location to develop a quiet and bucolic student residence community and will be seen as a differentiator and could be a program generator.

Shared Resources

The development of a precinct of shared Canadore and Nipissing services is key to the promotion of the strengths of the joint campus. This is the heart of the master plan, and provides the transportation infrastructure to support the continuing growth of the campus.

Parking

Ideally parking on campus is located in close proximity to main entrances to the education centre, and its visual impact is minimized through screening with the natural landscape of the campus.

The master plan identifies the primary parking zones for the campus to be located at the north and the south of campus, located in reasonable proximity to the buildings, and screened by a combination of future buildings and naturalized landscaping.

The development of the student residence community on the other side of the pond will only support smaller parking areas due to the sloped terrain.

The option of parking structures, although desirable, will remain cost prohibitive for the foreseeable future of the campus.

An in depth parking review, with recommendations for the next 10 years is included within the infrastructure segment of the Master Plan Document.

AVAILABLE SITES FOR DEVELOPMENT

This section of the Master Plan reviews the available sites within reasonable proximity to the Education Centre, and establishes the advantages and disadvantages of each site. Consideration is given to the Academic Precinct in which the site is located, and also the suitability of function as it relates to other site issues such as topography.

The parking lots

Lot 1 and 1a
Currently Lot 1 and 1a are among the more remote parking lots on campus. As Nipissing University expands their academic assets, these lots will become prime parking areas for access to the education centre academic complex. The combination of improved landscaping along the entry road and the development of academic buildings will screen the parking, limiting its aesthetic impact on the campus.

Lot 2
Lot 2 is within the long term Nipissing University Academic Precinct. It is an excellent building site, on the condition that is has the opportunity to be made contiguous with the education centre.

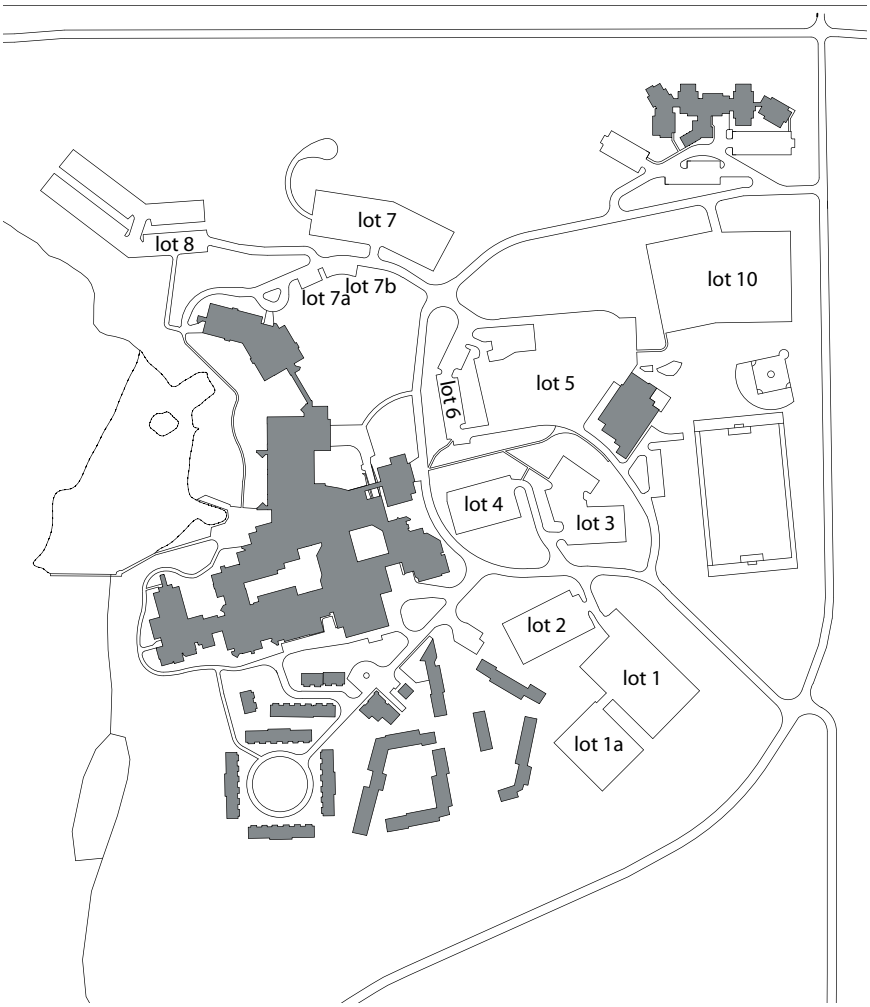
Lot 3
Lot 3 is a centrally located lot that is an excellent building site that is within the Shared Resource Precinct. The size of this parking lot will most likely be reduced by either the new Library or the Student Centre.

Lot 4 - Visitor Parking
Lot 4 is a centrally located lot that is an excellent building site that is within the Shared Resource Precinct. It will likely be home to either the new Library or the new Student Centre.

Lot 5
Lot 5 is a centrally located lot that is an excellent building site that is within the Shared Resource Precinct. It will be home to the addition of the Athletic Centre, and may also be home to the new Library or Student Centre. However, even with these campus additions Lot 5 should continue to provide some centrally located campus parking.

Lot 6
Lot 6 is a centrally located lot that is an excellent building site that is within the Shared Resource Precinct. It is likely to be home to the new Library or Student Centre.

Lot 7, 7a, 7b, and Lot 8



These parking lots will continue to serve the campus as parking lots for the foreseeable future of this Master Plan. They provide a significant amount of parking that is relatively convenient for access to Canadore College. There is enough available land in closer proximity to the Education Centre to leave these lots undeveloped.

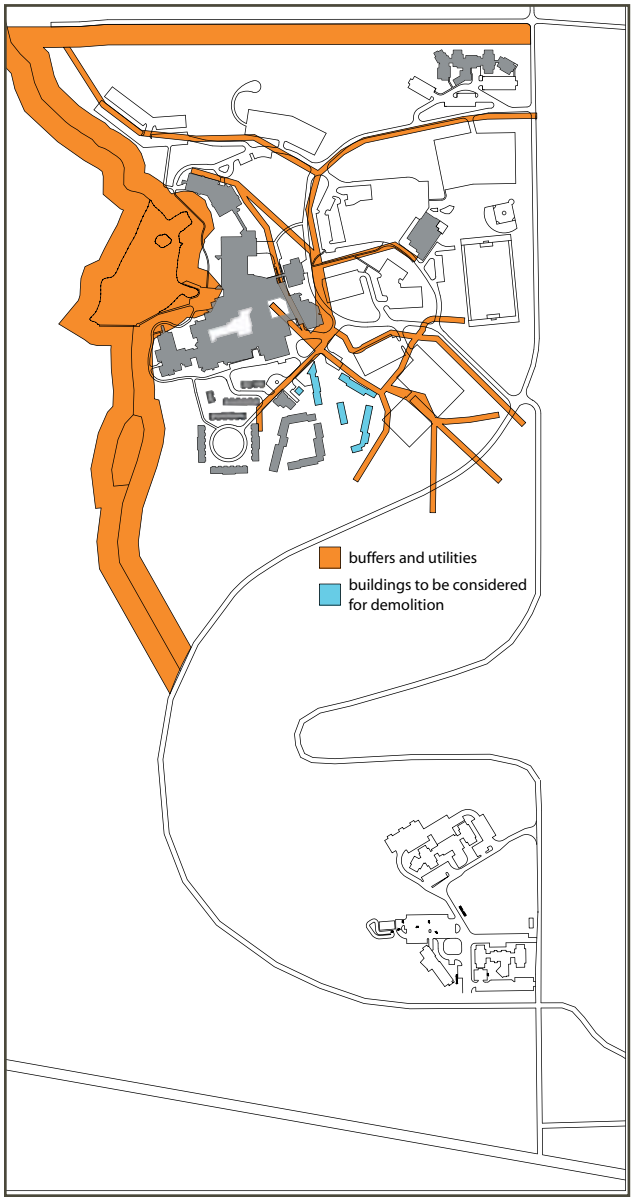
Lot 10

Lot 10 is located close to the athletic centre and the Governor's House Student Residence. It is currently one of the furthest lots from the Education Centre. With the addition of the Library and Student Centre this lot will be more convenient as major indoor circulation will be significantly closer.

Across the pond

As the Education Centre Campus continues to grow, development on the west side of the pond is inevitable. It is a matter of determining the best and most responsible use of this beautiful site. The majority of land owned by Canadore College and Nipissing University is on the west side of the pond, and most of this land is well outside of the 10 minute walking radius.

Although previous Master Plans have indicated the options of developing another academic node either near the Duchesnay River, or on the Plateau, these sites are well outside of the 10 minute walking distance. This would create increased vehicular traffic on campus and cause an unnecessary increase in parking demand. Further, it is impractical to resolve the class scheduling conflicts to optimize the use of campus classroom resources.



The challenges of proximity and contiguity suggest that academic development on the west side of the pond is less then ideal. This is further complicated by the challenges of the topography. The width of an academic building, and the amount of required parking to support academic development is not appropriate for the steep topography of the site.

The development of a new environmentally sustainable student residence community is ideal for the future of the campus. The narrow floor plate and reduced parking needs suit the steep topography of the site. Further, required infrastructure can be reduced significantly through the use of sustainable power and servicing options such as solar power and composting toilets. This is a viable direction of development, and will only become more accessible and obtainable in years to come.

Existing Residences

Nipissing University is currently landlocked for expansion into what has been identified as the Nipissing University Academic Precinct. This makes expansion difficult. In the short term this needs to be alleviated through the existing library space.

Nipissing University owns approximately 30% of the

rooms in this complex, it is suggested that the scatter rooms can be exchanged with Canadore College to obtain 3 of the oldest residence buildings that is closest proximity to the entry sequence. This will be an appropriate site for the expansion of Nipissing University with a building that can be contiguous with the Education Centre.

The land is suitable to build on, and has few issues besides minor site service incursions when Nipissing expands further.

Existing Library Space and Existing Gym

With the planned new Library, and if the primary food services relocates to the Student Centre, there will be available space within the Education Centre for renovation. This space should either remain as shared use space, or Nipissing University space. With both institutions maintaining a high utilization of larger classrooms, it is feasible that this space is converted into shared large classrooms with availability shared equally between Canadore College and Nipissing University. This would create a great hive of activity promoting cross interaction between students and faculty.

The expansion of the Athletic Centre may reduce the need for the existing shared gymnasium, allowing this space to be available for a new use. Due to its location within the heart of the Nipissing University Academic precinct any change in use should be for use by Nipissing University.

DEMONSTRATION PLANS

The Demonstration Plans are examples working towards implementing the Master Plan Vision. The plans are rooted in the implementation of the Master Plan Issues:

- Maintain and Enhance the Scenic Beauty of Campus
- Connection to the Landscape
- Institution Identity
- Residential Communities
- Enhance the Student Experience
- Environmental Sustainability
- Campus Density and Proximity
- Multiple Activity Nodes
- The City and the Campus
- Renovation and Campus Upgrades

The demonstration plans are developed based on the strategic plans of both institutions, infrastructure recommendations and academic projections which suggest the following additions to campus in the next 10-20 years:

- 3 700 square metre Student Centre Addition
- 4 600 to 7 400 square metre New Library
- Addition of 580 parking spaces
- Additional 20 000 gross square meters to Nipissing University Space Academic space based on ECS projections
- Additional 6 350 gross square meters to Canadore College Academic Space
- Addition to the Athletic Centre
- Additional 450 bed (approximately) student residence on the Eloy Farm Site
- Additional 700-1000 bed student residence development on the west side of the pond
- The completion of the two currently planned projects, the Media Arts addition, and the H-wing Science addition
- Conversion of the existing Library to large classrooms - shared, or for Nipissing University.

The locations of future building footprints are guided by the Master Plan Issues, site appropriateness, site availability, and site constraints (primarily topography, buffer zones, and infrastructure locations).

Within the Planning Context section of the Master Plan a key program issue is raised regarding the currently anticipated Student Centre Addition. The current program, particularly, the food service and conference centre component, has raised concern. The location of the primary food services on the campus is of significant importance. It needs to be centrally located for convenience, and to ensure sufficient use. This contributes significantly to the Student experience and the Density and proximity of the campus. For this reason two separate demonstration plans have been developed, using a student centre addition without food services, and a student centre addition with food services. For the in depth program recommendations please refer to the Planning Context section of the Master Plan.

Demonstration Plans_ Common Elements

Both Demonstration plans have the same vision for the Academic Precincts, the Student Residence Precincts and the Parking.

The Athletic Centre expansion, Media Arts Addition, and the H-wing Science Addition already have planned building footprints, those have been included in both demonstration plans.

The future recommendations for parking and the parameters for parking are discussed at length in the infrastructure section of this report. What is important to note is the new southern parking lot, and the improved proximity of lot 1 and lot 1a to Nipissing University's Academic Precinct. There is also the desire to retain some parking in the central part of campus, the retention of part of lot 3 can provide metered visitor parking with excellent proximity to the Shared Resource Precinct.

Contributes to:
- Connection to the landscape
- Maintaining and Enhancing the Scenic Beauty of Campus
- Campus Density and Proximity
- Environmental Sustainability

The Master Plan Issues identifies the important aspect of expansion to Hewgill Hall is the extension of Canadore College towards the entry sequences to campus. This will contribute to this particular Master Plan Issue, while also strengthening Institutional Identity. The contribution to Identity is to the whole, Nipissing and Canadore as equal partners with Shared Resources.

The Hewgill Hall expansion site is constrained by the path of existing site services (see infrastructure), and the improvement of the access road to the media arts delivery area. For these reasons, and to continue the exemplary model of Hewgill Hall with the bridge attached to the Education Centre, the expansion to the addition should be via a bridge connection.

Contributes to:
- Connection to the landscape
- Institution Identity
- Campus Density and Proximity
- Maintaining and Enhancing the Scenic Beauty of Campus
- Environmental Sustainability

The academic expansion of Nipissing University, as discussed previously in this section, is challenging. However, with the appropriate acquisition of the oldest student residence buildings Nipissing University is able to expand their academic resources in a contiguous manner via a bridge link to the main

education centre. The location of the oldest student residence buildings is close to the centre of campus, maintaining appropriate proximity.

The new Nipissing Academic Building improves the convenience of lot 1 and lot 1a, and also provides additional parking at the south end of campus.

The site does have challenges with the existing underground infrastructure, and the proximity of the remaining Student Residences.

Contributes to:
- Connection to the landscape
- Campus Density and Proximity
- Maintaining and Enhancing the Scenic Beauty of Campus
- Institution Identity
- Environmental Sustainability

Demonstration Plans_ Differences

The key master plan project for the next 5 years is the development of a new shared resources precinct on the Education Centre Campus. This will significantly contribute to reaching for the Master Plan Vision.

The intention to build a new library and a significant addition to the Student Centre will contribute the activity and vitality necessary to successfully create this new heart of campus. This will provide the framework for distributing traffic flow, improving service and delivery, and improving pedestrian safety.

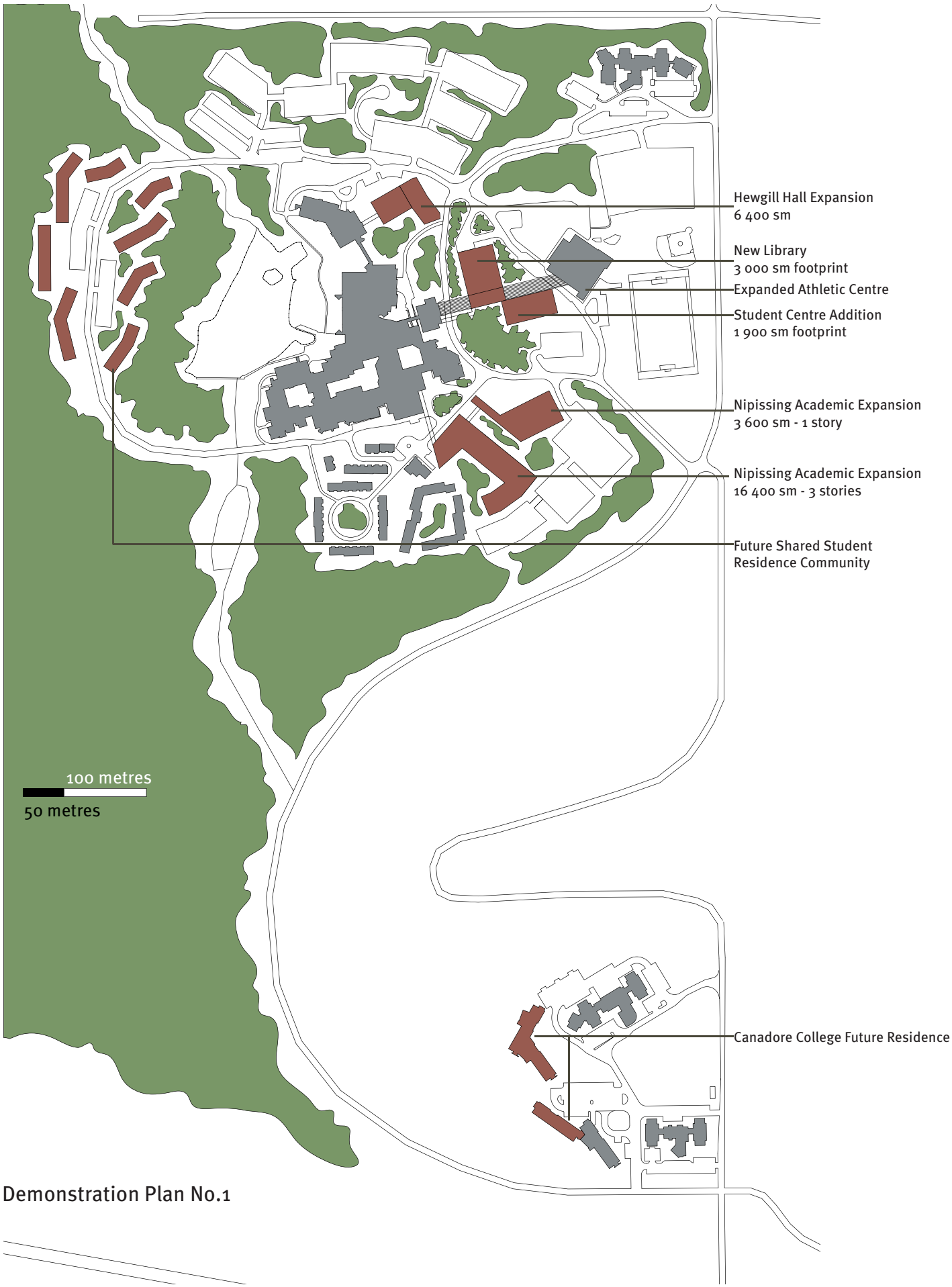
There are common elements in the 2 variations of the Shared Resources Precinct:

- Provide a functional and out of sight delivery/service area that serves both the new Library and the new Student Centre
- Relocate the student run convenience store into the new Student Centre Addition
- Establish a new hard surfaced entry plaza to the Library and the Student Centre that is accessed from both the existing bus stops and the new drop off area
- Add new area of naturalized landscaping to improve the entry sequence to campus, screen existing service areas, and bring the beauty of the west side of the pond to the east side of campus

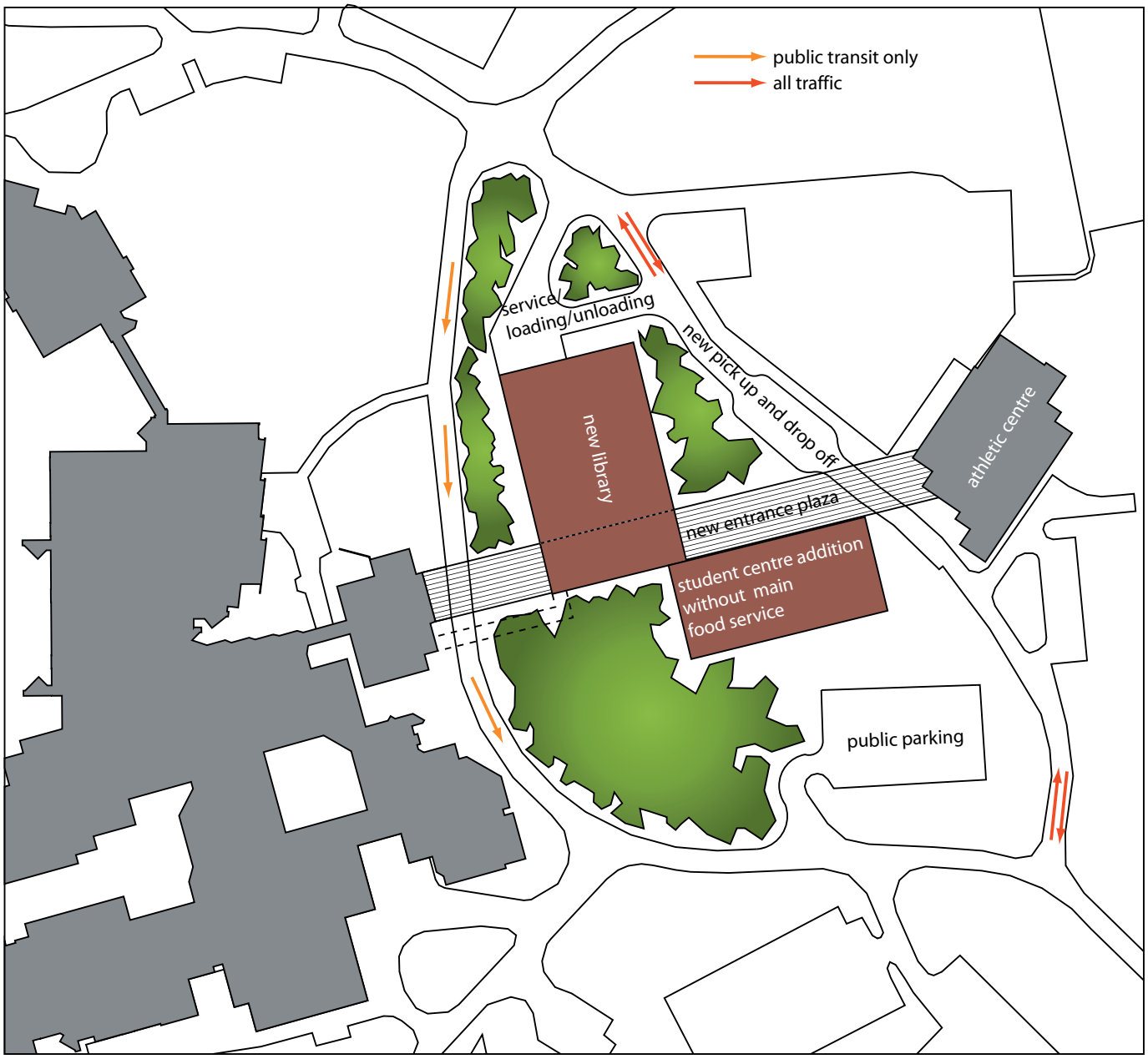
These goals contribute to:
- Institution Identity
- Maintaining and Enhancing the Scenic Beauty of Campus
- Multiple Activity Nodes
- Campus Density and Proximity
- Connection to the landscape
- Environmental Sustainability

The difference between the two plans focuses on programmatic suggestions for the Student Centre Addition, and the appropriate location of a Student Centre on Campus.
The Master Plan team supports that the Library should be the central and most prominent shared resource on campus. It is a symbol of dignity for all aspects of academia. Further, the existing food service area is in an ideal location, and any relocation will result in the cafeteria moving away from the centre of campus. It also currently has a great relationship with the pond, and views to the West side of campus.

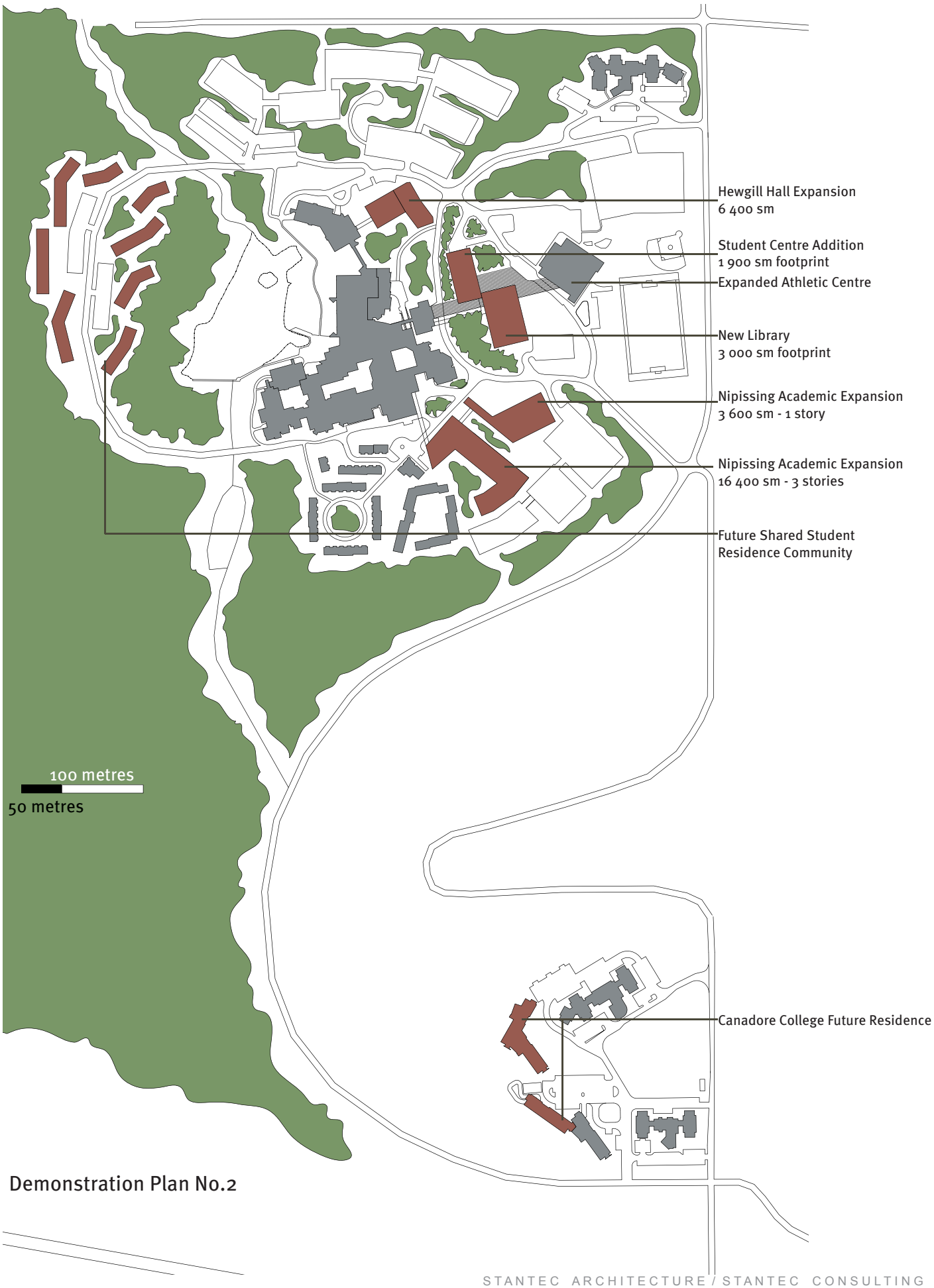
This is the impetus of Demonstration Plan No.1 and the corresponding Shared Resource Precinct.



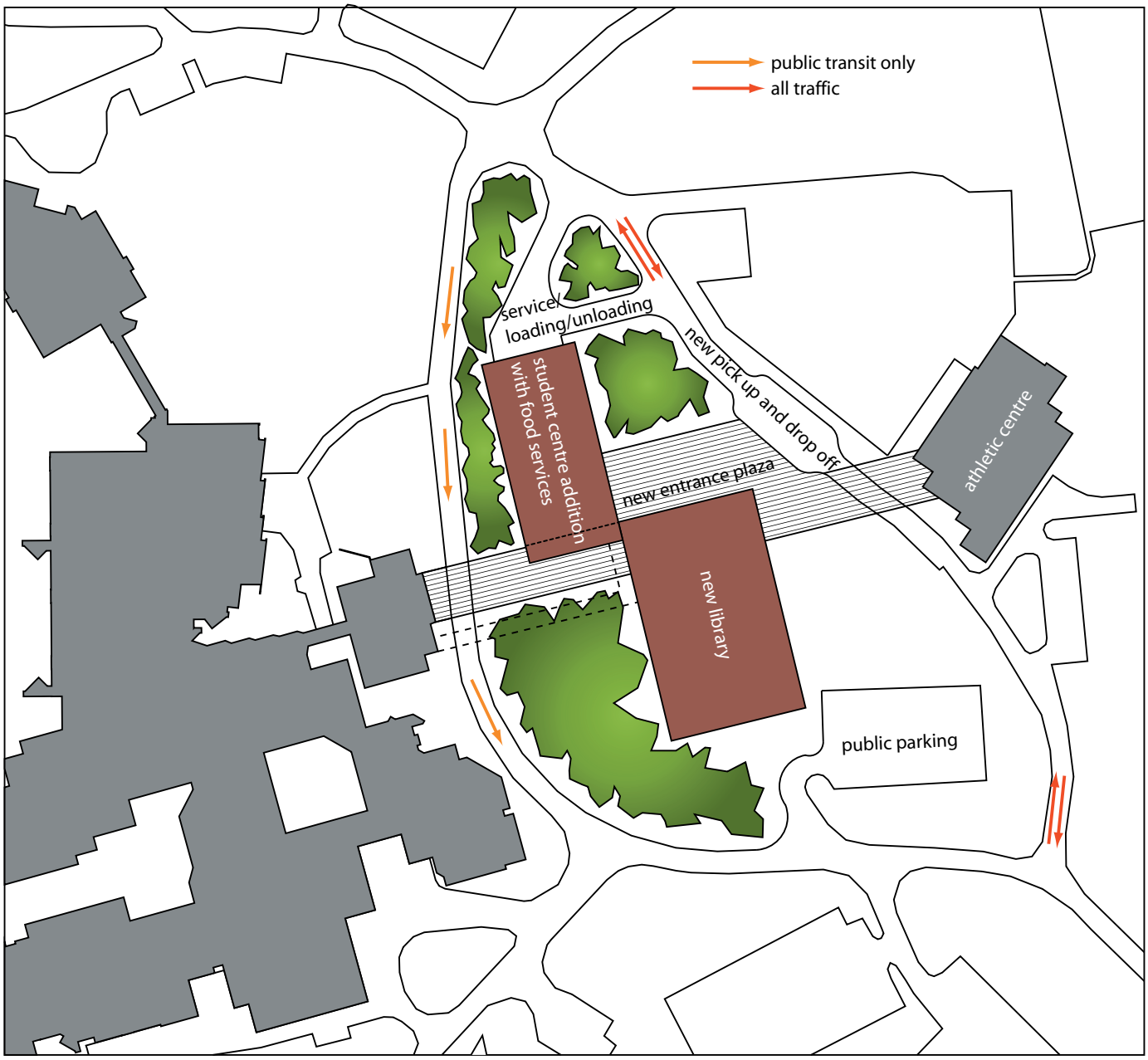
Demonstration Plan No.1



Demonstration Plan No.1_ Shared Resource Precinct



Demonstration Plan No.2



Demonstration Plan No.2_ Shared Resource Precinct

Appendix A

Electrical Site Analysis

APPENDIX - ELECTRICAL INFRASTRUCTURE

Existing Electrical Systems Inventory

The following sections list the existing outdoor 44,000V switchgear and oil filled transformer through to the main low voltage 600V and 208V distribution equipment in each main building including any related systems equipment at the Canadore College & Nipissing University Main Campus.

Main Outdoor 44,000 Volt Substation

The existing outdoor substation is a fenced enclosure of approximately 31' x 41'. It consists of two tower structures with one main oil filled transformer. The tower to the east receives the North Bay Hydro overhead 44kV pole line supply circuit LEET1-LC, with one top mounted air break switch and 65E slow speed fuse that isolates the transformer, and one set of lightning arrestors. The tower to the west supplies the overhead (ACSR) 13.8kV radial feed from the main transformer to the campus, with one top mounted air break switch and S&C SM-4 200E standard speed fuse, one set of utility metering CT's and PT's.

Main 40,000/13,800 Volt Transformer

The transformer is ONAN designed for outdoor use. The transformer is a three phase, 3000kVA , oil-filled unit made by Woden with the partial nameplate data as follows:

Transformer T1
Woden manufactured, in 1971
Configuration(delta/wye grounded) 44,000/13,800 Volts
3000/4000kVA, Type ONAN/ONAF, 55/65'C Rise, Z= 6.35%
60 Hz, 250kV BIL Primary, 110kV BIL Secondary,

This transformer does not have cooling fans; however, it can be upgraded to a fan cooled rating.

13.8kV Campus Cable Distribution

The existing 13.8kV main ACSR overhead radial feeder beginning at the 44kV main substation crosses College Drive and terminates at two separate dip poles located between parking lots 1 and 1A.

Dip pole #1 contains one set of Westinghouse type CX, 40C fused cutouts, one set of lightning arrestors and distributes power to the main campus building, the student residence buildings and H-wing via 3 x 1/C-#2 AWG, 15kV, 100% insulation rated, copper cables in a duct banks.

Dip pole #2 contains one S&C fused outdoor interrupter switch with type SM-4, 65E fused, one set of lightning arrestors and distributes power to Hewgill Hall via 1 x 3/C - #2 AWG, 15kV copper cable in a duct bank.

Both the dip pole #1 and dip pole #2 feeders share the existing (1 x 4) 4 cell utility duct bank

Canadore Nipissing 15kV Main Indoor Substation

The incoming cables are believed to be tapped from utility manhole #3 and are XLPE, CU, 3 x 1/C, sized at #2 AWG and rated at 15 kV, 100% insulation level.

There is one 13.8kV Medium Voltage (MV) fused load break cell serving the substation transformer. The switch is an S&C type SM-Alduti indoor interrupter switch rated at 600 amps, 40 kA interrupting, 13.8 kV nominal, 15.0 kV maximum, 95 kV BIL. The fuses are S&C type SM-4, 200E max. It could not be

determined what size of fuse is protecting the transformer.

The substation transformer is a three phase, dry type transformer. Pertinent ratings are listed as the following:
Hammond Serial # DB99E37
13,800/600V, Primary Delta, Secondary Delta
2000 kVA, Type ANN, Temperature Rise 80'C, Z=5.27% at 75'C

The transformer secondary high resistance grounded through an artificial neutral. This transformer does not have cooling fans and does not have a fan cooled rating.

It could not be determined what type of cable is feeding the transformer from the fused load break.

The 600V Switchboard is fed through a 2000A, 3-phase, 3-wire, low impedance FPE bus duct.

The 600V Switchboard is rated at 2000 Amps 3-phase, 3-wire and is 2 cells wide. Cell 1 contains the metering (Amps, volts, and kW Demand), an FPE type DSP-6 Ground Fault Alarm, the main 600V air circuit breaker, and one feeder breaker. Cells 2 contain 4 feeder breakers. The ACB's are all FPE H-2 600V breakers with the following ratings:

Brkr. Designation		Type	Frame	kA Int.	Trip Unit	Trips	Trip Rating
Main Brkr	FPE 50H2	2000A	50kA	Dashpot	LI	2000A	
Swbd -1	FPE 25H2	600A	25kA	Dashpot	LI	600A	
Pan. D2A.	FPE 25H2	600A	25kA	Dashpot	LI	600A	
B104/Cafeteria	FPE 25H2	600A	25kA	Carrier FB600ER	LSIG	600/300A	
Main Elect Room	FPE 25H2	600A	25kA	Carrier FB600ER	LSIG	480/240A	
Swbd.-2/Pan. D2D		FPE 25H2	600A	25kA	Carrier FB600ER	LSIG	600/300A

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

Hewgill Hall 15kV Padmount Transformer

The incoming cable from dip pole #2 is XLPE, CU, 1 x 3/C, sized at #2 AWG and rated at 15 kV.

The transformer feeding the Hewgill Hall 600V switchboard is 3-phase, oil filled. The transformer manufacturer could not be determined. Partial nameplate data is listed as the following:

Manufacturer N/A,
13800/600V, Primary Delta, Secondary Wye Grounded
N/A kVA, Type ONAN/ONAF, 55 or 65'C Rise, Z=N/A% at N/A kVA
60 Hz, 110kV BIL Primary, 60kV BIL Secondary

The transformer's secondary wye is grounded. The transformer has cooling external radiators. It could not be determined if the transformer has a fan cooled rating.

It could not be determined if the transformer contains primary fuses

Hewgill Hall 600V Switchboard

The incoming cable from the padmount transformer is Teck 90 or RA90, CU, 8 x 1/C, sized at 750 MCM.

The 600V Switchboard is manufactured by Cutler-Hammer, is rated at 1600 Amps 3-phase, 4-wire, and is 3 cells wide. Cell 1 contains the incoming cables. Cell 2 contains the metering (Amps, volts, and kW

Demand) and the main 600V Moulded Case Circuit Breaker (MCCB). Cells 3 contains a Cutler-Hammer type PL4, 1600A CDP panel with various MCCBs. The MCCB's are all Cutler-Hammer breakers with the following ratings for each unique MCCB:

Brkr. Designation	Type	Frame	kA Int.	Trip Unit	Trips	Trip Rating
Main Brkr	PCG	2000A	100kA	Seltronic	LSG	1600A
Feeder 1	HKD	400A	35kA	Thermal-Mag	LI	400A
Feeder 2	HJD	250A	25kA	Thermal-Mag	LI	250A
Feeder 3	HFD	225A	25kA	Thermal-Mag	LI	225

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

Student Residence 1 Outdoor Substation

The incoming cables are believed to be tapped from utility manhole #2 and are believed to be XLPE, CU, 1 x 3/C, sized at #2 AWG and rated at 15 kV.

The existing outdoor substation is a fenced enclosure of approximately 8' x 12'. It consists of one outdoor padmount loadbreak switch, and one outdoor enclosure containing a dry type distribution transformer and a CDP panel.

The loadbreak switch and fuse nameplate could not be determined.

The transformer feeding the Residence 1 CDP is 3-phase, dry-type. Pertinent ratings are listed as the following:
Hammond Serial # DB99E38
13,800/280(120)V, Primary Delta, Secondary Wye-Grounded
150 kVA, Type ANN, Temperature Rise 80'C, Z=5.47% at 150kVA
60Hz, 95kV BIL Primary

The transformer's secondary wye is grounded. The transformer does not have a fan cooled rating.

The 208V CDP panel is a Square D type HNC, 600A, 600V, rated panel with various MCCBs. The MCCB's are all Square D breakers with the following ratings for each unique MCCB:

Brkr. Designation	Type	Frame	kA Int.	Trip Unit	Trips	Trip Rating
Feeder 1	FA	100A	25kA	Thermal-Mag	LI	100A
Feeder 2	Q2	225A	10kA	Thermal-Mag	LI	225A

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

Student Residence 2 Outdoor Substation

The incoming cable are believed to be tapped from Student Residence #1 and are believed to be XLPE, CU, 1 x 3/C, sized at #2 AWG and rated at 15 kV.

The existing outdoor substation consists of one outdoor padmount transformer, and one outdoor enclosure containing a CDP panel.

The transformer feeding the Residence 1 CDP is 3-phase, oil-filled. Pertinent ratings are listed as the following:
Federal Pioneer manufacturerd
13,800/280(120)V, Primary Delta, Secondary Wye-Grounded

225kVA, Type ONAN, Rise 65'C, Z=4.2% at 225kVA
60Hz, 95kV BIL Primary

The transformer's secondary wye is grounded. The transformer does not have a fan cooled rating.

The 208V CDP panel is a Federal Pioneer type CDP, 800A, 208V, rated panel with various MCCBs. The MCCB's are all General Electric breakers. The breaker types and sizes could not be identified.

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

H-Wing 15kV Padmount Transformer

The incoming cable are believed to be tapped from Student Residence #2 and are believed to be XLPE, CU, 1 x 3/C, sized at #2 AWG and rated at 15 kV.

The transformer feeding the H-Wing 600V switchboard is 3-phase, oil-filled. Pertinent ratings are listed as the following:
Carte, Serial # 10338-001
13,800/600(347)V, Primary Delta, Secondary Wye-Grounded
500kVA, Type ONAN, Rise 65'C, Z=6.00% Guaranteed at 500kVA
60Hz, 95kV BIL Primary

There are two sets of fuses in series protecting the primary winding of the transformer. The first fuse set is a Cooper type Bay-O-Net, oil immersed, 40A fuse. The second fuse set is a fixed mounted Cooper type current limiting 125A fuse. The fuse is mounted within the tank and is intended to operate above the Bay-O-Net fuses interrupting capability at very high short circuit current faults.

H-Wing 600V Switchboard

The incoming cable from the padmount transformer is RW90, CU, 2 x 4/C, sized at 350 MCM in direct buried conduit.

The 600V Switchboard is manufacturer by Cutler-Hammer, is rated at 800 Amps 3-phase, 4-wire, and is 3 cells wide. Cell 3 contains the incoming cables and the main 600V Moulded Case Circuit Breaker (MCCB). Cells 1 and 2 both contain a Cutler-Hammer type PL4, 800A CDP panel with various MCCBs. The MCCB's are all Cutler-Hammer breakers with the following ratings for each unique MCCB:

Brkr. Designation	Type	Frame	kA Int.	Trip Unit	Trips	Trip Rating
Main Brkr	HMDL	800A	35kA	Digitrip 310	LS	600A
Feeder 1	HKD	400A	35kA	Thermal-Mag	LI	300A
Feeder 2	HFD	100A	25kA	Thermal-Mag	LI	100

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

Athletic Field House 15kV Padmount Transformer

The Athletics Field House transformer receives power from the North Bay Hydro overhead 12.47kV pole line supply circuit ECT1L located at College Drive. The dip pole contains one set of AB Chance fused cutouts rated at 25K, and one set of lightning arrestors.

The incoming cables are believed to be XLPE, CU, 3 x 1/C, sized at #2 AWG and rated at 15 kV in a (2 x 2) 4 cell concrete encased duct bank.

The transformer feeding the Athletics Field House 600V switchboard is 3-phase, oil filled. The transformer manufacturer could not be determined. Partial nameplate data is listed as the following:

Manufacturer N/A,
12470Wye(4160Delta)V/600(347)V, Primary Wye or Delta, Secondary Wye-Grounded
225kVA, Type ONAN, 65'C Rise, Z=4.2% Typical at 225kVA
60 Hz, 95kV BIL Primary

The transformer's secondary wye is grounded. The transformer does not have a fan cooled rating.

It could not be determined if the transformer contains primary fuses.

All equipment to the padmount transformer and including the transformer is owned and operated by North Bay Hydro.

Athletics Field House 600V Switchboard

The incoming cable from the padmount transformer could not be determined.

The 600V Switchboard is manufacturer by Federal Pioneer, is rated at 400 Amps 3-phase, 4-wire, and is contained in 1 cell. The switchboard contains a main 600V Moulded Case Circuit Breaker (MCCB) and a Federal Pioneer 400A CDP panel with various MCCBs. The MCCB's are all Federal Pioneer breakers with the following ratings for each unique MCCB:

Brkr. Designation	Type	Frame	kA Int.	Trip Unit	Trips	Trip Rating
Main Brkr	CK3400N	400A	35kA	MG STR 55 UP	LSIG	400A
Feeder 1	CE3150H	150A	35kA	Thermal-Mag	LI	150A

There is no Transient Voltage Surge Suppression (TVSS) unit installed on this switchboard.

Telecommunications System

During onsite discussions with the local telecoms authorities, there were no capacity issues identified with the telecommunications system. However, upon review of equipment, infrastructure, and documentation, the systems were found to be disorganized and poorly documented. The existing system should be reviewed, components and infrastructure should be reorganized in an orderly fashion, maintenance should be performed where necessary, and the resultant system configuration should be thoroughly documented.

APPRAISAL OF EXISTING EQUIPMENT

The following will describe pertinent electrical equipment components and comment on their integrity based on the electrical testing requirements, related electrical standards, and general problematic design features inherent to the equipment.

MAIN OUTDOOR 44KV SUBSTATION

General Substation Condition

Note that our survey was conducted in the winter with many of the substation components found snowed under. The condition of the exposed portion of the outdoor yard is acceptable.

A Utility representative was contacted with respect to substation grounding. The representative

mentioned that the grounding including Step and Touch potentials are questionable and may not meet safe levels as per standard IEEE 80. The substation is constructed in a rocky area where ground resistivity is very high. A ground grid study and design should be performed to ensure that the substation is properly grounded and meets the latest ESA code requirements. It was understood that a ground conductor was brought and extended over the road to better soil on the Facility side of the main road, however, it is uncertain whether a full Step and Touch potential study as per IEEE has been completed for this station.

Typically stone needs to be replaced over the years to maintain the current depths, and should be replaced by ¾" clean crushed stone to maintain the current Step and Touch potentials. Spraying should also be done to eliminate any plants from the yard at all times.

Incoming Utility Cables

The main incoming Utility cables are Aluminum Conductor Steel Reinforced (ACSR), probably sized close to 2/0 AWG. All cables and poles within the campus property line are owned and maintained by the College/ University facility, all over the boundary are under the authority of North Bay Hydro. All the cables and poles look to be in acceptable shape. No testing is required for these conductors.

There are lightning arrestors mounted in the overhead structure. The ratings of the units could not be determined; no testing records for these units have been located.

Main Steel Structures

The steel structures look to be in good condition. All grounding straps that were exposed look acceptable and properly done.

The air break switch on the structure should be operated at least once every 3 years to ensure proper operation.

Outgoing conductors

The outgoing conductors begin as Aluminum Conductor Steel Reinforced (ACSR), the size unknown, mounted on the campus owned pole line and then split into two separate underground feeders at dip pole #1 and dip pole #2. The underground cables are XLPE-insulated cable, rated for 15 kV. These cables will typically last at least 20 years when installed properly and used in good conditions.

The remainder of 13,800V distribution is completely underground, which will reduce the possibility of insulation failure due to lightning strikes. There are a set of lightning arrestors present at the outdoor substation (44,000V level) and at the downstream 13,800V dip poles #1 and #2, which will help to minimize any switching surges or the effects of MV fuse interruptions. This will limit the stress upon the insulation of these cables during these occurrences.

Utility manholes #2 and #3 house 15kV plug-on tap elbows needed to split the distribution feeder from dip pole #1 to the various loads. Since these elbows are underground they may be subjected to flooding. XLPE type cables and plug-on tap elbows are known to have a reduced life span when subjected to long periods of exposure to moisture. Water can infiltrate the cable insulation or the elbow joints and cause swelling and water treeing in the cable or short circuiting in the elbow leading premature failure. Also, the outgoing cables are not arranged with redundancy in mind. Any single point failure along either of the two cable runs will cause a power interruption to major portions of the campus. Depending on the cable fault location the system can be placed into service within a time frame of 12 to 48 hours, restoring full electrical service back to either faulted feeder. The outgoing cables from dip pole #1 are new and should have a long service life. The outgoing cables from dip pole #2 have been in service for approximately 20

years and should be monitored.

Testing should be done within these feeders (on a maximum 5-year basis) to determine when the trending of leakage currents will indicate the possibility of imminent failure. No testing values could be found for these cables.

System Configuration

This substation does not have primary or secondary redundancy. Any single point failure between the 44kV utility incoming service and 13.8kV dip poles #1 and #2 will cause a campus wide power interruption. Depending on the equipment that has failed the system can be resorted in a time frame of 12 to 72 hours. Since it is vital to maintain power continuity to the campus the distribution system should be re-designed for increased system redundancy so that the failed equipment can be isolated and services can be re-routing via a switch arrangement to back up any equipment at the 44kV of 13.8kV distribution level within a short time frame (1 hour). This can be achieved by the addition of radial and/or loop feeders at the 13.8kV distribution level and by adding a second 44kV service entrance transformer. A significant capital cost expenditure will be incurred by upgrading the system.

44,000V Transformer

Transformer life expectancy is, to a large extent, dependent on the life of the insulation. Aging or deterioration of the insulation is primarily a function of time and temperature. Therefore, the loading of the transformer plays a large part in determining its life expectancy since it affects the temperature of the insulation so directly. All loading on this transformer is well within its capabilities.

The September 2005 North Bay Hydro bill (for the complete facility) shows the greatest yearly demand load at 2113 kW at 88% PF, or 2397 kVA. This is 80% of the transformer's base rating capacity. Therefore, this is well within its capabilities and should not present any problems.

Based on future loading requirements, the transformer has the ability to be upgraded by 133% of its base rating of 3000 kVA to an extended rating of 4000 kVA by installing cooling fans.

There are too many variables to calculate the exact service life of a transformer, but close monitoring by annual chemical analysis of the insulating fluid and electrical testing can detect signs of deterioration and possibly give warning of imminent failure. The gas in oil and standard oil analysis test should be performed as part of the maintenance testing.

No testing results have been located for this transformer.

Fuses

The transformer primary fuses are S&C Electric, 65E, slow speed fuses rated at 165% of the transformer's base rating, 124% of the transformer's extended rating, and are properly sized for the application.

The transformer secondary fuses are S&C Electric, 200E, standard speed fuses rated at 160% of the transformer's base rating, 120% of the transformer's extended rating, and are properly sized for the application. The size of the ACSR outgoing feeder could not be confirmed and it is unknown if the feeder is properly protected by the fuse. These fuses may not be properly coordinated with the up stream protection.

Dip pole #1 fuses are Westinghouse CX, 40C and appear to be undersized based on the 1875kVA of connected transformer load. Theses fuses may not be properly coordinated with the down stream distribution transformer fuses.

The dip pole #2 fuses are S&C Electric, 65E, standard speed fuses. The size of the Hewgill Hall transformer rating is unknown and therefore coordination with the down stream equipment cannot be determined.

A Short Circuit, Device Evaluations, and Coordination Study should be performed on the existing system to ensure that all of the protective devices are rated to safely interrupt the maximum available fault currents and that proper coordination exists between the protective devices to avoid unnecessary power interruptions in the event of system faults.

No testing records could be found for any of the fuses.

CANADORE NIPISSING 15KV MAIN INDOOR SUBSTATION

13,800V Load Break Switches

The 13,800 Volt, 600 Amp load-breaking switch is very reliable and have not varied a great deal in design and construction over many years. As per NETA standard section 7.5.1.2., these devices require minimal service; mainly just contact alignment, cleaning, and lubrication.

No testing records could be found for this switch.

Fuses

The load break fuses are believed to be S&C expulsion fuses. The exact fuse link size could not be confirmed, since conformation involves removing the fuse links. This should be done at the next testing shutdown.

No testing records could be found for these fuses.

13,800V Transformer

The life expectancy of a transformer is often dependent upon the life of the insulation. Aging or deterioration of the insulation is primarily a function of time and temperature. Therefore, the loading of the transformer plays a large part in determining its life expectancy, since it affects the temperature of the insulation so directly. The concern for this substation is that during times of peak summer loading the resulting wear on the transformer may reduce its service life.

Spot measurements performed by the campus staff indicate that the peak load on the transformer is 1850A. The transformer is rated for 1923A at 600V. This is 96% of the transformers 2000kVA full load rating. During our February 2006 site investigation we measured the transformer load at 1110A or 58% of its full load rating

A transformer's predicted life expectancies with respect to ANSI/IEEE Standard C57.96-1989, 'IEEE Guide for Loading Dry-Type Distribution and Power Transformers' is based upon the expected insulation life expectancy curves based on maximum hot spot temperatures. A dry type transformer running at rated capacity in an ambient temperature of 30'C or less is assumed to have an average life expectancy of 20 years. The main campus transformer, which currently runs between 50% to 96% of its rated load is estimated to have a lifespan longer than 25 years as limited by hot-spot temperatures. The limitations then become much more related to the environmental and mechanical aging of the insulation, and less on the hot-spot temperatures, resulting in a much greater difficulty in determining absolute life expectancy.

600V Switchboard Metering

The analog metering within this switchboard is obsolete. Modern digital metering should be added which could provide many more measurements of which some of the more important include:

High speed recorders to measure transient events within and without the facility
Harmonic measurements to measure problematic levels of harmonics before they affect your facility
Min and Max readings to determine peak demand levels (something we cannot measure currently)
Alarming capabilities to warn personnel when certain power thresholds are surpassed
Unbalanced voltage measurements to determine if single phasing conditions are occurring
Built in communications to talk to Building Automation Systems, SCADA systems, or other systems as required
Many other system parameter measurements

The modern solid state meters allows facility personnel to more closely monitor and troubleshoot the electrical system within a facility at a fairly low cost.

600 Volt Air Circuit Breakers

The FPE H-2 series of air circuit breakers in the main 600V switchboard have a fairly common tendency for their control mechanisms to operate outside of specifications because of environmental degradation of their lubrication. This leads to two problems: the first is that a trip command will result in a slow operation of the circuit breaker, possibly resulting in personnel hazard; the second is the inability to properly close the breaker when required (trip free nuisance operation), resulting in excessive down time. The regular operation and lubrication of these mechanisms, at least every 2 to 3 years, should eliminate these possibilities. These mechanisms are fairly 'mature' and should be checked and adjusted fairly regularly.

No testing records could be found for these breakers.

600V Circuit Breaker Trip Units

There are a number of concerns with some of the switchboard breaker trip units.

The main breaker and the two feeder breakers serving Panel D2A and Swbd-1 contain trip units are series electromechanical type. These unit use either pneumatic or oil based reservoirs to provide time delays for the portion of the trip curve that provides thermal overloads. Typically, environmental degradation in the absence of regular operation will result in the malfunctioning of these trip units after many years. It is highly likely that these trip units are not properly operating at this time.

A second problem is that the trip unit cannot be easily tested by secondary injection, which uses a small test unit operating at tens of amps. Series electromechanical trip units require full primary injection testing to properly test the trip units, which is a difficult and time consuming task.

A third problem is that the three circuit breakers that have been retrofitted with true rms solid-state trip units have their instantaneous element improperly applied. Typically the main breakers should not have the instantaneous element applied at all, while all the feeder breakers should have either a coordinated time delay or an instantaneous element. This will allow the feeder breakers time to clear a fault before the main breaker trips.

It is highly recommended that the remaining three breakers containing series electromechanical trip units be retrofitted with a modern solid-state trip unit. Also, to ensure proper selectivity between the protective devices consideration should be given to performing and implementing a protective device Coordination Study.

System Configuration

The majority of the campus essential services are provided from this substation so it is imperative that power continuity is maintained at this location. This substation does not currently have any redundancy, either primary or secondary.

Since the peak load in this substation is close to the capacity of the transformer, consideration should be given to upgrade the existing radial system to a secondary selective system. This can be performed by adding a second 13.8kV fused load break switch, a 2000kVA transformer, a 2000A main breaker, and a 2000A tie breaker. With this proposed arrangement the failure of an individual 13.8kV feeder or transformer can easily be backed up by a simple switching procedure between the two main breakers and the tie breaker. Also, during peak load normal operating conditions the two transformers would share 50% of the total system load thereby increasing their service life expectancy.

Transient Voltage Surge Suppression (TVSS)

A concern with the 600V switchboard is the lack of Transient Voltage Surge Suppressors (TVSS). A TVSS serves to clamp the peak voltage on the switchboard to levels that will not harm the insulation. The peak voltage can rise to extreme levels during lightning strikes, switching operations, resonant conditions, short circuit faults, etc. if there is no TVSS unit present. These should be added to the switchboard as soon as possible. Ensure the TVSS is either directly connected to the bus or as near it as possible to ensure the shortest possible lead lengths to minimize the inductance (i.e. less than 14 inches is recommended). Typically, every extra inch of lead lengths adds between 10 to 25V to the actual Clamping or Let Through voltage at the bus. The leads should also be twisted or tie-wrapped to further reduce the inductance. Upsizing the lead size is also an improvement, but is the least effective enhancement.

HEWGILL HALL 15KV PADMOUNT TRANSFORMER AND 600V SWITCHBOARD

The switchboard is fairly new and in good shape. The following are concerns regarding the switchboards or the devices within.

600V Switchboard Metering

The Westinghouse FT-1 shoring switch wiring within the metering compartment has been modified to expose the Current Transformer (CT) secondary connections. The CT secondary wiring is presently connected using marreted joints. If these joints are accidentally separated the CTs will produce extremely high voltages that can be hazardous to personnel. It is recommended that the original shorting switch arrangement be restored.

The analog metering within this switchboard is obsolete. Modern digital metering should be added which could provide many more measurements of which some of the more important include:

High speed recorders to measure transient events within and without the facility
Harmonic measurements to measure problematic levels of harmonics before they affect your facility
Min and Max readings to determine peak demand levels (something we cannot measure currently)
Alarming capabilities to warn personnel when certain power thresholds are surpassed
Unbalanced voltage measurements to determine if single phasing conditions are occurring
Built in communications to talk to Building Automation Systems, SCADA systems, or other systems as required
Many other system parameter measurements

The modern solid state meters allows facility personnel to more closely monitor and troubleshoot the electrical system within a facility at a fairly low cost.

Transient Voltage Surge Suppression (TVSS)

A concern with the 600V switchboard is the lack of Transient Voltage Surge Suppressors (TVSS). A TVSS serves to clamp the peak voltage on the switchboard to levels that will not harm the insulation. The peak voltage can rise to extreme levels during lightning strikes, switching operations, resonant conditions, short circuit faults, etc. if there is no TVSS unit present. These should be added to the switchboard as soon as possible. Ensure the TVSS is either directly connected to the bus or as near it as possible to ensure the shortest possible lead lengths to minimize the inductance (i.e. less than 14 inches is recommended). Typically, every extra inch of lead lengths adds between 10 to 25V to the actual Clamping or Let Through voltage at the bus. The leads should also be twisted or tie-wrapped to further reduce the inductance. Upsizing the lead size is also an improvement, but is the least effective enhancement.

STUDENT RESIDENCE 1 OUTDOOR SUBSTATION

The 13.8kV fused loadbreak switch on the primary side of the padmount transformer is subject to the same issues as mentioned previously. Although minimal service is required for this device, more frequent maintenance and attention are suggested because the switch is located outdoors and therefore exposed to harsher operating conditions. Also, the size of the fuses should be confirmed during the next shutdown to ensure that they are adequately sized to provide the required overcurrent protection for the 150kVA transformer and secondary conductors supplying the 600A CDP panel as per the Ontario Electrical Safety Code. Expulsion or current-limiting fuses sized at 10A are recommended.

As indicated previously, transformer lifetime is largely affected by the rate at which its insulation degrades which is, in turn, influenced by its loading. It is recommended that metering be added to this installation so that the loading can be monitored to ensure that the transformer and other switchgear components are not experiencing significant overloading. A sophisticated, modern metering system may not be warranted for this substation, however, as it is a relatively small service.

A Transient Voltage Surge Suppression (TVSS) unit is recommended for this installation.

STUDENT RESIDENCE 2 OUTDOOR SUBSTATION

The 225kVA Federal Pioneer padmount transformer in this substation does not have its own primary or secondary protection. As a result, a fault on this portion of the system that is located downstream of the main CDP panel and not cleared by one its feeder breakers will be cleared by the dip pole #1 fused cutouts. This would cause power interruption to not only the other student residence substation but also H-wing and the main campus building (i.e. all loads serviced by dip pole #1).

It is recommended that a padmount fused loadbreak switch be added on the primary side of the transformer and the fuses should be sized appropriately to provide overcurrent protection for the transformer as well as the primary and secondary conductors as per the Ontario Electrical Safety Code. The fuse size should also be chosen to coordinate with the upstream dip pole #1 fuses as best as possible. However, as mentioned previously, the dip pole #1 fuses are Westinghouse CX, 40C and are undersized based on the 1875kVA of connected transformer load. As a result, achieving good coordination between these undersized fused and new fuses downstream to protect the 225kVA transformer will be difficult. This portion of the system would benefit from a short-circuit, device evaluation, and coordination study.

The 800A CDP panel lacks metering and surge protection. Both are recommended for this installation so that the load can be monitored and instances of overloading, and any power quality problems can be easily identified.

The feeder breakers in the CDP panel are Federal Pioneer thermal-magnetic molded-case circuit breakers. The types, sizes, and interrupting ratings of these breakers are not identified. This information should

be determined and documented, and it should be ensured that the breakers have sufficient interrupting ratings for the maximum available fault current they may be expected to clear. This is especially important for this installation because there is no primary protection for the transformer; a fault on the 208V system, downstream of the main CDP panel will be cleared by the dip pole #1 fusing if the MCCB exposed to the fault current is incapable.

H-WING 15KV PADMOUNT TRANSFORMER AND 600V SWITCHBOARD

The switchboard is fairly new and in good shape. The following are concerns regarding the switchboards or the devices within.

600V Switchboard Metering

There is currently no metering within this switchboard. Modern digital metering should be added which could provide many more measurements of which some of the more important include:

High speed recorders to measure transient events within and without the facility
Harmonic measurements to measure problematic levels of harmonics before they affect your facility
Min and Max readings to determine peak demand levels (something we cannot measure currently)
Alarming capabilities to warn personnel when certain power thresholds are surpassed
Unbalanced voltage measurements to determine if single phasing conditions are occurring
Built in communications to talk to Building Automation Systems, SCADA systems, or other systems as required
Many other system parameter measurements

The modern solid state meters allows facility personnel to more closely monitor and troubleshoot the electrical system within a facility at a fairly low cost.

Transient Voltage Surge Suppression (TVSS)

A concern with the 600V switchboard is the lack of Transient Voltage Surge Suppressors (TVSS). A TVSS serves to clamp the peak voltage on the switchboard to levels that will not harm the insulation. The peak voltage can rise to extreme levels during lightning strikes, switching operations, resonant conditions, short circuit faults, etc. if there is no TVSS unit present. These should be added to the switchboard as soon as possible. Ensure the TVSS is either directly connected to the bus or as near it as possible to ensure the shortest possible lead lengths to minimize the inductance (i.e. less than 14 inches is recommended). Typically, every extra inch of lead lengths adds between 10 to 25V to the actual Clamping or Let Through voltage at the bus. The leads should also be twisted or tie-wrapped to further reduce the inductance. Upsizing the lead size is also an improvement, but is the least effective enhancement.

ATHLETICS FIELD HOUSE 600V SWITCHBOARD

The switchboard is fairly new and in good shape. The following are concerns regarding the switchboards or the devices within.

600V Switchboard Metering

There is currently no metering within this switchboard. Modern digital metering should be added which could provide many more measurements of which some of the more important include:

High speed recorders to measure transient events within and without the facility
Harmonic measurements to measure problematic levels of harmonics before they affect your facility
Min and Max readings to determine peak demand levels (something we cannot measure currently)

Alarming capabilities to warn personnel when certain power thresholds are surpassed
Unbalanced voltage measurements to determine if single phasing conditions are occurring
Built in communications to talk to Building Automation Systems, SCADA systems, or other systems as required
Many other system parameter measurements

The modern solid state meters allows facility personnel to more closely monitor and troubleshoot the electrical system within a facility at a fairly low cost.

Transient Voltage Surge Suppression (TVSS)

A concern with the 600V switchboard is the lack of Transient Voltage Surge Suppressors (TVSS). A TVSS serves to clamp the peak voltage on the switchboard to levels that will not harm the insulation. The peak voltage can rise to extreme levels during lightning strikes, switching operations, resonant conditions, short circuit faults, etc. if there is no TVSS unit present. These should be added to the switchboard as soon as possible. Ensure the TVSS is either directly connected to the bus or as near it as possible to ensure the shortest possible lead lengths to minimize the inductance (i.e. less than 14 inches is recommended). Typically, every extra inch of lead lengths adds between 10 to 25V to the actual Clamping or Let Through voltage at the bus. The leads should also be twisted or tie-wrapped to further reduce the inductance. Upsizing the lead size is also an improvement, but is the least effective enhancement.

EXISTING AND FUTURE SYSTEM LOADING

A critical concern to the Canadore College & Nipissing University is that the future capacity of their Medium Voltage distribution system will be acceptable for both their current and proposed loading. Appendix 1 contains detailed information regarding the current and projected future loading of the campus as a whole and for certain facilities within the campus.

The present loading for the entire Canadore College & Nipissing University campus was estimated using North Bay Hydro billing demand figures. The peak loading for the campus within the past couple of years was 2113 kW, occurring in September of 2005. To estimate the future demand for the campus and for each major 15kV substation, both natural load growth and the effects of planned new facilities and facility expansions were taken into consideration. A factor of 1% per annum was used to estimate the natural load growth expected from the present date to the year 2020. To account for new facilities and expansions to existing facilities, loading of 5W per square foot was estimated, and best efforts were made to conservatively estimate the projected time of construction completion for these new developments. A 90% power factor was approximated for all of the capacity verification calculations.

Please note that the loading figures presented in the spreadsheets in Appendix 1 are intended to approximate the demand for the campus and its constituent facilities. Since each 15kV substation is not likely to experience heavy loading simultaneously and not all of the campus substations have been accounted for, the demand figures will not necessarily sum up to the total peak demand for the campus projected for each year.

GENERAL CAMPUS – MAIN 44KV SUBSTATION

The major components within the 44kV substation were evaluated based on the present loading as well as the future anticipated campus loading through the year 2020. As indicated, the present loading was determined through North Bay Hydro billing demand figures.

The components evaluated included the 44/13.8kV transformer and its primary fusing, as well the fusing and conductors for dip poles #1 and #2. The transformer was evaluated based on its 3MVA rated capacity with natural cooling, as well as its 4MVA fan-cooled rated capacity. As indicated in Appendix 1,

at present the transformer is capable of supporting the campus load without cooling fans as it is loaded to approximately 78% of its capacity. However, as developments are undertaken and the load continues to grow, it is anticipated that the transformer will likely start to experience significant overloading within the next five years with the newly added facilities. It is therefore recommended that cooling fans be added to the transformer at some point before major facilities are added on campus in preparation for the anticipated load growth. With the addition of the cooling fans, the transformer should be capable of supporting the campus load well into the foreseeable future.

All of the other components evaluated appear to be adequate to support the future anticipated load growth into the year 2020 with the exception of the fused cutouts on dip pole #1, which are already undersized for present loading conditions.

CANADORE NIPISSING MAIN INDOOR 15KV SUBSTATION

Current loading for this substation was determined through spot measurements, which indicated the presence very heavy loading conditions. The 13,800/600V transformer was found to be loaded to 96% of its rated capacity. The effects of loading of this magnitude on the life expectancy of a transformer were discussed previously. It is recommended that the loading on this substation be monitored for an interval of one week to determine whether or not this level of loading is typical for continuous periods of time. Short peaks of loading close to or even slightly exceeding a transformer's rated capacity are not of great concern as compared to continuous periods of heavy loading which can have a cumulative effect on the degradation of the transformer's insulation. If loading above 80% is found to be typical, it is recommended that this substation be upgraded. Needless to say, servicing any of the new developments via the main 15kV substation will not be an option unless the existing substation is upgraded or loads are transferred to other substations to create sufficient spare capacity.

HEWGILL HALL 15KV SUBSTATION

The loading on the Hewgill Hall substation was estimated using the analog metering on the low-voltage switchboard. The factor limiting the capacity of this substation is the incoming cables, rated for 120 amps as per Table 2 of the Ontario Electrical Safety Code. These cables are loaded to an estimated 23% of their capacity at present and to only 26% of their capacity in the year 2020 as a result of natural load growth. However, it should be noted that these figures are based on the assumption that typical loading conditions were present at the time that the switchboard meters were read which is not necessarily the case. As is the case with the other low-voltage switchboards on campus with obsolete analog metering or no metering system at all, this system would benefit from the installation of a modern solid-state metering system so that loading conditions may be accurately assessed over longer intervals of time and any power quality problems that exist may be identified and corrective measures taken.

STUDENT RESIDENCE 15KV SUBSTATIONS

The loading on the two student residence 15kV substations could not be determined or ascertained since there are no metering instruments on the main CDP panels. For the purposes of evaluating the capacity of the major substation components, the loading was estimated, for each substation, to be 50% of the 13,800/208V transformer's rated capacity. If these loading levels are representative of typical conditions, all substation components are expected to be capable of accommodating future anticipated load growth. The loading should be monitored for a one-week interval as was indicated for the other substations. Even if spare capacity is found to be available in either one of these substations, it is not recommended that any significant load be added to the low-voltage CDP panels in the future (i.e. the proposed new student residence) as they should not be overdutied. Protection and coordination issues within these substations were identified previously within this report.

H-WING 15KV SUBSTATION

Due to the location of the Nipissing Science Addition, a development planned for the immediate future, servicing the facility from the H-Wing 15kV substation will be convenient. In order to determine whether or not this can be done, however, it must be ensured that all major substation components have sufficient spare capacity to accommodate this extra load. Present loading for this substation is estimated at 33% of the 13,800/600V transformer's capacity, leaving enough spare capacity to support the Nipissing Science Addition and accommodate natural load growth expected through the year 2020. However, a solid-state metering system is highly recommended for the low-voltage switchboard as there is currently no metering system at all. The loading should be monitored and recorded for at least a one-week interval to determine whether or not there is sufficient spare capacity to support the Science Addition. If the present continuous average loading is found to exceed 200-300kVA , care should be taken when sizing and adding the additional loading of the Science Facility to the H-Wing system. If the existing loading is found to be in excess of 300kVA, the transformer and secondary cabling may have to be upgraded.

FUTURE SYSTEM CONFIGURATION

For a critical campus type system, there are a number of fundamental objectives required from the medium voltage electrical distribution system. They are prioritized below:

1. Minimize occurrences of any system failures, or
2. Minimize downtime in the event of a system failure, and
3. Minimize range of power outage in the event of a system failure

Typically, this would be done by the following strategies:

1. Select good quality products, properly rated and engineering for their application
2. Ensure proper and regular maintenance and testing of distribution system.
3. Ensure complete redundancy in the event of a component failure (avoid single point of failures)
4. Minimize time to switch configuration in the event of a system failure

The bulk of the electrical distribution components within the Canadore College and Nipissing University campus were found to be of good quality and in acceptable condition. However, there were a few issues with the scope and regularity of maintenance, as described earlier in the report, as well as some instances where devices are obsolete, inadequately sized for the load, and/or not providing satisfactory system protection.

The two major concerns with the distribution system, however, are related to the capacity of the main 15kV substation and the lack of redundancy within the system at all levels. Plans to upgrade the campus distribution system should therefore be devised address both of these issues, ensuring that the capacity of the system is increased as necessary to accommodate future developments and that the redundancy of the system is improved.

There is suspected to be capacity issues with the 13,800/600V transformer within the main 15kV substation. One method to address this issue would be to request that the manufacturer to provide a fan-cooled rating for the transformer and install cooling fans to add capacity to the transformer. This may increase the transformer's rated kVA by about 25-33%. The 600V switchboard would then need to be upgraded to 3200A (with a high-resistance grounding unit) in order to utilize this extra capacity. This is a good short-term alternative for providing extra system capacity at a location that is central to the campus. This will likely alleviate any capacity constraints for this substation and provide spare capacity so that future developments may be serviced from this substation.

Order-of-magnitude pricing for this option is as follows:

Add ANF rating to transformer	$12,000.00
Upgrade primary cables and fusing	$6,000.00
Replace secondary 600V buss	$15,000.00
Replace secondary 600V switchboard (3200A main, HRG, 4 breakers plus tie)	$220,000.00

At present, there were no double-ended low-voltage or medium-voltage switchgear installations found on the campus and the entire campus is serviced by a single North Bay Hydro feeder. As a result, there are a number of single point failure locations within the complex. The provision of redundancy at the low-voltage level should be considered for the facilities on campus, prioritizing the most critical installations where power continuity is the most important. The 600V system serviced by the Canadore Nipissing Main Indoor 15kV substation should be the first candidate as the majority of the campus essential services are provided from this substation. This is especially true since the peak load in this substation was found to be close to the capacity of the transformer, as just discussed. The provision of a redundant system, meaning the addition of a second 13.8kV fused load break switch, 2000kVA transformer, and 2000A switchboard complete with a 2000A main breaker, and 2000A tie breaker, will eliminate some single-point failures within one of the most essential parts of the campus distribution system, address the capacity issues, and provide spare capacity for the future. The new equipment can be added to the same room as the existing substation equipment, space permitting, or in a room close by to facilitate interconnection of the low-voltage switchboards.

Order-of-magnitude pricing for this option is as follows:

Add 2nd fused loadbreak	$20,000.00
Add primary cabling	$6,000.00
Add 2nd 2000 kVA transformer	$85,000.00
Add secondary 600V buss	$20,000.00
Add 2nd 600V switchboard (2000A main, HRG, 3 breakers plus tie)	$180,000.00

The conversion of the Canadore Nipissing Main Indoor 15kV substation into a fully redundant system will equip the system to accommodate the anticipated load growth and significantly improve the level of redundancy. However, there will still be a number of single-point failures within the system that will become more of a concern as the campus continues to grow in the coming years. Eventually a second utility feeder and an additional 44/13.8kV transformer complete with primary and secondary switchgear will be recommended for the campus. This extra feeder will not be necessary for capacity reasons for a number of years but will be recommended for redundancy reasons.

This additional utility feeder will also facilitate the formation of a loop feeder for the campus, further eliminating the number of single-point failures. A brief description of the work and new equipment that would be involved in implementing creating a medium-voltage loop system is provided as follows.

A 15kV main switchgear vault could be allocated within an existing building, built external to the existing facilities, or implemented via outdoor walk-in switchgear within a fenced enclosure on the campus. This switchgear would provide radial feeds or start a loop as required and as budget is allocated. There are currently two main 13kV feeds; if we assume that the higher priority Main and Hewgill hall feed will eventually be turned into a loop with any new buildings (it is also possible to turn both feeds into one loop - not priced out below), the approximate order of magnitude budget for this work would be as follows:

New 15kV loop switchgear and ancilliary equipment (not including new building)	$300,000.00
New 15kV loop switches at two existing substations	$80,000.00
Construction and materials	$60,000.00
Modifications to existing electrical rooms	

(not including any new space required)	$50,000.00
Possible upgrades to loop cable, installed	$250/m

Note, that this does not include any repairs to existing or new duct bank, new switchgear for new buildings, etc.

CONCLUSIONS AND RECOMMENDATIONS

Through detailed examination of the Canadore College & Nipissing University Main Campus Electrical System, it has been established that there are problems with system configuration, system capacity, lack of redundancy, and/or device reliability. It is clear that any problems with this switchgear could lead to power interruptions. However, with the implementation of the following recommendations, and if the existing equipment remains well maintained, this should result in satisfactory operation for the foreseeable future.

Regardless of the selection of options detailed in this report, this electrical testing should be performed on an annual or semi-annual basis to ensure that the existing electrical equipment is in the best functioning order as possible. Based on the previous information provided, we advance the following recommendations, listed from highest priority to lowest priority:

Recommendations:

Modern solid-state metering should be added to each of the main low-voltage switchboards, prioritizing the largest and most essential installations. (Budget $6,000 per switchboard, with 5 meters for a total of $30,000)
The dip pole #1 fuses should be upgraded to larger fuses. (Budget $3,200)
Transient Voltage Surge Suppression should be added to each main LV switchboard. (Budget $6,000 per switchboard, with 6 TVSS for a total of $36,000)
All main switchboard air circuit breakers should be retrofitted with modern solid-state trip units. (Budget $5,000 per circuit breaker, with 3 trip units for a total of $15,000)
A ground-grid study and design should be completed for the 44kV substation. (Budget $12,000)
The Canadore Nipissing Main Indoor 15kV substation should be converted to a fully redundant system in the immediate future. (Budget pricing as provided in previous section)
In the long-term future, a medium-voltage loop system should be created for Main and Hewgill hall feed and the new proposed buildings on campus. (Budget pricing as provided in previous section)
A complete short-circuit, device evaluation, and coordination study should be completed for the Canadore College & Nipissing University medium-voltage and main low-voltage distribution systems. (Budget $16,000)
A complete single-line diagram should be done including the main incoming utility feeder down to the main low-voltage switchboards in each facility on campus. (Budget $16,000)
Eventually, a second utility feeder and 44/13.8kV transformer should be added to form a fully redundant distribution system.

Appendix B

Infrastructure upgrades cost estimate summary

Description of Work

Electrical

	Priority	Unit Cost	Quantity	Total Estimate
1. Modern solid-state metering should be added to each of the main low-voltage switchboards, prioritizing the largest and most essential installations. (Budget $6,000 per switchboard, with 5 meters for a total of $30,000)		$ 6,000	5	30000
2. The dip pole #1 fuses should be upgraded to larger fuses. (Budget $3,200)		$ 3,200	1	$ 3,200
3. Transient Voltage Surge Suppression should be added to each main LV switchboard. (Budget $6,000 per switchboard, with 6 TVSS for a total of $36,000)		$ 6,000	6	$ 36,000
4. All main switchboard air circuit breakers should be retrofitted with modern solid-state trip units. (Budget $5,000 per circuit breaker, with 3 trip units for a total of $15,000)		$ 5,000	3	$ 15,000
5. A ground-grid study and design should be completed for the 44kV substation. (Budget $12,000)		$ 12,000	1	$ 12,000
6. Increase capacity of existing 1500 substation (mutually exclusive of 7. (either or, not both)				$ 253,000
Add ANF rating to transformer		$ 12,000	1	
Add 2nd fused loadbreak		$ 6,000	1	
Add primary cabling and fusing		$ 15,000	1	
Replace secondary 600 volt bus		$ 220,000	1	
Replace secondary 600 volt switchboard (3200oA main, HRG, 4 breakers plus tie)				
7. The Canadore Nipissing Main Indoor 15kV substation should be converted to a fully redundant system in the immediate future. (Budget pricing as provided in previous section)				$ 311,000
Add 2nd fused loadbreak		$ 20,000	1	
Add primary cabling		$ 6,000	1	
Add 2nd 2000 kVA transformer		$ 85,000	1	
Add secondary 600 volt bus		$ 20,000	1	
Add 2nd 600 volt switchboard (2000A main, HRG, 3 breakers plus tie)		$ 180,000	1	
8. In the long-term future, a medium-voltage loop system should be created for Main and Hewgill hall feed and the new proposed buildings on campus. (Budget pricing as provided in previous section)				$ 490,000
New 15kV loop switchgear and auxiliary equipment (excluding new addition as)		$ 300,000	1	
New 15kV loop switches at two existing sub-stations		$ 80,000	1	
materials and labor		$ 60,000	1	
Modifications to existing electrical rooms (excluding room expansion costs if required)		$ 50,000	1	
Possible upgrades to loop cable installed (cost per meter)		$ 250		
9. A complete short-circuit, device evaluation, and coordination study should be completed for the Canadore College & Nipissing University medium-voltage and main low-voltage distribution systems. (Budget $16,000)		$ 16,000	1	$ 16,000
10. A complete single-line diagram should be done including the main incoming utility feeder down to the main low-voltage switchboards in each facility on campus. (Budget $16,000)		$ 16,000	1	$ 16,000

Electrical

Summary of Recommendations

Recommended for **immediate implementation to address health and safety concerns** ,	5		$ 12,000
Recommended for action within 12 months to address system reliability problems, improve system protection, and enable system monitoring	1, 2,3,4		$ 84,200
Requires as a **minimum strategy to facilitate additional load capacity** (min. 500 kVA, approx 8,333 Square meters @ 54Watts/m2.)	6		$ 253,000
Recommended to provide either full redundancy, or 2000 kVA of additional capacity , or a combination therefore. With this addition, approx 33,000 Square meters @ 54Watts/m2 of new building area could potentially be added on this sub.	7		$ 311,000
Significant upgrade enhancement for full redundancy to existing substations for enhanced reliability in the event of a major power failure	8		$ 490,000
Required **to maximize protection** , coordination, and selectivity within the electrical distribution system.	9		
Required to maximize operator awareness and **minimize the likelihood of operational error** or personnel hazards due to incorrect isolation or switching arrangements.	10		$ 16,000

Mechanical

Summary of Recommendations

HVAC Primary Rooftop Equipment Replacement Life Cycle Feasibility Study	$ 25,000
Burried high pressure gas distribution piping (downs stream of existing meter) **- allowance per meter -**	$ 100

Appendix C

Student Centre Addition Considerations

The Master Plan identifies the addition to the Student Centre as a key component to the development and health of an expanded Shared Resource precinct in the centre of the Education Centre Campus development. The location placements suggested in the Master Plan are vital to create the new public vehicle drop off area which is crucial to expanding campus transportation infrastructure to increase safety and opportunity. The future potential of the expanded athletic centre, the new library, and the additional student centre space and their positive impact on campus are significant. This forward looking vision cannot be accomplished if the Student Centre is expanded on its existing site. Both site options for contiguous expansion also have further complications.

Expansion of the existing Student Centre to the east, over the road, causes the following concerns:

- There will need to be an additional loading dock added as the current loading dock is only capable of serving the bar due to operating hours. This currently contributes to traffic congestion issues with deliveries to the convenience store, and a double loading dock does not meet the requests of the student council.

- Further, this site is over water, gas, hydro, storm, and sewer lines that service the campus loop and the athletic centre. This is a significant amount of site servicing to consider relocating, or limiting access to.

- The campus transportation infrastructure will require significant revision that will result in the substantial loss of buildable sites (to provide turnarounds to the north and south of the expansion or to allow road relocation to the east of the addition), and this will limit the potential for adding a second main entrance to campus to alleviate traffic and safety concerns.

Expansion of the existing Student Centre to the north and south causes the following concerns:

- The limited size of the sites will eliminate the potential for future expansion of the student centre.

- Development of the North side of the Student Centre will limit the visibility of Canadore College until such time as the addition to Hewgill Hall proceeds. This is not projected within the next 10 years. It is not feasible to correct the current service road grading issues, add to the student centre, and add to the media arts program (in reasonable proximity) in a manner that provides Canadore College with the desired campus presence.

- The nature of providing two smaller additions to the North and the South of the existing building will require significant renovation of the existing facility to achieve functional and program goals. This will interrupt existing activities and can cause revenue loss.

For these additional reasons the Master Plan team does not consider these as viable solutions for the Education Centre Campus.

As a means to open up dialogue towards a possible resolution we are suggesting the following considerations.

The location of the existing Student Centre is currently the central gateway to the Education Centre. Because of this it is also suitable for other programs such as health services and security, providing the opportunity to establish consolidated student services. This option was discussed during the Master Planning process, but was jointly dismissed due to the complications of building ownership, and difficulty in the re-use of the lower and mezzanine levels.

This line of thinking does, however, lead towards the best possible scenario for the accomplishing the Master Plan Vision. In an ideal Master Plan the entire program of the student centre would be located in the newly developed Shared Resource Precinct on the east side of the roadway. This would relieve current servicing issues and contribute substantially to the success of the new shared resources core proposed in the Master Plan. If the complications could be worked through, the campus would benefit and the Student Council's requests would be met. It is worth noting that the

lower level of the existing Student Centre does have the potential to be converted to a 300 seat auditorium.

Another alternative is a midway proposal where the main level of the existing Student Centre is changed to academic support, and the lower and mezzanine levels remain as the campus pub. To meet the requests of the Student Councils the feasibility of a sub-grade tunnel connection would need to be explored. If economically feasible a tunnel would route increased pedestrian traffic by the pub, and could provide service access to both sides of the roadway.

The above suggestions are made in respect to the Master Plan Vision as a means of accomplishing the future goals of the Master Plan and strengthening the Education Centre Campus. The Master Plan team acknowledges that there are issues and complications that are beyond the Master Plan that require resolution for either of these scenarios to be worked through, and recommend these as a starting point for dialogue.