UNIVERSITY OF TORONTO

OFFICE OF THE GOVERNING COUNCIL

FOR RECOMMENDATION **CONFIDENTIAL** ***IN CAMERA***

TO: Business Board

SPONSOR: Professor Scott Mabury, Vice President, University Operations
CONTACT INFO: 416-978-2031, scott.mabury@utoronto.ca

PRESENTER: As above
CONTACT INFO:

DATE: November 14, 2017 for November 27, 2017

AGENDA ITEM: 12(a)

ITEM IDENTIFICATION:

Capital Project: New Science Building at the University of Toronto Mississauga - Financing Requirement

JURISDICTIONAL INFORMATION:

Under the *Policy on Capital Planning and Capital Projects*: "… proposals for capital projects exceeding $10 million must be considered by the appropriate Boards and Committees of the Governing Council on the joint recommendations of the Vice President and Provost and the Vice President, University Operations. Normally, they will require approval of the Governing Council. Execution of such projects is approved by the Business Board".

Under the *Policy* "…if a project will require financing as part of the funding, the project proposal must be considered by the Business Board."

GOVERNANCE PATH:

A. Project Planning Report – Project Planning Report, Budget and Source of Funds

1. Campus Affairs Committee [For Recommendation] (October 31, 2017)
2. Campus Council [For Recommendation] (November 21, 2017)
3. Academic Board [For Recommendation] (November 23, 2017)
4. **Business Board [Financing, For Recommendation] (November 27, 2017)**
5. Executive Committee [For Endorsement & Forwarding] (December 5, 2017)
6. Governing Council [For Approval] (December 14, 2017)

B. Execution of the Project

1. Business Board [For Approval] (November 27, 2017)

PREVIOUS ACTION TAKEN:

No previous action

HIGHLIGHTS:

While UTM has constructed over 18,895 nasm of area across six buildings over the past seven years, adding significantly to UTM's space inventory, this spatial growth has primarily addressed the needs for teaching-related space and for accommodation of non-laboratory based academic departments. The cumulative effect is of a pronounced need for new science laboratories and related space in order to keep up with recent and anticipated enrolment growth as well as address the demands of current and future research initiatives.

This need for science research laboratories is a long-standing issue that has been noted in two External Reviews. In the *External Reviewers' Report on the Department of Biology* (November, 2010), the reviewers noted: "Research space is at a premium for this department. The anticipated new faculty hires, which are absolutely necessary to carry out the teaching mission, will require additional space." Similarly in the *External Review of the Department of Chemical & Physical Sciences* (February, 2017), the reviewers expressed their concerns about the "lack of properly designed educational and research space" and further "that the space problems for this department are serious and acute".

Although UTM has aggressively optimized and modernized its teaching and research laboratories and supporting infrastructure over the last six years, UTM is currently renovating the last remaining stock of heavily-serviced research space in the William G. Davis Building. Additional research laboratory capacity simply cannot be added.

UTM has also recently launched the Centre for Medicinal Chemistry (CMC), an interdisciplinary centre for the development of new therapeutics that target cancer and other diseases. The CMC currently consists of an established senior scientist and a recent faculty hire within the Department of Chemical and Physical Sciences (CPS). The Centre will be expanded to include a director and eight principal investigators in molecular biology, and computational chemistry. It is projected that these principal investigators will grow to include approximately 127 graduate students, research associates, and post-doctoral fellows by 2022/23.

This new interdisciplinary centre is expected to spur the growth of research in a number of UTM's science-based academic departments; namely, the Department of Biology, the Department of Chemical and Physical Sciences, Department of Anthropology, Department of Psychology, Department of Mathematics and Computational Science, and the Forensic Science program.

The hiring of faculty members and the recruitment of graduate students and research staff in the wet laboratory sciences cannot proceed until UTM provides the requisite facilities to attract the level of talent that is appropriate for the University of Toronto. Equally important, facilitation of the success of faculty members who are building their research teams requires that UTM provide appropriate and sufficient wet laboratory space to support successful academic careers. Noteworthy is that major research projects of national significance are currently constrained by lack of space, and this places the

wet laboratory research potential at UTM at a disadvantage in comparison to opportunities at the other campuses.

The Centre for Medicinal Chemistry has a significant requirement for a diverse range of research facilities, especially heavily-serviced chemistry laboratories (fume cabinet intensive). In order to meet the needs of UTM's current and future research initiatives, UTM proposes the development of a new state of the art Science Building.

The proposed new capital project will be developed to not only accommodate the activities of the new Centre for Medicinal Chemistry but also to provide expansion of research facilities for UTM's other laboratory-based departments. The Science Building will also provide a new home for the Forensic Science program that is currently accommodated in a small amount of office space in the Health Sciences Complex; a relocation that will allow this program to expand to its full potential. In addition, the project presents an opportunity to revitalize, expand and connect to the Davis Building's current central shipping and receiving facilities, an essential piece of infrastructure that serves a large portion of the campus and will support the activities of the new Science Building.

Momentum for the Science Building has been growing and with the launch of the CMC in the fall of 2016, it was announced that some of the equipment needs of the Centre have been addressed with an award from the Canada Foundation for Innovation (CFI). An additional contribution from Orlando Corporation began the support by external philanthropy, and a contribution from the Office of the Provost signaled the significance of this initiative within the University. The project has also generated a high level of interest and enthusiasm from the City of Mississauga as a major feature for promotion, particularly as it parallels a push by the City for its life sciences cluster.

UTM intends to construct the new Science Building with the CMC as its foundational occupant, with additional investment to support a broader tapestry of laboratory-based sciences. To that end, at the beginning of 2017, the University of Toronto established a formal Project Planning Committee with broad University and UTM representation (including undergraduate and graduate students) to develop the specifics of the proposed construction project and to submit its recommendations to Governing Council for full implementation.

The full Project Planning Committee met six times, with numerous meetings of topic-specific working groups feeding their work into the main committee. The Project Planning Committee was able to build upon extensive work for such a project done at UTM over the past ten years as new science facilities were considered – those earlier potential projects did not move forward because of other major capital needs and priorities.

The proposed project includes a total area of 7,134 nasm (approximately 15,552 gsm) distributed across four levels above grade plus one level below with an additional fifth level mechanical penthouse. Connections to the adjacent Davis Building are proposed at the basement, main (Level 2) and fourth floor levels to provide a continuity of activity across these buildings.

The proposed space program includes the following groups:

- Centre for Medicinal Chemistry
  - Research Platforms: Laboratories & Support
  - Offices & Support
- General Science Expansion
  - Laboratories & Support
  - Offices & Support
- High Performance Computing Data Centre
- Forensic Science Program
- Campus & Building Services Support – Shipping & Receiving

The project's location was identified in the 2011 UTM Campus Master Plan as Site 1 with a development envelope that includes additional capacity beyond the Science Building's proposed area. The project's design must therefore also plan for later expansion on any remaining site area. The project will also include a significant amount of landscape design to ensure that the new Science Building is integrated into the surrounding UTM fabric and continues the positive transformation of the built environment in this sector of the campus.

The project schedule, developed jointly by Campus & Facilities Planning and UTM, is as follows:

• Architect Selection	September-December, 2017
• Schematic Design	January-July, 2018
• Design Development	August-December, 2018
• Construction Documents	January-July, 2019
• Tender and Award Completion	October-November, 2019
• Construction Start	November, 2019
• Substantial Completion	November, 2021

The above project milestones are based on a traditional design-bid-build process and not the design-build approach that UTM has so successfully used for recent major capital projects. With the need to satisfy a number of government agencies with regards to the high-end research laboratories and other complex facilities, a design-build approach exposes the project to too many risks that can be detrimental from a cost and scheduling standpoint.

FINANCIAL IMPLICATIONS:

a) Total Project Cost Estimate

The estimated Total Project Cost is $152.9 million, including "Construction Costs" of $111,600,000 (2017 estimated costs plus inflation to 1Q 2019, the expected construction start). Those estimates are the result of two Class C estimates prepared by external consultants: the first in 2016, at the very earliest phase of planning; and a second in August 2017, based upon the detailed and refined Space Program contained in the approved Project Planning Report.

Extensive comparative analysis was done to confirm the appropriateness of the estimated construction costs. First, the detailed Space Programs and costs of previous, somewhat similar University of Toronto projects was reviewed: UTSC's Environmental Science & Chemistry Building (ESC); the Engineering/Medicine laboratory project in the MaRS complex; and, the much earlier Centre for Cellular & Biomedical Research (CCBR) project on the St. George campus.

Scarborough's ESC Building is multi-purpose in its scope: it has undergraduate teaching facilities (approximately 23.3% of the total nasm); mixed (dry & wet) research space (at 36.4%); academic offices (at 27.7%); non-academic functions; and does not include an animal (mouse) care facility. While it does have a similar total fume hood count, there are significant differences in the nature of that equipment (see fume hood comments on CCBR below).

The scope of the MaRS TEBL project revolved around medical research in wet laboratories but is not anywhere near as intense as the UTM project as it is more biology-based than chemistry-based, has only 12 fume hoods and was a fit-up of space in the already built MaRS complex.

The CCBR project is most similar but even that comparison has limitations, beyond the fact that CCBR was completed12 years ago (2005) and the planning undertaken in 2003. The CCBR was designed to accommodate primarily cellular & biomolecular research in its 10 primary open laboratories (4,777 nasm) with a planned maximum of 60 fume hoods. In comparison, the UTM project will house the Centre for Medicinal Chemistry (CMC), a very heavy, fume hood intensive chemistry research operation with its 13 primary research modules having no less than 64 fume cabinets (60 of those are large 8-foot units for synthetic chemistry housed in only 799 nasm of lab space). An additional 34 fume hoods will be in the other modular wet research laboratories. Therefore, the UTM project will have almost 100 fume hoods in less than half the lab space than CCBR holds its 60 units. That additional fume hood intensity and the fact that there have been significant developments in the nature of fume hood and laboratory design over the past 12 years diminishes the utility of the CCBR as a direct comparator. It should also be noted that the UTM project will be built to obtain LEED certification (Silver at least).

In summary, the prior University of Toronto projects examined are not especially instructive in regard to costs.

As recently cited by University Planning, Design and Construction (UPDC), the 2016 Altus Group's published data on construction costs in the GTA for different types of buildings is an appropriate reference point for comparison purposes. That same publication for 2017 included an expected range for "Universities & Colleges – Laboratories (Level 1 and 2)" of between $450 and $650 per gross square foot of built space, construction costs only (fume hoods and other fixed equipment included).

When the estimated construction costs for the UTM project are normalized so that they are directly comparable to the ALTUS methodology (remove 1Q 2019 inflation provision), the resulting construction cost is $632 per gross square foot. That is within the range to be expected for this kind of building in the GTA. UTM has a high degree of confidence in the estimated construction costs and in the estimated Total Project Costs for the new Science Building.

It should also be noted that UTM will follow the same approach successfully used in earlier, major capital projects: (i) the design process will be tightly managed to ensure that the building is "designed-to-budget"; and (ii) once construction begins, the project will also be "built-to-budget".

b) Operating Costs

Based upon current direct and indirect operating costs, the project is expected to increase UTM operating costs by $2,134,430 per year, beginning in December, 2021. These estimates capture the incremental costs (including estimated inflation between 2017 and December, 2021) related to the new Science Building and include: utilities, caretaking/housekeeping, engineering, property management, grounds, Facilities Management & Planning, health & safety, stores, police, and information technology services.

Provision has been made within UTM's Five-year Operating Budget for these increased annual operating costs.

c) Funding Sources

The funding sources for the new UTM Science Building are as follows:

UTM Capital Reserves	$ 97,952,551
Long-term borrowing	$ 30,000,000
Capital Campaign	$ 20,000,000
Provost Funds	$ 4,999,605
TOTAL:	**$152,952,156**

UTM believes in a conservative approach to financial planning and management. While there is a high level of confidence that the fundraising target of $20,000,000 will be met, UTM understands that should fundraising beyond the already confirmed $7,000,000 not be realized, Capital Reserves must be in place as backup to any shortfall. Further, since the timing of the additional $13,000,000 in expected donations is unknown at this time, a detailed financial analysis has confirmed that UTM will be in a position to make up any such shortfall. Accordingly, those required accumulations of Capital Reserves, as shown in the Alternative Cash Flow set out below, have been incorporated into UTM's multi-year financial plan (2017-18 to 2021-22). UTM's track record of successfully meeting planned accumulation schedules for Capital Reserves related to previous major capital projects provides a high degree of confidence that the Capital Reserves will be available as needed. UTM is also confident that this commitment of Capital Reserves can be met with no negative impact on the timely achievement of its academic plans and aspirations as set out in UTM's recently published Academic Plan.

UTM Science Building: Alternative Projected Cash Flow[1]

Fiscal	Reserves	Donations[3,5]	Matching[3]	Borrowing[4]	Project Cash Burn[2]	Cumulative Surplus (Shortfall)
2017-18 (In-hand)	$28.223				($2.127)	**$26.093**
2018-19	14.487				(7.639)	**32.944**
2019-20	26.742	2.300	2.300		(22.547)	**41.739**
2020-21	20.500	2.300	2.300		(72.687)	**(5.848)[4]**
2021-22	21.000	2.400	0.400	30.000	(47.952)	**-**
Total:	**$110.952**	**$7.000**	**$5.000**	**$30.000**	**$152.952**	**-**

NOTES:
1) "Alternative" cash flow in unlikely event that additional $13m in donations (beyond confirmed $7m) does not materialize.
2) Prepared by Project Development and based on estimates provided by external cost consultant (Turner & Townsend).
3) Confirmed donations/matching flow at start of construction, (November, 2019)
4) Shortfall will be charged T-bill rate plus 25 basis points when in deficit; more than likely to be offset by interest earned while in surplus at T-bill rate. Long term Borrowing ($30.0m) would be issued at substantial completion (November, 2021).
5) Actual total fundraising target is $20m.

RECOMMENDATION:

Be It Resolved:

Subject to Governing Council approval in principle of the project

THAT the New Science Building at the University of Toronto Mississauga with a space program of approximately 15,552 gross square metres (gsm) (approximately 7,134 net assignable square metres (nasm)), as outlined in the Project Planning Report dated September 21, 2017, be approved in principle with a total project cost of $152,952,156 including a maximum amount of long term financing not to exceed $30,000,000.

DOCUMENTATION PROVIDED:

- Report of the Project Planning Committee for the New Science Building at the University of Toronto Mississauga (September 21, 2017)

Report of the Project Planning Committee for the New Science Building at the University of Toronto Mississauga

UTM Facilities Management & Planning

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I. Executive Summary

The University of Toronto Mississauga campus was established in 1967 as one of three campuses of the University of Toronto and has grown into a vibrant academic community of some 11,700 undergraduate students, 900 graduate students, 147 programs and 980 faculty and staff. The 97-hectare campus is located within the Regional Municipality of Peel, itself an area of significant population and economic growth. Over the next five years, UTM's undergraduate and graduate programs are projected to grow by 7% and 25%, respectively. UTM anticipates a significant proportion of this enrolment and research growth to occur within the traditional laboratory-based sciences including Chemical & Physical Sciences and Biology.

While UTM has constructed over 18,895 nasm of area across six buildings over the past seven years, adding significantly to UTM's space inventory, this spatial growth has primarily addressed the needs of non-laboratory based academic departments. The cumulative effect is a pronounced need for new science laboratories and related space in order to keep up with recent and anticipated enrolment growth, as well as to address the demands of current and future research initiatives.

UTM has also recently launched the Centre for Medicinal Chemistry (CMC), an interdisciplinary centre for the development of new therapeutics that target cancer and other diseases. The CMC currently consists of an established senior scientist and a recent faculty hire within the Department of Chemical and Physical Sciences (CPS). The Centre will be expanded to include a director and eight principal investigators in molecular biology, and computational chemistry. It is projected that these principal investigators will grow to include approximately 127 graduate students, research associates, and post-doctoral fellows by 2022/23.

This new interdisciplinary centre is expected to spur the growth of research in a number of UTM's science-based academic departments; namely, the Department of Biology, the Department of Chemical and Physical Sciences, Department of Anthropology, Department of Psychology, Department of Mathematics and Computational Science, and the Forensic Science Program.

The hiring of faculty members and the recruitment of graduate students and research staff in the wet laboratory sciences cannot proceed until UTM provides the requisite facilities to attract the level of talent appropriate for the University of Toronto. Equally important, facilitation of the success of faculty members who are building their research teams requires that UTM provides appropriate and sufficient wet laboratory space to support successful academic careers. Noteworthy is that major research projects of national significance are currently constrained by lack of space, and this places the wet laboratory research potential at UTM at a disadvantage in comparison to opportunities which exist at the other campuses.

Although UTM has aggressively optimized and modernized its teaching and research laboratories and supporting building infrastructure over the last six years, UTM currently is renovating the last remaining stock of wet research space in the William G. Davis Building. The Centre for Medicinal Chemistry has a significant requirement for a diverse range of research facilities, especially heavy wet chemistry laboratories (fume cabinet intensive) and animal (mouse) care facility. In order to meet the needs of UTM's current and future wet research initiatives, UTM proposes the development of a new state-of-the-art Science Building.

The proposed new capital project will not only accommodate the activities of the new Centre for Medicinal Chemistry but also will provide an expansion of research facilities for UTM's other

laboratory-based departments. The Science Building will also provide a new home for the Forensic Science program currently accommodated in a small amount of office space in the Terrence Donnelly Health Sciences Complex. This relocation will allow this program to expand to its full potential. The project also presents an opportunity to revitalize, expand and connect to the Davis Building's current central shipping and receiving facilities, an essential piece of infrastructure that serves a large portion of the campus and will support the activities of the new Science Building.

Momentum for the Science Building has been growing, and with the launch of the CMC in the fall of 2016, it was announced that some of the equipment needs of the Centre have been addressed with an award from the Canada Foundation for Innovation (CFI). An additional contribution from the Orlando Corporation began the external philanthropic support, and a contribution from the Office of the Provost signaled the significance of this initiative within the University.

UTM intends to construct the new Science Building with the CMC as its foundational occupant, with additional investment to support a broader tapestry of wet laboratory sciences. In working towards this goal, the University of Toronto established a formal Project Planning Committee at the beginning of 2017 with broad University and UTM representation to develop the specifics of the proposed construction project and to submit its recommendations to Governing Council for full implementation.

The proposed project includes a total area of 7,134 nasm (approximately 15,552 gsm) distributed across four levels above grade plus Basement, with an additional fifth level mechanical penthouse. Connections to the adjacent Davis Building are proposed at the Basement, Main (Level 2) and Fourth Floor levels (at minimum) to provide a continuity of activity across these buildings.

The proposed space program includes the following groups:

- Centre for Medicinal Chemistry
    - Research Platforms: Laboratories and Support
    - Animal (Mouse) Care Facility
    - Offices and Support
- General Science Expansion
    - Laboratories and Support
    - Offices and Support
- High Performance Computing Data Centre
- Forensic Science Program
- Campus and Building Services Support – Shipping and Receiving

The project's location was identified in the 2011 UTM Campus Master Plan as Site 1 with a development envelope that includes additional capacity beyond the Science Building's proposed area. The project's design must therefore also plan for later expansion on any remaining site area. The project will include a significant amount of landscape design to ensure that the new Science Building is integrated into the surrounding UTM fabric and continues the positive transformation of the built environment in this sector of the campus.

II. Project Background

a) Committee Membership

Paul Donoghue	Chief Administrative Officer (UTM) (Co-Chair)
Bryan Stewart	Vice-Principal, Research (UTM) (Co-Chair)
Ulrich Krull	Vice-President & Principal (UTM)
Steven Short	Associate Chair, Research, Department of Biology (UTM)
Claudiu Gradinaru	Chair, Department of Chemical & Physical Sciences (UTM)
Patrick Gunning	Professor, Department of Chemical & Physical Sciences (UTM)
Angela Lange	Vice-Dean, Faculty, Office of the Academic Dean (UTM)
Robert Gerlai	Professor, Department of Psychology (UTM)
Scott Prosser	Professor, Department of Chemical & Physical Sciences (UTM)
Susan Senese	Director, Information & Instructional Technology Services (UTM)
Luke Barber	Manager, IT Solutions & Risk Management (UTM)
Nour Alideeb	Undergraduate Student, President UTMSU
Marise Hopkins	Undergraduate Student, Vice-President, External UTMSU
Kayla Dias	Graduate Student, Vice-President UTMAGS
Paige Homme	Graduate Student, Department of Chemical & Physical Sciences (UTM)
Gilbert Delgado	Chief, University Planning, Design & Construction (UPDC) (UofT)
Christine Burke	Director, Campus & Facilities Planning (UPDC) (UofT)
Costas Catsaros	Director, Project Development (UPDC) (UofT)
Alan Webb	Planner, Campus & Facilities Planning (UPDC) (UofT)
Paull Goldsmith	Executive Director, Facilities Management & Planning (UTM)
Stepanka Elias	Director, Operations, Design & Construction (FMP) (UTM)
Vikas Mehta	Director, Utilities & Operations (FMP) (UTM)
William Yasui	Assistant Director, Capital Planning & Construction (FMP) (UTM)
Saba AlSaady	Planner, Capital Planning & Construction (FMP) (UTM)
Carmen Brown	Administrative Project Assistant (FMP/UTM) (Committee Secretary)

b) Terms of Reference

1. Identify the space program as it relates to the existing and approved academic plan at UTM; taking into account the impact of approved and proposed programs that are reflected in increasing faculty, student and staff complement. Plan to realize maximum flexibility of space to permit future reallocations, as program needs change.
2. Demonstrate that the proposed space program will be consistent with the Council of Ontario Universities' and the University's own space standards.
3. Identify all secondary effects, including space reallocations from the existing site, impact on the delivery of academic programs during construction and the possible required relocation as required to implement the plan of existing units.
4. Address campus-wide planning directives as set out in the Campus Master Plan, open space plan, urban design criteria, and site conditions that respond to the broader University community.
5. Identify equipment and moveable furnishings necessary to the project and their estimated cost.
6. Identify all data, networking and communication requirements and their related costs.
7. Identify all security, occupational health and safety and accessibility requirements and their related costs.

8. Identify all costs associated with transition during construction and secondary effects resulting from the realization of this project.
9. Determine a total project cost estimate (TPC) for the capital project including costs of implementation in phases if required, and also identify all resource costs to the University.
10. Identify all sources of funding for capital and operating costs.
11. Complete report by July 29, 2017.

c) Background Information

The University of Toronto Mississauga (UTM) is a 97-hectare campus located within the Regional Municipality of Peel, an area of significant population and economic growth. Undergraduate enrolment in 2016-17 reached 11,699 full-time equivalents (FTE); graduate enrolments stand at 874 FTE overall, including Medical Academy students and professional program masters students. Over the next five years, UTM's undergraduate and graduate programs are projected to grow by 7% and 25%, respectively. UTM anticipates a significant proportion of these enrolment growths to occur within the traditional laboratory-based sciences including Chemical & Physical Sciences (CPS) and Biology (BIO).

A major element in supporting past and projected growth has been the implementation of a multi-year capital plan designed to provide the additional facilities required not only to meet existing spatial requirements but also to accelerate progress in a number of priority areas such as faculty recruitment. UTM's space shortfalls have been partially met with the completion in 2014 of Deerfield Hall and the Innovation Complex (an addition to the Kaneff Centre). These additions to UTM's space inventory provided new accommodations for Theatre and Drama Studies (Department of English and Drama Studies), the Department of Mathematical and Computational Science, the Department of Psychology, the Department of Management, the Institute for Management and Innovation (IMI), the Department of Economics, and the Office of the Registrar.

At the start of 2016, the North Building was demolished and construction of Phase B of the North Building Reconstruction project currently is underway. When completed in the summer of 2018, this six-storey academic building will accommodate a significant number of traditional and technology-driven classrooms, and will provide new homes for the Departments of English and Drama Studies, Historical Studies, Language Studies, Philosophy, Political Science and Sociology. This building will also accommodate the Robert Gillespie Academic Skills Centre and the Department of Facilities Management and Planning.

Although these three capital projects have added, or will add, significantly to UTM's space inventory, this spatial growth has primarily addressed the needs of non-laboratory based academic departments. Likewise, while the re-allocation of space vacated by these departments will benefit a number of UTM's users, it does not materially add to the campus' inventory of science laboratories. The cumulative effect is of a pronounced need for new science laboratory and related space in order to keep up with recent and anticipated enrolment growth as well as address the demands of current and future research initiatives.

Recently, UTM has launched the Centre for Medicinal Chemistry (CMC) an interdisciplinary centre for the development of new therapeutics that target cancer and other diseases. The CMC currently consists of an established senior scientist and a recent faculty hire within the Department of Chemical and Physical Sciences (CPS). The Centre will expand to include a director and eight principal investigators in molecular biology and computational chemistry. It is projected that these nine

principal investigators will grow to include approximately 127 graduate students, research associates, and post-doctoral fellows by 2022/23.

This new interdisciplinary centre is expected to spur research growth in a number of UTM's science-based academic departments; namely, the Department of Biology, the Department of Chemical and Physical Sciences, Department of Anthropology, Department of Psychology, Department of Mathematics and Computational Science, and the Forensic Science program.

Although UTM has aggressively optimized and modernized its teaching and research laboratories and supporting building infrastructure over the last six years, UTM is currently renovating the last remaining stock of wet research space in the William G. Davis Building. The Centre for Medicinal Chemistry has a significant requirement for a diverse range of research facilities, especially heavy wet chemistry laboratories (fume cabinet intensive) and animal (mouse) care facility. In order to meet the needs of UTM's current and future wet research initiatives, UTM proposes the development of a new Science Building that will be attached to the existing Davis Building.

The proposed new capital project will be developed not only to accommodate the activities of the new Centre for Medicinal Chemistry but also to provide an expansion of research facilities for UTM's other laboratory-based departments. The Science Building will also provide a new home for the Forensic Science program which currently is accommodated in a small amount of office space in the Health Sciences Complex; a relocation which will allow this program to expand to its full potential.

d) Statement of Academic Plan

1. The History:

The availability of wet laboratory space at what is now known as the UTM Campus began with investment in the first building, the North Building, at Erindale College in 1967. The completion of the South Building in the early 1970's added a sizeable inventory of wet laboratory space. Until the late 1990's, the campus remained at a relatively steady student enrolment and faculty member complement, with laboratory facilities suitable for the size of the academic operations.

The decision by the Province to modify the high school curricular structure imposed the challenge of the "double cohort" around 2003. The requirement for the enrolment expansion due to the double cohort and the changing demand due to demographics had been predicted in 2000, and consideration of new science laboratories focused on proposals for investment in undergraduate teaching and research laboratories in a plan prepared in 2001. Expansion of wet laboratory research space was not a priority for the Province and the plan was set aside.

As the result of a successful application to the Canada Foundation for Innovation in 2002, UTM added a few research laboratories and renovated some core laboratory space for the life and physical sciences. With the aforementioned enrolment, undergraduate teaching laboratory space has been expanded through renovations in the South Building (renamed the William G. Davis Building in 2009), in part by displacing research operations, adding even more pressure to the limited inventory of wet research laboratory space. Such pressure led to the development of plans for a major research laboratory addition to the Davis Building in 2009; however this proposal remained unfunded as the Province signaled preference for investment in undergraduate teaching infrastructure.

2. The Need:

By the end of 2017, all available locations for wet laboratory research space within the Davis Building will have been renovated, maximizing opportunities for creating and upgrading labs across the UTM campus. It is essential that new wet laboratory research space be constructed at UTM over the next few years to meet the long-range plans for research at UTM. The hiring rates for new faculty and the enrolment of doctoral-stream graduate student in the sciences at UTM have trailed the undergraduate student enrolment numbers, with the outcome being that UTM at present has the highest student-to-faculty and the lowest graduate student-to-faculty ratios of any Division at the University of Toronto.

The hiring of faculty members and the recruitment of graduate students and research staff in the wet laboratory sciences cannot proceed until UTM provides the requisite facilities to attract the level of talent appropriate for the University of Toronto. Equally important, facilitation of the success of faculty members who are building their research teams requires that UTM provide appropriate and sufficient wet laboratory space to support successful academic careers. Noteworthy is that major research projects of national significance are currently constrained by lack of space, and this places the wet laboratory research potential at UTM at a disadvantage in comparison to opportunities at the other campuses.

3. The Opportunity:

The need to build new wet laboratory science space has become critical. As a strategy to catalyze and leverage investments, UTM recognizes that nationally significant research programs can serve as focal points to attract support. New research opportunities rooted in laboratory sciences that are of strategic significance to UTM have materialized because of the innovative faculty who have been hired. In particular, UTM has committed to the development of a Centre for Medicinal Chemistry (CMC), which will focus on creation of new therapeutics targeting cancers and other illnesses.

This wet laboratory initiative will provide space to assemble a team of faculty members who in collaboration will:

- Identify the optimal point for interference with biochemical processes associated with specific biochemical pathways; efficiently synthesize and isolate lead compounds,
- Determine the molecular binding properties of lead compounds,
- Evaluate the effectiveness of the lead compounds using a range of cell lines; and,
- Begin the process of evaluation of the biological response in animals (mice).

At its launch in the fall of 2016, it was announced that some of the equipment needs of the CMC have been addressed with a substantial award from the Canada Foundation for Innovation (CFI). A significant additional contribution from Orlando Corporation began the support by external philanthropy, and a contribution from the Office of the Provost signaled the significance of this initiative within the University. The CMC will play a significant role in offering new educational programs and experiential opportunities, attracting talent, contributing to economic growth by generating intellectual property, and being an innovation hub in the Region of Peel. The Centre will generate start-up companies, allowing for speedier translation of innovation into the marketplace. The impact of the Centre will be amplified through integration into the local life-sciences and health-care sectors for the benefit of regional prosperity.

UTM intends to construct a science complex that will house the CMC as the foundational occupant, with further investment to support a broader tapestry of wet laboratory sciences; this will address the

campus' more general research laboratory expansion needs. To realize this goal, at the beginning of 2017, the University of Toronto established a formal Project Planning Committee with broad University and UTM representation to develop the specifics of the proposed construction project and to submit its recommendations to Governing Council for full implementation.

e) Space Requirement

1. Existing Space

Centre for Medicinal Chemistry, Chemistry & Physical Sciences, and Biology

Unlike previous capital projects at the UTM Campus, space planning for the new Science Building has not considered the total space allocations and future requirements for entire academic departments. This proposal will provide only research laboratories, associated offices and support facilities for the Centre for Medicinal Chemistry (CMC), research-specific wet laboratories, associated offices and support facilities for wet laboratory-based researchers (primarily in the Departments of Biology and Chemistry and Physical Science), and departmental facilities for the Forensic Science Program. Most of the proposed space program has been developed to accommodate new hires for the aforementioned user groups.

At this time, the nascent Centre of Medicinal Chemistry is not a discrete operational department but is administered by the Office of the Vice-Principal, Research, and as such, the CMC is not a COU reportable academic unit. Currently, the principal investigators and their research teams associated with the CMC occupy 560 net assignable square metres of research space in the Davis Building that are assigned to the Department of Chemistry and Physical Sciences (CPS). However, as the CMC will consist of multi-disciplinary research platforms, researchers may also be associated with the Department of Biology.

The Department of Chemistry and Physical Science currently occupies 1,757 nasm of research laboratory (COU space Category 3) and support space, and 778 nasm of academic office space (COU space Category 4) in the Davis Building (2016/17 reporting year). This profile does not include facilities that are undergoing renovations and were not available for departmental use at the time of writing this report; another 120 nasm of research facilities will be added to CPS's space allocation within the next year.

Similarly, the Department of Biology in the current 2016/17 COU profile occupies 2,374 net assignable square feet of research facilities (Category 3) and 864 net assignable square metres of academic office space (Category 4) in the William G. Davis Building. As with CPS, this profile does not include facilities that are undergoing renovations and were not available for departmental use at the time of writing this report; another 564 nasm of research facilities will be added to Biology's COU space allocation within the next year.

Forensic Science Program

As with the CMC, the Forensic Science Program is a multi-disciplinary program that is not a discrete academic department. As such, this program's faculty and associated space allocations are presently included within the Department of Anthropology which serves as the 'home' department of the current Forensic Science program director, faculty and staff. However, faculty and staff from other departments are and could be involved through cross-appointment; such as Biology, Biomedical Communications, and Psychology. Through the provision of multi-disciplinary research, teaching and

office space, the infrastructure of the new Science Building will allow for the potential of the Forensic Science Program to develop into a full-status Department in the future. The program director, the administrative assistant and associated faculty/instructors presently are assigned four offices (totaling 58 nasm) in the Terrence Donnelly Health Sciences Complex (fourth floor) and a crime scene laboratory called the Forensic House (87 nasm). Research space currently is included in the occupant profile for the Department of Anthropology.

Facilities Management & Planning

Facilities Management & Planning (FMP) is responsible for the campus' central shipping, receiving and storage (warehouse) facilities that are currently located on the lowermost level of the Davis Building. These facilities have not had any major renovations recently, and over time have been modified as needed to meet specific requirements of FMP and Davis Building occupants. Warehousing and storage functions have either been combined in the main warehouse facility or scattered over a number of smaller rooms created over time by expropriating areas from either larger facilities (such as the main warehouse) or from non-assignable areas (such as corridors).

The original design of the Davis Building did not include facilities for the proper storage of chemicals, chemical/biological wastes, or other laboratory consumables (e.g. compressed gases, liquid nitrogen). Non-volatile/flammable chemicals are stored within sections (one of the caged areas and open shelving) within the main warehouse area. Chemical and biological wastes share a portable structure that has been subdivided to keep these wastes separated and modified to ensure their safe storage; this structure is located outside the Davis Building in the vehicle service area close to the loading dock.

FMP's Campus Services has two suites of rooms in the lowermost level that are used by its custodial staff as lunch rooms, change/locker rooms and washrooms; there is also a custodial foreperson's office and duty room on the second floor close to the Meeting Place.

Currently, FMP is assigned or responsible for 784 square metres of space associated with the aforementioned activities. Several of these spaces are not shown (Chemical/Bio Waste portable structure) or discretely identified (Examination furniture storage in the Service Tunnel, DV0126B) in UTM's space inventory. However, the areas associated with these functions have been field measured. There are three storage rooms have been created by partitioning off corridor, DV0126, and are less than ideal arrangements for these uses.

The new Science Building project affords UTM and FMP an opportunity to address deficiencies within its existing facilities and operations not only through new construction but also with the re-organization and renovation of the existing facilities. This will ensure that all spaces and functions are relevant not only to FMP's operations but also optimal for the users of the Science and Davis Buildings.

2. Occupant Profile

In previous capital projects at UTM, an occupant profile was developed for each proposed user group or space category. Occupant profiles are based on current and projected numbers of FTE faculty, staff, graduate and undergraduate students and Council of Ontario Universities (COU) Building Block space formulae (unit allocations for prescribed input measures). Typically, occupant profiles are prepared for entire administrative and academic departments.

The new Science Building presents an atypical case where the conventional COU occupant profile must be modified to suit the needs of the project's analysis. As stated above, occupant profiles are normally prepared for entire academic and administrative departments. However, the new Science Building is intended to accommodate the research laboratories, research support facilities and offices associated with the Centre for Medicinal Chemistry and new wet laboratory-based research (primarily for the Department of Biology, and the Department of Chemistry and Physical Sciences). For this reason, selective occupant profiles have been prepared for this project.

As a Centre, the CMC is not a conventional academic department nor does it generate any space distinctly assignable to CMC. As the CMC will be primarily comprised of researchers cross-appointed in Chemistry and Biology, CMC's profile was rolled into a combined partial profile for the two science departments. As well, the Office of the Academic Dean does not usually project the number of FTE faculty, staff or graduate students beyond two years past the current 2016/17 academic year. For planning purposes, this report has therefore projected FTE counts to the 2022/23 academic year due to the expected length to design and construct the building (estimated completion date of December 2021). The normal two-year academic planning cycle had to be not only extrapolated another four years into the future but also address other conditions; such as the current very low graduate student (doctoral stream) to faculty ratios.

The table below shows the current and projected FTE counts for Biology and CPS based on the approved academic growth of Biology and CPS to 2018/19, extrapolated growth of Biology and CPS to 2022/23, and the anticipated complement of principal researchers, research staff and graduate students for the CMC.

COU Input Measures: Faculty, Staff and Graduate Students

		2016/17	2022/23 (new Science Building)					
	COU Cat.	**BIO & CPS**	**CMC**	**BIO & CPS (Non-CMC)**	**Assignment (tbd)**	**Totals**	**Not in Capital Project**	**Grand Totals (By 2022/23)**
Faculty	4.1	56.90	9.00	19.00	6.00	34.00	0.00	90.90
Post Doc. Fellows	4.2	33.00	20.00	2.00	12.00	34.00	0.00	67.00
Research Associates	4.2	4.30	7.00	2.00	2.00	11.00	0.00	15.30
Grad. Student	4.3	123.00	100.00	60.00	90.00	250.00	0.00	373.00
Admin. Staff	4.4	29.50	0.00	0.00	0.00	0.00	13.00	42.50
Field Staff	4.5	1.00	0.00	0.00	0.00	0.00	1.00	2.00
Totals		**247.70**	**136.00**	**83.00**	**110.00**	**329.00**	**14.00**	**590.70**

Note: In the above table, the numbers shaded in green are the faculty, post-doctoral fellows, staff and graduate students who are accounted for in either the new building or in existing allocations. The column in yellow are

for administrative and field staff who have not been accommodated in this project and will either need to be accommodated elsewhere or via space efficiencies (e.g. more shared offices) found in existing space.

The remainder of the space program will allow the relocation and modest expansion of the Forensic Science program, and the remediation and expansion of UTM's shipping, receiving, waste management and warehousing operations. The following space requirements and space program sections identify the space allocated to them in the new Science Building.

3. Space Requirements:

Research and Office Facilities for CMC and Wet Laboratory Expansion

The tables below compare existing to the proposed allocations for research space (COU space category 3) and academic office space (COU space category 4), as well as generated space requirements for the Departments of Chemistry & Physical Sciences, and Biology, and the Centre for Medicinal Chemistry (after the new Science Building has been fully occupied in 2022/23).

According to the COU analysis of research facilities for CPS and Biology, the existing space allocation for these two departments is 75.4% of the area generated using COU's 2016 space formula (Research Laboratory Space, Category 3, Group A, space factor of 40 nasm per FTE researcher vs. a space factor of 45 nasm per FTE researcher in the COU 2013 formula). The anticipated revised space formula for Research Laboratories represented by the 2016 COU Guidelines is closer to the existing realities of wet laboratory space on the UTM campus, better embodying the efficiency sought by the new Science Building's space program and has been applied throughout this analysis. The analysis of allocation for research space after the new Science Building has been occupied shows that the projected allocation will be 83.2% of the area generated using COU's space formula (8,666 nasm vs 10,422 nasm).

This improvement is a significant increase over the current ratio.

COU Overview (Category 3): new Science Building (BIO, CPS, CMC)

	Academic Year 2016/17				
	Biology - Researchers	**CPS - Researchers**	**Totals - Researchers**	**COU - FTE Factor**	**Totals - FTE Researchers**
Faculty Research	36.00	20.90	56.90	1.0	56.90
Post-Doctoral Fellows	16.00	17.00	33.00	0.5	16.50
Research Associates	2.00	2.30	4.30	0.5	2.15
Graduate Student	72.00	51.00	123.00	0.5	61.50
Totals	**126.00**	**91.20**	**217.20**		**137.05**

COU Generated (Cat 3)		5,482.00
UTM Inventory (Cat 3)		4,131.00
Net Addition (Cat 3)		0.00
Totals (Cat 3)		4,131.00
Inventory vs. Generated		75.36%

COU Overview (Category 3): new Science Building (BIO, CPS, CMC)

	Academic Year 2022/23				
	Growth - Researchers	**Growth – FTE Researchers**	**Totals - Researchers**	**COU - FTE Factor**	**Totals - FTE Researchers**
Faculty Research	28.00	28.00	84.90	1.0	84.90
Post-Doctoral Fellows	22.00	11.00	55.00	0.5	27.50
Research Associates	9.00	4.50	13.30	0.5	6.65
Graduate Student	160.00	80.00	283.00	0.5	141.50
Totals	**219.00**	**123.50**	**436.20**		**260.55**

COU Generated (Cat 3)		10,422.00
UTM Inventory (Cat 3)		4,815.00
Net Addition (Cat 3)		3,851.00
Totals (Cat 3)		8,666.00
Inventory vs. Generated		83.15%

The analysis and comparison of academic office space (COU category 4) focuses on the space needed to support research in the new Science Building. In this case, some comparisons between existing and projected allocations for academic office space are useful. CPS and Biology currently occupy 1,841 nasm of offices and office support space. The current COU formula generates for these two departments 2,332 nasm for a ratio of 78.9 % (existing inventory vs COU generated). As with research space, this ratio indicates that these two departments are under-supplied with academic office space.

This project will provide academic office space which will accommodate not only the researchers identified with the aforementioned research facilities but also new faculty and staff hires, and new doctoral-stream graduate students who are not directly associated with the CMC or the CPS and Biology research platforms slated for the new building. When fully occupied, the proposed allocation for offices in the new Science Building will double the amount of office space for CPS and Biology (assuming that the existing allocations are not eroded). The projected allocation at 79.32% of the COU generated amount does not change significantly from the current ratio, but does allow the recruitment of a considerable number of new faculty and staff, and graduate students. These new recruitments will be crucial in improving UTM's faculty-to-undergraduate and faculty-to-graduate student ratios.

COU Overview (Category 4): new Science Building (BIO, CPS, CMC)

	2016/17					
	COU Cat.	**Unit Amount**	**Biology**	**CPS**	**Totals**	**COU Generated**
FTE Faculty	4.1	12.00	36.00	20.90	56.90	682.80
Post-Doc Fellows	4.2	12.00	16.00	17.00	33.00	396.00
Research Assoc	4.2	12.00	2.00	2.30	4.30	51.60
Grad Students	4.3	3.00	72.00	51.00	123.00	369.00
Non-Academic Staff	4.4	12.00	16.50	13.00	29.50	354.00
Field Staff	4.4	12.00	0.00	1.00	1.00	12.00
Subtotals			142.50	105.20	247.70	1,865.40
Office Support	4.5	25%				466.35
Totals (Cat 4)						**2,331.75**

	Projected growth (Biology, CPS CMC)							2022/23	
	2017/18	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**Sub-totals**	**Totals**	**COU Generated**
FTE Faculty	6.00	0.00	1.00	8.00	9.00	10.00	**34.00**	90.90	1,090.80
Post-Doc Fellows	6.00	0.00	1.00	8.00	9.00	10.00	**34.00**	67.00	804.00
Research Assoc	1.00	0.00	0.00	2.00	3.00	4.00	**10.00**	14.30	171.60
Grad Students	21.00	26.00	32.00	56.00	57.00	8.00	**250.00**	373.00	1,119.00
Non- Academic Staff	0.00	0.00	1.00	2.00	4.00	6.00	**13.00**	42.50	510.00
Field Staff	0.00	0.00	0.00	0.00	0.00	1.00	**1.00**	2.00	24.00
Subtotals	34.00	26.00	35.00	76.00	82.00	89.00	342.00	589.70	3,719.40
Office Support									929.85
Totals (Cat 4)									4,649.25

Growth accommodated in New Science Building

Growth accommodated elsewhere on the UTM Campus

COU Category	**Exist. Inv.**	**COU Generated**	**new Science Bldg**	**Adjusted Total**	**COU Generated**
4.1	804.42	682.80	414.00	1,218.42	1,090.80
4.2	109.73	447.60	312.00	421.73	975.60
4.3	475.47	369.00	750.00	1,225.47	1,119.00
4.4	324.98	366.00	0.00	324.98	534.00
4.5	125.96	466.35	371.00	496.96	929.85
Totals	1,840.56	2,331.75	1,847.00	3,687.56	4,649.25
Inv/COU Gen	78.93%			79.32%	

Forensic Science Program

The Committee has recommended that the existing program be relocated from its current location in the Terrence Donnelly Health Science Complex (four offices on the fourth floor) and add two additional offices to accommodate new hires expected in the near future. It is recommended that some office support space be included to ensure some level of self-sufficiency in the new location. Specifics of this program's space allocations are discussed in the later section on *Space Program and Functional Plan* and the room data sheets (RDS).

The four vacated offices from the Health Science Complex will be returned to the UTM's Space Planning and Management Committee for re-assignment. The Forensic House and the technician's allocation in the Davis Building are unaffected by this project.

If the program gains full departmental status or grows beyond the proposed space allocation, then additional offices will be taken from the pool of unassigned offices and any requirements for research space will also be factored into the allocation of the pool of wet research laboratories in the new building.

Facilities Management & Planning

As noted earlier, the Davis Building's original loading dock and surrounding facilities have barely managed to meet the shipping, receiving, warehousing and waste management needs of the building and the surrounding campus. When the Davis Building was originally constructed, its designers never envisioned the level and complexity of materials, equipment and activities that would pass through or be accommodated in the loading dock space. The addition of the new Science Building will add considerably to the demands placed on this type of operation.

The new building is proposed to include 1,241 nasm for an expanded shipping, receiving, warehousing and waste management operation as well as more appropriate staff facilities for the Custodial Services. As well, the project will renovate, re-purpose and integrate 513 nasm of the existing facilities into the new, upgraded dock operations; the remainder of the existing space (approximately 270 nasm) will be returned as net non-assignable space (COU category 16). After new construction and renovations, the new dock operations will have a total of 1,754 nasm; an increase of just over 200% over the existing allocation. The facilities will service and support the new Science Building and Davis Building as well as a portion of the campus' central shipping and receiving needs.

Additional Space Allocation

The VP Research will initiate an advisory committee to assess and administer space allocations for any new occupancies and changes within the new Science Building.

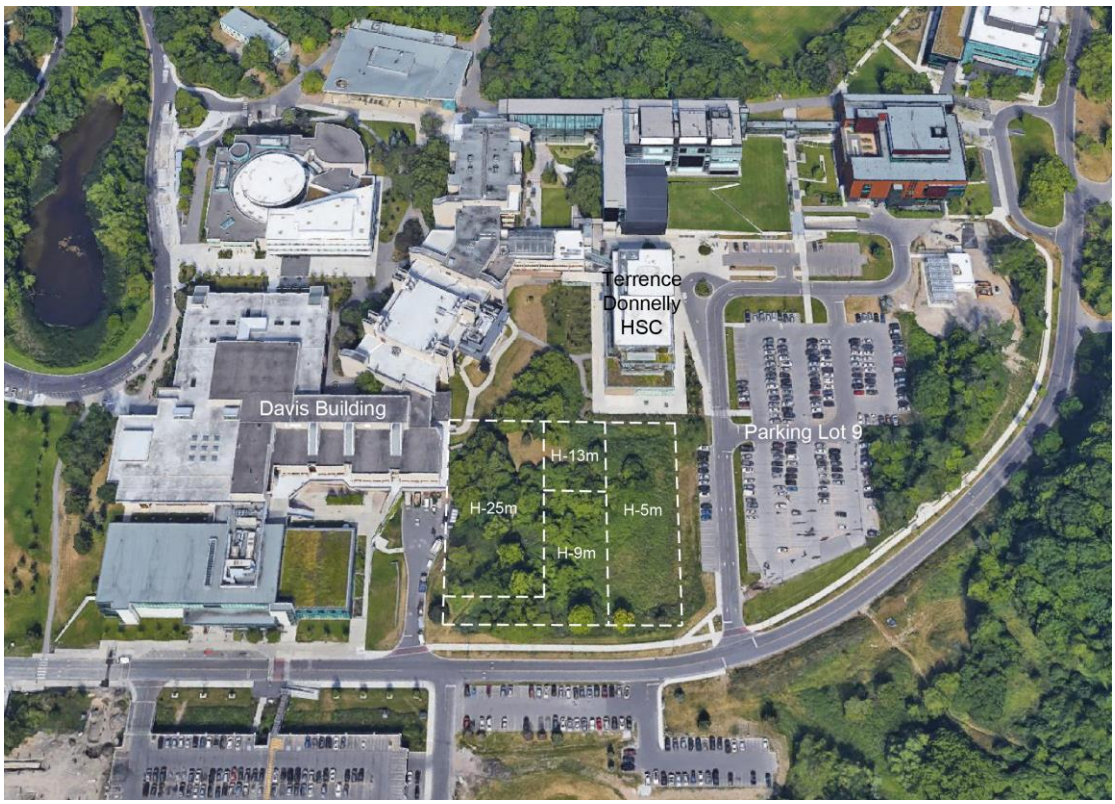
III. Project Description

a) Vision Statement

The University of Toronto Mississauga has long recognized the need to construct new wet laboratory science facilities to meet the requirements of its research efforts. UTM has also recognized that nationally significant research programs can serve as focal points to attract even greater financial support, activities that can catalyze and leverage investments already made to its researchers; new research opportunities rooted in laboratory sciences that are of strategic significance to UTM have materialized because of the innovative faculty who have been retained by UTM's academic departments. In particular, UTM has committed to the development of a Centre for Medicinal Chemistry (CMC) that will focus its research endeavors on the creation of new therapeutics targeting cancers and other illnesses.

UTM intends to design and construct a state-of-the-art Science Building that will not only house the CMC but also support a broader tapestry of wet laboratory sciences including CPS, Biology and Forensic Science; these facilities will permit the CMC to realize its research aspirations and will address UTM's research laboratory expansion needs. The building will provide shape to a community of researchers, encouraging collaboration through inventive design, creating an infrastructure of interdisciplinary development and discovery.

This new construction will provide highly-serviced research laboratories and laboratory support space in a structure that is sustainable, energy-efficient, functionally effective and architecturally attractive while making a bold statement about the innovative science taking place within its walls.



Site 1 Development Footprint – *from 2011 Campus Master Plan*

Although the new Science Building will be connected to the Davis Building, allowing it to take advantage of the opportunity to extend established pedestrian and servicing networks, the building should also read as its own edifice with its own identity. Part of this identity will be established by the inclusion of a main entrance, a clearly identifiable 'front door' to the building, which may be best located at the northern end of the site, and opening onto the current Parking Lot 9 (the future Academic Quad area). Likewise, within the building itself, the functional organization of activities and occupants must strike a balance between discernable identities (primarily CMC, with CPS, Biology and Forensic Science) and an interdisciplinary whole which fosters collaboration and interaction.

The new building's location within the greater Site 1 development envelope (UTM Campus Master Plan 2011) must be carefully considered in order to maximize efficiency and functionality while maintaining the possibility for the future development of any remaining unused areas. The project will include significant landscape elements such as a forecourt and an articulation of its enclosure of the courtyard to the west, in order to integrate with the surrounding buildings and open space networks. The new Science Building will contribute to the significant science-based activities taking place in this sector of the campus, and help establish a critical mass of science infrastructure comprised by the neighbouring Davis Building and Health Science Complex.

b) Space Program and Functional Plan

Space Program

The total project area is 7,134 nasm, approximately 15,552 gsm based on an overall area gross-up factor of 2.18. It is anticipated that building layout and space efficiencies as determined through the design process may reduce the overall gross up factor. While this gross-up factor is higher than typically found in academic buildings, the new Science Building's space program is comprised of highly-serviced wet laboratories and support facilities as well as an Animal (Mouse) Care Facility; this type of building will have a significant amount of primary mechanical and electrical systems and redundant back-up systems for critical areas. Also, the building's utility requirements for heating and cooling, and emergency/back-up power likely will not be met by the campus' central operations and will instead be met within the building itself (not the Central Utility Plant).

Summary of COU Generated Areas and Proposed Space

Program	COU Category	COU 2013 Generated (nasm)	COU 2016 Generated (nasm)	Proposed Space (nasm)	% G/P (2013)	% G/P (2016)
CMC - Research Platforms: Labs & Support	3.0	3,263	2,900	2,324	71.2%	80.1%
CMC – Animal Care Facility						
CMC – Offices and Support	4.0	732	732	784	107.1%	107.1%
UTM Science Expansion – Labs & Support	3.0	4,905	4,360	1,527	31.1%	35.0%
UTM Science Expansion – Offices & Support	4.0	1,208	1,208	1,063	88.0%	88.0%
High Performance Computing Data Centre	12.0	n/a	n/a	70	-	-
Forensic Science Program – Offices & Support	4.0	105	105	125	119.0%	119.0%
Campus and Building Services Support	9.0, 12.0	n/a	n/a	1,241	-	-
Total				**7,134**		

Note: A change in the COU space formulae is anticipated for 2016-17, reducing Category 3.0 (Research Laboratory Space), Group A disciplines from a space factor of 45 to 40 nasm per FTE input. This smaller space factor is more closely aligned to the research space demands of the new Science Building and has been used as the reference guideline in allocating program areas.

A: Centre for Medicinal Chemistry Research Cluster:

The new Centre for Medicinal Chemistry Research Cluster will be used mainly by CMC Researchers at (3,108.0) nasm, except some areas that will be shared by CMC, with Biology, and Chemistry & Physical Sciences. The CMC space program has been sub-divided into its component research platforms, the Animal (Mouse) Care Facility, and its office allocations. The following sub-sections discuss each of these modules.

A1: Synthetic Chemistry Research Module

The Synthetic Chemistry Research Module will house the main CMC research laboratories, 10 modular laboratories of 70 nasm each, with laboratory support space consisting of equipment/instrumentation, balance and small equipment, chemical preparation, preparation and autoclave, chemical dispensing and general storage rooms that have a total of area allocation of 140 nasm.

In the space program, it is recommended that this module be located on the 3rd & 4th floors; the 70 nasm laboratory modules need be located adjacent to each other. This adjacency will allow for the ready movement of researchers and materials between the modules and will accommodate future expansion of specific research activities. Also, these primary laboratories need to have their support areas located nearby, and located close to the building's central support facilities

Laboratories will have secured access (UTM T-Card security access system) and will be segregated from the building's main entrance, public thoroughfares, and any other noisy/high traffic areas.

This primary research laboratories module will accommodate the chemistry research activities typically assigned to a single research team. These laboratory modules could be linked with others to form larger facilities and will be configured in a manner allowing for these larger laboratories to be readily returned to the smaller basic modules. As well, these laboratories should be capable of being subdivided to accommodate specialized equipment needs or research functions.

Each CMC laboratory will have six (6) fume cabinets that are 8'-0" wide to accommodate the heavy use in these labs.

A1: Synthetic Chemistry Research	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Primary Research Laboratory	10	70	700	SCR -3.1-01
Equipment/Instrumentation Rooms	2	20	40	SCR -3.2-01
Balance and Small Equipment Rooms	2	10	20	SCR -3.2-02
Chemical Preparation Rooms	2	10	20	SCR -3.2-03
Preparation and Autoclave Rooms	2	10	20	SCR -3.2-04
Chemical Storage/Dispensing Room	2	10	20	SCR -3.2-05
General Storage Rooms	2	10	20	SCR -3.2-06
Subtotal – Synthetic Chemistry Research:	**22**		**840**	

A2: Molecular Biology/Oncology Research Module

The Molecular Biology/Oncology Research Module will consist of one (1) primary research laboratory that is 100 nasm in size and two (2) cell culture facilities that will be shared by CMC and Biology with a total allocation of 120 nasm. This module will also have the following support areas: balance and small equipment rooms totaling 20 nasm and controlled environment rooms of 16 nasm, preparation/sterilization room at 20 nasm and storage rooms of 20 nasm.

It is recommended to locate the module on the 2nd floor except for the cell culture facilities which should be located on the 2nd and 3rd floors.

A2: Molecular Biology/Oncology Research	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Primary Research Laboratory	1	100	100	MBO -3.1-01
Cell Culture Facility	2	60	120	MBO -3.2-01
Balance and Small Equipment Rooms	2	10	20	MBO -3.2-02
Controlled Environment Rooms	2	8	16	MBO -3.2-03
Preparation/Sterilization Room	1	20	20	MBO -3.2-04
Storage Rooms	2	10	20	MBO -3.2-05
Subtotal – Molecular Biology/Oncology Research:	**10**		**296**	

A3: Humanized Mouse Research Module

As per the Canadian Council on Animal Care (CCAC) Guidelines, laboratory animals are not allowed to leave and re-enter the CMC Animal (Mouse) Care Facility; this protocol ensures that cross contamination with other specimens does not occur. Therefore the Humanized Mouse Research Module will need to be located within the CMC Animal (Mouse) Care Facility.

This module consists of one (1) primary research laboratory of 80 nasm and laboratory support areas (equipment, instrument, preparation and storage rooms) of 70 nasm for a total of 150 nasm.

A4: Computational Chemistry Research Module

The Computational Chemistry Research Module consists of two (2) primary research laboratories with a total of 80 nasm, a collaborative work area of 45 nasm, and laboratory support and storage areas which total 30 nasm.

The Computational Chemistry Research Module is recommended to be located on the 2nd floor, as close as possible to the HPC Data Centre.

A4: Computational Chemistry Research	**# of Rooms**	**Nasm per Room**	**Total Nasm**	**Room Data I.D. #**
Primary Research Laboratory (Wet Chemistry)	2	40	80	CCR -3.1-01
Collaborative Computer Laboratory	1	45	45	CCR -3.1-02
Support Facility (Wet Laboratory)	1	20	20	CCR -3.2-01
Storage Room	1	10	10	CCR -3.2-02
Subtotal – Computational Chemistry Research:	**5**		**155**	

A5: CMC Animal (Mouse) Care Facility

The design of this facility will need to meet the *Guidelines on Laboratory Animal Facilities* as required by the Canadian Council on Animal Care and will only be accessed by authorized researchers and support staff.

This area's construction will present a considerable amount of planning attention due to the rigorous standards concerning health, safety and permit regulations. Laboratory mice will be the only specimens present in this area, and they will remain in this area (no movement to other facilities in the building or on campus).

The space program allocates varying sizes of animal (mouse) housing rooms (medium, small and smaller) with their support areas (procedure and support rooms), surgical suite, storages; feed, bedding, racks and cages and also staff areas (office, meeting room, lobby, change and washrooms) and docks (clean and dirty). The total area required is 883 nasm.

A6: CMC Academic Office Space

CMC's Academic Office areas will consist of private and shared offices, and offices support space; such as, reception area, photocopy/facsimile rooms, lounge, storage and kitchenettes. Offices will be assigned to principal investigators (faculty), other researchers (e.g. researcher associates, post-doctoral fellows), graduate students, and administrative support staff. The provision of a slightly larger than generated envelope of office support space anticipates the additional demands of the CMC as the building's foundational occupant group.

In the Space Program, the offices (faculty, academic and researchers), small meeting rooms and office support areas were located on each floor (2^{nd}, 3^{rd} and 4^{th}) such that they are conveniently located to the appropriate research clusters. The CMC's main office operations and office for principal investigators will need to be separated from noisy/high-traffic areas; office space for research associates, post-doctoral fellows and graduate students will need to be close to the CMC laboratories.

A6: CMC Academic Office Space	**# of Rooms**	**Nasm per Room**	**Total Nasm**	**Room Data I.D. #**
Director Office	1	18	18	CMC - 4.1-01
Faculty Offices	8	12	96	CMC -4.1-02
Other Academic Offices	7	12	84	CMC -4.1-03
Postdoctoral (Shared - 2 per room)	10	12	120	CMC -4.2-01
Graduate Student Offices (Shared - 5 per room)	20	15	300	CMC -4.3-01
Reception Area	1	12	12	CMC -4.5-01
Office Support - Photocopier/Printer Room	3	12	36	CMC -4.5-02
Office Support - Collaboration Room/Lounge (20-seat)	1	50	50	CMC -4.5-03
Office support – Storage	2	18	36	CMC -4.5-04
Kitchenette (1 @ 12 + 2 @ 10)	3	12 + 10	32	CMC -4.5-05
Subtotal – CMC Academic Offices Space:	**56**		**784**	

B: New Wet Research Cluster:

The New Wet Research Cluster will be shared primarily by researchers from the Departments of Biology, and Chemistry & Physical Science, as well as the CMC. The allocation of space in this cluster will not be restricted to these aforementioned groups but will be available to researchers from other wet-laboratory-based initiatives and assignments will considered on the potential synergies with the resident activities in the building. The cluster consists of a Collaborative Wet Research Module that totals 1,507 nasm and an Academic Office Space Module of 1,063 nasm. When combined with the resultant overall campus inventory of wet laboratories, this new research cluster will bring the overall total of wet laboratory space at UTM to 83.15% of COU generated to actual space inventory (not including Animal Care facilities).

B1: Collaborative Wet Research Module

The Collaborative Wet Research Module will be used primarily by biology and chemistry researchers and will consist of modular wet (heavy, medium and light) research laboratories and laboratory support areas (e.g. equipment and instrument rooms, freezer and refrigerator farm, chemical, equipment and supplies storage areas). As with the CMC clusters, it is recommended that these laboratories be located adjacent to each other to accommodate collaborative research and to permit expansion of researchers into adjacent facilities. Laboratory support areas should be close to each other (serving as a centralized support facility) but be readily accessible to all researchers. Similar to the CMC, laboratories will have secured access (UTM T-Card security access system) and will be separated from the main entrance, public thoroughfare, large meeting room and any other noisy/high traffic areas. In the space program, these laboratories and the laboratory support areas are recommended to be distributed between three floors of the building (2nd, 3rd and 4th).

Each laboratory should be capable of being subdivided into smaller modules to accommodate specialized equipment needs or research functions. Wet (heavy and medium) laboratories will have two (2) fume cabinets as required by biologists and chemists; laboratory design should allow for the conversion of a heavy wet laboratory into a medium laboratory if needed in the future.

Freezer farms are proposed for this module; they will accommodate the following equipment: -80° freezer, walk-in -20° freezer and walk-in +4° refrigerator, and will be located on each laboratory floor (2nd, 3rd and 4th levels). Equipment and supplies storage room will be located on floor level one where it is easily accessed by all of the researchers in the building. This facility will be sub-divided with individual chain-link fence lockers (approximately 1.22 m x 2.74m in size for each) with lockable doors.

B1: Collaborative Wet Research	**# of Rooms**	**Nasm per Room**	**Total Nasm**	**Room Data I.D. #**
Primary Wet (Heavy) Research Laboratory	10	64	640	CWR -3.1-01
Primary Wet (Medium) Research Laboratory	5	64	320	CWR -3.1-02
Primary Wet (Light) Research Laboratory	4	60	240	CWR -3.1-03
Autoclave / sterilization room (central)	1	20	20	CWR -3.2-01
Freezer, Equipment, Instrument, Support Room	3	60	160	CWR -3.2-02
Cold room at 4C	1	16	16	CWR -3.2-03
Freezer room at -20C	1	16	16	CWR -3.2-04
Microscope room	1	25	25	CWR -3.2-05
Chemical storage	1	20	20	CWR -3.2-06
Storage equipment/supplies	1	50	50	CWR -3.2-07
Subtotal – Collaborative Wet Research:	**28**		**1,507**	

B2: General Academic Offices Space

The Academic Offices Space Module will consist of offices and office support spaces (i.e. meeting rooms, kitchenettes and photocopier/facsimile areas) and will be assigned to principal investigators

(faculty), other researchers (research associates, post-doctoral fellows and technicians) and graduate students primarily for the Departments of Biology and Chemistry & Physical Sciences.

In the Space Program, these offices, meeting rooms and office support areas were distributed between the three laboratory floors (2nd, 3rd and 4th), while the large meeting room was placed on the main floor level (level 2) to provide easy access to all building occupants and visitors.

B2: Academic Offices Space	**# of Rooms**	**Nasm per Room**	**Total Nasm**	**Room Data I.D. #**
Faculty Offices (Private)	25	12	300	AOS -4.1-01
Other Academic/Admin. Offices	2	12	24	AOS -4.1-02A
Postdoc. Offices (Shared - 2 per room)	7	12	84	AOS -4.1-02B
Graduate Student Offices (Shared - 5 per room)	30	15	450	AOS -4.2-01
Kitchenette	2	12	24	AOS -4.5-01
Copy Area	2	8	16	AOS -4.5-02
Meeting room small (capacity 6-8)	5	24	120	AOS -4.5-03
Meeting Room (capacity 20)	1	45	45	AOS -4.5-04
Subtotal – Academic Offices Space:	**74**		**1,063**	

C: High Performance Computing Data Centre:

The High Performance Computing (HPC) Data Centre will accommodate servers, switches, racks/cabinets, cabling and physical infrastructure needed to support the high performance computing requirements of researchers not only of the CMC but also on the UTM campus. This facility has been sized to accommodate additional equipment to meet future computing needs for the 5 to10 years after the facility has been opened. Due to the inherent utility demands that data centres can place on a building's infrastructure, the design of the HPC Data Centre needs to be as energy efficient and eco-friendly as possible.

The HPC Data Centre will consist of two (2) major areas: a main server room of approximately 50 nasm and a technician's work area of approximately 20 nasm with a visual separation (glass partition) between them. It is recommended that this facility have a raised floor and the servers to be housed in liquid cooling racks/cabinets.

The Server room will house HPC (High Performance Computing) servers, racking and networking equipment. Initially, this server area will accommodate a single row of eight (8) cabinets (with a long, rectangular footprint), a VESDA fire suppression system, and an uninterrupted power source (UPS). The work room will serve as a server/equipment assembly, repair and monitoring area for I&ITS staff.

The HPC Data Centre will be located in the lowermost level of the building (level 0) in order for it to be close to the building infrastructure services and loading dock. However, this facility can be prominently located within public view to showcase this centre's high technology equipment that is reflective of the researchers' activities in the Science Building.

Although the HPC Data Centre will have a high public profile, it will still be required to have secure access with accessibility from authorized I&ITS staff.

C: HPC Data Centre	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Server Room	1	50	50	HPC -12.1-01
Work Area Room		20	20	
Subtotal – HPC Data Centre:	**2**		**70**	

D: Forensic Science Program Cluster:

The Forensic Science program typically has its faculty, instructors and support staff who are assigned to a variety of academic departments (e.g. Anthropology, Biomedical Communications, Biology, Chemistry and Psychology) or a retained on a contractual basis (e.g. stipend instructors) as needed by the offered courses. As such, the program does not report or generate any space allocations. Currently, the program director and core instructors/staff are accounted in UTM's space inventory under the Department of Anthropology (in the Health Sciences Complex). There is future anticipation to have the Forensic Science Program obtain accreditation as a full academic department, with the new Science Building providing the space resources necessary to support this development. The fulsome envelope of space for this group anticipates the needs associated with the transformation into a full, stand-alone department.

For planning purposes, the program is anticipated to have a director (or chair), an administrative support staff and five FTE faculty/instructors by the end of this project's planning horizon. The space program consists of 125 nasm assigned for offices and support space (reception, kitchenette and copy/fax area).

The Forensic Science program requires undergraduate teaching laboratories, but its current and future needs will be accommodated within existing science teaching facilities in the Davis Building. The program's director and faculty also have requirements for research laboratory space. Currently, its research requirements are being met within Anthropology's allocation in the Health Sciences Complex. This, and any future needs, will be considered for inclusion in the New Wet Research Cluster the Academic Dean and Vice-Principal Research when the allocation plan for the new building is developed.

As identified in the Space Program, the Forensic Science Program Cluster is recommended to be located on the main floor – Level 2 to have the program visible to the public.

D: Forensic Science	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Program Director's Office	1	18	18	FSP -4.1-01
Administrative Staff Offices	1	12	12	FSP -4.4-01
Academic Offices	5	12	60	FSP -4.1-02
Reception/Waiting Area	1	20	20	FSP -4.5-01
Office Support and Kitchenette	1	15	15	FSP -4.5-02
Subtotal – Forensic Science:	**9**		**125**	

E: Facilities Management & Planning:

Facilities Management & Planning (FMP) will have new facilities located on two levels of the Science Building. The lowermost level (0 or basement) will house the new Shipping/Receiving/Stores Area (E1) and the next level up will accommodate the Campus Services Area (E2).

The new shipping, receiving, warehousing and waste management facilities will have not only the same floor elevation as the existing facilities but also be contiguous with existing operations. The new custodial facilities on the next floor up will accommodate staff who provide custodial services to the new Science Building and to the Davis Building. As such, it will need to be conveniently located for both buildings as well as the buildings' dock operations.

The existing dock operation has had difficulties meeting the needs of the Davis Building occupants and has developed in an ad hoc manner over the years. The demands of the new Science Building will be far greater than what can be handled in the current arrangement. The need for a larger, more efficient facility is clearly evident.

The 1,241 nasm program area for the new FMP facilities provides a significant, but needed, increase. When added to the proposed renovations of existing facilities (net area of 513 nasm), the combined Science/Davis Building operation will have a total of 1,754 nasm - a significant increase of 185% over existing allocations.

FMP's Building Operations and Services Division is responsible for building maintenance, custodial services, recycling, shipping/receiving and stores. This unit also works with the Grounds Division to handle each building's waste management. UofT's Environmental Health and Safety unit works with end users and FMP for the safe storage and disposal of hazardous materials (chemical, biological, radioactive, etc.).

Upon completion of the new Science Building, this building will constitute a significant built presence on campus, and the amount of waste and recyclables will dramatically increase. The space program, therefore, includes an enclosed waste management facility that will accommodate a 15-cubic yard trash compactor two 6-cubic yard bins for general recyclables, and miscellaneous solid waste such as: special waste/recyclables (e.g. lamps, ballasts. wood skids, etc.).

The new Science Building will have to significantly increase the need for custodial services. This project will include new lunch and change rooms, shower and washroom suites for housekeeping staff, a supervisor's office, duty room and supplies and equipment storage. The existing custodial facilities by the Davis Building shipping and receiving area will be vacated, demolished and renovated to accommodate additional warehousing capabilities.

E1: Shipping/Receiving/Stores Area

E1: Shipping/Receiving/Stores Area	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Loading Dock	1	225	225	FMP -12.1-01
General Warehouse Storage (Short-Term)	1	225	225	FMP -12.1-02
General Warehouse Storage (Medium-Term)	1	400	400	FMP -12.1-03
Central Academic Stores	1	35	35	FMP -12.1-04
Central Chemical/Solvent Stores	1	80	80	FMP -12.1-05
Gas Cylinder Stores	2	8	16	FMP -12.1-06
Recycling/Waste Storage	2	25	50	FMP -12.1-07
Supervisor's Office	1	15	15	FMP -10.1-01
Subtotal – Shipping/Receiving/Stores:	**10**		**1,046**	

E2: Campus Services Area

E2: Campus Support Services	# of Rooms	Nasm per Room	Total Nasm	Room Data I.D. #
Main Storage Facility (Supplies and Equipment)	1	75	75	FMP -9.1-01
Lunch Room (Women)	1	28	28	FMP -9.1-02
Change Room/Lockers (Women)	1	21	21	FMP -9.1-03
Showers/Washroom (Women)	1	(9.3)	(9.3)	FMP -9.1-04
Lunch Room (Men)	1	28	28	FMP -9.1-05
Change Room/Lockers (Men)	1	21	21	FMP -9.1-06
Showers/Washroom (Men)	1	(9.3)	(9.3)	FMP -9.1-07
Foreperson's Office	1	12	12	FMP -10.1-02
Duty Room	1	10	10	FMP -10.1-03
Subtotal – Campus Support Services:	**9**		**195**	

Renovations to Existing Shipping and Receiving Facility

Currently, FMP and other building users occupy approximately 618.61 square metres of facilities for shipping, receiving, waste management, warehousing and storage on level 0 of the Davis Building. Several of these spaces; such as, the caged storage area in the Service Tunnel for examination tables and chairs, and a series of small storage rooms that created by erecting walls in corridor DV0126, are not ideal from a fire safety or security standpoint. As well, the current situation in the loading dock facilities does not allow for the timely dispersal of delivered goods to clients; many of these deliveries are dropped on the loading dock floor or other circulation areas.

The placement of these materials causes not only an inefficient shipping and receiving operation but also creates congestion for foot and wheeled traffic.

The partial floor plan of Level 0 presented below shows the current arrangement of the Davis Building loading dock and surrounds.

William G. Davis Building – Basement (Level – 0) – partial 'L' Block - Existing

UTM proposes that the renovation of the above area be renovated as part of this project to address the aforementioned operational issues, and to integrate the renovated space with the new facilities proposed in the Science Building. This renovation should be designed and constructed to match the new building's materiality; the combined facility should function and appear as one harmonious operation.

UTM recommends that the existing loading dock (DV0132) be expanded by the demolition of the recycling/waste management room (DV0132B) and the shipping office (DV0132A), and by extending the loading dock out to the edge of the existing canopy (underside of podium walkway on

the second floor). This additional floor area will allow for the construction of a new corridor between the loading dock and the existing kitchen operations. This corridor will also provide a direct connection to the Science Building. There will not be any physical separation between the expanded existing loading dock and the new facility in the Science Building. This corridor is proposed to be no less than 2.80m wide.

The above corridor will be extended roughly west through the existing floor area designated as DV0132K to meet with a renovated corridor (approximately 3.05m wide) that will be re-established along the west side of the original corridor, DV0126. This renovated corridor will require the demolition of the existing storage rooms (DV0126A, DV0126D, DV0126E and DV0126F) and the demolition of the existing corridor wall along the east side which will be replaced with a new wall approximately 1.66m further to the west. The renovated corridor will need to jog to the east at its south end to travel around existing mechanical equipment.

The partial floor plan below illustrates the new and renovated corridors and the subsequent re-development of available floor space into re-purposed shipping, receiving, warehousing and storage facilities.

William G. Davis Building – Basement (Level – 0) – partial 'L' Block - Proposed

In summary, this proposed renovation will result in:

Revised Loading Dock	153.20 nasm
Academic Stores (Caged Areas):	
- 6 cages @ 12.00 nasm each	72.00 nasm
- 6 cages @ 10.00 nasm each	60.00 nasm
- 10 cages @ 6.00 nasm each	60.00 nasm
Examination Furniture Storage	95.00 nasm
Central Campus Mail Room	36.45 nasm
FMP Secure Storage	26.13 nasm
Radioactive Waste Storage	18.00 nasm
Custodial Closet	5.40 sm
Kitchen Stores (New)	7.10 nasm
Unassigned Stores	25.50 nasm
Total Allocation	551.73 sm

The reduction in area after renovations is due to the development of the new and revised corridor system and the elimination of undesirable spaces (e.g. the caged area in the Service Tunnel). UTM recognizes that a number of building features; such as, fire hose cabinets, grease traps, etc. will need to be relocated, improved or supplemented as a result of the renovations. It is expected that these renovations will not take place until the facilities in the new building are operational and will not begin until of the existing functions have been relocated to the new building. Renovations will be phased to ensure that demolition, abatement and new construction will have minimal disruptions to adjacent building activities.

Non-Assignable Areas

Included in the building project are non-assignable elements that are not specifically described in the Space Program and unpublished room data sheets (RDS), although both will be part of the design team's responsibility in the design of the new Science Building. Because non-assignable spaces are not detailed with individual room data sheets, their design will be developed from best architectural and engineering practices, and from UTM's construction standards and specifications.

Non-assignable areas include: washrooms, elevators, corridors, stairs, electrical and telecommunications closets, mechanical rooms and shafts, etc. These aspects of the building program are not included in the above summary of assigned spaces. All of the building's assignable and non-assignable areas are to be accommodated within the recommended building gross up factor of 2.18 times the net assignable area (nasm) described in the space program. It is anticipated that building layout and space efficiencies as determined through the design process may reduce the overall gross up factor.

UTM's Facilities Management & Planning assumes that the following non-assignable areas will need to be contained within the new Science Building project. As space-related items are not static by nature, changes to UTM's policies, standards and specifications will likely change during the design and construction phases of the project.

Basement Level (Level 0) and First Floor (Level 1):

1. Building entry facility (BEF) for telecommunications to accommodate voice and data lines for the new Science Building and for future growth within the UTM Campus.

2. Building entry facility (BEF) for heating and cooling (District Energy System) supplies from and returns to the Central Utility Plant (CUP), domestic water and gas (propane and/or if required); as well, this mechanical room will accommodate the equipment associated with the gray water system (if applicable), fire suppression system, compressors and booster pumps (if required), and flow/consumption meters. Note: The above description assumes that heating and cooling services will originate from the CUP; however, engineering investigations may recommend that the District Energy System's heating and cooling needs be met by generation within the building or nearby, and not in the CUP.
3. Building entry facility (BEF) for line voltage and emergency/back up electrical power; this main electrical room will accommodate the main electrical panel, consumption meter and emergency power switchgear.

Note: The BEF's (especially the mechanical services) may be located in a double height facility that extends into the level one floorplate.

First Floor (Level 1):

1. This area will likely accommodate the building and laboratory infrastructure needed to not only provide primary support of that facility but also any necessary back-up or redundant systems.

Each Assignable Floor (Levels 0 to 4):

1. Elevators – at least two electric gearless traction elevators with one large enough to accommodate systems office furniture, laboratory casework, equipment, etc. The larger elevator must serve all floors including the mechanical penthouse, and ideally be located near the shipping, receiving and waste management facilities. The two elevators can be located beside each other. A dedicated short run (clean) elevator may be required to serve the Animal (Mouse) Care Facility.
2. Stairs – number and location will depend on design and O.B.C. requirements; one set of stairs will need to extend to the mechanical penthouse. Feature stairs have been architecturally significant elements in all of UTM"s recent new buildings and should be considered in the design of this building.
3. Electrical room(s) with power distribution panel(s) and sub-meters for each floor will be required. Electrical rooms will be stacked on top of each other. Note: the dimensional size of the building may require more than one stack of electrical rooms.
4. Telecommunications Closet(s) with boards (for voice) and racks (for data, security & AV systems) in each closet that are suitably located for proper coverage on each floor. These rooms will be stacked on top of each other. Wireless access points (WAPs) will be provided throughout the building to ensure the coverage specified in I&ITS' standards. Note: the dimensional size of the building may require more than one stack of communications rooms.
5. Each floor will have at least one custodial closet; larger floors or locations of high pedestrian traffic will require one of UTM's large custodial rooms that are designed to accommodate more cleaning equipment and materials, as well as a ride-on scrubber. If the floor is large, has a significant amount of assignable space or has a segmented room layout, then two or more standard custodial closets may be require two or more closets. These rooms will be stacked on top of each other & likely next to, or close to washrooms.
6. Washrooms (male & female) with high occupancy floors having more fixtures. UTM requires the provision of a universal washroom on each floor and at least one of these should be an assisted facility (i.e. with lift & adult change table). UTM would like at least one, preferably two of the public washrooms not to be gender specific. As with custodial closet, washrooms will be stacked on top of each other. A staff washroom will need to be located within the Campus Support and the Animal (Mouse) Care Facilities.

7. Each floor will be supplied with UTM standard water bottle filling/drinking fountain units.

Mechanical Penthouse:

1. The primary function of this area is to accommodate the building's air handling equipment but will also likely accommodate other mechanical equipment such as a workstation for the Building Automation System (BAS).
2. The HVAC design for the laboratory fume cabinets may involve manifolding with a common exhaust plenum(s) and exhaust stack.
3. Elevator machine room(s) may need to be provided as separate rooms within the penthouse for related equipment and/or controls.

Other considerations for building design if not shown in room data sheets or UTM design standards:

1. All custodial, campus services and waste management equipment, safety and security systems (including emergency phones, CCTV cameras and intrusion alarms, door contacts, public address, fire annunciator panel/passive graphics, fire safety plan and MDDS boxes, card access, and Medeco hard key hardware), audio-visual equipment and infrastructure (instructional and digital wayfinding/information), IT systems equipment and infrastructure, and building, room, directories and wayfinding signage will be included in the project.
2. All building entrances and roof areas will be supplied with outside hose bibs (non-freeze wall hydrants) & GFI electrical outlets; additional hydrant & GFI outlets will be needed to be provided along grade level building elevations & roof areas (especially green roofs). All main entrances will also have power-operated doors. Main building entrances and vestibules should not have door mullions (preferred) or be supplied with removable mullions.
3. Each stair landing will need to be supplied with standard, wall electrical outlet for housekeeping and maintenance purposes; also standard outlets will need to be provided along all corridors and public areas.
4. Standard water fountain/bottle filling stations will need to be provided on all floors of the building; no less than two stations on each floor.
5. Public showers assigned for building users, and to be located at first floor close to the storage area (Collaborative Wet Research) CWR-3.2-07

Functional Plan

The proposed space program has two major clusters with the most prominent being the Centre for Medicinal Chemistry Research Cluster, the New Wet Research Cluster, the Facilities Management & Planning facility and the expansion to the existing Shipping and Receiving area. The smallest grouping is for the Forensic Science Program Cluster.

These groupings suggest a general functional distribution of the program to place the Laboratories and laboratory support areas of the two major clusters (the Centre for Medicinal Chemistry Research Cluster and the New Wet Research Cluster) on the upper floors with secure access to each cluster. Offices and meeting rooms will be distributed throughout the floors. Forensic Science Cluster is to be located at main floor to provide easy access and visible to the public.

Several factors begin to shape the layout and massing of the new Science Building space program:

- Efficiency of stacking and massing
- Critical adjacencies to, and separation from, other program areas
- Desire for natural light
- Appropriately scaled ceiling heights and volumes
- Direct access to the exterior, at grade levels
- Clustering of space according to hours of operation

- Energy efficiency
- Need for security

Room data sheets have been prepared in which specific functional requirements, including the factors listed above, have been identified on a room-by-room basis. As well, the section on Non-Assignable area provides details on unassigned areas that may influence the new Science Building floor layouts and overall design.

There is a two-storey grade change between the inner campus (project site) and Outer Circle Road; this will result in a basement condition at up to two levels (Basement and a portion of the First Floor). The new shipping and receiving area will be located at the Basement level as it is an expansion to the existing shipping and receiving area in the neighbouring Davis Building and because of the existing vehicle/truck access.

The First Floor Level may house the Mechanical/Electrical Services Area and partially serve some labs and/or other areas located above (2nd floor). The building's main entry may also be located at the First Floor level (Level 1) in order to take advantage of the grade situation at the northern end of the development site.

The Second Floor (main level) will be at same level as the Davis building Second Floor (Level 2) to work as an continuation to Davis Building and will have the main entrance to the Research Wing (the new Science Building). The Second Floor will house offices, meeting room(s), some laboratories and the Forensic Science Program, while the Third and Fourth Floors will have the Centre of Medicinal Chemistry Research Cluster and the New Wet Research Cluster - laboratories and laboratory support areas with restricted access to these two clusters, the Fifth floor will house the Mechanical/Electrical Services Area that will serve laboratories and the laboratory support areas at the Third and Fourth Floors and other areas of the new Science Building.

In order to arrive at a realistic budget and to demonstrate the fit of the program with the approved envelope while preserving the required functional relationship of the program elements, the following vertical arrangement of the assignable space, or functional plan, is proposed;

Space Program	**Area (nasm)**
A3: Humanized Mouse Research (Laboratories and Lab Support)	150
A5: CMC Animal (Mouse) Care Facility (Animal Housing rms & support)	883
C: HPC Data Centre	70
E1: Facilities Management & Planning (Shipping/Receiving/Stores)	1,046
B1: Collaborative Wet Research (Laboratory Support)	50
E2: Facilities Management & Planning (Campus Services)	195
Mechanical and Electrical Services	

Space Program (continued)	Area (nasm)
A2: Molecular Biology/Oncology Research (Laboratories & Lab Support)	236
A4: Computational Chemistry Research (Laboratories and Lab Support)	155
A6: CMC Academic Offices Space (Offices and Departmental Support)	158
B1: Collaborative Wet Research (Laboratory Support)	60
B2: Academic Offices Space (Offices and Departmental Support)	371
D: Forensic Science Program (Offices and Departmental Support)	125
A1: Synthetic for Medicinal Chemistry Research (Labs & Lab Support)	420
A2: Molecular Biology/Oncology Research (Laboratory Support)	60
A6: CMC Academic Offices Space (Offices and Departmental Support)	322
B1: Collaborative Wet Research (Laboratories and Laboratory Support)	789
B2: Academic Offices Space (Offices and Departmental Support)	362
A1: Synthetic for Medicinal Chemistry Research (Labs and Lab Support)	420
A6: CMC Academic Offices Space (Offices and Departmental Support)	304
B1: Collaborative Wet Research (Laboratories and Laboratory Support)	628
B2: Academic Offices Space (Offices and Departmental Support)	330
Mechanical and Electrical Services	
Grand Total	**7,134**

It should be noted that the above locations are based on the aforementioned Room data sheets and planning principles for the functional layout envisioned for the new Science Building. The actual design of the Science Building may place specific facilities and/or departments on different floor levels.

c) Building Considerations

1. Standards of Construction:

UTM's recently constructed buildings (or under construction) have progressed considerably from the basic, functional forms that are evident in earlier structures; as demonstrated by Deerfield Hall, the Innovation Complex, the Instructional Centre, the Terrence Donnelly Health Sciences Complex, and the Hazel McCallion Academic Learning Centre. These recent buildings can be considered as not only architectural benchmarks but also as general standards of construction quality for the Science Building.

For planning and costing purposes, it is assumed that the Science Building will be similar to the North Building Reconstruction Phase B, the Innovation Complex, the Terrence Donnelly Health Sciences Complex and Deerfield Hall from a construction standard standpoint.

However, the laboratories contained within the new Science Building will be similar to the recently completed Medicinal and Molecular Biology Laboratories in the Davis Building (DV3017 and DV3017A), and the Gunning Laboratories (DV3023). All laboratories and laboratory support spaces in the Science Building will be constructed and finished to Biocontainment Level 2 (BCL2) and will

contain energy efficient, ultra-low (flow) face velocity, variable air volume fume cabinets, height adjustable and/or fixed-height benches with adjustable shelving units, LED lighting, exposed painted structure ceilings, epoxy floors and painted walls.

UTM expects that any existing areas in the Davis Building that are affected by the Science Building project, especially the renovations in the Davis Building loading dock facilities, will be completed to match or complement the level of fit and finish proposed for the new building.

2. **Building Characteristics and Massing:**

Floor-to-Floor Heights

The planning intent is to have the new Science Building Basement floor level match where possible the floor elevations of the basement (Level 0, loading Dock), 2nd floor (Level 2, Main Level) and 4th floor (Level 4) of the Davis Building.

Currently, the floors at Davis Building have the following finished floor-to-floor elevations:

Basement (Level 0)	3.70m
First – Third Floors (Level 1 - Level 3)	4.00m
Fourth Floor (Level 4 – Penthouse)	5.00m

New Science Building is projected to be designed to finished floor-to-floor elevations within the following approximate values:

Basement (Level 0)	3.70m
First – Fourth Floors (Level 1 – Level 4)	4.80m
Penthouse (Level 5)	5.80m

* It should be noted that the floor-to-floor heights and configuration of the new Science Buildings floor levels may vary to allow for the provision of a main entry at grade (i.e. Level 1) at one end of the building, and connection to the Davis Building's main circulation route (i.e. Level 2) at the other end of the new structure.

3. **Structural Complexity and Built Form**

The new Science Building is anticipated to be of a similar structural complexity and built form to the Terrence Donnelly Health Sciences Complex (TDHSC) and Deerfield Hall. The new project should be legible as its own building but will be connected at key levels to the Davis Building.

For planning and costing purposes, it was assumed that laboratories in the Science Building will have a similar level of finish to the Davis Building's Medicinal and Molecular Bio Laboratories (rooms DV3016 and DV3017).

Landscape design and execution will also play an important role in the scope of the project, including significant regrading and design of adjacent outdoor spaces that will connect and enhance the accessibility of the new Science Building. The level of landscape material and planting will be similar to recent projects on campus, such as the Instructional Centre, TDHSC, and HMALC.

4. Key Building Components and Systems:

Mechanical / Electrical and Data

UTM will not specifically proscribe the mechanical and electrical systems that must be used in the design and construction of the Science Building; however, the design team will be required to meet the users' specific laboratory, UTM's requirements for LEED® Silver (minimum) certification, UTM's design standards, and the requirements of all associated municipal, regional, provincial and federal regulatory agencies. Special considerations will need to be given to any systems that require redundancy.

Although UTM has extensive design standards and specifications, UTM is willing to consider innovative approaches to achieve or exceed the criteria that have been imbedded in its policies, standards and specifications.

However, for planning and costing purposes, it is assumed that the Science Building will have similar building systems to those incorporated into Deerfield Hall and the North Building Reconstruction Phase B project. Both buildings are or will be heated through the campus' district energy system that is based on a high $\Delta°T$ hot water system, and will be cooled through the central chilled water system. Electrically, both buildings have line voltage supplied from the main campus service (by Alectra Utilities – formerly known as Enersource) and emergency power has been brought over from the central emergency generators that are located in the Central Utilities Plant.

Although the same design philosophy is proposed for the Science Building, UTM recommends that all utilities infrastructure, such as hot water boilers, chiller and cooling tower, and emergency generator, be incorporated in the new building. FMP requires that any utilities generated within the building be connected either to existing utilities services (primarily through the Service Tunnel) or directly to the Central Utility Plant through a new utilities loop (likely along Outer Circle Road).

All utilities will be metered and sub-metered (if needed), and all building systems monitored and/or controlled through Facilities Management and Planning's building automation system (BAS). UTM's Facilities Management & Planning has established and regularly updates specifications and standards for architectural design, mechanical and electrical design, and building automation systems. As well, UTM's Information and Instructional Technology Services division and Campus Police maintain standards and specifications for their systems.

All of UTM's design standards and specifications, and policies and procedures are available through UTM's Facilities Management and Planning, and will be made available to all invested parties as required.

Accessibility

The University is committed to equitable access to all of the building's facilities by the whole campus community. A Universal Design Consultant typically is retained early in the design process to ensure that the consultant's recommendations will be incorporated into the built project.

To address the broad diversity of people who will use the facilities, the signage system will be designed to assist individuals with disabilities in identifying spaces (e.g. Braille, high contrast) and wayfinding. Attention will be given to the layout of the space and the materials used and the Manager of the AccessAbility Resource Centre will be consulted throughout the design process.

An amendment to the Ontario Building Code (2012) related to Accessibility was filed on December 27, 2013 (Ontario Regulation 368/13). Effective for applications submitted after January 1, 2015, the requirements are more stringent and impact the following areas relevant to this project: barrier-free path of travel; visual fire safety devices, washrooms, and seating in assembly spaces.

UTM has also been pursuing the move to make its spaces more inclusive by retrofitting and converting existing washrooms to be gender neutral, and has required that current new construction projects; such as, the North Building Reconstruction Phase B, include gender neutral washrooms and assisted, accessible washrooms.

Personal Safety and Security

The building design must allow its students, faculty, staff and visitors' access as required and as allowed, safely and easily. At the same time, the design must be sensitive to the needs of those whose activities require security after hours. Limited areas of this building could be operational throughout the week for 24 hours a day.

A detailed security plan will need to be developed for each room, zone or floor, and factored into the design of the building to ensure that accessibility, security and functional objectives are all met simultaneously. Specific security requirements have been identified by occupants of the Science Building in the room data sheets prepared to describe their individual rooms; these room data sheets are available as an appendix under separate cover.

Building Access Systems

Currently, most of UTM's older buildings have exterior doors that are manually unlocked (either standard locksets or panic bars) by Campus Police. As well, interior facilities that are accessed by students, faculty and staff on a regular basis such as, classrooms, study rooms, lounges, etc., are also unlocked and locked in the same manner as the building's exterior doors. UTM has transitioned to a new hard key system that provides greater control of security to academic and administrative units over their own space. The new Medeco system has been included in recently completed renovations and new buildings, including Deerfield Hall, Innovation Complex, and North Building Reconstruction Phase B (under construction), and will be included as part of the Science Building project.

Recently, new buildings have installed electronically-controlled exterior doors that can be operated by a soft key (card) that is either locally programmed or network-driven. Access to and through the Science Building will need to be well-controlled. The particular system or mix of systems that will be provided need to be developed by the project design team in conjunction with Campus Police,

Information & Instructional Technology Services, Facilities Management and Planning, the building occupants and other campus agencies.

Although the Science Building could be accessed directly from the Davis Building, its building access system does not have to specifically match the existing system(s) in the Davis Building (that has not been fully updated with current hard key or electronic/soft key hardware). However, a significant amount of travel by researchers, graduate students, support staff and materials will likely occur between the Science Building and the Davis Building; the selected system(s) for the new building will need to accommodate this functional requirement into consideration.

The room data sheets identify the specific access and security requirements for each room; however, these requirements were developed in the absence of a building design. As the new building's design is developed, on-going discussions with end-users, Campus Police and Facilities Management & Planning will be essential to ensure that the required levels of access control to the building, floors, zones/clusters and rooms is maintained.

Currently, UTM uses a soft key system that employs card readers for controlled access after normal hours of operation; all UTM faculty, staff and graduate students are provided with T-Cards that are programmed to grant access to approved areas. These readers are set up to read the magnetic strip on the T-Card as it is swiped through the reader. It should be noted that recent projects have installed card readers in passenger elevators and, in some locations, entry to stairwells to secure floor levels after normal building operating hours.

At the time of this report, it is understood that all three campuses of the University of Toronto will be migrating or converting to new card access system but the specifics were not available publication. It has been conveyed to the Committee that the new system will involve proximity card readers and is expected to be begin roll out in early fall semester of 2018. This date coincides with the projected date for the preparation of contract document but the specification for any hardware and associated installation specifications should be made available before this point in the project.

Although indicated in the room data sheets, it is worth repeating that any electronic security system installed at UTM will need to have hard key override for use by police, emergency, maintenance and custodial staff.

CCTV and Related Systems

UTM currently has closed circuit security cameras (CCTV) in critical areas of the campus, buildings and rooms. Wherever there are concerns of personal safety or the security of specific equipment (for example, research laboratories, computer laboratories), cameras are strategically located to provide suitable coverage; these cameras are connected to Campus Police's monitors and recording servers (via the campus' internet) in the William G. Davis Building. As well, Campus Police may request that some cameras be located outside the building to provide coverage of building entrances/exits and surrounding landscaped areas.

The number of cameras that will be needed in this project will depend on the building's design and layout. For planning purposes, the total project cost (TPC) estimate includes an adjusted allowance based on the projected cost of the same system that is currently being installed in the North Building Reconstruction Phase B project. Most of the cameras that have been supplied are fixed and are specified and located to provide the best coverage possible; where required pan-tilt-zoom (PTZ) cameras have been installed to optimize coverage.

UTM currently has emergency call stations located throughout the campus grounds and in some building locations; these stations are located in either high-risk areas or convenient locations (for example, readily visible in pedestrian travel routes or building entrances). The most recent building project has included the requirement for the camera closest to a call station to be able to pan, tilt and zoom onto the call station when the emergency function is activated.

As with all recently-completed buildings on campus, public address (PA) systems for emergency communication and notification have been included in the budget. The PA system will cover the main hallways and any high occupancy locations; in the past, PA systems have been locally operated by Campus Police or emergency personnel, but for this project, the system should also have the capability to be operated remotely from the Campus Police office.

Servicing (including Garbage, Recycling and Deliveries)

The original Davis Building loading dock facilities have operated continuously since its opening over 40 years ago. With the exception of minor upgrades and maintenance, the existing dock has not changed. Adjacent storage functions have been adapted over time in order to accommodate the changing needs of the campus and the building's users. The existing facilities are marginal in its ability to properly and securely store chemicals, chemical and biological wastes, building waste and even medium- to long-term warehousing of materials and equipment owned by the campus and building users. The immediate dock floor area should be kept clear to ensure the safe and efficient unloading and loading of delivery vehicles.

When the Science Building comes online, the shipping, receiving and storage requirements of this operation will place demands on the Davis facility well beyond its capacity. This building proposal includes the significant expansion of the dock and warehousing operations not only by doubling the size of the loading dock but also constructing new and renovating existing facilities to provide discrete and secure warehousing and storage spaces. These new and revitalized facilities will not only meet the needs of the campus as a whole but also the users of the new Science and Davis Buildings.

This project will also significantly increase the amount of space for waste management, not only of regular building wastes (more waste and recycling bins, additional or larger waste compactor) but also new facilities for the safe storage of chemical, biological and radioactive wastes.

As this project will expand and renovate the existing facilities, construction activities will need to be carefully phased and coordinated to minimize disruptions to Davis Building's occupants. Wherever and whenever possible, FMP will shift shipping and receiving operations to the new facilities being constructed in the North Building Reconstruction Phase B project; these new facilities are projected to be fully operational by the summer of 2018 (well before the start of construction for the Science Building). As well, FMP will investigate alternate methods of delivery for smaller shipments, such as stationery supplies, couriers, etc. – for example, direct deliveries by the shipping company/couriers to recipients who are not resident in the Davis Building.

Acoustics

The acoustical quality of the built environment is important in several areas of the building's design. In any large public areas, such as the suggested central circulation lobby, it is critical that noise created in these spaces is not unduly transmitted into adjacent study, research and office areas. This concern has had to been addressed during design development or post construction in other projects that included large public volumes. Any open study, research and office areas may require both passive and active sound treatments to ensure that any noise or sound generation within the room is kept to an acceptable level.

Signage and Donor Recognition

This project will need to provide all necessary signage, wayfinding and donor recognition associated with the Science Building. Interior signage includes not only those signs mandated by the Ontario Building Code but also departmental identifications, room names and numbers, room schedules (as required) and interior wayfinding. Exterior signage includes building identification, street and road signage for pedestrian and vehicular wayfinding, and other site-specific signage (e.g. parking, loading dock instructions, etc.). As well, UTM utilizes digital signage for the cycling of campus information, events, student services, etc.

UTM has specifications and standards for both interior, exterior and digital signage that the design team will be required to implement on this New Science Building project.

5. **Sustainability Design and Energy Conservation (LEED)®:**

The University of Toronto has a long commitment to environmental sustainability across the academic and administrative operations of this institution. The University has been guided by an Environmental Protection Policy since 1994. This policy outlines the University's commitment to minimizing negative impacts on the environment, conservation and wise use of natural resources, and including environmental concerns in planning. The policy also commits the University to meeting and where possible, exceeding, environmental standards, regulations, and guidelines.

U of T Mississauga's banner for growth - Grow Smart, Grow Green - balances campus development with environmental sensitivity and responsibility. With the on-going efforts of the tri-campus Sustainability Board and its sub-committees reviewing energy, capital projects and funding models for sustainable initiatives, the University of Toronto continues to make strides in the area of sustainability.

The most intriguing of new buildings on the campus have met a rigorous set of university design standards, including environmentally sustainable measures. This project will follow the lead of recent projects at UTM: the Hazel McCallion Library (HMALC) achieved LEED® Silver in 2007; followed by LEED® Gold certification in 2009 for the William G. Davis (South) Building Phase 1 Renovation, LEED® Silver certifications in 2011 for the Instructional Centre and in 2014 for the Innovation Complex, and LEED® Gold certification in 2017 for the Terrence Donnelly Health Science Complex. UTM is awaiting LEED® Silver certification for one other major building project for Deerfield Hall (completed in 2014). A significant construction project, that is currently underway, North Building Reconstruction Phase B, is expected to achieve LEED® Silver, but is currently on target for LEED® Gold.

In fact UTM has required that all new buildings and major renovations be designed and built to a minimum LEED® Silver certification before the City of Mississauga adopted the same requirement for new buildings as part of its Green Development Standards. Although the City of Mississauga has subsequently removed this requirement for new construction, UTM continues to be committed to ensuring that its buildings are energy efficient and sustainable.

The Science Building project will be designed and constructed to meet LEED® NC certification at a Silver rating, or better. Some of the sustainable design strategies that can be considered are:

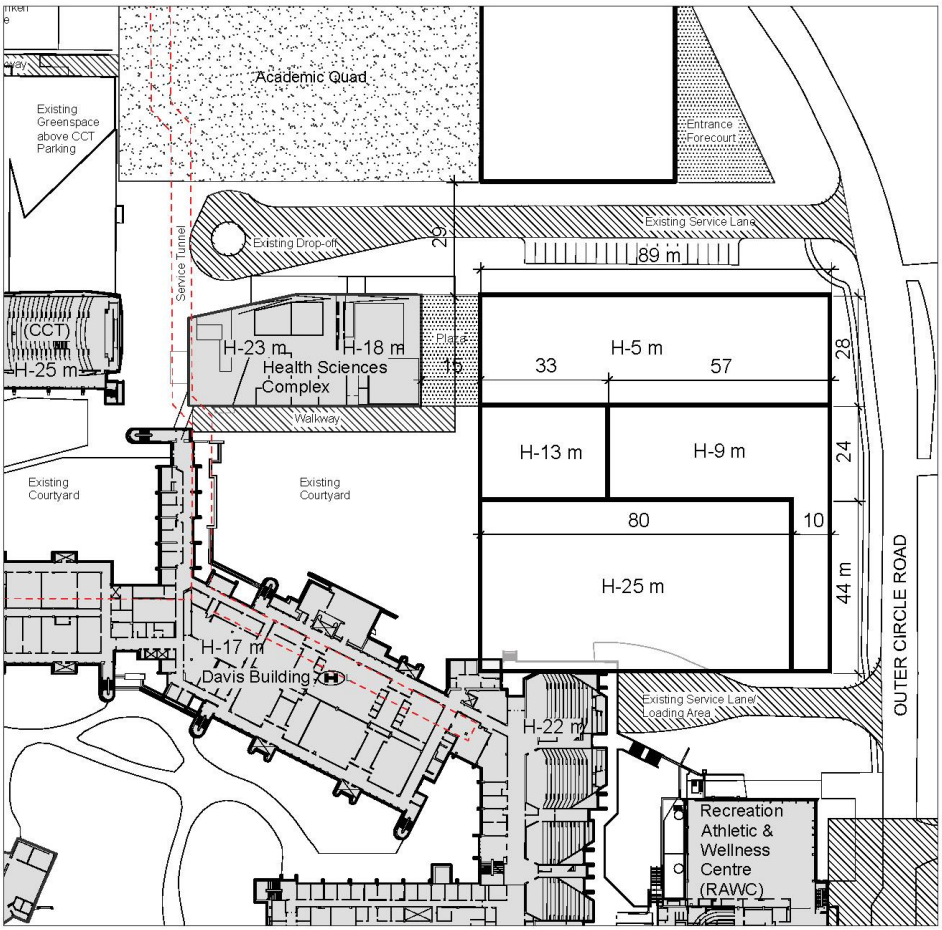
- Green roofs
- Rainwater harvesting systems for flushing toilets and urinals, and/or for landscape watering systems
- Low maintenance native plantings
- Water-efficient fixtures and combined water fountains/bottle-filling stations
- Durable, local materials with renewable and/or recycled content
- Energy efficient equipment and fixtures
- Energy efficient lighting (LED) and controls, coordinated with natural light where appropriate
- Zoned HVAC control wherever beneficial and desirable (with heat recovery from building's exhaust systems)
- Flexible building automation systems (with occupancy/occupant load sensors to moderate HVAC and lighting levels)
- Optimal energy efficiency for reduced operating cost and emissions
- Provision of recycling depots for source-separation of waste throughout the building to meet the needs of the University's recycling and waste reduction programs and vehicular access to these sites
- Roof areas suited to the incorporation of solar thermal water collectors and photovoltaic collectors if opportunities for such installations become available.
- Ultra-low flow, energy efficient fume cabinets in laboratories (with variable volume air flow and automated sashes)

d) Site Consideration:

1. <u>Campus Planning:</u>

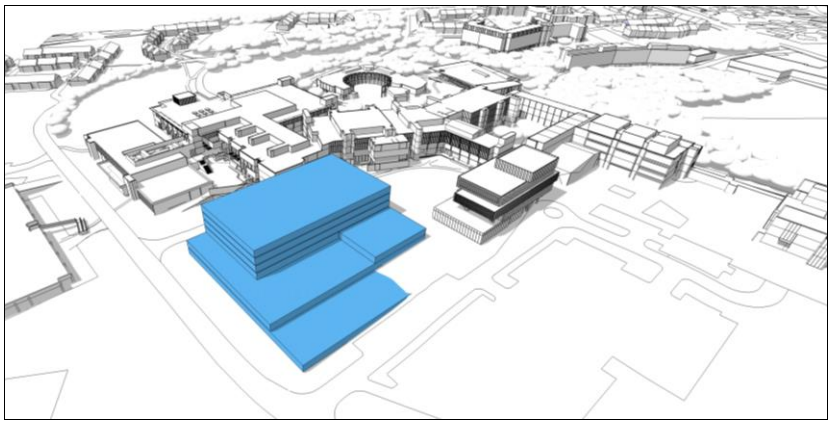
Campus planning at UTM has evolved with enrolment growth and has been guided by key principles established in the Campus Master Plan of 2000. Eight major buildings have been added to the inventory at UTM since 2000, plus one under construction; their siting and massing following the planning principles set out in that document. The 2011 Campus Master Plan builds on the 2000 Master Plan taking into account the growth as it has actually transpired since the earlier plan was published.

The area designated to accommodate the new Science Building is identified as Site 1 in the Campus Master Plan (2011).



Site 1, 2011 UTM Campus Master Plan
The envelope for Site 1 included massing guidelines and suggested heights and setbacks.

The design of the new Science Building shall re-evaluate this original envelope and must allow for a potential future phase within any remaining site area.



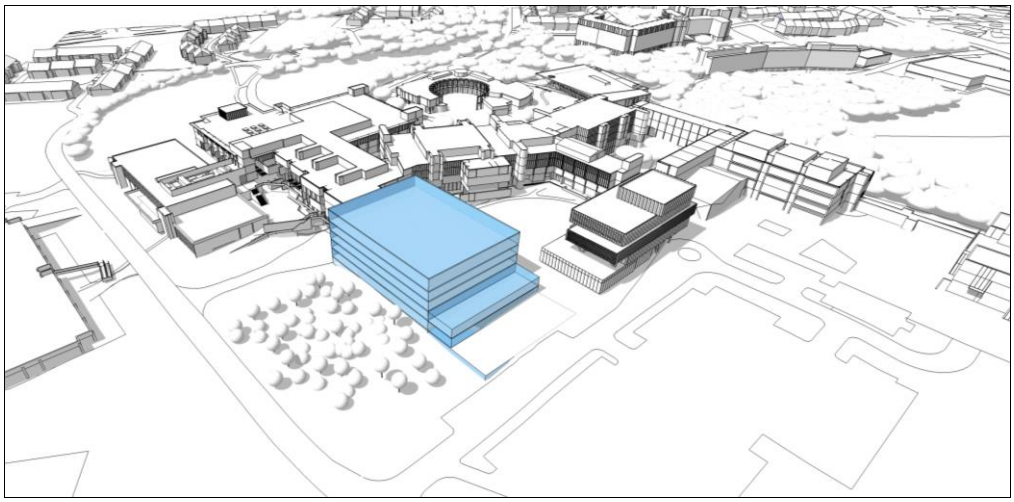
Site 1 Development Envelope – *from 2011 Campus Master Plan*

Area within Proposed Site 1 Development Envelope (gsm) (*from 2011 Campus Master Plan*)

Site 1			
Discounted Envelope	(above grade):	25,167	
	(below grade):	2,210	(assumes 1 storey below existing courtyard)
Less Area to be Demolished:		105	(1 storey addition to Davis Building)
Net Site Increase:		**27,272 gsm**	

Note that the available site envelope includes the potential to extend at Level 0 to the outer perimeter of the site boundaries. The area to the east of the Terrence Donnelly Health Science Complex could accommodate Level 0 building area below grade with a 'green roof' landscape forecourt at Level 1 as part of the entry area for the new Science Building. See 'Open Space' section for more details.

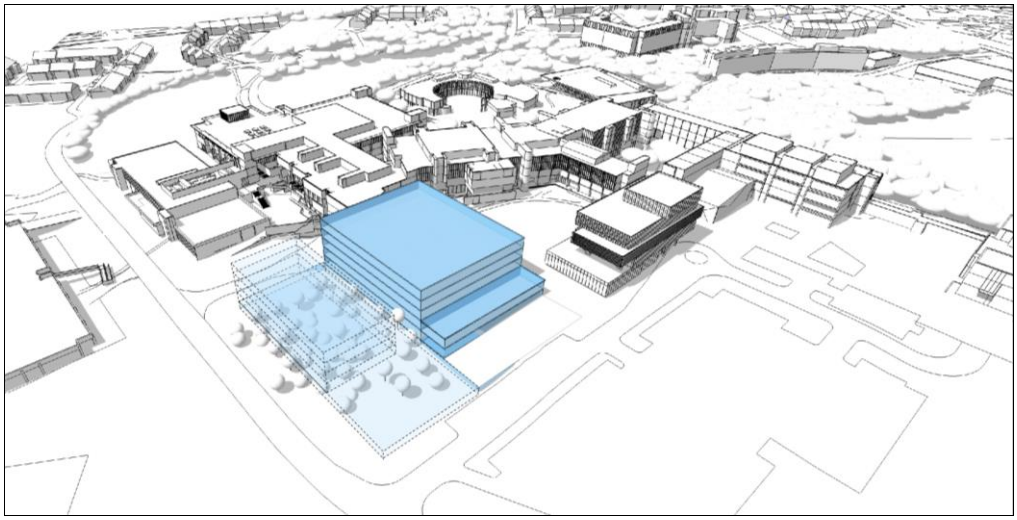
In order to test the proposed space program of the new Science Building to the available development capacity of Site 1, the following Test Fit building configuration was developed for illustration purposes:



New Science Building – Test Fit: Potential Building Configuration

The test fit illustration above uses an overall development envelope of approximately 18,500 gsm (including one level below grade, Level 0), which when discounted by 15% overall to allow for design flexibility, fits the projected building program of 7,134 nasm (approximately 15,552 gsm).

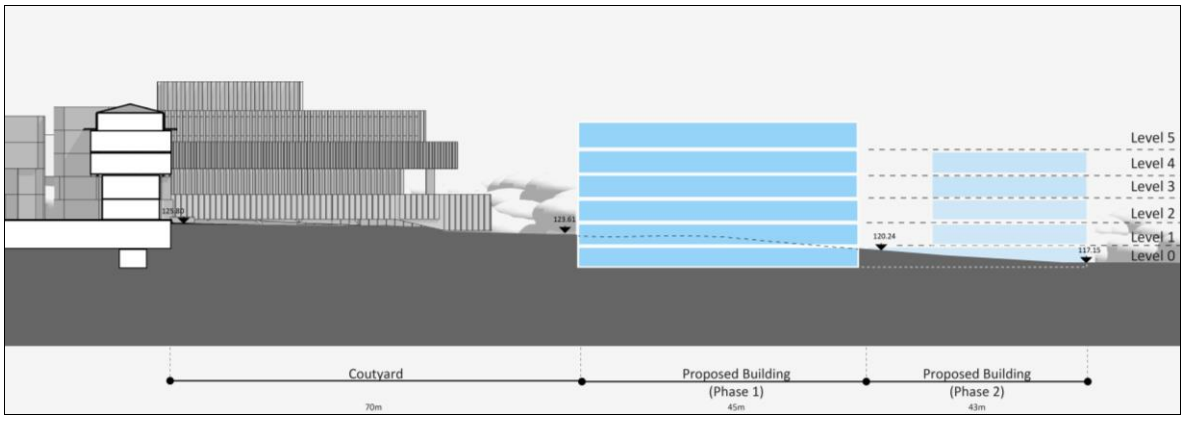
Furthermore, to test the available capacity for a subsequent later development phase on Site 1, the Test Fit included the following additional later phase building envelope for illustration purposes:



New Science Building – Test Fit: Potential Building Envelope with later Phase (shown dashed)

Site 1 provides the opportunity to extend the Davis Building north toward Parking Lot 9, which will be the location of a future Academic Quad as identified in the Campus Master Plan. The building (and any later addition or future building) on Site 1 will be highly visible from Outer Circle Road; and will complete the formation of a courtyard between the Davis Building science wing, and the Terrence Donnelly Health Sciences Complex.

The site is characterised by a dramatic slope, with a two-storey change in elevation between the main floor (Davis Building Level 2) and the Outer Circle Road level. The site's location, and the height of the potential building envelope, offer prime views toward the Credit River Valley, and presents a number of options in where and how a new building could meet the surrounding grades and landscape. The site section diagrams below postulate potential massing scenarios and illustrate in a general way some of the level changes across the site.



Site Section – Test Fit: (cut east-west, looking north) – Illustration of Potential Building Envelope

Within the site parameters and needs described in this report, the design consultant team will be asked to determine the optimal siting and configuration for the new Science Building, while also planning for how the remaining site area would be best developed and connected to the Science Building as part of a future expansion or stand-alone building.

2. Height and Massing:

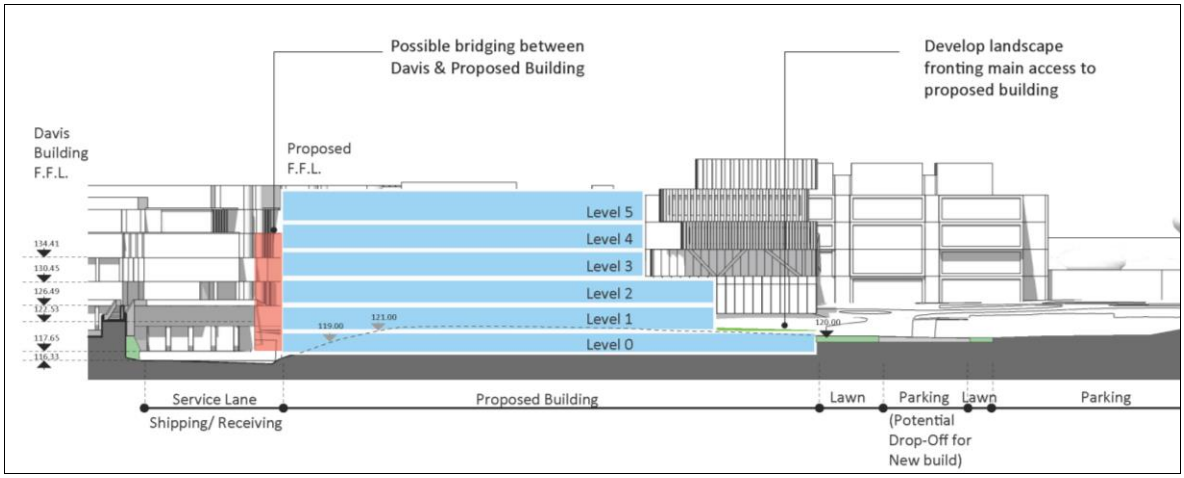
The height of the new building is projected at 25 m, from Levels 0 through 4 (five storeys above grade from Outer Circle Road) plus a mechanical penthouse at Level 5. This sizable building will exert a considerable presence on the campus in this sector and will add to the diverse architectural composition of the University's and the City of Mississauga's built environment.

If possible, the Science Building envelope should step up progressively from 3 floors at northern end of site to 5 floors to preserve views from the Davis Building and existing courtyard area. Stepping the building mass would also help to preserve visibility to the Terrence Donnelly Health Sciences Complex (HSC) from the ring road.

3. Campus Connections:

While the proposed envelope has the potential to connect to the Davis Building on all levels, enabling the expansion of all existing academic and ancillary space there, the key needs for connection to the Davis Building are at: Level 0 (Basement) to allow seamless servicing from the Davis loading dock; Level 2 (Main) to allow interior pedestrian connection from the Meeting Place and central circulation spine of Davis; and another at either Level 3 or 4 to allow for a more controlled access from existing research areas adjacent within Davis. The connections will require planning around the existing main corridor and egress system, and matching, or transitioning to existing floor-to-floor heights.

The site is served directly by the main road and parking, and the campus' main loading dock at the Davis Building, providing an optimal location for programs requiring a high level of servicing at Level 0 (Basement).



Site Section – Test Fit (cut north-south, looking west) – Illustration of Potential Building Envelope

See 'Pedestrian Routes' below for a description of circulation relationships across the broader site context.

4. Zoning Regulations:

The campus is identified by the Mississauga Zoning By-law 0225-2007 as Institutional; "I" refers to Hospital and University/College that serve a regional function, in appropriate locations throughout the City; and "I-5" specifically to UTM campus. Further detail is provided under Part 12 of the By-law. The specified site is well within minimum setbacks and other regulation lines on campus. The current zoning by-law does not include a height restriction specific to this site.

5. Site Context:

Site Conditions

The site was historically a quarry, and is currently covered mostly in existing shrub vegetation and an assortment of trees; during the construction of the Health Science Complex, a dry pond on the site was determined not to be needed and was filled during the excavation of the HSC site. Refer to Section '7. Environmental Issues' for further information.

A significant amount of site excavation and regrading will be required, as in addition to the building construction itself, the project must establish connections at grade to the existing courtyard space immediately adjacent to the west (bounded by the Terrence Donnelly Health Sciences Complex and the Davis Building) (Level 1 or 2), a main entry to the north at Parking Lot 9 (Level 1 or 2), and situating the lowest level to coincide with Level 0 of Davis.

Geotechnical information is not available for the site identified for the new Science Building; however, geotechnical reports for the adjacent Health Science Complex (March 2008) and Recreation, Athletics and Wellness Centre (February 2004) will be available to the design and construction teams. The design and construction teams will be responsible for more detailed geotechnical investigations once the building's form has been established.

Along with the geotechnical investigations, the design and construction teams will need to undertake underground utilities locates as UTM has not carried out any recent studies in this portion of the campus and has not yet created an accurate operational site services plan.

View from Outer Circle Road, towards west, Davis Building Loading Dock, Site 1 at right.

View from Terrence Donnelly HSC, looking east to Site 1, David Building at right.

View from Parking Lot 9, looking south to Site 1, Terrence Donnelly HSC at right.

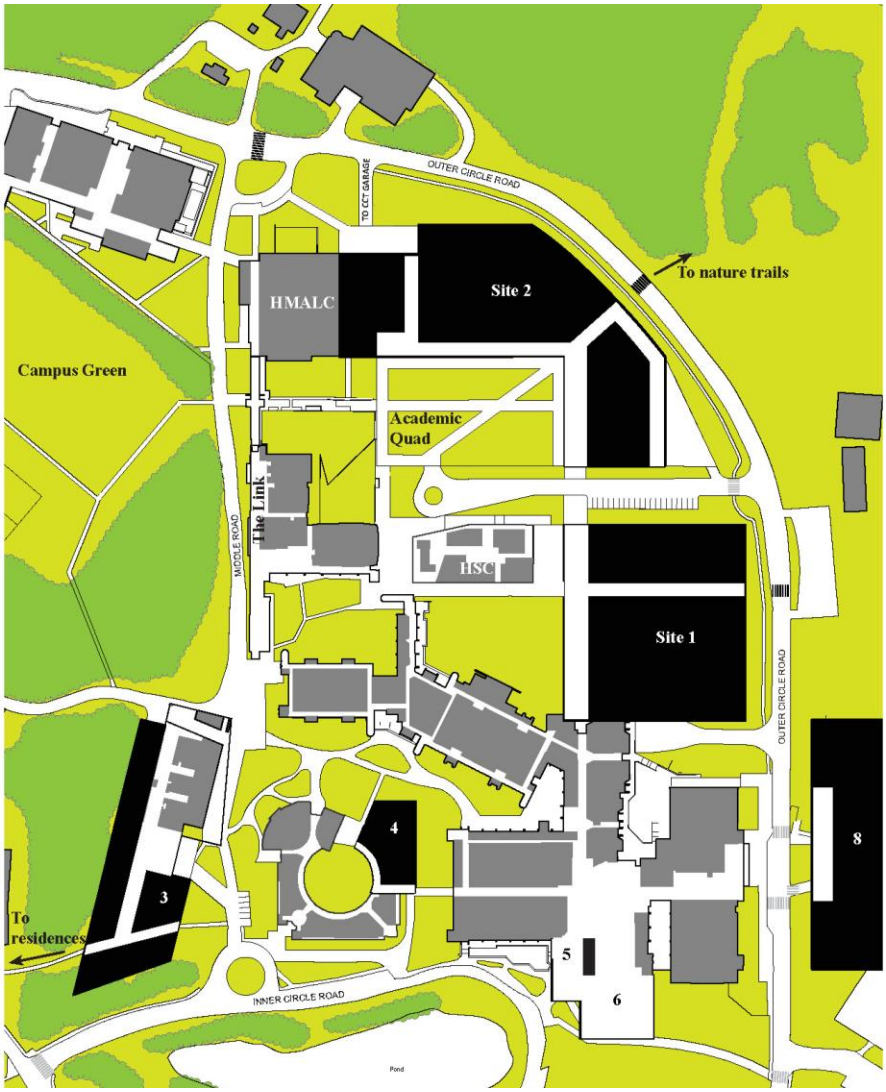
Pedestrian Routes

A main level interior pedestrian link will be an important feature of the new Science Building. This link should act as an extension from the Davis Building front entrance and Meeting Place, and connect through with future expansion in the sector: Site 2, and a future Academic Quad to the north. It would build on the existing framework and typology of primary pedestrian routes, running parallel to the Link through CCT.

The front door and main entry for the new Science Building should be considered at the north end of the site, with pedestrian access via a new forecourt as part of the project, which will face the Parking Lot 9 area. Due to changes in grade across the site, the appropriateness of locating the Science Building main entry at either Level 1 or Level 2 must be explored in greater detail as part of the project design.

Establishing a new pedestrian route into the site from Outer Circle Road at the entry to Parking Lot 9 will be needed and must be incorporated into the project's overall scope of landscape work. This route will connect to the sidewalk that currently terminates at the Health Science Complex. Site planning and pedestrian access strategies should account for short term and long term site configurations, including the possibility of a tertiary route down to the Outer Circle Road through the

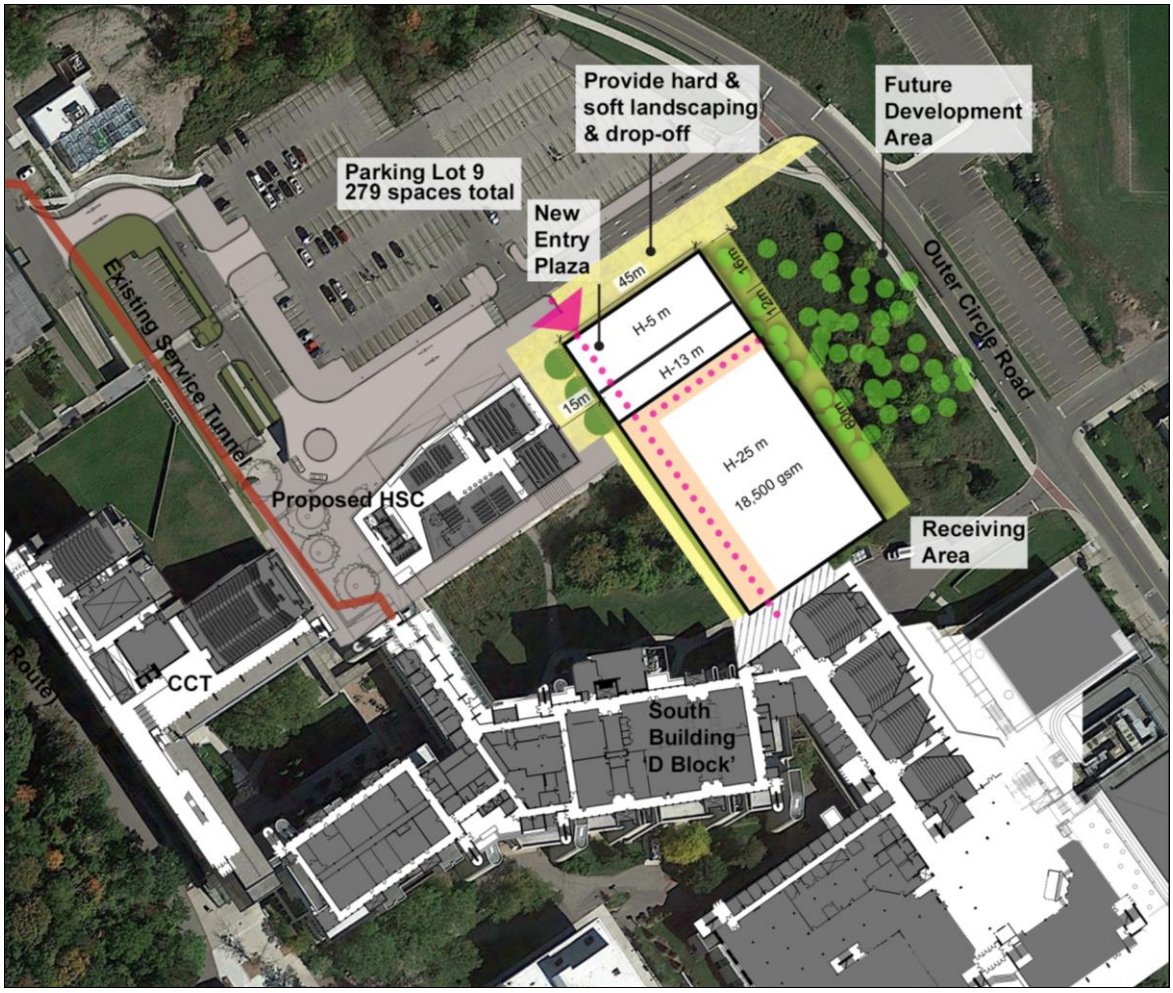
green space to the east. As part of the long term functionality for the overall site development, the new Science Building must also plan for a secondary pedestrian connection to a future development on any remaining site area. Connections to the courtyard area to the west are also needed. Refer to 'Pedestrian Routes' site diagram illustration from the 2011 Campus Master Plan below for more detail.



'Pedestrian Routes' site diagram illustration from the 2011 Campus Master Plan

Open Space

A new landscape plaza or forecourt should be incorporated as part of the main entry sequence of the new Science Building. This area may be a roof surface if building area is situated below and should incorporate hard and soft landscaping, with accommodation for benches, bicycle parking, in line with the campus' standard palette of street furniture and materials.



Parking and Transportation

There are up to 21 parking spaces within Parking Lot 9 that could be affected by the scope of landscape and development work as part of the new Science Building project. It is anticipated that a requisite number of barrier-free accessible parking spots will be located in this vicinity, as well as any requirements for emergency access vehicles. A pick-up/drop-off lay-by should also be accommodated within this area.

It should be anticipated that a transportation study will be required to assess the impact of the project and recommend the optimal configuration of vehicular access, pick-up and drop-off areas, parking strategy and emergency access.

Servicing

As described above, all servicing for the new Science Building will be accommodated through the Davis Building loading area (partially upgraded as part of this project), and routed via Level 0. The project should anticipate a servicing strategy for later development on any remaining areas of Site 1.

Site Access during Construction

Portion of Parking Lot #8, Surface Lot B, that is facing the construction site will be closed during construction to provide space for construction trailers and staging areas for construction materials, deliveries, materials storage and vehicle/equipment maneuvering. A small portion of Parking Lot #9 that is immediately facing the construction site might also be closed during construction to provide space for materials storage and/or site access.

At a certain point access to the existing loading dock will have to be closed to tie in the new and existing loading docks and expand (widen) the road leads to the main loading dock. Deliveries, waste storages and construction waste bins will need to be relocated to other sits on campus.

During construction, the project team will need to work with UTM staff to minimize the effects of any road access shutdowns. Sufficient notification of any planned closures will need to be communicated well enough in advance to ensure reasonable accommodation of campus services. Access to construction site (gate) will cross the pedestrian walkway during material deliveries to site, flagman will be required to ensure the safety of the individuals. During construction, the project team will need to work with UTM staff to minimize the effects of any road access shutdowns. Delivery time needs to be coordinated and might be scheduled during before/after UTM business hours.

It should be noted that construction vehicle traffic on Mississauga Road north of the Outer Circle Road entrance is prohibited by municipal by-law and the preferred intersection for construction vehicles to enter or leave the campus is the Collegeway Entrance.

6. Demolition of Existing Structures:

A portion of an addition of the Davis Building at Level 2 may need to be demolished in order to have the Science Building connected to the Davis Building on Level 0 (Basement), Level 2 and a possibility of additional levels. Selective demolition at other levels may be needed in order to accommodate these new connections.

An exterior podium (at Level 2) currently extends from the Recreation, Athletics and Wellness Centre, over the Davis Building loading dock and on to the entrance at the north end of Davis' 'L' Block. The northern most portion of this podium will need to be demolished, but the Science Building's design will need to provide a new terminus for this podium.

Before any portion of the existing Davis Building can be demolished, an extensive investigation into possible hazardous building materials will have to be undertaken and any identified materials will have to be properly removed and disposed. UTM does have a currently completed report on asbestos-containing materials in the Davis Building that will be made available to consultants and contractors. After abatement work has been completed and building certified of being clear of all hazardous materials, UTM's Facilities Management & Planning will decommission any affected building systems and salvage any useful items and components.

7. Environmental Issues:

The building site does not fall within environmentally regulated areas such as Area of Natural and Scientific Interest (ANSI) or Environmentally Significant Areas (ESA), verified by the Credit Valley Conservation Authority (CVC) Regulated Features map. However, a number of species-at-risk have been identified on the UTM campus and UTM is now required to retain appropriate specialists (third party consultant and Ministry of Natural Resources) to investigate the presence of any species of interest or if habitat is present in the subject area for these species.

An arborist report will determine the extent (if any) of any mature trees on site that may require municipal permitting for removal. The building's mechanical strategy must ensure the insulation or amelioration of sound sources from the building such as air handling equipment in the mechanical penthouse. UTM has not undertaken a comprehensive campus-wide update of tree inventories recently, and has only commissioned arborist studies for specific construction projects (none of which cover the proposed building site). An up-to-date arborist report will be needed as part of the Site Plan Approval application for the project.

The Ministry of the Environment will need to approve the installation and operation of the emergency generator. As well, the City of Mississauga and the Ministry of the Environment will likely require assurances that emissions from the Science Building will not be a concern. The scope of the Science Building project includes a considerable number of large chemical fume cabinets to accommodate the activities of a significant number of medium to heavy chemical researchers; the type, amount and the dispersion of emissions from the building will be a focus of these government agencies. After the design of the building's form and mechanical system have been developed to a point that the consultants are confident will meet the project's requirements, a micro-climate study will likely be needed to model the dispersion patterns of any emissions and the potential effects on the adjacent buildings and surrounding neighbourhoods

8. Noise or Vibration Restrictions (Isolation, Working Hours):

Construction activities will be major sources of dust, dirt, noise and vibration. Although UTM's campus community has proven to have a significant tolerance to these situations during normal hours of campus operations, the constructor and its trades must still provide notifications ahead of time of any activities that may be potentially disruptive or annoying to the campus and surrounding communities. Disruptions and annoyances are especially important to avoid during examination periods and after hours. Any service disruptions, such as road or pedestrian route closures, utilities shutdowns, crane lifts, etc. need to be carefully planned, well ahead of the event and the execution of these disruptive events carried out effectively and efficiently.

Campus-wide and user-specific notifications will need to be sent out in a timely fashion; notification no less than one calendar week before the event is currently required although major disruptions (such as utility shutdowns) will require much longer lead times. UTM requires a moving three-week look ahead construction schedule with noise/vibration/dust ratings. Construction activities and three-week look-ahead schedules are typically posted on Facilities Management & Planning's website.

e) Campus Infrastructure Considerations:

UTM's campus is effectively serviced by a central utilities system with most of its services centered in the Central Utilities Plant (CUP) and distributed to the campus' central building by a service

tunnel. The campus' infrastructure and building systems are continually being upgraded and the Science Building project is expected to participate in and benefit from the latest changes.

Prior to the writing of this report, UTM engaged consulting engineers to complete preliminary feasibility studies to establish the probable demands the new Science Building would place on the campus' utilities and to recommend the size of services to the building and to determine the ability of the campus' infrastructure to deliver these services.

At the time of writing this report, the CUP was undergoing improvements (new DES hot water boilers and 1000-ton chiller) and UTM's Facilities Management & Planning division were readying to implement additional improvements (two new replacement steam boilers, pumps, valves, etc.) that will not be in service until sometime during the design phase of the Science Building. Until the demands and actual outputs are realized after a full heating and cooling cycle, the impact of these additions and improvements will not fully understood.

The design engineers will have to make thorough investigations into the Science Building's infrastructure requirements (with appropriate redundancies) before developing the best strategies (or options) to meet the new building's needs. UTM has developed detailed design specifications and standards for its mechanical, electrical and building automation systems (see Appendix: Mechanical and Electrical Design Criteria); these specifications and standards are reviewed and updated on a regular basis and those attached to the report may change during design.

1. District Energy System (Heating and Cooling)

The Science Building will be the fourth construction project to incorporate central high Δ°T hot water heating and chilled-water cooling (District Energy System or DES) as the building's base HVAC infrastructure.

The earlier engineering study proposed to upgrade the current CUP high Δ°T system and piping with the supply and installation of two 350 HP steam boilers, providing capacity and redundancy for new building; the consulting engineers calculated the need for 12,000 lbs/hour of steam. These boilers would tap into the existing steam distribution system with steam being supplied to the Science Building through the Service Tunnel; unused steam and condensate return lines are available from the main food commissary (DV0134 via corridor DV0126K). The incoming steam would then be converted to appropriate temperature hot water within the building's main mechanical room and distributed from there to the rest of the building.

Although there appears to be sufficient floor space within the CUP to accommodate the proposed new boilers, the design engineers will need to compare this approach to the option of supplying and installing DES hot water boilers within the building itself. The eventual design will be selected on the basis of best engineering practices and relative economies of construction and operation. If the boilers are accommodated within the building, then their output should be capable of being sent back (if needed) to the CUP (either through the Service Tunnel via new hot water lines or a new hot water loop along Outer Circle Road).

UTM currently has completed the replacement of the original cooling tower with a new state- of-the-art modular installation, and to upgrade the internal circulation within the CUP to meet the existing needs of the UTM campus. As well, the North Building Reconstruction Phase B is installing a new 1000-ton (two stage) chiller to meet the DES needs of that building. This new chiller has been placed beside the two existing 1000-ton chillers.

Although the demand for chilled water will not likely exceed the three chillers capacities, the actual demands (prior to the Science Building's load being included) for the campus will not be known until the new chiller and subsequent upgrades have been fully implemented. Even with these additions and upgrades, there is likely insufficient capacity to meet the incremental needs of the Science Building (and any other growth in that sector).

Peak cooling demand for the Science Building is estimated at 500 tons; however, two 500-ton chillers are recommended to ensure adequate output as well as redundancy. The new chillers will require a 150mm connection to the CUP's existing distribution system. The chilled water distribution lines have been extended to the location of the Science Building in the same manner as the steam and condensate lines, but there is a possibility that there is not a suitable location within the CUP to accommodate these two units (or a single two-stage, 1000-ton unit). In that case, the chiller(s) will have to be located within or near the new Science Building. As with the heating service, if cooling is locally generated, it will be still required to tie into the existing distribution system either to supplement or back-up the existing infrastructure (or vice versa).

2. Gas Service

Laboratory gas will be brought into the Science Building from the Service Tunnel and will be carried through the building's main service shaft. However, this service will not be distributed to laboratories, unless specified in the room data sheet (RDS); the project's intent is to have laboratory gas available on each floor level ready to be distributed if needed at a later date.

Natural gas will only need to be supplied if the design of the building's mechanical and electrical systems require this fuel sources (e.g. emergency generator, DES hot water boilers, etc.).

3. Electrical Service

The preliminary engineering study identified a need for a new 2000 kVA substation that could be served by an existing 15kV switch along the Outer Circle Road (near Parking Lot #8). This new substation will need to be supplied and installed by UTM's utility supplier (Alectra Utilities). Electric utilities will be properly metered/sub-metered and all building systems monitored and/or controlled through Facilities Management and Planning's building automation system (BAS).

4. Emergency and Back-up Power

Currently, UTM has two central diesel-powered generators in the CUP with a total output of 1.0 MW; however, with the completion of the Research Greenhouse and the North Building Reconstruction Phase B, there will be no capacity to accommodate the Science Building's sizeable needs for emergency and back-up power. As well, the CUP does not have the physical space to accommodate another generator.

The consulting engineers for the earlier feasibility study recommended that a new generator be supplied and installed in a location within or adjacent to the Science Building. UTM recommends that this new generator be gas-fired and that its output be 1.0 MW. As well, UTM recommends that this generator have a connection (through switch gear) to the existing emergency service to act as a back-up to the two existing central generators (or vice versa).

5. Sanitary Services and Stormwater Management

The preliminary investigation into the infrastructure requirements for the Science Building determined that its needs could probably be met with a 150 mm sanitary service and a 400 mm storm service. These services will have to be verified during design and the most appropriate locations to tie into existing lines will have to be made at that time.

6. Domestic Water

The preliminary feasibility study for the new Science Building calculated a demand for domestic water that could be met with a 100mm incoming water line. As well, a separate line for the fire protection service (as per the Ontario Fire Code) will be required. The size and subsequent routing of this service will need to be investigated during design development.

7. Communications (Voice/Data)

Currently, the campus' main incoming 10G (Cogent) fiber optic cable enters the UTM campus from Mississauga Road at the middle entrance through Oscar Peterson Hall to north portion of Outer Circle Road. Prior to the North Building Reconstruction Phase B, this fiber optic cable then travelled along the outside of the road and crossed across the road in front of Block B of the North Building (now demolished). From the North Building's building entry facility (BEF), the cable exited the building back across the Outer Circle Road and along the road to the CUP where it enters the main service tunnel. Prior to the demolition of the North Building, the fiber optic connections to Deerfield Hall, up Principal's Road (to Lislehurst, the Paleomagnetism Laboratory, Forensic House and the Grounds Building, and to the CUP were re-routed. From the CUP, the cable runs through the tunnel to the campus' main server room in the William G. Davis Building.

A second 1G (Orion) fiber optic cable for the Mississauga Academy of Medicine enters the campus from Mississauga Road at the North Entrance, runs along Outer Circle Road, crosses the road and enters the North Building's BEF. As with the 10G cable, the 1G cable follows the same path to the CUP, through the service tunnel to the Terrence Donnelly Health Science Complex.

UTM's I&ITS proposes to relocate the existing campus server room to a new location in Deerfield Hall prior to the completion of the North Building Phase B project. Service will then be distributed back to the campus via a 144-strand fiber optic cable that was installed down the Five-Minute Walk during the Deerfield Hall project (and terminates at the existing Davis Building server room). The new Science Building will include a new High Performance Computing Data Centre to address the specific needs of UTM's researchers.

UTM has moved towards voice over internet telephones (VOIP) with only emergency handsets or call stations (such as elevator and emergency phones) using copper service.

For the Science Building, data and voice communications will be directed out of the Davis Building's building entry facilities (BEFs) for Bell and internet services, through the Davis Building and into the Science Building's BEFs.

8. Roads and Pedestrian Pathways

The Science Building is anticipated to be accessed from a number of different locations and directions. The building will be accessed either directly from Outer Circle Road through a main

entrance or indirectly through William G. Davis Building. With the Science Building being located close to the Parking Lot #9, a strong pedestrian connection with the Parking Lot #9 is essential.

Realignment of the existing pedestrian pathway is anticipated along the length of the building (Campus Green side) to connect to new pathways and hard landscaping that has been completed with earlier campus landscaping projects and are included with the Science Building project. During construction, the existing pedestrian walkway will need to be maintained to allow pedestrian traffic along Outer Circle Road and between the Health Science Complex and William G. Davis Building.

UTM has just completed major improvements to its sidewalk system along most of Outer Circle Road. The Science Building project is expected to further enhance this pedestrian network.

9. Bicycle Parking:

As with UTM other LEED® Silver certification projects, The Science Building will include the provision for the secure parking of bicycles. As well, the City of Mississauga will likely have a requirement for the number and types of bicycle parking that the project will need to provide.

10. Servicing and Fire Access:

As noted earlier, the shipping and receiving, and waste management facilities for the Science Building will expand the existing operations in the Davis Building and will be accessed through an expansion of the existing service yard that is currently accessed directly from the Outer Circle Road. The design team will have to include a traffic consultant to determine the types and volume of vehicle traffic assist in the design of the service road, yard and loading dock.

Fire access for the new Science Building will need to be considered carefully in the design process, especially given that it is a structure that densely filled with scientific equipment and materials. For planning purposes, the access road into Parking Lot 9 will be the primary firefighting "street" with additional access from the service yard and the Davis Building-Health Science Complex courtyard. Access for fire department vehicles into this courtyard is required, with a suitably designed and constructed route between the Science Building and adjacent Health Science Complex.

f) Secondary Effects

There is a possibility that the Science Building may have an impact on the Central Utility Plant (CUP) and the Service Tunnel. If practical (physically and/or economically), the heating and cooling needs of the Science Building will be best served from the campus' central infrastructure. Preliminary engineering investigations suggest additional steam and chilled water generation at the CUP; the building's needs will be better understood when its design has been developed. At that time, the consulting engineers can determine in consultation with FMP staff if the CUP has any surplus capacity and, if not, can the CUP reasonably accommodate any new equipment. If the CUP cannot accommodate the new building's needs, then heating and cooling will have to be generated within the building itself or nearby (e.g. a "mini-CUP"). This approach will minimize impact on the CUP but may have an effect on the campus' distribution infrastructure. If any utilities are generated within or near the new building (heating, cooling and emergency electrical power), UTM will require that these services are connected to the campus' central distribution network through the Service Tunnel and or through a direct bury loop (possibly along Outer Circle) back to the CUP. This arrangement will add another level of utilities redundancy for both the Science Building and the CUP.

Although the proposed Science Building does not intend to remove any areas from the Davis Building space inventory, the new building's design and its construction will have a significant effect on the occupants and activities that are located in adjacent areas or nearby. Noise, vibrations, dust and odors are typical and constant annoyances experienced by neighbours to any major construction site. Although the project team and contractors will work closely with UTM staff to ameliorate these situations, they cannot be eliminated. FMP have already approached the occupants of the immediately adjacent spaces (notably Food Services and the Office of the Registrar), and will work with them identify potentially disruptive situations and to develop and provide temporary solutions when required. As well, as with previous and on-going renovation and construction projects, FMP and project teams have established and implemented procedures and protocols to deal with any service interruptions during construction (e.g. electrical and emergency power, heating cooling, etc.).

The W.G. Davis Building will be significantly affected in two major areas during construction; shipping, receiving, waste management and warehousing, and food services. The Davis Building's freight elevator is located conveniently by existing the loading dock and if it is taken out of service for any reason, its loss will significant as it is the only elevator that is capable of moving large deliveries. Shipping and receiving, waste management and warehousing operations will be effected throughout the Science Building's construction.

The loading dock cannot be closed for the entire time of the project, but could be during slow periods of activities in the building and campus. FMP can minimize the shipping and receiving activities at the existing dock by redirecting these activities to other locations. By the summer of 2018, a new dock operation will be fully functional in the new North Building Reconstruction Phase B; this location will not only handle shipments for the North Building and Deerfield Hall but also the UTM campus at large. As well, a smaller facility is available at the Instructional Centre and will likely be used primarily to divert Custodial Services' activities. Consideration is being given to have smaller deliveries (i.e. couriers, stationery supplies, etc.) brought directly to occupants in all buildings on campus with short term parking by deliverers' vehicles at building entrances.

The existing Davis Building loading dock will be used to accept only critical materials for the Davis Building. Warehousing and storage functions should not affected until the existing facilities are slated to be renovated (after the new building's facilities are operational). During the renovation of the existing loading dock facilities, construction activities will have some impact on adjacent athletic and recreational facilities.

Currently, biological and chemical wastes are stored in a partitioned portable structure in the loading docks service yard and the building's only trash compactor is located beside the dock (potentially within the construction site of the new building). UTM will relocate these activities as and when needed.

Shipping/Receiving/Stores Areas	Proposed Action:	Notes:
Loading Dock	Retain; incorporate DV0132A area	New Science Building; existing (slightly expanded)
General Warehouse (Short to Long-Term)	Retain; re-configure as new central stores (long-term) - new DV0131	Caged areas for long-term storage of non-FMP items/materials; assume 6 cages @ 8.89 nasm each (existing), 6 cages @ 12.22 nasm and 3 cages @ 17.17 nasm with remaining floor area for circulation
Central Academic Stores	Retain; reassign to Food Services	Short-term storage awaiting pick-up by or delivery to academic user
General Storage	Demolish; relocate to new DV0132D or new DV0131	New DV0132B, C and D developed from reducing area and reconfiguring existing DV1032C and F
General Storage	Retain but reconfigure with DV0132F into new DV0131B, C and D	New DV0132B, C and D developed from reducing area and reconfiguring existing DV1032C and F
Open storage area	Relocate to new DV0131 (caged areas)	Included in new DV0131
Central Chemical Stores	Caged area (~8.89 sm) +++	Subdivide new into 40 nasm (bulk solvent/flammable chemicals, 20 nasm (chemical waste), 20 nasm (bio waste)
Gas Cylinder Stores	Caged area (~8.89 sm)	One area for full cylinders; one for empty cylinders
Chemical Waste and Bio Waste Stores	Remove	Temporary relocation during construction; included in New Science Building (Central Chemical Stores)
Radioisotope Waste Storage	Demolish; relocate to new DV0132B	New DV0132B, C and D developed from reducing area and reconfiguring existing DV1032C and F
Recycling/Waste Facilities	Demolish; return to existing dock	New Science Building
Supervisor's Office	Retain; secondary office/support	
Campus Services Areas		
Examination Furniture Storage	Demolish caging; return to Service Tunnel	Move furniture to new storage facility (new DV0130)
Main Storage Facility (Supplies and Equipment)	Relocate to new bldg; demolish and restore as corridor	New Science Building
Lunch Room, Change Room/Lockers and Washroom - (W-M)	Release; reassign to new central stores (long-term)	New Science Building
Foreperson's Office and Duty Room	Release and re-assign	New Science Building

The other major activity adjacent to the construction site is Food Services main commissary kitchen, related functions and Spigel Hall. The commissary kitchen cannot be shut down during construction and deliveries to this operation and movement of meals/materials from it to other operational

locations must be safeguarded during construction and renovations. Not only are shipping and receiving activities essential but also dust and vermin control (i.e. food safety) must be maintained at all times. Service disruptions must also be carefully coordinated, and some small rooms may need to be temporarily vacated and accommodated elsewhere in the Davis Building.

Area affected	Area (nasm)	Relocated to:
Kitchen DV1101, DV110 and DV1105	380.00	This area cannot be relocated and its functions will have to be modified to allow for the Meeting Place and OPH dining and food preparation facility to minimize the food disruption on campus.
Spigel Hall DV1102	362.00	DV1143 Booking functions
Chartwell offices DV1099	52.00	DV1113/1113A Office area only

The last major secondary effect on the main floor (Level 2) of the W.G. Davis building that accommodates the International Educational Centre (suite DV2071) in a small, one-storey bump out (suite DV2071). This small addition will need to be demolished prior to construction of the new building. This Centre will be temporarily relocated to Deerfield Hall, and is under consideration for the new Student Services Plaza that is planned for development after the Davis Building Phase 2 Renovation for the new Meeting Place is completed. A large lecture hall DV2072 with capacity of 292 may be disrupted by noise and vibrations during construction; classes in these rooms may need to be scheduled elsewhere when needed. Public corridors in the building and exterior walkways (courtyard, podium) will also be affected.

Area affected	Area (nasm)	Relocated to:
International Educational Centre DV2071	92.00	Deerfield Hall on temporary basis; new Student Services Plaza when those renovations are completed (after Davis Building Phase 2, Meeting Place)
FMP Custodial Storage DV2070	56.50	During construction, custodial storage will be relocated to the lower level of the Instructional Building if work is needed to be completed in this room.
Lecture Hall DV2072	266.00	Bookings during anticipated construction activities to be minimized. Once, the project is complete, this room will resume its function as a large lecture hall.

The secondary effects on the third floor of the W.G. Davis building a smaller classroom, DV3093, with a capacity of 50 seats will be similarly disrupted as the lecture theatre below, and its classes re-scheduled into other locations as required. Public corridors DV3086K and DV3072K and labs open into theses corridors will be also be affected.

Area affected	Area (nasm)	Relocated to:
Classroom DV3093	104.00	This classroom will be taken out of bookings and classes will be scheduled in the new North Building Reconstruction Phase B. The long term use of this area will depend on the design of the new building and its connection to the existing W.G. Davis.

The secondary effects on the 4rd floor of the W.G. Davis building may include the loss of a small storage room used by Biology Department in support of adjacent teaching laboratories (DV4088 A=10 nasm). Public Corridors DV4083K and DV4073K and labs open into theses corridors will likely be effected. It should be noted that the W.G. Davis building is four stories tall on the D-block side, and only three stories tall on the JKL-block side.

Area affected	Area (nasm)	Relocated to:
Lab Storage (Biology) DV4088	10.00	This area will be assimilated into the teaching laboratory and other teaching support spaces available to the Department of Biology.

Beyond the effects on the occupants of the Davis Building, vehicle parking and traffic will also be affected. A strip of parking spots along the southern edge of parking lot #9 with 21 spots will likely be lost during construction, and at least half of these spots may be permanently lost due to the design of the new building's forecourt and access road. All of the 21 spots may be lost if the vehicle layby in front of the Health Science Complex cannot be used for the Science Building, and the new building requires its own layby, and if specialty spots (e.g. accessible spots) cannot be located close enough elsewhere in Lot 9.

As well, all or portions of Lot #8b with 80 parking spots might be affected by construction as this lot may be assigned to the contractors as a trailer compound for site offices and/or a staging area for construction materials.

The temporary loss of 101 parking spots (and a permanent loss of up to 21 spots) for three years of construction will be significant (especially during peak demand periods). However, UTM has provided additional spots during construction activity recently (e.g. Parking Deck 2 in 2016). With the completion of the North Building Reconstruction Phase B, Lot #1 with 31 spots will be returned to service in the summer of 2018. Past arrangements have included creating temporary spots at the Grounds Building and Central Utilities Plant. Long term parking needs will be addressed with the construction of Parking Deck 3.

Refer to diagram below.

Figure – Parking Lots affected by construction of New Science Building

g) Post-Construction Considerations:

It is premature to determine if any space will be released by existing researchers when the Science Building is completed. For planning purposes, it was assumed that, if any researchers do relocate from the Davis Building to the Science Building, the vacated space will be re-assigned to new hires or existing researchers in the Departments of Biology, and Chemistry & Physical Sciences. The Academic Dean, the Vice-Principal, Research and academic chairs will consider the complement of researchers to be accommodated in the Science Building and will make applications to UTM's Space Planning & Management Committee for the appropriate allocation within the new building, and the re-allocation of any existing space that may be vacated in the Davis Building.

h) Project Schedule

The project schedule, developed jointly by Campus & Facilities Planning and UTM, is as follows:

- Architect Selection — September-December, 2017
- Schematic Design — January-July, 2018
- Design Development — August-December, 2018
- Construction Documents — January-July, 2019
- Tender and Award Completion — October-November, 2019
- Construction Start — November, 2019
- Substantial Completion — November, 2021

The schedule assumes all municipal approvals may be achieved within the timelines.

The Committee assumes that the interest from the architectural, engineering and construction community will be strong and that exhaustive, intensive and time-consuming RFP/RFT processes will be required. As well, the above project milestones are based on a traditional design-bid-build process and not a design-build approach. With the need to satisfy a number of government agencies with regards to the high-end research laboratories, a design-build approach exposes the project to too many risks that can be detrimental from a cost and scheduling standpoint.

IV. Resource Implications

a) Total Project Cost Estimate (TPC)

The total estimated project cost for the Science Building includes a major addition to the William G. Davis Building of 15,552 gross square metres, and 7,134 net assignable square metres. It assumes that the general construction contract will be awarded toward the end of 2018 and that the building will be ready for occupancy for the end of 2021.

A construction cost estimate (Class D) was prepared by the firm of Turner Townsend, and was based on the scope of work as outlined in this report, the room data sheets, UTM design standards and specifications, and benchmark projects, such as North Building Reconstruction Phase B, Deerfield Hall and the Innovation Complex. The estimate assumes that the building will be delivered under a design-bid-build format, and that much of the project's requirements will be carried in this project cost estimate.

The TPC was completed by UPDC's Project Development Office and includes estimates or allowances for the following:

- Construction costs, including renovations (assuming a lump sum type of tender to qualified general contractors in the month of December 2018)
- Site services (District Energy System infrastructure, high voltage transformer and emergency power generation and distribution, water, storm and sanitary system relocations, extensions and connections, gas service, telecommunications
- Infrastructure upgrades in the sector, Central Utility Plant and Service Tunnel
- Demolition
- Hard and soft landscaping
- Standard and enhanced commissioning
- Construction and project contingencies
- Applicable taxes
- Permits and insurance; that is, all fees associated with the project; such as, site plan approval (SPA), building permits, municipal development charges, etc.
- Hazardous waste removal (third party investigations, abatement, disposal, testing for release to contractor)
- Secondary effects
- Professional fees for all required services; such as, architects, engineers, commissioning agents, specialized consultants (e.g. for environmental/wildlife assessments, building envelope, LEED certification, micro-climate, acoustic, etc.), project management, compliance and payment certifiers.
- LEED silver certification (minimum)
- Building Information Modeling (BIM) to UTM's specifications
- Fullfit-out of infrastructure & equipment for electronic building access, telecommunications, electronic security, public address & audio-video requirements – including any and all licensing fees
- Millwork, fixed and loose furniture, furnishings and equipment (excluding loose research equipment)
- Computer and telephone terminations (including labelling to UTM specifications)
- Moving, storage (temporary) and relocations (including furnishings and equipment)

- All OBC-mandated and non-OBC-mandated, building and room identification signage, and interior and campus wayfinding signage (including digital signage)
- Own forces (e.g. Campus and Custodial Services, operating engineers) and third party costs (e.g. fire systems service providers, security)
- Financing costs and escalation
- Miscellaneous costs (e.g. donor recognition, ceremonies)

TPC does not include cost of new research and office equipment or consumables or telecommunications equipment (personal computers, telephones) that are not part of the base building.

b) Operating Costs

The projected operating cost estimates for the Science Building have been developed using UTM's experience with the Terrence Donnelly Health Sciences Complex (HSC); the HSC (LEED Gold) is the only recent capital project that has included wet research laboratories. Although the Science Building's space program includes a considerable amount of heavy wet research laboratories, it has been assumed that improvements in LEED-related building and laboratory systems will keep unit operating costs close to those for the HSC.

In 2014, the Health Science Complex had direct and indirect operating costs of $260.88 per net assignable square metre (nasm) of building space. With published inflation rates since 2014, this unit cost is equivalent to $277.45/nasm in 2017. If the same rate of inflation is experienced in the next five years, then the unit operating cost is projected to be $299.19 per net assignable square metre. At that rate, the Science Building will have an annual operating cost of $2,134,430 (in 2022); provisions will be made for these additional operating costs in UTM's five-year operating budget.

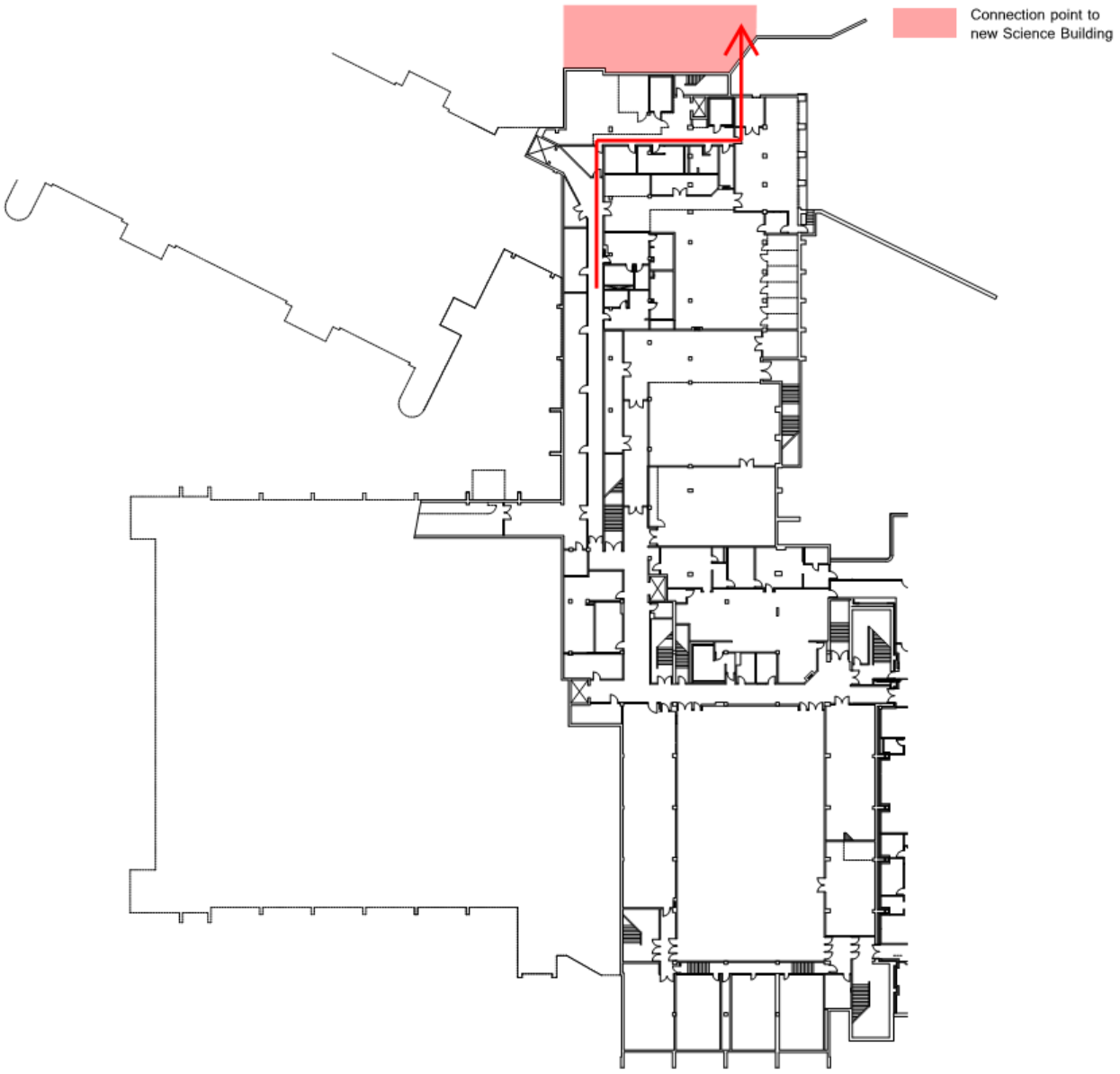
c) Funding Sources and Cash Flow Analysis

The Science Building project will be funded by:

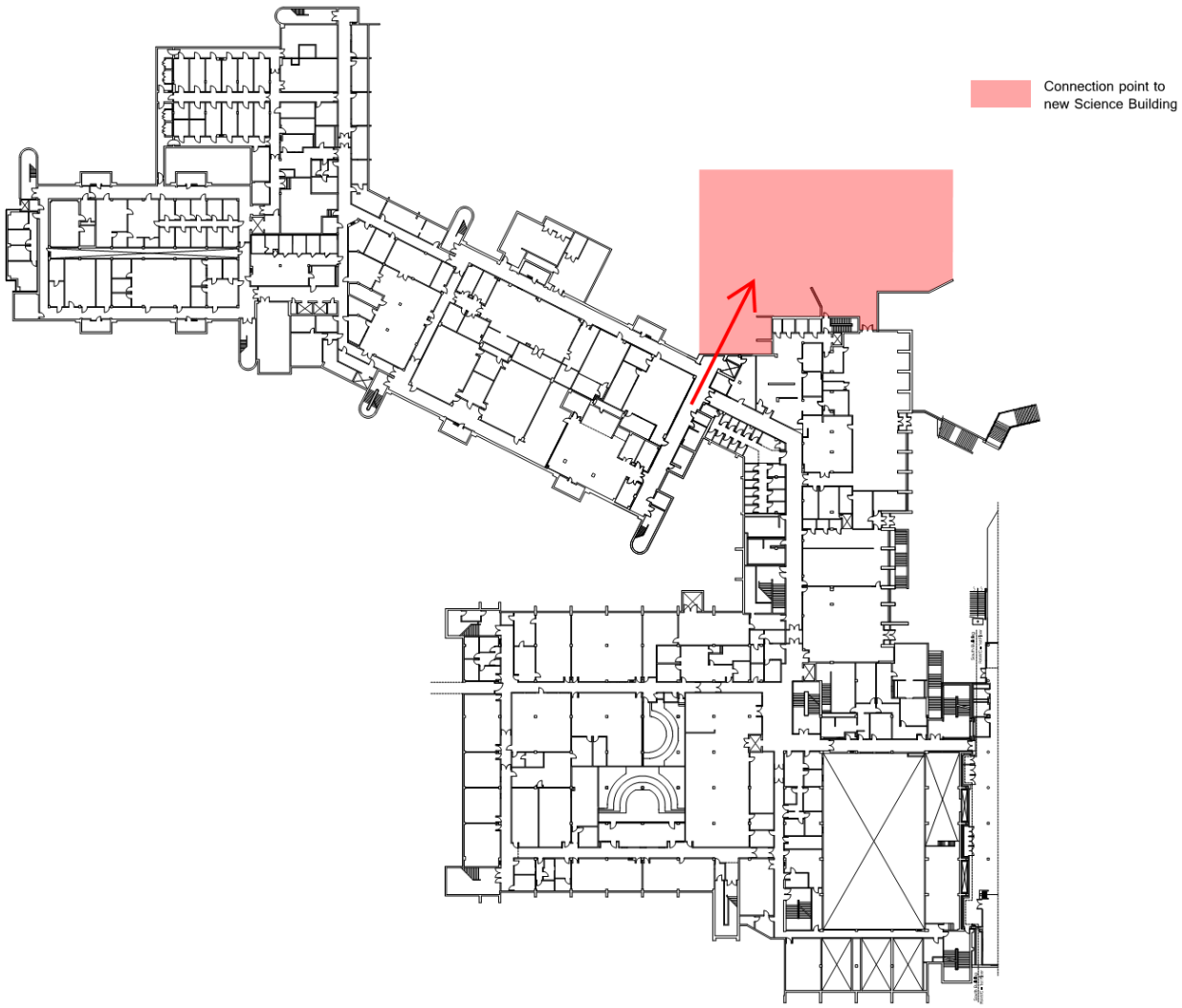
- UTM Capital Reserves (derived from the UTM Operating Budget)
- Capital Campaign Funds (Donations and Matching Funds)
- Financing

APPENDICES:

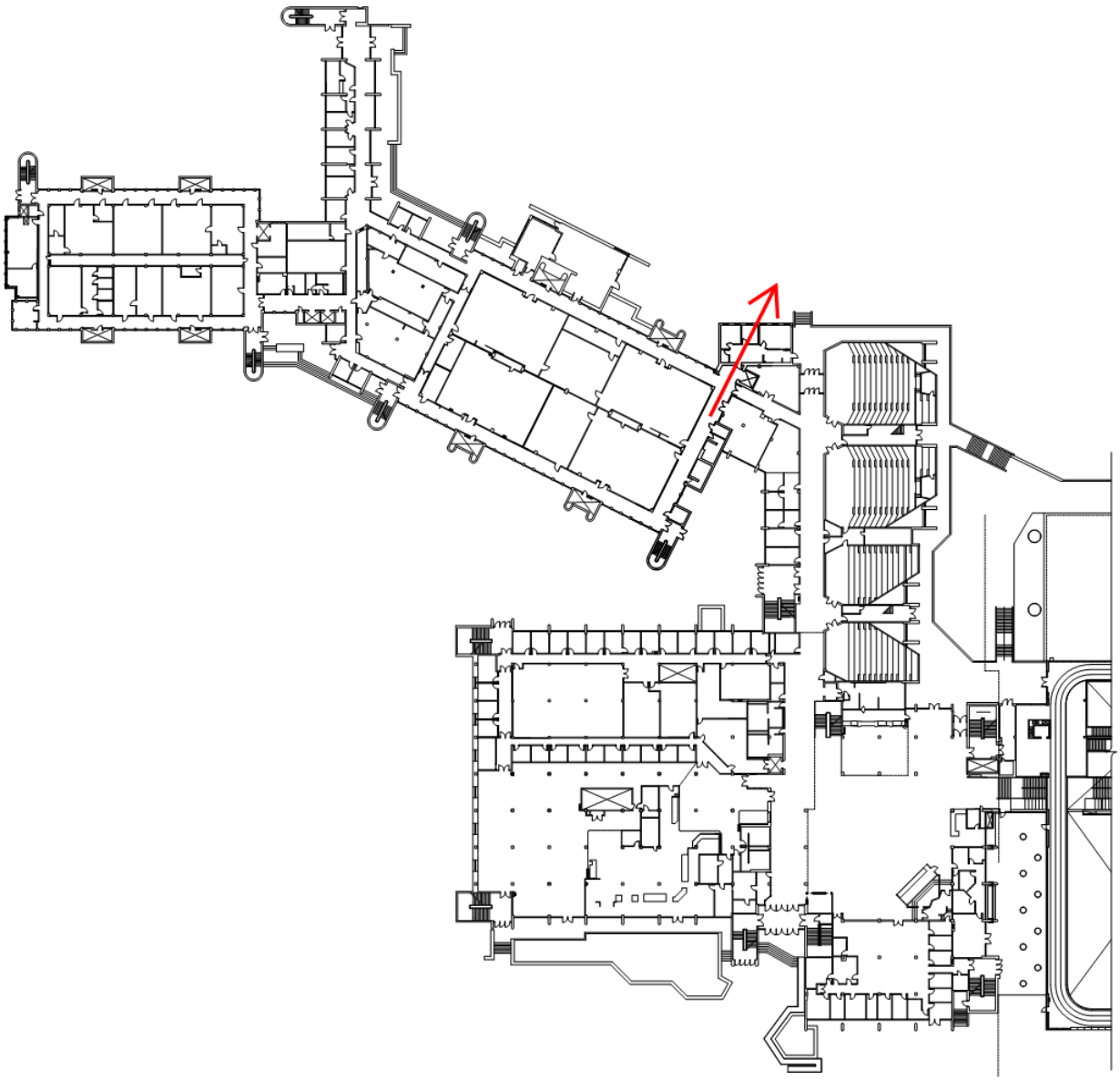
A. Room Specification Sheets (on request)
B. Site 1 campus master Plan (on request)
C. Existing Davis Building Plans with connection points to new Science Building
D. Total Project Cost Estimate (on request to limited distribution)



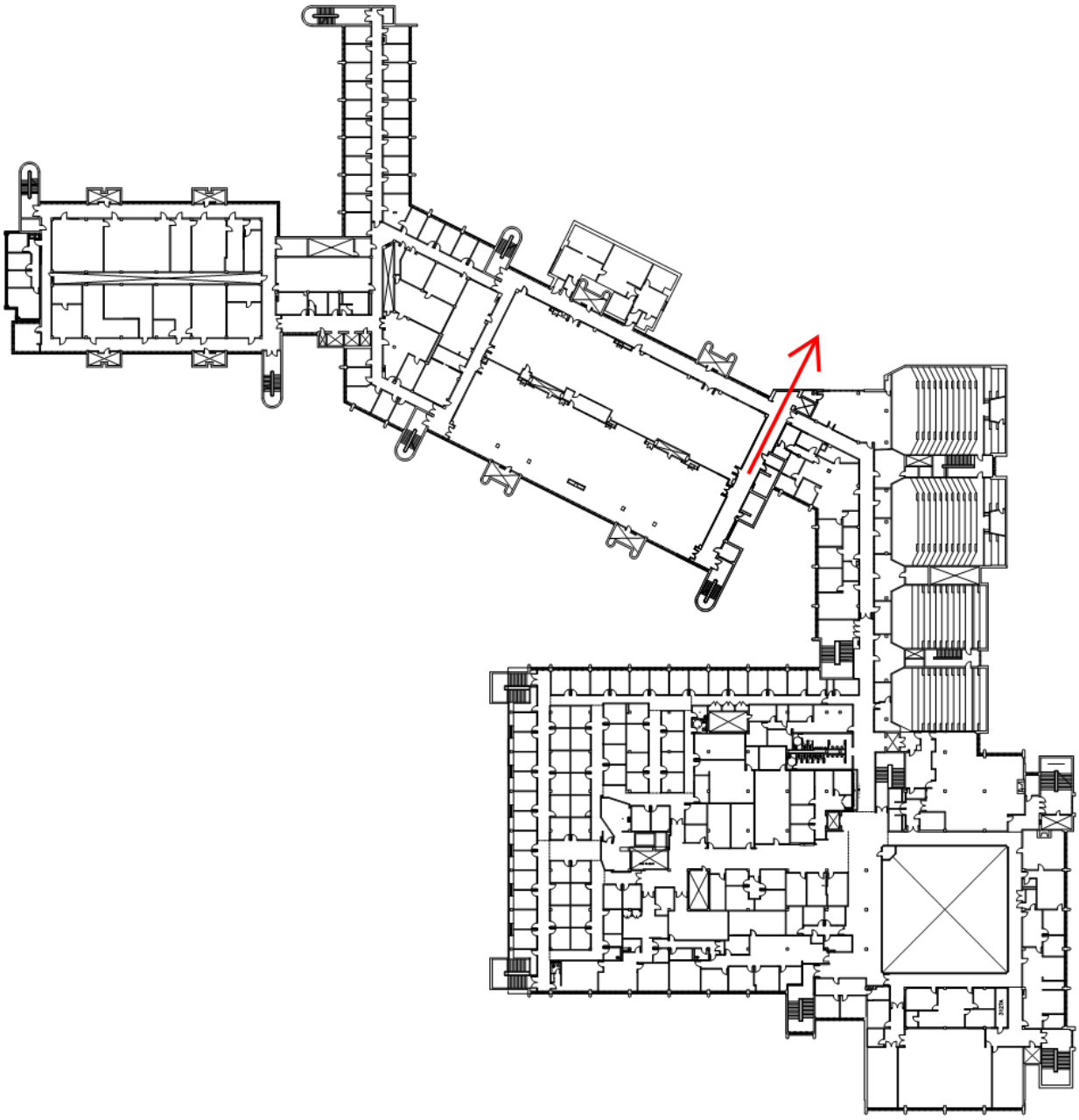
William G. Davis Building – Basement (Level – 0)



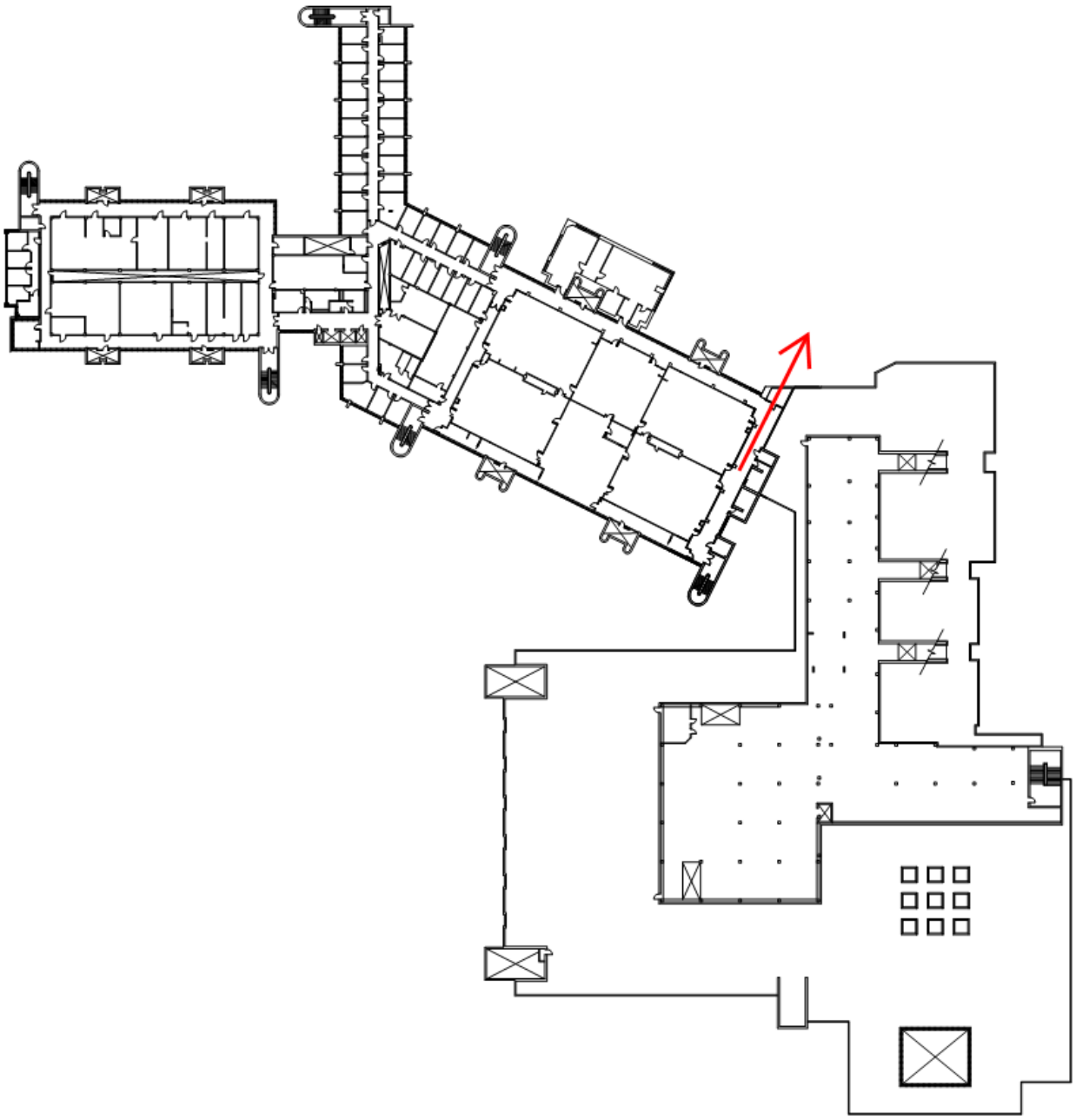
William G. Davis Building – 1st Floor (Level – 1)



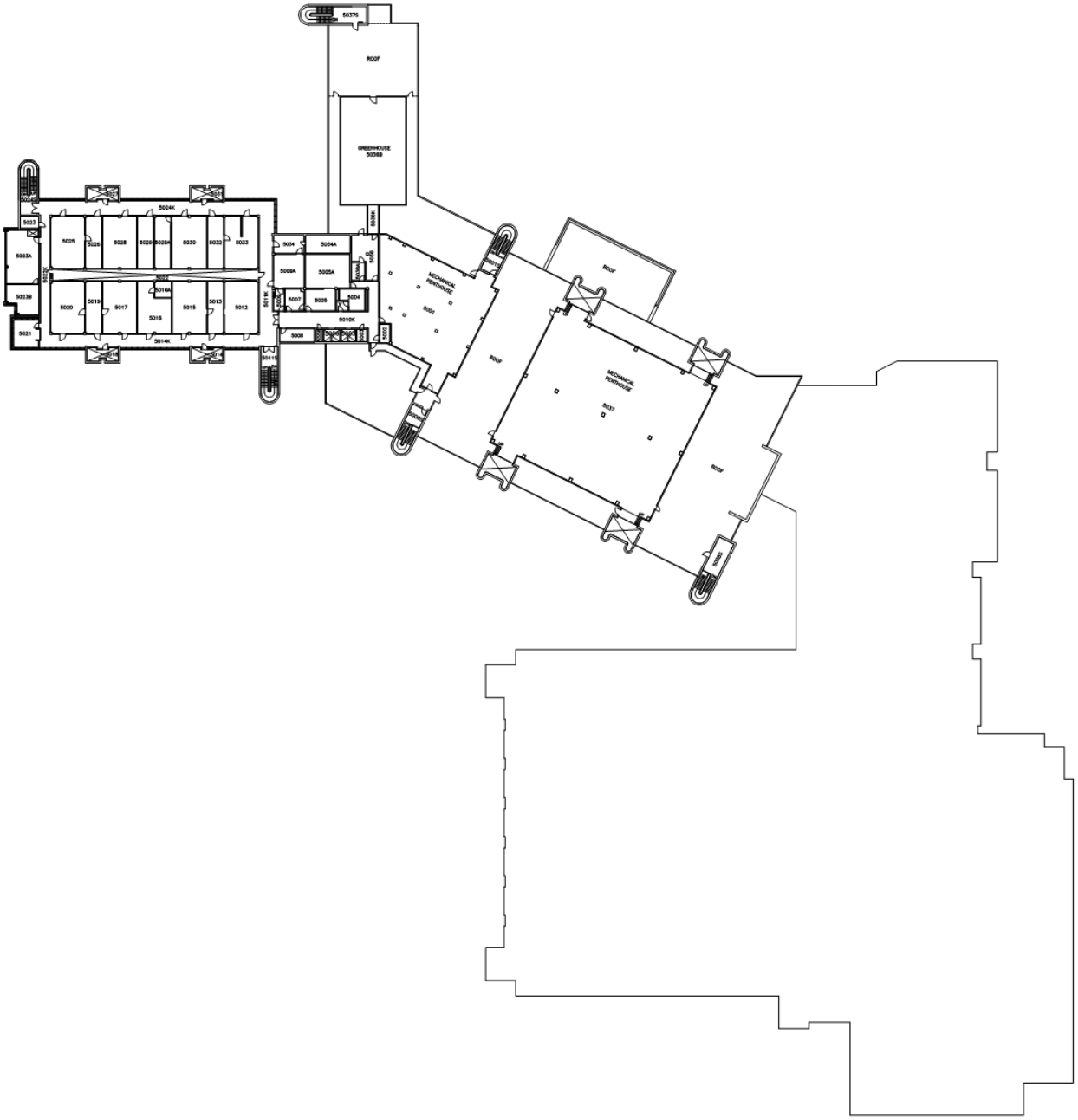
William G. Davis Building – Main Floor (Level – 2)



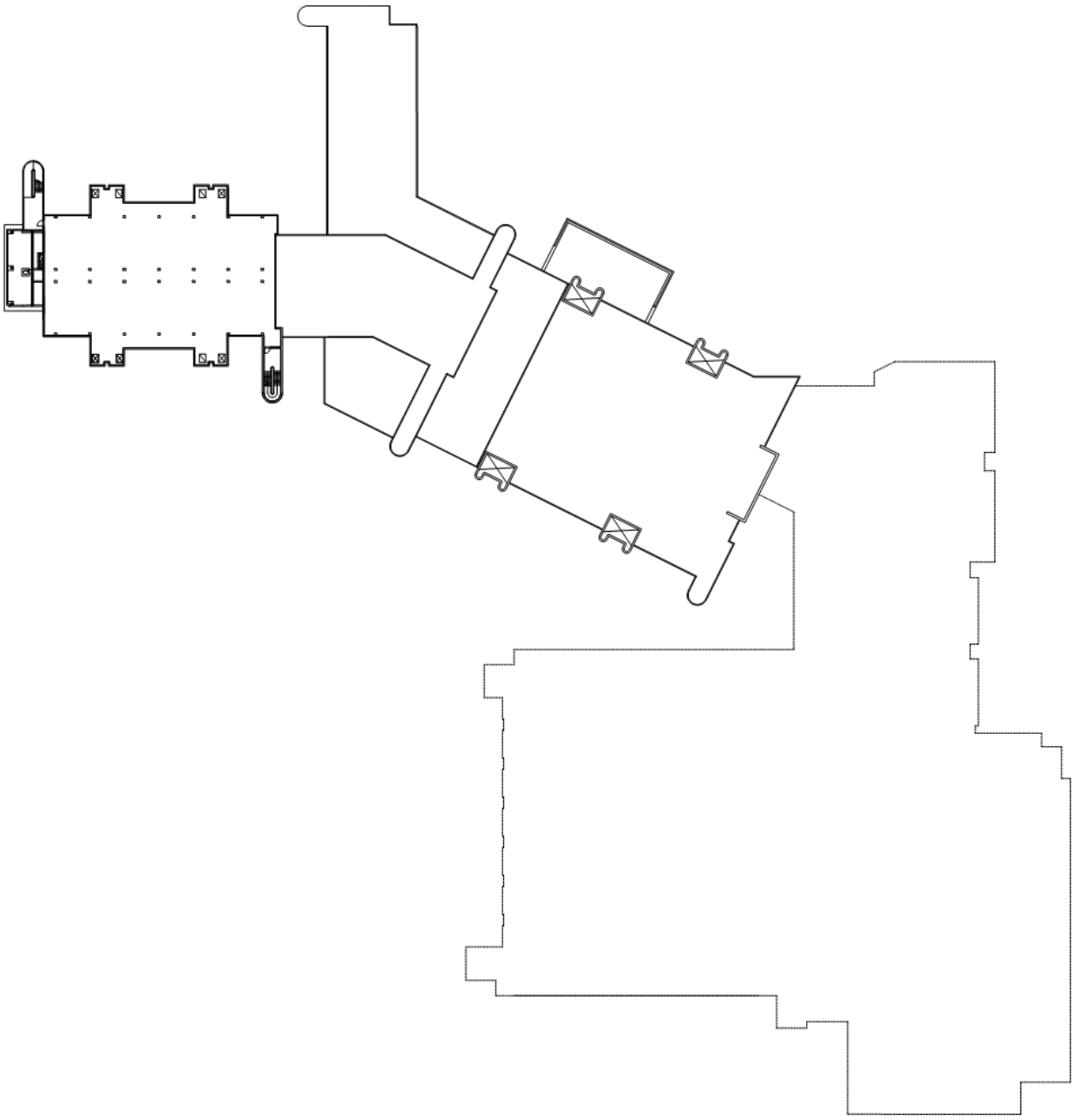
William G. Davis Building – 3rd Floor (Level – 3)



William G. Davis Building – 4th Floor (Level – 4)



William G. Davis Building – 5th Floor (Level – 5)



William G. Davis Building – 6th Floor (Level – 6)

UTM SCIENCE BUILDING

CAPITAL PROJECT

Campus Affairs Committee
October 31, 2017

PROJECT BACKGROUND & RATIONALE

(2001; 2006; 2009; present day)

Pronounced Need for New Science laboratories

Previous capital projects have addressed needs of non-laboratory based academic departments

Research Initiatives

CMC
Major research projects currently constrained
Need for wet labs; cross-departmental work

External Review: Biology

Research space is at a premium for this department

Faculty Hiring

Hiring in the wet laboratory sciences cannot proceed until UTM provides the requisite facilities

External Review: Chemical & Physical Sciences

Lack of properly designed educational and research space

Graduate Student Recruitment

Provide appropriate and sufficient wet laboratory space to support successful academic careers.

PROPOSED SPACE PROGRAM

- Centre for Medicinal Chemistry
- General Science Expansion
- High Performance Computing Data Centre
- Forensic Science Offices
- Campus & Building Services

PROPOSED SPACE PROGRAM

Total Project Area: 7,134 nasm
Approx. 15,552 gsm

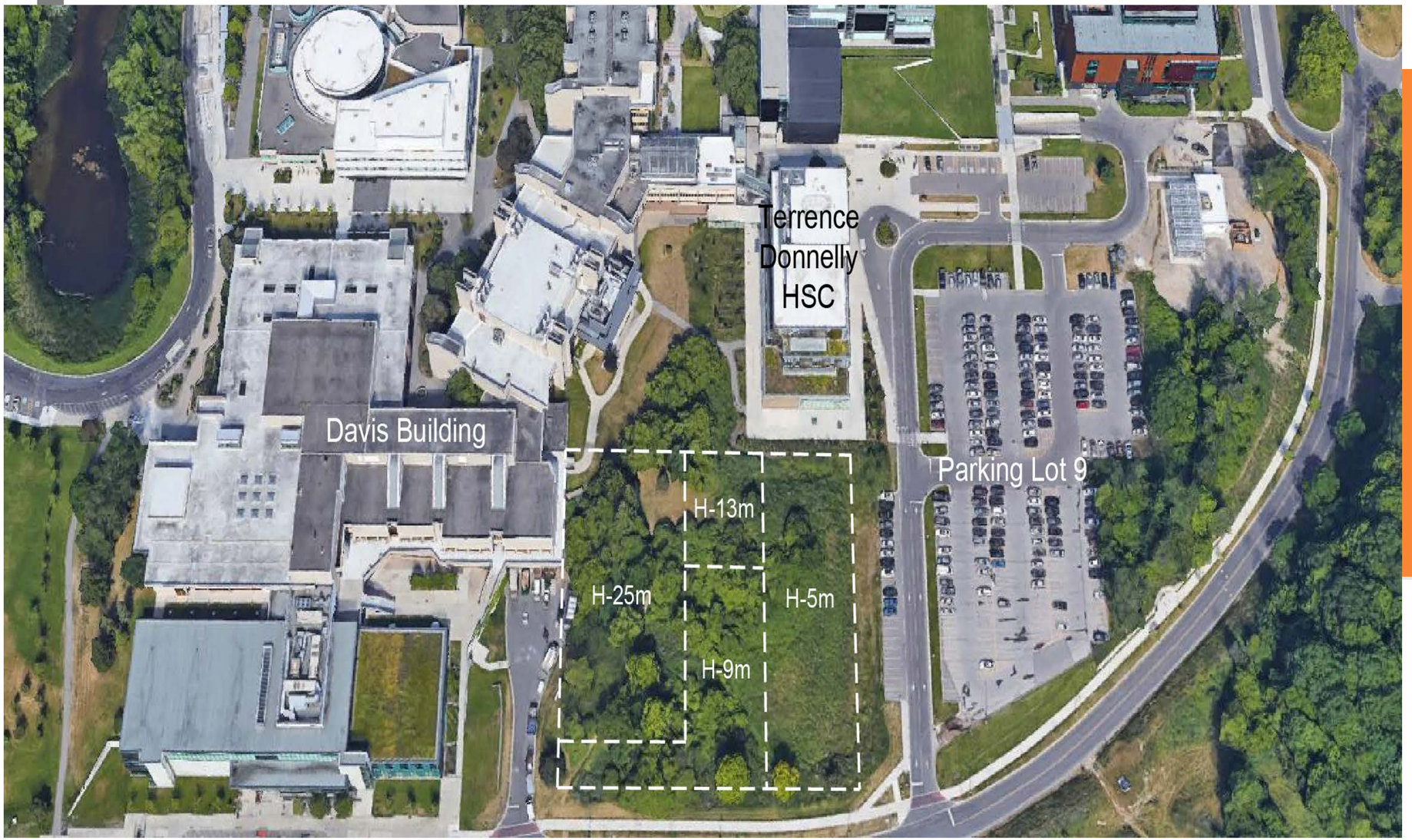
Comprised of highly-serviced wet laboratories, instrument rooms, computational facility, support facilities, offices.

Significant amount of primary mechanical and electrical systems and redundant back-up systems for critical areas.

Utility requirements for heating and cooling, and emergency/back-up power will be met within the building itself (not the Central Utility Plant)

Shipping/Receiving

DEVELOPMENT FOOTPRINT



From *2011 Master Plan*

Location within the greater *Site 1 development envelope (UTM Campus Master Plan 2011)*

Connected to Davis Building

Inclusion of a main entrance, opening onto the current Parking Lot 9.

BUILDING CONSIDERATIONS

Standards of Construction

- Planning and Costing: generally assume similar to recent campus capital projects

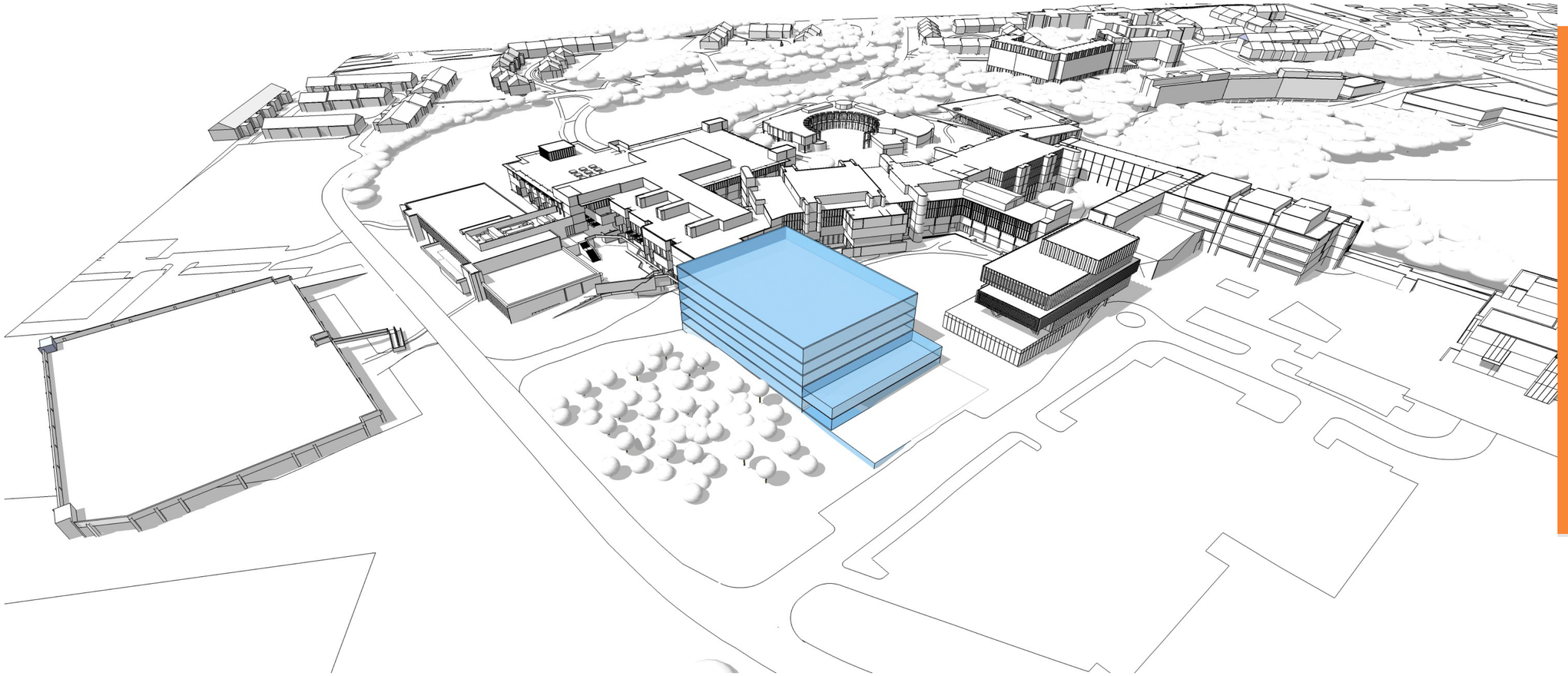
- Laboratories will be similar to the recently completed Medicinal and Molecular Biology Laboratories in the Davis Building (DV3017 and DV3017A), and the Gunning Laboratories (DV3023).

- Constructed and finished to Biocontainment Level 2 (BCL2)

    - Energy efficient, ultra-low (flow) face velocity, variable air volume fume cabinets

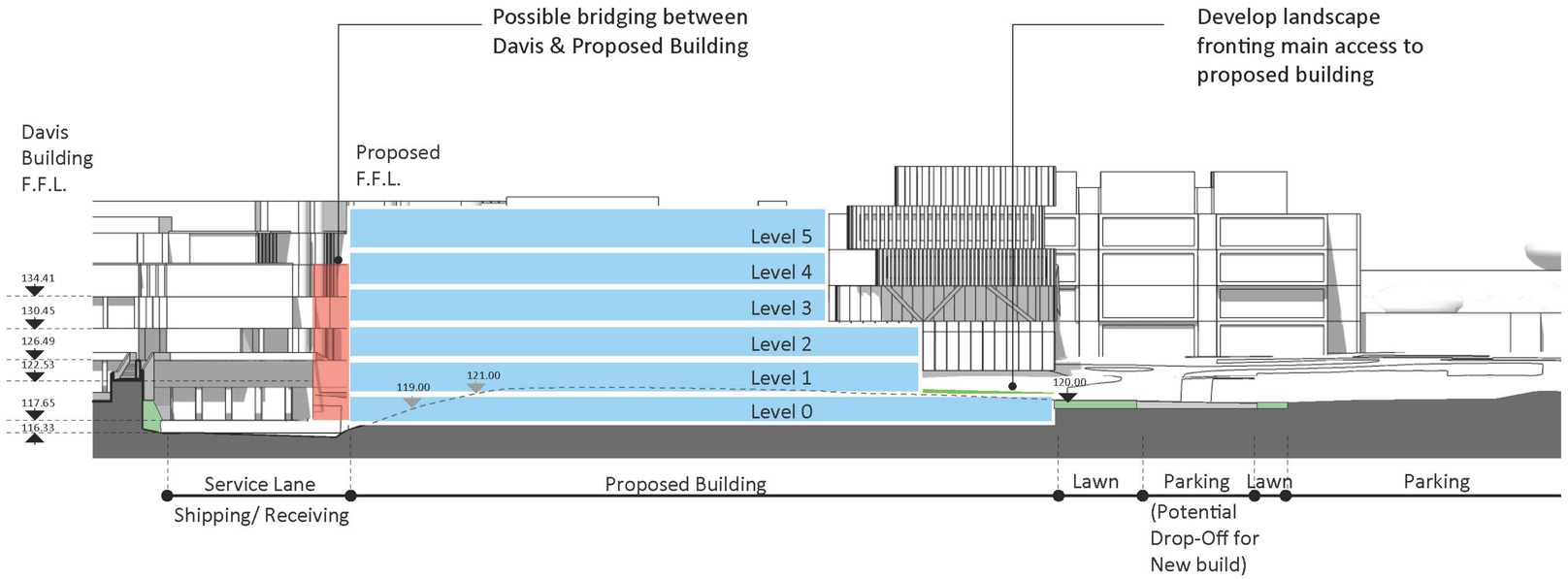
    - Height adjustable and/or fixed-height benches with adjustable shelving units, LED lighting, exposed painted structure ceilings, epoxy floors and painted walls.

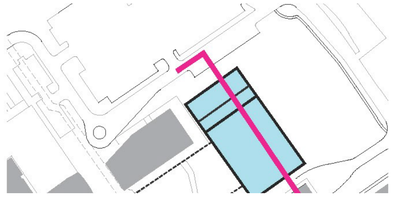
POTENTIAL BUILDING CONFIGURATION



Test fit for illustration purposes

ILLUSTRATION OF MASSING & CONNECTIONS

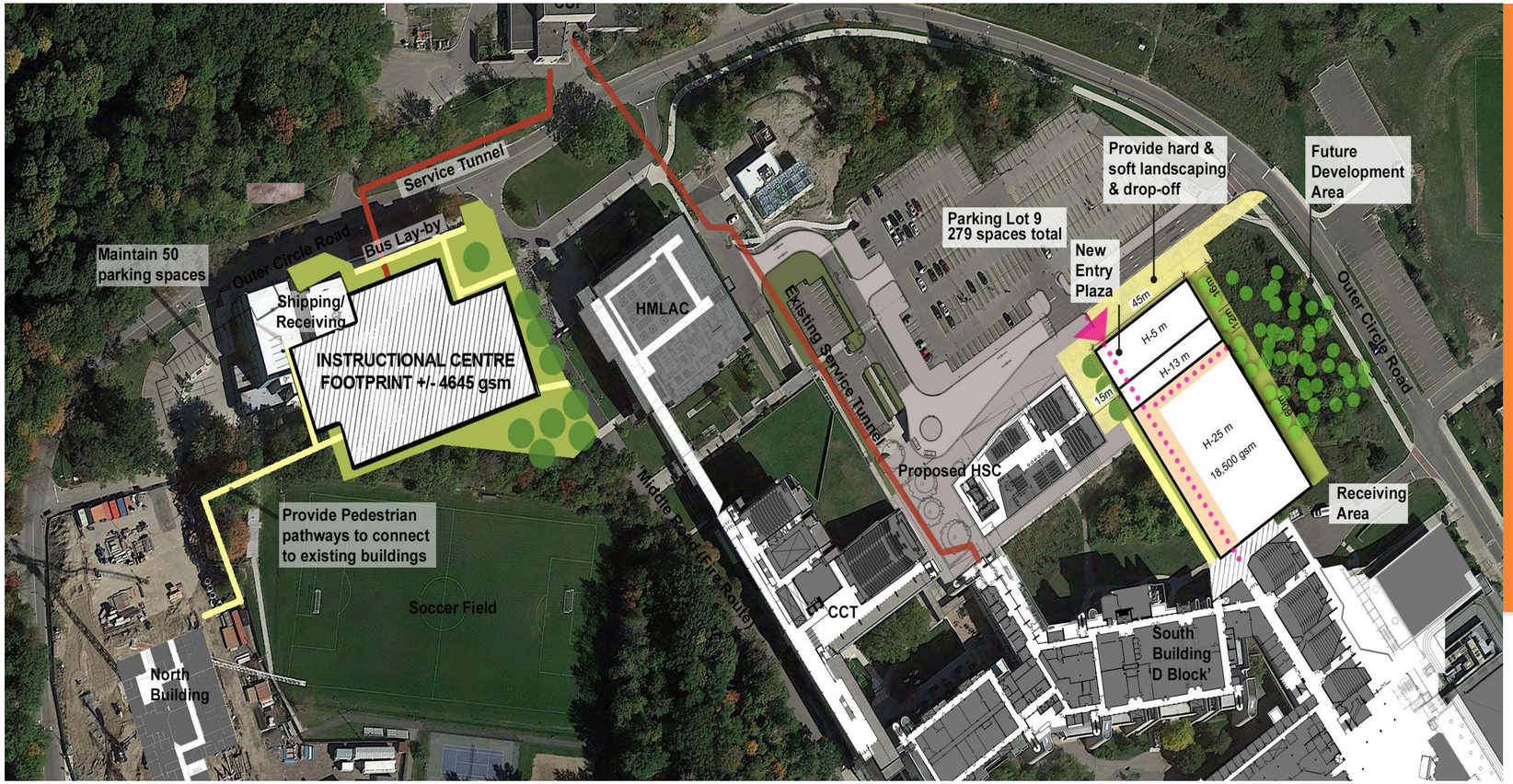




Dramatic slope.
Two-storey change in elevation between the main floor (Davis Building Level 2) and the Outer Circle Road level

Height: projected at 25 m, from Levels 0 through 4.

SUSTAINABILITY DESIGN & ENERGY CONSERVATION



Will be designed at LEED Silver or better:

- Green roofs, rainwater harvesting
- Materials – local, renewable/recycled content
- Ultra-low flow, energy efficient fume cabinets in labs.

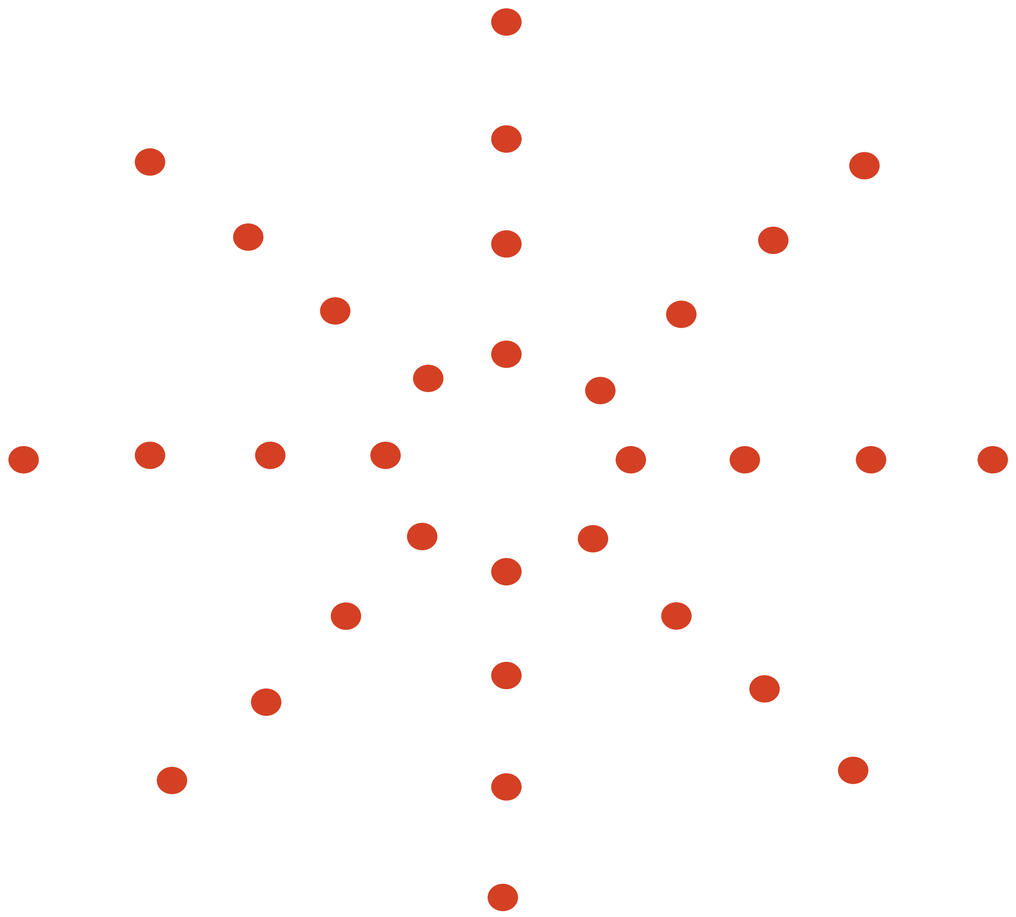
CONTINGENCY & SECONDARY EFFECTS

Contingency Plans

Secondary Effects

- Lab space in Davis Building
- Shipping Receiving
- Parking
- Noise and Vibration
- Demolition of Existing Structures
- Site access during construction

SCHEDULE



Architect Selection
By December 2017

Governance
December 14, 2017

Schematic Design
January – July 2018

Design Development
August – Dec. 2018

Construction Documents
January – July 2019

Tender & Award

Completion
October – November 2019

Construction Start
November 2019

Substantial Completion
November 2021

PROJECT PLANNING COMMITTEE

Paul Donoghue	Chief Administrative Officer (UTM) (Co-Chair)
Bryan Stewart	Vice-Principal, Research (UTM) (Co-Chair)
Ulrich Krull	Vice-President & Principal (UTM)
Steven Short	Associate Chair, Research, Department of Biology (UTM)
Claudiu Gradinaru	Chair, Department of Chemical & Physical Sciences (UTM)
Patrick Gunning	Professor, Department of Chemical & Physical Sciences (UTM)
Angela Lange	Vice-Dean, Faculty, Office of the Academic Dean (UTM)
Robert Gerlai	Professor, Department of Psychology (UTM)
Scott Prosser	Professor, Department of Chemical & Physical Sciences (UTM)
Susan Senese	Director, Information & Instructional Technology Services (UTM)
Luke Barber	Manager, IT Solutions & Risk Management (UTM)
Nour Alideeb	Undergraduate Student, President UTMSU
Marise Hopkins	Undergraduate Student, Vice-President, External UTMSU
Kayla Dias	Graduate Student, Vice-President UTMAGS
Paige Homme	Graduate Student, Department of Chemical & Physical Sciences (UTM)
Gilbert Delgado	Chief, University Planning, Design & Construction (UPDC) (UofT)
Christine Burke	Director, Campus & Facilities Planning (UPDC) (UofT)
Costas Catsaros	Director, Project Development (UPDC) (UofT)
Alan Webb	Planner, Campus & Facilities Planning (UPDC) (UofT)
Paull Goldsmith	Executive Director, Facilities Management & Planning (UTM)
Stepanka Elias	Director, Operations, Design & Construction (FMP) (UTM)
Vikas Mehta	Director, Utilities & Operations (FMP) (UTM)
William Yasui	Assistant Director, Capital Planning & Construction (FMP) (UTM)
Saba AlSaady	Planner, Capital Planning & Construction (FMP) (UTM)
Carmen Brown	Administrative Project Assistant (FMP/UTM) (Committee Secretary)

THANK YOU

Total Project Cost Estimate and Sources of Funding to be discussed in the *In Camera* session

MOTION

Be It Recommended:

1. THAT the Report of the Project Planning Committee for a New Science Building, dated September 21, 2017, be approved in principle, and

2. THAT the project scope of the Science Building, totaling 7,134 net assignable square metres (15,552 gross square metres) to be located on Development Site 1 as detailed in the 2011 UTM Campus Master Plan, be approved in principle, expected to be funded from a combination of the following sources:

UTM Capital Reserves
Long-term Borrowing
Campaign (Donations/Fundraising)
Provost Matching Funds