AUGUST, 2010

APPENDIX

DALHOUSIE UNIVERSITY

CAMPUS MASTER PLAN

FRAMEWORK PLAN

DALHOUSIE UNIVERSITY
Inspiring Minds

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A.1

APPENDIX A.1

TRANSPORTATION DEMAND MANAGEMENT (TDM)

GUIDELINES FOR IMPLEMENTINGTHE MULTI-YEAR TDM PROGRAM

3-PART PHASE TDM STRATEGY

TDM is achieved in stages gradually over time as travel needs and habits shift due to a variety of factors such as changes in travel options and habits, costs and public policy. The 3-part Dalhousie strategy focuses on

1. Promoting Improved Transit and Alternative Transportation travel modes, aimed at shifting the commuting modal split away from dependency on the private automobile and reducing demand for campus parking;
2. Increasing Student and Staff Housing choices, both on campus and within surrounding neighbourhoods, within walking and convenient transit travel, similarly aimed at reducing automobile trips;
3. Rationalizing Campus Parking facilities, aimed at concentrating and rationalizing campus parking locations to reduce needless searching, adjusting supply to meet changes in both Dalhousie and public demand over time, and adjusting parking rates over time to more accurately match costs.

SUCCESS FACTORS

Typically, universities successful at achieving TDM programs tend to rely on certain key factors such as:

- effective program administration reporting to the executive that is then fully supported by that executive,
- the University's public commitment to the program's principles and phased targets,
- collaboration and support of municipal agencies and politicians,
- effective communications with the communities affected by the programs and changes (staff, students, public, neighbours and the general public) to ensure their support,
- public pride in the program's achievements at each step over time.

PROGRAM ADMINISTRATION

- Establish a Dalhousie University organization typically called a "Transportation Management Association (TMA)" to promote TDM initiatives, similar for example, to the McMaster University All-modes Commuting & Transportation (ACT) program created in 2002;
- Assign the administrative responsibility for undertaking the TDM program to the Director of its Sustainability Office;
- Attempt to define a TDM mandate and target area broader than the limits of the University, to affect the surrounding community and include participation of neighbouring institutions and private sector organizations such as the hospitals, St. Mary's University, school and neighbourhood organizations and the business associations, offering the University as a central resource for program planning and development; uniform TDM policies and goals should be established across the organizations;
- A key initiative critical to success will be to establish a TDM Program Steering Committee chaired by the Program Director to assist in establishing and meeting practical phased targets over time and report to the University Executive. Essential to the University, this Committee should include board members and executives responsible for university finance, facilities management, student services and human resource affairs, as well as appropriate HRM and Metro Transit officials and HRM councillors, and also to include representatives of other participating organizations;
- Dedicate a portion of parking revenues to help off-set the costs of implementing the above programs.

PROGRAM INITIATIVES AND MILESTONE TARGETS

1. Transit and Alternative Transportation

- Actively lobby for enhanced bus service and extended hours in collaboration with the community (revised plans are already underway to increase bus service on Spring Garden/Coburg, Robbie and Summer streets); focus on destinations which serve particularly high volumes of staff and students and the visiting public, such as Dalplex, Learning Commons Hubs, Arts Centre and other assembly spaces, Dental School public clinics, and the proposed conference centre at Sexton;
- Until adequate public bus service is provided along the University Avenue/ Morris corridor connecting the campuses, Dalhousie should operate a local shuttle bus, jointly with the hospitals and perhaps other institutions in the area if possible;
- Improve the SE corner of LeMarchant and University Ave as a Transit Terminus (e.g. widened bus lay-by, landscaping, SUB entrance and waiting lobby with good visibility and access to transit information;
- Adopt a shared-bicycle program that encourages students and staff to use Dalhousie-provided bikes to move within the campus; there is extensive evidence of increased urban bike use even in cold and inclement weather conditions where bikes are conveniently and inexpensively accessible;
- Work with CarShare HFX to increase the coverage and availability of car share vehicles on the campuses and nearby student housing areas;
- Reschedule the standard class day to reduce impact on peak hour traffic volume, for example, by scheduling classes between 9:30 am and 7pm;
- Employ a full summer course term that would increase seasonal alternative transportation modes including transit, bicycles and walking;
- Extend UPass privileges to staff and faculty, taking advantage of Metro's policy of awarding discounted fare packages to large employers;
- Partner with Metro and neighbouring institutions (e.g. CDHA, SMU) to provide remote park-and-ride facilities (that would also contribute to Dalhousie's parking requirements at lower land costs);
- Provide education and awareness programs for students and staff to promote inform on the available transportation options.

2. University Housing

- Increase undergraduate and graduate units on campus, in collaboration with the private sector: the planned strategy of intensifying campus development with mixed-use buildings that include student and staff housing choices is not only aimed at achieving TDM goals but also benefits the University in attracting a diverse – including international – population using its available land resource. Dalhousie can also increase the rental inventory by gradually converting its residential properties for student and staff rental occupancy. The challenge will be to achieve these initiatives using creative financing models including public/private partnerships. The target is to gradually reduce the number of students and staff who commute daily to the university by private automobile, impacting the community environment and requiring costly campus parking facilities;
- Also adopt initiatives to encourage the private sector to increase the supply of rental units within walking distance of the campus, and to ensure that these units are managed in mutually responsible manner; this requires an active operating relationship between the University Housing Service, the private landlords and the tenants; for example, a university housing referral service could be established to encourage neighbourhood property owners to list and maintain adequate rental units and assist students and staff to access housing choices within walking distance of the campus;
- Engage community representatives in an on-going consultative process to monitor the progress of these initiatives.

3. Campus Parking

- Adopt long range objectives of (1) reducing the demand for parking by increasing the benefits of choosing alternative means of travel to the campus and (2) reclaiming small dispersed parking spaces to enhance campus open space and support new building projects;
- Promote a ride share/car pool program with incentives, to reduce parking demand;
- Further encourage reduction in campus parking demand by providing remote transit commuter park-and-ride lots, as discussed above, that would result in reduced commuter travel and parking costs;
- Concentrate campus parking facilities (both surface and structured) and adopt a system of assignment and information to reduce existing patterns of having to search for a vacant parking space, creating inefficiencies and unnecessary traffic;
- Rationalize on-campus parking fees and gradually align fees with costs to provide, maintain and operate them, as other parking initiatives achieve positive results.

A.2

APPENDIX A.2

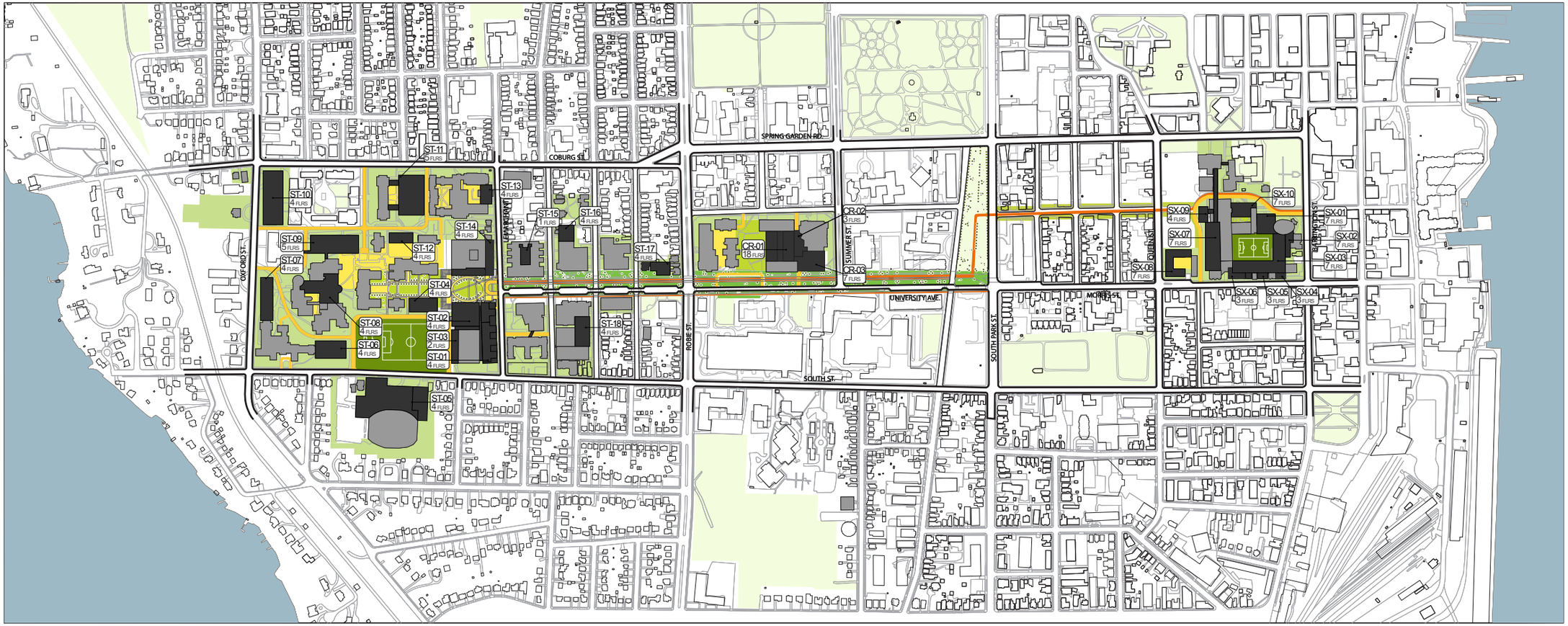
CAMPUS DEVELOPMENT CAPACITY

CAMPUS DEVELOPMENT CAPACITY ANALYSIS

The University Framework Plan mapped on page 17 indicates proposed Future Development Sites throughout the campus. By assuming reasonable, but not necessarily maximum building heights on these future sites, a potential gross floor area (gsf) can be calculated and totalled as an indication of the potential capacity of the existing university to accommodate further development. The following map and table describe this analysis, indicating that a total of approximately 3.28M gsf could be added to the campus in the future, compared with a total existing space inventory of some 4.14M gsf, or a significant increase in the order of 79 %.

This analysis suggests that without expanding its present land holding, the University can expand its space inventory (and its enrolment at current space standards) far beyond its growth expectation. This finding supports the principle in the Plan of intensifying campus development to enhance campus interaction and vitality, efficiency and sustainability.

DALHOUSIE UNIVERSITY						
BUILDING DEVELOPMENT SITES	AREA (sq.m.)	FLOORS #	TOTAL (sq.m.)	TOTAL (gsf)	LESS EXISTING gsf ELIMINATED	NET gsf
STUDLEY CAMPUS						
ST-01	4,562	4	18,248	196,420	19,882	176,538
ST-02	2,405	4	9,620	103,549	0	103,549
ST-03	905	2	1,810	19,483	8,302	11,181
ST-04	1,085	4	4,340	46,715	36,196	10,519
ST-05	5,885	4	23,540	253,382	0	253,382
ST-06	2,052	4	8,208	88,350	26,517	61,833
ST-07	2,016	4	8,064	86,800	0	86,800
ST-08	2,876	4	11,504	123,828	0	123,828
ST-09	3,290	5	16,450	177,066	11,900	165,166
ST-10	4,090	4	16,360	176,098	0	176,098
ST-11	3,515	5	17,575	189,176	0	189,176
ST-12	1,125	4	4,500	48,438	0	48,438
ST-13	556	4	2,224	23,939	21,532	2,407
ST-14	1,849	4	7,396	79,610	0	79,610
ST-15	724	1	724	7,793	3,520	4,273
ST-16	926	4	3,704	39,870	0	39,870
ST-17	1,180	4	4,720	50,806	5,120	45,686
ST-18	1,673	4	6,692	72,032	4,000	68,032
SUB TOTAL	**40,714**	**-**	**165,679**	**1,783,354**	**136,969**	**1,646,385**
CARLETON CAMPUS						
CR-01	3,261	18	58,698	631,820	0	631,820
CR-02	916	3	2,748	29,579	24486	5,093
CR-03	1,895	7	13,265	142,783	0	142,783
SUB TOTAL	**6,072**	**-**	**74,711**	**804,182**	**24486**	**779,696**
SEXTON CAMPUS						
SX-01	1,378	7	9,646	103,829	0	103,829
SX-02	719	7	5,033	54,175	0	54,175
SX-03	3,682	7	25,774	277,429	0	277,429
SX-04	215	3	645	6,943	3458	3,485
SX-05	252	3	756	8,138	3458	4,680
SX-06	550	3	1,650	17,760	0	17,760
SX-07	2,730	7	19,110	205,698	0	205,698
SX-08	1,338	7	9,366	100,815	0	100,815
SX-09	217	4	868	9,343	0	9,343
SX-10	1,027	7	7,189	77,382	0	77,382
SUB TOTAL	**12,108**	**-**	**80,037**	**861,511**	**6916**	**854,595**
OVERALL TOTAL	**58,894**	**-**	**320,427**	**3,449,047**	**168,371**	**3,280,676**


ST-11 5 FURS
ST-10 4 FURS
ST-09 5 FURS
ST-07 4 FURS
ST-14 4 FURS
ST-12 4 FURS
ST-04 4 FURS
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CR-01 15 FURS
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CR-03 7 FURS
SX-09 4 FURS
SX-07 7 FURS
SX-10 7 FURS
SX-01 7 FURS
SX-02 7 FURS
SX-03 7 FURS
SX-08 7 FURS
SX-06 3 FURS
SX-05 3 FURS
SX-04 3 FURS
COBURG ST.
SPRING GARDEN RD.
OXFORD ST.
LEMARCHANT
SUMMER ST.
ROBIE ST.
UNIVERSITY AVE
SOUTH ST.
SOUTH PARK ST.
MORRIS ST.
QUINPOOL
BARRINGTON ST.

A.3

APPENDIX A.3

UTILITIES & SERVICES

Dalhousie University

Utility Infrastructure Assessment

IBI GROUP

CBCL LIMITED
Consulting Engineers

Introduction

As part of the overall campus master planning exercise, the existing campus utility infrastructure has been the subject of an overview assessment. The purpose of this assessment is to assess the current status of the existing utility systems and their ability to accommodate current utility demands, and determine what impact the future developments outlined in the Campus Master Plan would have on this existing infrastructure.

The utility infrastructure systems included in this assessment include:

- Water supply and distribution
- Storm and sanitary drainage
- Electrical supply and distribution
- Steam supply and distribution

The findings of the assessment are contained in the following paragraphs.

Executive Summary

The key findings of the utility infrastructure assessment are as follows:

<u>Water</u>

- Existing water supply and distribution systems are adequate for current and future domestic needs. Depending on the nature and size of each proposed development, booster pumps may well be required, to meet fire safety requirements and domestic use.

<u>Storm and Sanitary</u>

- The storm and sanitary drainage systems serving the Dalhousie campus sites are connected to a combined storm and sanitary municipal system. Portions of this municipal system are undersized and do not meet current HRM design standards.
- Assuming the proposed developments comply with HRM Design Guidelines that limit the post development flows to 40% of the corresponding uncontrolled flow levels, the peak flows experienced in the combined sewer systems will be reduced. This will have a beneficial impact on the frequency of overflows, since all peak flows will be reduced compared to existing conditions.

<u>Electrical Supply and Distribution</u>

- The existing 23 kV system servicing the Studley and Carleton campuses is essentially operating at its capacity; it will be essential to upgrade the present system either by increasing the capacity or by creating new campus distribution systems.
- To accommodate the additional loads that would be imposed by the future developments of the Master Plan, consideration should be given to adding a new main 25 kV feed to the west side of the Studley Campus to service both existing and new buildings on the western side of the campus.
- While significant opportunities exist for overall improvement in campus-wide electrical energy consumption, it is unlikely these improvements could be realised quickly enough to avoid the need for the second main feed to the Studley and Carleton campuses.

Steam Supply and Distribution

- The central heating plant is at maximum capacity and will not be able to support any significant new loads.
- Central heating plant boilers are 37 years old and are near the end of their useful life.
- The “backbone” of the system is steam piping installed in a tunnel network, as well as direct buried pipe.
- The piping system in the tunnel is in excellent condition, and with some small exceptions, capable of handling all proposed additional load.
- Piping that is direct buried from Tupper Building to Sexton campus is problematic and has had ongoing maintenance issues, particularly around Chamber 5 located at Morris St/Brenton St.

Water Supply

Description of Water System

The Dalhousie campus falls within two separate pressure zones in the Halifax Water distribution system. The Sexton and Carleton campuses fall in the “Peninsula Intermediate” zone, which is bounded to the south along Oakland Road and University Avenue (refer to **Figure X**). The average water pressures in those portions of the campus that fall within this zone range from approximately 47 psi (at Coburg Road/LeMarchant Street Intersection) to 70 psi (near the Tupper Building to the east and along Oxford Street to the west). The Sexton campus falls with the “Peninsula Low” zone, bounded the west by South Park Street and to the north by Spring Garden Road. In this zone, the average domestic water pressures in the Sexton campus range from 55psi (along Queen Street) to 70 psi (along Barrington Street).

Commentary

Generally, the minimum preferred domestic water pressure for any building is 40 psi. If water pressures within a building are expected to be below 40 psi, then water pressure boosting within the building is generally required through the installation and operation of water booster pumps in the buildings plumbing system. Typically, for every ten feet of building height, water pressure reduces by roughly 4.5 psi.

The supply and distribution systems within each Halifax Water zone seem to be capable of meeting current and future campus domestic use requirements. With respect to availability of sufficient fire flows in the study area, it is very difficult to make such calculations without a detailed knowledge of each existing or proposed building’s occupancy, size, and method of construction.

It is very likely that most large buildings constructed on campus in the future would require the installation of individual building fire pumps, to boost pressures and flows to those levels required for fire safety.

Storm and Sanitary Drainage

Pipes in the Dalhousie sewage system are separated between sanitary and stormwater drainage. The portion of the system that drains westward towards the Northwest Arm is separated until it reaches the edge of the Arm. The other portion, which drains eastward towards the Halifax downtown area, becomes combined when connected to the municipal system. As such, stormwater overflows are mixed with sanitary sewage.

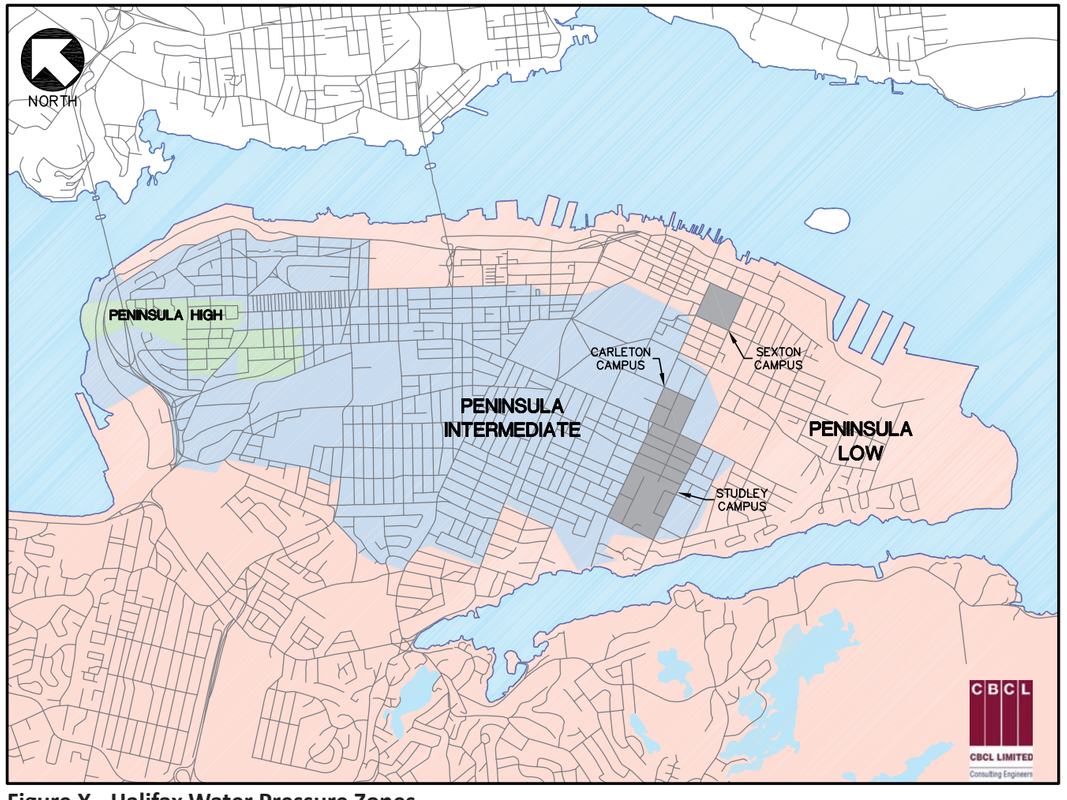


Figure X - Halifax Water Pressure Zones

For the purposes of this assessment, it is assumed that each Master Plan development will follow the HRM Municipal Service System Design Guidelines, which limit post-development peak flows to less than 40% of the corresponding post-development uncontrolled 1 in 100 year flow levels.

Since the municipal drainage system is supposed to be designed to drain 1 in 5 year flows, it is assumed that the 40% flow control requirement is extended to the 1 in 5 year event. The analysis of the impacts of the Master Plan developments on the drainage system are made with respect to the 1 in 5 year event.

This assessment has used stormwater drainage data available from HRM. It is noted that this data is, in some instances, incomplete and unconfirmed.

Areas have been assembled in groups (sewersheds) based on their drainage outlets. These areas are shown on **Figure Y** for the Studley campus.

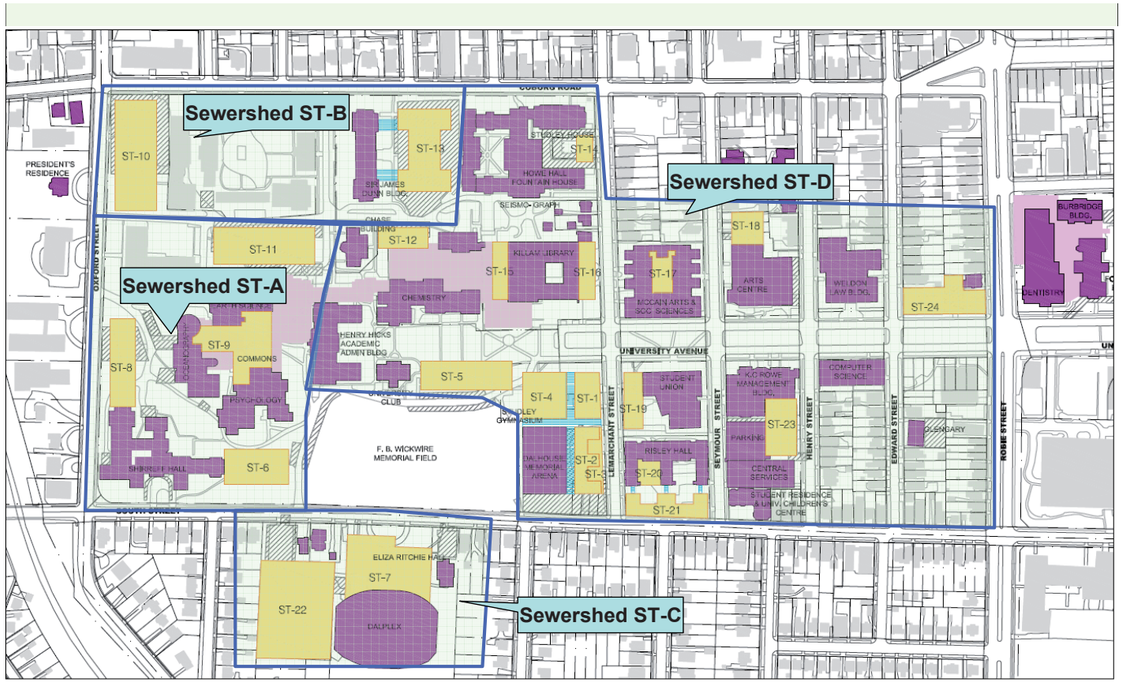


Figure Y - Sudvision of Areas by Sewershed - Studley Campus

Halifax peninsular typical manhole cover and interior

Sewershed draining towards the Northwest Arm (Studley Campus):

This area drains to a separated system (sanitary and stormwater). Since the expected increase in population from this development is not known, no assessment of increased flows in the sanitary system can be made.

ST - A: South Side (Sites ST6, ST8, ST9 and ST11):

Concerning the stormwater system, the peak flow is estimated at approximately 0.95 m³/s. This is calculated using the rational method, with the following parameters:

- Surface area: 6.17ha
- Maximum overland flow length: 340m
- Runoff coefficient: 0.6
- Surface slope: 10 %
- Design event: 1 in 5 year storm

The stormwater system is composed of three pipes, two of them 200mm in diameter, and the third 550mm in diameter. Their slope is unknown, but the land grading is at an average of approximately 10%. This gives a total pipe capacity of approximately 1.6 m³/s.

This result indicates that it is likely that there is capacity in the system during the 1 in 5 year storm.

With the proposed development on this sewershed, the drained stormwater flows will increase, due to the construction of structures with impervious surfaces, which do not allow percolation of rainfall into the ground. It is estimated that the areas slated for development form a total surface area of approximately 4.1 ha. Without any flow control, this has the potential of increasing the peak flows to 1.36 m³/s. With flow control, however, the peak flow from the entire site will be reduced to 0.73 m³/s (lower than existing peak flows). The flow control will therefore have no negative impact on the system.

ST - B: North Side (Sites 10 and 13):

Using a similar method, the peak flow is estimated at 0.67 m³/s:

This is calculated using the rational method, with the following parameters:

- Surface area: 4.2ha
- Maximum overland flow length: 375m
- Runoff coefficient: 0.7
- Surface slope: 3.6 %
- Design event: 1 in 5 year storm

The stormwater system includes a pipe with a diameter of 375 mm. No slope information is available, but using the slope of the ground surface, the capacity is approximately 0.3 m³/s. The HRM pipe that runs along Coburg Road has a diameter of 300 mm, with an estimated capacity of 0.2 m³/s, which is shared with other areas. It would therefore seem that there are capacity limitations in this area during the 1 in 5 year storm. This is not uncommon on the Halifax peninsula.

The proposed development includes two buildings in this sewershed (sites 10 and 13), with a total surface area of approximately 4.2 ha (full development of the watershed surface). The peak flows would increase to 0.95 m³/s with this development. With the implementation of flow control, the peak flows can be expected to be reduced to approximately 0.38 m³/s (a reduction of 33% compared to existing peak flows). This is clearly beneficial, especially in an area which is experiencing drainage capacity issues.

ST - C: Sites 7 and 22

These sites drain in a different direction, towards the south and therefore has been considered on its own. The peak flow expected from the areas covered is approximately 0.41 m³/s.With development but no flow control, this flow would increase to approximately 0.54 m³/s. With flow control, this drops to 0.22 m³/s (reduction of 46% compared to existing flows).

The piped system just downstream consists of a 375mm pipe at 3.7%, with a capacity of 0.31 m³/s. Since this capacity is shared with the adjacent properties, it may be beneficial to connect a portion of the development to Dalhousie St, and the remainder to Oakland Rd.

ST - D: Draining towards the Downtown Halifax Area (Studley Campus)

Upstream Block (Sites ST- 1,2,3,4,5,14,15,16,17,18,19,20,21,23 and 24 - Upstream of Robie Street)

The peak flow for this sewershed is estimated at 1.95 m³/s:

This is calculated using the following parameters:

- Surface area: 21.1ha
- Maximum overland flow length: 740m
- Runoff coefficient: 0.7
- Surface slope: 2 %
- Design event: 1 in 5 year storm

The stormwater system at the corner of South and Robie St consists of a 400x600 mm pipe with a capacity of approximately 0.35 m³/s.This pipe is therefore currently undersized according to the HRM design standards.

The proposed development covers a total surface of approximately 6.13 ha. With no flow control, this would increase peak flows to approximately 2.2 m³/s. With flow control, this will be reduced to approximately 1.7 m³/s, thus alleviating peak flows to a small extent.

Middle Block (Sites CR1-CR4 - Between Robie St and Summer St) - Carleton Campus

The peak flow for the block containing areas 10 and 11 is estimated at 0.43 m³/s:

This is calculated using the following parameters:

- Surface area: 3.0ha
- Maximum overland flow length: 355m
- Runoff coefficient: 0.7

- Surface slope: 2.1 %
- Design event: 1 in 5 year storm

The stormwater system at the corner of University and Summer St, consists of a 300mm diameter pipe, with an estimated capacity of approximately 0.21 m³/s, which means it does not conform to current HRM design standards.

The proposed development covers a combined area of approximately 1.5 ha. With no flow control, this would increase the peak 1 in 5 year flows to approximately 0.51 m³/s. With the flow control, this would then be reduced to approximately 0.33 m³/s (reduction of 23%).

Downstream Block by Barrington St - Sexton Campus

The peak flow for the Sexton campus is estimated at 0.81 m³/s:

This is calculated using the following parameters:

- Surface area: 6.7ha
- Maximum overland flow length: 565m
- Runoff coefficient: 0.7
- Surface slope: 3.1 %
- Design event: 1 in 5 year storm

The stormwater system at the corner of Barrington and Morris St, consists of a 450mm diameter storm sewer pipe, and a 900mm combined sewer pipe, with an estimated combined capacity of approximately 3.1 m³/s, which is shared with other sites along Morris Street. Since the surface area of site 12 covers more than 50% of the total drainage area to that point, it is expected this system meets the HRM design requirements at this location.

With no flow control, this development (5.4ha) would increase the peak 1 in 5 year flows to approximately 1.09 m³/s. With the flow control, this would then be reduced to approximately 0.53 m³/s (reduction of 35% compared to existing flows).

Typical manhole condition

Flow control devices

Increases in Sanitary Flow

This assessment has focused primarily on stormwater drainage flows. Sanitary flows, by comparison, would only represent a small fraction of the stormwater drainage flows. In this sewershed, the sanitary flows are currently estimated to be approximately 0.5% of the peak stormwater flows. It is assumed therefore, that the increase in sanitary flows that would result for the developments of the Master Plan would have only a marginal impact on the combined sanitary and stormwater sewer system serving the campus sites.

Electrical Distribution System Summary

The assessment of the Dalhousie campus electrical supply and distribution infrastructure addressed the following key areas aspects:

- Existing system capacity
- Existing system loading
- Addition of second campus distribution system
- Allowance for connection to campus system in new buildings
- Energy targets
- Energy reduction technologies and strategies
- On-site renewable technologies

<u>Description of Supply and Distribution Systems</u>

The Dalhousie Studley and Carleton campuses are supplied primarily from the campus-wide 23 kV distribution system, emanating from the Weldon Law Building, and distributed throughout the campus via a walk-through tunnel system. The 23 kV system is supplied by a NSPI 25 kV feeder from the Armdale substation and is stepped down to 23 kV to match the campus system. While most of the main buildings of the campus are supplied from the campus 23 kV distribution system, there are several buildings supplied directly from the Nova Scotia Power Inc. 25 kV distribution system.

Figures U, V and W (on the following pages) indicate the location and extent of the tunnel used for electrical and steam distribution.

The Sexton campus, including Gerrard Hall, is supplied directly from the NSPI system from a 25 kV feeder emanating from the NSPI Water Street substation.

The rate code at which electricity is charged to Dalhousie for the campus-wide 23 kV distribution is Rate Code 12 or Large General Tariff. The rate code for the individually fed buildings is Rate Code 11 or General Tariff. Both rates charge on the basis of maximum demand and energy consumption. For this reason, it is not obvious, without detailed evaluation, what rate code yields the lowest cost of electricity. Additionally, the capital cost of new infrastructure required for either option would be different and this would have to be taken into consideration.

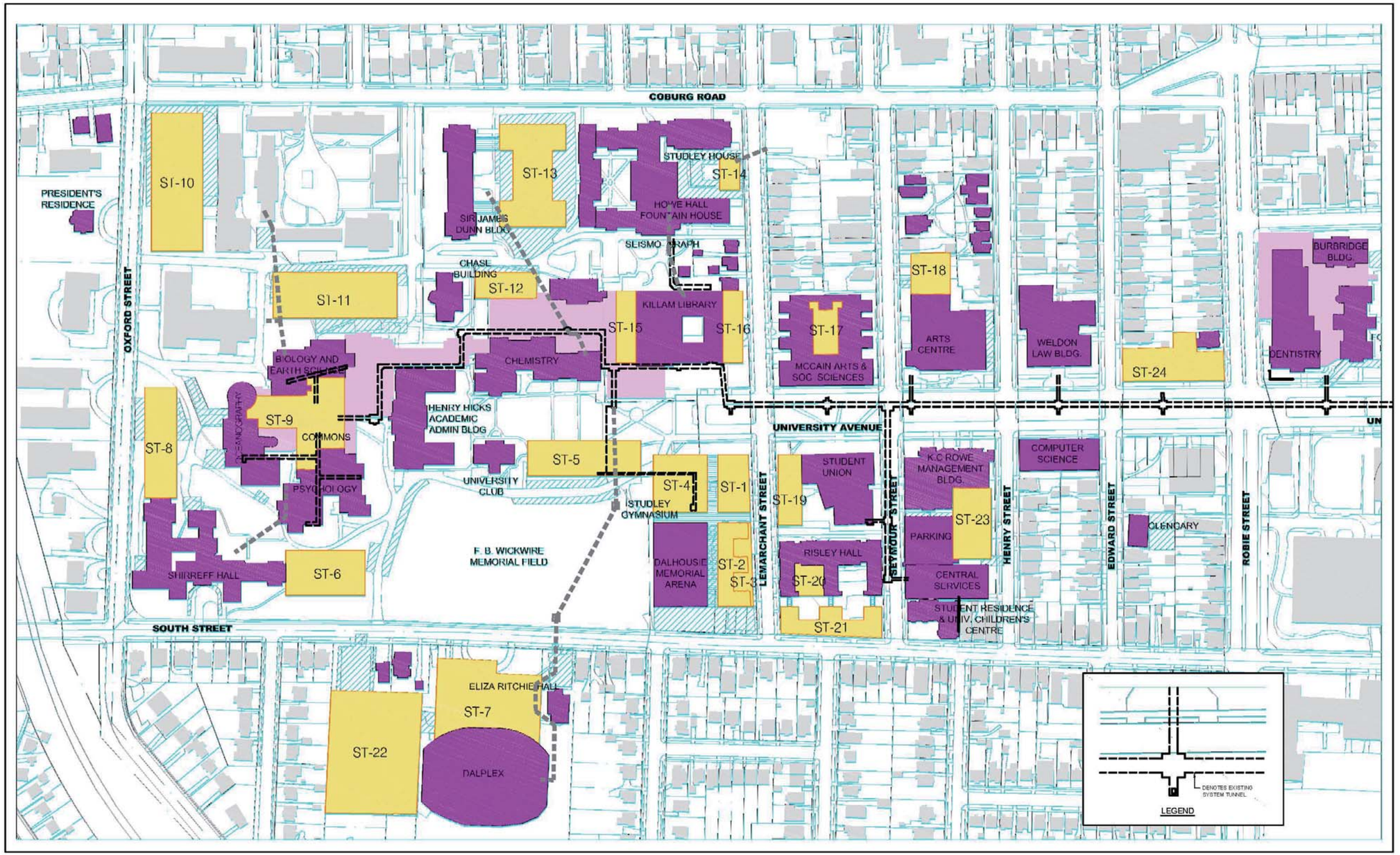


FIGURE U - SERVICE TUNNELS - MAIN CAMPUS (STUDLEY)

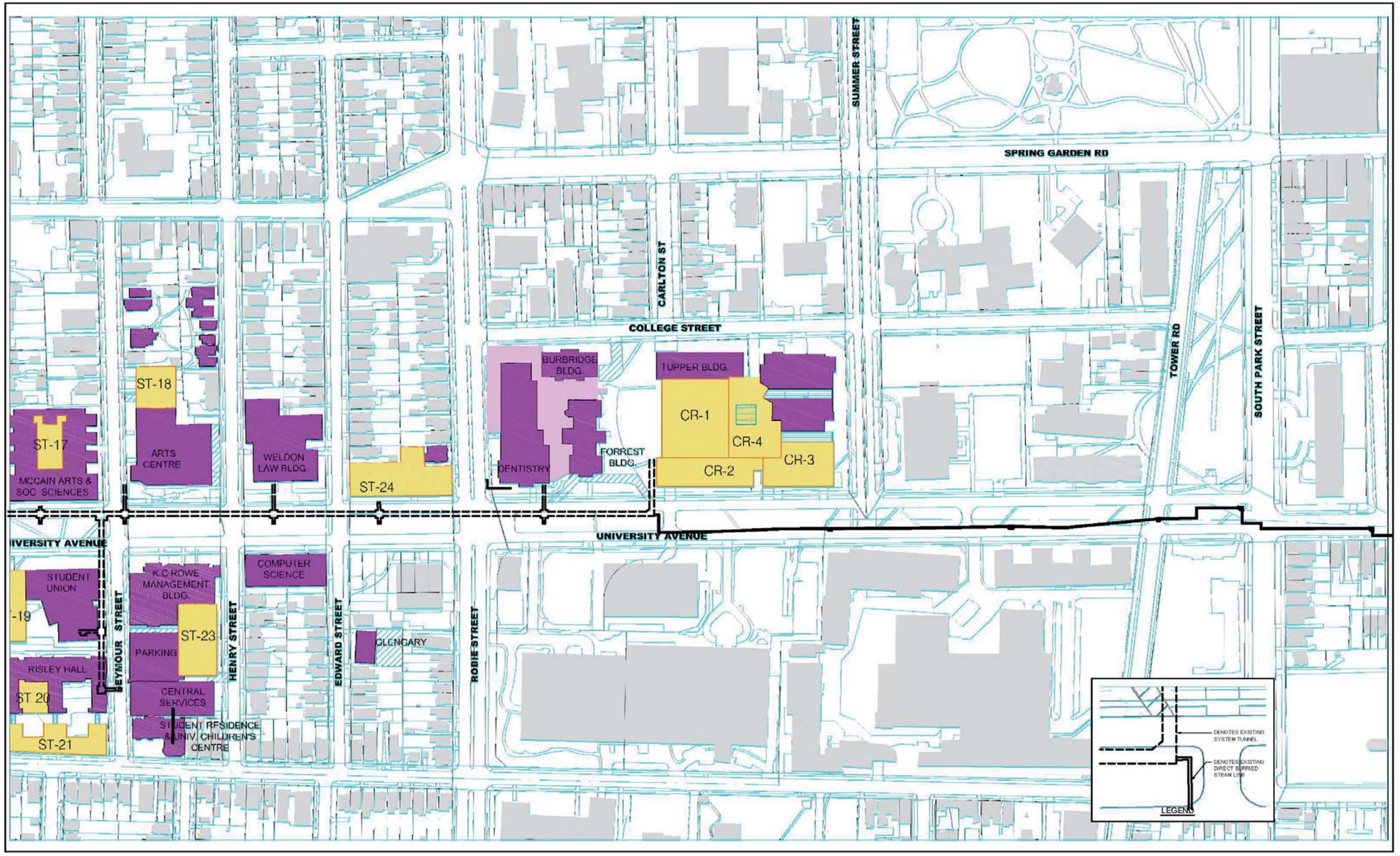


FIGURE V - SERVICE TUNNELS & STEAM LINE - HEALTH SCIENCES CAMPUS (CARLETON)

FIGURE W - STEAM LINE - DOWNTOWN CAMPUS (SEXTON)

Existing Electrical Loads

The following electrical load information has been collected from the Facilities group and represents loads recorded over the last twelve months.

The existing infrastructure is designed for a maximum load of 12,000 kVA; the maximum load recorded on the 23 kV system in the last twelve months is 10,538 kVA. Therefore, the system is essentially up to its capacity, and it will be essential for the University to look at this and make decisions vis-à-vis upgrading the present system, either by increasing the capacity, or by creating new campus distribution systems.

Building	Area (sq.ft.)	System	Max. Load(kVA)	Min. Load(kVA)	Avg. Load(kVA)
Arena	71,193	Campus 23kV	325	150	258
Arts	175,308	Campus 23kV	358	290	336
Chase	28,801	Campus 23kV	93	77	85
Chemistry	94,991	Campus 23kV	615	491	567
Computer Science	70,640	Campus 23kV	315	260	278
Central Services Bldg.	80,463	Campus 23kV	1,882	515	1,194
Dalplex	178,769	Campus 23kV	620	455	546
Dentistry	206,879	Campus 23kV	1,305	1,106	1,173
Dunn	89,991	Campus 23kV	510	438	476
Eliza Ritchie	23,997	Campus 23kV	135	20	80
Henry Hicks	106,614	Campus 23kV	164	140	153
Howe Hall	223,727	Campus 23kV	294	212	265
Kenneth Rowe	122,054	Campus 23kV	527	429	474
Life Sciences Centre	450,052	Campus 23kV	1,732	1,607	1,677
McCain	153,843	Campus 23kV	497	415	451
Risley Hall	177,100	Campus 23kV	386	186	326
Sherriff Hall	171,776	Campus 23kV	297	132	239
Tupper	379,218	Campus 23kV	1,661	1,544	1,610
Weldon Law	99,991	Campus 23kV	550	290	358
Student Union Bldg.	124,378	Campus 23kV	N/A	N/A	N/A
Killam Library	250,520	Campus 23kV	N/A	N/A	N/A

Building	Area (sq.ft.)	System	Max. Load(kVA)	Min. Load(kVA)	Avg. Load(kVA)
Total 23 kV System (NSPI Meter)		**Campus 23kV**	**10,528**	**9,087**	**9,643**
B Building	37,769	NSPI 25kV	992	824	591
F Building	24,146	NSPI 25kV	36	32	34
G Building	20,843	NSPI 25kV	222	190	136
Gerard Hall	94,270	NSPI 25kV	221	143	186
H Building	43,831	NSPI 25kV	258	93	179
P Building	5,472	NSPI 25kV	125	71	82

Commentary

Future Considerations

Under this Master Plan, there are a number of proposed buildings planned which in total will add a relatively significant load to the total load of the Dalhousie campus. To deal with these additional loads, consideration should be given to adding a new main 25 kV feed to the west side of the campus to service proposed new buildings along and near Oxford Street. The new feed could supply the Life Sciences Building and the existing buildings now fed through the Life Sciences Building, and also extend out to the new buildings. Ultimately, this could evolve into East and West distribution systems. Offloading the East system by removing the Life Sciences Building could free up approximately 3,000 kVA of capacity for future projects on the east side of the campus. The timing and location for the new service could be coordinated with major renovation works or new construction in this portion of the campus.

Splitting up the campus-wide distribution system may also offer the opportunity to covert the 23 kV system to a more standard 25 kV system, depending how the split is implemented.

Future decisions to connect new buildings to the campus-wide system (as opposed to a connection directly from the NSPI system) may be impacted, in part by any parallel decisions to extend the existing utility services tunnel system.

Should new buildings be constructed and serviced directly from the Utility, it is recommended that allowances are made for future connection to the campus electrical distribution system. This may include spare ductbanks, spare conduits and physical space for medium voltage switches.

Energy Efficiency

In addition to reconfiguring the existing systems, consideration should be given to the energy usage of both the existing and new buildings. Energy targets should be established for new construction/major renovation and building renovation projects. The establishment of these targets should be such that they are meaningful but achievable, graduated such that the energy use targets become more aggressive over time, and building energy usages should be monitored and compared to the targets, to track progress. It is also imperative that energy targets are both accepted and supported by senior Dalhousie administration.

Energy targets will be specific to the building types, size and usage and will differ for new construction/major renovation and minor renovation projects. A recommendation for new construction and major renovation targets would be initially set at 35% better than the Model National Energy Code of Canada (MNECB), with an ultimate goal of carbon neutrality by the year 2030. The 2030 targets would be in line with Architecture 2030 and the Canada Green Building Council goals. In addition to the MNECB, CaGBC (LEEDTM) and Architecture 2030, there are a number of other resources available regarding energy usage including but not necessarily limited to NRCan, Energy Star and ASHRAE 90.1.

The reduction in electrical energy use can be accomplished through efficient design, use of efficient and properly sized equipment, control strategies, ongoing maintenance and both initial and ongoing commissioning activities. Some sample energy efficient technologies and techniques include: geothermal, fuel cells, variable frequency drives on HVAC and pumping equipment, duct/pipe sized to reduce motor loads, use of efficient/low loss transformers, high efficiency ballasts and lamps, daylight harvesting, occupancy controlled ventilation and lighting, high insulation values in walls and roofs, high thermal insulation values of window, optimized solar heat gain coefficient of windows, drain water heat recovery, low flow shower heads and faucets, ventilation air heat recovery, optimized building controls systems, optimized building orientation (for new buildings), passive solar heating and minimizing uncontrolled air leakage.

In addition to the reduction in energy usage, consideration for on-site renewable technologies should be considered; this may include technologies such as solar air, solar hydronic panels, photo voltaic panels, biomass and wind power.

Steam Supply and Distribution

System Description

The Dalhousie campus is heated through an underground steam distribution network supplied from a Central Heating Plant (CHP) located in the Facilities Management Building. The CHP was built in 1971 and consists of two Babcock & Wilcox D-Type water tube boilers. These boilers are each rated at 85,000 lb/hr at 150 psig saturated giving a total plant capacity of 170,000 lb/hr. The boilers were designed for and currently fire Bunker C heavy fuel oil. The boilers supply steam to the entire campus (approx 4,000,000 sq.ft) via a tunnel system. The Sexton campus (Formerly TUNS) is also connected to the CHP through a direct buried steam line connected to the east end of the distribution system. The CHP operates 24 hours a day, 365 days per year.

Peak load of approximately 162,000 lb/h occurs in the winter heating season. The summer load is approximately 40,000 lb/h and comes mainly from absorption chillers.

There is a 12” steam line that runs from the CHP under Seymour Street to Chamber B (Seymour/University). Here the steam line tees into the backbone of the steam distribution system which runs east-west along University Avenue. The steam lines on University Avenue are 10” from Chamber B (Seymour/University) east to Tupper Building. From Tupper Building to Summer Street the main is 16”. (Note: This line was sized by Nova Scotia Power to be part of a much larger district heating scheme.)

From Summer Street to Sexton, the steam line is sized at 8” and consists of direct buried pipe with 10 access chambers approximately every 300 ft.

The 12” steam line runs from Chamber B (Seymour/University) west past the Killam Library to Chamber F (SW Corner of Killam Library). From Chamber F, the line is reduced to 10” and runs around the north side of Chemistry and Henry Hicks Buildings and into LSC.

Branch lines to supply various buildings or groups of buildings are taken from the main line in various locations.

Central heating plant

Comments

1. The existing central heating plant at Dalhousie University is inadequate to support any future growth. The existing plant capacity is nameplate rated at 170,000 lb/hr (2 x 85,000 lb/hr boilers). Peak winter demand is in the order of 162,000 lb/hr. If one boiler fails in the winter, there would be major disruptions to campus operations. Under such an occurrence the University has an emergency plan that can be deployed which will simply avoid damage to the buildings in terms of weather impact. The space conditions will not be suitable for normal use, and research will be put at risk.

2. At 37 years old, the existing boilers are nearing the end of their useful life and are theoretically due to be replaced.

3. The 12” line that runs from the CHP under Seymour Street to Chamber B (Seymour/University) is at its velocity limit right now. This is not an issue currently because it is sized properly for the capacity of the existing CHP. If the CHP is expanded, then this line will need to be increased in size.

4. At Chamber F (SW Corner of Killam Library) the steam line is reduced to 10” and runs around the North side of Chemistry and Henry Hicks Buildings and into LSC. If all future development west of Chamber F (ST6, ST8-13) is completed then this 10” line would need to be upgraded to 12”.

5. There is an 8”direct buried line from Summer St to Sexton campus. It has capacity to supply 60,000 lb/hr. Current usage at campus could be estimated at approximately 15,000 lb/hr. The additional capacity on this line could accommodate proposed future growth of this site. It is noted that there are ongoing maintenance problems with this buried line. The main problems have been around water flooding in access chambers particularly Chamber 5 at the Morris Brenton intersection.

6. The main steam line along University Ave is adequately sized so that it could accommodate additional steam input from another source i.e. VG Hospital or Halifax Infirmary. The 10” section from Chamber B (Seymour/University) to Tupper might need to be increased depending if the current plant is kept in operation.

7. With new modern LEED equivalent buildings, we have estimated peak heating loads at 25 Btu/hr/ft2 depending on the type of building (i.e., multi story, research etc). For non-LEED buildings, we would assume 35 Btu/hr/ft2. For steam line sizing we have used a velocity limit of 10,000 ft/min.

A.4

APPENDIX A.4

ENERGY

Dalhousie ENERGY

Supply/Demand Analysis and Recommendations

Dalhousie Energy

Supply/Demand Analysis and Recommendations (draft)

June, 2009

**"Energy cannot be created or destroyed;
it can only be changed from one form to another." -Albert Einstein**

"If you can't measure it, you can't manage it" -Robert Kaplan

"Think outside the box? There is no box" – Amory Lovins

Abstract

- Dalhousie University owns a large portfolio of buildings with almost 5.0 million square feet spread over roughly 100 buildings on 3 campuses. The campus Master Plan estimates a capacity to increase that built area by over 3.0 million square feet over time.
- Dalhousie now spends approximately $14 million/year on energy but lacks an overall energy vision or management plan. Energy performance data for individual buildings is incomplete or entirely lacking.
- Energy costs are budgeted on a year to year basis with reference to market conditions. Energy distribution equipment and networks for steam heat and electricity are currently operating at full capacity.
- Energy prices will rise and be increasingly complicated by issues regarding the depletion, security, and impact on climate by the fossil fuels Dalhousie relies directly on for space heating and indirectly on for electricity.
- Governments, corporations, NGO's, utilities and citizens are taking a variety of steps with varying degrees of urgency to ensure security of energy supply, mitigation of and adaptation to climate change and other strategies in support of a de-carbonized economy.
- Dalhousie needs to develop a holistic and integrated energy perspective and a comprehensive energy management plan to ensure future viability of the university and sustain its aspiration for growth. Dalhousie has the resources for supporting such a vision with the Office of Sustainability, the College of Sustainability and ongoing multidisciplinary energy research.
- Leadership from the board of governors and the most senior levels of administration will be required to implement this transformative change.
- Establish targets for energy reduction and a team to manage and direct operations funded through energy savings.

In Summary: Consume less energy and search out alternative, renewable sources.

Overview

Dalhousie occupies roughly 4,900,000SF of built space, including residences, across 3 campuses.

Annual energy costs for the University are approaching **$14M/year** or approximately **$2.85/SF.** At this rate energy costs are a distant second to Dalhousie's annual compensation budget (roughly $200M/year) but unlike the complex structures built around human resource management, there appears to be no such plan around energy management and in particular demand side management. At today's prices high performance buildings could be operating at less than **$2.00/SF.** A 25% reduction in energy consumption would produce a net savings of **$3.5M/year.** With the potential to add as much as 3,000,000SF of additional built area with Master Planned development the annual burden of energy costs, at today's prices, would rise by almost $9,000,000. Complicating the metrics of the calculation are the improved performance of buildings, new and old, the volatility of fuel prices, and the security of supply- particularly of fossil fuels.

The consumption of fossil fuels and its impact on Climate Change are a relatively recent complication. Increasingly dire predictions about the future arrive almost daily through the popular news media with the scientific community weighing in with each report of the Intergovernmental Panel on Climate Change. (IPCC) The International post- Kyoto conference scheduled for Copenhagen in December 2009 will almost certainly reveal even more worrisome data from all corners of the globe.

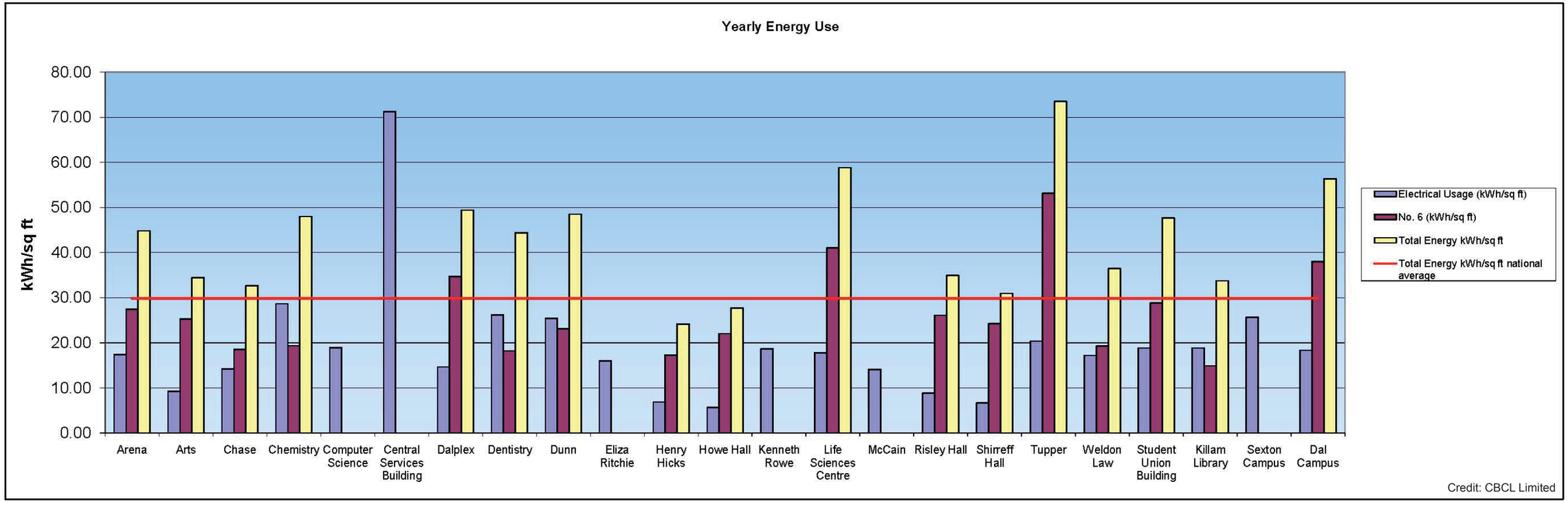
Some would even argue the rate of depletion of fossil fuels, oil and gas in particular, is the more serious challenge.

It is in this context that Dalhousie needs to consider its own relationship to energy supply, distribution and use. There is uncertainty around energy in the future both globally and locally and the future is both a moment and a long time.

Dalhousie is currently running at capacity for both its steam generation potential and its electrical distribution network. In each case the University is at a tipping point.

Dalhousie buildings range in type from wood frame to stone to concrete, to glass and steel construction and in age from over 150 years to the present. Together with the people who occupy them, they consume plenty of energy. Every single Dalhousie building consumes more energy than it needs to. In many cases, like the Dunn, Tupper and Life Sciences buildings for example, energy costs are far above those of contemporary buildings such as the McCain and Rowe buildings. Low performance building design, age, deferred maintenance on equipment and building upgrades and lack of strategic energy management have been contributing factors to the wasteful use of a finite resource. A significant energy savings initiative needs to be developed in a long term, strategic, and universal way.

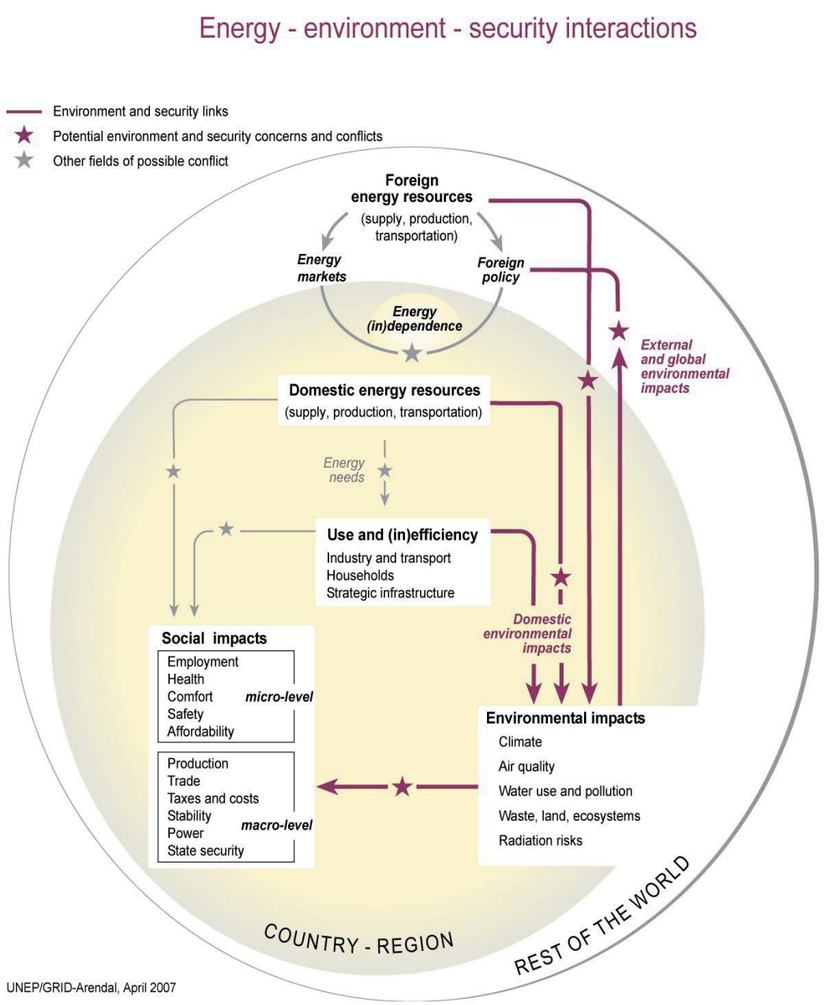
Figure 1 illustrates an incomplete view of Dalhousie's energy consumption (based on available data) and compared to a Canadian national average.



Supply and Demand

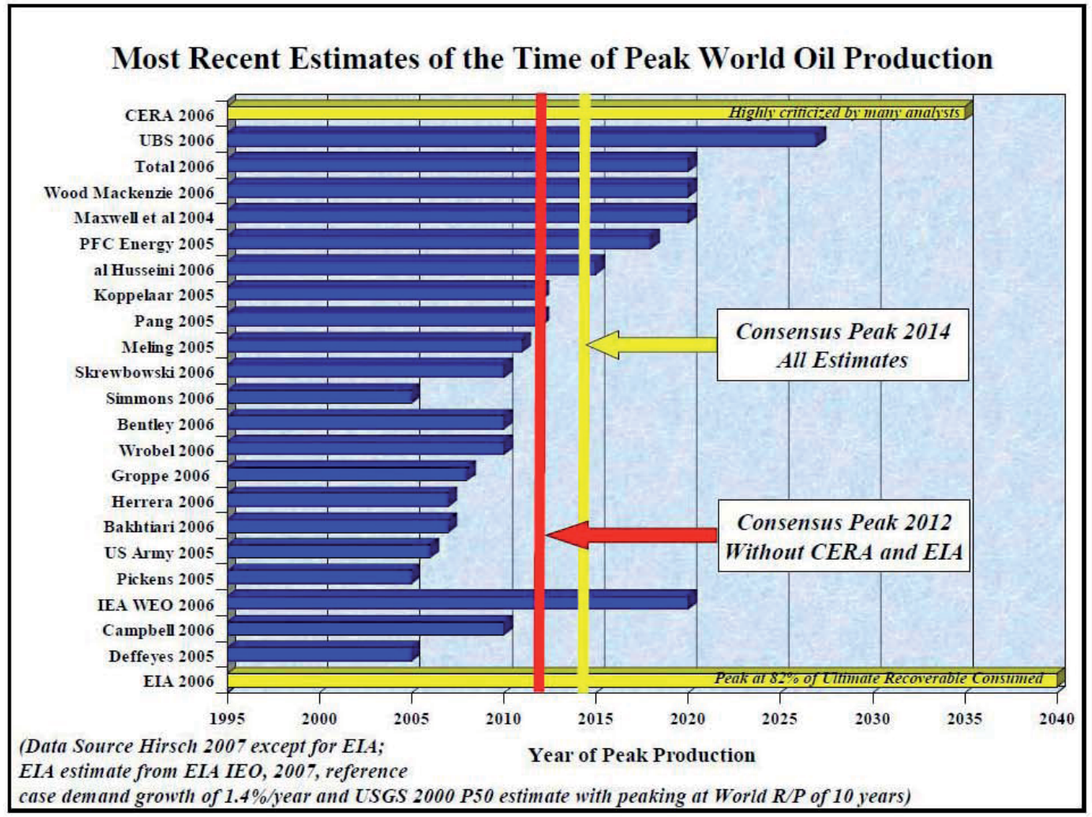
It is assumed the future will bring steadily, if not sharply, increasing energy costs and the rate of fossil fuel resource depletion and climate impacts present additional risk. Opinions differ on global "peak oil". The Association of Scientists for Peak Oil (ASPO) suggests it has already passed and the International Energy Agency (IEA) representing the oil industry suggests it may not be reached until at least 2020 although it has recently warned of a looming oil capacity crunch as early as 2013. Almost all of Nova Scotia's electricity is produced through the combustion of imported coal (Columbia) and most of its space heating need is met by the combustion of imported oil (Gulf of Mexico/US, Venezuela). As a result, Nova Scotia's energy security is at risk and so therefore is Dalhousie's.

Figure 2 illustrates global issues related to energy security.



Global demand is growing, global supply is dwindling and the geopolitical challenges of fossil fuel extraction and retrieval from ever more remote sources are getting increasingly complicated and risky. Exactly how much remains is a matter of conjecture but with daily global consumption at roughly 85,000,000 barrels it's a fact there is less and less every day.

Figure 3 illustrates recent estimates for Peak World Oil Production.



With renewable energy sources beginning to make headway through wind, hydro, solar and the promise of tidal and biomass all encouraged by the Environmental Goals and Sustainable Prosperity Act of 2007 concerns over supply may diminish over time. Over 85% of Nova Scotia's energy needs are currently met by the combustion of fossil fuels. For Dalhousie this number is closer to 100% with its reliance on Bunker C fuel oil to produce and distribute steam heat and its reliance on NSPI's coal generated electricity. With anticipated additional costs assigned to carbon based fuel combustion an additional burden will be added to Dalhousie's annual energy budget. Hydro-electric power from Labrador offers a potential clean energy option for Nova Scotia but there is a risk the transmission lines and the energy may bypass the Province and go directly to highly competitive markets in the north eastern United States.

Fossil fuels continue to rise in price in a highly volatile market. 10 years ago a barrel of oil was US$16. In September 2007 it was US$80. In August, 2008 it skyrocketed to US$147 – a price many say was a glimpse of the future. By December 2008 the price had fallen precipitously to bottom out at US$33 then in the subsequent 6 months it has more than doubled to over US$70/barrel. No dependable price forecast is available.

Dalhousie's Budget Advisory Committee has monitored the volatility in energy costs and the 2008-2009 budget for energy was increased by $1,800,000. The subsequent year's budget, 2009-2010 actually reduces the energy budget by $300,000, presumably at least partly in response to the lower oil prices seen in late 2008 and early 2009. In the absence of a long term energy strategy, the budget process manages energy costs on a year to year basis based on historical market data. Energy impacts on the broader life of the university or projected savings through demand side management were not evident in Budget Advisory Committee (BAC) minutes.

Dalhousie Facilities Management estimates the university will require capacity augmentation by December 2010. Recent project-centred initiatives addressing supply side Dalhousie energy concerns describe 5 options. In order of descending capital cost they are as follows. (capital cost/annual O & M savings/CO2 Reduction/ simple payback)

1. 15 MW Co-Gen/VG-HI-Dal Interconnection ($47M/$856k/106k tonnes/12 years)
2. 15MW Co-Gen/ VG Dal Interconnection ($41.2M/$560k/105k tonnes/12.6 years)
3. 7MW Co-Gen VG-Dal Interconnection ($30.4M/$560k/70.3k tonnes/7.4 years)
4. VG-Dal Interconnection/ Additional Boilers at VG ($16.1M/$560k/25.2k tonnes/6.9 years)
5. VG-Dal Interconnection/ Convert Dal to Gas ($5.7M/$170k/25.2k tonnes/5.5 years)

Carbon

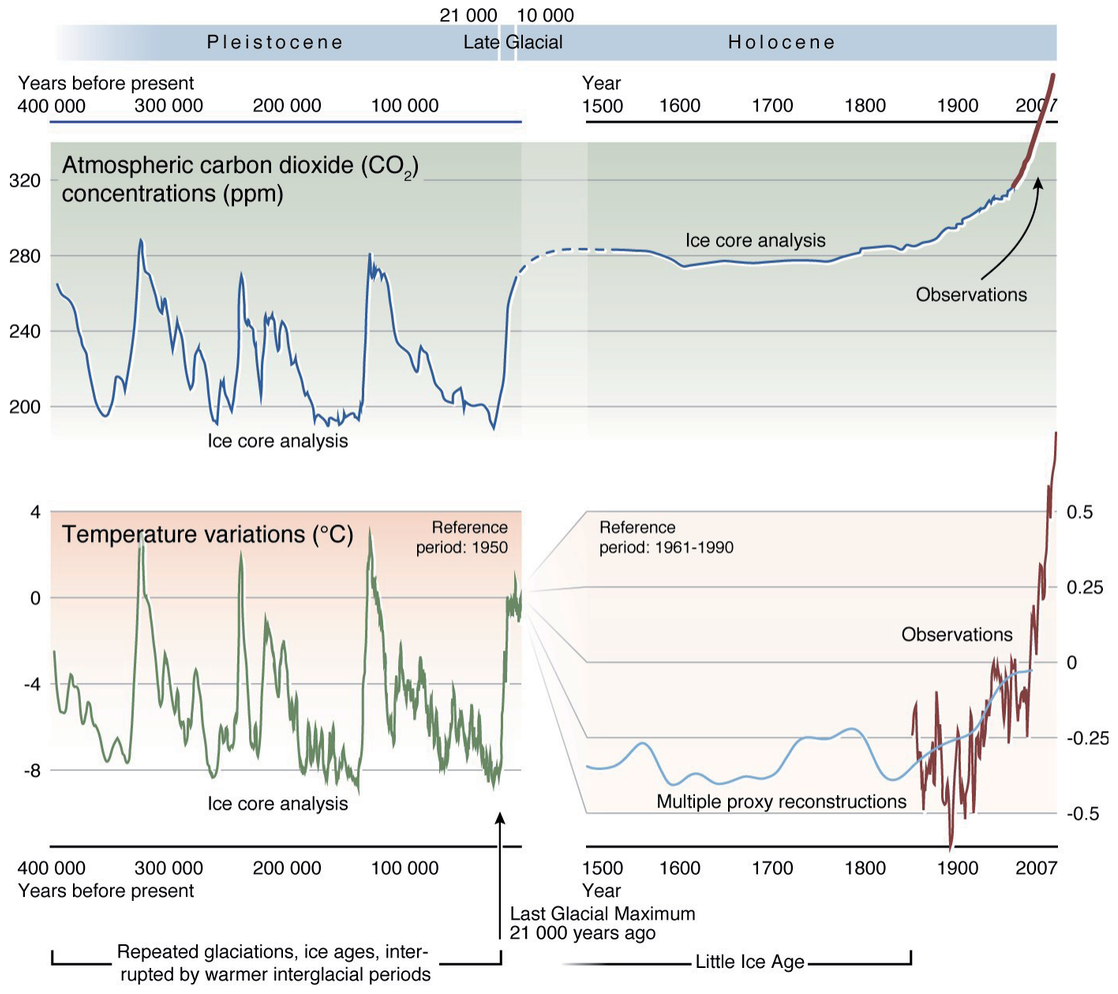
CO2 cap and trade policies in the European Union have already put a price on carbon in that market. Similar protocols will be in place in North America with the current federal government projecting regulations in place for cap and trade on carbon emissions by 2011. British Columbia established an ascending carbon tax commencing at $10/tonne in 2008.

The first carbon trading transaction within Nova Scotia was announced in June, 2009 when the Berwick Electric Commission purchased a one tonne carbon credit from Minas Basin Pulp and Power Company.

With its heavy reliance on fossil fuels, Dalhousie will also need to purchase carbon credits if it continues the current practice of generating its own steam with Bunker C oil. NSPI faces similar costs associated in generating electricity from coal.

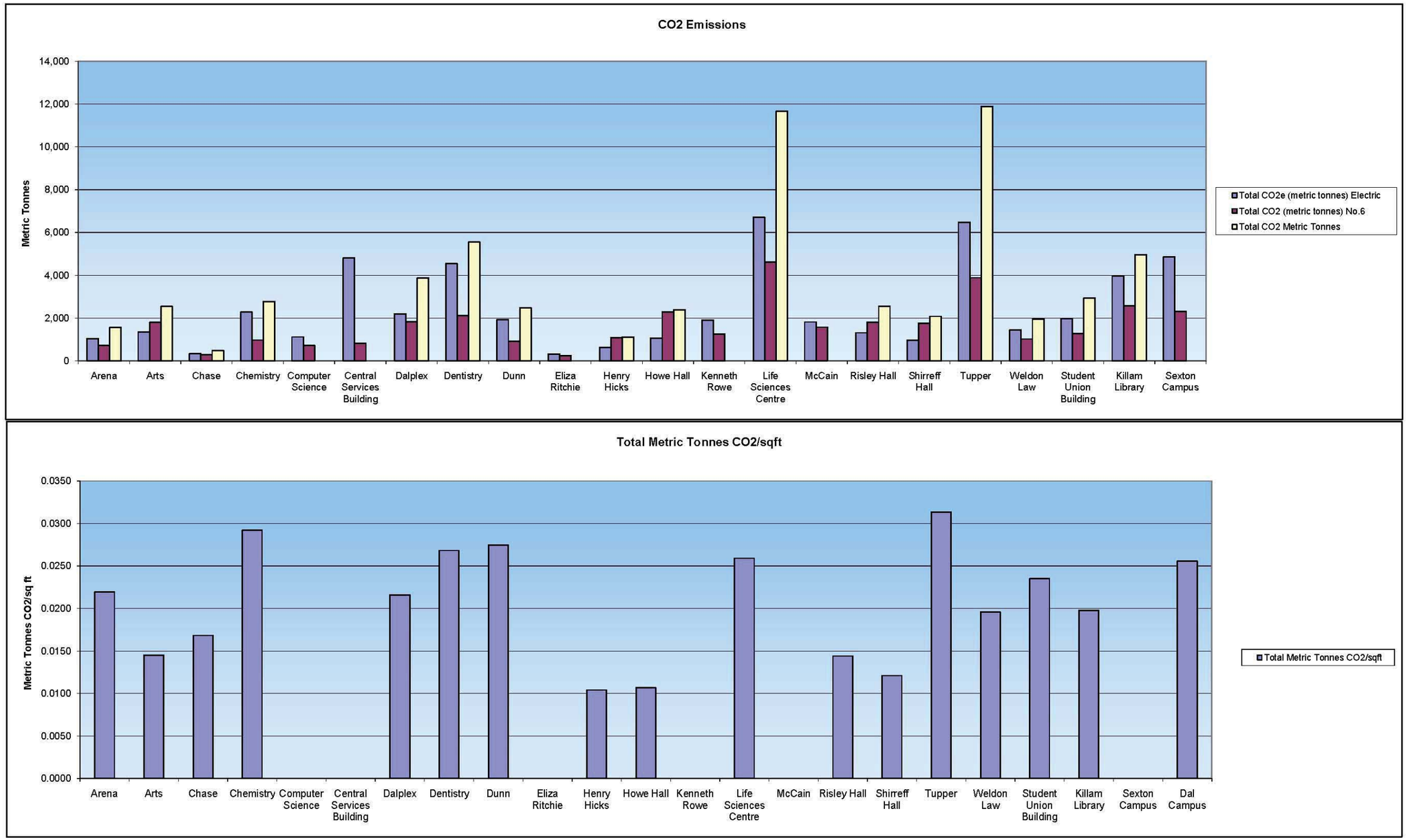
These are relatively new and increasingly urgent and challenging issues for governments, corporations, citizens - and universities, all over the world. Dalhousie and the world face an uncertain energy future. Solutions are not likely found in a "business as usual" approach.

Figure 4 illustrates the relationship between CO2 emissions and global temperature variations.



Credit: UNEP / GRID Arendal

Figure 5 illustrates partial CO2 emissions from Dalhousie.



Credit: CBCL Limited

A Competitive World

Many organizations, including universities and colleges in direct competition with Dalhousie are taking innovative approaches to energy management coupled to sustainability strategies and climate change action plans. Locally, the Nova Scotia Community College has demonstrated innovative approaches to holistic green programs and facilities and partnered with Nova Scotia Power to research alternative energy strategies through a program called “Advancing Sustainability”.

Dalhousie needs to demonstrate its leadership in energy policy to stabilize costs and continue to attract students and faculty increasingly tuned in to the internal green initiatives of university operations. They have to “walk the talk”.

For example, some institutions have long standing programs in place.

In 2006, the University of British Columbia ***completed*** an 8 year program called “Ecotrek” which included the retrofit of 300 academic buildings with energy and water conservation systems. Capital costs were recovered through energy performance contracting. Core campus energy use was reduced by 20%, water use by 30% and GHG’s by 15%. Annual savings for the university were over $2.5M. UBC has also cultivated a semi-autonomous relationship with the City of Vancouver to reach superior levels of sustainability through local food procurement, increased waste diversion from landfills and food waste composting for example. With its increasingly urban campus Dalhousie may be in a position to cultivate a similar relationship with the Halifax Regional Municipality.

University of Victoria installed 173 photovoltaic panels on their McKinnon Gym building in the 1980’s that generate 350,000kWh of energy every year. Solar panels are also used to power ticket dispensers and lights at campus transit stops.

In September 2008, Blekinge Institute of Technology in Karlskrona, Sweden, achieved carbon neutrality. Designed for a 2050 climate, Laurentian University’s Living with the Lakes project will be designed to exceed LEED Platinum.

Renewable energy technologies harvesting wind and solar energy are deployed at universities all over the United States and Canada. An assessment of solar energy potential for all Dalhousie buildings forms a key part of this campus master plan. Detailed solar energy assessments are provided for the Killam Library and Tupper Medical buildings.

Energy Touches Everything

Transportation: a key element of energy management with links to traffic demand management (TDM), fleet vehicle policies (hybrid, alternative fuels, size and type), staff air travel policies – alternate technology deployment eg webinars, video conferencing, and proactive support of active transportation policies.

Scheduling: In Nova Scotia primary energy is used for space heating. Expanding the use of buildings into the warmer months of the year is an opportunity to expand the role and mandate of Dalhousie with minimal energy impacts. More subtle shifts involving flex-time daily class schedules or expanding to 6 day/week programs will also present significant opportunities for energy savings.

Food services: Comprehensive energy policy can impact food service with initiatives around fuel type, local sourcing, organic standards and waste stream management.

Technology: Computers and other electrical devices consume large amounts of energy much of which is transformed to heat. Energy sensitive procurement policies can specify energy efficiency in goods and services. With a district energy network waste heat from buildings heavy in equipment use, labs for example, can be transferred to buildings with high heating demands like residences.

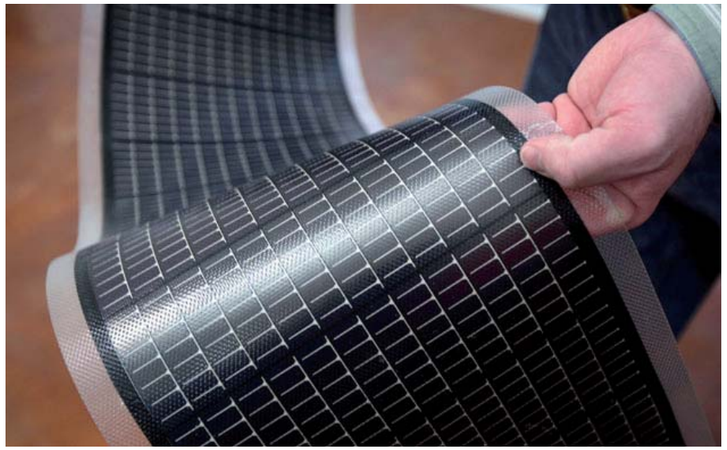
Green Building Standards: Organizations such as the Canada Green Building Council (www.cagbc.org) are developing energy benchmarking and performance measurement tools for buildings with products like LEED Existing Buildings - Operations and Maintenance (LEED EBOM) with the target of achieving 50% reduction in energy and water consumption for 100,000 commercial buildings and 1,000,000 homes by 2015. A 50 megatonne reduction in Canadian GHG emissions sets an ambitious goal for this program and will make a significant impact in meeting Canada’s Kyoto and post-Kyoto GHG reduction obligations. Universities and Colleges make up over 10% of LEED registered or certified buildings in Canada. Beginning in 2010 the Environmental Goals and Sustainable Prosperity Act will mandate LEED Gold for publicly funded buildings. More ambitious protocols are emerging to address the impact of building operations on green house gas emissions and climate change.

The Living Building Institute (www.ilbi.org) requires buildings to supply 100% of a building’s energy needs via on-site renewable technology. Over 50 projects are registered in North America.

Opportunities

As signatories to 3 international declarations related to environment and sustainability over the past 20 years, (the Halifax Declaration, the Talloires Declaration and the UNEP International Declaration on Cleaner Production), Dalhousie has already demonstrated a clear indication of its commitment. More recently, establishment of the Office of Sustainability, the College of Sustainability, The President’s Advisory Council on Sustainability and the imminent release of the University Sustainability Plan as well as ongoing research across many faculties provides further indication of where Dalhousie is moving in the future. If Dalhousie is going to succeed in becoming the best university in Canada, as it has set out to do, then it must give special attention to coordinating these efforts and establishing action plans to achieve specific and ambitious goals. Sustainability is a broad term and in the lexicon of environmental, social and economic confluence, it is giving way to the idea of “resilience” as a more poignant reminder of our fragile planet. A resilient university will be one that understands the full extent that society and its institutions rely on affordable, available and renewable sources of energy and that responsibility for the stewardship of available resources resides at the highest level.

Thin Film Solar Photo Voltaic Membrane



Credit: Manchester Guardian

Options for Consideration

1. Establish an Energy Vision and Management Plan for Dalhousie within the Office of Sustainability reporting directly to the President.

2. Establish an Energy Management team to carry out the vision. Hire an Energy Management director and supporting staff as required. Finance the Energy Management team and initiatives through energy savings. A 25% reduction in 5 years or less can provide up to $3.5M/year to fund operations.

3. Develop a comprehensive Demand Side Management plan. Set a minimum campus wide energy reduction target of 25% within 5 years. Review progress on a semi-annual basis. Continue to explore energy supply options including co-generation and alternative, renewable fuel sources with or without partners.

4. Start documenting all energy related data for every building. Identify units of energy consumed and cost per unit of energy. Express energy savings in dollars and tonnes of green house gas emissions saved. Identify building specific initiatives taken in each case with results expressed as above.

5. Install comprehensive monitoring and verification tools for every building.

6. Develop an energy efficiency and conservation education program for all university stakeholders to support individual action.

7. Post the Vision and Management plan on Dalhousie's web site. Communicate results from monitoring network in real time. Calculate and post green house gas emissions results on a daily basis.

8. Partner with governments, NSPI, other institutions and the private sector to collaborate, innovate and share data. Where appropriate cost share expenses on mutual initiatives.

9. Develop energy budgets for all new construction and major renovation projects. Use emerging energy performance tools such as LEED EBOM (Existing Buildings Operations and Maintenance).

10. Through the College of Sustainability and Dal Communications, develop a university wide awareness program to identify and address the meaningful links between energy management and water conservation, climate change, transportation, food, scheduling, waste management, air quality, lighting in addition to basic building operations.

A.5

APPENDIX A.5

SOLAR INVENTORY

This report was prepared by Green Power Labs Inc. (GPLI) for IBI Group/WHW Architects and Dalhousie University. The materials in this report reflect GPLI's best judgment based on the information available to the company at the time of report preparation. Any use of this report by a third party, or any reliance on or decisions made based on it, are the responsibility of such third parties. GPLI accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Executive Summary

Solar energy can be a valuable resource in Nova Scotia, providing a means to reduce life-cycle energy costs and environmental impacts, and to improve energy security. Dalhousie University's interest in solar energy is substantiated by recent developments in solar technologies, by increasing fuel prices, and by a global concern to reduce greenhouse gases.

The effectiveness of solar technologies depends on the amount of solar radiation available, the conversion capability of the available technologies, and the demands for use of the energy.

The objectives of this solar suitability assessment are to determine the suitability of the University facilities and open areas to solar energy, and to develop recommendations for applying solar energy technologies in the University's energy mix.

The solar resource is quantified using a combination of surface weather station information and satellite data for the geographic area.

Maps are presented for the Studley, Carleton and Sexton campuses describing solar gain and the effect of shading by obstructions to sunlight.

A SolarStar™ rating is used to identify the buildings most suited for solar applications.

Current technologies for solar water heating, solar air heating and photo-voltaic power generation are presented and discussed.

The generating potential of solar water heating and solar air heating on campus is mapped for each building.

The total solar resource and generating potential of buildings is estimated:

	Area (m^2) after Obstructions	Total Annual Radiation (MWh)	Solar Thermal Generating Potential (MWhth)	Solar Electric Generating Potential (MWhe)
Solar Suitable Roof Surface:	44,142	57,115	9,400	3,700
Solar Suitable Wall Surface:	23,182	22,903	12,600	-
TOTAL		**80,018**	**22,000**	**3,700**

Solar energy technology could replace 20% of the heating energy that is currently provided by the Central Heating Plant.

Building-mounted solar electrical generation could provide approximately 5% of the University's electrical needs.

Solar suitability assessments were carried out on the Sir Charles Tupper Building and the Killam Memorial Library. The buildings provide significant opportunities for using renewable energy technologies to displace the use of fossil fuel.

At both sites, solar air heating provides more energy at less cost than solar water heating.

1 Introduction

Solar energy can be a valuable resource in Nova Scotia, providing a means to reduce life-cycle energy costs and environmental impacts, and to improve energy security. Dalhousie University's interest in solar energy is substantiated by recent developments in solar technologies, by increasing fuel prices, and by a global concern to reduce greenhouse gases.

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The objectives of this solar suitability assessment are to determine the suitability of the University facilities and open areas to solar energy, and to develop recommendations for applying solar energy technologies in the University's energy mix.

First, the solar resource is quantified using surface weather station information and satellite data for the geographic area.

The effect of shading by obstructions to sunlight are calculated and mapped in terms of net solar gain for the Studley, Carleton and Sexton campus areas.

A SolarStar™ methodology is used to identify the buildings most suited for solar applications.

Solar technologies are discussed, and the solar generating potential of each building is estimated.

Finally, solar suitability assessments are carried out on two buildings, the Sir Charles Tupper Building and the Killam Memorial Library, to provide examples of the potential application of solar technologies at specific buildings.

2 Solar Resource Assessment

Users of solar energy technologies need high-quality solar radiation data to maximize the output of the energy systems and the return on investment.

Solar gain at the Earth's surface is the sum of direct and diffuse radiation. When sunlight passes through the Earth's atmosphere, a portion is scattered or absorbed by haze, particles, or clouds, of which only a portion reaches the Earth's surface as diffuse radiation. On an overcast day, essentially all radiation that reaches the ground is diffuse, while on a clear day most radiation is direct. Radiation levels are also affected by the position of the Sun above the horizon; this angle - and the nature of the air mass through which the sunlight travels - changes during the day and through the year.

Historically, ground measurements have been used to determine surface-level radiation and other weather parameters for renewable energy projects. Although ground measurement data have been used successfully in the past, there are inherent problems and limitations in using them for resource assessment. We access the solar energy information from NASA Earth Science Enterprise (ESE) program's satellite and reanalysis research data. In contrast to ground measurements, the Surface meteorology and Solar Energy (SSE) data set is a continuous and consistent global climatology of solar gain and other weather data over a period of 10 years or more.

Major inputs to the radiation calculations were obtained from the World Climate Research Program's International Satellite and Cloud Climatology Program (ISCCP) sponsored by NASA. Version DX 8-km radiance and cloud were used. Water vapour was taken from the NASA Data Assimilation Office's Version 1 Goddard Earth Observation System (GEOS-1) data for each 2^{O} x 2.5^{O} latitude/ longitude cell over the globe for the period July 1983 through June 1993 on a 3-hourly basis. The 10-year data period contained 3.5 El Nino years, 2 La Nina years, and 4.5 "near-average" years, which is representative for long-term climatology of the study area.

For solar energy resource assessments we use the total annual radiation based on calculations of monthly average solar gain on a horizontal surface. This value is typically referred to as global horizontal radiation, expressed as a daily average in units of kWh/m^2/ day. The following map, Figure 2-1, describes average yearly radiation levels on horizontal surfaces in Nova Scotia, based on these data.

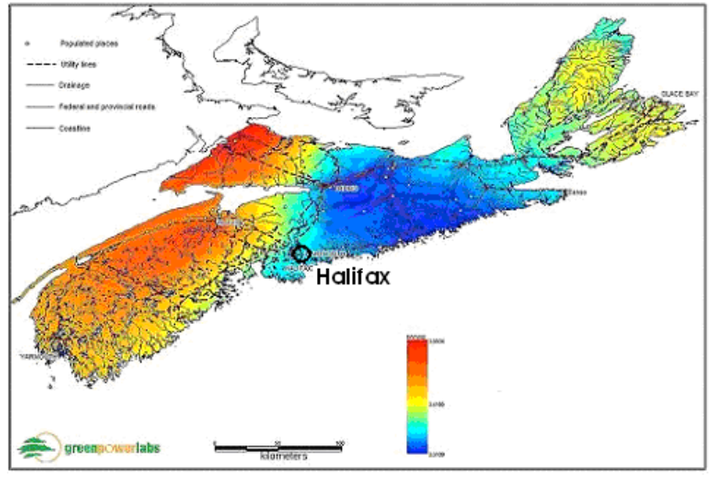


Figure 2-1: Solar map of Nova Scotia; Global Horizontal Radiation 3.3-3.6 kWh/m^2/day

Figure 2-2 below, shows the monthly dynamics of solar gain in Halifax Region, and differences between the ground site and satellite datasets.

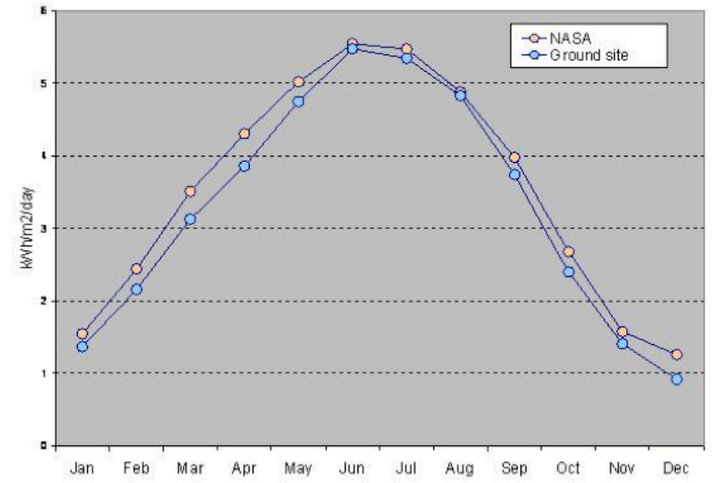


Figure 2-2: Global Horizontal Radiation, Halifax Region (kWh/m^2/ day).

Campus-Wide Solar Gain

The solar radiation rates of the Studley, Charleton and Sexton Campuses are presented in the following Figures. The maps were developed using the NASA data for solar gain, and an obstructions analysis of Lidar 3-D modeling data.

LIDAR (Light Detection And Ranging) is an optical remote sensing technology that measures properties of scattered light to find range and other information of a distant target. Airborne laser scanning delivers detailed surface information (approx. 10 points/m^2). This study used data for the Halifax area provided by PHB Technologies / LaserMap Image Plus under contract to Halifax Regional Municipality in May 2007. The data was processed to obtain the solar radiation intensity for each point in a 0.2 m grid covering the three campuses. At each point, a 'virtual fisheye' image of the surrounding topography was developed from the LIDAR data, as illustrated in Figure 2-3 and an obstructions analysis was performed to estimate the total annual solar radiation.

The virtual fisheye image shows obstructions to sunlight from the roof of the Nu-Tech building, Dalhousie index D280. The red line shows the Sun's path on June 15th; the blue line represents December 15th.

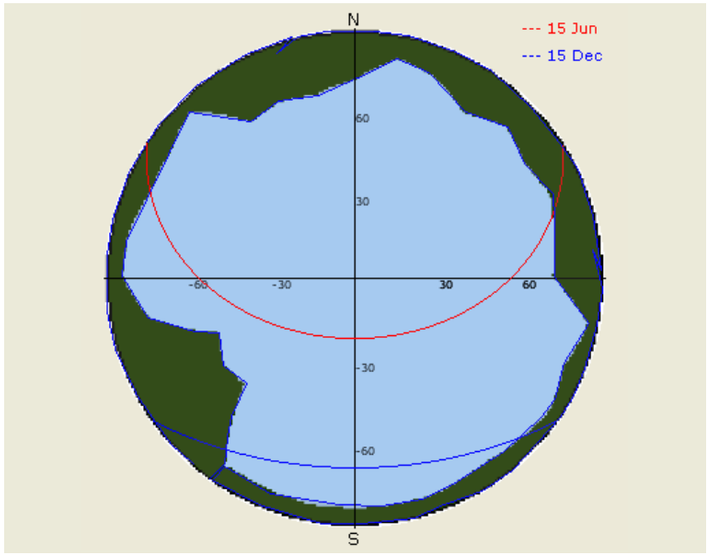


Figure 2-3: Virtual Fisheye Image - Roof of Nu-Tech Building.

Calculations were performed for the year in bi-weekly intervals. The model analyses the solar angle and altitude-air mass impacts throughout the day. The effects of shading from obstructions are calculated at each time-step on each component (direct, diffuse and reflected) of solar gain.

The results are mapped in Figure 2-4, Figure 2-5 and Figure 2-6 below.

The maps identify the best roof surfaces for the installation of solar technologies. The maps also identify the impact of landscaping features on solar throughout the campuses. For example, 'hot spots' in Figure 2-4 include the Wickwire Field and the Killam Library, while areas with trees have little solar gain at ground level.

The model may be used as a design tool, for example, by adding proposed building or landscaping options to the LIDAR data to obtain radiation characteristics throughout the year.

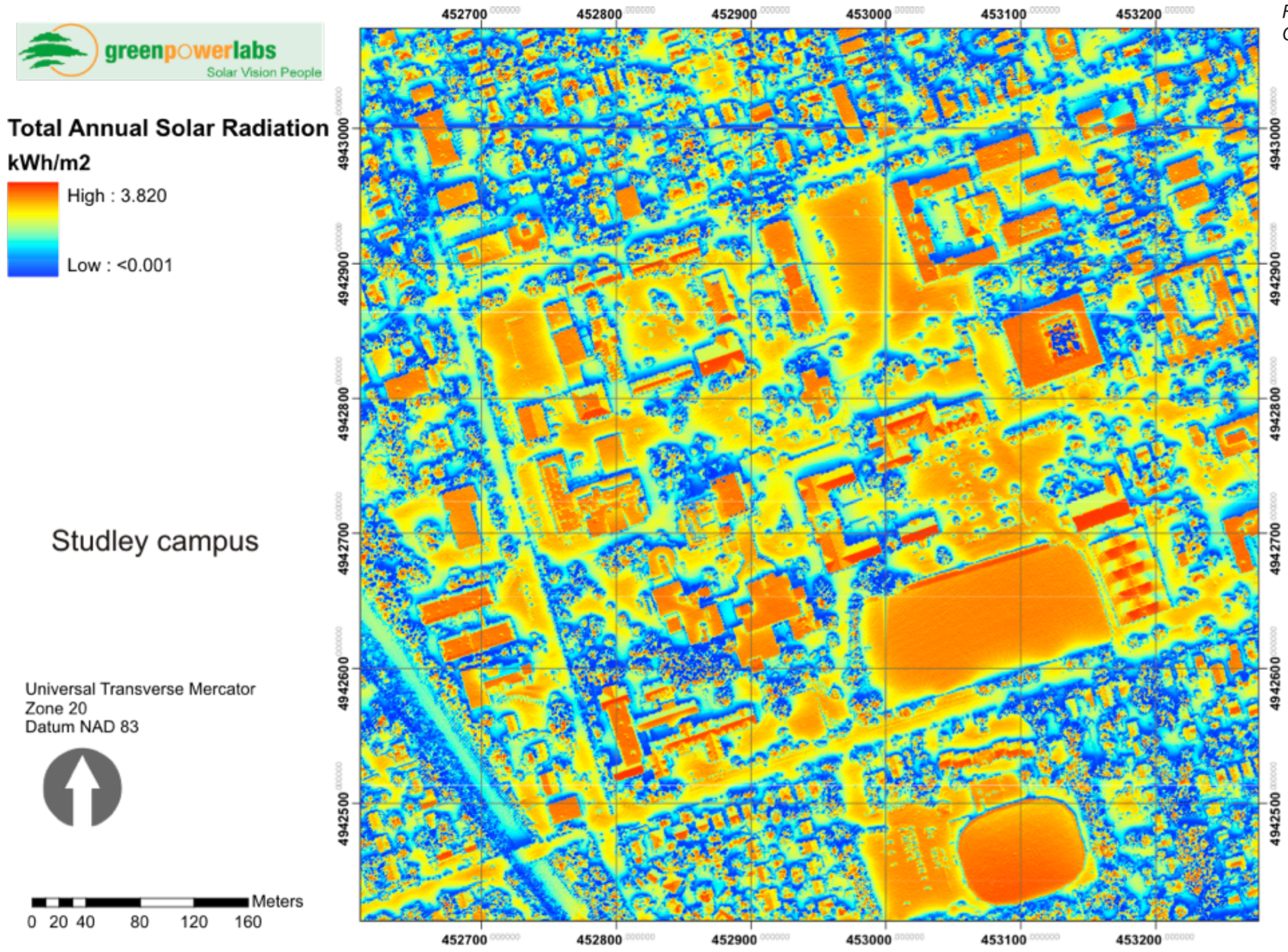


Figure 2-4: Solar Radiation Map – Studley Campus

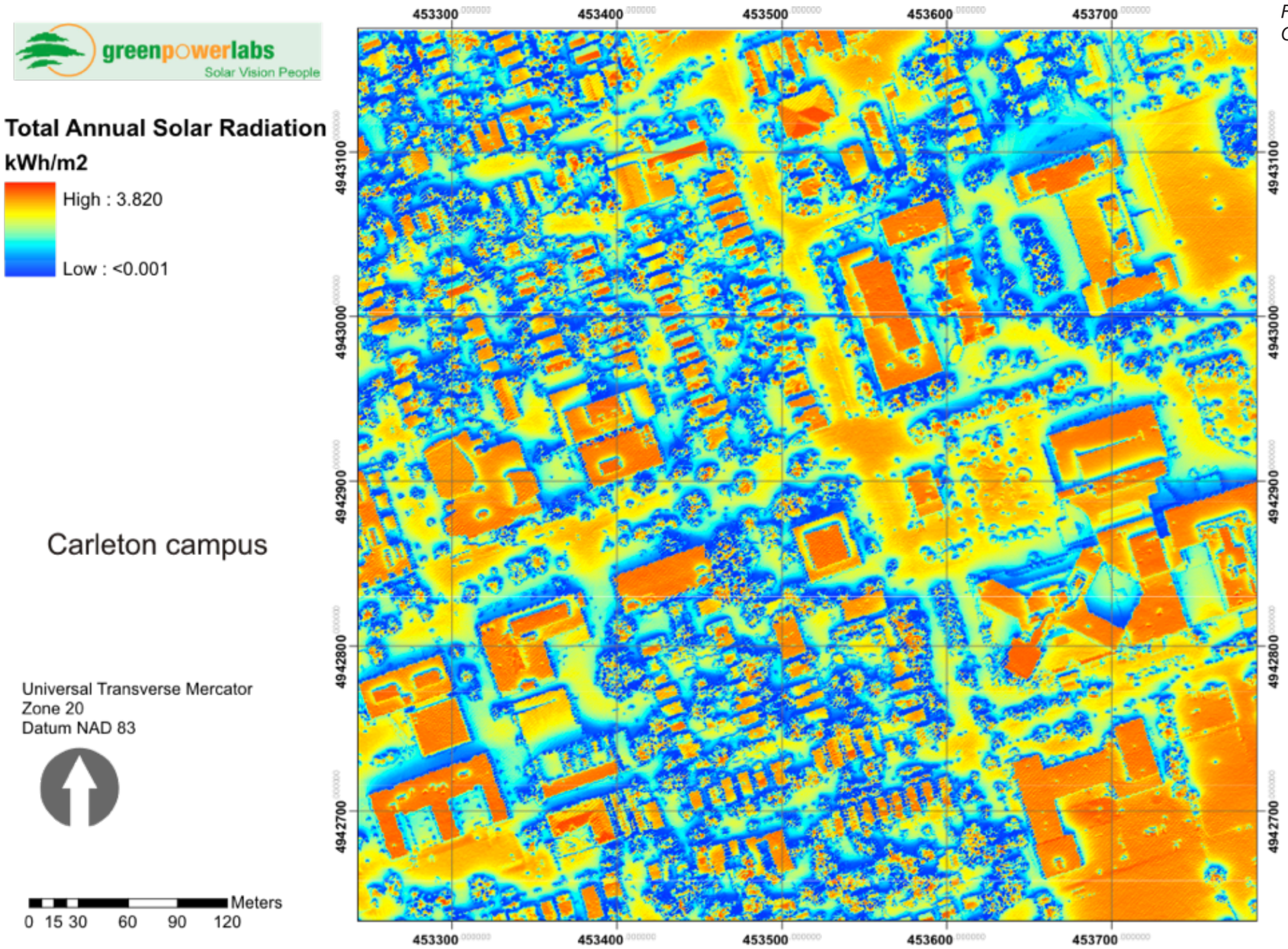


Figure 2-5: Solar Radiation Map – Carleton Campus

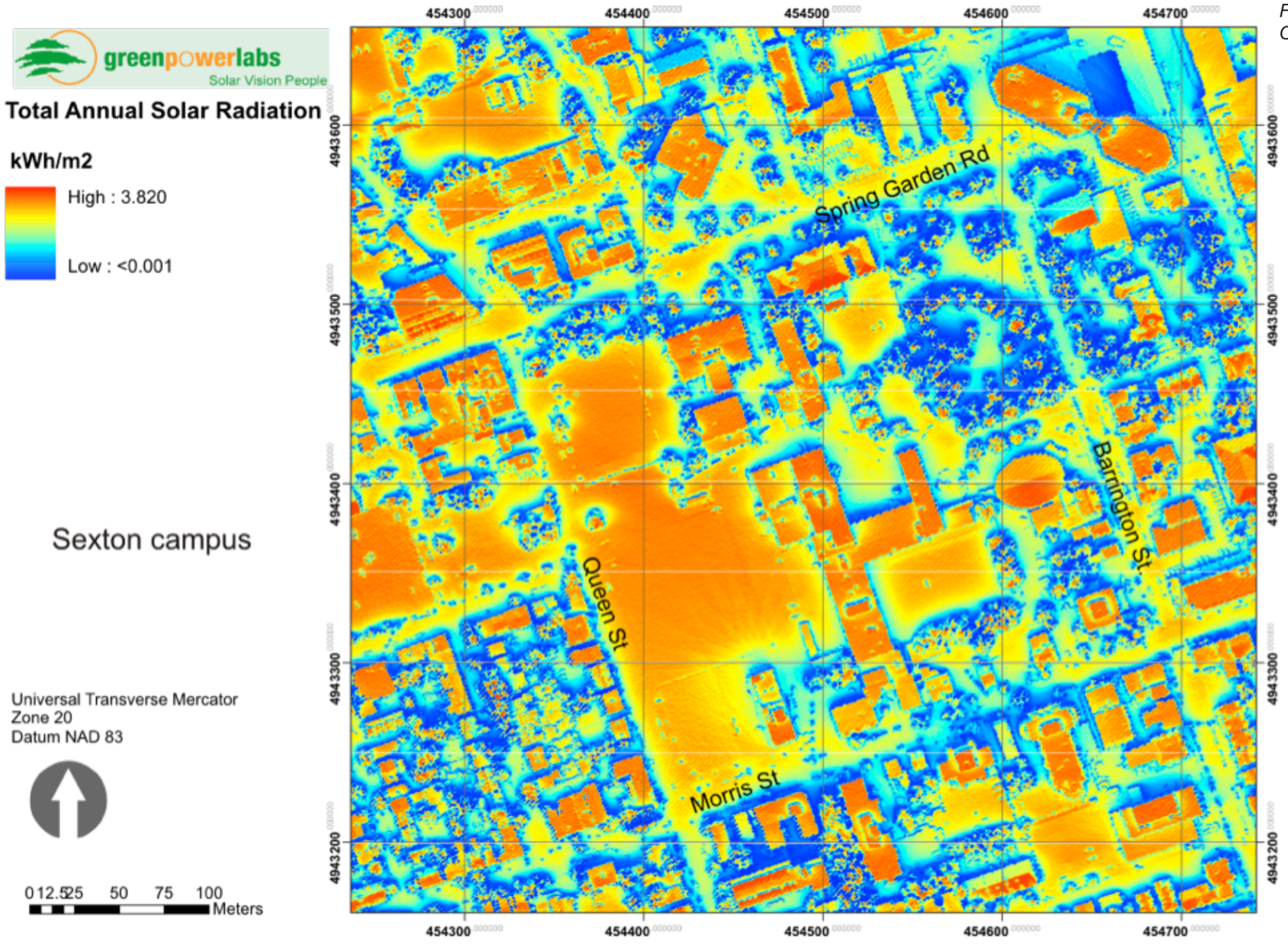


Figure 2-6: Solar Radiation Map – Sexton Campus

3 Solar Resource Potential of Campus Buildings

The suitability of a site for solar energy generation is determined by a number of natural and architectural factors, including topography, landscape, building aesthetic criteria, roof configuration and façade characteristics. For existing buildings, these factors are considered to estimate the areas of roof, wall and/or site surfaces which can be used for harvesting solar energy, and the net amount of solar radiation that can reach the surfaces.

In the case of roofs, the azimuth and slope affect the maximum theoretical solar gain of a surface. The roof shape and features determine the available surface area, or effective surface, of the roof. The surrounding vegetation, neighbouring buildings, open space and topography influence the proportion of the solar radiation reaching the effective surface.

At Dalhousie's geographic location, a flat surface has an average annual radiation rate of 3.52 kWh/m^2/d. A maximum radiation rate of 4.10 kWh/m^2/d is achieved for fixed surfaces which are sloped at an angle of 35º to the horizontal, and orientated due south.

The **solar suitability rate** of a surface is a measure of the value of a surface for solar energy generation; it is defined as a ratio of the annual solar gain of the surface to the solar gain of a surface that is orientated to maximize the value. The flat surface has a solar suitability rate of 88%.

Figure 3-1 shows the variation of solar suitability rate with azimuth and slope, specific to Dalhousie's geographic location.

The most southerly facing walls of Dalhousie buildings have an azimuth of between 18º and 22º east of south, the majority being at 18º. The larger buildings are predominantly flat-roofed: approximately 3/4 of the overall roof area is nominally flat, 1/8 is sloped and planar, and 1/8 is curved. The slopes typically vary between 20º (nominally 4:12) and 45º (12:12).

The solar suitability rates of the typical roof and wall elements are described below in Table 3-1.

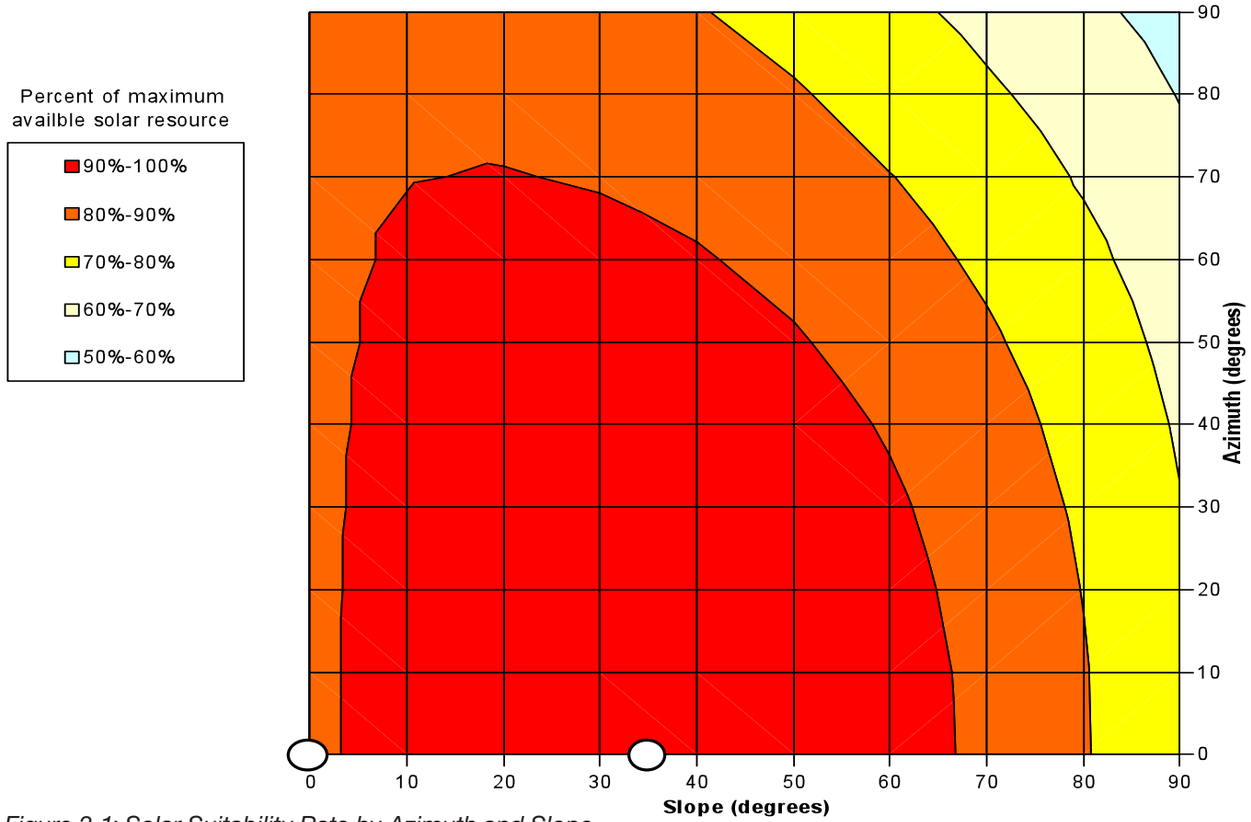


Figure 3-1: Solar Suitability Rate by Azimuth and Slope

Table 3-1: Solar Suitability Rates, Unobstructed – Dalhousie University

	Azimuth (deg)			
Slope	**'North'**	**'East'**	**'South'**	**'West'**
(deg)	+162	-108	-18	+72
0	88.0%	88.0%	88.0%	88.0%
20	72.8%	81.9%	97.2%	89.6%
45	53.7%	71.4%	98.1%	85.2%
90	35.1%	50.2%	71.2%	61.9%

The south faces of walls and sloped roofs are significantly more valuable than west- or east-facing slopes. West walls are more valuable than east walls. Also, as indicated by values for the north-facing slopes, diffuse and reflected radiation are significant to the total solar gain.

Solar suitable surfaces are areas of roofs, walls or landscape which are orientated and available for solar technologies. For this assessment, solar suitable surfaces were considered to include south- or west-facing roof or wall surfaces, or flat roofs, with a minimum dimension of 3.0 m (10') to accommodate solar equipment.

The 95 buildings included in this assessment have a total roof area of 88,000 m^2, of which 45,000 m^2 is considered suitable for solar applications. 62 of the buildings have flat roofs of which 41,000 m^2 is considered suitable for solar applications. The remaining 4,000 m^2 of suitable roof area is derived from sloped roofs, excluding the curved roof slopes of sports buildings.

The buildings have a total wall area of 128,000 m^2 of which 15,000 m^2 south-facing and 9,000 m^2 west-facing walls are considered suitable for solar applications.

Obstructions to solar radiation are critical to solar gain, as illustrated in Figure 2-4 to Figure 2-6 above. Obstructions affect primarily direct radiation through shading, but they also have a significant effect on diffuse radiation.

The effect of obstructions to solar gain at roofs and walls was determined using the virtual fisheye techniques described above and verification by visits to each site. Results are presented in the form of an equivalent loss of suitable surface area.

Results: the Solar Gain on the suitable surfaces, net of obstructions, is summarized in Table 3-2 below.

Table 3-2: Total Annual Radiation on Solar Suitable Surfaces

	Area (m^2) After Obstructions	Total Annual Radiation (kWh) After Obstructions
Solar Suitable Roof Surface:	44,142	57,115,721
Solar Suitable Wall Surface:	23,182	22,903,096
TOTAL		**80,018,817**

4 Solar Star Suitability Rating

A SolarStar™ rating system was used to provide a quick reference on the solar resource potential of each building. The system is used here as a first step to selecting candidate buildings for solar technologies.

The solar resource potential of each building's roof and wall surfaces is presented as a percentage of its optimum design value.

For flat roof surfaces, the optimum solar gain is considered to be that for a roof in which 80% of the roof area is available for solar equipment, being unused by skylights and/or mechanical systems.

For sloped roofs, the optimum is considered to be that for a roof in which one half of the roof area faces due south at the optimum slope, and all of this area is available for solar equipment.

For walls, the optimum is considered to include longer wall surfaces facing south in proportion to the 'golden ratio' of 1.618, for a given floor area, and 60% of wall surfaces being available for solar applications.

All surfaces are considered unobstructed.

The results for each building are presented in the following maps, Figure 4-1, Figure 4-2, and Figure 4-3.

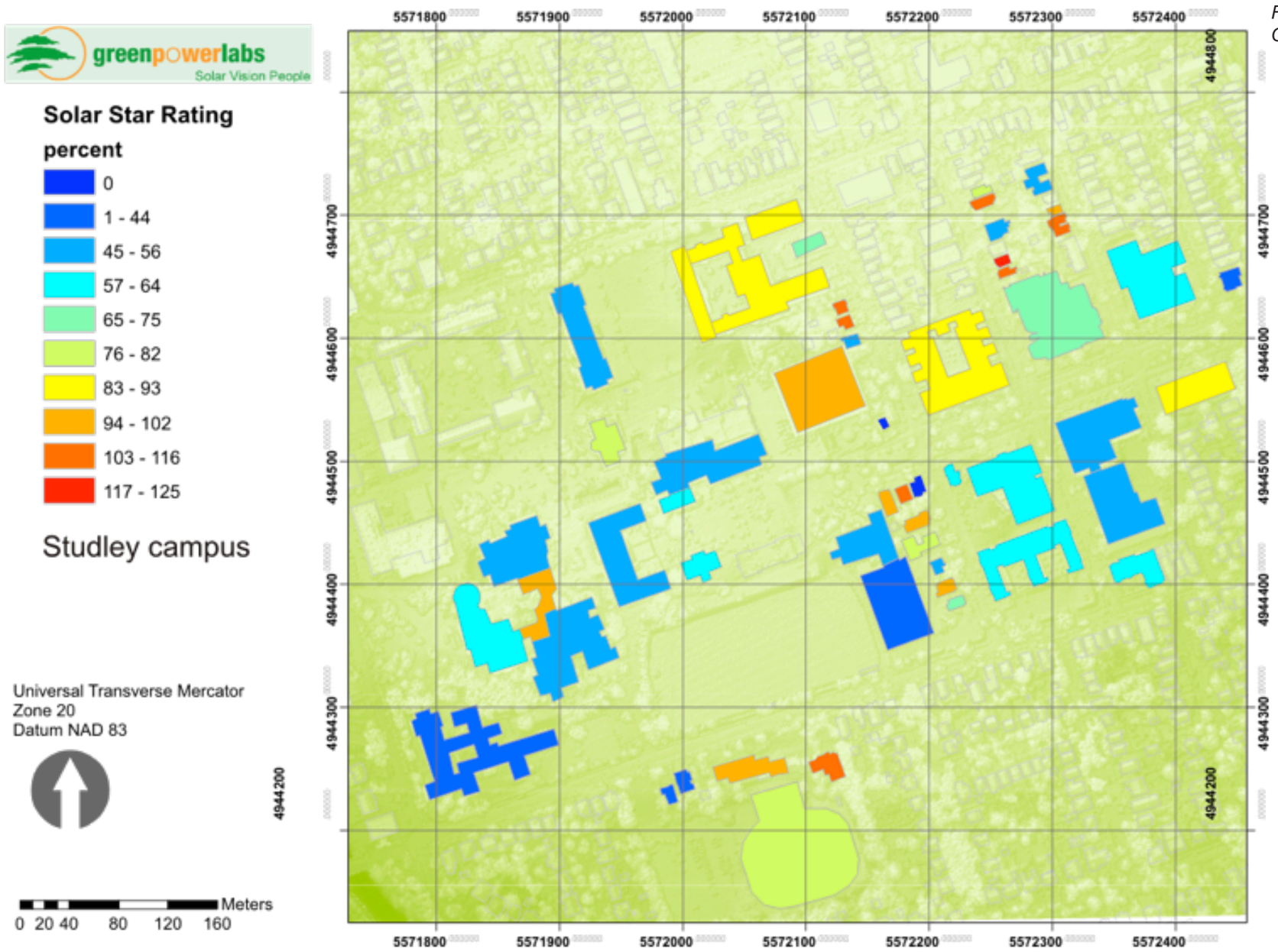


Figure 4-1: Solar Star™ Rating, Studley Campus.

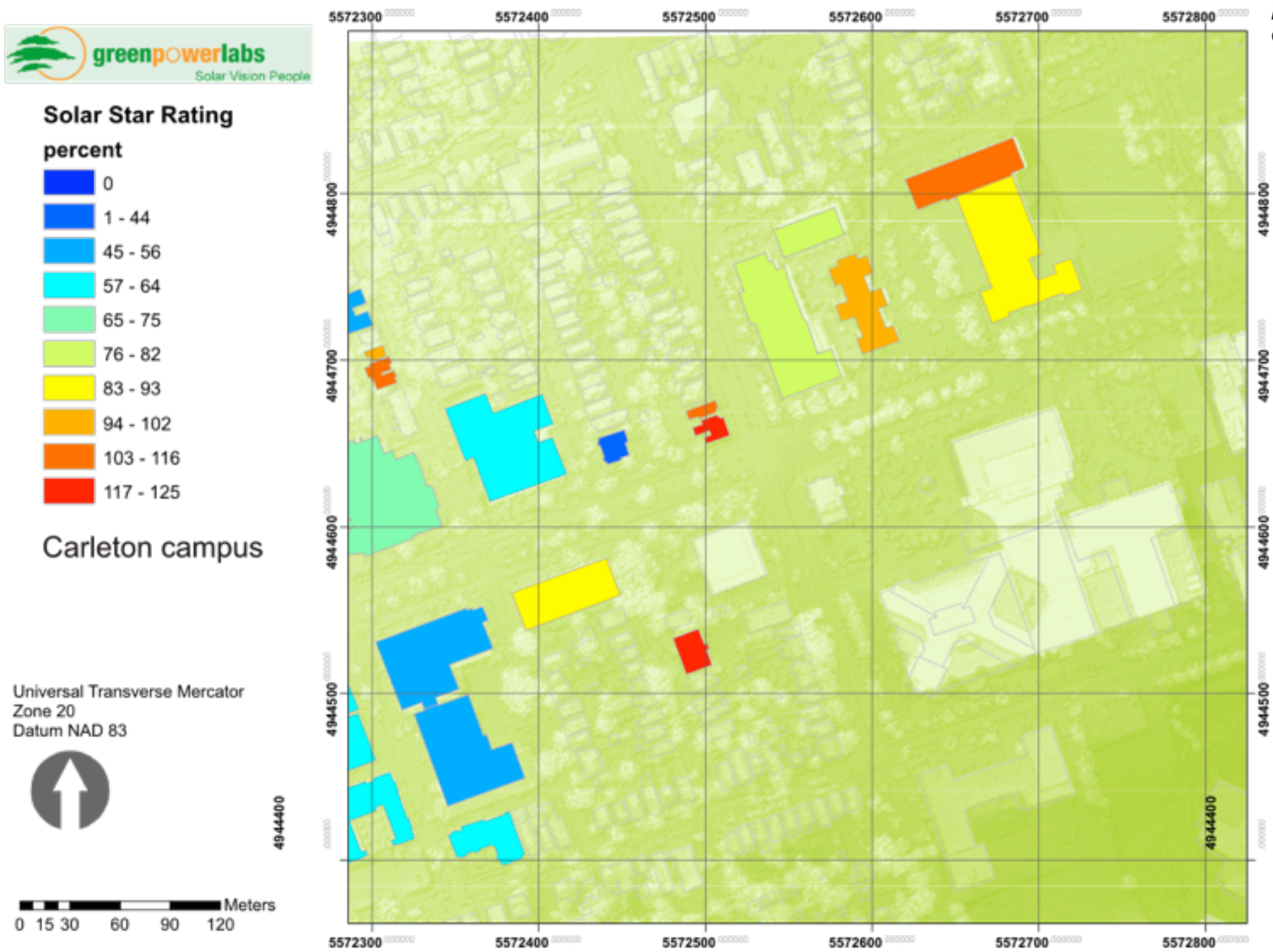


Figure 4-2: SolarStar™ Rating, Carleton Campus.

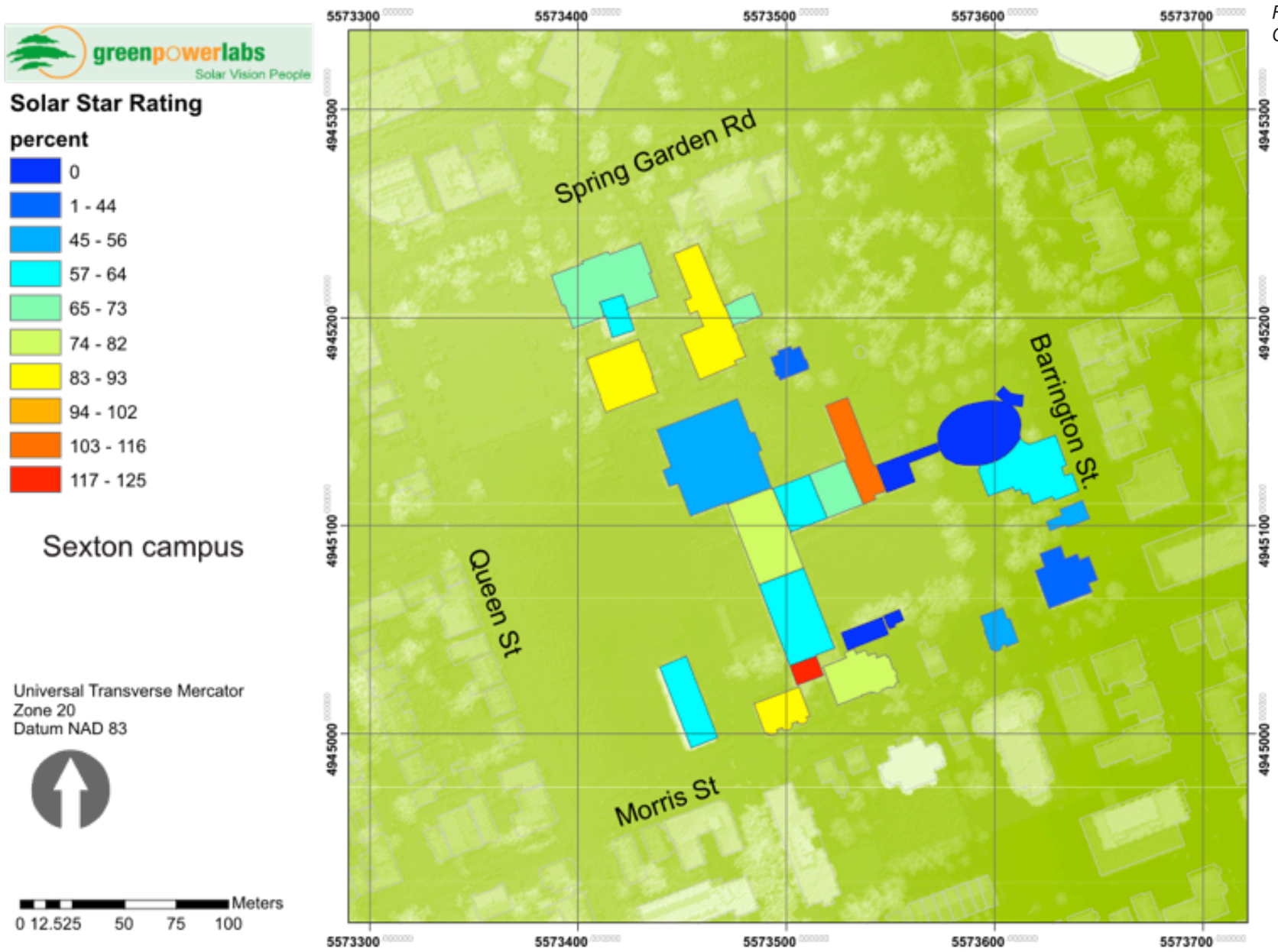


Figure 4-3: SolarStar™ Rating, Sexton Campus.

5 Solar Energy Generation Potential

Solar Water Heating (SWH) systems are used to preheat water for various applications. Most commonly, SWH systems are combined with a conventional heat source to provide domestic hot water.

The key component of SWH technology is the solar collector that converts the sunlight into heat. Types include:

Glazed Flat-Plate Collectors: the collector is contained within an insulated box covered with a sheet of glass. The box contains tubes attached to a metal absorber plate.

Evacuated-Tube Collectors: individual sealed vacuum tubes surround a metal absorber plate.

Unglazed Collectors: rubber or ultraviolet (UV) stabilized polymers are used, mainly for low-temperature applications such as heating residential swimming pools and aquaculture process water.

The most common type of solar collectors used in solar water heaters for medium- and high temperature commercial water heating applications are glazed flat-plate collectors.

Typically, SWH systems for domestic hot water include water storage tanks. The tanks store the solar energy to provide preheating at times of no solar gain; the tanks also limit overheating of the heat exchange fluid and stagnation of the collectors.

The most efficient SWH systems currently available have an energy conversion efficiency of 40-45% in typical applications.

The solar thermal generation potential of sloped roofs was estimated using a layout to maximize the number of panels on the solar suitable roof areas. For flat roofs, rows of panels were considered as spaced 6.0 m apart to control the effects of mutual shading. To account for typical edge distances, the layouts considered 90% of each roof dimension.

Solar Air Heating (SAH) technology is most widely used to heat ventilation air in buildings, but it has also been applied in processes such as crop drying where heated air is an important requirement. The worldwide demand for this technology has increased rapidly over the past decade. Solar air heating installations are being used in the cladding of south-facing exterior walls.

The system can be used to increase the volume of filtered fresh air in buildings while reducing heating costs.

Commercially-available solar air heating systems include:

Wall-Mounted Transpired Panel Collectors: a dark-coloured corrugated metal cladding is mounted several inches from the building's south, east or west wall. The cladding has small perforations which allow outside air to travel through its face. During the day, as outside air passes through the panel, it absorbs the solar heat generated at the panel.

Wall-Mounted Back-Pass Panel Collectors: air is drawn through inlet ports which may receive outdoor or indoor air; the air passes across the interior face of the panel before being introduced to the building's ventilation system.

Roof-Mounted Collectors: roof-mounted air intake plenums with transpired sections are connected to roof-mounted ventilation systems.

The wall-mounted transpired panel is used as the reference SAH technology for this study. A target system efficiency of 68% is recommended.

Solar photovoltaic (PV) power systems are used to convert solar energy into electricity. PV power systems do not have any moving parts and are therefore intrinsically durable. The PV cells commonly use semiconductor materials that allow electrons to be energized by sunlight and freed from their atoms. Once freed, the electrons move through the material, forming an electric current.

Some PV systems provide electricity for immediate use or to store in batteries for later use. Other PV systems feed electricity directly into a utility grid, in which case electricity is drawn from the grid independently of PV generation.

Most commercial building PV systems are in the range of 5 to 50 kW. Systems include:

Flat-plate PV systems: flat-plate panels can be either fixed in place or allowed to track the Sun with solar trackers. These systems are currently most common in solar power supply applications on commercial buildings.

Concentrator PV Systems: relatively inexpensive materials such as plastic lenses and metal housings focus solar energy for conversion to electricity. Building-integrated concentrator system may also generate heat for water or space heating applications.

A flat-plate PV system is used as the reference PV technology for this study. The current PV module efficiency is in the range of 15% to 18%. The PV generation potential of the site was estimated using a possible layout of panels on the solar suitable roof areas to maximize the number of panels, similar to that for SWH technologies.

Results: The solar energy generating potential of the existing buildings on campus is summarized below in.

Table 5-1, and is mapped for each building in Figure 5-1, Figure 5-2 and Figure 5-3.

Table 5-1: Total Annual Solar Energy Generation Potential

	Area (m^2) After Obstructions	Total Annual Radiation (MWh) After Obstructions	Solar Thermal Generating Potential (MWh thermal)	Solar Electric Generating Potential (MWhe)*
Solar Suitable Roof Surface:	44,142	57,115	9,400	3,700
Solar Suitable Wall Surface:	23,182	22,903	12,600	-
TOTAL		**80,018**	**22,000**	**3,700**

* Electrical generation potential would displace solar water heating potential at roof surfaces

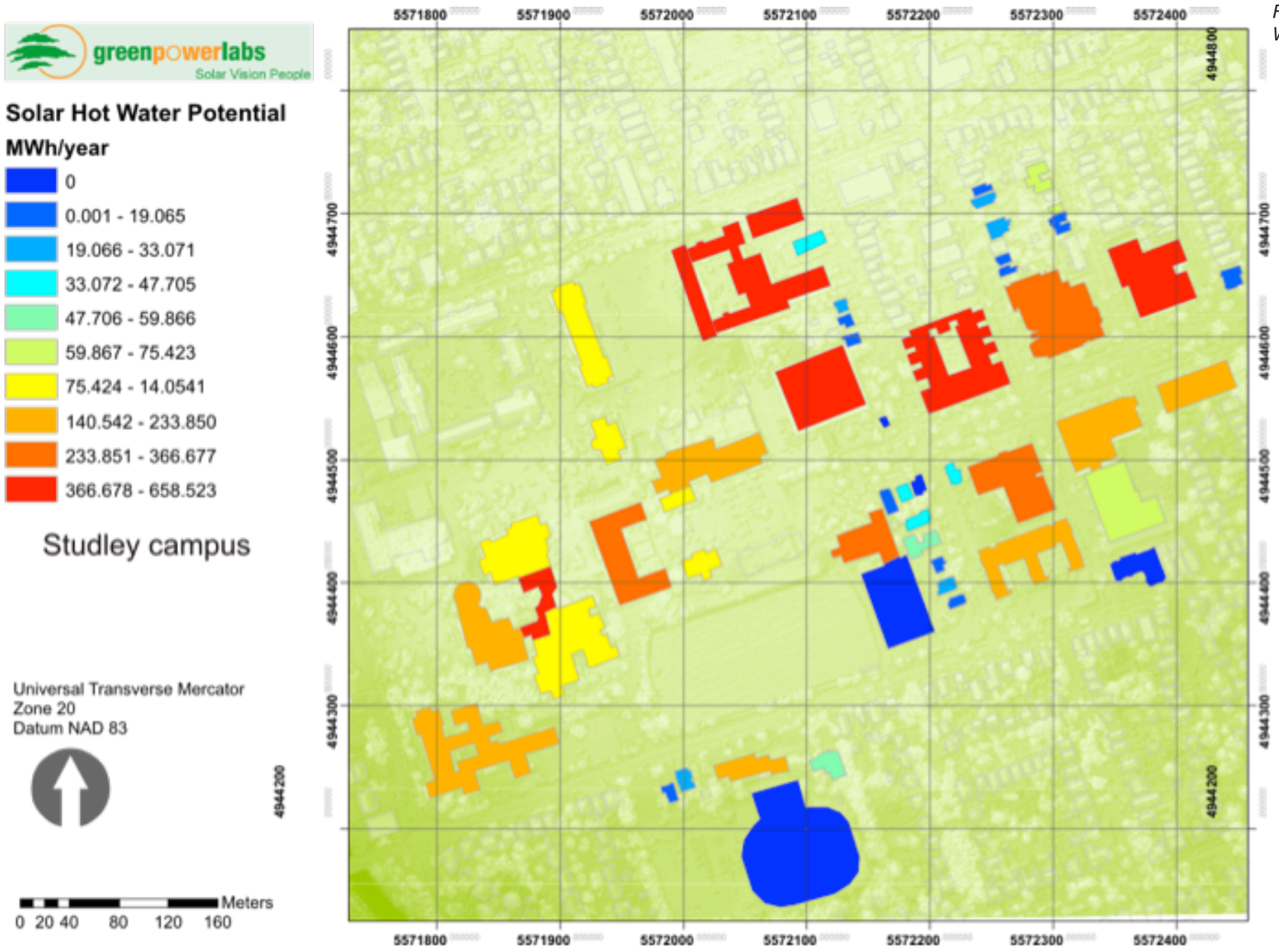


Figure 5-1: Studley Campus Buildings - Solar Water Heating and Air Heating Potential

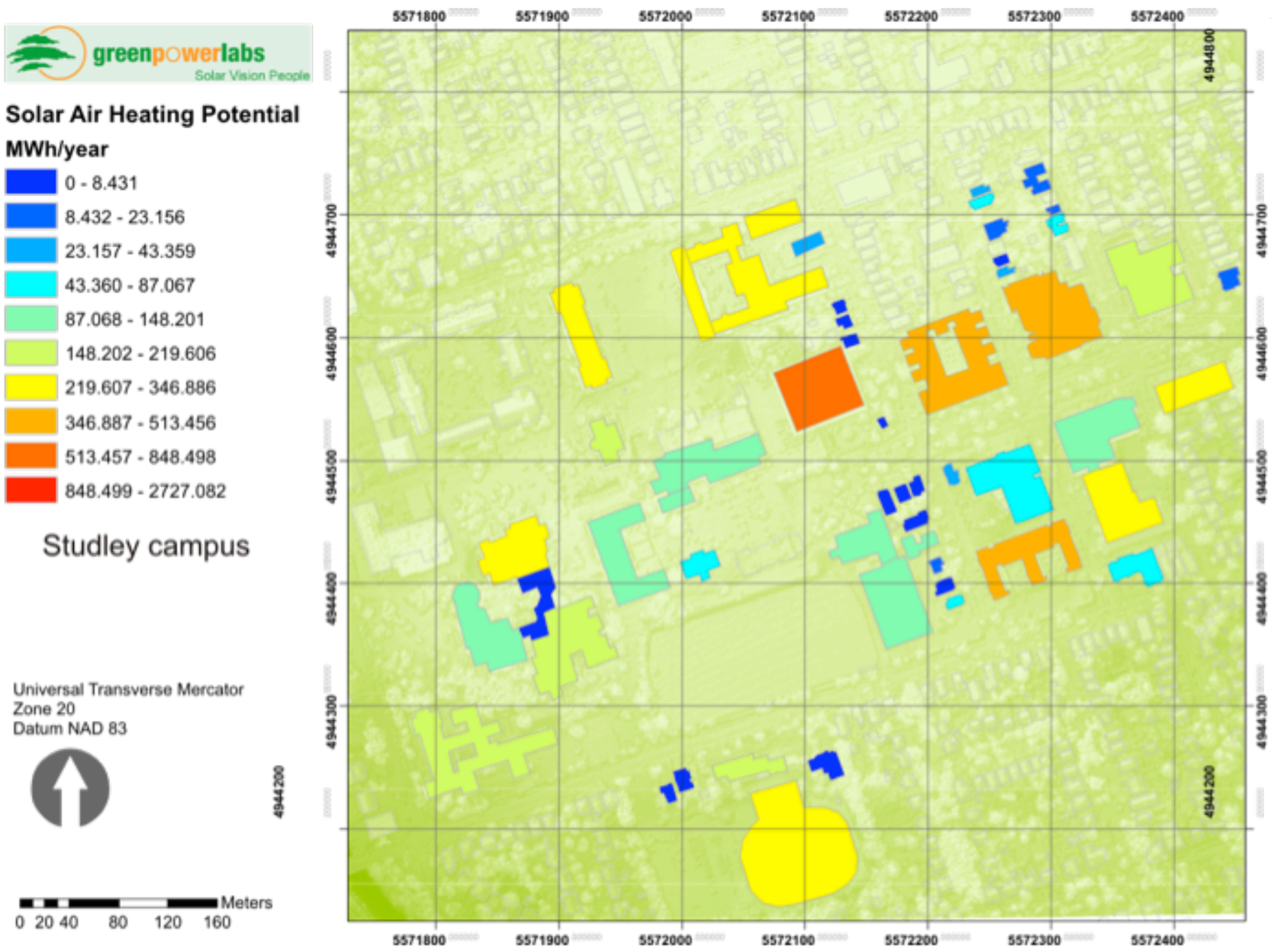


Figure 5-1: Studley Campus Buildings - Solar Water Heating and Air Heating Potential

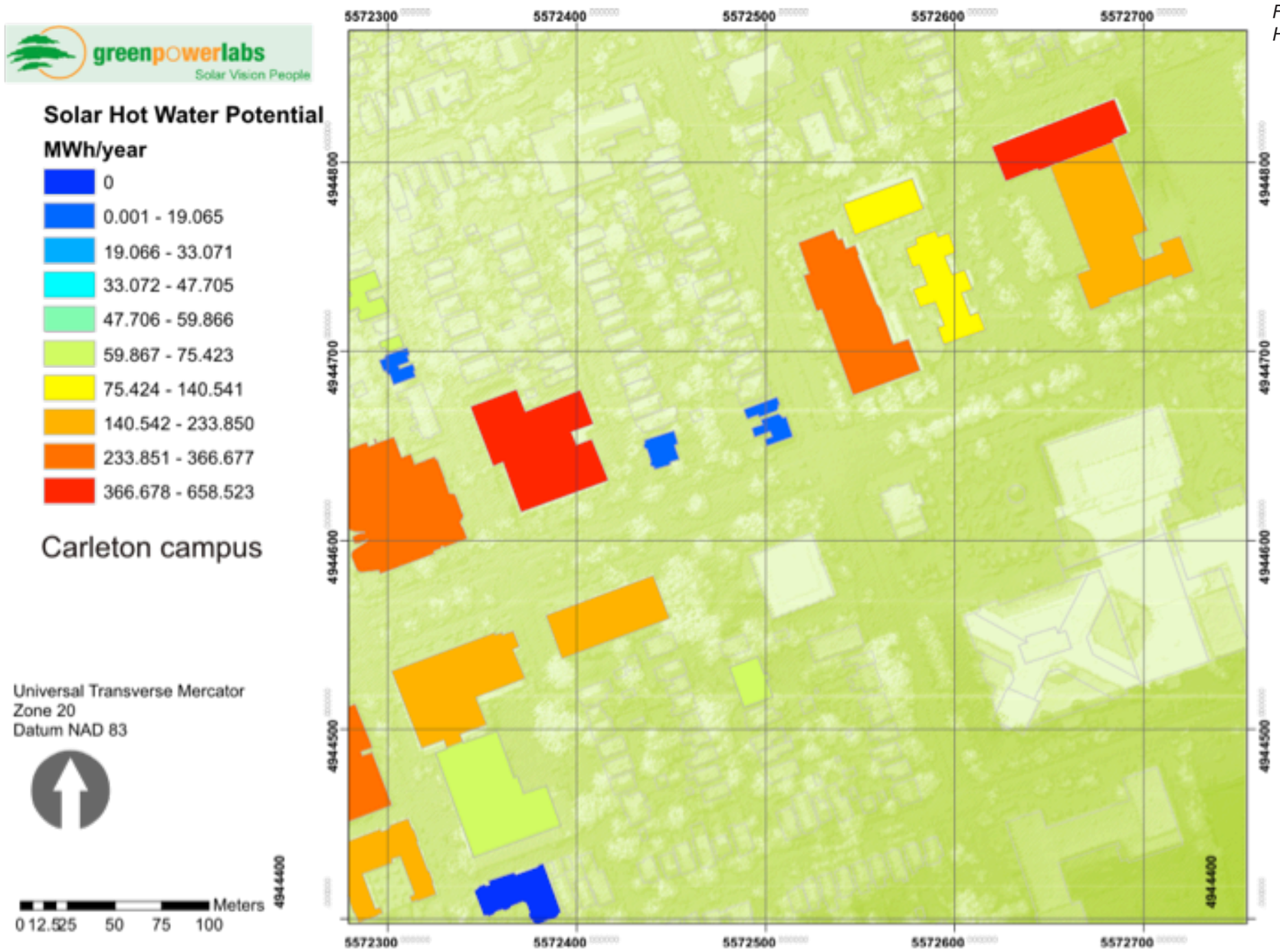


Figure 5-2: Carleton Campus - Solar Water Heating and Air Heating Potential

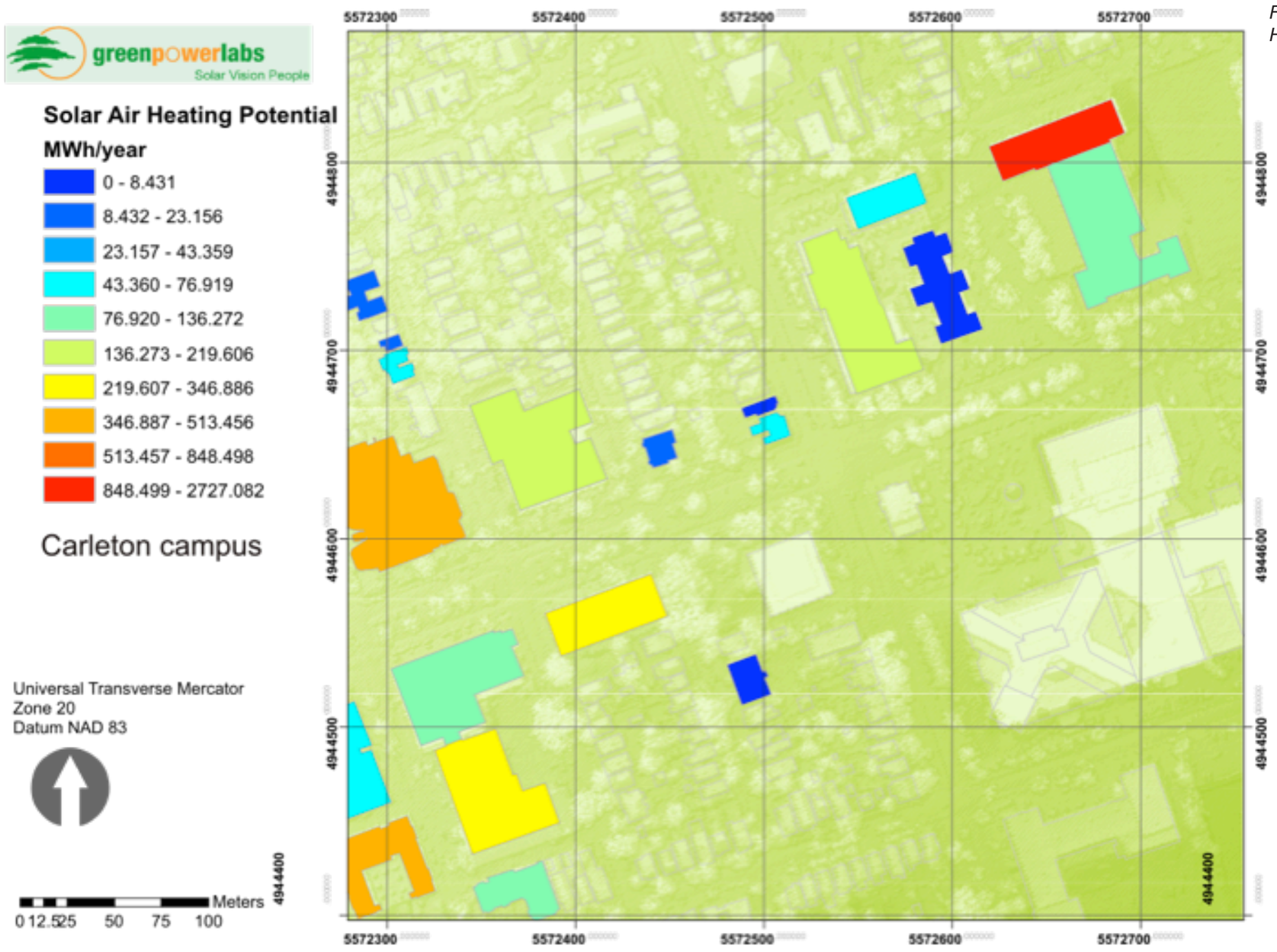


Figure 5-2: Carleton Campus - Solar Water Heating and Air Heating Potential

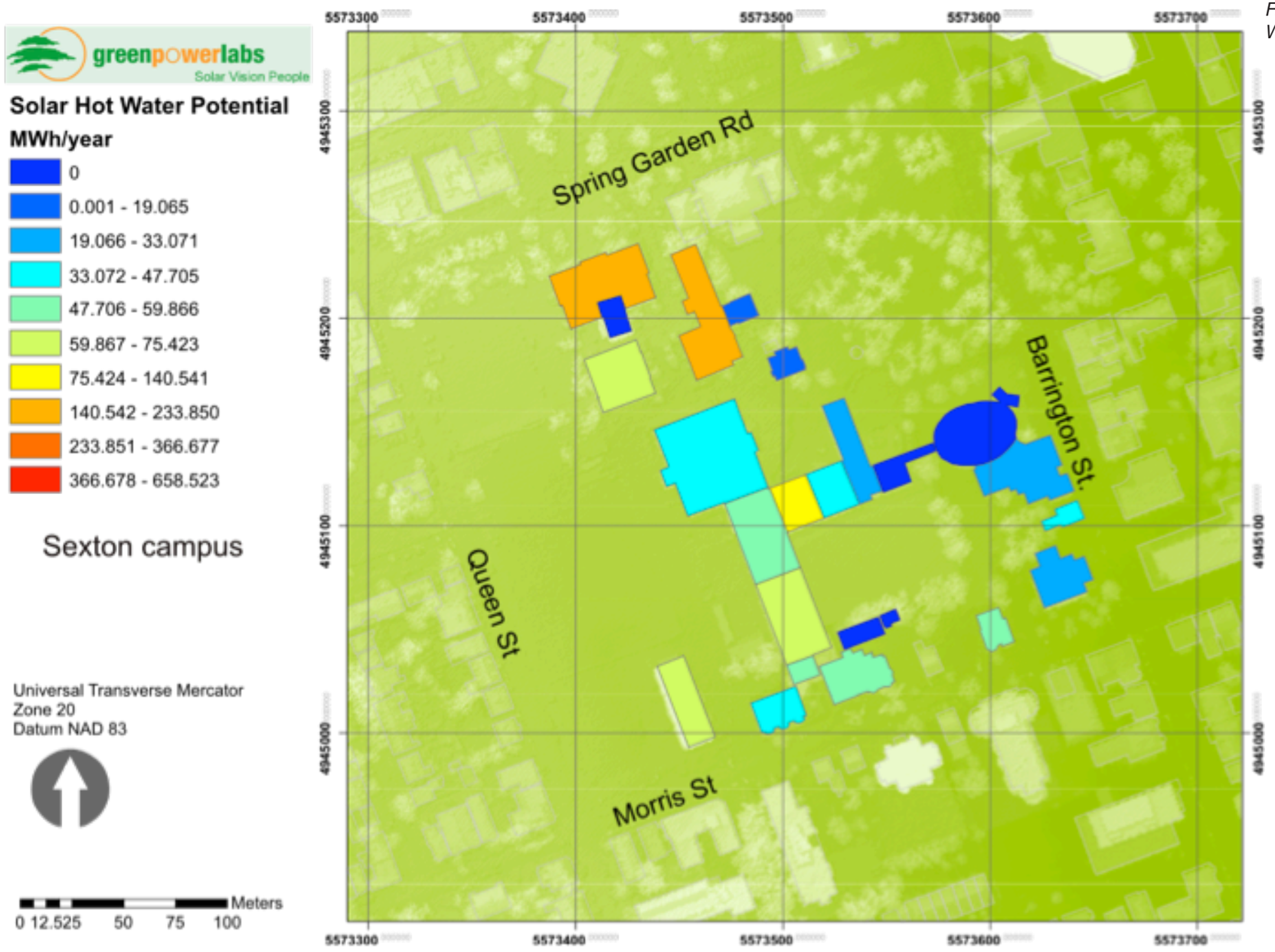


Figure 5-3: Sexton Campus Buildings - Solar Water Heating and Air Heating Potential

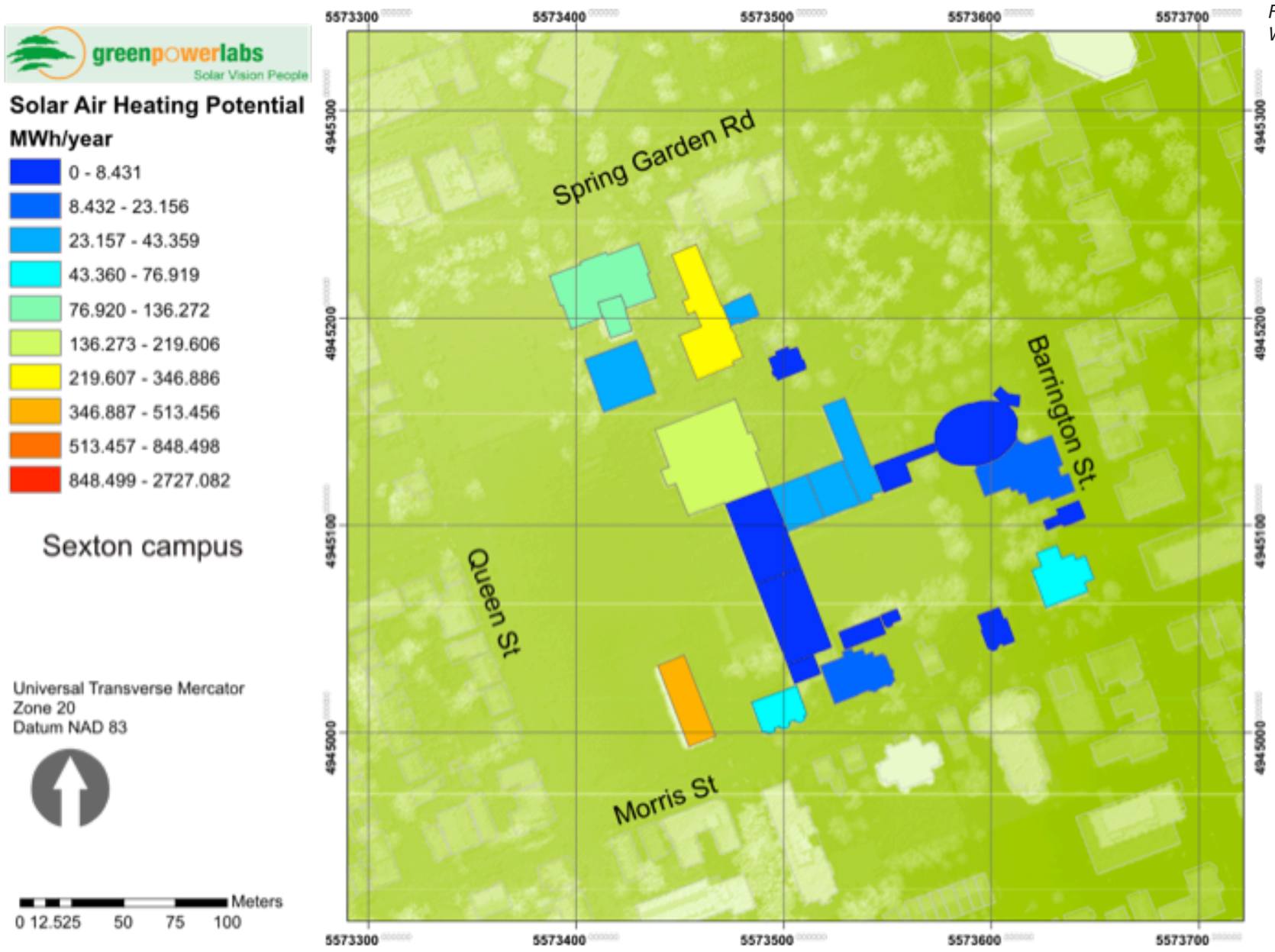


Figure 5-3: Sexton Campus Buildings - Solar Water Heating and Air Heating Potential

6 Solar Suitability Assessment – Tupper Building

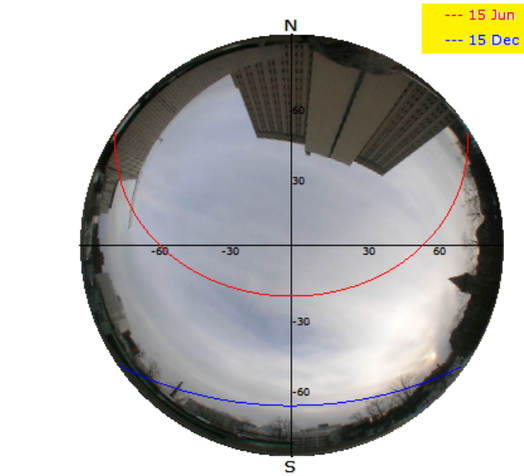
The Sir Charles Tupper Building uses energy in the forms of electricity for lighting, equipment and services, and steam from the Central Services Building for space heating and domestic hot water.

Solar Resource Potential

Table 6-1 below describes the larger roof surfaces of the building.

Table 6-1: Tupper Building Roof Segments

The roof surfaces are generally flat. Obstructions to solar gain at the 3rd Floor Roof are described in Figure 6-1: air conditioning units and vents located to the east of roof affect direct radiation and the building tower to the north reduces diffuse radiation. The penthouse roof is generally unobstructed.



Solar pathway on June 15th

Solar pathway on December 15th

Obstructions factor %	
January	16
February	15
March	15
April	15
May	14
June	13
July	13
August	13
September	14
October	16
November	17
December	19
Annual Average	**14**

Figure 6-1: Sky Hemisphere and Obstructions Factor, 3rd Floor Roof

Roof Segment 1 - 3rd Floor Roof Facing South

Roof Segment 2 – Penthouse Facing East

Roof plan

Typically, solar collector panels are installed in a sloped position to maximize the intensity of the solar resource. A slope of approximately 350 and row spacing of 2.5 times the collector dimension is recommended to maximize year-round energy production. As described in Table 6-2 below, the total solar energy yield for rack-mounted panels is less than the flat-roof condition.

Table 6-2: Solar Yield at Solar Suitable Surfaces

Roof segment	Total on the roof segment, kWh/d	Annual total energy yield, MWh
1 - flat roof	2,414	881.67
1 - rack-mounted system	1,772	647.39
2 - flat roof	2,112	771.41
2 - rack-mounted system	1,551	566.43

Table 6-3 below describes the most suitable wall surface for solar applications.

Table 6-3: Tupper Building Wall Segments

South Wall Segment 1

Notes: Each floor includes a mechanical room with an air intake grille on the south face of the building. The intake grilles are 1.2 m wide and 2.4 m high; they align directly above each other in the centre of the precast wall.

Air is exhausted by ducts which are led to top of the building.

The following table indicates the average solar energy available at the south-facing wall segment throughout an average year. The increased values in winter months, relative to the fall and summer months, is due to the angle of the Sun in the sky and increased solar reflection when there is snow. The peaking winter values are important to solar air applications which are used for space heating.

Table 6-4: Tupper Building South Wall Solar Energy Resource Potential

Month	Daily solar energy resource potential azimuth -19 degrees (kWh/m²/d)
January	3.12
February	3.81
March	3.43
April	2.89
May	2.70
June	2.69
July	2.77
August	2.96
September	3.24
October	3.11
November	2.44
December	2.34
Annual	**2.95**

Energy Consumption

Hot water is used by in Tupper Building's cafeteria kitchens, washrooms and utility rooms. The water is circulated at an operating temperature of 60OC. The quantity of hot water used is not measured. We estimate hot water consumption to be 2,600,000 L annually, requiring 163 MWh of energy.

Energy requirements for air heating are dependent on the rate of fresh air supply, the outside air temperature and heat content, the required building temperature, building heat losses and building heat sources.

The energy required to heat fresh air was estimated to be 417 MWh annually. Our energy modelling used a design fresh air supply flow rate of 1,200 CFM per floor, an occupancy rate of 60 persons per floor, 12-hours daily, Monday-Saturday, an indoor air temperature range of 21-23^{O}C, and a heating season of October to April.

Energy Generation Potential

Solar water heating (SWH) technologies preheat water in combination with a conventional heating source. The Tupper Building includes domestic hot water tanks in the Mechanical Penthouse which are heated by steam from the Central Services Building. The SWH system will pre-heat water supplied to these tanks. We recommend the detailed consideration of a system with 40 collectors and 3,600 L of storage. The collector system would constitute four sets of ten-collector arrays mounted on racks on the most convenient segment of roof. Roof Segment 2 is proposed.

The solar energy delivered by the proposed system is described in Table 6-5 below.

Table 6-5: Tupper Roof Segment 2 SWH Heating Delivered by Month

Month	Heating delivered (MWh) before obstructions	Obstruction Factor	Heating delivered (MWh) after obstructions
January	3.44	0.0%	3.44
February	4.74	0.0%	4.74
March	6.63	0.0%	6.63
April	6.86	0.0%	6.86
May	7.66	0.0%	7.66
June	7.91	0.0%	7.91
July	8.16	0.0%	8.16
August	7.66	0.0%	7.66
September	6.65	0.0%	6.65
October	5.25	0.0%	5.25
November	2.93	0.0%	2.93
December	2.30	0.0%	2.30
Annual Total	**70.19**	0.0%	70.19

The system's characteristics are described below in Table 6-6.

Table 6-6: Tupper Building - SWH System Performance

40-collector, 3600 L storage SWH system		
SWH system capacity	kWth	75.3
Specific yield (1)	kWh/m^2	522
Energy Delivered	MWh/year	70.19
Solar fraction		42.9%
Greenhouse Gas Reduction	te CO2/year	29
Budget		$220,000
Nova Scotia Solar Water Heating Rebate		$20,000-$33,000
ecoENERGY for Renewable Heat (Federal incentive)		$33,800
Financial Payback Period (2)	years	12

1. Specific yield is the amount of energy delivered annually per unit of gross collector area after obstructions.
2. Return on Investment: our analysis considered the following:

- No.6 oil price $ .70 /L
- Average efficiency of distributed energy system 65%

Annual increase in oil price: 10%.

The proposed Solar Air Heating (SAH) application is to pre-heat air for the HVAC systems at each floor.

The system provides more energy at less cost than solar water heating.

A wall-mounted transpired panel is proposed, centred on the existing intake louvres and running the full height of the South Wall, as illustrated in Figure 6-2. The proposed panel is supported 200-300 mm from the precast surface; the framing is connected through the precast concrete panels to the building structure at each floor. A panel width of 5.6 m (18') is recommended. The system's characteristics are described below in Table 6-7.

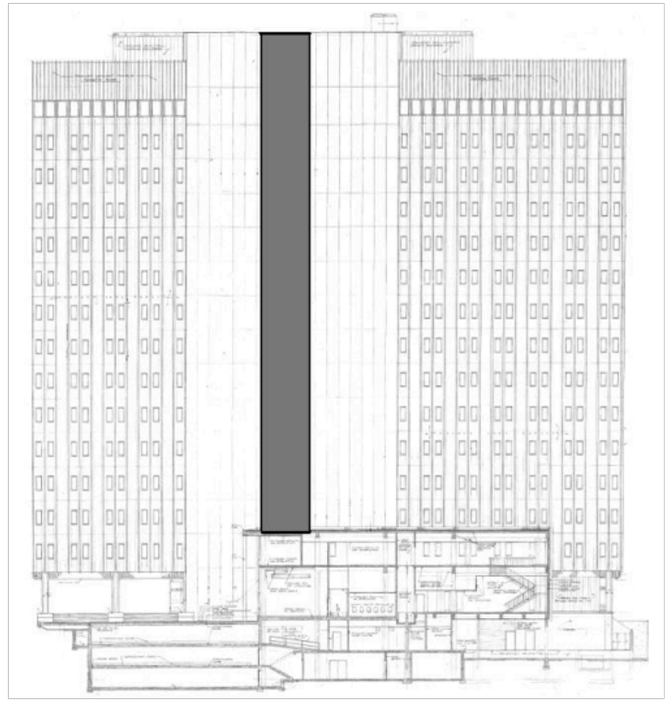


Figure 6-2: Tupper Building South Wall with Solar Air Heating Panel

Table 6-7: Tupper Building – Solar Air Heating System Performance

5.6 m wide SAH system		
Energy Delivered	MWh/year	125.85
Solar fraction		30%
Greenhouse Gas Reduction	te CO2/year	51.8
budget		$156,000
Nova Scotia Solar Water Heating Rebate		$20,000
ecoENERGY for Renewable Heat (Federal incentive)		$18,800
Financial Payback Period (1)	years	6.5

(1) See Table 6-6 footnotes.

7 Solar Suitability Assessment – Killam Library

The Killam Memorial Library uses energy in the form of steam from the Central Services Building for space heating and domestic hot water heating. Electricity is used for lighting, equipment and services.

The building includes a five-storey atrium which provides an interior courtyard and natural light to the surrounding building. The building was constructed in the mid-1960's; the courtyard was enclosed by a translucent roof in the late 1990's.

Solar Resource Potential

Table 7-1: below identifies two of the larger roof surfaces of the building.

Table 7-1: Killam Library Roof Segments

Notes: Roof surfaces are generally flat and unobstructed. The single major obstruction is the atrium roof, which is approximately 1.2 m – 2.4 m above the original roof.

The two roof segments selected represent approximately half of the roof area. Table 7-2 below indicates the total solar energy yield for collector panels in the flat position and for arrays of rack-mounted panels sloped at 35^{O}. Collectors in Roof Segment 1 are orientated 19^{O} east of due south; collectors on Roof Segment 2 are orientated due south.

Table 7-2: Solar Yield at Solar Suitable Surfaces

Roof segment	Daily Solar radiation intensity kWh/m²/d)	Total on the roof segment, kWh/d	Annual total energy yield, MWh
1 - flat roof	3.52	3,168	1,157.11
1 - rack-mounted system	4.04	2,326	849.64
2 - flat roof	3.39	2,179	795.75
2 - rack-mounted system	3.93	1,616	590.41

Roof Segment 1 - West Side of Roof

Roof Segment 2 - South Side of Roof

Roof plan

For solar air heating applications, Table 7-3 below describes the most suitable wall surface for solar applications.

Table 7-3: Killam Library South Wall

Notes: five-storey structure; large areas clad with precast concrete panels; upper sections are finished in structural concrete. Two central HVAC rooms: above the Fifth Floor west side, and basement-level Mechanical Rooms. Air intakes are on west side above fifth floor and at ground level in the courtyard.

As with the Tupper Building, the maximum available daily solar gain over an average year is 2.98 kWh/m²/d. For the heating period under investigation (October to April) the average daily gain at the south wall of the Killam Library is 3.02 kWh/m²/d.

Energy Consumption

Hot water is used by the Killam Library for cafeteria sinks, washrooms and cleaning. The domestic hot water consumption was estimated to be 1,168,000 L annually, requiring 72.8 MWh of energy.

The energy required to provide fresh air and heat the space was estimated to be 700 MWh annually, using minimum standards for fresh air supply.

Energy Generation Potential

The Killam Library includes domestic hot water tanks in the basement-level Mechanical Room which are heated by steam from the Central Services Building. The solar water heating system will pre-heat water supplied to these tanks. We recommend a system with 20 collectors and 1,800 L of storage for budgeting purposes, and that hot water use is measured as part of the system design.

Table 7-4: Killam Library - SWH System Performance

20-collector, 1800 L storage SWH system		
SWH system capacity	kWth	37.7
Specific yield (1)	kWh/m²	590
Energy Delivered	MWh/year	33.9
Solar fraction		46.5%
Greenhouse Gas Reduction	te CO2/year	14.1
budget		$96,000
Nova Scotia Solar Water Heating Rebate		$14,400
ecoENERGY for Renewable Heat (Federal incentive)		$16,900
Financial Payback Period (1)	years	10.5

(1) See Table 6-6 footnotes.

The proposed solar air heating system will:

- increase the amount of fresh air to the building;
- de-stratify air in the atrium; and
- pre-heat the air that is drawn into the basement-level air handling system.

A transpired collector panel is recommended on the south wall, connected to the roof of the atrium by a roof-top duct and fan. The solar-warmed air will mix with air in the atrium roof area, causing air to be circulated downward to the floor of the courtyard and into the mechanical HVAC system.

The solar air heating system was evaluated for a flow rate of 6,000 CFM, which is estimated to be 1/3 – 1/2 of the total fresh air requirement for the building, or one air change in the atrium every 40-45 minutes.

The air heating panel will be centred over the in-situ concrete wall at the top floor of the South Elevation. The design dimensions of the panel are illustrated in Figure 7-1; architectural requirements would determine the final shape, colour(s) and possible use of the panel for signage.

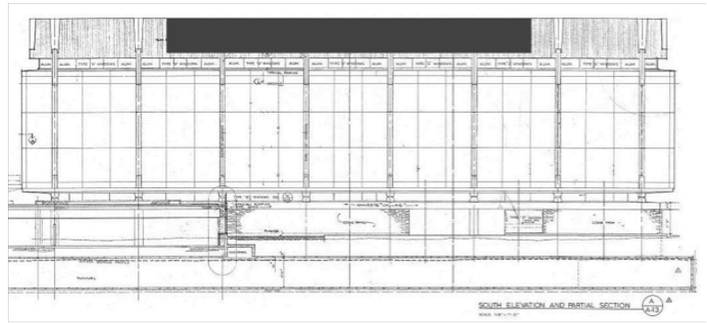


Figure 7-1: Killam Library South Wall with Solar Air Heating Panel (Concept)

While not investigated in this study, a similar panel may be used on the west wall to preheat air entering the penthouse-level HVAC system.

The system's characteristics are described below in Table 7-5.

Table 7-5: Killam Library – Solar Air Heating System Performance

125 m² SAH system		
Energy Delivered	MWh/year	90.2
Solar fraction		39%
Greenhouse Gas Reduction	te CO2/year	38.7
budget		$110,000
Nova Scotia Solar Water Heating Rebate		$16,500
ecoENERGY for Renewable Heat (Federal incentive)		$8,000
Financial Payback Period (1)	years	5.5

(1) See Table 6-6 footnotes.

8 Conclusions

The solar suitability assessment investigated the suitability of the University facilities and open areas to solar energy, and offers recommendations and examples for using solar energy technologies in the University's energy mix.

The solar resource is quantified using a combination of surface weather station information and satellite data for the geographic area.

Maps are presented for the Studley, Carleton and Sexton campuses describing solar gain and the effect of shading by obstructions to sunlight.

A SolarStar™ rating is used to identify the buildings most suited for solar applications.

Current technologies for solar water heating, solar air heating and photo-voltaic power generation are presented and discussed.

The generating potential of solar water heating and solar air heating on campus is mapped for each building.

The solar resource and generating potential of buildings is summarized in Table 8-1.

Table 8-1: Total Annual Solar Energy Generation Potential

	Area (m^2) after Obstructions	Total Annual Radiation (MWh)	Solar Thermal Generating Potential (MWhth)	Solar Electric Generating Potential (MWhe)*
Solar Suitable Roof Surface:	44,142	57,115	9,400	3,700
Solar Suitable Wall Surface:	23,182	22,903	12,600	-
TOTAL		**80,018**	**22,000**	**3,700**

* Electrical generation potential would displace solar water heating potential at roof surfaces

Solar energy technology could replace 20% of the heating energy that is currently provided by the central heating plant.

Building-mounted solar electrical generation could provide approximately 5% of the University's electrical needs.

Solar suitability assessments were carried out on the Sir Charles Tupper Building and the Killam Memorial Library. The buildings provide significant opportunities for using renewable energy technologies to displace the use of fossil fuel: solar water heating and air heating technologies have the capacity to deliver 40-50% of the buildings' domestic hot water needs and 30-40% of the buildings' space heating energy needs.

At both sites, solar air heating provides more energy at less cost than solar water heating.

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B.1

APPENDIX B.1

LEARNING COMMONS HUBS

April 2010

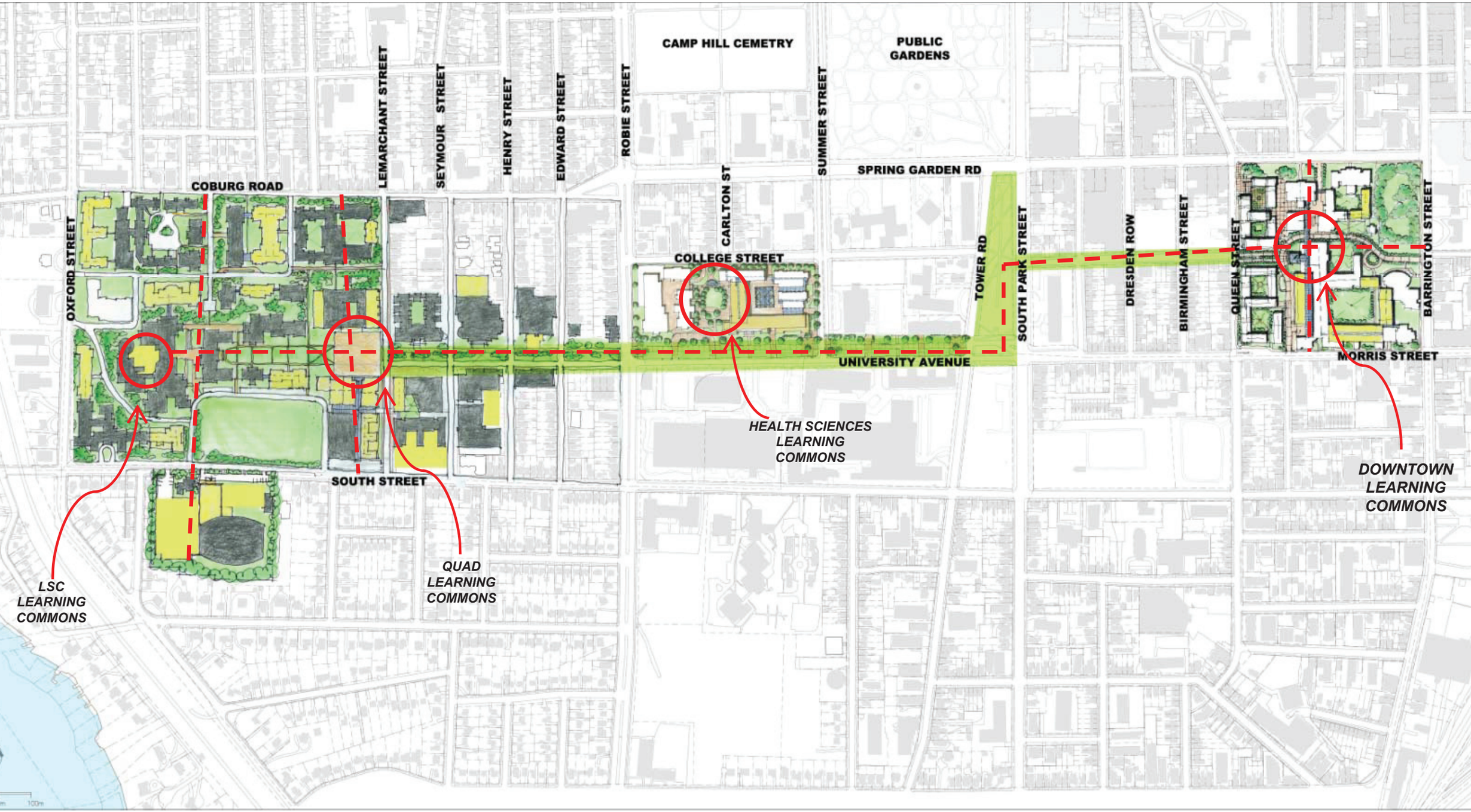
The HUB Concept

Design Guidelines for Dalhousie University Learning Commons HUBS

Contents :

Why the HUB Concept is Important : Dalhousie University's campus master plan has articulated a vision of creating four Learning Commons Hubs across the campus to address the changing nature of education and encourage idea exchange among students. This plan is recognition of Dalhousie's facilities as strategic resources with the potential to advance both their mission and competitive advantage.

With each passing year, higher education is facing new trends and universities are challenged by an evolving array of external forces, including advances in technology, emerging new user needs, and increasing demands for real-world learning environments. Dalhousie's capacity to respond to new trends directly affects it's ability to compete in the academic arena and fulfill its mission. As a result, institutions throughout the world are developing long-term strategic plans for available resources including capital, people, technology, information and, of particular importance, facilities. "Learning Hubs" are emerging as a design concept that provides highly interactive learning environments not restricted by subject boundaries, a single learning style, or fixed body of information, but rather allow students to coherently communicate ideas, concepts, and arguments using a variety of mediums. The proposed Learning Commons Hubs at Dalhousie are envisioned as collaborative centres with integrated resources and technology that support the increasingly mobile student work patterns and encourage group synergies to occur outside of more formal classroom environments.


COBURG ROAD
OXFORD STREET
LEMARCHANT STREET
SEYMOUR STREET
HENRY STREET
EDWARD STREET
ROBIE STREET
CAMP HILL CEMETRY
CARLTON ST
SUMMER STREET
PUBLIC GARDENS
SPRING GARDEN RD
TOWER RD
SOUTH PARK STREET
DRESDEN ROW
BIRMINGHAM STREET
QUEEN STREET
BARRINGTON STREET
COLLEGE STREET
UNIVERSITY AVENUE
SOUTH STREET
MORRIS STREET
LSC LEARNING COMMONS
QUAD LEARNING COMMONS
HEALTH SCIENCES LEARNING COMMONS
DOWNTOWN LEARNING COMMONS

Defining the HUB Concept at Dal: The Learning Commons Hubs at Dalhousie are intended to provide innovative learning spaces beyond the classroom to support interdisciplinary and group study and promote social interaction.

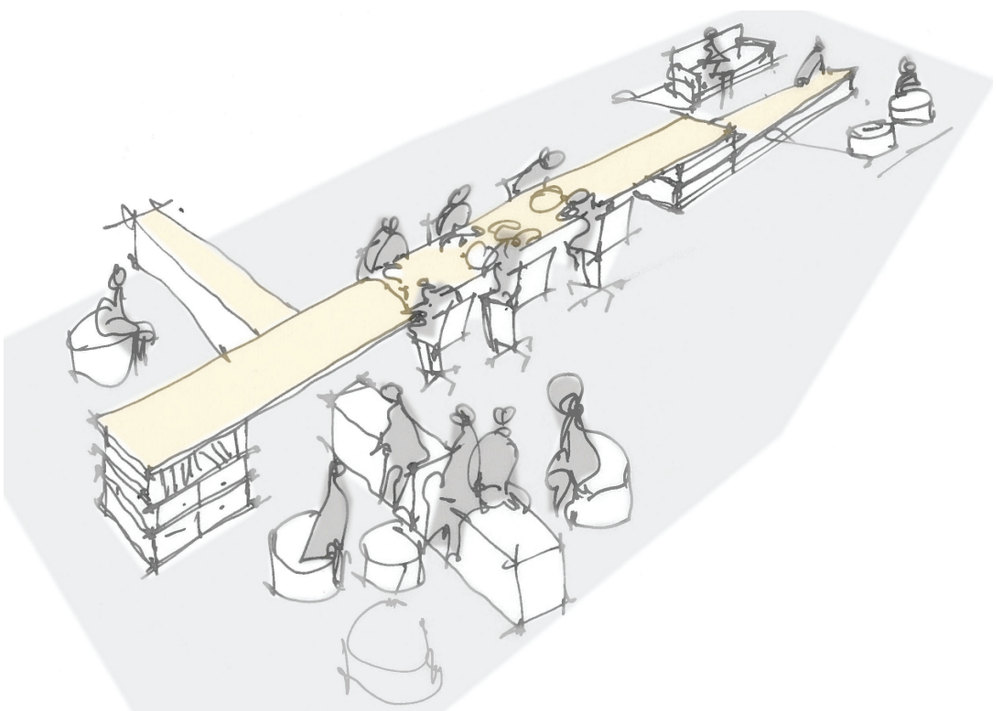
The Learning Commons Hubs are spaces focused on students but essentially designed to include everyone with an overarching objective of encouraging mingling between students, faculty, staff and the surrounding community. Much like a lobby in a hotel, these Learning Commons Hubs should act as a welcoming entrance to the facility, establish a sense of place, and provide an informal destination to be used outside of formal class times. They are envisioned to be modern, attractive and flexible learning environments and information centres that provide access to a wide range of opportunities and accommodate different styles of learning. They should efficiently combine the provision of state-of-the-art multimedia technology with traditional information resources and support. While a common philosophy will set the parameters for the designs, the Learning Commons Hubs are not intended to have identical design outcomes. Thus, specific services and functions within each Hub should be tailored to reflect the unique characteristics and culture of its location while still providing a common set of services and facilities.

The four essential characteristics of the Learning Hubs listed below are further defined in the following pages of this report:

- Concentrate Resources
- Incorporate Innovative Technology
- Promote Social Synergy
- Maximize Flexibility

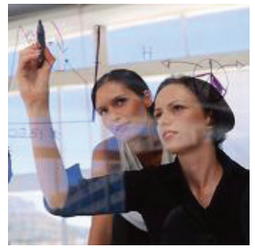


Concentrate Resources : The Learning Commons Hub will contribute meaningful elements of interest while simultaneously providing seamless points of access to information resources and support services.

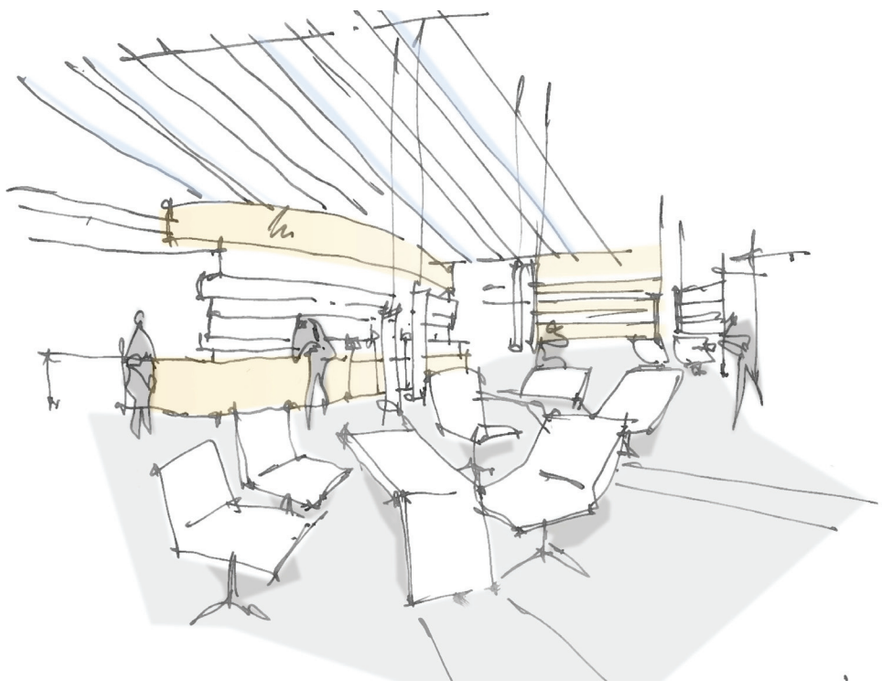


Create an environment that draws people in by providing valuable resources, particularly ones that facilitate learning. Some examples of possible elements that demonstrate this characteristic:

- One-stop Reference and Help Desk (information, ITS, research, orientation, student services)
- Supplementary library services
- Student Society space/desk (shared)
- Attractive and affordable food and coffee services
- Self-prep food area (microwave, hot water)
- Vending machines
- Personal or project-based locker storage
- Washrooms (and possibly shower facilities)
- Short-term child care
- Exhibition / gallery space
- Space for faculty to be available / conduct seminars


Incorporate Innovative Technology : In recognizing that the digital age has irrevocably affected both the learning and teaching process with technology emerging as a primary tool of education, a sophisticated technological infrastructure is an integral attribute of the Learning Commons Hubs.

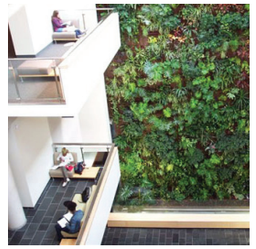


Interior public spaces present an opportunity to incorporate innovative technology into campus design. Some examples of possible elements that demonstrate this characteristic:

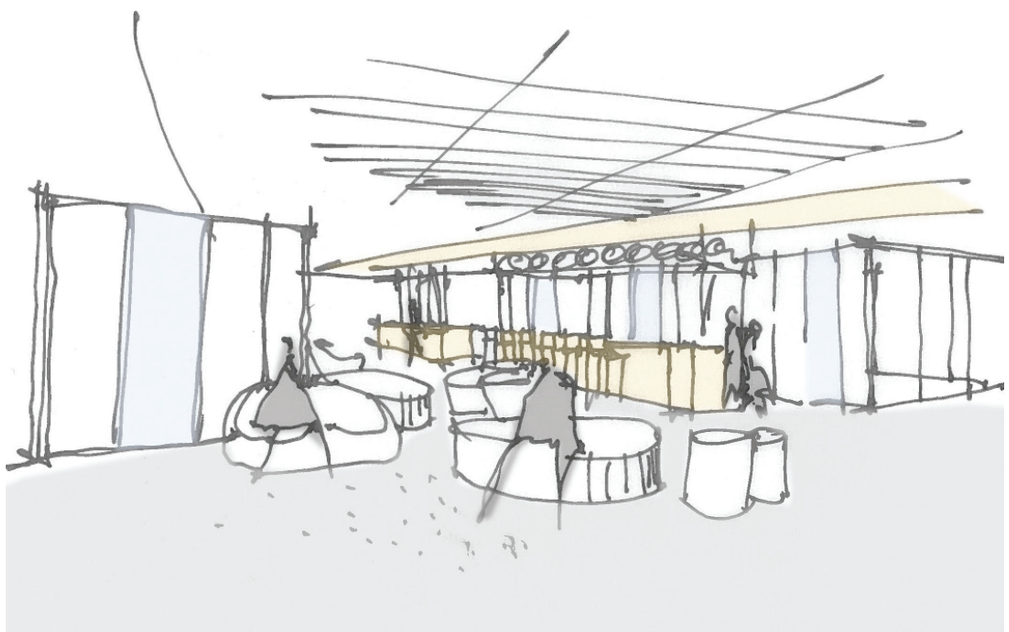
- Digital information screens, posting areas
- Printers and copiers
- Electronic plug outlets
- Wireless or plug-in internet access
- Plug and play display monitors or projectors
- Interactive, touch sensitive screens
- Scribble surfaces (SMART boards or whiteboards)
- Computers labs
- KVM switch (keyboard, video or video display unit, mouse)
- Video conferencing







Promote Social Synergy : The Learning Commons HUBs will facilitate socialization and interdisciplinary interaction as a valuable component of the learning experience.



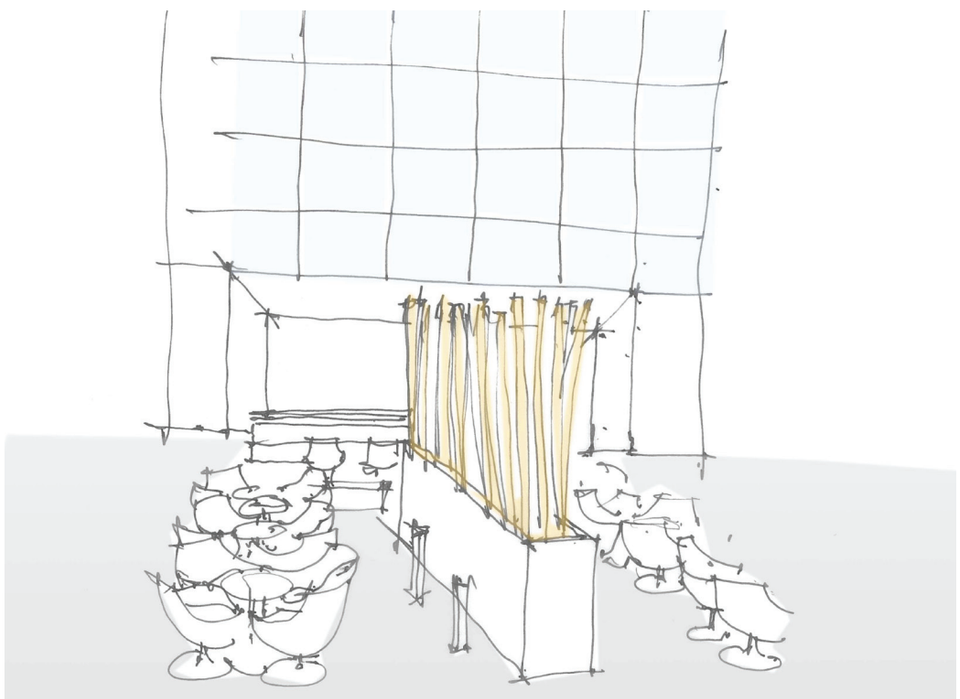
Create a learning community that expands the learning experience from the classroom to other learning contexts. Some examples of possible elements that demonstrate this characteristic:

- Welcoming entrance to the building, the gathering lobby and help desk, etc.
- Transparency (reduce barriers & intimidation; “people attract people”)
- Sustainability themes as learning opportunity (living wall, aquarium, green roof)
- Comfort (quality furnishings and materials)
- A variety of furniture/seating options (lounge, touchdown, or group arrangements)
- Entertainment (climbing wall, educational games, music room, TVs)
- Health and well-being (natural light and ventilation)
- Capability to host events (alumni, student societies, guest lectures)





Maximize Flexibility : Creating highly flexible environments allows the Learning Commons Hubs to accommodate a variety of functions and activities while minimizing potential barriers for future possibilities.

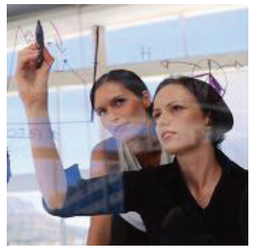


Establish flexible designs that allows spaces to be used creatively for different purposes and is easily adaptable for future requirements or changes in technology. Some examples of possible elements that demonstrate this characteristic:

- Space use and systems flexibility
- Space expansion capacity
- No walls or easily moveable walls
- Innovative acoustical / sound barriers
- Moveable / changeable furniture that can be continually reconfigured
- Environmental controls
- Universal design principles / barrier-free access
- Facilitates group learning (variety of group study spaces & large work surfaces)
- Extended or continuous hours of operation / access















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B.2

APPENDIX B.2

ATHLETICS & RECREATION PROGRAM

Executive Summary

Universities across Canada averaged a 0.6 percent growth in enrolment during the 2007-2008 academic year. The previous year also saw a relatively small increase in university enrolment (0.9 percent). These two years are notable departures from the steady increase of 2.9 percent in university enrolment over the last ten years. The swelling ranks of student populations have put additional demands on the university infrastructure, in particular athletic and recreation programming and facilities.

The purpose of this study is to review fitness and athletic trends for the purposes of informing the master planning process at Dalhousie University. This is undertaken through a literature review of athletic/fitness trends and a comparative review of athletics and recreation programs and facilities, as well as usage and revenue generation.

The study is organized into three sections. The first section reviews fitness and athletics trends literature. The second section is a comparative analysis of select universities including Dalhousie that details participation in formal (varsity, club teams) and informal (drop-in recreation, intramurals) recreation. The third section provides a summary of findings. An appendix contains tables listing specific information for each of the six universities in the comparison of facilities, use, varsity teams, drop in recreation, club sports, wellness and fitness, and facilities.

It should be noted that the comparative review did not produce homogeneous results. The statistical information regarding these topics varied greatly between universities and affected the results of the comparative analysis. The universities surveyed have different operating models, departmental structures, reporting structures, and policies. These differences pose challenges to comparing the athletics and recreation programs. In addition, there was varying degrees of available information pertaining to public use of facilities. Generally the public use of the recreational facilities varied and no space standards exist to assist programming for public use. However, the most notable finding regarding public use of the recreational facilities was the generation of revenue through this use.

Introduction and Purpose

The purpose of this study is first to examine fitness industry trends to gain an understanding of potential future student demands for athletic/fitness facilities, and second, to provide a comparative review of athletic and recreation programs and users in six Canadian universities.

The first section of the report is a literature review of fitness trends. The literature is drawn from the American College of Sports Medicine, American Council on Exercise, and Statistics Canada. The information pertains mainly to 2009 fitness trends and Canadian participation in sport.

The second section of the report provides a comparative overview of athletic and recreation programs and facilities available at the following Canadian universities:

- Dalhousie University
- McGill University
- Memorial University
- Queen's University
- University of New Brunswick (Fredericton)
- University of British Columbia (Vancouver)

A profile was developed for each university that lists the recreational activities available to students (varsity team sports, sports clubs, and intramurals), total number of participants in each type of recreational activity, wellness and fitness programming, recreational facilities, and new recreational facilities. Where available data pertaining to the public use of the recreational facilities, space utilization and revenue generation, is presented.

Section 1: Review of Fitness Industry Trends Literature

Fitness trends are sensitive a number of variables. These variables include: levels of disposable income, new fitness technologies (equipment and routines), participation in sports, the media, and the development of niche markets. Consequently, changes in the variables, such as levels of disposable income, will influence annual fitness trends.

1.1 Fitness Trends for 2009

The American College of Sports Medicine (ACSM) is a sports medicine and exercise science organization with international, national and regional membership of 20,000. For the past four years (2007-2010) ACSM has published a survey of its members to determine future fitness trends. The report introduction notes that the purpose of the survey is to capture annual trends and that it is normal and even expected that the same trends would appear for multiple years in a trends survey.

In late 2009, the American College of Sports Medicine (ACSM) undertook a survey of 9,9889 of ACSM certified professionals (personal trainers, health/fitness instructors, health fitness experts, exercise specialists, health/fitness directors and program directors) to determine the top worldwide fitness trends for 2010.

The fitness trends for 2010 confirmed findings from the 2008 and 2009 surveys. Six of the top ten fitness trends have perpetuated through the 2008, 2009 and 2010 surveys (see Table 1). The remaining four fitness trends have shifted over the three years from stabilization activities (balance training, yoga, pilates, and stability ball) to including more directed fitness/sport related activities (functional fitness, sport-specific training, and group personal training).

Table 1: Top 10 Worldwide Fitness Trends 2008, 2009, 2010

	2008		2009		2010
1.	Educated and experienced fitness	1.	Educated and experienced fitness	1.	Educated and experienced fitness
2.	Children and obesity	2.	Children and obesity	2.	Children and obesity
3.	Personal training	3.	Personal training	3.	Personal training
4.	Strength training	4.	Strength training	4.	Strength training
5.	Core training	5.	Core training	5.	Core training
6.	Special fitness programs for older adults	6.	Special fitness programs for older adults	6.	Special fitness programs for older adults
7.	Pilates	7.	Pilates	7.	Functional fitness
8.	Functional fitness	8.	Stability ball	8	Sport-specific training
9.	Stability ball	9.	Sport-specific training	9.	Pilates
10.	Yoga	10.	Balance training	10.	Group personal training

Source: American College of Sports Medicine, 2009.

Upon the completion of the survey a group of internationally recognized experts in the fields of health and fitness were asked to comment on the findings.

1.2 American Council on Exercise: Fitness Trend Predictions

The American Council on Exercise (ACE) is one of the largest non-profit fitness certification, education, and training providers in the world. ACE has been conducting surveys of its worldwide network of personal trainers, group fitness experts, advanced health and fitness specialists and lifestyle and weight management consultants since 1999.

For comparative purposes the results of the 2008, 2009, and 2010 fitness trends are included in Table 2. While there are some similarities between the two years, there are also differences. Most notably is the shift towards exercise that required little or no equipment. ACE attributes this simplification of fitness programs to a decline in disposable income pertaining to the economic recession.

Table 2: ACE Fitness Trends, 2008, 2009, and 2010

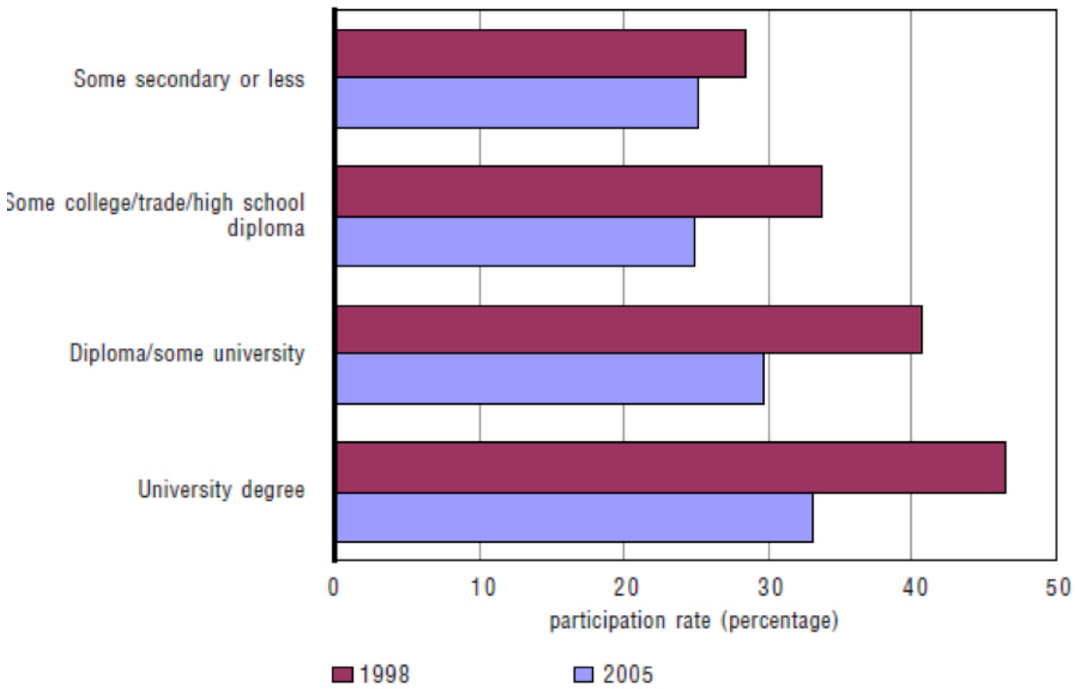
ACE Most Popular Fitness Trends in 2008	ACE Most Popular Fitness Trends in 2009	ACE Most Popular Fitness Trends in 2010
1. Out of the box workouts	1. Boot camp style workout	1. Cost-conscious workouts at fitness clubs and at home
2. Body weight and equipment free workouts	2. Budget friendly workouts	2. Group training
3. Event or sports specific programming	3. Specialty classes	3. Time efficient workouts for the time pressured American
4. Boomer fitness focus	4. Getting back to basics	4. Exergaming
5. Focused express workouts	5. Circuit training	5. Boomer-specific programs
6. Total wellness programming	6. Kettlebells	6. Functional training workouts
7. Hybrid programming	7. Boomer fitness	7. Health and fitness awareness
8. Personal training	8. Technology based fitness	8. Importance of proper professional credentials
9. Technology based workouts	9. Event or sport specific exercises	9. Specialty exercise classes
10. Functional strength training	10. Mixing it up	10. Fitness training tools
Source: American Council on Exercise. "Fitness Trend Predictions." 2008, 2009, 2010.		

1.3 Sport Participation in Canada, 2005

In 2004, as part of the General Social Survey, Statistics Canada produced a report that analyzed Canadian participation in sport. The survey detailed many aspects of participation in sport (activities, rates of participation across age groups and gender, socio-economic factors that contribute to participation in sports, and the rationale for sports participation). However, due to the breadth of the report, only the most relevant sections have been noted herein.

Statistics Canada has found a relationship between educational attainment and participation in organized sport. Persons with university educational attainment levels are much more likely (33 percent) to participate in organized sports than persons with a high school education (25 percent). Figure 1 captures sport participation across levels of education attainment for 1998 to 205. Figure 1 also captures the decline in the number of Canadians participating in sports from 1998 (34 percent) to 2005 (28 percent).

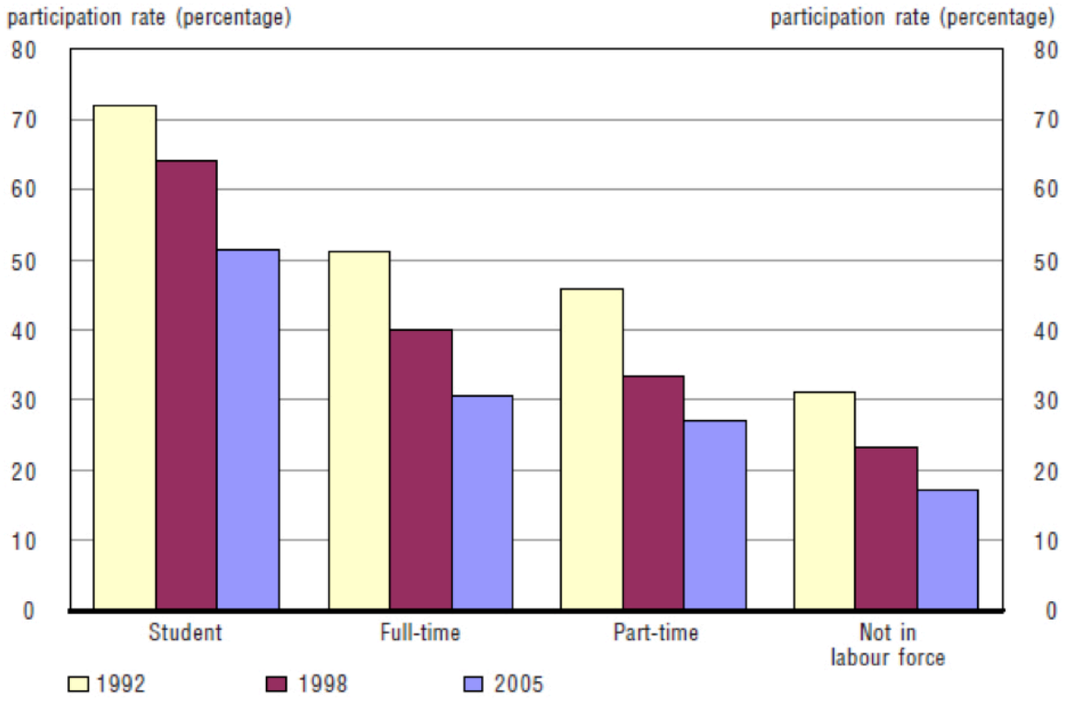
Figure 1: Sport Participation Rates by Level of Education, 1998 and 2005



Source: Statistics Canada, 2005.

Students have the highest participation in sport than any other group in Canadian society. However, this rate has fallen from 68 percent in 1998 to 51 percent in 2005.

Figure 2: Participation Rates by Labour Force Status, 1992, 1998 and 2005



Source: Statistics Canada, 2005.

Of the Canadians surveyed, 73 percent indicated that relaxation was the most beneficial outcome of participating in sports. This was followed closely by physical health and fitness at 68 percent. Improvement in social networks by meeting new friends/acquaintances ranks as least important at 34 percent.

Section 2: Comparative Analysis

Data Collection

The athletics and recreation data presented in this section was collected through on-line research and where warranted (where data was insufficient) by phone interviews with athletics and recreation staff members. However, there are still data gaps that were unable to be addressed through either of these means.

Overall, the data pertaining to the type of recreational activities (varsity teams, sports clubs, intramurals, wellness and fitness) was fairly consistent across the surveyed universities. However, the specific data pertaining to number of participants varied across the universities. The most notable differences include:

- Number of students on varsity teams;
- Number of students participating in club sports;
- Number of students participating in intramurals;
- Number of students using fitness and wellness programs and facilities;
- Public utilization of recreational facilities; and
- Revenue generated from public use of the facilities.

Table 3 is a comparative review of the available data of the select universities.

Table 3: Athletics and Recreation Comparing Dalhousie with Other Universities

	Dalhousie	McGill	Memorial	Queen's	UNB (Fredericton)	UBC (Vancouver)
Student population	15,300	32,514	17,298	21,607	8,400*	44,982
Varsity teams		50	14	35	14	19
Student participants	246	413	132	344	181	265
Academic All-Canadian Scholarships**	75	136	27	87	54	51
Sponsorship Fundraising		N/A	N/A	$1.58 million***	$200,000	$2 million
Club sports (Inter-university)		3	3	14	Same as varsity	Same as varsity
Student participants		N/A	N/A	200	N/A	N/A
Intramural sports						
Number of intramural activities		15	7	5	5	10
Number of teams		782	N/A	N/A	N/A	1,600
Student participants		9,384	N/A	6,000	4,000	160,000
Recreational clubs (recreational)		Same as club sports	8	32	22	Same as intramurals
Student participants		N/A	N/A	2,324	N/A	1,600
Drop-In Recreation						
Number of activities		14	4	5	6	5
Student participants		300-400/day	N/A	300/day	N/A	40,000 +(one time and repeat)
Instructional Programs (Sports/certificates/dance/fitness/ yoga/pilates/50+ exercise)						
Number of programs		74	15	48	23	48
Student participants		N/A	N/A	1300	N/A	N/A
Facilities						
Ice arena	1	1	1	1		1
Badminton courts	2	6	part of gymnasium			part of gymnasium
Climbing wall	1				1	1

	Dalhousie	McGill	Memorial	Queen's	UNB (Fredericton)	UBC (Vancouver)
Dance studio	1				1	1
Dojo						1
Fields	2	2		4	2	7
Field House	1 (3 gyms)	1				
Fitness centre	2	1	1	1	1	1
Gymnasium	2w	1	3	3	2	3
Indoor field				1		
Pool	1	1	1	1	1	2
Racquetball courts	1			2	3	
Track (indoor)	1		1	1	1	
Stadium	1	1		1		1
Squash courts	7	13	3	7		
Tennis courts (outdoor)	2	4		2		
Tennis courts (indoor)		4				4
Public utilization of facilities		80% public use non-academic term/20% academic term	The Works Centre 90% public; The Field House 90% student use	N/A	N/A	90% public use non-academic term/10% academic term
Public and student use of facilities		3000 daily visits	30,000 weekly visits to the Aquarena and Field House	PEC 80,000 visits/month		N/A
Revenue from public use		N/A	N/A	N/A	N/A	N/A
Recent capital investments						
Facility		N/A	Field House (opened in 2002)	Queen's Centre	Chapman field (all weather turf and dome)	Thunderbird winter sports centre (arena)
Cost		N/A	$13 million	$26 million	$1.7 million	$38.5 million
Year opened		N/A	2002	under construction	2007	2008

	Dalhousie	McGill	Memorial	Queen's	UNB (Fredericton)	UBC (Vancouver)
*** Student population in 2006/07**						
** Academic All-Canadians CIS Academic All-Canadian certificates are presented annually to student-athletes who have achieved an academic standing of 80% or better while playing on one of their university's varsity teams.						
**** Includes facility rentals**						

Section 3: Summary of Findings & conclusions

The summary of findings from the literature review and comparative analysis include:

- Fitness trends for 2010 suggest that exercises with little to no equipment are most highly demanded. Fitness activities that use little or no equipment include activities such as pilates and boot camp. This suggests that consumers have a price sensitivity during economic recessions, but that participation in fitness persists during these periods.
- The Statistics Canada report suggests that a person with a university degree is more likely to participate in sport than a person with lower levels of educational attainment. As a result facilitating sport participation in university will help to create a healthier population across Canada.
- The Statistics Canada study notes that there has been a decline in sports participation across Canada, but students continue to be the largest group that participate in sports across the labour force. Therefore, there continues to be a strong demand for athletics and recreation facilities at universities.
- The Statistics Canada study reveals that survey participants engage in sports primarily to promote relaxation. This is an important consideration for university administrators as university can be stressful time for students. As a result students should have access to adequate facilities.
- The universities surveyed indicated that the increase in student enrolment has not resulted in a commensurate increase in athletics facilities. As a result the demand for athletics facilities outstrips the supply. All of the universities surveyed noted that their athletics facilities were insufficient to satisfy the demands of students let alone to satisfy the demand from the community at large. While capital investments have been made at some universities they have only partially alleviated the demand for student athletics and recreation spaces For example, at Queen's University intramurals teams meet on a ten to fourteen day cycle and not weekly, as they did in the past.
- Student populations do not have a direct bearing on the number of varsity teams offered at the universities. For example, UNB Fredericton has the same number of varsity teams as Memorial University even though it has less than half of the student population. McGill University has the most varsity teams, but it has a smaller student population than UBC which has less than half of McGill's varsity teams.
- The Academic All-Canadian Scholarship does not directly correlate to the size of the varsity programs. For example, 33 percent of McGill University varsity athletes were awarded an All-Canadian Scholarship and 29 percent of University of New Brunswick varsity athletes were awarded an All-Canadian Scholarship. There are over twice as many varsity athletes at McGill University than the University of New Brunswick.
- Intramural sports varied between the schools, with some schools having fewer intramural sports and more sports clubs.
- The data on public use of the recreational facilities varied:
  - McGill – summer 80 % public use of facilities, winter 20% public use of facilities.
  - Memorial – the Works Centre 90% public, The Field House 90% student use.
  - Queen's – not available.
  - UBC – 90% public use non-academic term/10% academic term.
  - UNB – no data exists; this data is not collected by the university.

The data on revenue generated from public use was generally not available. This directly relates to the budgeting process of the universities. The available data includes:

  - McGill – would not disclose.
  - Memorial – not available.
  - Queen's – approximately 25% of the 6.3 million is derived from revenue generation (this data includes many other components; more specific data has been requested).
  - UBC – not available.
  - UNB – not available.
- The universities surveyed employ different operating and financial models.
  - At Memorial University the Aquarena (fitness centre, pool, and arena) and the Field House are under the management of a separately incorporate entity, The Works. The Aquarena was constructed in 1989 and the Field House opened in 2002. The Works did not finance the capital costs of either facility. The Field House was constructed with funds raised during an alumni capital campaign in 2000. This entity operates the Aquarena and Field House, has a separate board of directors, and directly reports to the president of Memorial. However, The Works does not operate like a line department in that it is not a part of the university per se.

    The Works has an annual operating budget of $5.5 million. This is generated through a University subsidy ($396,000), City of St. John's subsidy ($125,000), student recreation fees ($1.25 million), and through public programs ($3.7 million). Prior to the current operating model the City had operated the Aquarena until 1995 and then the University operated it until 2002. Both the City and the University contributed approximately 70 percent to the operating budget. Under the current operating model the University now contributes less than 10 percent to the total operating budget. The City contributes a subsidy to The Works because there are no public facilities within the same area that have a 65m pool.

    As part of the management agreement The Works is entitled to retain any additional revenue that they have attained above and beyond operating costs. Since The Works began operations in 2002 they have accumulated $2 million in "savings." They have used portions of this funding for capital upgrades to their facilities. To date The Works has financed all capital improvements, the University has not provided any capital funding for upgrades.
  - McGill, Memorial, Queen's, and UBC derive part of their operating revenue from corporate sponsorship of their varsity teams. At McGill, Queen's, and UBC the corporate sponsors support the varsity department. At Memorial University there are corporate sponsors for the varsity department as well as sport specific sponsors. For example, the women's volleyball team is sponsored by Don Cherry's Sports Grill. Corporate sponsors are advertized through announcements at games, print material, and hospitality opportunities. Data was not available on the revenue generated from sponsorship funding at McGill, Memorial, Queen's, and UBC.

Conclusions

Dalhousie University is at an impasse; demand for the existing athletics and recreation facilities by the student population and public is consistently outstripping supply. The demand for increasing athletics and recreation facilities on campus is common across the universities surveyed. Each university is approaching the development of future athletics and recreation facilities through unique organizational arrangements. To proactively chart a course towards athletics and recreation renewal on campus Dalhousie needs to seek out a "made for Dalhousie" solution that investigates new opportunities for creative organizational arrangement. As a part of this process Dalhousie could evaluate new opportunities for management and cost-sharing of the existing and future athletics and recreation facilities. The example of Memorial University's unique management of The Works, should be further investigated and analyzed for applicability at Dalhousie University. Dalhousie University should undertake a business case analysis to evaluate the best organizational and management fit for existing and future athletics and recreation facility development.

Appendix: UniversitY Athletics and Recreation Profiles

Table 4 McGill University Athletics and Recreation

2008 Data			
Varsity Teams		**Drop-In Recreation**	
Number of varsity teams	50	Activity	
Number of students on varsity teams	413	Badminton	
		Basketball	
Men	**Women**	Jogging	
Badminton	Badminton	Shinny Hockey	
Baseball	Basketball	Skating	
Basketball	Cheerleading	Soccer	
Cross-country	Cross-country	Squash	
Curling	Curling	Swimming	
Cycling	Cycling	Table Tennis	
Fencing	Fencing	Tennis	
Figure skating	Fieldhockey	Tennis Round Robin	
Football	Figure skating	Ultimate Frisbee	
Golf	Ice hocky	Volleyball	
Ice hockey	Lacrosse	Water-polo	
Lacrosse	Rowing	**Instructional Courses (classes)**	
Rowing	Rugby	Course	Number of courses offered
Rugby	Sailing	Dance (11)	11
Sailing	Skiing-Alpine	Aquatics (4)	4
Skiing-Alpine	Skiing-Nordic	Fitness and Wellness (Aerobics and Yoga) (22)	22
Skiing-Nordic	Soccer	Martial Arts (10)	10
Soccer	Squash	Sports (9)	9
Squash	Swimming	Outdoor Pursuits (2)	2
Swimming	Synchronized Swimming	Staff Fitness (McGill Staff only) (16)	16
Tennis	Tennis	**Facilities**	74
Track & Field	Track & Field	McGill Sports Centre	
Ultimate	Ultimate	McConnell Arena	
Volleyball	Volleyball	Percival Molson Stadium	
Wrestling	Wrestling	Tomlinson Field house	
Intramurals		G. Donald Love Competition Hall	
Ball Hockey		Memorial Pool	
Basketball		Webster Squash Courts	
Dodgeball		McGill Sports Medicine Clinic	
Flag Football		Forbes Field	
Ice Hockey		Outdoor Tennis Courts	
Outdoor Soccer		Use of facilities (Percival Molson Stadium, the Sports Complex, McConnell Arena, as well as the McGill Sport Medicine Clinic)	70% of students and 40% of staff regularly use the facilities
Ultimate		McGill Sports Complex	3,000 daily visits
Volleyball		**Summer Camps**	
Club Sports		McGill Summer Camps	1,000 children
McGill Masters Swim Club			
McGill Triathlon Club			
University Squash Club			

Table 5 Memorial University – Memorial University Sea-Hawks (Varsity and Club Sports) and Memorial School of Human Kinetics and Recreation

2008 Data			
Varsity Teams		**Fitness and Recreation Courses**	
Number of varsity teams	14	Course	Number of courses offered
Number of students on varsity teams	132	Fitness and Wellness (Aerobics and Strength Conditioning)	13
Men	**Women**	Boot Camp & Tone	
Basketball	Basketball	Athletic Style Step	
Cross Country	Cheerleading	Advanced Step	
Curling	Curling	Intermediate Step	
Soccer	Soccer	Body Bar Sculpt	
Swimming	Swimming	Body Bar Interval	
Volleyball	Volleyball	Absolute Abs	
Wrestling	Wrestling	High / Low & Absolute Abs	
Varsity Team Corporate Sponsors		Pilates Toning	
HITS 99.1 FM		Morning Fit	
K-Rock		Trim & Tone	
The Telegram		On the Ball	Fitness studio classes
Molson Canadian		Shallow water fitness	
Pizza Hut		Deep water fitness	Pool classes
KFC		**Casual Recreation/Drop-in**	
Life… With the Works		Indoor track	No booking required
Holiday Inn		Green sports courts	Booking required
Mitsubishi Motors		Hardwood courts	Booking required
Subway		Squash courts	Booking required
LeGrow's Travel		**Facilities**	
Burger King		Aquarena	
Team Supporters		Field House	Indoor track, pool, field house courts, strength and conditioning centre
Iceberg (Curling)		Mun Gym	Courts - basketball, soccer
Don Cherry's (W Volley)		Fitness Centre	2 workout areas, 100 pieces of cardio, 2 squash courts
The Outfitter's (W Volley)			
Parsons & Sons Ltd (W Volley)			
Reebok (M Volley)			
Specialty Apparel (M Volley)			
Frontline Paintball (M Volley)			
The Woods (M Volley)			
Club Teams			
Number of club teams	3		
Number of students on club teams	N/A		
Cheerleading			
Curling			
Rowing			
Intramurals			
Number of intramural activities	7		
Badminton			
Basketball			
Ultimate Frisbee			
Hockey			
Squash			
Bowling			
Water Polo			

Table 6 Queen's University – Queen's Athletics and Recreation

2008 Data			
Varsity Sports		**Intramurals**	
Number of varsity teams	35	Number of intramural teams	
Number of students on varsity teams	344	Number of students on sports clubs	
Men	**Women**	Volleyball	
Basketball	Basketball	Basketball	
Cross Country	Cross Country	Soccer	
Fencing	Fencing	Hockey	
Figure Skating	Field Hockey	Inntertube Waterpolo	
Football	Figure Skating	Instructional Programs	Number of courses offered
Hockey	Lacrosse	Fencing	3
Rowing	Hockey	Dance	2
Rugby	Rowing	Yoga	2
Soccer	Rugby	Stretching	1
Swimming	Soccer	Tai Chi	1
Track & Field	Swimming	Tennis	4
Volleyball	Track & Field	Pilates	2
	Volleyball	Golf	2
Sports Club (ICS Participation)		Squash	2
Number of sports clubs	11	Casual Recreation/Drop-In	
Number of students on sports clubs	200	Basketball	
Men	Women	Indoor Soccer	
Baseball	Cheerleading	Volleyball	
Cheerleading	Curling	Rec Swim	
Golf	Fastpitch	Badminton	
Lacrosse	Golf	Sports Days	
Mountain Biking	Mountain Biking	Geared to grades 4 to 8	
Nordic Skiing	Nordic Skiing	Annually three days per year	
Sailing	Sailing	$20 per student	
Squash	Squash	Facilities	
Triathlon	Synchro Swimming (w)	Physical Education Centre	
Ultimate	Triathlon	Richardson Stadium	
Water Polo	Ultimate	Tindall Field	
Wrestling	Water Polo	Memorial Centre	

	Wrestling	Queen's Centre	
Recreation Clubs			
Number of recreation clubs	32		
Number of students on recreation clubs	2500		
Archery Club			
Badminton Club			
Break Dance Club			
Climbing Club			
Dance Club			
Dance Team			
Dance Pack			
Equestrian Club			
Flow Dance Club			
Gymnastics Club			
Haidon Gumdo Club			
Highland Dance Club			
Indoor Field Hockey Club			
Jiu Jitsu Club			
Judo Club			
Karate Club			
Olynpic Tae Kwon Do Club			
Outdoors Club			
Rowing Club			
Scuba Club			
Ski and Snowboard Club			
Squash Club			
Table Tennis Club			
Tae Kwon Do Club			
Tennis Club			
Total Martial Arts Club			
Trampoline Club			
Wild Water Club			
Yoga Club			

Table 7 University of New Brunswick – University of New Brunswick Athletics (Fredricton) and University of New Brunswick Campus Recreation

2008 Data			
Varsity Teams		**Fitness and Recreation Courses**	
Number of varsity teams	14	Course	Number of Courses Offered
Number of students on varsity teams	200	Dance	11
Men	**Women**	Aquatics	4
Basketball	Basketball	Fitness and Wellness (Aerobics and Yoga)	22
Soccer	Soccer	Martial Arts	10
Volleyball	Volleyball	Sports	9
Hockey		Outdoor Pursuits	2
Swimming		Staff Fitness (McGill Staff only)	16
Club Teams		**Instructional Courses**	
Baseball		Dance	
Cheerleading		Bootcamp	
Cricket		Yoga/Pilates	
Cross Country		Aquafit	
Dance Club		Programs for 50+	
Fencing		**Open Recreation/Drop-in**	
Field Hockey		Basketball	
Football		Volleyball	
Judo		Skating	
Kayak		Badminton	
Lacrosse		Cardio room	
Masters Swim		Strength training	
Men's Rugby		Climbing wall	
Men's Swimming		Squash courts	
Ringette			
Rock Climbing		Facilities	
Scuba		Gymnasia (Main/West)	
Synchro Skating		Strength Training Room	
Table Tennis		Raquetball/Squash Courts (3)	
Women's Hockey		Dance Studio	
Women's Rugby		South Gym	
Wrestling		Fields (Softball/College)	
Intramurals		Climbing wall	
Number of students in intramurals	4000	Swimming Pool	
Badminton		Fitness Trail	
Softball		Aitken University Centre for Skating and Jogging	
Frisbee		Cardio Training Room	
Flag football		**Athletics Budget**	$1 million (06/07)
Outdoor soccer (M/W)			

Table 8 University of British Columbia – UBC Thunderbirds (Varsity) and UBC Rec

2008 Data				
Varsity Teams (CIS and NCAA)		**UBC Rec**		
Men	**Women**	UBC Rec participants (one time and repeat)	61,000	
Baseball	Basketball	UBC Rec events offered	68	
Basketball	Field Hockey	Intramurals		
Football	Golf	Ball Hockey		
Golf	Ice hockey	Volleyball		
Ice Hockey	Rowing	Soccer		
Rowing (m/w)	Soccer	Basketball		
Rugby	Swimming	Flag Football		
Soccer	Track	Futsal		
Swimming	Volleyball	Ultimate		
Track		Ice Hockey		
Volleyball		Dodgeball		
Varsity Sponsors		Summer Soccer League		
Booster Juice		**Drop-In Recreation**		
Big Kahuna		Volleyball		
Coca-cola		Badminton		
		Table Tennis		
Holiday Inn Hotel & Suites		Basketball		
RCMP		**Instructional Courses (classes)**		
Migz BBQ on Broadway		Martial Arts (17)		
drinkmilk.ca		Sport Instruction (1)		
Domino's Pizza		Certifications (1)		
Russell		Wellness/Conditioning/Running (5)		
Shopper's Drug Mart		Yoga (9)		
Mahony & Sons		Pilates (4)		
Molson		Dance (11)		
The Province		Facilities		
UBC Bookstore		Aquatic Centre		
The Pita Pit		Boathouse		
Powerbar		Tennis Centre		
Total fundraising from sponsorship	$2 million	Thunderbird Stadium		
Varsity athletics program expenditures	$4,525,800	War Memorial Gym		
Financial aid distributed to female athletes annual average	$188,094	Thunderbird Sports Centre (Arena)		
Intramurals		Student Recreation Centre (3 gym courts, dojo, fitness facility, and climbing wall)		
Ball Hockey		7 sports fields		
Volleyball		Community Use of the Facilities		
Soccer		University Neighbourhood Association	5,000 residents living on campus	
Basketball		University Neighbourhood Association	Pay student rates	
Flag Football		Public use of recreational facilities		non-academic term: 90% non-academic is public use

B.3

APPENDIX B.3

ACCESSIBILITY

ACCESSIBILITY

THE OBJECTIVE

Recognizing the diversity of interior and exterior environments comprising the Dalhousie University campus, the long term objective of full accessibility is indeed challenging, and a multi-year program to realize this objective is both complex and costly. Nevertheless, the objective is worthy and the need to address this problem is necessary; increasingly government regulations are focusing on meeting the requirements of the disabled for full access to both public and private built as well as service environments.

OPPORTUNITIES

The realistic approach to achieving a fully accessible campus is (1) to accept that it will take a number of years to achieve and must be carried out in phases of investment and construction, and (2) that it will generally be achieved as part of capital project initiatives: new construction, retro-fits, renovations and capital repairs & replacement (i.e. deferred maintenance) projects. A multi-year plan and implementation program is required to guide annual capital expenditures to achieve these initiatives.

PLAN PREPARATION

Preparation of the required Multi-year Accessibility Plan is outlined in terms of six basic steps:

1. Establishing an Accessibility Program Planning Committee to ensure that all essential university interest groups are represented including Facilities Management, the Dalhousie Office of Accessibility, the Office of Sustainability, students and faculty, and relevant executive vice presidents. It will be this committee that should set the objectives and terms of reference for the planning, with the assistance of external experts;
2. Reviewing current university Accessibility Standards and determining if they are adequate (considering options) and relevant to university objectives, operating policies and physical conditions;
3. Conducting a Technical Audit of the university built environment, aimed at identifying accessibility deficiencies and remediation costs in accordance with the standards;
4. Establishing criteria for Priority Setting and identifying Priority Projects aimed at phasing the improvements over time;
5. Identifying Plan Options that are then subjected to a feasibility analysis leading to determining the Preferred Plan;
6. Finalizing the Plan to include annual project definitions and capital programs, for adoption by the university executive and Board.

PLAN EXECUTION

Once adopted as policy, the role of the Committee is to set performance targets, measures and schedules, then routinely audit progress and record findings and conclusions in periodic reports.

Without the discipline of sustained stewardship and institutional commitment, the goal of achieving an accessible university campus cannot be achieved where, as in Dalhousie's case, the campus is comprised of many buildings of diverse age, design and condition.

B.4

APPENDIX B.4

SPACE FORECAST ANALYSIS

	Existing Space (NOTE 1) Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
CARLTON				
DENTISTRY	79,628	69,962	(9,666)	SEE NOTES 3 & 4
HEALTH PROFESSIONS	107,190	346,592	(239,402)	SEE NOTE 3
MEDICINE	121,115	210,360	(89,245)	SEE NOTE 4
COMMON POOL CLASSROOMS	16,229			
Totals	**324,162**	**NASF**		
			(338,314)	**NASF**

Space Shortage Based on COU Stds.

	2008 Undergraduate Enrolment	LOW END 2018 Projected Undergraduate Enrolment	HIGH END 2018 Projected Undergraduate Enrolment	LOW END 10-Year Change in Undergraduate Enrolment	HIGH END 10-Year Change in Undergraduate Enrolment	
DENTISTRY	247	247	-	-	(247)	
HEALTH PROFESSIONS	2,011	2,174	-	163	(2,011)	
MEDICINE	391	443	-	52	(391)	
	2,649	2,864	-	215	(2,649)	Students
NASF of Common Pool Classroom Per Student (Based on Existing)				6	6	NASF/Student
				1,317	**(16,229)**	**NASF**
				LOW	**HIGH**	

Estimated Additional Common Pool Classroom Space in the next 10 Years

	LOW END 2018 Projected Additional Faculty NASF	HIGH END 2018 Projected Additional Faculty NASF	
DENTISTRY	-	-	
HEALTH PROFESSIONS	15,597	-	
MEDICINE	15,365	-	
	30,962	**-**	**NASF**
	LOW	**HIGH**	

Additional Faculty Specific Space (NASF)

FOR THE CARLTON CAMPUS
IN THE NEXT 10 YEARS PLAN FOR:

LOW END	HIGH END	
338,314	338,314	To bring space to COU Standard
1,317	2,634	Growth in Common Pool Classrooms
30,962	61,924	Faculty Space for Enrolment Growth
370,593	**402,872**	**NASF**
1.65	1.65	Grossup Factor
611,479	**664,739**	**GSF**
LOW	**HIGH**	

Note 1: Existing Space Figures are for COU Formula Space Only and does not account for around 8000 NASF of other space under each Faculty OR Other Unviersity Services on tha campus
Note 2: Breakdown of Administrative Staff not available for direct comparison at this level of detail.
Note 3: There are also 16,229 NASF in Common Pool Classrooms on the Carlton Campus which are not inventoried under a specific Department/Faculty.
Note 4: Information for Dentistry Weekly Scheduled Contact Lab Hours is not available and therefore the Existing "Lab Undergraduate Space" of 35497 nasf is considered up to COU standards for this palnning exercise.

GENERAL NOTE: The comparison of existing space inventory by Faculty may not provide in certain instances a complete and realistic comparison between space inventoried under a certain Faculty and space generated by the COU method. While the COU generated space will include all classroom space required for a certain Faculty based on enrolment, the existing inventory for the same Faculty may not necessarily include this space which may be part of the "common pool" space. The variance, in certain instances, may therefore be misleading and conclusions should not be based on this summary.

DALHOUSIE UNIVERSITY MASTER PLAN
TABLE 1 - PROJECTED ENROLMENT AND SPACE REQUIREMENTS

	PROJECTED STUDENT ENROLMENT	
	(2008) BASELINE ENROLMENT 15277 STUDENTS	SHORT TERM PROJECTED ENROLMENT 17783 STUDENTS
PROJECTED SPACE REQUIREMENTS		
EXISTING NET ASSIGNABLE SPACE (NASF)	2,330,749	2,330,749
PROJECTED ADDITIONAL NET ASSIGNABLE SPACE (NASF)		260,111
TOTAL NET ASSIGNABLE SPACE (NASF)	**2,330,749**	**2,590,860**
TOTAL GROSS SPACE (GSF)	**3,845,736**	**4,274,919**

Note 1.1: NASF is Net Assignaable Square Feet
Note 1.2: GSF is Gross Squre Feet accounting for circulation, building service space and building and construction grossup
Note 1.3: Assumed incremental 5-Year increase in enrolment: **2506** students Ref. Table 6
Note 1.4: COU calculated incremental 5-Year increase in space requirements: **260,111** NASF Ref. Appendix C pages C3 and C4
Note 1.5: The existing assignable space DOES NOT include 647,342 nasf of residential space (COU Category 17 in the University Space Inventory). This space is dealt with separately at this time.
Note 1.6: Net assignable to gross space conversion factor used is **1.65**
Note 1.7: The 1.65 factor accounts for the 1,162,695 Non-Assignable SF (COU Category 16 in the University Space Inventory) and also allows for the building/construction grossup
Note 1.8: For details on Existing net assignable space, reference Table 2

DALHOUSIE UNIVERSITY MASTER PLAN
TABLE 2 - COMPARISON AT UNIVERSITY LEVEL: EXISTING SPACE TO COU GENERATED SPACE

DALHOUSIE UNIVERSITY

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	Baseline (2008) Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	Short Term Enrolment Growth Generated Space As Per COU Standards (NASF)
Formula Areas (NASF)					
1	Classroom Facilities	202,058	178,472	23,586	207,748
2	Lab Undergraduate	178,026	176,068	1,958	202,109
3	Lab Graduate & Faculty	410,478	678,466	(267,988)	709,995
4	Academic Office & Related Space	415,556	471,970	(56,414)	400,553
5	Campus Study Space & Library Facilities	261,217	253,843	7,374	282,028
6	Recreation Athletic Space	161,554	130,589	30,965	152,011
7	Food Services	45,401	72,550	(27,149)	84,450
8	Bookstore & Merchandizing Facilities	39,566	72,550	(32,984)	84,450
9	Plant Maintenance	31,037	32,303	(1,266)	33,971
10	Administrative Offices & Related Space	152,659	174,639	(21,980)	203,287
11	AV/TV Facilities	4,368	7,255	(2,887)	8,445
12	Central Services	15,569	14,510	1,059	16,890
13	Health Service Facilities	4,381	4,353	28	5,067
14	Student Activity Space	48,365	72,550	(24,185)	84,450
15	Assembly & Exhibition Facilities	70,831	21,765	49,066	25,335
Subtotal - Formula Areas		**2,041,066**	**2,361,881**	**(320,815)**	**2,500,789**
16	**Non-Assignable (SF)**	1,162,695			
Non-Formula Areas (NASF)					
17	Residential Space	647,342			
18	Animal Space				
19	Other	289,683			
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**937,025**			
TOTALS		**4,140,786**			

TOTAL ASSIGNABLE SF **2,978,091**

TOTAL NON-ASSIGNABLE SF **1,162,695**

39% is the percentage ofexisting non-assignable to existing assignable space

Note 2.1: NASF is Net Assignaable Square Feet
Note 2.2: COU refers to the Council of Ontario Universities method of generating space standards based on enrolments and other factors
Note 2.3: Existing Space Inventory numbers are based the Unioversity's inventory of buildings, spaces and rooms at the time of the analysis
Note 2.4: In the case of low/high COU estimating factors available, the low factors were used unless otherwise indicated
Note 2.5: Variances between Existing and COU Generated Space are only shown for the present.
Note 2.6: Showing variances for Growth Period is not feasible as the basecase after growth is an unknown.
Note 2.7: For calculations of COU generated space reference Appendix C, pages C-1, C2, C25 to C34
Note 2.8: COU Space Categories 16 to 20 are not formula-based, or based on enrolment/staffing related input measures, and therefore a comparison is not possible

DALHOUSIE UNIVERSITY MASTER PLAN
TABLE 3 - SUMMARY COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

FACULTY	Existing Space Inventory (NASF)	Baseline (2008) Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
SEXTON				
ARCHITECTURE & PLANNING	35,393	18,880	16,513	
ENGINEERING	79,628	210,150	(130,522)	SEE NOTE 3.11
STUDLEY				
ARTS & SOCIAL SCIENCES	94,650	105,586	(10,936)	SEE NOTES 3.10 & 3.12
COMPUTER SCIENCE	35,673	34,684	989	SEE NOTE 3.12
LAW	66,841	21,161	45,680	SEE NOTE 3.12
MANAGEMENT	29,828	73,930	(44,102)	SEE NOTE 3.12
SCIENCE	414,670	448,448	(33,778)	SEE NOTE 3.12
CARLTON				
DENTISTRY	79,628	34,465	45,163	SEE NOTES 3.13 & 3.14
HEALTH PROFESSIONS	107,190	346,592	(239,402)	SEE NOTE 3.13
MEDICINE	121,115	210,360	(89,245)	SEE NOTE 3.10
	1,064,616	**1,504,257**	**(439,641)**	

GENERAL NOTE: The comparison of existing space inventory by Faculty may not provide in certain instances a complete and realistic comparison between space inventoried under a certain Faculty and space generated by the COU method. While the COU generated space will include all classroom space required for a certain Faculty based on enrolment, the existing inventory for the same Faculty may not necessarily include this space which may be part of the "common pool" space. The variance, in certain instances, may therefore be misleading and conclusions should not be based on this summary. The detailed Tables 3A to 3J may provide clarifications in these instances and should also be reviewed.

Note 3.1: NASF is Net Assignable Square Feet.
Note 3.2: COU refers to the Council of Ontario Universities method of generating space standards based on enrolments and other factors.
Note 3.3: Existing Space Inventory numbers are based the University's inventory (by Department) of buildings, spaces and rooms at the time of the analysis.
Note 3.4: In the case of low/high COU estimating factors available, the low factors were used unless otherwise indicated.
Note 3.5: Variances between Existing and COU Generated Space are only shown for the present.
Note 3.6: For calculations of COU generated space reference Appendix C, pages C35 to C54.
Note 3.7: Some COU categories do not apply to all/some of the Faculties.
Note 3.8: Library stack/collection space (COU Category 5) may not be listed under a Department/Faculty and may account for some variances.
Note 3.9: COU Space Categories 16 to 20 are not formula-based, or based on enrolment/staffing related input measures, and therefore a comparison is not possible.
Note 3.10: Breakdown of Administrative Staff not available for direct comparison at this level of detail.
Note 3.11: There are also 8,217 NASF in Common Pool Classrooms on the Sexton Campus which are not inventoried under a specific Department/Faculty.
Note 3.12: There are also 85,179 NASF in Common Pool Classrooms on the Studley Campus which are not inventoried under a specific Department/Faculty.
Note 3.13: There are also 16,229 NASF in Common Pool Classrooms on the Carlton Campus which are not inventoried under a specific Department/Faculty.
Note 3.14: Information for Dentistry Weekly Scheduled Contact Lab Hours is not available and therefore comparison is not feasible.
Note 3.15: Faculty-specific details are provided in Tables 3A to 3J in the Appendices
Note 3.16: Summary Comparison above is for COU "Formula-Based" Space ONLY

DALHOUSIE UNIVERSITY MASTER PLAN
TABLE 4 - PROJECTED UNDERGRADUATE ENROLMENT AND SPACE REQUIREMENTS BY FACULTY/CAMPUS
FACULTY SPECIFIC SPACE ONLY AS PER UNIVERSITY SPACE INVENTORY

	Baseline Year (2008)					Short Term Projected				
	Existing Undergraduate Enrolment	Existing Net Assignable Space (NASF)	Projected Additional Net Assignable Space (NASF)	Total Net Assignable Space (NASF)	Total GROSS Space (GSF)	Projected Undergraduate Enrolment	Existing Net Assignable Space (NASF)	Projected Additional Net Assignable Space (NASF)	Total Net Assignable Space (NASF)	Total GROSS Space (GSF)
SEXTON										
Architecture & Planning	253	35393	744	36137	59626	264	36137	744	36881	60853
Engineering	1280	85706	1129	86835	143277	1289	86835	1129	87964	145140
Subtotals	**1533**	**121099**	**1873**	**122972**	**202903**	**1553**	**122972**	**1873**	**124844**	**205993**
STUDLEY										
Arts and Social Sciences	2665	94720	28253	122973	202906	3121	122973	28253	151227	249524
Computer Science	242	35883	920	36803	60725	254	36803	920	37723	62243
Law	455	66841	137	66978	110513	457	66978	137	67114	110739
Management	1325	29828	75117	104945	173159	2536	104945	75117	180062	297102
Science	2695	416199	76076	492275	812254	3293	492275	76076	568351	937779
Subtotals	**7382**	**643471**	**180503**	**823974**	**1359557**	**9661**	**823974**	**180503**	**1004477**	**1657387**
CARLTON										
Dentistry	247	85706	0	85706	141415	247	85706	0	85706	141415
Health Professions	2011	107190	15597	122787	202598	2174	122787	15597	138383	228333
Medicine	391	123259	15365	138624	228730	443	138624	15365	153990	254083
Subtotals	**2649**	**316155**	**30962**	**347117**	**572743**	**2864**	**347117**	**30962**	**378079**	**623831**
TOTALS	**11564**	**1080725**	**213338**	**1294063**	**2135203**	**14078**	**1294063**	**213338**	**1507400**	**2487211**

Note 4.1: NASF is Net Assignable Square Feet.
Note 4.2: GSF is Gross Square Feet accounting for circulation, building service space and building and construction grossup.
Note 4.3: Enrolment numbers DO NOT include Interdisciplinary/Multifaculty OR Graduate Students since there is no projected growth to these under the shown Faculties, and projected increase in space requirements is based on the increase in undergraduate enrolment.
Note 4.4: Projected Additional Net Assignable Space is based on the COU (Council of Ontario Universities) method of generating space standards based on enrolments and other factors.
Note 4.5: Existing Space Inventory numbers are based the University's inventory of buildings, spaces and rooms at the time of the analysis coded to Departments under each Faculty.
Note 4.6: For calculations of Projected Additional space (5-year incremental increase) by the COU method, reference Appendix C, pages C-5 to C24.
Note 4.7: Note that the existing space shown above is Department/Faculty specific and EXCLUDES other space such as Common Pool Classrooms etc.
Note 4.8: Net assignable to gross space conversion factor used is **1.65**

Assumed incremental 5 year increase in enrolment after 2013	
Architecture and Planning	11 students
Engineering	9 students
Arts and Social Sciences	456 students
Computer Science	12 students
Law	2 students
Management	1211 students
Science	598 students
Dentistry	0 students
Health Professions	163 students
Medicine	52 students

Assumed incremental 5 year increase in space after 2013 (SEE NOTE 4.6)	
Architecture and Planning	744 NASF
Engineering	1,129 NASF
Arts and Social Sciences	28,253 NASF
Computer Science	920 NASF
Law	137 NASF
Management	75,117 NASF
Science	76,076 NASF
Dentistry	0 NASF
Health Professions	15,597 NASF
Medicine	15,365 NASF

DALHOUSIE UNIVERSITY MASTER PLAN
TABLE 5 - SUMMARY OF CLASSROOM SPACE ANALYSIS

	Existing Classrooms (NASF)	Estimated Increase Over 5-Years (NASF)	Estimated Increase Over 5-Years (GSF)	
SEXTON				
Architecture & Planning	14,230	129	212	
Engineering	2,341	105	173	
Common Pool	8,217			SEE NOTE 5.6
Subtotals	**24,788**	**234**	**386**	SEE NOTE 5.5
STUDLEY				
Arts and Social Sciences	8,285	5,327	8,790	
Computer Science	1,685	140	231	
Law	12,832	23	39	
Management	1,354	14,147	23,343	
Science	7,728	6,986	11,527	
Common Pool	85,179			SEE NOTE 5.6
Subtotals	**117,063**	**26,624**	**43,930**	SEE NOTE 5.5
CARLTON				
Dentistry	2,341	0	0	
Health Professions	15,647	1,904	3,142	
Medicine	8,689	607	1,002	
Common Pool	16,229			SEE NOTE 5.6
Subtotals	**42,906**	**2,512**	**4,144**	SEE NOTE 5.5
TOTALS (FACULTY SPECIFIC)	**75,132**	**29,370**	**48,460**	SEE NOTE 5.5
TOTALS (COMMON POOL)	**109,625**	SEE NOTE 5.5		
TOTALS (ALL OTHER)	**17,301**	**0**		
GRAND TOTAL	**202,058**			

DETAIL OF COMMON POOL CLASSROOMS

BUILDING	AREA in NASF	CAMPUS
LSC-BIOL&EARTH	622	STUDLEY
LSC-OCEANOGRAPHY	918	STUDLEY
LSC-PSYCHOLOGY	4,345	STUDLEY
LSC-COMMON AREA	14,670	STUDLEY
DUNN BLDG	8,500	STUDLEY
HENRY HICKS ACAD	5,815	STUDLEY
CHEMISTRY	3,359	STUDLEY
KILLAM LIB	3,735	STUDLEY
MCCAIN ARTS&SC	24,096	STUDLEY
KENNETH C ROWE	13,656	STUDLEY
GOLDBERG COMPUPTER BLDG.	1,542	STUDLEY
A. MACDONALD	3,921	STUDLEY
DENTISTRY	9,107	CARLTON
TUPPER BLDG	7,122	CARLTON
B BLDG. & B. BLDG. ADDITION	8,217	SEXTON
	109,625	

Note 5.1: NASF is Net Assignable Square Feet.
Note 5.2: GSF is Gross Square Feet accounting for circulation, building service space and building and construction grossup.
Note 5.3: Net assignable to gross space conversion factor used is **1.65**
Note 5.4: For calculations of estimated increase over 5-years (incremental increase) by the COU method, reference Appendix C, pages C-5 to C24.
Note 5.5: Note that the estimated increase in net assignable square feet includes common pool classroom incremental increase.
Note 5.6: Details of Common Pool Classrooms are provided in side table.

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 6 - ENROLMENT / STAFF FIGURES USED IN ANALYSES

	SEXTON (Undergrad.)			STUDLEY (Undergrad.)							CARLTON (Undergrad.)				All (Grad.)		
	Architecture and Planning	Engineering	SUBTOTALS	Arts and Social Sciences	Computer Science	Law	Management	Science	Interdis./Other/Con.Ed./Multi Faculty	SUBTOTALS	Dentistry	Health Professions	Medicine	SUBTOTALS	GRADUATE STUDENTS		
STUDENT ENROLMENT FIGURES																**Undergrad.**	**ALL**
Actual Enrolment 2008	253	1280	**1533**	2665	242	455	1325	2695	61	**7443**	247	2011	391	**2649**	3652	**11625**	**15277**
Projected Enrolment 2013	264	1289	**1553**	3121	254	457	2536	3293	53	**9714**	247	2174	443	**2864**	3652	**14131**	**17783**
Projected Increase By 2013	11	9	**20**	456	12	2	1211	598	-8	**2271**	0	163	52	**215**	0	**2506**	**2506**
FTE Increase By 2013 (0.882353 Conversion Factor)	10	8	**18**	402	11	2	1069	528	-7	**2004**	0	144	46	**190**	0	**2211**	**2211**
FACULTY & GRADUATE STUDENT FTE'S																	
Faculty FTEs as of Dec. 1, 2008	24	88	**112**	165	29	39	71	200	32	**536**	41	149	183	**373**	3		**1024**
Graduate Students FTEs as of Dec. 1 2008	123	299	**423**	209	171	24	448	441	74	**1366**		544	170	**714**	149		**2652**
PDF as of Dec. 1 2008		11	**11**	1			1	50		**52**		2	43	**45**	7		**115**
Average Number of Student FTE PER Faculty FTE	14	16		16	13	11	23	14	4		5	16	3		53		**16**
Projected Increase (5-Yr. Increment) Faculty FTE's	0.7	0.5	**1.2**	25.9	0.8	0.2	46.8	37.4		**111.1**	0.0	9.2	16.3	**25.6**	0.0		**138**
Projected Total Faculty FTE's by 2013	24.9	88.3	**113.3**	190.9	30.1	39.2	117.6	237.2	52.0	**667.0**	41.0	158.2	199.3	**398.6**	3		**1182**
MGMNT./ADMIN./PROF. SUPPORT STAFF																	
FTE ACAD. Staff (COU Cat. 4) as of Dec. 1, 2008																	**590**
FTE ADMIN. Staff (COU Cat. 10) as of Dec. 1, 2008																	**832**
Av. Num. of Student FTE PER Cat. 4 Staff FTE																	**22.8**
Av. Num. of Student FTE PER Cat. 10 Staff FTE																	**16.2**
Proj. Increase (5-Yr. Increment) Cat. 4 Staff FTE's																	**97**
Proj. Increase (5-Yr. Increment) Cat. 10 Staff FTE's																	**136**
Projected Total Cat. 4 Staff FTE's by 2013																	**687**
Projected Total Cat. 10 Staff FTE's by 2013																	**968**

Note 6.1: Student to FTE Conversion Factor **0.8824**
Note 6.2: Student Enrolment and Projected Enrolment are based on actual and preliminary enrolments by Faculty as of December 1, 2008.
Note 6.3: In order to estimate increase to Faculty FTEs and Other Staff FTEs, the exisitng ratios of Faculty (or Other Staff) FTEs to Student FTEs is used at this time.
Note 6.4: Non-Faculty FTEs include administrators, professionals, support, research admin. support, research support staff union, NS Union of pub. employees, staff other, confidential clerical secretarial and senior mgmnt.
Note 6.5: Non-Faculty FTE's EXCLUDES non-office workers for Facilities Management as well as Housing staff located in COU Category 17 offices
Note 6.6: All other Non-Faculty Staff are split into two categories: Academic Staff (under COU category 4) and Administrative Staff (under COU category 10)
Note 6.7: Staff FTE's for the following Departments are EXCLUDED: Anaesthesia; Emergency Medicine; Faculty of Medicine General: Kellogg Library; Law Libnrary; Obstetrics & Gynaecology; Ophthalmology and Visual Science; Oral and Maxillofacial Sciences; Pathology: Pediatrics; Radiation Oncology; Radiology; Saint John Regional Hospital; Sexton Design and Tech. Library; Surgery; Un iversity Library; University Secretariat-Senate; Urology; Varsity; Writing Resource Center. (188 FTE's)
Note 6.8: FTE's for Post-Graduate Med Ed (483 FTE's) /Other PDFs are EXCLUDED in Details

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 6 - ENROLMENT / STAFF FIGURES USED IN ANALYSES

This part of Table 6 is linked to Appendix C "Calculations by COU Standards Method" and is for calculation purposes only.
Count for COU Calculation (Cat. 3 Research Lab Space)
(Count based on predominant lab type)

	All 08	Add-5		Arch.	Eng.		Arts&	Comp.	Law	Mgmnt	Sc.			Dent.	Health	Medicine
Gp. A	1197.56	62.951	**Faculty**	85.91	243.005		269.745	114.72	50.83	295.335	445.242			41	421.955	289.365
Gp. B	243.005	0.48835		**E**	**B**		**E**	**D**	**E**	**E**	**A**			**A**	**A**	**A**
Gp. C.			**Add-5**	0.679	0.488		25.930	0.807	0.162	46.794	37.395			0.000	9.244	16.312
Gp. D	114.72	0.80681														
Gp. E	701.82	73.5651														

DALHOUSIE MASTER PLAN
APPENDIX A - DATA FOR WEEKLY SCHEDULED CONTACT LAB HOURS BY FACULTY

WEEKLY SHCEDULED CONTACT LAB HOURS - WSCLH - DATA USED IN ANALYSIS
DATA TRANSFEREDD TO APPENDIX C AS SQUARE FEET (Overrides Formulas for Cat. 2)

10.76426265		Fall 2008 Actual Enrollment	HOURS	m2 GENERATED	SF GENERATED	COU Factor Used	(SF) Sub-totals / Dept.
ANAT	12	0	2	0	0	0.6	
ANAT	9999	102	6	367	3953	0.6	
ANAT	12	1		0	0	0.6	
							3953
BIOC	3	3	3	5	58	0.6	
BIOC	3	2	3	4	39	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	3	2	2	2	26	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	0	0		0	0	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	30	20	2	24	258	0.6	
BIOC	30	15	3	27	291	0.6	
BIOC	34	31	3	56	601	0.6	
BIOC	26	34	3	61	659	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	3	4	3	7	78	0.6	
BIOC	3	3	3	5	58	0.6	
BIOC	3	1	2	1	13	0.6	
BIOC	3	3	2	4	39	0.6	
BIOC	5	1		0	0	0.6	
BIOC	3	2	3	4	39	0.6	
BIOC	92	90	6	324	3488	0.6	
							6168
BIOE	999	0	3	0	0	0.8	
BIOE	9999	6	3	14	155	0.8	
BIOE	9999	0		0	0	0.8	
BIOE	99	9	3	22	233	0.8	
							388
BIOL	12	9	2	11	116	0.6	
BIOL	21	21	3	38	407	0.6	
BIOL	21	21	3	38	407	0.6	
BIOL	21	21	3	38	407	0.6	
BIOL	21	20	3	36	388	0.6	
BIOL	21	21	3	38	407	0.6	
BIOL	21	21	3	38	407	0.6	
BIOL	19	17	2	20	220	0.6	
BIOL	19	18	2	22	233	0.6	
BIOL	19	20	2	24	258	0.6	
BIOL	19	17	2	20	220	0.6	
BIOL	19	17	2	20	220	0.6	

(NASM) TOTALS Faculty	(NASF) TOTALS Faculty	
79	853	ARCHITECTURE & PALNNING
71	759	ARTS & SOCIAL SCIENCES
105	1133	COMPUTER SCIENCE
5855	63024	ENGINEERING
1268	13653	HEALTH PROFESSIONS
340	3656	MANAGEMENT
446	4805	MEDICINE
8192	88185	SCIENCE
16357 SM	**176068 SF**	**TOTAL (ALL)**

BIOL	0	3		0	0	0.6
BIOL	19	17	2	20	220	0.6
BIOL	5	0	3	0	0	0.6
BIOL	5	1	3	2	19	0.6
BIOL	10	5	3	9	97	0.6
BIOL	25	23	2	28	297	0.6
BIOL	25	25	2	30	323	0.6
BIOL	25	24	2	29	310	0.6
BIOL	25	25	2	30	323	0.6
BIOL	25	23	2	28	297	0.6
BIOL	28	27	3	49	523	0.6
BIOL	28	24	3	43	465	0.6
BIOL	28	25	3	45	484	0.6
BIOL	28	27	3	49	523	0.6
BIOL	21	21	3	38	407	0.6
BIOL	6	0		0	0	0.6
BIOL	26	23	3	41	446	0.6
BIOL	26	25	3	45	484	0.6
BIOL	9	3	3	5	58	0.6
BIOL	9	1	3	2	19	0.6
BIOL	25	20	2	24	258	0.6
BIOL	25	24	3	43	465	0.6
BIOL	19	19	2	23	245	0.6
BIOL	21	20	3	36	388	0.6
BIOL	21	20	3	36	388	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	21	2	25	271	0.6
BIOL	24	22	2	26	284	0.6
BIOL	24	22	2	26	284	0.6
BIOL	24	19	2	23	245	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	20	2	24	258	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	23	2	28	297	0.6
BIOL	24	21	2	25	271	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	23	2	28	297	0.6

BIOL	24	23	2	28	297	0.6
BIOL	24	22	2	26	284	0.6
BIOL	24	24	2	29	310	0.6
BIOL	24	24	2	29	310	0.6
BIOL	75	12		0	0	0.6
BIOL	19	17	2	20	220	0.6
BIOL	19	18	2	22	233	0.6
BIOL	2	2	2.5	3	32	0.6
BIOL	3	4	2.5	6	65	0.6
BIOL	25	24	3	43	465	0.6
BIOL	25	11	3	20	213	0.6
BIOL	25	24	3	43	465	0.6
BIOL	25	23	3	41	446	0.6
BIOL	25	25	3	45	484	0.6
BIOL	25	23	3	41	446	0.6
BIOL	5	5		0	0	0.6
BIOL	21	21	3	38	407	0.6
BIOL	26	28	3	50	543	0.6
BIOL	26	28	3	50	543	0.6
BIOL	26	27	3	49	523	0.6
BIOL	26	25	3	45	484	0.6
BIOL	26	29	3	52	562	0.6
BIOL	26	18	3	32	349	0.6
BIOL	20	17	3	31	329	0.6
BIOL	20	18	3	32	349	0.6
BIOL	20	18	3	32	349	0.6
BIOL	20	17	3	31	329	0.6
BIOL	0	0	3	0	0	0.6
BIOL	3	0	2.5	0	0	0.6
BIOL	2	0	2.5	0	0	0.6
BIOL	26	27	3	49	523	0.6
BIOL	17	11	4	26	284	0.6
BIOL	10	0		0	0	0.6
BIOL	24	21	2	25	271	0.6
BMNG	14	10		0	0	0.3
BUSI	80	57	1.5	26	276	0.3
CHEE	39	30	2	48	517	0.8
CHEE	60	41	2	66	706	0.8
CHEE	50	32	3	77	827	0.8
CHEE	50	30	3	72	775	0.8
CHEE	9999	2	2	3	34	0.8
CHEE	9999	30	4	96	1033	0.8
CHEM	18	18	3	32	349	0.6
CHEM	18	18	3	32	349	0.6
CHEM	30	29	3	52	562	0.6
CHEM	60	56	3	101	1085	0.6
CHEM	45	45	3	81	872	0.6
CHEM	40	39	3	70	756	0.6
CHEM	30	31	3	56	601	0.6
CHEM	30	14	3	25	271	0.6
CHEM	50	48	3	86	930	0.6

29742

0

276

3892

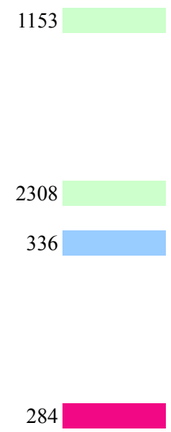
CHEM	50	43	3	77	833	0.6
CHEM	25	24	3	43	465	0.6
CHEM	25	24	3	43	465	0.6
CHEM	50	48	3	86	930	0.6
CHEM	50	49	3	88	949	0.6
CHEM	50	35	3	63	678	0.6
CHEM	50	47	3	85	911	0.6
CHEM	50	50	3	90	969	0.6
CHEM	50	48	3	86	930	0.6
CHEM	12	12	4	29	310	0.6
CHEM	12	12	4	29	310	0.6
CHEM	12	12	4	29	310	0.6
CHEM	50	50	3	90	969	0.6
CHEM	30	30	3	54	581	0.6
CHEM	30	21	3	38	407	0.6
CHEM	20	13	3	23	252	0.6
CHEM	50	49	3	88	949	0.6
CHEM	60	61	3	110	1182	0.6
CHEM	50	50	3	90	969	0.6
CHEM	12	10	4	24	258	0.6
CHEM	6	0	4	0	0	0.6
CHEM	30	20	1.5	18	194	0.6
CHEM	30	8	1.5	7	78	0.6
CHEM	24	26	4	62	672	0.6
CHEM	24	23	4	55	594	0.6
CHEM	18	17	3	31	329	0.6
CHEM	12	6	3	11	116	0.6
CHEM	50	47	3	85	911	0.6
CHEM	50	50	3	90	969	0.6
CHEM	50	47	3	85	911	0.6
CHEM	12	10	3	18	194	0.6
CHEM	12	5	3	9	97	0.6
CHEM	12	9	3	16	174	0.6
CHEM	25	6		0	0	0.6
CHEM	25	25	3	45	484	0.6
CHEM	25	20	3	36	388	0.6
CHEM	50	47	3	85	911	0.6
CHEM	50	48	3	86	930	0.6
CHEM	50	18	3	32	349	0.6
CIVL	9999	45	2	72	775	0.8
CIVL	999	64	3	154	1653	0.8
CIVL	40	40	3	96	1033	0.8
CIVL	9999	67	2	107	1154	0.8
CIVL	9999	65	3	156	1679	0.8
CIVL	9999	13	2	21	224	0.8
CIVL	9999	36	2	58	620	0.8
CIVL	9999	47	2	75	809	0.8
CIVL	40	44	3	106	1137	0.8
COMM	45	43	1.5	19	208	0.3
COMM	45	44	1.5	20	213	0.3
COMM	45	45	1.5	20	218	0.3
COMM	45	44	1.5	20	213	0.3
COMM	45	45	1.5	20	218	0.3

27701

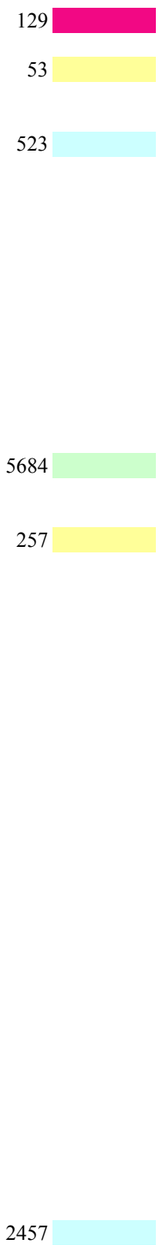
9085

COMM	45	44	1.5	20	213	0.3	
COMM	45	44	1.5	20	213	0.3	
COMM	31	33	1.5	15	160	0.3	
COMM	45	43	1.5	19	208	0.3	
COMM	45	45	1.5	20	218	0.3	
COMM	45	45	1.5	20	218	0.3	
COMM	45	43	1.5	19	208	0.3	
COMM	45	43	1.5	19	208	0.3	
COMM	45	44	1.5	20	213	0.3	
COMM	15	14	1.5	6	68	0.3	
							2998
CSCI	34	25	3	23	242	0.3	
CSCI	34	30	3	27	291	0.3	
CSCI	34	24	3	22	233	0.3	
CSCI	34	6	3	5	58	0.3	
							823
DCYT	4	3	2	4	39	0.6	
DCYT	10	6	1.5	5	58	0.6	
DCYT	10	9	3	16	174	0.6	
DCYT	10	9	3.5	19	203	0.6	
DCYT	3	2	2	2	26	0.6	
DCYT	3	2	2	2	26	0.6	
							526
DMUT	5	4	3	7	78	0.6	
DMUT	5	5	3	9	97	0.6	
DMUT	5	6	3	11	116	0.6	
							291
ECED	9999	43	1.5	39	417	0.6	
ECED	91	113	3	203	2189	0.6	
ECED	91	90	3	162	1744	0.6	
ECED	9998	42	3	76	814	0.6	
ECED	999	33	3	59	639	0.6	
ECED	99	31	3	56	601	0.6	
ECED	999	47	2	56	607	0.6	
ECED	99	35	2	42	452	0.6	
ECED	999	33	2	40	426	0.6	
ECED	9999	13	1.5	12	126	0.6	
ECED	60	19	2	23	245	0.6	
							8260
ECMM	0	3	2	2	19	0.3	
ECMM	0	4	2	2	26	0.3	
							45
ECON	50	31	1.5	14	150	0.3	
							150
ENGI	60	58	3	139	1498	0.8	
ENGI	60	58	3	139	1498	0.8	
ENGI	60	57	3	137	1473	0.8	
ENGI	60	42	3	101	1085	0.8	
ENGI	60	61	3	146	1576	0.8	
ENGI	60	62	3	149	1602	0.8	
ENGI	90	80	3	192	2067	0.8	
ENGI	90	87	3	209	2248	0.8	
							13046
ENGM	60	49	1.5	22	237	0.3	
ENGM	60	35	1.5	16	170	0.3	

ENGM	60	60	1.5	27	291	0.3
ENGM	60	58	1.5	26	281	0.3
ENGM	9999	21	2	13	136	0.3
ENGM	9999	6	2	4	39	0.3
ENVE	25	11	2	18	189	0.8
ENVE	9999	31	3.0	74	801	0.8
ENVE	999	19	3	46	491	0.8
ENVE	30	24	2	38	413	0.8
ENVE	9999	16	3	38	413	0.8
ENVE	9999	5		0	0	0.8
ENVI	25	26	2	31	336	0.6
ENVS	4	1	2	1	13	0.6
ENVS	10	4	3	7	78	0.6
ENVS	10	1	3	2	19	0.6
ENVS	10	4	3	7	78	0.6
ENVS	10	3	3	5	58	0.6
ENVS	10	2	3	4	39	0.6
ERTH	15	15	3	27	291	0.6
ERTH	10	4	3	7	78	0.6
ERTH	20	18	3	32	349	0.6
ERTH	40	28	3	50	543	0.6
ERTH	40	36	3	65	698	0.6
ERTH	5	3	3	5	58	0.6
ERTH	5	0	3	0	0	0.6
ERTH	10	10	3	18	194	0.6
ERTH	5	3	3	5	58	0.6
ERTH	10	4	3	7	78	0.6
ERTH	5	1	3	2	19	0.6
ERTH	40	15	3	27	291	0.6
ERTH	35	18	3	32	349	0.6
ERTH	10	6	3	11	116	0.6
ERTH	5	0	3	0	0	0.6
ERTH	28	15	2	18	194	0.6
ERTH	20	11	2	13	142	0.6
ERTH	30	28	3	50	543	0.6
ERTH	30	29	3	52	562	0.6
ERTH	30	25	3	45	484	0.6
ERTH	20	14	3	25	271	0.6
ERTH	30	19	3	34	368	0.6
FOSC	25	3	3	5	48	0.5
FOSC	25	4	3	6	65	0.5
FOSC	25	15	3.5	26	283	0.5
FOSC	9999	5	3	8	81	0.5
FOSC	999	2	3	3	32	0.5
FOSC	20	2	3	3	32	0.5
FOSC	20	6	3	9	97	0.5
FOSC	5	4	3	6	65	0.5
GEOG	5	3	3	5	48	0.5
GEOG	5	1	3	2	16	0.5



GEOG	5	0	3	0	0	0.5
GEOG	5	0	3	0	0	0.5
GEOG	5	0	3	0	0	0.5
GEOG	5	4	3	6	65	0.5
HINF	20	11	1.5	5	53	0.3
HSCE	23	17	1.5	15	165	0.6
HSCE	52	37	1.5	33	358	0.6
IENG	999	25	2	40	431	0.8
IENG	50	29	2	46	499	0.8
IENG	50	23	2	37	396	0.8
IENG	999	25	2	40	431	0.8
IENG	999	24	1.5	29	310	0.8
IENG	999	24	2	38	413	0.8
IENG	999	47	2	75	809	0.8
IENG	9999	25	2	40	431	0.8
IENG	999	26	2	42	448	0.8
IENG	9999	14	2	22	241	0.8
IENG	9999	21	2	34	362	0.8
IENG	99	53	2	85	913	0.8
INFO	30	30	1.5	14	145	0.3
INFO	30	23	1.5	10	111	0.3
KINE	9	7	1	4	38	0.5
KINE	9	8	1	4	43	0.5
KINE	9	9	1	5	48	0.5
KINE	9	9	1	5	48	0.5
KINE	9	9	1	5	48	0.5
KINE	9	9	1	5	48	0.5
KINE	25	10	1.5	8	81	0.5
KINE	25	12	1.5	9	97	0.5
KINE	25	10	1.5	8	81	0.5
KINE	25	24	1.5	18	194	0.5
KINE	16	16	1.5	12	129	0.5
KINE	16	15	1.5	11	121	0.5
KINE	16	12	1.5	9	97	0.5
KINE	16	11	1.5	8	89	0.5
KINE	16	4	1.5	3	32	0.5
KINE	16	13	1.5	10	105	0.5
KINE	16	7	1.5	5	57	0.5
KINE	17	17	1	9	91	0.5
KINE	19	19	1	10	102	0.5
KINE	14	14	1	7	75	0.5
KINE	9	9	1	5	48	0.5
KINE	16	15	1.5	11	121	0.5
KINE	25	24	1	12	129	0.5
KINE	25	24	1	12	129	0.5
KINE	25	25	1	13	135	0.5
KINE	25	14	1	7	75	0.5
KINE	25	24	1.5	18	194	0.5
MARI	18	18	2.5	27	291	0.6



MARI	17	15	2.5	23	242	0.6	
MARI	9	7	3	13	136	0.6	
MARI	9	8	3	14	155	0.6	
MARI	7	4	3	7	78	0.6	
MARI	8	3	3	5	58	0.6	
MARI	33	12	4	29	310	0.6	
							1269
MATL	999	39	3	94	1008	0.8	
MATL	9999	25	3	60	646	0.8	
MATL	999	14	3	34	362	0.8	
MATL	999	14	2	22	241	0.8	
MATL	999	13	2	21	224	0.8	
MATL	999	13	2	21	224	0.8	
MATL	9999	22	3	53	568	0.8	
MATL	999	22	3	53	568	0.8	
MATL	9999	0		0	0	0.8	
MATL	9999	13	3	31	336	0.8	
MATL	9999	22	3	53	568	0.8	
MATL	9999	18	3	43	465	0.8	
							5210
MECH	999	61	3	146	1576	0.8	
MECH	999	57	3	137	1473	0.8	
MECH	999	59	3	142	1524	0.8	
MECH	999	60	2	96	1033	0.8	
MECH	999	61	2	98	1051	0.8	
MECH	999	57	2	91	982	0.8	
MECH	20	20	3	48	517	0.8	
MECH	20	13	2	21	224	0.8	
MECH	9999	21	2	34	362	0.8	
							8964
MICI	46	0	2	0	0	0.6	
MICI	45	41	2	49	530	0.6	
MICI	45	42	2	50	543	0.6	
MICI	12	0		0	0	0.6	
							1072
MINE	40	37	3	89	956	0.8	
MINE	999	18	3	43	465	0.8	
MINE	9999	27	3	65	698	0.8	
MINE	9999	7	3	17	181	0.8	
MINE	9999	17	2	27	293	0.8	
MINE	40	36	2	58	620	0.8	
MINE	9999	9	2	14	155	0.8	
MINE	30	19	3	46	491	0.8	
MINE	9999	5	2	8	86	0.8	
MINE	9999	11	3	26	284	0.8	
							4228
NESC	20	22	1.5	20	213	0.6	
NESC	20	22	1.5	20	213	0.6	
NESC	55	49	2	59	633	0.6	
NESC	6	11	2	13	142	0.6	
NESC	10	2	1.5	2	19	0.6	
NESC	5	3	1.5	3	29	0.6	
							1250
NUMT	4	4	2	5	52	0.6	

NUMT	8	5	4	12	129	0.6
NUMT	8	2		0	0	0.6
NUMT	4	4	2	5	52	0.6
NUMT	4	1	2	1	13	0.6
NUMT	4	4	2	5	52	0.6
NURS	34	34	2	20	220	0.3
NURS	34	35	2	21	226	0.3
NURS	34	33	2	20	213	0.3
NURS	33	25	2	15	161	0.3
NURS	12	13	4	16	168	0.3
NURS	12	14	4	17	181	0.3
NURS	12	12	4	14	155	0.3
NURS	12	12	4	14	155	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	10	10	2	6	65	0.3
NURS	12	8	4	10	103	0.3
NURS	10	10	2	6	65	0.3
NURS	7	7	4	8	90	0.3
NURS	12	11	2	7	71	0.3
NURS	11	9	2	5	58	0.3
NURS	11	10	2	6	65	0.3
NURS	17	12	2	7	78	0.3
NURS	17	17	2	10	110	0.3
NURS	17	17	2	10	110	0.3
NURS	17	17	2	10	110	0.3
NURS	17	17	2	10	110	0.3
NURS	17	17	2	10	110	0.3
NURS	17	17	2	10	110	0.3
NURS	16	13	2	8	84	0.3
NURS	16	15	2	9	97	0.3
NURS	4	0	4	0	0	0.3
NURS	8	8	4	10	103	0.3
NURS	6	5		0	0	0.3
NURS	12	12	2	7	78	0.3
NURS	12	7	2	4	45	0.3
NURS	10	10	2	6	65	0.3
NURS	10	9	2	5	58	0.3
NURS	10	3	2	2	19	0.3
OCEA	5	0	2	0	0	0.6
OCEA	15	0	2	0	0	0.6
PETR	30	6	2	10	103	0.8
PHAR	95	87	3	157	1686	0.6
PHAR	95	92	3	166	1783	0.6
PHYC	20	15	3	27	291	0.6

297

3733

0

103

3468

PHYC	51	42	3	76	814	0.6
PHYC	52	43	3	77	833	0.6
PHYC	52	43	3	77	833	0.6
PHYC	50	39	3	70	756	0.6
PHYC	51	36	3	65	698	0.6
PHYC	48	43	3	77	833	0.6
PHYC	70	42	3	76	814	0.6
PHYC	45	42	3	76	814	0.6
PHYC	70	45	3	81	872	0.6
PHYC	50	27	3	49	523	0.6
PHYC	35	25	3	45	484	0.6
PHYC	40	31	3	56	601	0.6
PHYC	10	15	3	27	291	0.6
PHYC	43	37	3	67	717	0.6
PHYC	10	4	3	7	78	0.6
PHYC	30	25	3	45	484	0.6
PHYC	5	1	3	2	19	0.6
PHYC	38	31	3	56	601	0.6
PHYC	1	5	3	9	97	0.6
PHYC	15	14	1	8	90	0.6
PHYC	9998	1	1	1	6	0.6
PHYC	1	1	3	2	19	0.6
PHYC	5	0	3	0	0	0.6
PHYC	5	1	3	2	19	0.6
PHYC	5	1	3	2	19	0.6
PHYC	2	1	3	2	19	0.6
PHYC	9999	3		0	0	0.6
PHYC	48	50	3	90	969	0.6
PHYC	1	1	3	2	19	0.6
PHYC	9999	0		0	0	0.6
PHYC	9999	0		0	0	0.6
PHYC	9999	2		0	0	0.6
PHYC	9999	0		0	0	0.6
PHYL	9998	5		0	0	0.6
PHYL	9998	0		0	0	0.6
PHYL	60	38	2	46	491	0.6
PHYL	60	28	2	34	362	0.6
PLAN	45	44	3	79	853	0.6
PSYO	10	13	2	13	140	0.5
PSYO	10	20	2	20	215	0.5
PSYO	10	16	2	16	172	0.5
PSYO	10	16	2	16	172	0.5
PSYO	10	17	2	17	183	0.5
PSYO	10	17	2	17	183	0.5
PSYO	10	15	2	15	161	0.5
PSYO	10	16	2	16	172	0.5
PSYO	10	18	2	18	194	0.5
PSYO	10	18	2	18	194	0.5
PSYO	20	0	2	0	0	0.5
PSYO	20	14	2	14	151	0.5
PSYO	9	6	2	6	65	0.5
PSYO	20	11	1.5	8	89	0.5

12614

853

853

PSYO	15	4	1.5	3	32	0.5	
							2123
RADT	17	17	3	31	329	0.6	
RADT	6	6	3	11	116	0.6	
RADT	6	6	3	11	116	0.6	
RADT	17	16	1.5	14	155	0.6	
RADT	5	5	3	9	97	0.6	
RADT	5	5	3	9	97	0.6	
RADT	6	6	3	11	116	0.6	
RADT	6	5	3	9	97	0.6	
							1124
RSPT	15	8	3	14	155	0.6	
RSPT	10	7	2	8	90	0.6	
RSPT	15	12	3	22	233	0.6	
RSPT	15	9	1.5	8	87	0.6	
RSPT	15	13	3	23	252	0.6	
RSPT	15	3	1.5	3	29	0.6	
RSPT	15	12	2	14	155	0.6	
RSPT	99	6	3	11	116	0.6	
RSPT	99	6	3	11	116	0.6	
							1234
THEA	24	16	1.5	14	155	0.6	
THEA	24	19	1.5	17	184	0.6	
THEA	24	15	1.5	14	145	0.6	
THEA	24	15	1.5	14	145	0.6	
THEA	30	10	2	12	129	0.6	
							759
10694	1233	**16,357**			176,068		**176,068**
		SM			**SF**		**SF**

DALHOUSIE MASTER PLAN
APPENDIX B - PROJECTED INCREASE IN UNDERGRADUATE LAB SPACE USED IN COU CALCULATIONS

THIS TABLE IS USED IN CALCULATIONS IN APPENDIX C
PROJECTED INCREASE IN LAB *(UNDERGRADUATE)* SPACE (COU CATEGORY 2)
ANALYSIS BASED ON WEEKLY SCHEDULED CONTACT LAB HOURS (WSCLH) IN APPENDIX A

FACULTY	COU Generated Lab Space (NASF) Based on WSCLH for Fall 2008	Enrolment Fall 2008	Equiv. FTEs Fall 2008	Lab Space (NASF) Per FTE	Projected FTE's 2013	Projected Increase in TFE's (2008 to 2013)	Projected Increase in Lab Space (NASF) By 2013	Major Lab Group
Architecture and Planning	853	253	223	3.818972928	233	10	**37**	X
Arts and Social Sciences	759	2665	2351	0.322725902	2754	403	**130**	Z
Computer Science	1133	242	214	5.308293466	224	10	**56**	Z
Dentistry	N/A	247	218	N/A	247	29	**N/A**	
Engineering	63024	1280	1129	55.80269071	1137	8	**423**	W
Health Professions	13653	2011	1774	7.694297283	1918	144	**1105**	X
Law	N/A	455	401	N/A	457	56	**N/A**	
Management	3656	1325	1169	3.126754062	2238	1069	**3342**	Z
Medicine	4805	391	345	13.92801892	443	98	**1365**	X
Science	88185	2695	2378	37.08465975	2906	528	**19583**	X
Interdisciplinary/Multi Faculty	N/A	61	54	N/A	47	-7	**N/A**	
TOTALS	**176,068**	**11625**	**10257**	**127**	**12604**	**2347**	**26,041**	

5-Yr. Incremental Increase

WSLCH Reference calculations in Appendix A
FTE Conversion Factor 0.882353

Year 2008	Year 2013	Year 2018	Year 2024	Year 2029	Year 2034	
176,068	**202,109**	**228,150**	**254,191**	**280,232**	**306,273**	**(NASF)**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2008 ENROLMENT (15277 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	13480	FTE Students	16,580	**178,472**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**176,068**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1197.562	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	53,890		
	Group B	30	NASM	243.005	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,290		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	114.72	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,147		
	Group E	1	NASM	701.82	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	702	**678,466**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1177	FTE Faculty + 15% Allowance	15,305		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	590	FTE Academic Staff Requiring Offices	7,670		
	Office Services	25%	NASM	25%	25% of above	8,769	**471,970**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	13480	FTE Students	8,088		
	Student Computer Rooms	0.08	NASM	10257	FTE Undergraduate Students	821		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	1244260	EV for rest of collection	6,221		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	4552	**253,843**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	13480	FTE Students	12,132		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**130,589**	Check
7	**Food Services**							
	Low Range	0.5	NASM	13480	FTE Students	6,740		
	High Range	0.7	NASM		FTE Students	0	**72,550**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	13480	FTE Students	6,740		
	High Range	0.7	NASM		FTE Students	0	**72,550**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	3,001	**32,303**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	832	FTE Non-Academic Staff Requiring Offices	10,816		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	5,408	**174,639**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	13480	FTE Students	674		
	High Range	0.35	NASM		FTE Students	0	**7,255**	
12	**Central Services**							
	Low Range	0.1	NASM	13480	FTE Students	1,348		
	High Range	0.3	NASM		FTE Students	0	**14,510**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	13480	FTE Students	404		
	High Range	0.05	NASM		FTE Students	0	**4,353**	

14	**Student Activity Space**						
	Low Range	0.5	NASM	13480	FTE Students	6,740	
	High Range	0.7	NASM		FTE Students	0	**72,550**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	13480	FTE Students	2,022	
	High Range	0.4	NASM		FTE Students	0	**21,765**

TOTAL NASF 2,361,881

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM 219,419

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: INCREMENTAL INCREASE OF 2,506 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	2211	FTE Students	2,720	**29,276**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**26,041**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	62.95102909	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	2,833		
	Group B	30	NASM	0.488353687	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	15		Approx.
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		2% / Yr.
	Group D	10	NASM	0.806810519	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	8		of
	Group E	1	NASM	73.56508316	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	74	**31,529**	Existing
4	**Academic Office & Related Space**							
	Faculty	13	NASM	158	FTE Faculty + 15% Allowance	2,060		
	Other Research Appointments	13	NASM	0	FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM	0	FTE Graduate Students	0		
	Non-Academic Staff	13	NASM	97	FTE Academic Staff Requiring Offices	1,258		
	Office Services	25%	NASM	25%	25% of above	830	**44,651**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	2211	FTE Students	1,327		
	Student Computer Rooms	0.08	NASM	2211	FTE Undergraduate Students	177		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	125000	EV for 0-300,000 volumes	875		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	550	**31,529**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	2211	FTE Students	1,990		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**21,422**	Check
7	**Food Services**							
	Low Range	0.5	NASM	2211	FTE Students	1,106		
	High Range	0.7	NASM		FTE Students	0	**11,901**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	2211	FTE Students	1,106		
	High Range	0.7	NASM		FTE Students	0	**11,901**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	321	**3,459**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	136	FTE Non-Academic Staff Requiring Offices	1,774		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	887	**28,647**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	2211	FTE Students	111		
	High Range	0.35	NASM		FTE Students	0	**1,190**	
12	**Central Services**							
	Low Range	0.1	NASM	2211	FTE Students	221		
	High Range	0.3	NASM		FTE Students	0	**2,380**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	2211	FTE Students	66		
	High Range	0.05	NASM		FTE Students	0	**714**	

DALHOUSIE UNIVERSITY MASTER PLAN
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14	**Student Activity Space**						
	Low Range	0.5	NASM	2211	FTE Students	1,106	
	High Range	0.7	NASM		FTE Students	0	**11,901**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	2211	FTE Students	332	
	High Range	0.4	NASM		FTE Students	0	**3,570**

TOTAL NASF **260,111**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **24,164**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF ARCHITECTURE AND PLANNING
INPUT: INCREMENTAL INCREASE OF 11 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	10	FTE Students	12	**129**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**37**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	0.679163345	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1	**7**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1	FTE Faculty + 15% Allowance	10		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	3	**137**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	10	FTE Students	6		
	Student Computer Rooms	0.08	NASM	10	FTE Undergraduate Students	1		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	550	EV for 0-300,000 volumes	4		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	2	**139**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	10	FTE Students	9		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**94**	Check
7	**Food Services**							
	Low Range	0.5	NASM	10	FTE Students	5		
	High Range	0.7	NASM		FTE Students	0	**52**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	10	FTE Students	5		
	High Range	0.7	NASM		FTE Students	0	**52**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	1	**10**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	10	FTE Students	0		
	High Range	0.35	NASM		FTE Students	0	**5**	
12	**Central Services**							
	Low Range	0.1	NASM	10	FTE Students	1		
	High Range	0.3	NASM		FTE Students	0	**10**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	10	FTE Students	0		
	High Range	0.05	NASM		FTE Students	0	**3**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	10	FTE Students	5	
	High Range	0.7	NASM		FTE Students	0	**52**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	10	FTE Students	1	
	High Range	0.4	NASM		FTE Students	0	**16**

TOTAL NASF **744**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **69**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF ENGINEERING
INPUT: INCREMENTAL INCREASE OF 9 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	8	FTE Students	10	**105**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**423**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM	0.488353687	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	15		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**158**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	0	FTE Faculty + 15% Allowance	6		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	2	**85**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	8	FTE Students	5		
	Student Computer Rooms	0.08	NASM	8	FTE Undergraduate Students	1		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	450	EV for 0-300,000 volumes	3		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	2	**113**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	8	FTE Students	7		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**77**	Check
7	**Food Services**							
	Low Range	0.5	NASM	8	FTE Students	4		
	High Range	0.7	NASM		FTE Students	0	**43**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	8	FTE Students	4		
	High Range	0.7	NASM		FTE Students	0	**43**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	1	**10**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	8	FTE Students	0		
	High Range	0.35	NASM		FTE Students	0	**4**	
12	**Central Services**							
	Low Range	0.1	NASM	8	FTE Students	1		
	High Range	0.3	NASM		FTE Students	0	**9**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	8	FTE Students	0		
	High Range	0.05	NASM		FTE Students	0	**3**	

14	**Student Activity Space**						
	Low Range	0.5	NASM	8	FTE Students	4	
	High Range	0.7	NASM		FTE Students	0	**43**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	8	FTE Students	1	
	High Range	0.4	NASM		FTE Students	0	**13**

TOTAL NASF **1,129**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **105**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF ARTS AND SOCIAL SCIENCES
INPUT: INCREMENTAL INCREASE OF 456 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	402	FTE Students	495	**5,327**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**130**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	25.92975521	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	26	**279**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	26	FTE Faculty + 15% Allowance	337		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	84	**4,536**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	402	FTE Students	241		
	Student Computer Rooms	0.08	NASM	402	FTE Undergraduate Students	32		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	22800	EV for 0-300,000 volumes	160		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	100	**5,742**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	402	FTE Students	362		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**3,898**	Check
7	**Food Services**							
	Low Range	0.5	NASM	402	FTE Students	201		
	High Range	0.7	NASM		FTE Students	0	**2,166**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	402	FTE Students	201		
	High Range	0.7	NASM		FTE Students	0	**2,166**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	39	**416**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	402	FTE Students	20		
	High Range	0.35	NASM		FTE Students	0	**217**	
12	**Central Services**							
	Low Range	0.1	NASM	402	FTE Students	40		
	High Range	0.3	NASM		FTE Students	0	**433**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	402	FTE Students	12		
	High Range	0.05	NASM		FTE Students	0	**130**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	402	FTE Students	201	
	High Range	0.7	NASM		FTE Students	0	**2,166**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	402	FTE Students	60	
	High Range	0.4	NASM		FTE Students	0	**650**

TOTAL NASF **28,253**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **2,625**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF COMPUTER SCIENCE
INPUT: INCREMENTAL INCREASE OF 12 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	11	FTE Students	13	**140**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**56**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	0.806810519	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	8		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**87**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1	FTE Faculty + 15% Allowance	12		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	3	**162**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	11	FTE Students	6		
	Student Computer Rooms	0.08	NASM	11	FTE Undergraduate Students	1		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	600	EV for 0-300,000 volumes	4		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	3	**151**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	11	FTE Students	10		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**103**	Check
7	**Food Services**							
	Low Range	0.5	NASM	11	FTE Students	5		
	High Range	0.7	NASM		FTE Students	0	**57**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	11	FTE Students	5		
	High Range	0.7	NASM		FTE Students	0	**57**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	1	**13**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	11	FTE Students	1		
	High Range	0.35	NASM		FTE Students	0	**6**	
12	**Central Services**							
	Low Range	0.1	NASM	11	FTE Students	1		
	High Range	0.3	NASM		FTE Students	0	**11**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	11	FTE Students	0		
	High Range	0.05	NASM		FTE Students	0	**3**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	11	FTE Students	5	
	High Range	0.7	NASM		FTE Students	0	**57**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	11	FTE Students	2	
	High Range	0.4	NASM		FTE Students	0	**17**

TOTAL NASF **920**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **85**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF LAW
INPUT: INCREMENTAL INCREASE OF 2 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	2	FTE Students	2	**23**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**0**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	0.161887974	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**2**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	0	FTE Faculty + 15% Allowance	2		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	1	**33**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	2	FTE Students	1		
	Student Computer Rooms	0.08	NASM	2	FTE Undergraduate Students	0		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	100	EV for 0-300,000 volumes	1		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	0	**25**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	2	FTE Students	2		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**17**	Check
7	**Food Services**							
	Low Range	0.5	NASM	2	FTE Students	1		
	High Range	0.7	NASM		FTE Students	0	**9**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	2	FTE Students	1		
	High Range	0.7	NASM		FTE Students	0	**9**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	0	**2**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	2	FTE Students	0		
	High Range	0.35	NASM		FTE Students	0	**1**	
12	**Central Services**							
	Low Range	0.1	NASM	2	FTE Students	0		
	High Range	0.3	NASM		FTE Students	0	**2**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	2	FTE Students	0		
	High Range	0.05	NASM		FTE Students	0	**1**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	2	FTE Students	1	
	High Range	0.7	NASM		FTE Students	0	**9**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	2	FTE Students	0	
	High Range	0.4	NASM		FTE Students	0	**3**

TOTAL NASF **137**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **13**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF MANAGEMENT
INPUT: INCREMENTAL INCREASE OF 1211 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	1069	FTE Students	1,314	**14,147**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**3,342**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	46.79427662	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	47	**504**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	54	FTE Faculty + 15% Allowance	700		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	175	**9,413**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	1069	FTE Students	641		
	Student Computer Rooms	0.08	NASM	1069	FTE Undergraduate Students	85		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	60550	EV for 0-300,000 volumes	424		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	266	**15,250**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	1069	FTE Students	962		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**10,352**	Check
7	**Food Services**							
	Low Range	0.5	NASM	1069	FTE Students	534		
	High Range	0.7	NASM		FTE Students	0	**5,751**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	1069	FTE Students	534		
	High Range	0.7	NASM		FTE Students	0	**5,751**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	99	**1,061**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	1069	FTE Students	53		
	High Range	0.35	NASM		FTE Students	0	**575**	
12	**Central Services**							
	Low Range	0.1	NASM	1069	FTE Students	107		
	High Range	0.3	NASM		FTE Students	0	**1,150**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	1069	FTE Students	32		
	High Range	0.05	NASM		FTE Students	0	**345**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	1069	FTE Students	534	
	High Range	0.7	NASM		FTE Students	0	**5,751**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	1069	FTE Students	160	
	High Range	0.4	NASM		FTE Students	0	**1,725**

TOTAL NASF **75,117**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **6,978**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF SCIENCE
INPUT: INCREMENTAL INCREASE OF 598 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	528	FTE Students	649	**6,986**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**19,583**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	37.39502126	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,683		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**18,114**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	43	FTE Faculty + 15% Allowance	559		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	140	**7,522**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	528	FTE Students	317		
	Student Computer Rooms	0.08	NASM	528	FTE Undergraduate Students	42		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	29900	EV for 0-300,000 volumes	209		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	131	**7,530**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	528	FTE Students	475		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**5,112**	Check
7	**Food Services**							
	Low Range	0.5	NASM	528	FTE Students	264		
	High Range	0.7	NASM		FTE Students	0	**2,840**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	528	FTE Students	264		
	High Range	0.7	NASM		FTE Students	0	**2,840**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	78	**835**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	528	FTE Students	26		
	High Range	0.35	NASM		FTE Students	0	**284**	
12	**Central Services**							
	Low Range	0.1	NASM	528	FTE Students	53		
	High Range	0.3	NASM		FTE Students	0	**568**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	528	FTE Students	16		
	High Range	0.05	NASM		FTE Students	0	**170**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	528	FTE Students	264	
	High Range	0.7	NASM		FTE Students	0	**2,840**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	528	FTE Students	79	
	High Range	0.4	NASM		FTE Students	0	**852**

TOTAL NASF **76,076**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **7,067**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF DENTISTRY
INPUT: INCREMENTAL INCREASE OF 0 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	0	FTE Students	0	**0**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**0**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**0**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	0	FTE Faculty + 15% Allowance	0		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	0	**0**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	0	FTE Students	0		
	Student Computer Rooms	0.08	NASM	0	FTE Undergraduate Students	0		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	0	EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	0	**0**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	0	FTE Students	0		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**0**	Check
7	**Food Services**							
	Low Range	0.5	NASM	0	FTE Students	0		
	High Range	0.7	NASM		FTE Students	0	**0**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	0	FTE Students	0		
	High Range	0.7	NASM		FTE Students	0	**0**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	0	**0**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	0	FTE Students	0		
	High Range	0.35	NASM		FTE Students	0	**0**	
12	**Central Services**							
	Low Range	0.1	NASM	0	FTE Students	0		
	High Range	0.3	NASM		FTE Students	0	**0**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	0	FTE Students	0		
	High Range	0.05	NASM		FTE Students	0	**0**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	0	FTE Students	0	
	High Range	0.7	NASM		FTE Students	0	**0**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	0	FTE Students	0	
	High Range	0.4	NASM		FTE Students	0	**0**

TOTAL NASF **0**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **-**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF HEALTH PROFESSIONS
INPUT: INCREMENTAL INCREASE OF 163 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	144	FTE Students	177	**1,904**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**1,105**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	9.243628966	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	416		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**4,478**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	9	FTE Faculty + 15% Allowance	120		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	30	**1,617**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	144	FTE Students	86		
	Student Computer Rooms	0.08	NASM	144	FTE Undergraduate Students	12		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	8150	EV for 0-300,000 volumes	57		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	36	**2,053**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	144	FTE Students	129		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**1,393**	Check
7	**Food Services**							
	Low Range	0.5	NASM	144	FTE Students	72		
	High Range	0.7	NASM		FTE Students	0	**774**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	144	FTE Students	72		
	High Range	0.7	NASM		FTE Students	0	**774**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	20	**214**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	144	FTE Students	7		
	High Range	0.35	NASM		FTE Students	0	**77**	
12	**Central Services**							
	Low Range	0.1	NASM	144	FTE Students	14		
	High Range	0.3	NASM		FTE Students	0	**155**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	144	FTE Students	4		
	High Range	0.05	NASM		FTE Students	0	**46**	

14	**Student Activity Space**						
	Low Range	0.5	NASM	144	FTE Students	72	
	High Range	0.7	NASM		FTE Students	0	**774**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	144	FTE Students	22	
	High Range	0.4	NASM		FTE Students	0	**232**

TOTAL NASF **15,597**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **1,449**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

FACULTY OF MEDICINE
INPUT: INCREMENTAL INCREASE OF 52 STUDENTS BY YEAR 2013

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	46	FTE Students	56	**607**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**1,365**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	16.31237886	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	734		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**7,902**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	19	FTE Faculty + 15% Allowance	244		
	Other Research Appointments	13	NASM		FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM		FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	61	**3,281**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	46	FTE Students	28		
	Student Computer Rooms	0.08	NASM	46	FTE Undergraduate Students	4		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	2600	EV for 0-300,000 volumes	18		
	Stack Remainder 2	0.006	NASM	0	EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM	0	EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	11	**655**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	46	FTE Students	41		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**445**	Check
7	**Food Services**							
	Low Range	0.5	NASM	46	FTE Students	23		
	High Range	0.7	NASM		FTE Students	0	**247**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	46	FTE Students	23		
	High Range	0.7	NASM		FTE Students	0	**247**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	19	**207**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	46	FTE Students	2		
	High Range	0.35	NASM		FTE Students	0	**25**	
12	**Central Services**							
	Low Range	0.1	NASM	46	FTE Students	5		
	High Range	0.3	NASM		FTE Students	0	**49**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	46	FTE Students	1		
	High Range	0.05	NASM		FTE Students	0	**15**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	46	FTE Students	23	
	High Range	0.7	NASM		FTE Students	0	**247**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	46	FTE Students	7	
	High Range	0.4	NASM		FTE Students	0	**74**

TOTAL NASF **15,365**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **1,427**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2013 ENROLMENT (17783 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	15691	FTE Students	19,300	**207,748**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**202,109**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1260.513029	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	56,723		
	Group B	30	NASM	243.4933537	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,305		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	115.5268105	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,155		
	Group E	1	NASM	775.3850832	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	775	**709,995**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1359.056518	FTE Faculty + 15% Allowance	17,668		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	687	FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	7,442	**400,553**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	15691	FTE Students	9,415		
	Student Computer Rooms	0.08	NASM	12469	FTE Undergraduate Students	997		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	1369560	EV for rest of collection	6,848		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	5041	**282,028**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	15691	FTE Students	14,122		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**152,011**	Check
7	**Food Services**							
	Low Range	0.5	NASM	15691	FTE Students	7,845		
	High Range	0.7	NASM		FTE Students	0	**84,450**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	15691	FTE Students	7,845		
	High Range	0.7	NASM		FTE Students	0	**84,450**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	3,156	**33,971**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	968	FTE Non-Academic Staff Requiring Offices	12,590		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	6,295	**203,287**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	15691	FTE Students	785		
	High Range	0.35	NASM		FTE Students	0	**8,445**	
12	**Central Services**							
	Low Range	0.1	NASM	15691	FTE Students	1,569		
	High Range	0.3	NASM		FTE Students	0	**16,890**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	15691	FTE Students	471		
	High Range	0.05	NASM		FTE Students	0	**5,067**	

DALHOUSIE UNIVERSITY MASTER PLAN
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14	**Student Activity Space**						
	Low Range	0.5	NASM	15691	FTE Students	7,845	
	High Range	0.7	NASM		FTE Students	0	**84,450**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	15691	FTE Students	2,354	
	High Range	0.4	NASM		FTE Students	0	**25,335**

TOTAL NASF **2,500,789**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **232,323**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2018 ENROLMENT (20289 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	17902	FTE Students	22,020	**237,024**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**228,150**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1323.464058	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	59,556		
	Group B	30	NASM	243.9817074	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,319		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	116.333621	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,163		
	Group E	1	NASM	848.9501663	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	849	**741,524**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1320	FTE Faculty + 15% Allowance	17,155		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	784	FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	7,314	**393,651**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	17902	FTE Students	10,741		
	Student Computer Rooms	0.08	NASM	14680	FTE Undergraduate Students	1,174		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	1494860	EV for rest of collection	7,474		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	5529	**310,213**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	17902	FTE Students	16,112		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**173,432**	Check
7	**Food Services**							
	Low Range	0.5	NASM	17902	FTE Students	8,951		
	High Range	0.7	NASM		FTE Students	0	**96,351**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	17902	FTE Students	8,951		
	High Range	0.7	NASM		FTE Students	0	**96,351**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	3,401	**36,606**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	1105	FTE Non-Academic Staff Requiring Offices	14,364		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	7,182	**231,934**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	17902	FTE Students	895		
	High Range	0.35	NASM		FTE Students	0	**9,635**	
12	**Central Services**							
	Low Range	0.1	NASM	17902	FTE Students	1,790		
	High Range	0.3	NASM		FTE Students	0	**19,270**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	17902	FTE Students	537		
	High Range	0.05	NASM		FTE Students	0	**5,781**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	17902	FTE Students	8,951	
	High Range	0.7	NASM		FTE Students	0	**96,351**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	17902	FTE Students	2,685	
	High Range	0.4	NASM		FTE Students	0	**28,905**

TOTAL NASF **2,705,181**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **251,311**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2024 ENROLMENT (22795 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	20113	FTE Students	24,739	**266,300**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**254,191**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1386.415087	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	62,389		
	Group B	30	NASM	244.4700611	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,334		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	117.1404316	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,171		
	Group E	1	NASM	922.5152495	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	923	**773,054**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1457	FTE Faculty + 15% Allowance	18,946		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	880	FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	7,762	**417,757**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	20113	FTE Students	12,068		
	Student Computer Rooms	0.08	NASM	16891	FTE Undergraduate Students	1,351		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	1620160	EV for rest of collection	8,101		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	6017	**338,398**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	20113	FTE Students	18,102		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**194,854**	Check
7	**Food Services**							
	Low Range	0.5	NASM	20113	FTE Students	10,057		
	High Range	0.7	NASM		FTE Students	0	**108,252**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	20113	FTE Students	10,057		
	High Range	0.7	NASM		FTE Students	0	**108,252**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	3,689	**39,707**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	1241	FTE Non-Academic Staff Requiring Offices	16,139		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	8,069	**260,582**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	20113	FTE Students	1,006		
	High Range	0.35	NASM		FTE Students	0	**10,825**	
12	**Central Services**							
	Low Range	0.1	NASM	20113	FTE Students	2,011		
	High Range	0.3	NASM		FTE Students	0	**21,650**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	20113	FTE Students	603		
	High Range	0.05	NASM		FTE Students	0	**6,495**	

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14	**Student Activity Space**						
	Low Range	0.5	NASM	20113	FTE Students	10,057	
	High Range	0.7	NASM		FTE Students	0	**108,252**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	20113	FTE Students	3,017	
	High Range	0.4	NASM		FTE Students	0	**32,476**

TOTAL NASF **2,941,045**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **273,223**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2029 ENROLMENT (25301 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	22324	FTE Students	27,459	**295,576**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**280,232**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1449.366116	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	65,221		
	Group B	30	NASM	244.9584147	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,349		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	117.9472421	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,179		
	Group E	1	NASM	996.0803326	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	996	**804,583**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1595	FTE Faculty + 15% Allowance	20,738		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	977	FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	8,210	**441,863**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	22324	FTE Students	13,395		
	Student Computer Rooms	0.08	NASM	19102	FTE Undergraduate Students	1,528		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	1745460	EV for rest of collection	8,727		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	6505	**366,583**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	22324	FTE Students	20,092		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**216,275**	Check
7	**Food Services**							
	Low Range	0.5	NASM	22324	FTE Students	11,162		
	High Range	0.7	NASM		FTE Students	0	**120,153**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	22324	FTE Students	11,162		
	High Range	0.7	NASM		FTE Students	0	**120,153**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	3,977	**42,808**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	1378	FTE Non-Academic Staff Requiring Offices	17,913		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	8,956	**289,229**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	22324	FTE Students	1,116		
	High Range	0.35	NASM		FTE Students	0	**12,015**	
12	**Central Services**							
	Low Range	0.1	NASM	22324	FTE Students	2,232		
	High Range	0.3	NASM		FTE Students	0	**24,031**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	22324	FTE Students	670		
	High Range	0.05	NASM		FTE Students	0	**7,209**	

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14	**Student Activity Space**						
	Low Range	0.5	NASM	22324	FTE Students	11,162	
	High Range	0.7	NASM		FTE Students	0	**120,153**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	22324	FTE Students	3,349	
	High Range	0.4	NASM		FTE Students	0	**36,046**

TOTAL NASF **3,176,909**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **295,135**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS

DALHOUSIE UNIVERSITY
INPUT: 2034 ENROLMENT (27807 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	24536	FTE Students	30,179	**324,852**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**306,273**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	1512.317145	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	68,054		
	Group B	30	NASM	245.4467684	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,363		
	Group C	20	NASM	0	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	118.7540526	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,188		
	Group E	1	NASM	1069.645416	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,070	**836,113**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	1733	FTE Faculty + 15% Allowance	22,529		
	Other Research Appointments	13	NASM	115	FTE Other Research Appointments	1,495		
	Graduate Sudents	4	NASM	2652	FTE Graduate Students	10,606		
	Non-Academic Staff	13	NASM	1074	FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	8,658	**465,969**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	24536	FTE Students	14,721		
	Student Computer Rooms	0.08	NASM	21313	FTE Undergraduate Students	1,705		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM	300000	EV for 0-300,000 volumes	2,100		
	Stack Remainder 2	0.006	NASM	300000	EV for next 300,000 volumes	1,800		
	Stack Remainder 3	0.005	NASM	2470760	EV for rest of collection	12,354		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	7744	**435,135**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	24536	FTE Students	22,082		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**237,697**	Check
7	**Food Services**							
	Low Range	0.5	NASM	24536	FTE Students	12,268		
	High Range	0.7	NASM		FTE Students	0	**132,054**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	24536	FTE Students	12,268		
	High Range	0.7	NASM		FTE Students	0	**132,054**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	4,321	**46,514**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM	1514	FTE Non-Academic Staff Requiring Offices	19,687		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	9,844	**317,876**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	24536	FTE Students	1,227		
	High Range	0.35	NASM		FTE Students	0	**13,205**	
12	**Central Services**							
	Low Range	0.1	NASM	24536	FTE Students	2,454		
	High Range	0.3	NASM		FTE Students	0	**26,411**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	24536	FTE Students	736		
	High Range	0.05	NASM		FTE Students	0	**7,923**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

14	**Student Activity Space**						
	Low Range	0.5	NASM	24536	FTE Students	12,268	
	High Range	0.7	NASM		FTE Students	0	**132,054**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	24536	FTE Students	3,680	
	High Range	0.4	NASM		FTE Students	0	**39,616**

TOTAL NASF **3,453,745**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **320,853**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF ARCHITECTURE AND PLANNING
INPUT: 2008 ENROLMENT (253 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	223	FTE Students	275	**2,956**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**853**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**0**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	28	FTE Faculty + 15% Allowance	363		
	Other Research Appointments	13	NASM	0	FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM	123	FTE Graduate Students	493		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	214	**11,515**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	223	FTE Students	134		
	Student Computer Rooms	0.08	NASM	223	FTE Undergraduate Students	18		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	33	**1,994**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	223	FTE Students	201		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**2,163**	Check
7	**Food Services**							
	Low Range	0.5	NASM	223	FTE Students	112		
	High Range	0.7	NASM		FTE Students	0	**1,201**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	223	FTE Students	112		
	High Range	0.7	NASM		FTE Students	0	**1,201**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	32	**345**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	223	FTE Students	11		
	High Range	0.35	NASM		FTE Students	0	**120**	
12	**Central Services**							
	Low Range	0.1	NASM	223	FTE Students	22		
	High Range	0.3	NASM		FTE Students	0	**240**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	223	FTE Students	7		
	High Range	0.05	NASM		FTE Students	0	**72**	

14	**Student Activity Space**						
	Low Range	0.5	NASM	223	FTE Students	112	
	High Range	0.7	NASM		FTE Students	0	**1,201**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	223	FTE Students	33	
	High Range	0.4	NASM		FTE Students	0	**360**

TOTAL NASF **24,223**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **2,250**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF ENGINEERING
INPUT: 2008 ENROLMENT (1280 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	1129	FTE Students	1,389	**14,953**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**63,024**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM	243.005	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	7,290		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**78,473**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	101	FTE Faculty + 15% Allowance	1,314		
	Other Research Appointments	13	NASM	11	FTE Other Research Appointments	143		
	Graduate Sudents	4	NASM	299	FTE Graduate Students	1,197		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	663	**35,706**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	1129	FTE Students	678		
	Student Computer Rooms	0.08	NASM	1129	FTE Undergraduate Students	90		

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	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	169	**10,091**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	1129	FTE Students	1,016		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**10,942**	Check
7	**Food Services**							
	Low Range	0.5	NASM	1129	FTE Students	565		
	High Range	0.7	NASM		FTE Students	0	**6,079**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	1129	FTE Students	565		
	High Range	0.7	NASM		FTE Students	0	**6,079**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	240	**2,586**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	1129	FTE Students	56		
	High Range	0.35	NASM		FTE Students	0	**608**	
12	**Central Services**							
	Low Range	0.1	NASM	1129	FTE Students	113		
	High Range	0.3	NASM		FTE Students	0	**1,216**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	1129	FTE Students	34		
	High Range	0.05	NASM		FTE Students	0	**365**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	1129	FTE Students	565		
	High Range	0.7	NASM		FTE Students	0	**6,079**	
15	**Assembly & Exhibition Facilities**							
	Low Range	0.15	NASM	1129	FTE Students	169		
	High Range	0.4	NASM		FTE Students	0	**1,824**	

TOTAL NASF	**238,023**
NASM to NASF Conversion Factor	10.76426265
TOTAL NASM	**22,112**

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF ARTS & SOCIAL SCIENCES
INPUT: 2008 ENROLMENT (2665 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	2351	FTE Students	2,892	**31,134**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**759**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**0**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	190	FTE Faculty + 15% Allowance	2,466		
	Other Research Appointments	13	NASM	1	FTE Other Research Appointments	13		
	Graduate Sudents	4	NASM	209	FTE Graduate Students	834		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	828	**44,585**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	2351	FTE Students	1,411		
	Student Computer Rooms	0.08	NASM	2351	FTE Undergraduate Students	188		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	353	**21,009**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	2351	FTE Students	2,116		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**22,781**	Check
7	**Food Services**							
	Low Range	0.5	NASM	2351	FTE Students	1,176		
	High Range	0.7	NASM		FTE Students	0	**12,656**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	2351	FTE Students	1,176		
	High Range	0.7	NASM		FTE Students	0	**12,656**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	231	**2,487**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	2351	FTE Students	118		
	High Range	0.35	NASM		FTE Students	0	**1,266**	
12	**Central Services**							
	Low Range	0.1	NASM	2351	FTE Students	235		
	High Range	0.3	NASM		FTE Students	0	**2,531**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	2351	FTE Students	71		
	High Range	0.05	NASM		FTE Students	0	**759**	

14	**Student Activity Space**						
	Low Range	0.5	NASM	2351	FTE Students	1,176	
	High Range	0.7	NASM		FTE Students	0	**12,656**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	2351	FTE Students	353	
	High Range	0.4	NASM		FTE Students	0	**3,797**

TOTAL NASF **169,075**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **15,707**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF COMPUTER SCIENCES
INPUT: 2008 ENROLMENT (242 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	214	FTE Students	263	**2,827**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**1,133**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM	114.72	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,147		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**12,349**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	34	FTE Faculty + 15% Allowance	438		
	Other Research Appointments	13	NASM	0	FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM	171	FTE Graduate Students	683		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	280	**15,088**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	214	FTE Students	128		
	Student Computer Rooms	0.08	NASM	214	FTE Undergraduate Students	17		

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	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	32	**1,908**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	214	FTE Students	192		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**2,069**	Check
7	**Food Services**							
	Low Range	0.5	NASM	214	FTE Students	107		
	High Range	0.7	NASM		FTE Students	0	**1,149**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	214	FTE Students	107		
	High Range	0.7	NASM		FTE Students	0	**1,149**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	54	**577**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	214	FTE Students	11		
	High Range	0.35	NASM		FTE Students	0	**115**	
12	**Central Services**							
	Low Range	0.1	NASM	214	FTE Students	21		
	High Range	0.3	NASM		FTE Students	0	**230**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	214	FTE Students	6		
	High Range	0.05	NASM		FTE Students	0	**69**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	214	FTE Students	107		
	High Range	0.7	NASM		FTE Students	0	**1,149**	
15	**Assembly & Exhibition Facilities**							
	Low Range	0.15	NASM	214	FTE Students	32		
	High Range	0.4	NASM		FTE Students	0	**345**	

TOTAL NASF **40,156**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **3,731**

FACULTY OF LAW

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

CALCULATIONS (TRANSFER Existing Space Categories ONLY) | **INPUT: 2008 ENROLMENT (455 STUDENTS)**

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	401	FTE Students	494	**5,315**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**0**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	50.83	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	51	**547**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	45	FTE Faculty + 15% Allowance	583		
	Other Research Appointments	13	NASM	0	FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM	24	FTE Graduate Students	95		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	169	**9,119**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	401	FTE Students	241		
	Student Computer Rooms	0.08	NASM	401	FTE Undergraduate Students	32		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	60	**3,587**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	401	FTE Students	361		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**3,889**	Check
7	**Food Services**							
	Low Range	0.5	NASM	401	FTE Students	201		
	High Range	0.7	NASM		FTE Students	0	**2,161**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	401	FTE Students	201		
	High Range	0.7	NASM		FTE Students	0	**2,161**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	42	**455**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	401	FTE Students	20		
	High Range	0.35	NASM		FTE Students	0	**216**	
12	**Central Services**							
	Low Range	0.1	NASM	401	FTE Students	40		
	High Range	0.3	NASM		FTE Students	0	**432**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	401	FTE Students	12		
	High Range	0.05	NASM		FTE Students	0	**130**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	401	FTE Students	201		

	High Range	0.7	NASM		FTE Students	0	**2,161**
15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	401	FTE Students	60	
	High Range	0.4	NASM		FTE Students	0	**648**

TOTAL NASF **30,821**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **2,863**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF MANAGEMENT
INPUT: 2008 ENROLMENT (1325 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	1169	FTE Students	1,438	**15,479**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**3,656**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM	295.335	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	295	**3,179**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	81	FTE Faculty + 15% Allowance	1,059		
	Other Research Appointments	13	NASM	1	FTE Other Research Appointments	13		
	Graduate Sudents	4	NASM	448	FTE Graduate Students	1,792		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	716	**38,534**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	1169	FTE Students	701		
	Student Computer Rooms	0.08	NASM	1169	FTE Undergraduate Students	94		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		

DALHOUSIE UNIVERSITY MASTER PLAN
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	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	175	**10,445**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	1169	FTE Students	1,052		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**11,326**	Check
7	**Food Services**							
	Low Range	0.5	NASM	1169	FTE Students	585		
	High Range	0.7	NASM		FTE Students	0	**6,292**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	1169	FTE Students	585		
	High Range	0.7	NASM		FTE Students	0	**6,292**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	142	**1,530**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	1169	FTE Students	58		
	High Range	0.35	NASM		FTE Students	0	**629**	
12	**Central Services**							
	Low Range	0.1	NASM	1169	FTE Students	117		
	High Range	0.3	NASM		FTE Students	0	**1,258**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	1169	FTE Students	35		
	High Range	0.05	NASM		FTE Students	0	**378**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	1169	FTE Students	585		
	High Range	0.7	NASM		FTE Students	0	**6,292**	
15	**Assembly & Exhibition Facilities**							
	Low Range	0.15	NASM	1169	FTE Students	175		
	High Range	0.4	NASM		FTE Students	0	**1,888**	

TOTAL NASF **107,180**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **9,957**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF SCIENCE
INPUT: 2008 ENROLMENT (2695 STUDENTS)

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	2378	FTE Students	2,925	**31,484**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**88,185**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	445.242	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	20,036		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**215,672**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	230	FTE Faculty + 15% Allowance	2,987		
	Other Research Appointments	13	NASM	50	FTE Other Research Appointments	650		
	Graduate Sudents	4	NASM	441	FTE Graduate Students	1,764		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	1,350	**72,664**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	2378	FTE Students	1,427		
	Student Computer Rooms	0.08	NASM	2378	FTE Undergraduate Students	190		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	357	**21,245**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	2378	FTE Students	2,140		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**23,037**	Check
7	**Food Services**							
	Low Range	0.5	NASM	2378	FTE Students	1,189		
	High Range	0.7	NASM		FTE Students	0	**12,798**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	2378	FTE Students	1,189		
	High Range	0.7	NASM		FTE Students	0	**12,798**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	573	**6,164**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	2378	FTE Students	119		
	High Range	0.35	NASM		FTE Students	0	**1,280**	
12	**Central Services**							
	Low Range	0.1	NASM	2378	FTE Students	238		
	High Range	0.3	NASM		FTE Students	0	**2,560**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	2378	FTE Students	71		
	High Range	0.05	NASM		FTE Students	0	**768**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	2378	FTE Students	1,189		
	High Range	0.7	NASM		FTE Students	0	**12,798**	

15	**Assembly & Exhibition Facilities**						
	Low Range	0.15	NASM	2378	FTE Students	357	
	High Range	0.4	NASM		FTE Students	0	**3,840**

TOTAL NASF 505,293

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM 46,942

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF DENTISTRY
INPUT: 2008 ENROLMENT (247 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	218	FTE Students	268	**2,886**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**0**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	41	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	1,845		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**19,860**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	47	FTE Faculty + 15% Allowance	613		
	Other Research Appointments	13	NASM	0	FTE Other Research Appointments	0		
	Graduate Sudents	4	NASM	0	FTE Graduate Students	0		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	153	**8,247**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	218	FTE Students	131		
	Student Computer Rooms	0.08	NASM	218	FTE Undergraduate Students	17		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	33	**1,947**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	218	FTE Students	196		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**2,111**	Check
7	**Food Services**							
	Low Range	0.5	NASM	218	FTE Students	109		
	High Range	0.7	NASM		FTE Students	0	**1,173**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	218	FTE Students	109		
	High Range	0.7	NASM		FTE Students	0	**1,173**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	55	**590**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	218	FTE Students	11		
	High Range	0.35	NASM		FTE Students	0	**117**	
12	**Central Services**							
	Low Range	0.1	NASM	218	FTE Students	22		
	High Range	0.3	NASM		FTE Students	0	**235**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	218	FTE Students	7		
	High Range	0.05	NASM		FTE Students	0	**70**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	218	FTE Students	109		
	High Range	0.7	NASM		FTE Students	0	**1,173**	
15	**Assembly & Exhibition Facilities**							
	Low Range	0.15	NASM	218	FTE Students	33		
	High Range	0.4	NASM		FTE Students	0	**352**	

TOTAL NASF	**39,935**
NASM to NASF Conversion Factor	10.76426265
TOTAL NASM	**3,710**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF HEALTH PROFESSIONS
INPUT: 2008 ENROLMENT (2011 STUDENTS)

			COU		**COU**	**Total COU**	

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

COU Cat. #	COU Space Category	COU Space Factor	Space Factor Description	COU Input Measure	Input Measure Description	Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	1774	FTE Students	2,183	**23,493**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**13,653**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	421.955	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	18,988		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**204,392**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	171.35	FTE Faculty + 15% Allowance	2,228		
	Other Research Appointments	13	NASM	2	FTE Other Research Appointments	26		
	Graduate Sudents	4	NASM	544	FTE Graduate Students	2,176		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	1,107	**59,596**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	1774	FTE Students	1,065		
	Student Computer Rooms	0.08	NASM	1774	FTE Undergraduate Students	142		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		
	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	266	**15,853**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	1774	FTE Students	1,597		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**17,190**	Check
7	**Food Services**							
	Low Range	0.5	NASM	1774	FTE Students	887		
	High Range	0.7	NASM		FTE Students	0	**9,550**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	1774	FTE Students	887		
	High Range	0.7	NASM		FTE Students	0	**9,550**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	495	**5,332**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	1774	FTE Students	89		
	High Range	0.35	NASM		FTE Students	0	**955**	
12	**Central Services**							
	Low Range	0.1	NASM	1774	FTE Students	177		
	High Range	0.3	NASM		FTE Students	0	**1,910**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	1774	FTE Students	53		
	High Range	0.05	NASM		FTE Students	0	**573**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	1774	FTE Students	887		
	High Range	0.7	NASM		FTE Students	0	**9,550**	
15	**Assembly & Exhibition Facilities**							

	Low Range	0.15	NASM	1774	FTE Students	266	
	High Range	0.4	NASM		FTE Students	0	**2,865**

TOTAL NASF **374,463**

NASM to NASF Conversion Factor 10.76426265

TOTAL NASM **34,788**

CALCULATIONS (TRANSFER Existing Space Categories ONLY)

FACULTY OF MEDICINE
INPUT: 2008 ENROLMENT (391 STUDENTS)

COU Cat. #	COU Space Category	COU Space Factor	COU Space Factor Description	COU Input Measure	COU Input Measure Description	Total COU Generated Space (NASM)	TOTALS IN (NASF)	
Formula Areas								
1	**Classroom Facilities**	1.23	NASM	345	FTE Students	424	**4,568**	
2	**Lab Undergraduate**							
	Group W	0.8	NASM	0	WSLCH	0		See
	Group X	0.6	NASM	0	WSLCH	0		WSCLH
	Group Y	0.5	NASM	0	WSLCH	0		See
	Group Z	0.3	NASM	0	WSLCH	0	**4,805**	WSCLH
3	**Lab Graduate & Faculty**							
	Group A	45	NASM	289.365	FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	13,021		
	Group B	30	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group C	20	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group D	10	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0		
	Group E	1	NASM		FTE Faculty + 0.5 Other Researchers + 0.5 Graduates	0	**140,166**	
4	**Academic Office & Related Space**							
	Faculty	13	NASM	210.45	FTE Faculty + 15% Allowance	2,736		
	Other Research Appointments	13	NASM	43	FTE Other Research Appointments	559		
	Graduate Sudents	4	NASM	170	FTE Graduate Students	679		
	Non-Academic Staff	13	NASM		FTE Academic Staff Requiring Offices	0		
	Office Services	25%	NASM	25%	25% of above	993	**53,468**	
5	**Campus Study Space & Library Facilities**							
	Study	0.6	NASM	345	FTE Students	207		
	Student Computer Rooms	0.08	NASM	345	FTE Undergraduate Students	28		
	Stack (Compact Storage)	0.004	NASM	0	EV for actual % of Collection in Compact Storage	0		
	Stack Remainder 1	0.007	NASM		EV for 0-300,000 volumes	0		
	Stack Remainder 2	0.006	NASM		EV for next 300,000 volumes	0		
	Stack Remainder 3	0.005	NASM		EV for rest of collection	0		

DALHOUSIE UNIVERSITY MASTER PLAN
APPENDIX C - CALCULATION BY COU STANDARDS METHOD

	Service	0.25	0.25x(Stack&Study)	No Input Required	25% of Stack and Study Totals	52	**3,082**	Atypical
6	**Recreation Athletic Space**							
	All Institutions	0.9	NASM	345	FTE Students	311		
	Institutions with less than 4,000 FTE	2000	NASM	No Input Required	PLUS ?			Check
	Institutions with 4,000 to 8,000 FTE	1000	NASM	No Input Required	PLUS ?	0	**3,342**	Check
7	**Food Services**							
	Low Range	0.5	NASM	345	FTE Students	173		
	High Range	0.7	NASM		FTE Students	0	**1,857**	
8	**Bookstore & Merchandizing Facilities**							
	Low Range	0.5	NASM	345	FTE Students	173		
	High Range	0.7	NASM		FTE Students	0	**1,857**	
9	**Plant Maintenance**	0.015	1.5% of Total NASM	No Input Required	Sum of NASM Categories 1-15 (& 17-20 if applied)	295	**3,171**	Atypical
10	**Administrative Offices & Related Space**							
	Administrative Offices	13	NASM		FTE Non-Academic Staff Requiring Offices	0		
	Office Services	0.5	50% of NASM	No Input Required	50% of Space Generated for Non-Academic Staff	0	**0**	Atypical
11	**AV/TV Facilities**							
	Low Range	0.05	NASM	345	FTE Students	17		
	High Range	0.35	NASM		FTE Students	0	**186**	
12	**Central Services**							
	Low Range	0.1	NASM	345	FTE Students	35		
	High Range	0.3	NASM		FTE Students	0	**371**	
13	**Health Service Facilities**							
	Low Range	0.03	NASM	345	FTE Students	10		
	High Range	0.05	NASM		FTE Students	0	**111**	
14	**Student Activity Space**							
	Low Range	0.5	NASM	345	FTE Students	173		
	High Range	0.7	NASM		FTE Students	0	**1,857**	
15	**Assembly & Exhibition Facilities**							
	Low Range	0.15	NASM	345	FTE Students	52		
	High Range	0.4	NASM		FTE Students	0	**557**	

TOTAL NASF	**219,399**
NASM to NASF Conversion Factor	10.76426265
TOTAL NASM	**20,382**

LIBRARY COLLECTION ASSUMPTIONS USED IN CALCULATIONS

	Average over 5 years		Totals over 5 years	
Average Yearly Growth is	25,000	EV	125,000	EV
Average Yearly Growth in Enrolment	501.2	Students	2506	Students

15277		
15470	193	students
15886	416	students
16436	550	students
17093	657	students
17783	690	students

Average Yearly New EV Per Student		49.88028731	New EV/Student	49.88028731	EV/Student
USE in Calculations for incremental grwoth		**50**	**EV/Student**		

0

Existing Volume	1,844,260	EV
	120.72	Existing EV/Student

T-3A ARCHITECTURE & PLANNING

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)
Formula Areas (NASF)				
1	Classroom Facilities	14,230	2,956	11,274
2	Lab Undergraduate	5,711	853	4,858
3	Lab Graduate & Faculty			0
4	Academic Office & Related Space	11,716	11,515	201
5	Campus Study Space & Library Facilities	749	1,994	(1,245)
6	Recreation Athletic Space			0
7	Food Services			0
8	Bookstore & Merchandizing Facilities			0
9	Plant Maintenance			0
10	Administrative Offices & Related Space			0
11	AV/TV Facilities			0
12	Central Services			0
13	Health Service Facilities			0
14	Student Activity Space	460	1,201	(741)
15	Assembly & Exhibition Facilities	2,527	360	2,167
Subtotal - Formula Areas		**35,393**	**18,880**	**16,513**
16	**Non-Assignable (SF)**			
Non-Formula Areas (NASF)				
17	Residential Space			
18	Animal Space			
19	Other			
20	Health Sciences Clinical Facilities			
Subtotal - Non-Formula Areas		-		
TOTALS		**35,393**		

TOTAL ASSIGNABLE SF **35,393**

TOTAL NON-ASSIGNABLE SF -

0% of Assignable

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T-3B ENGINEERING

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	2,341	14,953	(12,612)	SEE NOTE 3.11
2	Lab Undergraduate	35,497	63,024	(27,527)	
3	Lab Graduate & Faculty	6,444	78,473	(72,029)	
4	Academic Office & Related Space	28,322	35,706	(7,384)	
5	Campus Study Space & Library Facilities	600	10,091	(9,491)	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities			0	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space			0	
11	AV/TV Facilities			0	
12	Central Services			0	
13	Health Service Facilities			0	
14	Student Activity Space	6,271	6,079	192	
15	Assembly & Exhibition Facilities	153	1,824	(1,671)	
Subtotal - Formula Areas		**79,628**	**210,150**	**(130,522)**	
16	**Non-Assignable (SF)**	4,418			
Non-Formula Areas (NASF)					
17	Residential Space				
18	Animal Space				
19	Other	6,078			
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**6,078**			
TOTALS		**90,124**			
	TOTAL ASSIGNABLE SF	**85,706**			
	TOTAL NON-ASSIGNABLE SF	**4,418**			***5% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T-3C ARTS & SOCIAL SCIENCES

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	8,285	31,134	(22,849)	SEE NOTE 3.12
2	Lab Undergraduate	2,522	759	1,763	
3	Lab Graduate & Faculty			0	
4	Academic Office & Related Space	45,691	44,585	1,106	
5	Campus Study Space & Library Facilities	5,937		5,937	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities	531	12,656	(12,125)	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space	3,828	0	3,828	SEE NOTE 3.10
11	AV/TV Facilities			0	
12	Central Services			0	
13	Health Service Facilities			0	
14	Student Activity Space	1,043	12,656	(11,613)	
15	Assembly & Exhibition Facilities	26,813	3,797	23,016	
Subtotal - Formula Areas		**94,650**	**105,586**	**(10,936)**	
16	**Non-Assignable (SF)**	2,597			
Non-Formula Areas (NASF)					
17	Residential Space	70			
18	Animal Space				
19	Other				
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**70**			
TOTALS		**97,317**			
	TOTAL ASSIGNABLE SF	**94,720**			
	TOTAL NON-ASSIGNABLE SF	**2,597**			***3% of Assignable***

T-3D COMPUTER SCIENCE

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)
Formula Areas (NASF)				
1	Classroom Facilities	1,685	2,827	(1,142) SEE NOTE 3.12
2	Lab Undergraduate	3,743	1,133	2,610
3	Lab Graduate & Faculty	13,815	12,349	1,466
4	Academic Office & Related Space	11,495	15,088	(3,593)
5	Campus Study Space & Library Facilities	3,977	1,908	2,069
6	Recreation Athletic Space			0
7	Food Services			0
8	Bookstore & Merchandizing Facilities			0
9	Plant Maintenance			0
10	Administrative Offices & Related Space			0
11	AV/TV Facilities			0
12	Central Services	552	230	322
13	Health Service Facilities			0
14	Student Activity Space	406	1,149	(743)
15	Assembly & Exhibition Facilities			0
Subtotal - Formula Areas		**35,673**	**34,684**	**989**
16	**Non-Assignable (SF)**			
Non-Formula Areas (NASF)				
17	Residential Space			
18	Animal Space			
19	Other	210		
20	Health Sciences Clinical Facilities			
Subtotal - Non-Formula Areas		**210**		
TOTALS		**35,883**		

TOTAL ASSIGNABLE SF **35,883**

TOTAL NON-ASSIGNABLE SF **-** ***0% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T-3E LAW

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	12,832	5,315	7,517	SEE NOTE 3.12
2	Lab Undergraduate			0	
3	Lab Graduate & Faculty	188	547	(359)	
4	Academic Office & Related Space	14,639	9,119	5,520	
5	Campus Study Space & Library Facilities	35,479	3,587	31,892	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities			0	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space			0	
11	AV/TV Facilities			0	
12	Central Services	765	432	333	
13	Health Service Facilities			0	
14	Student Activity Space	2,938	2,161	777	
15	Assembly & Exhibition Facilities			0	
Subtotal - Formula Areas		**66,841**	**21,161**	**45,680**	
16	**Non-Assignable (SF)**	107			
Non-Formula Areas (NASF)					
17	Residential Space				
18	Animal Space				
19	Other				
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**-**			
TOTALS		**66,948**			
	TOTAL ASSIGNABLE SF	**66,841**			
	TOTAL NON-ASSIGNABLE SF	**107**		***0% of Assignable***	

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T-3F MANAGEMENT

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)
Formula Areas (NASF)				
1	Classroom Facilities	1,354	15,479	(14,125) SEE NOTE 3.12
2	Lab Undergraduate			0
3	Lab Graduate & Faculty	2,170	3,179	(1,009)
4	Academic Office & Related Space	23,857	38,534	(14,677)
5	Campus Study Space & Library Facilities	117	10,445	(10,328)
6	Recreation Athletic Space			0
7	Food Services			0
8	Bookstore & Merchandizing Facilities			0
9	Plant Maintenance			0
10	Administrative Offices & Related Space			0
11	AV/TV Facilities			0
12	Central Services			0
13	Health Service Facilities			0
14	Student Activity Space	2,330	6,292	(3,962)
15	Assembly & Exhibition Facilities			0
Subtotal - Formula Areas		**29,828**	**73,930**	**(44,102)**
16	**Non-Assignable (SF)**	1,126		
Non-Formula Areas (NASF)				
17	Residential Space			
18	Animal Space			
19	Other			
20	Health Sciences Clinical Facilities			
Subtotal - Non-Formula Areas		**-**		
TOTALS		**30,954**		

TOTAL ASSIGNABLE SF **29,828**

TOTAL NON-ASSIGNABLE SF **1,126** ***4% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T-3G SCIENCE

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	7,728	31,484	(23,756)	SEE NOTE 3.12
2	Lab Undergraduate	62,747	88,185	(25,438)	
3	Lab Graduate & Faculty	213,086	215,672	(2,586)	
4	Academic Office & Related Space	101,629	72,664	28,965	
5	Campus Study Space & Library Facilities	20,960	21,245	(285)	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities			0	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space			0	
11	AV/TV Facilities			0	
12	Central Services	955	2,560	(1,605)	
13	Health Service Facilities			0	
14	Student Activity Space	5,100	12,798	(7,698)	
15	Assembly & Exhibition Facilities	2,465	3,840	(1,375)	
Subtotal - Formula Areas		**414,670**	**448,448**	**(33,778)**	
16	**Non-Assignable (SF)**	2,209			
Non-Formula Areas (NASF)					
17	Residential Space				
18	Animal Space				
19	Other	1,529			
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**1,529**			
TOTALS		**418,408**			
	TOTAL ASSIGNABLE SF	**416,199**			
	TOTAL NON-ASSIGNABLE SF	**2,209**			***1% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T3-H DENTISTRY

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	2,341	2,886	(545)	SEE NOTE 3.13
2	Lab Undergraduate	35,497	0	35,497	SEE NOTE 3.14
3	Lab Graduate & Faculty	6,444	19,860	(13,416)	
4	Academic Office & Related Space	28,322	8,247	20,075	
5	Campus Study Space & Library Facilities	600	1,947	(1,347)	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities			0	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space			0	
11	AV/TV Facilities			0	
12	Central Services			0	
13	Health Service Facilities			0	
14	Student Activity Space	6,271	1,173	5,098	
15	Assembly & Exhibition Facilities	153	352	(199)	
Subtotal - Formula Areas		**79,628**	**34,465**	**45,163**	
16	**Non-Assignable (SF)**	4,418			
Non-Formula Areas (NASF)					
17	Residential Space				
18	Animal Space				
19	Other	6,078			
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**6,078**			
TOTALS		**90,124**			
	TOTAL ASSIGNABLE SF	**85,706**			
	TOTAL NON-ASSIGNABLE SF	**4,418**			***5% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

T3-I HEALTH PROFESSIONS

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)
Formula Areas (NASF)				
1	Classroom Facilities	15,647	23,493	(7,846) SEE NOTE 3.13
2	Lab Undergraduate	14,113	13,653	460
3	Lab Graduate & Faculty	15,557	204,392	(188,835)
4	Academic Office & Related Space	42,607	59,596	(16,989)
5	Campus Study Space & Library Facilities	4,468	15,853	(11,385)
6	Recreation Athletic Space	8,835	17,190	(8,355)
7	Food Services			0
8	Bookstore & Merchandizing Facilities			0
9	Plant Maintenance			0
10	Administrative Offices & Related Space	678	0	678
11	AV/TV Facilities			0
12	Central Services			0
13	Health Service Facilities			0
14	Student Activity Space	3,462	9,550	(6,088)
15	Assembly & Exhibition Facilities	1,823	2,865	(1,042)
Subtotal - Formula Areas		**107,190**	**346,592**	**(239,402)**
16	**Non-Assignable (SF)**	1,319		
Non-Formula Areas (NASF)				
17	Residential Space			
18	Animal Space			
19	Other			
20	Health Sciences Clinical Facilities			
Subtotal - Non-Formula Areas		**-**		
TOTALS		**108,509**		
	TOTAL ASSIGNABLE SF	**107,190**		
	TOTAL NON-ASSIGNABLE SF	**1,319**		***1% of Assignable***

T3-J MEDICINE

COU Cat. #	COU Space Category	Existing Space Inventory (NASF)	2008 Enrolment Generated Space As Per COU Standards (NASF)	VARIANCE Existing to COU Generated (NASF)	
Formula Areas (NASF)					
1	Classroom Facilities	8,689	4,568	4,121	
2	Lab Undergraduate	10,475	4,805	5,670	
3	Lab Graduate & Faculty	57,598	140,166	(82,568)	
4	Academic Office & Related Space	35,742	53,468	(17,726)	
5	Campus Study Space & Library Facilities	1,530	3,082	(1,552)	
6	Recreation Athletic Space			0	
7	Food Services			0	
8	Bookstore & Merchandizing Facilities	243	1,857	(1,614)	
9	Plant Maintenance			0	
10	Administrative Offices & Related Space	3,740	0	3,740	SEE NOTE 3.10
11	AV/TV Facilities	620	186	434	
12	Central Services	560	371	189	
13	Health Service Facilities			0	
14	Student Activity Space	1,918	1,857	61	
15	Assembly & Exhibition Facilities			0	
Subtotal - Formula Areas		**121,115**	**210,360**	**(89,245)**	
16	**Non-Assignable (SF)**	1,276			
Non-Formula Areas (NASF)					
17	Residential Space	2,144			
18	Animal Space				
19	Other				
20	Health Sciences Clinical Facilities				
Subtotal - Non-Formula Areas		**2,144**			
TOTALS		**124,535**			
	TOTAL ASSIGNABLE SF	**123,259**			
	TOTAL NON-ASSIGNABLE SF	**1,276**			***1% of Assignable***

DALHOUSIE UNIVERSITY MASTER PLAN
TABLES 3A to 3J - COMPARISON AT FACULTY LEVEL: CURRENT SPACE TO COU GENERATED SPACE

NOTES TO ABOVE TABLES 3A to 3J

GENERAL NOTE: The comparison of existing space inventory by Faculty may not provide in certain instances a complete and realistic comparison between space inventoried under a certain Faculty and space generated by the COU method. While the COU generated space will include all classroom space required for a certain Faculty based on enrolment, the existing inventory for the same Faculty may not necessarily include this space which may be part of the "common pool" space. The variance, in certain instances, may therefore be misleading.

NOTES COMMON TO ALL TABLES

Note 3.1: NASF is Net Assignable Square Feet.
Note 3.2: COU refers to the Council of Ontario Universities method of generating space standards based on enrolments and other factors.
Note 3.3: Existing Space Inventory numbers are based the University's inventory (by Department) of buildings, spaces and rooms at the time of the analysis.
Note 3.4: In the case of low/high COU estimating factors available, the low factors were used unless otherwise indicated.
Note 3.5: Variances between Existing and COU Generated Space are only shown for the present.
Note 3.6: For calculations of COU generated space reference Appendix C, pages C35 to C54.
Note 3.7: Some COU categories do not apply to all/some of the Faculties.
Note 3.8: Library stack/collection space (COU Category 5) may not be listed under a Department/Faculty and may account for some variances.
Note 3.9: COU Space Categories 16 to 20 are not formula-based, or based on enrolment/staffing related input measures, and therefore a comparison is not possible.

TABLE SPECIFIC NOTES REFERENCED IN INDIVIDUAL TABLES

Note 3.10: Breakdown of Administrative Staff not available for direct comparison at this level of detail.
Note 3.11: There are also 8,217 NASF in Common Pool Classrooms on the Sexton Campus which are not inventoried under a specific Department/Faculty.
Note 3.12: There are also 85,179 NASF in Common Pool Classrooms on the Studley Campus which are not inventoried under a specific Department/Faculty.
Note 3.13: There are also 16,229 NASF in Common Pool Classrooms on the Carlton Campus which are not inventoried under a specific Department/Faculty.
Note 3.14: Information for Dentistry Weekly Scheduled Contact Lab Hours is not available and therefore comparison is not feasible.