

**FOR APPROVAL**

**TO:** Planning and Budget Committee

**SPONSOR:** Gail Milgrom, Acting Assistant Vice-President, Campus and Facilities Planning

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**DATE:** October 25, 2011 for November 2, 2011

**AGENDA ITEM:** 8.....

**ITEM IDENTIFICATION**

Project Planning Report for University of Toronto Mississauga Teaching Laboratories Renovation in the William G. Davis Building: Phase 1

**JURISDICTIONAL INFORMATION**

Under the Policy on Capital Planning and Capital Projects, the Planning & Budget Committee reviews Project Planning Reports prepared for a capital project and recommends to the Academic Board approval in principle of the project.

**BACKGROUND**

In June, 2011, the Ontario government announced capital funding estimated at \$17.5 million for the Renovation of Undergraduate Teaching Laboratories at the University of Toronto Mississauga (UTM). This funding will enable UTM to undertake a multi-year renewal program of its teaching laboratories. The first phase of this initiative is the renovation of the Biology teaching laboratories located on the 4<sup>th</sup> floor of the William G. Davis building.

UTM's first science laboratories were built almost 40 years ago and in many cases the facilities barely meet current regulatory standards. Renovation to a substantial part of UTM's Davis Building D-block, accommodating both teaching and research laboratories (Biology, Chemical Physical Sciences, Anthropology, Geography), is essential to maximize the utilization of the existing infrastructure. Renovations will support increased numbers of undergraduate, research-based master's and doctoral graduate programs, and provide the updated infrastructure needed to support today's scientific teaching and research.

**HIGHLIGHTS**

A review of the Biology department and its undergraduate program was conducted in November, 2010, and reported to the University's Director of Academic Programs and Policy in September, 2011. The review noted steadily increasing pressure on the department's space and outdated laboratory equipment. A key recommendation of the review was that additional and/or renovated teaching laboratory space must be made available if the department is to continue to fulfill its academic mission.

The Biology department is currently engaged in an academic and strategic planning process to support enrolment growth and expansion of lab-based courses. Experiential learning is a top academic priority of the department. To do so, the department plans to reduce group sizes, increase the opportunity for hands-on experience and re-introduce laboratories to courses that previously had

them. Investment in the physical structure will allow the improvement of pedagogical techniques, as well as more efficient use of space to deliver an effective educational experience to UTM's students.

The proposed renovation project, with its focus on improving the functionality and quality of the existing Biology teaching laboratory space, is a timely first step in addressing the challenges of breadth of discipline, laboratory specialization, and increasing course demands.

The renovation of the 4<sup>th</sup> floor will result in a net area gain of 180 nasm by incorporating existing windowed corridor space DV4083K (current 1,140 nasm to new 1,320 nasm). The new configuration will allow natural light into the laboratory spaces by expanding all the way to the existing exterior glazing. The work will also incorporate DV4088 (29 nasm), presently accommodating five graduate student workstations, into the new teaching laboratory space. These stations will be reallocated within existing Biology space.

The construction of the project is planned to begin by April 2012 with occupancy by September 2012.

### **FINANCIAL AND PLANNING IMPLICATIONS**

The estimated Total Project Cost of the Phase 1 renovation is \$8,600,000.

With expanded cleaning requirements due to increased course activity, the total costs (electricity, operation and maintenance) for Biology's 4<sup>th</sup> floor teaching laboratory space are anticipated to increase by \$18,000 from the current cost of \$25,300 per annum to \$43,300 per annum.

### **FUNDING SOURCES**

Funding sources for the construction of the project include \$5,400,000 from the Provincial Government and a contribution of \$3,200,000 from the UTM Operating Fund.

### **SCHEDULE**

UTM Biology will make provisions to maximize the construction window by allowing decontamination and subsequent demolition to begin as early as possible (end of March 2012).

AFD Approval to hire consultants	September 16, 2011
Consultant Selection and Design	September-December 2011
Planning and Budget Approval	November 2, 2011
Business Board Approval	December 12, 2011
Laboratory Bench/Fume Hood Tender	January, 2012
Permit Application	January-February, 2012
General Tender	March, 2012
Construction	April-August, 2012
Occupancy	September, 2012

### **RECOMMENDATIONS**

Be It Recommended to the Academic Board:

- (i) THAT the Project Planning Report for the UTM Teaching Laboratories Renovation in the William G. Davis Building: Phase 1, dated October 25, 2011, be approved in principle.
- (ii) THAT the project scope as identified in the Project Planning Report be approved in principle at a Total Project Cost of \$ 8.6 M with funding as follows:

Provincial Government	\$ 5,400,000
<u>UTM Operating Fund</u>	<u>\$ 3,200,000</u>
Total	\$ 8,600,000

Project Planning Report for University of Toronto Mississauga  
Teaching Laboratories Renovation  
in the William G. Davis Building: Phase 1

October 25, 2011

Facilities Management & Planning, University of Toronto Mississauga

## I. EXECUTIVE SUMMARY

In June, 2011, the Ontario government announced capital funding estimated at \$17.5 million for the Renovation of Undergraduate Teaching Laboratories at the University of Toronto Mississauga (UTM). This funding will enable UTM to undertake a multi-year renewal program of its teaching laboratories. The first phase of this initiative is the renovation of the Biology teaching laboratories located on the 4<sup>th</sup> floor of the William G. Davis building.

UTM's first science laboratories were built almost 40 years ago and in many cases the facilities barely meet current regulatory standards. Renovation to a substantial part of UTM's Davis Building D-block, accommodating both teaching and research laboratories (Biology, Chemical Physical Sciences, Anthropology, Geography), is essential to maximize the utilization of the existing infrastructure. Renovations will support increased numbers of undergraduate, research-based master's and doctoral graduate programs, and provide the updated infrastructure needed to support today's scientific teaching and research.

The upper levels of the D-block will be dedicated to teaching laboratories. The renovation process of the D-block began in the summer of 2011 with the renovation of the Chemistry Teaching Laboratories (funded by UTM). This renovation created two large teaching labs containing a significant number of fume hoods that will accommodate large first and second year chemistry courses. To minimize disruption of the teaching programs, the renovation of the remaining laboratories must be phased over several summer periods. All renovations are expected to be completed by September, 2015. This report details the requirements for Phase 1 of the project, to renovate and upgrade the undergraduate teaching laboratories for Biology on the 4<sup>th</sup> floor of the Davis Building D-Block.

A review of the Biology department and its undergraduate program was conducted in November, 2010, and reported to the University's Director of Academic Programs and Policy in September, 2011. The review noted steadily increasing pressure on the department's space and outdated laboratory equipment. A key recommendation of the review was that additional and/or renovated teaching laboratory space must be made available if the department is to continue to fulfill its academic mission.

The Biology department is currently engaged in an academic and strategic planning process to support enrolment growth and expansion of lab-based courses. Experiential learning is a top academic priority of the department. To do so, the department plans to reduce group sizes, increase the opportunity for hands-on experience and re-introduce laboratories to courses that previously had them. Investment in the physical structure will allow the improvement of pedagogical techniques, as well as more efficient use of space to deliver an effective educational experience to UTM's students.

A significant challenge that educators face is offering students a breadth of Biology-related experience, a challenge that is reflected in the demands placed upon laboratory classrooms. These classrooms must reflect the breadth of sub-discipline activity that occurs within the larger field of Biology as well as cater to the specific support, preparation and storage demands of the program. In particular, biologists have a great need for the storage, growth and preparation of live materials or samples for their students.

In order to create an effective Biology teaching environment on the 4<sup>th</sup> floor of the Davis Building, the following key elements must inform the design of the new laboratories:

- Create attractive, welcoming spaces that are ergonomically designed to enable the maximum numbers of students to flow through the space with minimal effort;
- Reclaim natural lighting to the laboratories wherever possible;
- Create a laboratory layout within the building footprint that encourages efficient use of available space by students, staff, instructors and teaching assistants;

- Provide internet-capable workstations at student work areas to enable electronic lab protocols, e-data collection and submission of work;
- Create an environment that promotes teamwork, collaboration and creativity among students, staff and faculty;
- Provide well-planned, efficiently used support space and storage areas to serve adjacent classrooms;
- Combine large open spaces for some classroom activities alongside smaller more intimate settings. Consistency in design, technology, furniture and equipment between labs will facilitate flexibility in scheduling and increase room use efficiency.

The proposed renovation project, with its focus on improving the functionality and quality of the existing Biology teaching laboratory space, is a timely first step in addressing the challenges of breadth of discipline, laboratory specialization, and increasing course demands.

The renovation of the 4<sup>th</sup> floor will result in a net area gain of 180 nasm by incorporating existing windowed corridor space DV4083K (current 1,140 nasm to new 1,320 nasm). The new configuration will allow natural light into the laboratory spaces by expanding all the way to the existing exterior glazing. The work will also incorporate DV4088 (29 nasm), presently accommodating five graduate student workstations, into the new teaching laboratory space. These stations will be reallocated within existing Biology space.

Short term secondary effects of the project include temporary storage of equipment from vacated 4<sup>th</sup> floor laboratories within existing Biology space. Undergraduate Biology teaching in laboratory space on the 1<sup>st</sup> floor will be temporarily suspended during construction due to noise and service disruptions. Master's of Biotechnology courses that take place in the summer term will be relocated to avoid disruption to curriculum due to noise. Laboratory support areas located on the 4<sup>th</sup> floor will remain operational.

The W.G. Davis Building D-block also accommodates several research laboratories. These will be moved during a later phase to the lower level of the building; a location away from main pedestrian traffic and more suitable in location for the sophisticated and sensitive research equipment. The upper levels of the D-block will be dedicated to teaching laboratories. The renovation process of the D-block started in the summer of 2011 with the renovation of the Chemistry Teaching Laboratories (funded by UTM). This renovation created two large teaching labs containing a significant number of fume hoods that will accommodate large first and second year chemistry courses.

The proposed schedule for Phase 1 of the renovations is based on advanced planning to allow for construction to commence in April immediately after classes finish. It is essential for construction to be completed by the end of August 2012 as UTM does not have an alternate location to accommodate Biology practical courses.

With expanded cleaning requirements due to increased course activity, the total costs (electricity, operation and maintenance) for Biology's 4<sup>th</sup> floor teaching laboratory space are anticipated to increase by \$18,000 from the current cost of \$25,300 per annum to \$43,300 per annum.

The estimated Total Project Cost for the project is \$8,600,000. Funding sources for the construction of the project include \$5,400,000 from the Ontario government and a contribution from UTM's Operating Fund of \$3,200,000.

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## II. PROJECT BACKGROUND

### a) Membership

Mr. P. Donoghue (co-chair), Chief Administrative Officer, UTM  
Mrs. G. Milgrom (co-chair), Acting Assistant Vice-President, Campus and Facilities Planning  
Mr. A. Webb, Planner, Campus and Facilities Planning  
Mrs. L. Snowden, Assistant Dean, Office of the Dean  
Prof. U. Krull, Vice-Principal, Research University of Toronto  
Prof. B. Stewart, Chair Department of Biology, UTM  
Prof. P. Macdonald, Chair Department Chemical Physical Sciences, UTM  
Prof. K. Wilson, Chair Geography, UTM  
Prof. J. Sidnell, Chair Anthropology, UTM  
Mrs. M. Vincent, Staff Department Chemical Physical Sciences, UTM  
Mrs. C. Moon, Staff Department of Biology, UTM  
Mr. P. Goldsmith, Director, Facilities Management & Planning, UTM  
Mr. R. Peters, Facilities Management & Planning, UTM  
Mr. J. Lim, Chief Information Officer, UTM  
Ms. S. Elias, Facilities Planner, Facilities Management & Planning, UTM  
Mr. W. Yasui, Facilities Planner, Facilities Management & Planning, UTM  
Mr. J. Binks, Director - Planning & Estimating, Real Estate Operations  
Mr. A. Singh, Undergraduate student, Department of Biology, UTM  
Ms. L. Clark, Undergraduate student, Department of Biology, UTM

### Sub-Committee Membership

Mr. P. Donoghue (co-chair), Chief Administrative Officer, UTM  
Prof. B. Stewart, Chair Department of Biology, UTM  
Prof. A. Lange, Department of Biology, UTM  
Prof. S. Short, Department of Biology, UTM  
Ms. C. Moon, Staff Department of Biology, UTM  
Ms. C. Bouilly, Staff Department of Biology, UTM  
Ms. M. Kalich, Staff Department of Biology, UTM  
Ms. L. Cheung, Staff Department of Biology, UTM  
Ms. S. Elias, Facilities Planner, Facilities Management & Planning, UTM  
Mr. A. Webb, Planner, Campus and Facilities Planning  
Mr. A. Singh, Undergraduate student, Department of Biology, UTM  
Ms. L. Robertson, Graduate student, Department of Biology, UTM

## **b) Background Information**

On June 20, 2011, the Ontario government announced funding of \$52.5 million toward the estimated \$75 million cost of two major capital projects at UTM: \$35 million (of an estimated total of \$50 million) for the Phase 1 reconstruction of the North building and \$17.5 million (of an estimated total of \$25 million) for teaching laboratory renovations in the W.G. Davis building. The funding will enable UTM to undertake a multi-year renewal program for teaching laboratories.

UTM's first science laboratories were built almost 40 years ago and in many cases barely meet today's regulatory standards. The laboratories' inefficient layouts do not provide the flexibility needed to increase the flow-through of larger numbers of students or the requirements of current technology. Renovation to a substantial part of the W.G. Davis Building D-block, accommodating both teaching and research laboratories, is essential to maximize the utilization of the existing infrastructure to support increased numbers of undergraduate, research-based master's and doctoral graduate programs, and to provide the updated infrastructure needed for today's scientific teaching and research.

The W.G. Davis Building D-block also accommodates several research laboratories. These will be moved to the lower level of the building; a location away from main pedestrian traffic and more suitable in location for the sophisticated and sensitive research equipment. The upper levels of the D-block will be dedicated to teaching laboratories. The renovation process of the D-block started in the Summer, 2011 with the renovation of the Chemistry Teaching Laboratories (funded by UTM). This renovation created two large teaching labs containing a significant number of fume hoods that will accommodate large first and second year chemistry courses. To minimize disruption of the teaching programs, the renovation of the remaining laboratories must be phased over several summer periods. All renovations are expected to be completed by September, 2015.

Over the next four years, the remaining areas of the teaching block of the W.G. Davis block (approximately 3,100 nasrn) will be sequentially renovated starting on the 4th floor – Phase 1. This first phase is scheduled for the Summer, 2012 followed by six subsequent phases with a proposed final completion in 2015. The last phase of the project will include the renovation of research laboratories displaced by the teaching laboratory renovation on the 2<sup>nd</sup> and 3<sup>rd</sup> floors.

UTM will hire a consultant, with Accommodations and Facilities Directorate approval, for the architectural, mechanical and electrical design work of this phase of the project. This work will begin in advance of final Planning & Budget approval of the Biology teaching laboratories project planning report. This approach was selected to allow sufficient time for the design, contract document preparation, and furniture tender essential to complete the renovation of the Biology 4<sup>th</sup> floor laboratories by September 1, 2012.

## **c) Statement of Academic Plan**

It is expected that in the next century, biologists will be the scientific leaders using discovery-based science to tackle some of the world's greatest challenges. To support progress in this area, exemplary education of the next generation of scientists in the contemporary field of biology is of vital importance. The UTM Department of Biology is therefore engaged in a broad range of scholarly activity across the discipline while engaging its students in learning through discovery.

In recent years the department has expanded significantly and is one of the largest disciplines on the UTM campus. In 2002/03 there were ~1600 FCE students in Biology courses and by 2009/10 there were almost 3200 FCE students. (*source: UTM Dean's Office*). The department likewise offers programs that are in high demand. In 2009/10 there were over 400 students enrolled in Biology Specialist Programs and over 800 in Biology Major programs. (*source: Department of*



*Biology Self-Study 2010*). In the 2010/11 academic year, Biology offered 13 courses with practical sections that will serve over 2,600 students.

Like other sciences, education in biology requires students to acquire knowledge and learn methods to develop new knowledge. Science is a process that requires intellectual and technical skills that must be practiced. As such, growth in student numbers has placed strains on the academic programming of the department. Biology has always valued experiential learning, and an effective venue for such learning is a laboratory-based course. The department has re-organized its programs to preserve this method of teaching in spite of increased enrolment numbers. However, sacrifices have been made that include reducing the total number of hours students are in the laboratory (such as taking labs on a bi-weekly rather than weekly basis), increasing group sizes within courses, and cancelling some lab-based courses altogether.

A review of the Biology department and its undergraduate program was conducted in November, 2010, and reported to the University's Director of Academic Programs and Policy in September, 2011. The review noted steadily increasing pressure on the department's space and outdated laboratory equipment. A key recommendation of the review was that additional and/or renovated teaching laboratory space must be made available if the department is to continue to fulfill its academic mission.

The department is currently engaged in an academic and strategic planning process. It is reasonable to expect that expansion and improvement of lab-based courses, and experiential learning in general, will be a top academic priority of the department. Indeed, Biology plans to reduce group sizes, increase the opportunity for hands-on experience and re-introduce laboratories to courses for which the laboratory component had been removed. Investment in the physical structure will allow UTM Biology to improve its pedagogical techniques, as well as use its space most efficiently to deliver an effective educational experience to its students.

## **d) Space Requirements**

### **Overview of Existing Space**

UTM Biology has a total of twelve teaching laboratories comprising 1,626 nasm supported by 617 nasm of preparation rooms, greenhouse, environmental chambers and storage space. The total area of teaching laboratories (COU Category 2) is 2,240 nasm and is spread across several floors of the W.G. Davis Building. The first year laboratories are located on the 1<sup>st</sup> floor, the microbiology laboratory is located on the 2<sup>nd</sup> floor, and the remaining teaching laboratories are located on the 4<sup>th</sup> floor.

Phase 1 of the UTM Teaching Laboratory renovation will affect only the eight 4<sup>th</sup> floor Biology teaching laboratories and their associated preparation rooms (1,140 nasm). The area to be renovated also incorporates the existing windowed corridor (DV4083K) which will not only increase the assignable space to approximately 1,320 nasm, but will also provide natural light to the teaching laboratory and support spaces.

Please see Appendix for full departmental space inventory.

### **Occupant Profile**

The occupants of the newly renovated laboratories will be UTM Biology faculty, staff, teaching assistants and students. With Biology forming one of the three foundational scientific disciplines, along with Chemistry and Physics, the range of scientific activity covered by the discipline is broad and diverse. Such activity ranges from investigating the function of single molecules and genes through to the study of whole ecosystems on a global scale. In addition to generating foundational knowledge, Biology is closely linked to related disciplines in the health,

environmental, and social sciences. Biologists are therefore at the forefront of addressing problems such as climate changes, loss of species biodiversity, food production, and human health. These issues touch on many disciplines and also have political, economic and cultural components.

A significant challenge that educators face is offering students a breadth of Biology-related experience, a challenge that is reflected in the demands placed upon laboratory classrooms. The curriculum of most biology departments is planned along sub-disciplinary lines and this has a direct impact on the requirements of the physical laboratory space where much of the hands-on experiential learning occurs. Biologists traditionally identify with sub-disciplines such as Ecology and Evolution; Cell and Molecular Biology; Microbiology; Physiology and Organismal Biology; although there is increasingly more overlap between these sub-disciplines (i.e. ecological physiology and microbial ecology). The laboratory classrooms must reflect the breadth of sub-discipline activity that occurs within the larger field of Biology, a requirement that leads to a certain degree of specialization of the laboratory classrooms.

Biology laboratories have unique needs for support, preparation and storage space. Although biologists have in-laboratory equipment needs (such as microscopes), the labs tend not to be as equipment intensive as Physics labs. Likewise, some Biology labs use chemicals and require equipment associated with, for example, molecular biology, but Biologists are not as dependent on such items as Chemistry labs. Biologists do however have a great need for the storage, growth and preparation of live materials or samples for their students. For example, greenhouses and plant growth chambers are required to maintain the plant material used in plant-based courses. Live animal colonies, typically insects and fish, need to be maintained in proper facilities. Storage space for archival collections is important to ensure proper care and maintenance of these samples. Refrigerators, freezers and incubators are also an essential component of storing and maintaining student material. While the support spaces are not used directly by students, such space is absolutely critical to the academic requirements of Biology courses.

A further space-related challenge for the department is the increasing popularity of the program. In parallel, the University has indicated that student experience and hands-on experiential learning are to be promoted throughout the curriculum. The department is therefore faced with the challenge of finite laboratory space and the specialization of rooms versus an increasing demand for courses featuring laboratory components. The overall student population has also grown substantially, with the number of students in Biology doubling in the past 6 years.

The proposed renovation project, with its focus on improving the functionality and quality of the existing Biology teaching laboratory space, is a timely first step in addressing the challenges of breadth of discipline, laboratory specialization, and increasing course demands.

The following tables indicate the Weekly Student Contact Hours (WSCH) generated by student enrolments for each Biology course with a teaching laboratory component (practical hours) for the Fall 2010 and Spring 2011 terms. Using the WSCH totals and applying the COU space guideline of 0.6 nasm per contact hour generates the total recommended areas (NASM Generated).

**Table – Existing Biology Teaching Laboratory Courses, Fall 2010**

<b>TEACHING LABS</b>					
<b>Course</b>	<b>Enrolment Fall 2010</b>	<b>Practical Hours / Week</b>	<b>WSCH</b>	<b>COU Space Factor</b>	<b>NASM Generated</b>
BIO 152	705	1.5	1,058	0.6	634.5
BIO 204	318	1.5	477	0.6	286.2
BIO 313	24	3	72	0.6	43.2
BIO 314	90	4	360	0.6	216
BIO 318	50	3	150	0.6	90

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BIO 333	24	1.5	36	0.6	21.6
BIO 335	18	3	54	0.6	32.4
BIO 338	40	3	120	0.6	72
BIO 354	45	3	135	0.6	81
BIO 370	52	3	156	0.6	93.6
FSC 300	23	2	46	0.6	27.6
<b>Total</b>	<b>1,389</b>		<b>2,664</b>	<b>0.6</b>	<b>1,598</b>

Average WSCH per enrolled student = 2.6

**Table – Existing Biology Teaching Laboratory Courses, Spring 2011**

<b>TEACHING LABS</b>					
<b>Course</b>	<b>Enrolment Fall 2010</b>	<b>Practical Hours / Week</b>	<b>WSCH</b>	<b>COU Space Factor</b>	<b>NASM Generated</b>
BIO 153	631	1.5	946.5	0.6	567.9
BIO 215	269	3	807	0.6	484.2
BIO 312	48	3	144	0.6	86.4
BIO 318	50	3	150	0.6	90
BIO 325	74	3	222	0.6	133.2
BIO 329	24	3	72	0.6	43.2
BIO 333	24	1.5	36	0.6	21.6
BIO 338	40	3	120	0.6	72
BIO 370	52	3	156	0.6	93.6
BIO 409	43	8	344	0.6	206.4
FSC 300	23	2	46	0.6	27.6
<b>Total</b>	<b>1,278</b>		<b>3,043.5</b>	<b>0.6</b>	<b>1,826.1</b>

Average WSCH per enrolled student = 3.1

It is anticipated that, over time, increased course enrolments with FTE student growth, combined with additional course offerings, will significantly increase the number of students enrolled in Biology practical sections per term thereby potentially increasing the Weekly Student Contact Hours (WSCH).

The COU space guidelines generate 0.6 nasm per WSCH for all teaching laboratory and support space. The current WSCH total generates 1,826 nasm.

Following the renovations, the area of UTM Biology's teaching laboratory area will be 118% of the COU standard based on current enrolments. This will allow for the expected growth in student enrolment and the anticipated reinstatement of practical sections in some courses.

### **III. PROJECT DESCRIPTION**

#### **a) Vision Statement**

The Department of Biology envisions its students receiving a first-class, contemporary education that reflects the modern field of biology. The expectation is that all students will understand the scientific methods required to advance knowledge, that they will develop the capacity to critically evaluate the world around them, and that some of them will go on to become the next generation biologists. To achieve this vision, students need access to state-of-the-art laboratories equipped with technology and equipment that will enable the latest pedagogical approaches to biology education.

The following are key elements to the vision for new biology laboratories:

- Create attractive, welcoming spaces that are ergonomically designed to enable the maximum numbers of students to flow through the space with minimal effort;
- Reclaim natural lighting to the laboratories wherever possible;
- Create a laboratory layout within the building footprint that encourages efficient use of available space by students, staff, instructors and teaching assistants;
- Provide internet-capable workstations at student work areas to enable electronic lab protocols, e-data collection and submission of work;
- Create an environment that promotes teamwork, collaboration and creativity among students, staff and faculty;
- Provide well-planned, efficiently used support space and storage areas to serve adjacent classrooms;
- Combine large open spaces for some classroom activities alongside smaller more intimate settings. Consistency in design, technology, furniture and equipment between labs will facilitate flexibility in scheduling and increase room use efficiency.

Incorporation of these elements into the overall laboratory design will transform the UTM Biology laboratory-based education by creating efficient, attractive space in combination with technology that promotes teamwork and collaboration. To fully achieve the department's educational vision, a joint effort between Biology, Facilities, the Registrar's Office, and Computing Services is required to implement not only the physical revitalization of the building but also to maintain the space, schedule and timetable the occupation of the labs for most efficient use, and install and support the technology environment.

This vision also recognizes that scholarship at UTM encompasses both teaching and research as inseparable activities. As such, every effort must be made early in the planning process to acknowledge that the UTM Davis Building renovations will occur in an active research environment. Such renovations have the potential to significantly disrupt research unless proper redundancy and contingency planning to protect research occurs in parallel with renovation planning.

#### **b) Space Program & Functional Plan**

The W.G. Davis Building teaching laboratory renovation will be phased over four summers. The various renovation stages will take place during the summer months to minimize disruption to teaching. The multi-year schedule will allow for coordination with other large capital construction and renovation projects planned for the UTM campus.

The proposed 4<sup>th</sup> floor renovated space comprises of 1,140 nasm of existing laboratories plus 180 nasm of windowed circulation space creating 1,320 nasm of newly renovated laboratory

space (1,670 gross square metres). The new configuration will allow natural light into the laboratory spaces by expanding the assignable area all the way to the existing exterior glazing.

### **Design Improvements**

The renovation will provide teaching efficiencies by creating labs of 48 seats, instead of the current 24 seat model. This allows flexibility in the scheduling of larger class sections as well as the option of splitting the sections into smaller groups (12 to 24 students) within the larger spaces based on bench configurations of 12 students per island (with a single shared sink).

The technology incorporated into the laboratory will include computers at each teaching station, direct visual access to a central demonstration counter, and audio-visual teaching presentation stations. Another design strategy for increasing teaching flexibility is the provision of similarly configured laboratory spaces with ample storage. The new teaching labs will be outfitted to the same base specifications with the following exceptions:

- Lab 1 will have added plumbed gases to all teaching stations to support emerging courses in plant physiology
- Lab 3 (microbiology teaching laboratory) will have a lower capacity of 36 students reflecting the nature of courses taught in the laboratory and the associated forecasted enrolments. This room will also have gas distributed to all teaching stations versus the air and vacuum provided in the other four laboratories.
- Lab 4 will have downdraft tables incorporated into the student laboratory benches, and an automated fish tank set up along one side of the lab

The plan proposes a central preparation space, versus the current model of several small preparation rooms. It is expected that this will create space efficiencies and reduce the distance and travel time between preparation space and teaching laboratories. The central preparation space will allow for shared equipment, materials, and document resources thus creating further operational efficiencies for the department. Perhaps most important, a central preparation room will allow for sharing of information and the fostering of community and cooperation among the various technical and academic staff using these spaces.

The central preparation area is to have new walk-in refrigeration and freezer units that will allow for more efficient storage of materials and reduce the overall number of individual refrigeration units.

## UTM Biology Teaching Laboratory Space Program

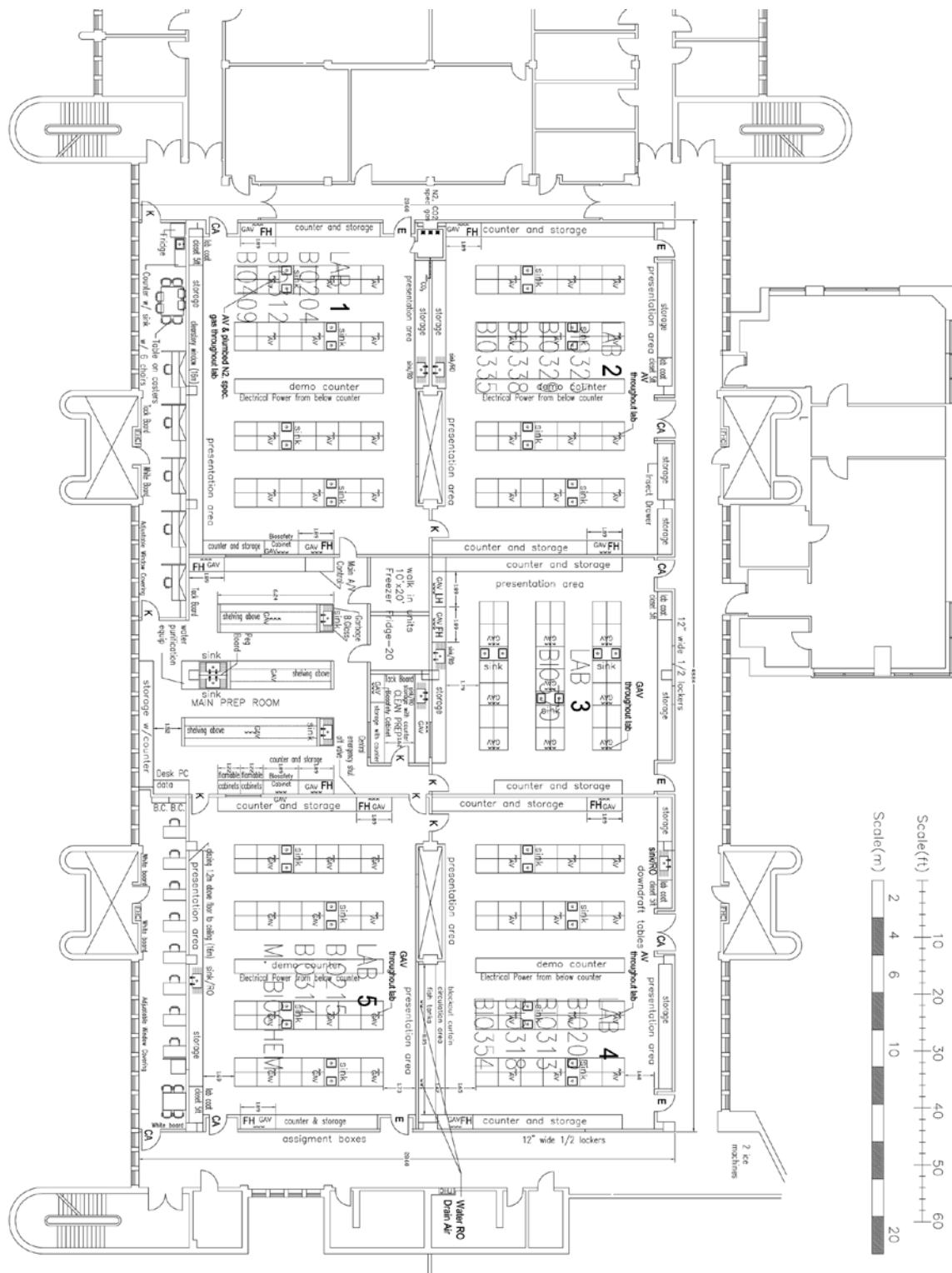
SPACE USE	CAPACITY	SPACE PROGRAM (NASM)
<b>Undergraduate Teaching Laboratories</b>		
Laboratory 1	48	220
Laboratory 2	48	220
Laboratory 3	48	220
Laboratory 4	48	220
Laboratory 5	36	160
<b>Sub-total</b>	<b>228</b>	<b>1,040</b>
<b>Laboratory Support Spaces</b>		
Microbiology Preparation Room	2	15
Main Laboratory Preparation Room	5	170
<b>Sub-total</b>	<b>228</b>	<b>185</b>
<b>Lab Related Academic Office Space</b>		
Lab Technician Office	5	50
Teaching Assistant Office	8	45
<b>Sub-total</b>		<b>95</b>
<b>Grand Total</b>		<b>1,320</b>

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Project UTM 2011

#### 4<sup>th</sup> Floor test layout with new laboratories:





## **c) Building Considerations**

### **Accessibility**

The University of Toronto is committed to ensuring that its buildings and services are accessible to persons with disabilities and requires all consultants to adhere to University's Barrier Free Design Standards. The requirements for this project include push-button activated door openers on laboratory corridor access doors and at least one barrier-free student station per teaching lab.

### **Safety and Security**

Access to the 4<sup>th</sup> floor Biology teaching laboratories will be controlled by card access. This will ensure safe operation during main laboratory hours and allow after-hours access to students to complete their individual course work.

The doors to the main preparation and clean lab preparation rooms will be controlled by mechanical keys. These keys will be distributed to the laboratory technicians only.

All laboratory furniture is to be lockable. All student benches are to be keyed to one key and all perimeter (staff) benches are to be keyed to a second key. This approach will provide a simple way to secure the area as required.

### **Computing**

The proposed laboratory will have computer stations integrated throughout the room allowing students to access laboratory materials, course information, and to share experimental data and submit laboratory reports.

Computing and communications will utilize the network already available in the W.G. Davis Building. The standard laboratory will have several dedicated data ports for presentation areas in addition to a wireless environment throughout all of the laboratories.

The existing wireless infrastructure in these areas (cabling + access points) will be enhanced. If the access point is to be taken down during renovation, the access point must be re-installed onto its original location. Cabling for the access points must be protected during renovation.

All other existing data cables must be pulled back to their respective wiring closets and un-terminated. New data cables must be installed to the UTM wiring standard.

Please see Appendix D: Total Project Cost (available on request) for more detailed information.

## **d) Site Considerations**

### **Campus Planning**

UTM accommodates its academic activities in several buildings across campus. The W.G. Davis Building provides the specialized space required for teaching and research activities of the physical and life sciences.

Earlier space planning initiatives identified a need for a new Science Complex in order to support anticipated growth in the physical and life sciences. As the new building proposal currently has no funding, it is essential to maximize the space utilization of existing serviced space in the W.G. Davis Building.

## **e) Campus Infrastructure Considerations**

All services required for the operation of the renovated laboratories are available within the existing W.G. Davis Building. No major modifications to the systems supplying the laboratories are required. However, the renovation work on the 4th floor must include the following infrastructural work:

- Replacement of reheat coils and pneumatic controls on the floor,
- Replacement of isolation valves on all services for the 4th floor,
- Cleaning and refurbishment of perimeter finned radiators,
- Inspection and possibly replacement of all electrical panels and breakers.

## **f) Environmental Impact – Construction/Renovation**

Design and construction must be carried out in accordance with all applicable environmental, health and safety legislation and University of Toronto policies and standards.

The current lighting, fluorescent lighting ballasts may contain PCB's - heavily regulated substances under the Canadian Environmental Protection Act. The benefits of a lighting retrofit to new T-8 lighting ballasts include the removal of PCB's and replacing them with ballasts that do not include PCB's or other highly regulated materials. In addition, through a lighting retrofit, the laboratory will reduce energy consumption, and the generation of waste from lamp replacement, due to the much longer lifetime of the proposed lighting retrofits.

The number of fume hoods used in the renovated Biology laboratories will be lower than the number of existing fume hoods. Furthermore, the recently upgraded Mechanical HVAC infrastructure of the D-block will allow the use of low-velocity, variable-flow fume hoods.

## **g) Environmental Impact – Laboratory Operation**

The proposed renovation addresses this recommendation and the following specific objectives as outlined in the University of Toronto Environmental Protection Policy:

### **Fundamental Principles**

- Meet and where possible exceed environmental standards, regulation, and guidelines.
- Meet and, where reasonably possible, exceed compliance with applicable federal, provincial and local environmental regulations and other requirements to which the University subscribes.
- Operate so as to minimize negative impacts on the environment.
- Adopt practices that reflect the conservation and wise use of natural resources.
- Respect biodiversity.

### **Specific Objectives**

- Minimize the use of energy, water and other resources, through efficient design, management and practice.
- Minimize waste generation and actively manage the impact of waste, emissions, & effluents generated by University activities.
- Minimize noise and odour pollution from University activities.
- Manage the use of chemicals or toxic substances in accordance with regulatory requirements and established environmental practises, including scientific research practises.

- Include biodiversity and environmental concerns in planning and landscape decisions and minimize negative impacts of University activities on biodiversity and natural spaces.

## **h) Environmental Impact – Waste Management**

The University is committed to being a positive and creative force in the protection of the local and global environment through its teaching, research, and administrative environments. It also recognizes that it and all members of the University community have the responsibility to act in ways consistent with its fundamental principles of minimizing negative impacts on the environment and the conservation and wise use of natural resources.

## **i) Secondary Effects**

The renovation of the 4<sup>th</sup> floor will incorporate DV4088 (29 nasm) currently used to accommodate five graduate student workstations in the Biology Department. These stations will be reallocated within existing Biology space allocation.

The 4<sup>th</sup> floor renovation will allow Biology to incorporate a microbiology teaching and preparation laboratory, thus vacating DV2059C on the 2<sup>nd</sup> floor. The Biology teaching space will temporarily contract by 230 nasm, allowing this 2<sup>nd</sup> floor space to accommodate a teaching laboratory for Anthropology from May 2012 to May 2015. Following completion of later phase renovations in 2015, Anthropology will then relocate their teaching activities to other renovated laboratory space on the 2<sup>nd</sup> floor. The DV2059C space will be reallocated to Biology, enabling enrolment growth by accommodating larger undergraduate second year course sections. These second year sections will be migrated from the 4<sup>th</sup> floor teaching labs.

In addition to the teaching laboratories and central preparation room, the renovation will provide eight student workstations. These stations will accommodate graduate and undergraduate teaching assistants to meet with students and hold office hours, allowing for the separation of teaching support activity from research and from other quiet space.

## **j) Staging**

Temporary storage of equipment during the laboratory renovations will be accommodated within the existing Biology space allocation.

- No undergraduate teaching in Biology will take place during the construction in order to avoid disruption to curriculum due to noise and service shutdowns. This will allow Biology to use the 1<sup>st</sup> floor laboratories for storage of displaced materials from the 4<sup>th</sup> floor.
- The microbiology laboratory located on the 2<sup>nd</sup> floor of the W.G. Davis building will be vacated to early 2015 to accommodate a temporary teaching laboratory for Anthropology (see Secondary Effects). All equipment and teaching materials will be stored on the 1<sup>st</sup> floor during construction.
- Master's of Biotechnology courses that take place in the summer term will be located on the 2<sup>nd</sup> floor in the existing Physics laboratory. Practical sessions will be scheduled in July and August in order to avoid demolition noise associated with the proposed renovation.
- The Biology laboratory support area located on the 4<sup>th</sup> floor (DV4007) will remain operational in order to allow Biology laboratory staff to prepare teaching materials for September 2012.

## **k) Phasing**

The proposed renovations of the undergraduate laboratories in the W.G. Davis Building will take place over the next four years in order to take advantage of the summer semester construction window and allow for coordination with other capital projects that are planned for the UTM campus:

- Phase 1 – as described in this report, for the Biology teaching laboratory renovation 4<sup>th</sup> floor (Summer 2012)

Subsequent phases are:

- Phase 2 - Anthropology teaching laboratory renovation 2<sup>nd</sup> floor (Spring 2012)
- Phase 3 - Chemistry teaching laboratory renovation 3<sup>rd</sup> floor (Summer 2013)
- Phase 4 - Main floor teaching laboratory renovations East side (Summer 2014)
- Phase 5 - Main floor teaching laboratory renovations West side (Summer 2015)
- Phase 6 - Physics teaching laboratory renovation (Summer 2015)
- Phase 7 - Research laboratory renovations - secondary effects (Fall 2015)

## **l) Schedule**

The proposed UTM Teaching Laboratory Renovation - Phase 1 (Biology 4<sup>th</sup> floor) will take place in the April 1 – August 31 2012.

Biology will make provisions to maximize the construction window by allowing decontamination and subsequent demolition to begin as early as possible (end of March 2012).

AFD Approval to hire consultants	September 16, 2011
Consultant Selection and Design	September-December 2011
Planning and Budget Approval	November 2, 2011
Business Board Approval	December 12, 2011
Laboratory Bench/Fume Hood Tender	January, 2012
Permit Application	January-February, 2012
General Tender	March, 2012
Construction	April-August, 2012
Occupancy	September, 2012

The proposed schedule is based on advanced planning to allow for construction to commence in April immediately after classes finish. It is essential for construction to be completed by the end of August as UTM does not have an alternate location to accommodate Biology practical courses.

## IV. RESOURCE IMPLICATIONS

### a) Total Project Cost

The estimated total project cost is \$ 8,600,000. Please see Appendix D: Total Project Cost (available on request) for more detailed information.

### b) Operating Cost

The cost for utilities in the renovated area will be significantly lower than the existing utility costs due to the lower number of fume hoods, which will be also be more energy efficient, variable air volume and low velocity operation.

Conversely, the maintenance costs of the renovated area will be higher due to more intensive course scheduling resulting in the need for more frequent cleaning, increased supplies, and more support from the building engineers.

With expanded cleaning requirements due to increased course activity, the total costs (electricity, operation and maintenance) for Biology's 4<sup>th</sup> floor teaching laboratory space are anticipated to increase by \$18,000 from the current cost of \$25,300 per annum to \$43,300 per annum.

### c) Funding Sources

Phase 1 of the UTM Teaching Laboratories Renovations will be funded by \$5.4 M from the Provincial Government and \$3.2 M from the UTM Operating Fund.

## V. RECOMMENDATIONS

Be It Recommended to the Academic Board:

- (i) THAT the Project Planning Report for the UTM Teaching Laboratories Renovation in the William G. Davis Building: Phase 1, dated October 25, 2011, be approved in principle.
- (ii) THAT the project scope as identified in the Project Planning Report be approved in principle at a Total Project Cost of \$ 8.6 M with funding as follows:

Provincial Government	\$ 5,400,000
<u>UTM Operating Fund</u>	<u>\$ 3,200,000</u>
Total	\$ 8,600,000

## APPENDICES

- Appendix A: Existing Space Inventory
- Appendix B: Equipment and Furnishings Schedule (available on request)
- Appendix C: Room Specification Sheets (available on request)
- Appendix D: Total Project Cost (available on request)
- Appendix E: Environmental Checklist (available on request)

## **APPENDIX A:**

**Table – Existing UTM Biology Teaching Laboratory Space Inventory**

Flr	Rm	Cat	Cat Name	Description	Share Type	Percent	Occ	Area (nasm)	Use Name
1	1080	02.1	Sched Class Lab	Wet Lab	None	100	24	120.66	Wet Lab
1	1082	02.1	Sched Class Lab	Wet Lab	None	100	24	121.74	Wet Lab
1	1085	02.1	Sched Class Lab	Wet Lab	None	100	24	121.74	Wet Lab
1	1087	02.1	Sched Class Lab	Wet Lab	None	100	24	102.45	Wet Lab
2	2059C	02.1	Sched Class Lab	Wet Lab - Microbiology	None	100	60	181.68	Dry Lab Test
3	3028	02.1	Sched Class Lab	Environment	Time	20	0	19.24	Class Lab-Student Stns
4	4066	02.1	Sched Class Lab	Wet Lab	None	100	24	119.84	Wet Lab
4	4068	02.1	Sched Class Lab	Wet Lab	None	100	24	120.91	Wet Lab
4	4071	02.1	Sched Class Lab	Wet Lab	None	100	56	243.09	Wet Lab
4	4073	02.1	Sched Class Lab	Wet Lab	None	100	56	233.95	Wet Lab
4	4076	02.1	Sched Class Lab	Wet Lab	None	100	24	119.84	Wet Lab
4	4078	02.1	Sched Class Lab	Wet Lab	None	100	24	120.91	Wet Lab
								<b>1,626.05</b>	
1	1012	02.3	Undrgr Lab Supt	Lab Greenhouse	Space	50	0	70.95	Lab Greenhouse
1	1081	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	24.30	Lab Prep
1	1084	02.3	Undrgr Lab Supt	Lab Storage and Supply	None	100	0	20.67	Lab Storage and Supply
1	1086	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	45.63	Lab Prep
1	1091	02.3	Undrgr Lab Supt	Lab Storage and Supply	None	100	0	7.91	Lab Storage and Supply
2	2060	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	45.63	Lab Prep
2	2064	02.3	Undrgr Lab Supt	Lab Storage and Supply	None	100	0	7.83	Lab Storage and Supply
4	4007	02.3	Undrgr Lab Supt	Lab Apparatus Cleaning	Space	50	0	27.41	Lab Apparatus Cleaning
4	4067	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	26.34	Lab Prep
4	4070A	02.3	Undrgr Lab Supt	Darkroom	None	100	0	7.18	Darkroom
4	4070B	02.3	Undrgr Lab Supt	Sterilization Room	None	100	0	5.39	Lab Autoclave
4	4072	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	48.09	Lab Prep
4	4074	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	47.95	Lab Prep
4	4077	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	26.12	Lab Prep
4	4080	02.3	Undrgr Lab Supt	Instrument Room	None	100	0	21.09	Instrument Room
5	5036	02.3	Undrgr Lab Supt	Greenhouse Prep Room	Space	75	1	21.68	Lab Prep
5	5036B	02.3	Undrgr Lab Supt	Lab Greenhouse	Space	75	0	162.36	Lab Greenhouse
								<b>616.53</b>	
<b>Category 2 Total</b>								<b>2,242.58</b>	



**Table – Existing Space to be Renovated**

Room ID	Category Code	Category Short Name	Description	Share Type	Share Percent	Share Occupancy	Area (nasm)	Use Name
4066	02.1	Sched Class Lab	Wet Lab	None	100	24	119.84	Wet Lab
4067	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	26.34	Lab Prep
4068	02.1	Sched Class Lab	Wet Lab	None	100	24	120.91	Wet Lab
4070A	02.3	Undrgr Lab Supt	Darkroom	None	100	0	7.18	Darkroom
4070B	02.3	Undrgr Lab Supt	Sterilization Room	None	100	0	5.39	Lab Autoclave
4071	02.1	Sched Class Lab	Wet Lab	None	100	56	243.09	Wet Lab
4072	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	48.09	Lab Prep
4073	02.1	Sched Class Lab	Wet Lab	None	100	56	233.95	Wet Lab
4074	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	47.95	Lab Prep
4076	02.1	Sched Class Lab	Wet Lab	None	100	24	119.84	Wet Lab
4077	02.3	Undrgr Lab Supt	Lab Prep	None	100	0	26.12	Lab Prep
4078	02.1	Sched Class Lab	Wet Lab	None	100	24	120.91	Wet Lab
4080	02.3	Undrgr Lab Supt	Instrument Room	None	100	0	21.09	Instrument Room
							<b>1,140.70</b>	