BOARD OF GOVERNORS
Thursday, October 8, 2020 at 8:30 a.m.
Videoconference via Zoom

AGENDA

A. OPEN SESSION

1. REMARKS FROM THE CHAIR

2. NOTICE OF MEETING - SEPTEMBER 24, 2020

3. APPROVAL OF THE AGENDA - OPEN SESSION

CONSENT (8:30 a.m.)

4. MINUTES OF PREVIOUS MEETING – JUNE 4, 2020 (OPEN SESSION)

Approval

6 - 17

a. Minutes - June 4, 2020 (Open Session)

5. BUSINESS ARISING (none)

6. COMMITTEE REPORTS

a. EXECUTIVE AND GOVERNANCE COMMITTEE

Information

18

i. Actions Taken on Behalf of the Board

b. REMUNERATIONS COMMITTEE

Approval

19

Report from the Remunerations Committee

20

i. Ratification of Tentative Agreement – SEIU Unit 2 (Machinists)
c. PLANNING AND RESOURCES COMMITTEE

Approval

21 Report from the Planning and Resources Committee
22 - 68 i. Statement of Investment Policies and Procedures - Hourly Plan

7. REPORTS RECEIVED FOR INFORMATION

Information


MOTION: that items 4 to 7 be approved or received for information by consent.

REGULAR (8:35 a.m.)

8. BUSINESS ARISING (none)

9. COMMUNICATIONS (none)

10. PRESIDENT’S REPORT TO THE BOARD (8:40 a.m.)

Information

73 - 78 a. President's Report to the Board
79 - 82 b. Addendum to President's Report to McMaster University's Board of Governors: Overview of Security Services

11. COMMITTEE REPORTS (9:30 a.m.)

a. AUDIT AND RISK COMMITTEE

Approval

83 Report from the Audit and Risk Committee
     ii. Appointment of External Auditor for 2020-2021

b. EXECUTIVE AND GOVERNANCE COMMITTEE

Notice of Motion

180 Report from the Executive and Governance Committee
181 - 187 i. Revisions to Board By-Laws – Appendix B - Banking Resolution Changes
12. PRESENTATION TO THE BOARD OF GOVERNORS (10:15 a.m.)

Name: Dr. Karen Mossman
Vice-President (Research)
Title: Nuclear Research Strategy

Information

13. OTHER BUSINESS (11:00 a.m.)

a. McMaster Nuclear Market Study Final Report
McMaster University

MINUTES OF THE BOARD OF GOVERNORS
June 4, 2020 at 9:00 a.m.
via Videoconference (Zoom)

PRESENT:  Mr. B. Merkel (Chair), Ms L. Allan, Ms J. Allen, Ms L. Brown, Ms. S. Cruickshanks, Dr. J. Daniel, Mr. S. Donnelly, Mr. P. Douglas, Mr. D. Feather, Mr. M. Ferencich, Dr. D. Farrar, Dr. C. Filipe, Dr. A. Holloway, Mr. D. Horwood, Mr. D. Huctwith, Ms R. Jamieson, Dr. R. Kleiman, Ms S. McLarty, Mr. R. Narro Perez, Mr. K. Nye, Dr. L. Parker, Ms J. Rowe, Ms F. Samji, Dr. S. Searls Giroux, Mr. N Skelding, Dr. D. Sloboda, Ms C. Stefanikiewicz, Dr. E. Szathmáry, Mr. T. Valeri, Dr. R. Walker, Ms E. Way, Mr. D. Williamson, Ms A. Thyret-Kidd (University Secretary), Ms M. Zheng (Associate University Secretary), Mr. T. Paul (Governance Coordinator)

OBSERVERS:  Ms B. Couchman, Mr. R. Couldey, Ms E. Davies, Mr. Da-Ré, Ms A. Farquhar, Ms D. Henne, Dr. K. Mossman, Dr. P. O’Byrne, Dr. A. Sills, Ms T. Smith, Ms M. Williams

INVITED:  Ms D. Martin, Assistant Vice-President and Chief Facilities Officer
Ms W. McKenna, Assistant Vice-President and Chief Human Resources Officer
Ms M. Pooran, Director of Employee and Labour Relations
Dr. A. al Shaibah, Associate Vice-President (Equity and Inclusion)
Dr. J. Richardson, Professor and Assistant Dean, School of Rehabilitation Science
Mr. Iain Clarkson, Budget Director
Dr. J. Lee, Associate Vice-President (Institutional Research and Analysis)
Mr. E. Amaral, Statistician and Programmer, Institutional Research and Analysis
Mr. J. Gunter, Senior Manager Business Development, Financial Affairs
Dr. E. Zuroski, Associate Professor, Department of English and Cultural Studies

REGrets RECEIVED:  Mr. J. Coles, Mr. A. Jhaveri, Dr. A. Niec, Ms J. Pike

A.  OPEN SESSION

1.  REMARKS FROM THE CHAIR

Mr. Merkel welcomed members to the June Board meeting.

It was noted that the Secretariat is collecting feedback and suggestions on the Board of Governors Handbook. Comments and any suggestions for improvement can be submitted to Ms Andrea Thyret-Kidd or Ms Michelle Zheng.
The Board was informed that Mr. Giancarlo Da-Ré, President, McMaster Students Union, will be attending meetings as an Observer of the Board of Governors for the 202-2021 academic year.

2. NOTICE OF MEETING – May 21, 2020

The Notice of Meeting was circulated on May 21, 2020.

3. APPROVAL OF THE AGENDA – OPEN SESSION

Mr. Merkel noted that no requests had been received to move any items from the Consent to the Regular agenda of the Open Session.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the Open Session agenda for the meeting of June 4, 2020, and that items 4-7 be approved or received for information by Consent.

The Motion was Carried.

CONSENT

4. MINUTES OF THE PREVIOUS MEETING – April 16, 2020 (OPEN SESSION)

Motion:
that the Board of Governors approve the Open Session minutes of the meeting held on April 16, 2020 as circulated

Approved by Consent

5. BUSINESS ARISING

6. REPORTS RECEIVED FOR INFORMATION

a. Report from Health, Safety and Risk Management

   The material was for information.

7. COMMITTEE REPORTS

   a. Planning and Resources Committee

      i. McMaster Innovation Park – Audited Financial Statements
Motion:
that the Board of Governors receive the McMaster Innovation Park 2019 Audited Financial Statements, as contained in Attachment I.

Approved by Consent

ii. Hourly Pension Plan Amendment No. 3 and May 1, 2020 Plan Restatement

Motion:
that the Board of Governors approve Amendment No. 3 to the Contributory Pension Plan for Hourly-Rated Employees of McMaster University Including McMaster Divinity College and the text of the Contributory Pension Plan for Hourly-Employees of McMaster University Including McMaster Divinity College (as amended and restated effective May 1, 2020) and incorporating Amendment No. 1, No. 2, and No. 3.

Approved by Consent

REGULAR

8. BUSINESS ARISING

There was no business arising from the minutes of the meeting held on April 16, 2020.

9. COMMUNICATIONS

There were no communications for the meeting of June 4, 2020.

10. PRESIDENT’S REPORT TO THE BOARD

Dr. Farrar explained that recent Board meetings have all been focused on the impact of COVID-19 and our responses to it, and that it will be discussed again today, but first he wanted to speak about something even more important and fundamental to our community and society. Dr. Farrar noted that “We have all watched with grief and anger as recent events have unfolded in the United States and in Canada, and as black members of our society have been targeted, abused and killed. Anti-black racism and violence have persisted in our society for far too long. I want to publicly denounce this and acknowledge the deep pain, grief, and harm that members of our communities, particularly Black communities, are experiencing at this time. I also want to acknowledge the many colleagues around the University who have made their voices heard. I appreciate the work of the Equity and Inclusion Office, the members of PACBIC, the members of the African Caribbean Faculty Association of McMaster University, the Community Engagement Office, the MSU and others who are identifying and challenging systemic racism and systemic inequities, and offering support to our students, colleagues and friends. The
“new normal” that I mentioned earlier makes us physically distant but cannot divide us as a community, nor diminish our responsibility to support and respect one another. We must acknowledge the deeply-rooted, historic and ongoing pain that Black members of our community face. And we must act. The African Caribbean Faculty Association issued a moving and thought-provoking statement yesterday. I thank them for doing so and reminding us all of our obligations and responsibilities as members and leaders of the University community, and as citizens. Our agenda today includes the annual report from PACBIC, which gives us a further opportunity to reflect on the challenges faced by many groups in our community and on our campus. We must educate ourselves and hold ourselves accountable. We are being asked to consider the actions that need to be taken - individually and collectively - to address these serious and divisive issues and inequities, and to move our community and institution forward. Words must come with action. I look forward to hearing Senators’ reflections on the PACBIC report when it is presented.”

The President highlighted his written report to the Board. Members heard that there was a recent announcement about plans for the fall term to be almost entirely online, with a few exceptions for courses that require access to labs and other specialized facilities. These courses are being identified within each Faculty and guiding protocols for the safe use of learning labs that respects physical distancing and cleaning protocols are being established. Similarly, residence spaces are only being offered on an exceptional basis in order to reduce health risks and meet physical distancing requirements.

Dr. Farrar informed the Board that the University is investing significantly in the online experience to assist faculty in developing high quality programs to help ensure a high-quality virtual learning environment. There is an increased focused on ensuring that students continue to have opportunities to interact with each other and their instructors. Enhancements are being made to student supports with particular emphasis on student well-being, mental health, technical assistance, and ensuring accessibility.

A phased return to research is underway, with Phase 1 beginning on May 30. As of June 1, more than 200 submissions – representing more than 1100 faculty, students and staff – had been approved to support research activities across campus. The University continues to be extremely concerned about the impact of the current situation on graduate students. During Phase 1 of the return to on-campus research, graduate students from a number of labs will be able to restart or continue their research. The School of Graduate Studies is currently working with the Vice-President (Research)’s office to put in place guidelines and measures to allow incoming graduate students to safely begin programs that require access to on-campus facilities in time for a September start.

The University continues to to work closely with the Ministry and with peer institutions in the U15 and COU to ensure that both levels of government are aware of the impacts of COVID-19 on students and institutions. The Government Relations team continues to monitor available funding opportunities and has already been successful in receiving funding for research projects through the COVID-19 Rapid Research Fund. New
information regarding possible capital/stimulus funding opportunities continues to be monitored.

Dr. Farrar reminded Board Members that the class of 2020 have now completed their programs and their degrees were formally conferred by Senate yesterday. Virtual celebrations are underway and we all join in congratulating the students who have been able to successfully complete their degrees in these challenging circumstances.

A member asked if an announcement has been made regarding university athletic programs. The Associate Vice-President (Students & Learning) has been working with teams on how to deal with the various issues related to coaching and team environments.

A question was asked with regard to the facilities on campus used to support students. Dr. Searls Giroux explained that various student support services are available and have shifted online. Between now and the fall a number of changes could occur and the university is working through a gradual return to work process. Athletics is also looking at what kinds of services can be adapted to be online and decisions will likely unfold over the summer.

A member inquired about staff support programs. Dr. Farrar noted that there are a number of existing programs. Ms. McKenna explained that a fair bit of work has been done and a lot of messages has been sent to staff and managers. Human Resources is developing workshops and resources for managers.

A question was raised if the University is considering assessing discounts on residence services for students from disadvantageous groups or with poor work from home conditions. Dr. Farrar explained that current efforts into that space has been to find scholarship and bursary money for these students to obtain the resources they need. There is an internal campaign to generate funds as well. Ms Williams explained that to date the university has fundraised $3M for COVID related research and student support.

A member asked Dr. Farrar for his thoughts on the quality of learning and the university’s reputation on the university’s response to COVID. Dr. Farrar noted that there could be reputational implications based on the university’s decision making. The universities that have taken hybrid approaches and have decided to keep residences open are now scrambling. McMaster’s approach is to be online and to be completely prepared. With this approach, McMaster can manage how many people can be on campus. Responding to the COVID situation in this way has garnered a lot of support. This approach has had no impact on the University’s enrolment for the spring/summer terms.

A member noted that there will be various items such as work stoppages that will play a big role when things return to normal. Dr. Farrar explained that there is a motion later in the meeting to stop the Tenure and Promotion clock given the work stoppages that have been experienced. Dr. Searls Giroux explained that SPS B13 adds an additional year to
the tenure and promotion clock. There is also a faculty work load policy that would allow faculty to discuss work loads with their dean on a case by case basis. Conversations are being held for how the university will deal with research and parental leaves. In addition, an enhanced mental health package was included in the last round of MUFA bargaining.

11. MINUTE OF APPRECIATION

a. Minute of Appreciation – Fraser M. Fell

Ms Williams informed the Board of Governors of the passing of Dr. Fraser M. Fell.

It is with great sadness that the Board of Governors of McMaster University notes the passing of Dr. Fraser M. Fell.

Dr. Fell was born in Toronto on June 17, 1928 and graduated from McMaster University in 1949 with a Bachelor of Arts in Political Economy and received his law degree in 1953 from Osgoode Hall Law School. He was a member of the Canadian Bar Association (Ontario) and the York County law Association. He has held executive or governance roles in many enterprises and gave generously of his time to public service.

Dr. Fell’s family has a long relationship and history of service to McMaster University. His father, Dr. Charles Fell, was a member of the class of 1917 and received a Doctor of Laws in 1957 before serving as McMaster’s Chancellor from 1960-65, as well as a member of the Board of Governors. Dr. Fraser Fell was also a member of McMaster’s Board of Governors and served as a member of the Changing Tomorrow, Today Campaign Cabinet. He served as Chair of the Board from 1981-82. In 1987, he received an honorary Doctor of Laws from McMaster and in 1992 was inducted into the McMaster Alumni Gallery of Distinction. He was invested as a Member in the Order of Canada in 1996.

As an expression of our regard for the contributions of Dr. Fraser Fell to McMaster University, it is moved that this Minute of Appreciation be recorded in the permanent minutes of the Board of Governors and a copy sent to his family.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve that the Minute of Appreciation be recorded in the permanent minutes of the Board of Governors and a copy sent to his family.

The Motion was Carried.
12. REPORT FROM SENATE

Dr. Farrar provided an overview of the report from Senate.

a. Tenure and Promotion Policy Revisions

At its meeting on March 11, 2020, Senate reviewed and approved the proposed revisions to the Tenure and Promotion Policy. Details of the proposed revisions are contained in Attachment I of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the amendments to the Tenure and Promotion Policy, as circulated.

The Motion was Carried.

b. SPS B13 - Extension of Timeline for Academic Assessments in Response to the COVID-19 Pandemic

At its meeting on April 29, 2020, the Senate Executive Committee approved, on behalf of Senate, the establishment SPS B13 - Extension of Timeline for Academic Assessments in Response to the COVID-19 Pandemic. Details of the proposal are contained in Attachment II of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the establishment of Policy SPS B13 - Extension of Timeline for Academic Assessments in Response to the COVID-19 Pandemic effective May 12, 2020.

The Motion was Carried.

c. Centre for Human Rights and Restorative Justice (CHRRJ)

At its meeting on June 3, 2020, Senate reviewed and approved, the establishment of the Centre for Human Rights and Restorative Justice (CHRRJ). Details of the proposal are contained in Attachment III of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the establishment of the Centre for Human Rights and Restorative Justice (CHRRJ) as circulated.

The Motion was Carried.
d. Termination of the Stem Cell and Cancer Research Institute (SCC-RI)

At its meeting on June 3, 2020, Senate reviewed and approved, the termination of the Stem Cell and Cancer Research Institute (SCC-RI). Details of the proposal are contained in Attachment IV of the circulated report.

A member inquired about the rationale for the termination of Institute. It was explained that it has recently become clear that the original mandate of the Institute, and its unique collaborative approach to stem cell research, are no longer aligned with the best interests of the Institute members or of the Faculty of Health Sciences. The Board heard that following the departure of the Institute’s Director in 2019 an external review of the Institute was performed. The result of the external review was a unanimous recommendation that the institute be terminated.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the termination of the Stem Cell and Cancer Research Institute (SCC-RI) Termination, effective June 30, 2020.

The Motion was Carried.

13. COMMITTEE REPORTS

a. Executive and Governance Committee

Mr. Merkel provided an overview of the report from the Executive and Governance Committee. It was noted that amendments to the By-Laws require two meetings of the Board, one to provide notice of motion, and a second for final approval. The following items were approved in principle at the Board’s April 16, 2020 meeting, and are now presented for final approval.

i. Terms of Reference – Human Resources Committee

At its April 16, 2020 meeting, the Board of Governors approved in principle, on the recommendation of the Executive and Governance Committee, proposed revisions to the Terms of Reference for the Human Resources Committee within the Board of Governors By-laws. Details of the proposed revisions are contained within Attachment I of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve, the attached revisions to The Human Resources Committee Terms of Reference within the Board of
Governors By-Laws, as circulated.

The Motion was Carried.

ii. Terms of Reference – Executive and Governance Committee

At the same meeting, the Board of Governors approved in principle, on the recommendation of the Executive and Governance Committee, proposed revisions to the Terms of Reference for the Executive and Governance Committee within the Board of Governors By-laws. Details of the proposed revisions are contained within Attachment II of the circulated report.

Members were informed that following the April 16, 2020 Board meeting, minor revisions to the proposed membership of the Executive and Governance committee were made. The original proposal was to include the Chair of the Pension Trust Committee (PTC) on the Executive and Governance Committee. However, there is no requirement that the Chair of PTC be a Board member. The revisions propose that a Board member who is also a member of the PTC join the Executive and Governance Committee.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve, the attached revisions to the Executive and Governance Committee Terms of Reference within the Board of Governors By-Laws, as circulated.

The Motion was Carried.

iii. Revisions to Board By-Laws – Execution of Instruments

At the same meeting, the Board of Governors approved in principle, on the recommendation of the Executive and Governance Committee, proposed revisions to Appendix E - Resolution Respecting the Execution of Instruments By McMaster University within the Board of Governors By-Laws. Details of the proposed revisions are contained within Attachment III of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve, the attached revisions to Appendix E - Resolution Respecting the Execution of Instruments By McMaster University within the Board of Governors By-Laws, as circulated.
iv. Request for Observer Status

At the same meeting, the Board of Governors approved in principle, on the recommendation of the Executive and Governance Committee, proposed revisions to list of official observers within the Board of Governors By-Laws. Details of the proposed revisions are contained within Attachment IV of the circulated report.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve, the attached revision to By-Law 12. (1) within the Board of Governors By-Laws, as circulated.

The Motion was Carried.

b. Planning and Resources Committee

Mr. Donnelly provided an overview of the report from the Planning and Resources Committee.

i. 2020-2021 Consolidated Budget

The Board was informed that on May 21, 2020, the Planning and Resources Committee reviewed and approved the 2020-2021 Consolidated Budget. The enclosed report describes in detail the budget for 2020-21, including information related to the strategic priorities of McMaster University. The University’s consolidated budget is comprised of the operating, ancillary, research, capital and trust funds. The budget was also presented to the University Planning Committee and Senate for information and is now presented to the Board of Governors for final approval.

Dr. Richardson delivered a presentation on the consolidated budget to the Board. Members received an overview of several key components of the budget. Several highlights of the budget include continued freezing of domestic fees, performance-based funding, the delaying of SMA 3, and adjustments due to COVID-19. The operating budget is $721 million which represents approximately 72% of the total budget revenue. It was noted that Capital projects such as the PGCLL have contributed to a 36% increase in classroom space on campus.
Ms Henne reviewed the budget sensitivity scenarios with the Board. It was explained that the included charts are a stress test for the McMaster. The document shows a conservative budget, including less projected revenue from international and domestic tuition. In the event that international and domestic enrolment are lower than anticipated, the University’s carry forward will be able to help. The Board asked questions and discussed the presentation. In response to several questions and comments regarding the impact of the COVID-19 situation on the university’s finances, members heard that the intention is to bring an updated consolidated budget back to the Board when there is further information available.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the 2020-21 Consolidated Budget, as circulated.

The Motion was Carried.

ii. Tuition and Miscellaneous Fees

At the same meeting, on the recommendation of the Budget Committee and the University Student Fees Committee, the Planning and Resources Committee reviewed and approved, the 2020-2021 and 2021-2022 tuition and miscellaneous fees. The tuition and miscellaneous fee information is contained in Attachment II of the circulated report.

It was noted that the Student Fees Committee has requested that the Miscellaneous Fees portion of the Tuition and Miscellaneous fees schedules document be withdrawn at this time and re-submitted at a later date. As a result of the recent announcement indicating that Fall classes will be online due to COVID-19 and the large number of students impacted, the Committee would like work with student groups to review the supplementary fees over the next few weeks to ensure that those fees are fair and reasonable.

IT WAS DULY MOVED AND SECONDED,

that the Board of Governors approve the 2020-21 and 2021-22 tuition fees, as circulated and amended at the meeting.

The Motion was Carried.

iii. Energy Management Plan
Ms Martin reviewed the University’s Energy Management Plan with the Board for information purposes. Members heard that the document highlights the past success of the previous energy management plans and creates a roadmap for a sustainable future.

14. REPORTS RECEIVED FOR INFORMATION

a. President’s Advisory Committee on Building an Inclusive Community – Annual Report

Dr. Arig al Shaibah and Dr. Eugenia Zuroski, co-chairs of PACBIC addressed the President’s Advisory Committee on Building an Inclusive Community Annual Report. It was noted that PACBIC recently released a statement regarding anti-black racism which was endorsed by the President and administration. Dr. al Shaibah spoke to the recent statement issues by the African and Caribbean Faculty Association at McMaster (ACFAM) regarding anti-black racism and racial justice.

15. RECOGNITION OF RETIRING BOARD MEMBERS

Mr. Merkel recognized the contributions of the following members retiring from the Board of Governors:

Mr. Aaditeya Jhaveri, representative of undergraduate students
Mr. Rodrigo Narro Perez, representative of graduate students
Ms Elizabeth Way, Non-teaching staff elected member
Dr. Anne Niec, Senate appointed member
Dr. Allison Holloway, Senate appointed member
Mr. David Williamson – Board-elected member
Ms Jagoda Pike, Lieutenant Governor in Council appointed member
Dr. Susan Searls Giroux, Acting Provost and Vice-President (Academic)

It was noted that each retiring Board member will receive a gift of appreciation in recognition of their valuable service.

16. OTHER BUSINESS

There was no other business for the Open Session portion of the meeting.
REPORT TO THE BOARD OF GOVERNORS
from the
EXECUTIVE AND GOVERNANCE COMMITTEE

Actions Taken on Behalf of the Board:

a. **Revisions to Terms of Reference**

On July 10, 2020, the Executive and Governance Committee approved, on behalf of the Board of Governors, revisions to the following Terms of Reference:

i. **TOR – Alba DiCenso Professorship in Advanced Practice Nursing**
ii. **TOR – Vice Dean, Education**

b. **2020-2021 Miscellaneous Fees Schedule**

On July 31, 2020, the Executive and Governance Committee approved, on behalf of the Board of Governors, the revised Miscellaneous Fees for the 2020-2021 academic year.

c. **2020 Hourly Pension Plan Valuation**

On July 31, 2020, the Executive and Governance Committee approved, on behalf of the Board of Governors, the 2020 valuation report for the Hourly Pension Plan.
i. Ratification of Tentative Agreement – SEIU Unit 2 (Machinists)

At its meeting on September 28, 2020, the Remunerations Committee reviewed and approved the tentative agreement between McMaster University and SEIU Unit 2 (Machinists). Details of the tentative agreement are contained in Attachment I of the circulated report.

It is now recommended,

that the Board of Governors approve the tentative agreement between McMaster University and SEIU Local 2 (Machinists) for a 5-year term effective October 8, 2020, and expiring September 30, 2025, with terms outlined in the circulated report.
Board of Governors Decision Summary
September 29, 2020

Recommendation
The Board of Governors ratify the tentative agreement reached with SEIU Unit 2 (Machinists) for the period effective Date of Ratification to September 30, 2025.

Prior Committee Review

Description
Renewal of the collective bargaining agreement with SEIU Unit 2 - Machinists (3 employees), negotiated within mandate and in compliance with the Protecting a Sustainable Public Sector for Future Generations Act, 2019 (formerly, “Bill 124”).

Financial Implications

<table>
<thead>
<tr>
<th>Wage Rate Effective Date:</th>
<th>% Wage Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 (Date of Ratification – September 30, 2021)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Year 2 (October 1, 2021 – September 30, 2022)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Year 3 (October 1, 2022 – September 30, 2023)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Year 4 (October 1, 2023 – September 30, 2024)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Year 5 (October 1, 2024 – September 30, 2025)</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

- an additional $1000 lump sum payment will be provided to active employees in Year 5
- elimination of first 3 unpaid sick days for absences beginning Year 3
- alignment of vacation day schedule with Unifor Unit 4, to allow for sequential increase of 1 day per year between 14 and 18 years of service – beginning Year 4
- increase GRRSP contributions and University matching in Year 5, from 5% to 7% after the YMPE

Alignment with University Strategy

- **Institutional Alignment**: Reduced administrative processes by simplifying sick leave administration.
- **Fiscal Responsibility**: Simplified and aligned health and dental benefit plans with other “Skilled Employee” groups, effectively eliminating the need for a separate plan. Closed post-retirement benefits plan to new employees. Financial outcomes within mandate and legally compliant.
- **Inclusive Excellence**: Incorporated gender-neutral language. Agreed to Pay Equity language and a Pay Equity maintenance agreement. Introduced Pregnancy leave Supplemental Unemployment Benefits to resolve a human rights issue with comingling benefits for Pregnancy and Parental leaves.
- **Labour Relations Stability**: 5 year agreement. Engaged in respectful and productive discussions; the relationship with SEIU is strong.

Major Risks and Mitigating Factors Identified

<table>
<thead>
<tr>
<th>Risk</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of non-compliance with new legislation</td>
<td>Agreed to increases in compliance with the legislation, Protecting a Sustainable Public Sector for Future Generations Act, 2019</td>
</tr>
</tbody>
</table>

Prepared By: Wanda McKenna, AVP & Chief Human Resources Officer
Reviewed by: Roger Couldrey, Vice President (Administration)
REPORT TO THE BOARD OF GOVERNORS
from the
PLANNING AND RESOURCES COMMITTEE

i. Statement of Investment Policies and Procedures – Hourly Plan

At its meeting on September 24, 2020 the Planning and Resources Committee reviewed and approved the revised Statement of Investment Policies and Procedures for Contributory Pension Plan for Hourly Employees. Details of the proposal are contained in Attachment I of the circulated report.

It is now recommended,

that the Board of Governors approve the revised Statement of Investment Policies and Procedures for Contributory Pension Plan for Hourly Employees as set out in the attached.

Board of Governors: FOR APPROVAL
October 8, 2020
Date: September 15, 2020
To: Planning and Resources Committee
From: Hourly Pension Plan Committee
Subject: Statement of Investment Policies and Procedures – Hourly Plan

Recommendation:

That the Planning and Resources Committee approve for recommendation to the Board of Governors, the revised Statement of Investment Policies and Procedures for Contributory Pension Plan for Hourly Employees as shown in Appendix A.

Financial Implications: No Immediate implications.

Description/Background: The Pension Benefits Act requires that the Contributory Pension Plan for Hourly-Rated Employees of McMaster University Including McMaster Divinity College’s (“Hourly Plan”) Statement of Investment Policy and Procedures (SIP&P) be reviewed each year.

The Hourly Pension Plan Committee completed a review of the Statement of Investment Policies and Procedures with its investment consultant (Mercer). The proposed revisions update the policy to align with the implementation of the latest investment strategy review/asset/liability study completed in 2018 and to reflect items of a housekeeping nature.

Alignment with university strategy: The policy updates are aligned with the Hourly Plan investment strategy

Important considerations: The SIP&P changes, once approved will align monitoring with Hourly Plan’s with the implementation of the investment strategy.

Major risks: No major risks have been identified.

Mitigating factors identified: Not applicable

Prepare by: Financial Affairs

Reviewed by: AVP (Administration) & CFO

Appendix A is the revised policy with blacklined changes. The material changes to the policy are summarized in Table 1 (page 2).
<table>
<thead>
<tr>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Section 2.4 &amp; 4.2 (pg. 6 &amp; 14 of the Hourly Plan SIP&amp;P)</td>
<td>The Overall Asset Mix and the Total Fund Benchmark have been updated to reflect the implementation of the approved rebalancing of the fixed income portfolio. The rebalancing transitioned the mix of the target bond portfolio to a mix of Universe bonds and long-term bonds from the Universe bonds. (completed in earlier this year). This rebalancing supports better/improved matching of assets and liabilities and reflects the results of the latest asset/liability study and investment strategy review in which target portfolio mix was derived as the best fit portfolio, at the time, to manage the objectives of the Plan.</td>
</tr>
</tbody>
</table>
Appendix A.

STATEMENT OF INVESTMENT POLICIES AND PROCEDURES

FOR

CONTRIBUTORY PENSION PLAN FOR HOURLY EMPLOYEES
Complete Policy Title: Statement of Investment Policies and Procedures
McMaster University Contributory Pension Plan for Hourly-Rated Employees

Approved by: Board of Governors
Date of Original Approval(s): February 17, 2005

Responsible Executive: Assistant Vice-President (Administration)
Enquiries: Business Management Services

DISCLAIMER: If there is a Discrepancy between this electronic policy and the written copy held by the policy owner, the written copy prevails.
Contents

Section 1—Overview ................................................................................................................................. 1
  1.1 Purpose of Statement......................................................................................................................... 1
  1.2 Background of the Plan ...................................................................................................................... 1
  1.3 Plan Profile ...................................................................................................................................... 1
  1.4 Objective of the Plan .......................................................................................................................... 2
  1.5 Investment Objectives, Beliefs and Risk Appetite .............................................................................. 2
  1.6 Delegation of Responsibility and Administration ........................................................................... 3

Section 2—Asset Mix and Diversification Policy ....................................................................................... 6
  2.1 Investment Objectives - Portfolio Return Expectations ................................................................. 6
  2.2 Investment Risk Tolerance - Expected Volatility ........................................................................... 6
  2.3 Management Structure ..................................................................................................................... 6
  2.4 Asset Mix ....................................................................................................................................... 6

Section 3—Permitted and Prohibited Investments ..................................................................................... 8
  3.1 General Guidelines .......................................................................................................................... 8
  3.2 Derivatives, Options and Futures ..................................................................................................... 8
  3.3 Permitted Investments ...................................................................................................................... 8
  3.4 Minimum Quality Requirements ...................................................................................................... 10
  3.5 Maximum Quantity Restrictions .................................................................................................... 10
  3.6 Prior Permission Required ................................................................................................................ 11
  3.7 Prohibited Investments .................................................................................................................... 12
  3.8 Securities Lending .......................................................................................................................... 12
  3.9 Borrowing ........................................................................................................................................ 12
  3.10 Liquidity ......................................................................................................................................... 12
  3.11 Environmental, Social and Governance ......................................................................................... 13
  3.12 Conflicts Between the Policy and Pooled Fund Investment Policies ............................................. 13

Section 4—Monitoring and Control ......................................................................................................... 14
  4.1 Performance Measurement .............................................................................................................. 14
  4.2 Compliance Reporting by the Investment Manager ......................................................................... 14
  4.3 Standard of Professional Conduct .................................................................................................. 15

Section 5—Administration ...................................................................................................................... 16
  5.1 Conflicts of Interest ........................................................................................................................ 16
  5.2 Related Party Transactions ............................................................................................................. 17
  5.3 Selecting Investment Managers ..................................................................................................... 18
  5.4 Monitoring of Investment Managers ............................................................................................. 18
  5.5 Dismissal of an Investment Manager .............................................................................................. 18
  5.6 Voting Rights .................................................................................................................................. 18
  5.7 Valuation of Investments Not Regularly Traded ............................................................................. 19
  5.8 Valuation of Investments ................................................................................................................ 19
  5.9 Life Annuities .................................................................................................................................. 19
  5.10 Policy Review ................................................................................................................................ 19
Section 1—Overview

1.1 Purpose of Statement
This Statement of Investment Policies and Procedures (the ‘Policy’) is intended to set out the investment framework which shall apply at all times for the Contributory Pension Plan for Hourly-Rated Employees of McMaster University Including McMaster Divinity College (the ‘Plan’).

This Policy is based on the ‘prudent person portfolio approach’ to ensure the prudent investment and administration of the assets of the Plan (the ‘Fund’) within the parameters set out in the Pension Benefits Act (Ontario) and the regulations thereunder.

1.2 Background of the Plan
McMaster University was established in 1887 by the bequest of William McMaster and is a university incorporated under the laws of the Province of Ontario, which provides operating grants annually to the University.

The University sponsors the Plan, which is a defined benefit pension plan into which its contributions and the employees' contributions are deposited. These contributions are made biweekly and are remitted before the end of the following month to the Plan's trustee.

As directed by the McMaster University Hourly Pension Plan Retirement Committee (the ‘Committee’), the University contracts with third parties to provide trustee, custodial, investment management, actuarial, and consulting services.

Retiree benefits are paid from the Plan. Also paid from the Plan are termination and death benefits, trustees' fees, audit fees, actuaries' fees, investment management fees, consultants' fees, filing fees and other related costs as approved by the Committee.

1.3 Plan Profile
(a) Contributions
The Plan is contributory. Each Plan member is required to contribute in accordance with the Plan Text and limited by specified maximums, as applicable.

The University will pay the balance required to provide the cost of benefits. The minimum University contribution each year is an amount equal to the contributions made by the Plan members during the year.

(b) Benefits
For service prior to January 1, 1986, the amount of annual pension will be the pension earned to December 31, 1985 increased in accordance with periodic amendments thereafter.

For service after December 31, 1985, the amount of annual pension payable to a Plan member will be:
(i) 1.4% of Best Average Earnings up to the Average Year’s Maximum Pensionable Earnings times years of Credited Service, plus
(ii) 2.0% of Best Average Earnings in excess of the Average Year’s Maximum Pensionable Earnings times years of Credited Service.
The amount by which twice the Plan member’s required contributions with interest exceed the commuted value of the Member’s benefit shall be paid to the Plan member.

Pensions in payment after January 1, 2003, will be increased by the excess over 6% of the 5 year average return on the Fund, subject to a maximum increase equal to the change in the CPI for the previous Plan year.

1.4 Objective of the Plan

The objective of the Plan is to provide participants with defined pension benefits based on a Best Average Earnings and with potential indexation of retirement benefits, as defined in the Plan Text. It is important to set up an appropriately diversified asset mix in order to ensure continued prudent and effective management of the Fund.

1.5 Investment Objectives, Beliefs and Risk Appetite

Funding Objectives

The Plans’ funding objectives are to:

(a) Manage the volatility and level of contributions;
(b) Maintain benefit security, and
(c) Reduce the likelihood of special solvency payments and target to maintain the solvency funded ratio above 85% at all future actuarial valuation dates.

Investment Objectives

The investment objective of the Plans’ investments is to earn a return sufficient to keep the Plan sustainable over the long term, while keeping benefit levels and contribution rates stable. This requires an appropriate balance between risk and return.

Risk Appetite

Based on the characteristics of the Plan, the Committee has determined that the Plan has a moderate risk appetite for investment risk, as demonstrated by the approved asset classes, investment targets and limits within this policy.

Investment Beliefs

The Hourly Pension Committee (“Committee”) has, from time to time, reviewed and confirmed its investment beliefs which take into consideration the types of investments and associated risks that are aligned with investment objectives and risk appetite.

The Committee recognizes that, based on historical data and on forecasted returns, the asset classes most likely to produce the greatest return in excess of inflation over time are also likely to exhibit the most volatility. Conversely, the asset classes likely to be the least volatile are likely to produce the lowest returns over time. The investment philosophies and strategies must take into account both return and risk objectives.

Therefore, it is reasonable to adopt a long-term asset mix strategy with an appropriate equity content that is well diversified.
1.6 Delegation of Responsibility and Administration

The University is the legal administrator of the Plan and is therefore responsible for all matters relating to the administration, interpretation and application of the Plan, including developing, monitoring and amending this Policy. The Committee assists the University with the administration of the Plan.

Overall responsibility for the Plan ultimately rests with the Board of Governors of the University. The Committee assists the Board in fulfilling its fiduciary responsibilities. As well, other suppliers assist the University as described below.

(a) The Board of Governors will:

(i) Determine the level of the University’s contribution to the Plan on the recommendation of the Planning and Resources Committee and in accordance with the guidelines set out in the Hourly Pension Plan text;

(ii) Consider items endorsed by the Planning and Resources Committee and approve where appropriate;

(iii) Be responsible for the delegation of any responsibilities not specifically mentioned.

(b) The Planning and Resources Committee of the Board of Governors will:

(i) Consider recommendations by the Committee concerning the level of the University’s contribution to the plan and endorse those recommendations to the Board of Governors where appropriate;

(ii) Consider items brought forward by the Committee for approval and endorse recommendations to the Board of Governors where appropriate.

(c) The Committee will:

(i) Approve and make recommendations where necessary to the Planning and Resources Committee regarding changes to the Investment Manager(s), Custodian/Trustee, and Investment Consultant;

(ii) Monitor and review performance of the Investment Manager(s) on a qualitative and quantitative basis at least semi-annually;

(iii) Review the Fund’s performance on a quarterly basis, and approve situations of deviations or proposed deviation by the Fund Manager from the Policy to the Planning and Resources Committee;

(iv) Discuss and promote awareness and understanding of the Plan by Members of the Plan and persons receiving benefits under the Plan;

(v) Review the Statement of Investment Policy and Procedures (the “Policy”) at least annually, make changes, and endorse to the Planning and Resources Committee for approval as required;
(vi) Review the actuarial valuation, changes in methods and assumptions and its impact upon the Plan, and endorse to the Planning and Resources Committee for approval;

(vii) Review the financial statements and endorse to the Planning and Resources Committee for approval;

(viii) Approve and recommend to the Planning and Resources Committee proposed changes to the Plan text;

(ix) Consider other matters as may be referred to the Committee by the participating unions, Planning and Resources Committee or the Board of Governors;

(d) The Investment Manager(s) will:

(i) Invest the assets of the Fund in accordance with this Policy and applicable legislation;

(ii) Notify the Committee, in writing, of any significant changes in the Investment Manager’s philosophies and policies, personnel or organization and procedures;

(iii) Meet with the Committee as required and provide written reports regarding their past performance, their future strategies and other issues requested by the Committee; and

(iv) Provide semi-annual compliance reports that confirms that the Manager has complied with the Policy or identifies areas of non-compliance.

(e) The Custodian/Trustee will:

(i) Maintain safe custody over the assets of the Plan;

(ii) Execute the instructions of the University and the Investment Manager(s); and,

(iii) Record income and provide monthly financial statements to the University as required.

(f) The Actuary will:

(i) Perform actuarial valuations of the Plan as required;

(ii) Advise the Committee on any matters relating to the Plan design, membership and contributions;

(iii) File appropriate documents and reports with relevant authorities; and

(iv) Assist the Committee in any other way required.
(g) The Investment Consultant will:

(i) Assist in the development and implementation of this Policy;

(ii) Monitor the performance of the Fund and the Investment Managers and advise the Committee on such performance;

(iii) Monitor the Investment Managers’ compliance reports;

(iv) Support the Committee on matters relating to investment management and administration of the Fund; and,

(v) Meet with the Committee as required.

(h) University Management will:

(i) Comment and make recommendations to the Planning and Resources Committee on the appointment of the Actuary;

(ii) Ensure the plan’s administration complies with all applicable legislation and regulations;

(iii) Make recommendations to the parties to the collective agreements regarding amendments to the plan text;

(iv) Perform any duties or obligations not noted above and as described in Article 13 – Administration of the Plan of the Plan text.
Section 2—Asset Mix and Diversification Policy

2.1 Investment Objectives - Portfolio Return Expectations
The Fund will be managed on a going-concern basis. The primary objective is to ensure that the benefits defined in the Plan can be paid.

The secondary performance objective is to outperform a benchmark portfolio constructed from rates of return (including income) of the Standard & Poor’s Toronto Stock Exchange Composite Index (S&P/TSX Composite Index), the Standard & Poor’s 500 Index (S&P 500 Index), the Morgan Stanley Capital International Europe, Australasia and Far East Index (MSCI EAFE Index), FTSE Canada Long Bond Index and the FTSE Canada Universe Bond Index over rolling four-year time periods.

2.2 Investment Risk Tolerance - Expected Volatility
The expected volatility of investment returns for the Fund is directly related to the asset mix strategy; specifically, the balance between Canadian equities, foreign equities and Canadian bonds. Volatility is inherent in investing and will be managed according to the minimum and maximum asset mix ranges as outlined in Section 2.4. It is expected that the volatility of Fund returns should be similar to the volatility of the Total Combined Fund Benchmark Portfolio set out in Section 4.1.

The Committee will monitor the volatility of the fund and underlying manager(s).

2.3 Management Structure
The Committee believes that an Investment Manager with an active mandate can reduce portfolio risk below market risk and potentially add value both through security selection and asset allocation strategies.

2.4 Asset Mix
(a) Overall Asset Mix
The benchmark portfolio is representative of the long-term asset mix policy for the Fund as set out by the Committee. The Total Fund benchmark portfolio and asset mix guidelines (by market value) are set out below:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Minimum %</th>
<th>Benchmark %</th>
<th>Maximum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian equities</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>U.S. equities</td>
<td>8</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>Non-North American equities</td>
<td>7</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Total equities</td>
<td>35</td>
<td>55</td>
<td>70</td>
</tr>
<tr>
<td>Bonds</td>
<td>25</td>
<td>45</td>
<td>65</td>
</tr>
<tr>
<td>Cash and Short-term</td>
<td>0</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Total Fixed Income</td>
<td>50</td>
<td>45</td>
<td>65</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The actual asset mix at any time may deviate from the Benchmark indicated above. The manager shall monitor and adjust the asset mix to ensure that the actual asset mix stays within the ranges as indicated by the minimums and maximums specified.

The Investment Manager shall comply with restrictions imposed by federal or provincial legislation and regulations.

**(b) Categorization per Pension Benefits Act**

The target mix for each category listed in subsection 76(12) of the Regulations to the Pension Benefit Act (Ontario) is as follows:

<table>
<thead>
<tr>
<th>Investment Category</th>
<th>Target Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insured contracts</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mutual or pooled funds or segregated funds</td>
<td>0.0%</td>
</tr>
<tr>
<td>Demand deposits and cash on hand</td>
<td>0.0%</td>
</tr>
<tr>
<td>Short-term notes and treasury bills</td>
<td>0.0%</td>
</tr>
<tr>
<td>Term deposits and guaranteed investment certificates</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mortgage loans</td>
<td>0.0%</td>
</tr>
<tr>
<td>Real estate</td>
<td>0.0%</td>
</tr>
<tr>
<td>Real estate debentures</td>
<td>0.0%</td>
</tr>
<tr>
<td>Resource properties</td>
<td>0.0%</td>
</tr>
<tr>
<td>Venture capital</td>
<td>0.0%</td>
</tr>
<tr>
<td>Corporations referred to in subsection 11(2) of Schedule III of the PBSR</td>
<td>0.0%</td>
</tr>
<tr>
<td>Employer issued securities</td>
<td>0.0%</td>
</tr>
<tr>
<td>Canadian stocks</td>
<td>20.0%</td>
</tr>
<tr>
<td>Non-Canadian stocks</td>
<td>35.0%</td>
</tr>
<tr>
<td>Canadian bonds and debentures</td>
<td>45.0%</td>
</tr>
<tr>
<td>Non-Canadian bonds and debentures</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other investments</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
The minimum rating for the target investment allocation of Canadian fixed income securities is BBB (or equivalent), as rated by at least one Recognized Bond Rating Agency as defined in section 3.4 (b). Notwithstanding this target, actual quality requirements and permitted ranges shall be determined by the Investment Manager(s) responsible for implementation of the strategy.
Section 3—Permitted and Prohibited Investments

3.1 General Guidelines
The investments of the Fund must comply with the requirements and restrictions imposed by the applicable legislation, including but not limited to the requirements of the Ontario Pension Benefits Act, the federal Income Tax Act (Canada) and any relevant regulations.

3.2 Derivatives, Options and Futures
The pooled funds may utilize derivatives, options or futures if their policies permit. The derivatives instruments allowable under the Policy may be used only when they are regularly traded upon a recognized marketplace. Any investment in derivative securities shall be solely for non-speculative and non-leveraged purposes.

3.3 Permitted Investments
In general, and subject to the restrictions noted below, the Fund may invest in any of the asset classes and in any of the instruments listed below.

(a) Canadian and Foreign Equities
(i) Common and convertible preferred stock listed on a recognized exchange;
(ii) Debentures convertible into common or convertible preferred stock;
(iii) Rights, warrants and special warrants for common or convertible preferred stock;
(iv) Instalment receipts and American and Global Depository Receipts; and,
(v) Private placements of equities, where the security will be eligible for trading on a recognized exchange within a reasonable and defined time frame and subject to Section 3.4; and,
(vi) Canadian income trusts which provide provincially-legislated limited liability protection to the unitholders.
(b) **Bonds**
(i) Bonds, debentures, notes, non-convertible preferred stock and other evidence of indebtedness of Canadian and non-Canadian issuers whether denominated and payable in Canadian dollars or a foreign currency;
(ii) Mortgage-backed securities, guaranteed under the National Housing Act;
(iii) Term deposits and guaranteed investment certificates; and,
(iv) Private placements of bonds and asset backed securities subject to Section 3.4.

(c) **Cash and Short Term Investments**
(i) Cash on hand and demand deposits;
(ii) Treasury bills issued by the federal and provincial governments and their agencies;
(iii) Obligations of trust companies and Canadian and foreign banks chartered to operate in Canada, including bankers’ acceptances;
(iv) Commercial paper and term deposits; and,
(v) Deposit accounts of the custodian can be used to invest surplus cash holdings.

(d) **Derivative Instruments**
The use of derivative instruments which would be contracted on a leveraged basis is prohibited.

The following uses of non-leveraged derivative instruments for defensive purposes are permitted:
(i) Puts, calls, options, option contracts and futures or options on future contracts on securities that are permissible investments in accordance with this Statement;
(ii) The Investment Manager of an index portfolio may utilize fully backed, i.e. non-leveraged, derivative strategies designed to replicate the performance of specific market indices; and,

(e) **Other Investments**
Following appropriate consultation with and approval by the Committee, investment may be made in:
(i) Futures and options;
(ii) Pooled or mutual funds holding otherwise eligible investments, including any fund sponsored by the Investment Manager for the client’s benefit;
(iii) Foreign investments other than U.S. and international equities as provided for above;
(iv) Real estate;
(v) Mortgages, including index-linked mortgages; and,
(vi) Index-linked annuities.

Such approval will be considered to be in effect until written notice has been received that it has been rescinded by the Committee.

3.4 Minimum Quality Requirements

(a) Quality Standards
Within the investment restrictions for individual portfolios, all portfolios should hold a prudently diversified exposure to the intended market.

(i) The minimum quality standard for individual bonds and debentures is ‘BBB’ or equivalent as rated by a Recognized Bond Rating Agency, at the time of purchase.

(ii) The minimum average rating of the overall bond portfolio must be ‘A’, or better.

(iii) The minimum quality standard for individual short term investments is ‘R-1’ or equivalent as rated by a Recognized Bond Rating Agency, at the time of purchase.

(b) Rating Agencies
For purposes of this Policy, the following shall be considered a ‘Recognized Bond Rating Agency’:

(i) Dominion Bond Rating Agency;

(ii) Standard & Poor’s; and,

(iii) Moody’s InvestorsServices.

Should the rating on a short-term or bond investment fall below the minimum standards outlined above, the Investment Manager must immediately notify the Treasurer and action should be taken. The Treasurer must report all such occurrences and action undertaken to remedy the situation to the Committee.

3.5 Maximum Quantity Restrictions
The following restrictions are to be respected:

(a) Equities

(i) No one equity holding shall represent more than 10% of the market value of any one Investment Manager’s equity portfolio;

(ii) No one equity holding shall represent more than 10% of the voting shares of a corporation;

(iii) No one equity holding shall represent more than 10% of the available public float of such equity security;

(iv) Private placements can be held to a maximum of 10% of the equity portfolio; and

(v) No more than 15% of the market value of the equity Investment Manager’s
portfolio shall be invested in Royalty or Income Trusts

(b) **Bonds and Short Term Securities**

(i) Except for federal and provincial bonds, no more than 10% of an Investment Manager’s bond portfolio may be invested in the bonds of a single issuer and its related companies;

(ii) Except for federal and provincial bonds, no one bond holding shall represent more than 10% of the market value of the total outstanding for that bond issue;

(iii) No more than 10% of the market value of an Investment Manager’s bond portfolio shall be invested in bonds rated ‘BBB’ or equivalent and no bond rated ‘BBB’ or equivalent shall exceed 3% of the market value of the portfolio;

(iv) No more than 20% of the market value of an Investment Manager’s bond portfolio shall be invested in bonds denominated in a currency other than Canadian dollars;

(v) No more than 20% of the market value of a Investment Manager’s bond portfolio shall be invested in bonds of foreign issuers; and,

(vi) Private placements and asset-backed securities can be held to a maximum of 15% of the bond portfolio. The Investment Manager will advise the Committee when this category exceeds 10% of the bond portfolio.

3.6 **Prior Permission Required**

The following investments are permitted provided that the Investment Manager has obtained prior written permission from the Committee:

(a) Investment in any asset or security previously disqualified by the Committee by written notice to the Investment Manager;

(b) Direct investments in a Canadian resource property;

(c) Direct investments in mortgages;

(d) Direct investments in any one parcel of real property;

(e) Direct investments in venture capital financing; and,

(f) Investments in a pooled fund with objectives that conflict with this Policy;
3.7 **Prohibited Investments**

The Investment Managers shall not:

(a) Invest in companies for the purpose of managing them;

(b) Purchase securities on margin or engage in short sales, except in the case of a unleveraged synthetic index strategy where the manager will utilize futures contracts and short-term securities to attempt to create returns that match those of a specified index;

(c) Make any investment not specifically permitted by this Policy or the Investment Manager’s investment mandate.

(d) Invest in any securities issued by McMaster or its affiliates; or

(e) Make any investment not specifically permitted by this Policy or Investment Manager’s investment mandate.

3.8 **Securities Lending**

The investments of the Fund may be loaned for the purpose of generating revenue for the Fund, subject to the provisions of the Pension Benefits Act (Ontario), the Income Tax Act (Canada), and applicable regulations, and provided that appropriate controls are in place and there is an indemnity by the custodian against all losses as a result of the custodian’s securities lending program.

Such loans must be secured by cash and/or readily marketable high quality bonds, treasury bills, and/or letters of credit, discount notes and bankers’ acceptances of Canadian chartered banks. The amount of collateral taken for securities lending should reflect best practices in local markets, but should be a market value of at least 105% of the market value of the loaned securities under an enhanced indemnity agreement. The market value relationship between collateral and securities on loan must be calculated at least daily.

If the Fund is invested in a pooled fund, security lending will be governed by the terms and conditions of the pooled fund contract.

3.9 **Borrowing**

The Plan shall borrow money only for the purpose of covering a short-term contingency and the borrowing is for a period that does not exceed ninety days, subject to the Pension Benefits Act (Ontario), the Income Tax Act and the prior written permission of the Board of Governors, endorsed by the Committee.

3.10 **Liquidity**

The Plan shall maintain assets that are sufficiently liquid in order to make necessary payments to member when required and to enable other changes, as required.

The Investment Manager is expected to have sufficient liquid assets to enable payment of the Plan’s promised benefits in a timely manner.
3.11 Environmental, Social and Governance
“ESG” refers to the environmental, social and governance factors, including government/public policy and disclosure concerns, relevant to an investment that may have a financial impact on that investment. The university has a fiduciary duty to act in the long-term interests of the beneficiaries of the Plan. The Plan’s Investment Manager(s) determine the stock holding of the Fund. Where relevant and material to the assessment of investment value and mitigation of investment risk, ESG factors should be evaluated alongside other considerations by the Plan’s Investment Managers in the exercise of their delegated duties. The university does not impose specific constraints on portfolio investments on the sole basis of ESG factors.

3.12 Conflicts Between the Policy and Pooled Fund Investment Policies
While the guidelines in this Policy are intended to guide the management of the Fund, it is recognized that, due to the use of pooled funds, there may be instances where there is a conflict between this Policy and the investment policy of a pooled fund. In that case, the pooled fund policy shall dominate. However, wherever such a conflict results in non-compliance with the Policy, the Investment Manager must report this conflict explicitly in its quarterly compliance report.
Section 4—Monitoring and Control

41 Performance Measurement
Evaluation of investment performance will be made by the Committee and will take place quarterly based on the results at March 31, June 30, September 30, and December 31.

(a) Total Fund Benchmark
The primary objective of the Fund is to earn a rate of return that exceeds the rate of return on the benchmark portfolio over rolling four-year time periods plus 0.75%. The benchmark consists of the following market index total returns weighted as indicated:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P/TSX Composite Index</td>
<td>20</td>
</tr>
<tr>
<td>S&amp;P 500 Index (Cdn.$)</td>
<td>18</td>
</tr>
<tr>
<td>MSCI EAFE Index (Cdn.$)</td>
<td>17</td>
</tr>
<tr>
<td>FTSE Canada Universe Bond Index</td>
<td>20</td>
</tr>
<tr>
<td>FTSE Canada Long Bond Index</td>
<td>25</td>
</tr>
</tbody>
</table>

Total 100

A secondary objective of the Fund is to achieve, over a four (4) year period at least second quartile performance compared to a performance measurement service pension database.

Total rate of return is the time-weighted rate of return, before fees, based on the change of market value including realised and unrealised gains and losses and including income from all sources.

In addition to assessing performance relative to the Benchmark Portfolio, the Committee will examine risk factors and performance by asset class.

42 Compliance Reporting by the Investment Manager
The Investment Manager(s) must submit a compliance report on a semi-annual basis to the Committee. The compliance report should indicate whether or not the manager’s portfolio was in compliance with this Policy during the previous six months.

In the event that the Investment Manager’s portfolio is not in compliance with this Policy, the Investment Manager is required to detail the nature of the non-compliance in the quarterly
compliance report as well as notify the Treasurer and to implement an appropriate course of action to remedy the situation, as soon as practical.
43 Standard of Professional Conduct

The Investment Manager(s) are expected to comply at all times and in all respects with the Code of Ethics and Standards of Professional Conduct as promulgated by the CFA Institute or to a standard that is the equivalent of, or higher than that of the CFA.

The Investment Manager(s) will manage the assets with the care, diligence and skill that an Investment Manager of ordinary prudence would use in dealing with pension plan assets. The Investment Manager(s) will also use all relevant knowledge and skill that they possess, or ought to possess, as prudent fund managers.
Section 5—Administration

5.1 Conflicts of Interest

(i) Definition
For the purpose of this Policy, a conflict of interest is defined as any event in which any employee or member of or consultant to:

(a) Board of Governors,
(b) Planning and Resources Committee,
(c) Audit Committee,
(d) The Committee,
(e) Actuary,
(f) Investment Manager(s),
(g) Custodian/Trustee, and/or
(h) Consultant,

or any directly related party may gain a financial or other advantage from knowledge of, or participation in, an investment decision of the Fund, or a circumstance that could reasonably be interpreted as impairing his/her ability to render unbiased and objective advice or to fulfill his/her fiduciary responsibilities to act in the best interest of the beneficiaries of the Plan.

It is not possible to anticipate in advance, in this Policy, the multitude of situations which can arise. All persons listed above must, therefore, be cognizant of the possibility that conflicts, or perceived conflicts, may arise and must make timely and full disclosure in accordance with generally accepted concepts of fiduciary responsibilities, and in accordance with the procedures set forth below:

(ii) Responsibilities
This standard applies to the persons named in Section 5.1(i) above in the execution of their responsibilities under the Pension Benefits Act (Ontario) (the “Affected Persons”).

(iii) Disclosure
In the execution of their duties, the Affected Persons shall disclose any material conflict of interest relating to them, or any material ownership of securities, which could impair their ability to render unbiased advice, or to make unbiased decisions, affecting the administration of the Plan’s assets.

Further, it is required that no Affected Person shall make any personal financial gain (direct or indirect) because of his or her fiduciary position. However, normal and
reasonable fees and expenses incurred in the discharge of his/her responsibilities are permitted if documented and approved by the University.

No Affected Person shall accept a gift or gratuity or other personal favour, that is material, from a person with whom the Affected Person deals in the course of performance of his or her duties and responsibilities for the Plan.

It is incumbent on any Affected Person who believes that he or she may have a conflict of interest, or who is aware of any conflict of interest, to disclose full details of the situation in writing to the Chair of the Committee within three business days after the individual becomes aware of the conflict of interest. The disclosure should also be made orally if awareness of the conflict occurs during the discussion of Plan business.

The Committee, in turn, will decide what action is appropriate under the circumstances but, at a minimum, will table the matter at the next regular meeting of the Committee.

Normally, the individual disclosing the conflict of interest shall withdraw from the meeting during discussion of and vote on the issue causing the conflict of interest. The individual may be permitted, at the Committee's request, to participate in the discussion but he/she shall not be present for the vote.

The disclosure of a conflict of interest, the name of the individual declaring the conflict and the manner in which the conflict was resolved will be recorded in the minutes of the Committee.

52 Related Party Transactions

For the purpose of this section, a “related party”, “administration”, and a “transaction” in respect of the Plan have the meanings given to such terms in Schedule III of the Pension Benefits Standards Regulations (Canada), as amended from time to time. The following related party transactions are among those permitted for the Plan:

(a) Any transaction that is required for the operation or administration of the Plan under terms and conditions that are not less favourable to the Plan than market terms and conditions and such transaction does not involve the making of loans to, or investments in, the related party; or

(b) Any transaction, where the combined value of all transactions with the same related party is nominal or the transaction(s) is immaterial to the Plan.

For the purposes of this section, only the market value of the combined assets of the Plan shall be used as the criteria to determine whether a transaction is nominal or immaterial to the Plan. Transactions less than 3% of the combined market value of the assets of the plan are considered nominal. Two or more transactions with the same related party shall be considered a single transaction.
5.3 **Selecting Investment Managers**
In the event that a new Investment Manager must be selected or additional Investment Manager(s) added to the set of existing Investment Manager(s), the Committee will undertake an investment manager search with the assistance of a third-party investment consultant. The criteria used for selecting an investment manager will be consistent with the investment and risk philosophy set out in Section 1.5 (Investment Objectives, Beliefs and Risk Appetite).

5.4 **Monitoring of Investment Managers**
At least semi-annually, the Committee will monitor and review the:

(a) Assets and net cash flow of the Plan;
(b) Investment Manager’s, staff turnover, consistency of style and record of service;
(c) Investment Manager’s current economic outlook and investment strategies;
(d) Investment Manager’s compliance with this Policy, where an Investment Manager is required to complete and sign a compliance report; and
(e) Investment performance of the Fund in relation to the rate of return expectations outlined in this Policy.

5.5 **Dismissal of an Investment Manager**
The Committee shall consider from time to time whether an Investment Manager’s investment performance or any other circumstances may warrant the introduction of a probationary period or a change in Investment Manager(s). Such circumstances would include but not be limited to:

(a) Significant turnover in staff of Investment Manager(s);
(b) Change in ownership of Investment Manager(s);
(c) Failure of the Investment Manager(s) to satisfy all of the responsibilities set out in Section 3 of this Policy;
(d) Desire to diversify the management of the Fund or to add another Investment Manager(s);
(e) Unsatisfactory performance and/or compliance in relation to the performance standards specified in Sections 3 and 4 of this Policy.

5.6 **Voting Rights**
The Committee has delegated voting rights acquired through the investments held by the Plan to the custodian of the securities to be exercised in accordance with the Investment Manager’s instructions. Investment Managers are expected to exercise all voting rights related to investments held by the Fund in the interests of the Plan Members. The Investment Manager(s) shall provide their proxy policies to the Treasurer.

At least annually, the Investment Manager(s) shall provide Treasury with a report of proxy voting actions and how ESG factored into the voting.
At least annually, a summary report of Investment Manager proxy voting action and how ESG factored into the voting shall be provided to the Planning and Resources Committee of the Board of Governors.

The Committee reserves the right to take-back voting rights of assets held in segregated portfolios for specific situations.

Further, the Investment Managers must maintain records documenting how they voted and will advise the Treasurer if they voted against its own share voting policy.

5.7 Valuation of Investments Not Regularly Traded
The following principles will apply for the valuation of investments that are not traded regularly:

(a) Equities
   Average of bid-and-ask prices from two major investment dealers, at least once every calendar quarter.

(b) Bonds
   Same as for equities.

(c) Mortgages
   Unless in arrears, the outstanding principal plus/minus the premium/discount resulting from the differential between the face rate and the currently available rate for a mortgage of similar quality and term, determined at least once every calendar quarter.

(d) Real Estate
   A certified written appraisal from a qualified independent appraiser at least every two years.

(e) Resource Properties and Venture Capital
   A written market value assessment prepared by party qualified to make such assessments, at least every two years.

5.8 Valuation of Investments
The trustees of the pooled funds shall value the pooled fund units.

5.9 Life Annuities
Nothing in the Policy shall preclude the Fund from purchasing life annuities to secure the pensions of the Members in whole or in part.

5.10 Policy Review
The Policy may be reviewed and revised at anytime, but it must be formally reviewed by the Committee at least annually.
Complete Policy Title: Statement of Investment Policies and Procedures

McMaster University Contributory Pension Plan for Hourly-Rated Employees

Approved by: Board of Governors

Date of Original Approval(s): February 17, 2005

Date of Most Recent Approval: ( )

Supercedes/Amends Policy dated: October 24, 2019

Responsible Executive: Assistant Vice-President (Administration)

Enquiries: Business Management Services

DISCLAIMER: If there is a Discrepancy between this electronic policy and the written copy held by the policy owner, the written copy prevails.
# Contents

**Section 1—Overview**................................................................................................................................. 1  
1.1 Purpose of Statement................................................................................................................................. 1  
1.2 Background of the Plan............................................................................................................................... 1  
1.3 Plan Profile .............................................................................................................................................. 1  
1.4 Objective of the Plan ................................................................................................................................. 2  
1.5 Investment Objectives, Beliefs and Risk Appetite ...................................................................................... 2  
1.6 Delegation of Responsibility and Administration ...................................................................................... 3  

**Section 2—Asset Mix and Diversification Policy** ...................................................................................... 6  
2.1 Investment Objectives - Portfolio Return Expectations ............................................................................. 6  
2.2 Investment Risk Tolerance - Expected Volatility ....................................................................................... 6  
2.3 Management Structure ............................................................................................................................... 6  
2.4 Asset Mix ................................................................................................................................................. 6

**Section 3—Permitted and Prohibited Investments** ................................................................................... 8  
3.1 General Guidelines ................................................................................................................................... 8  
3.2 Derivatives, Options and Futures................................................................................................................... 8  
3.3 Permitted Investments ................................................................................................................................. 8  
3.4 Minimum Quality Requirements ................................................................................................................. 10  
3.5 Maximum Quantity Restrictions .............................................................................................................. 10  
3.6 Prior Permission Required ........................................................................................................................... 11  
3.7 Prohibited Investments ............................................................................................................................... 12  
3.8 Securities Lending ....................................................................................................................................... 12  
3.9 Borrowing .................................................................................................................................................. 12  
3.10 Liquidity .................................................................................................................................................... 12  
3.11 Environmental, Social and Governance .................................................................................................... 12  
3.12 Conflicts Between the Policy and Pooled Fund Investment Policies ....................................................... 13

**Section 4—Monitoring and Control** ........................................................................................................... 14  
4.1 Performance Measurement .......................................................................................................................... 14  
4.2 Compliance Reporting by the Investment Manager ................................................................................... 14  
4.3 Standard of Professional Conduct ............................................................................................................ 15

**Section 5—Administration** ....................................................................................................................... 16  
5.1 Conflicts of Interest ................................................................................................................................... 16  
5.2 Related Party Transactions .......................................................................................................................... 17  
5.3 Selecting Investment Managers .................................................................................................................. 18  
5.4 Monitoring of Investment Managers ......................................................................................................... 18  
5.5 Dismissal of an Investment Manager ......................................................................................................... 18  
5.6 Voting Rights ............................................................................................................................................. 18  
5.7 Valuation of Investments Not Regularly Traded .......................................................................................... 19  
5.8 Valuation of Investments .............................................................................................................................. 19  
5.9 Life Annuities .......................................................................................................................................... 19  
5.10 Policy Review .......................................................................................................................................... 19
Section 1—Overview

1.1 Purpose of Statement
This Statement of Investment Policies and Procedures (the ‘Policy’) is intended to set out the investment framework which shall apply at all times for the Contributory Pension Plan for Hourly-Rated Employees of McMaster University Including McMaster Divinity College (the ‘Plan’).

This Policy is based on the ‘prudent person portfolio approach’ to ensure the prudent investment and administration of the assets of the Plan (the ‘Fund’) within the parameters set out in the Pension Benefits Act (Ontario) and the regulations thereunder.

1.2 Background of the Plan
McMaster University was established in 1887 by the bequest of William McMaster and is a university incorporated under the laws of the Province of Ontario, which provides operating grants annually to the University.

The University sponsors the Plan, which is a defined benefit pension plan into which its contributions and the employees' contributions are deposited. These contributions are made biweekly and are remitted before the end of the following month to the Plan's trustee.

As directed by the McMaster University Hourly Pension Plan Retirement Committee (the ‘Committee’), the University contracts with third parties to provide trustee, custodial, investment management, actuarial, and consulting services.

Retiree benefits are paid from the Plan. Also paid from the Plan are termination and death benefits, trustees' fees, audit fees, actuaries' fees, investment management fees, consultants' fees, filing fees and other related costs as approved by the Committee.

1.3 Plan Profile
(a) Contributions
The Plan is contributory. Each Plan member is required to contribute in accordance with the Plan Text and limited by specified maximums, as applicable.

The University will pay the balance required to provide the cost of benefits. The minimum University contribution each year is an amount equal to the contributions made by the Plan members during the year.

(b) Benefits
For service prior to January 1, 1986, the amount of annual pension will be the pension earned to December 31, 1985 increased in accordance with periodic amendments thereafter.

For service after December 31, 1985, the amount of annual pension payable to a Plan member will be:
(i) 1.4% of Best Average Earnings up to the Average Year’s Maximum Pensionable Earnings times years of Credited Service, plus
(ii) 2.0% of Best Average Earnings in excess of the Average Year’s Maximum Pensionable Earnings times years of Credited Service.

The amount by which twice the Plan member’s required contributions with interest exceed the commuted value of the Member’s benefit shall be paid to the Plan member. Pensions in payment after January 1, 2003, will be increased by the excess over 6% of...
the 5 year average return on the Fund, subject to a maximum increase equal to the change in the CPI for the previous Plan year.

1.4 Objective of the Plan
The objective of the Plan is to provide participants with defined pension benefits based on a Best Average Earnings and with potential indexation of retirement benefits, as defined in the Plan Text. It is important to set up an appropriately diversified asset mix in order to ensure continued prudent and effective management of the Fund.

1.5 Investment Objectives, Beliefs and Risk Appetite

Funding Objectives
The Plans’ funding objectives are to:

(a) Manage the volatility and level of contributions;
(b) Maintain benefit security, and
(c) Reduce the likelihood of special solvency payments and target to maintain the solvency funded ratio above 85% at all future actuarial valuation dates.

Investment Objectives
The investment objective of the Plans’ investments is to earn a return sufficient to keep the Plan sustainable over the long term, while keeping benefit levels and contribution rates stable. This requires an appropriate balance between risk and return.

Risk Appetite
Based on the characteristics of the Plan, the Committee has determined that the Plan has a moderate risk appetite for investment risk, as demonstrated by the approved asset classes, investment targets and limits within this policy.

Investment Beliefs
The Hourly Pension Committee (“Committee”) has, from time to time, reviewed and confirmed its investment beliefs which take into consideration the types of investments and associated risks that are aligned with investment objectives and risk appetite.

The Committee recognizes that, based on historical data and on forecasted returns, the asset classes most likely to produce the greatest return in excess of inflation over time are also likely to exhibit the most volatility. Conversely, the asset classes likely to be the least volatile are likely to produce the lowest returns over time. The investment philosophies and strategies must take into account both return and risk objectives.

Therefore, it is reasonable to adopt a long-term asset mix strategy with an appropriate equity content that is well diversified.
1.6 Delegation of Responsibility and Administration

The University is the legal administrator of the Plan and is therefore responsible for all matters relating to the administration, interpretation and application of the Plan, including developing, monitoring and amending this Policy. The Committee assists the University with the administration of the Plan.

Overall responsibility for the Plan ultimately rests with the Board of Governors of the University. The Committee assists the Board in fulfilling its fiduciary responsibilities. As well, other suppliers assist the University as described below.

(a) The Board of Governors will:

(i) Determine the level of the University’s contribution to the Plan on the recommendation of the Planning and Resources Committee and in accordance with the guidelines set out in the Hourly Pension Plan text;

(ii) Consider items endorsed by the Planning and Resources Committee and approve where appropriate;

(iii) Be responsible for the delegation of any responsibilities not specifically mentioned.

(b) The Planning and Resources Committee of the Board of Governors will:

(i) Consider recommendations by the Committee concerning the level of the University’s contribution to the plan and endorse those recommendations to the Board of Governors where appropriate;

(ii) Consider items brought forward by the Committee for approval and endorse recommendations to the Board of Governors where appropriate.

(c) The Committee will:

(i) Approve and make recommendations where necessary to the Planning and Resources Committee regarding changes to the Investment Manager(s), Custodian/Trustee, and Investment Consultant;

(ii) Monitor and review performance of the Investment Manager(s) on a qualitative and quantitative basis at least semi-annually;

(iii) Review the Fund’s performance on a quarterly basis, and approve situations of deviations or proposed deviation by the Fund Manager from the Policy to the Planning and Resources Committee;

(iv) Discuss and promote awareness and understanding of the Plan by Members of the Plan and persons receiving benefits under the Plan;

(v) Review the Statement of Investment Policy and Procedures (the “Policy”) at least annually, make changes, and endorse to the Planning and Resources Committee for approval as required;
(vi) Review the actuarial valuation, changes in methods and assumptions and its impact upon the Plan, and endorse to the Planning and Resources Committee for approval;

(vii) Review the financial statements and endorse to the Planning and Resources Committee for approval;

(viii) Approve and recommend to the Planning and Resources Committee proposed changes to the Plan text;

(ix) Consider other matters as may be referred to the Committee by the participating unions, Planning and Resources Committee or the Board of Governors;

(d) The Investment Manager(s) will:

(i) Invest the assets of the Fund in accordance with this Policy and applicable legislation;

(ii) Notify the Committee, in writing, of any significant changes in the Investment Manager’s philosophies and policies, personnel or organization and procedures;

(iii) Meet with the Committee as required and provide written reports regarding their past performance, their future strategies and other issues requested by the Committee; and

(iv) Provide semi-annual compliance reports that confirms that the Manager has complied with the Policy or identifies areas of non-compliance.

(e) The Custodian/Trustee will:

(i) Maintain safe custody over the assets of the Plan;

(ii) Execute the instructions of the University and the Investment Manager(s); and,

(iii) Record income and provide monthly financial statements to the University as required.

(f) The Actuary will:

(i) Perform actuarial valuations of the Plan as required;

(ii) Advise the Committee on any matters relating to the Plan design, membership and contributions;

(iii) File appropriate documents and reports with relevant authorities; and

(iv) Assist the Committee in any other way required.
(g) The Investment Consultant will:

(i) Assist in the development and implementation of this Policy;

(ii) Monitor the performance of the Fund and the Investment Managers and advise the Committee on such performance;

(iii) Monitor the Investment Managers’ compliance reports;

(iv) Support the Committee on matters relating to investment management and administration of the Fund; and,

(v) Meet with the Committee as required.

(h) University Management will:

(i) Comment and make recommendations to the Planning and Resources Committee on the appointment of the Actuary;

(ii) Ensure the plan’s administration complies with all applicable legislation and regulations;

(iii) Make recommendations to the parties to the collective agreements regarding amendments to the plan text;

(iv) Perform any duties or obligations not noted above and as described in Article 13 – Administration of the Plan of the Plan text.
Section 2—Asset Mix and Diversification Policy

2.1 Investment Objectives - Portfolio Return Expectations
The Fund will be managed on a going-concern basis. The primary objective is to ensure that the benefits defined in the Plan can be paid.

The secondary performance objective is to outperform a benchmark portfolio constructed from rates of return (including income) of the Standard & Poor’s Toronto Stock Exchange Composite Index (S&P/TSX Composite Index), the Standard & Poor’s 500 Index (S&P 500 Index), the Morgan Stanley Capital International Europe, Australasia and Far East Index (MSCI EAFE Index), FTSE Canada Long Bond Index and the FTSE Canada Universe Bond Index over rolling four-year time periods.

2.2 Investment Risk Tolerance - Expected Volatility
The expected volatility of investment returns for the Fund is directly related to the asset mix strategy; specifically, the balance between Canadian equities, foreign equities and Canadian bonds. Volatility is inherent in investing and will be managed according to the minimum and maximum asset mix ranges as outlined in Section 2.4. It is expected that the volatility of Fund returns should be similar to the volatility of the Total Combined Fund Benchmark Portfolio set out in Section 4.1.

The Committee will monitor the volatility of the fund and underlying manager(s).

2.3 Management Structure
The Committee believes that an Investment Manager with an active mandate can reduce portfolio risk below market risk and potentially add value both through security selection and asset allocation strategies.

2.4 Asset Mix

(a) Overall Asset Mix
The benchmark portfolio is representative of the long-term asset mix policy for the Fund as set out by the Committee. The Total Fund benchmark portfolio and asset mix guidelines (by market value) are set out below:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Minimum %</th>
<th>Benchmark %</th>
<th>Maximum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian equities</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>U.S. equities</td>
<td>8</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>Non-North American equities</td>
<td>7</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Total equities</td>
<td>35</td>
<td>55</td>
<td>70</td>
</tr>
<tr>
<td>Universe Bonds</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Long Bonds</td>
<td>15</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Cash &amp; Short-Term</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Total Fixed Income</td>
<td>30</td>
<td>45</td>
<td>65</td>
</tr>
</tbody>
</table>
The actual asset mix at any time may deviate from the Benchmark indicated above. The manager shall monitor and adjust the asset mix to ensure that the actual asset mix stays within the ranges as indicated by the minimums and maximums specified.

The Investment Manager shall comply with restrictions imposed by federal or provincial legislation and regulations.

(b) **Categorization per Pension Benefits Act**

The target mix for each category listed in subsection 76(12) of the Regulations to the Pension Benefit Act (Ontario) is as follows:

<table>
<thead>
<tr>
<th>Investment Category</th>
<th>Target Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insured contracts</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mutual or pooled funds or segregated funds</td>
<td>0.0%</td>
</tr>
<tr>
<td>Demand deposits and cash on hand</td>
<td>0.0%</td>
</tr>
<tr>
<td>Short-term notes and treasury bills</td>
<td>0.0%</td>
</tr>
<tr>
<td>Term deposits and guaranteed investment certificates</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mortgage loans</td>
<td>0.0%</td>
</tr>
<tr>
<td>Real estate</td>
<td>0.0%</td>
</tr>
<tr>
<td>Real estate debentures</td>
<td>0.0%</td>
</tr>
<tr>
<td>Resource properties</td>
<td>0.0%</td>
</tr>
<tr>
<td>Venture capital</td>
<td>0.0%</td>
</tr>
<tr>
<td>Corporations referred to in subsection 11(2) of Schedule III of the PBSR</td>
<td>0.0%</td>
</tr>
<tr>
<td>Employer issued securities</td>
<td>0.0%</td>
</tr>
<tr>
<td>Canadian stocks</td>
<td>20.0%</td>
</tr>
<tr>
<td>Non-Canadian stocks</td>
<td>35.0%</td>
</tr>
<tr>
<td>Canadian bonds and debentures</td>
<td>45.0%</td>
</tr>
<tr>
<td>Non-Canadian bonds and debentures</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other investments</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

The minimum rating for the target investment allocation of Canadian fixed income securities is BBB (or equivalent), as rated by at least one Recognized Bond Rating Agency as defined in section 3.4 (b). Notwithstanding this target, actual quality requirements and permitted ranges shall be determined by the Investment Manager(s) responsible for implementation of the strategy.
Section 3—Permitted and Prohibited Investments

3.1 General Guidelines

The investments of the Fund must comply with the requirements and restrictions imposed by the applicable legislation, including but not limited to the requirements of the Ontario Pension Benefits Act, the federal Income Tax Act (Canada) and any relevant regulations.

3.2 Derivatives, Options and Futures

The pooled funds may utilize derivatives, options or futures if their policies permit. The derivatives instruments allowable under the Policy may be used only when they are regularly traded upon a recognized marketplace. Any investment in derivative securities shall be solely for non-speculative and non-leveraged purposes.

3.3 Permitted Investments

In general, and subject to the restrictions noted below, the Fund may invest in any of the asset classes and in any of the instruments listed below.

(a) Canadian and Foreign Equities

(i) Common and convertible preferred stock listed on a recognized exchange;

(ii) Debentures convertible into common or convertible preferred stock;

(iii) Rights, warrants and special warrants for common or convertible preferred stock;

(iv) Instalment receipts and American and Global Depository Receipts; and,

(v) Private placements of equities, where the security will be eligible for trading on a recognized exchange within a reasonable and defined time frame and subject to Section 3.4; and,

(vi) Canadian income trusts which provide provincially-legislated limited liability protection to the unitholders.
(b) **Bonds**
   (i) Bonds, debentures, notes, non-convertible preferred stock and other evidence of indebtedness of Canadian and non-Canadian issuers whether denominated and payable in Canadian dollars or a foreign currency;
   (ii) Mortgage-backed securities, guaranteed under the National Housing Act;
   (iii) Term deposits and guaranteed investment certificates; and,
   (iv) Private placements of bonds and asset backed securities subject to Section 3.4.

(c) **Cash and Short Term Investments**
   (i) Cash on hand and demand deposits;
   (ii) Treasury bills issued by the federal and provincial governments and their agencies;
   (iii) Obligations of trust companies and Canadian and foreign banks chartered to operate in Canada, including bankers’ acceptances;
   (iv) Commercial paper and term deposits; and,
   (v) Deposit accounts of the custodian can be used to invest surplus cash holdings.

(d) **Derivative Instruments**
   The use of derivative instruments which would be contracted on a leveraged basis is prohibited.
   The following uses of non-leveraged derivative instruments for defensive purposes are permitted:
   (i) Puts, calls, options, option contracts and futures or options on future contracts on securities that are permissible investments in accordance with this Statement;
   (ii) The Investment Manager of an index portfolio may utilize fully backed, i.e. non-leveraged, derivative strategies designed to replicate the performance of specific market indices; and,

(e) **Other Investments**
   Following appropriate consultation with and approval by the Committee, investment may be made in:
   (i) Futures and options;
   (ii) Pooled or mutual funds holding otherwise eligible investments, including any fund sponsored by the Investment Manager for the client’s benefit;
   (iii) Foreign investments other than U.S. and international equities as provided for above;
   (iv) Real estate;
   (v) Mortgages, including index-linked mortgages; and,
(vi) Index-linked annuities.

Such approval will be considered to be in effect until written notice has been received that it has been rescinded by the Committee.

3.4 Minimum Quality Requirements
(a) Quality Standards
Within the investment restrictions for individual portfolios, all portfolios should hold a prudently diversified exposure to the intended market.

(i) The minimum quality standard for individual bonds and debentures is ‘BBB’ or equivalent as rated by a Recognized Bond Rating Agency, at the time of purchase.

(ii) The minimum average rating of the overall bond portfolio must be ‘A’, or better.

(iii) The minimum quality standard for individual short term investments is ‘R-1’ or equivalent as rated by a Recognized Bond Rating Agency, at the time of purchase.

(b) Rating Agencies
For purposes of this Policy, the following shall be considered a ‘Recognized Bond Rating Agency’:

(i) Dominion Bond Rating Agency;

(ii) Standard & Poor’s; and,

(iii) Moody’s Investors Services.

Should the rating on a short-term or bond investment fall below the minimum standards outlined above, the Investment Manager must immediately notify the Treasurer and action should be taken. The Treasurer must report all such occurrences and action undertaken to remedy the situation to the Committee.

3.5 Maximum Quantity Restrictions
The following restrictions are to be respected:

(a) Equities
(i) No one equity holding shall represent more than 10% of the market value of any one Investment Manager’s equity portfolio;

(ii) No one equity holding shall represent more than 10% of the voting shares of a corporation;

(iii) No one equity holding shall represent more than 10% of the available public float of such equity security;

(iv) Private placements can be held to a maximum of 10% of the equity portfolio; and

(v) No more than 15% of the market value of the equity Investment Manager’s...
portfolio shall be invested in Royalty or Income Trusts

(b) **Bonds and Short Term Securities**

(i) Except for federal and provincial bonds, no more than 10% of an Investment Manager’s bond portfolio may be invested in the bonds of a single issuer and its related companies;

(ii) Except for federal and provincial bonds, no one bond holding shall represent more than 10% of the market value of the total outstanding for that bond issue;

(iii) No more than 10% of the market value of an Investment Manager’s bond portfolio shall be invested in bonds rated ‘BBB’ or equivalent and no bond rated ‘BBB’ or equivalent shall exceed 3% of the market value of the portfolio;

(iv) No more than 20% of the market value of an Investment Manager’s bond portfolio shall be invested in bonds denominated in a currency other than Canadian dollars;

(v) No more than 20% of the market value of an Investment Manager’s bond portfolio shall be invested in bonds of foreign issuers;

(vi) Private placements and asset-backed securities can be held to a maximum of 15% of the bond portfolio. The Investment Manager will advise the Committee when this category exceeds 10% of the bond portfolio.

3.6 **Prior Permission Required**

The following investments are permitted provided that the Investment Manager has obtained prior written permission from the Committee:

(a) Investment in any asset or security previously disqualified by the Committee by written notice to the Investment Manager;

(b) Direct investments in a Canadian resource property;

(c) Direct investments in mortgages;

(d) Direct investments in any one parcel of real property;

(e) Direct investments in venture capital financing; and,

(f) Investments in a pooled fund with objectives that conflict with this Policy;
3.7 Prohibited Investments
The Investment Managers shall not:

(a) Invest in companies for the purpose of managing them;

(b) Purchase securities on margin or engage in short sales, except in the case of a unleveraged synthetic index strategy where the manager will utilize futures contracts and short-term securities to attempt to create returns that match those of a specified index;

(c) Make any investment not specifically permitted by this Policy or the Investment Manager’s investment mandate.

(d) Invest in any securities issued by McMaster or its affiliates; or

(e) Make any investment not specifically permitted by this Policy or Investment Manager’s investment mandate.

3.8 Securities Lending
The investments of the Fund may be loaned for the purpose of generating revenue for the Fund, subject to the provisions of the Pension Benefits Act (Ontario), the Income Tax Act (Canada), and applicable regulations, and provided that appropriate controls are in place and there is an indemnity by the custodian against all losses as a result of the custodian’s securities lending program.

Such loans must be secured by cash and/or readily marketable high quality bonds, treasury bills, and/or letters of credit, discount notes and bankers’ acceptances of Canadian chartered banks. The amount of collateral taken for securities lending should reflect best practices in local markets, but should be a market value of at least 105% of the market value of the loaned securities under an enhanced indemnity agreement. The market value relationship between collateral and securities on loan must be calculated at least daily.

If the Fund is invested in a pooled fund, security lending will be governed by the terms and conditions of the pooled fund contract.

3.9 Borrowing
The Plan shall borrow money only for the purpose of covering a short-term contingency and the borrowing is for a period that does not exceed ninety days, subject to the Pension Benefits Act (Ontario), the Income Tax Act and the prior written permission of the Board of Governors, endorsed by the Committee.

3.10 Liquidity
The Plan shall maintain assets that are sufficiently liquid in order to make necessary payments to member when required and to enable other changes, as required.

The Investment Manager is expected to have sufficient liquid assets to enable payment of the Plan’s promised benefits in a timely manner.
3.11 Environmental, Social and Governance

“ESG” refers to the environmental, social and governance factors, including government/public policy and disclosure concerns, relevant to an investment that may have a financial impact on that investment. The university has a fiduciary duty to act in the long-term interests of the beneficiaries of the Plan. The Plan’s Investment Manager(s) determine the stock holding of the Fund. Where relevant and material to the assessment of investment value and mitigation of investment risk, ESG factors should be evaluated alongside other considerations by the Plan’s Investment Managers in the exercise of their delegated duties. The university does not impose specific constraints on portfolio investments on the sole basis of ESG factors.

3.12 Conflicts Between the Policy and Pooled Fund Investment Policies

While the guidelines in this Policy are intended to guide the management of the Fund, it is recognized that, due to the use of pooled funds, there may be instances where there is a conflict between this Policy and the investment policy of a pooled fund. In that case, the pooled fund policy shall dominate. However, wherever such a conflict results in non-compliance with the Policy, the Investment Manager must report this conflict explicitly in its quarterly compliance report.
Section 4—Monitoring and Control

41 Performance Measurement
Evaluation of investment performance will be made by the Committee and will take place quarterly based on the results at March 31, June 30, September 30, and December 31.

(a) Total Fund Benchmark
The primary objective of the Fund is to earn a rate of return that exceeds the rate of return on the benchmark portfolio over rolling four-year time periods plus 0.75%. The benchmark consists of the following market index total returns weighted as indicated:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P/TSX Composite Index</td>
<td>20</td>
</tr>
<tr>
<td>S&amp;P 500 Index (Cdn.$)</td>
<td>18</td>
</tr>
<tr>
<td>MSCI EAFE Index (Cdn.$)</td>
<td>17</td>
</tr>
<tr>
<td>FTSE Canada Universe Bond Index</td>
<td>20</td>
</tr>
<tr>
<td>FTSE Canada Long Bond Index</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

A secondary objective of the Fund is to achieve, over a four (4) year period at least second quartile performance compared to a performance measurement service pension database.

Total rate of return is the time-weighted rate of return, before fees, based on the change of market value including realised and unrealised gains and losses and including income from all sources.

In addition to assessing performance relative to the Benchmark Portfolio, the Committee will examine risk factors and performance by asset class.

42 Compliance Reporting by the Investment Manager
The Investment Manager(s) must submit a compliance report on a semi-annual basis to the Committee. The compliance report should indicate whether or not the manager's portfolio was in compliance with this Policy during the previous six months.

In the event that the Investment Manager’s portfolio is not in compliance with this Policy, the Investment Manager is required to detail the nature of the non-compliance in the quarterly compliance report as well as notify the Treasurer and to implement an appropriate course of action to remedy the situation, as soon as practical.
43 Standard of Professional Conduct

The Investment Manager(s) are expected to comply at all times and in all respects with the Code of Ethics and Standards of Professional Conduct as promulgated by the CFA Institute or to a standard that is the equivalent of, or higher than that of the CFA.

The Investment Manager(s) will manage the assets with the care, diligence and skill that an Investment Manager of ordinary prudence would use in dealing with pension plan assets. The Investment Manager(s) will also use all relevant knowledge and skill that they possess, or ought to possess, as prudent fund managers.
Section 5—Administration

5.1 Conflicts of Interest

(i) Definition
For the purpose of this Policy, a conflict of interest is defined as any event in which any employee or member of or consultant to:

(a) Board of Governors,
(b) Planning and Resources Committee,
(c) Audit Committee,
(d) The Committee,
(e) Actuary,
(f) Investment Manager(s),
(g) Custodian/Trustee, and/or
(h) Consultant,

or any directly related party may gain a financial or other advantage from knowledge of, or participation in, an investment decision of the Fund, or a circumstance that could reasonably be interpreted as impairing his/her ability to render unbiased and objective advice or to fulfil his/her fiduciary responsibilities to act in the best interest of the beneficiaries of the Plan.

It is not possible to anticipate in advance, in this Policy, the multitude of situations which can arise. All persons listed above must, therefore, be cognizant of the possibility that conflicts, or perceived conflicts, may arise and must make timely and full disclosure in accordance with generally accepted concepts of fiduciary responsibilities, and in accordance with the procedures set forth below:

(ii) Responsibilities
This standard applies to the persons named in Section 5.1(i) above in the execution of their responsibilities under the Pension Benefits Act (Ontario) (the “Affected Persons”).

(iii) Disclosure
In the execution of their duties, the Affected Persons shall disclose any material conflict of interest relating to them, or any material ownership of securities, which could impair their ability to render unbiased advice, or to make unbiased decisions, affecting the administration of the Plan’s assets.

Further, it is required that no Affected Person shall make any personal financial gain (direct or indirect) because of his or her fiduciary position. However, normal and
reasonable fees and expenses incurred in the discharge of his/her responsibilities are permitted if documented and approved by the University.

No Affected Person shall accept a gift or gratuity or other personal favour, that is material, from a person with whom the Affected Person deals in the course of performance of his or her duties and responsibilities for the Plan.

It is incumbent on any Affected Person who believes that he or she may have a conflict of interest, or who is aware of any conflict of interest, to disclose full details of the situation in writing to the Chair of the Committee within three business days after the individual becomes aware of the conflict of interest. The disclosure should also be made orally if awareness of the conflict occurs during the discussion of Plan business.

The Committee, in turn, will decide what action is appropriate under the circumstances but, at a minimum, will table the matter at the next regular meeting of the Committee.

Normally, the individual disclosing the conflict of interest shall withdraw from the meeting during discussion of and vote on the issue causing the conflict of interest. The individual may be permitted, at the Committee's request, to participate in the discussion but he/she shall not be present for the vote.

The disclosure of a conflict of interest, the name of the individual declaring the conflict and the manner in which the conflict was resolved will be recorded in the minutes of the Committee.

52 Related Party Transactions

For the purpose of this section, a “related party”, “administration”, and a “transaction” in respect of the Plan have the meanings given to such terms in Schedule III of the Pension Benefits Standards Regulations (Canada), as amended from time to time. The following related party transactions are among those permitted for the Plan:

(a) Any transaction that is required for the operation or administration of the Plan under terms and conditions that are not less favourable to the Plan than market terms and conditions and such transaction does not involve the making of loans to, or investments in, the related party; or

(b) Any transaction, where the combined value of all transactions with the same related party is nominal or the transaction(s) is immaterial to the Plan.

For the purposes of this section, only the market value of the combined assets of the Plan shall be used as the criteria to determine whether a transaction is nominal or immaterial to the Plan. Transactions less than 3% of the combined market value of the assets of the plan are considered nominal. Two or more transactions with the same related party shall be considered a single transaction.
5.3 Selecting Investment Managers
In the event that a new Investment Manager must be selected or additional Investment Manager(s) added to the set of existing Investment Manager(s), the Committee will undertake an investment manager search with the assistance of a third-party investment consultant. The criteria used for selecting an investment manager will be consistent with the investment and risk philosophy set out in Section 1.5 (Investment Objectives, Beliefs and Risk Appetite).

5.4 Monitoring of Investment Managers
At least semi-annually, the Committee will monitor and review the:

(a) Assets and net cash flow of the Plan;
(b) Investment Manager’s, staff turnover, consistency of style and record of service;
(c) Investment Manager’s current economic outlook and investment strategies;
(d) Investment Manager’s compliance with this Policy, where an Investment Manager is required to complete and sign a compliance report; and
(e) Investment performance of the Fund in relation to the rate of return expectations outlined in this Policy.

5.5 Dismissal of an Investment Manager
The Committee shall consider from time to time whether an Investment Manager’s investment performance or any other circumstances may warrant the introduction of a probationary period or a change in Investment Manager(s). Such circumstances would include but not be limited to:

(a) Significant turnover in staff of Investment Manager(s);
(b) Change in ownership of Investment Manager(s);
(c) Failure of the Investment Manager(s) to satisfy all of the responsibilities set out in Section 3 of this Policy;
(d) Desire to diversify the management of the Fund or to add another Investment Manager(s);
(e) Unsatisfactory performance and/or compliance in relation to the performance standards specified in Sections 3 and 4 of this Policy.

5.6 Voting Rights
The Committee has delegated voting rights acquired through the investments held by the Plan to the custodian of the securities to be exercised in accordance with the Investment Manager’s instructions. Investment Managers are expected to exercise all voting rights related to investments held by the Fund in the interests of the Plan Members. The Investment Manager(s) shall provide their proxy policies to the Treasurer.

At least annually, the Investment Manager(s) shall provide Treasury with a report of proxy voting actions and how ESG factored into the voting.
At least annually, a summary report of Investment Manager proxy voting action and how ESG factored into the voting shall be provided to the Planning and Resources Committee of the Board of Governors.

The Committee reserves the right to take-back voting rights of assets held in segregated portfolios for specific situations.

Further, the Investment Managers must maintain records documenting how they voted and will advise the Treasurer if they voted against its own share voting policy.

5.7 Valuation of Investments Not Regularly Traded
The following principles will apply for the valuation of investments that are not traded regularly:

(a) Equities
Average of bid-and-ask prices from two major investment dealers, at least once every calendar quarter.

(b) Bonds
Same as for equities.

(c) Mortgages
Unless in arrears, the outstanding principal plus/minus the premium/discount resulting from the differential between the face rate and the currently available rate for a mortgage of similar quality and term, determined at least once every calendar quarter.

(d) Real Estate
A certified written appraisal from a qualified independent appraiser at least every two years.

(e) Resource Properties and Venture Capital
A written market value assessment prepared by party qualified to make such assessments, at least every two years.

5.8 Valuation of Investments
The trustees of the pooled funds shall value the pooled fund units.

5.9 Life Annuities
Nothing in the Policy shall preclude the Fund from purchasing life annuities to secure the pensions of the Members in whole or in part.

5.10 Policy Review
The Policy may be reviewed and revised at anytime, but it must be formally reviewed by the Committee at least annually.
Health, Safety and Risk Management Report 2020-4

Health, Safety and Risk Management Report to the Board of Governors

Report 2020-4 for the period May 22, 2020 – September 14, 2020

The Health, Safety and Risk Management (HSRM) unit of Human Resources Services incorporates Environmental and Occupational Health Support Services (EOHSS), Employee Health Services (EHS) and works in cooperation with the Organizational Development unit. Together, we strive to promote the health, safety, wellness and engagement of all McMaster employees.

Executive Summary

• COVID-19 continues to be the most critical issue impacting McMaster.
• Crisis Management Group (CMG) continues to meet weekly providing a forum for discussion and decisions as required. A return to campus committee continues to meet regularly, helping to operationalize University decisions, and ensure coordinated communications and planning. HSRM is actively engaged in these and other campus planning committees.
• There was one Ministry of Labour, Training and Skills Development visit during the reporting period. The visit was as a result of an anonymous call from a retired employee. No orders were issued.
• WSIB lost time days decreased significantly in 2020 as compared with same period in 2019.

1. Training and Loss Prevention Initiatives

• The Environmental and Occupational Health Support Services (EOHSS) team continues to provide health and safety support to groups that are both working on campus and working remotely. A number of resources and guidance documents have been developed, and are available on the HR COVID-19 webpage. Views of the Occupational Health webpages have increased more than 200% in the past six months, over the previous six months – demonstrating the increased demand for support and guidance.

• EOHSS developed COVID-19 Awareness training for all members of the McMaster community. The training is mandatory for all individuals accessing campus. To date, 7,525 faculty, staff and students have completed the training.

• Non-medical face coverings have been ordered and received to be provided to all members of the University community for use in indoor public spaces. Two masks per individual are available for those required to be on site.

• Annual fire drills as required by the Ontario Fire Code have been completed for all campus buildings.

• EOHSS is preparing for a virtual recognition of Fire Prevention Week in Ontario during the week of October 5th, 2020. Content will be provided to help employees and students increase their fire safety awareness.

• The Central Joint Health and Safety Committee (JHSC) continues to convene virtually
Health, Safety and Risk Management Report 2020-4

with the most recent meeting occurring on September 16, 2020.

2. **Government Relations and External Inspections/Audits**

   - A Ministry of Labour, Training and Skills Development (MOLTSD) Inspector visited campus in July as a follow-up to an anonymous call from a retired employee. The inspector requested a copy of training records for Facility Services staff. Training records were provided, and no further action was required.

   - Notice was provided on August 28th, 2020 to the Hamilton Fire Department as per the Ontario Fire Code regarding the temporary unavailability of the fire pump in the Peter George Centre for Living and Learning. A fire watch was initiated by the University until the system was back online. The Hamilton Fire Department issued an order to the University under the Ontario Fire Code requiring the University to restore the building's fire pump to operating condition. The fire pump was restored to operating condition.

   - One WSIB claim for occupational illness due to noise-induced hearing loss was filed by a former employee. The claim was in Facility Services. In accordance with the Occupational Health and Safety Act, the MOLTSD needs to be notified upon any claim filed under WSIB regardless of approval status. The University maintains a noise control and hearing protection program which includes sound level testing in high noise areas, as well as employee training and instruction. MOLTSD has previously reviewed our noise program and had no concerns, as such, no follow up visit was required. [https://hr.mcmaster.ca/app/uploads/2019/01/RMM-403-Noise-Control-and-Hearing-Program.pdf](https://hr.mcmaster.ca/app/uploads/2019/01/RMM-403-Noise-Control-and-Hearing-Program.pdf)

3. **Employee Health Services Summary**

   3.1 **Critical Injuries**

   There were no critical injuries during this period.

   3.2 **Lost Time Update**

   The Employee Health Team (EHS) actively manages WSIB as well as salary continuance, sick leave, employee accommodation requests and long-term disability claims. EHS collaborates on a regular basis with departments and faculties to develop and maintain proactive strategies with the goal of helping employees stay at work and reduce lost time.

   The chart below illustrates the number of incidents, the number of WSIB-approved and pending claims for health care and lost time days, for the past four years.
In addition to the above 2020 lost time claims, additional lost time days emerging from incidents originating in previous calendar years are being tracked:

- 3 claims from incidents that occurred in 2019 are continuing to incur lost time in 2020. From January 2020 to August 31, 2020 these claims have a total of 377 additional lost time days. Of the 377 lost time days 160 days are still pending a WSIB decision
- 1 claim for 2017 continues to incur lost time which is an additional 174 days (Jan-Aug 2020)

There has been a significant decline in the number of claims in 2020 which is attributable to the remote working arrangements currently in place for most employees.

We also have experienced more complexity and less flexibility with our ability to provide modified work during this time. For example, if an employee works in a unit that has significantly decrease staffing such as hospitality services, we are unable to provide suitable modified work due to lack of available work.

4. Workplace Wellness Initiatives

Organizational wellness is supported by addressing the thirteen psychosocial factors related to the National Standard of Canada for Psychological Health and Safety in the Workplace. McMaster regularly hosts a wide range of activities and initiatives to promote wellness. Recent activities include:

- Development and delivery of weekly or bi-weekly employee well-being newsletters, resources, and 32 free virtual sessions on topics relating to stress-management, self-care, resilience, team engagement, recognition and appreciation, mental health, change and transition, family life and parenting, and more.
- Provided consultation and/or presentations to nine groups or departments on topics such as resilience, psychological health and safety, EFAP services, BIPOC wellness resources, mental health supports, among others.
- Provided strategic support and resources with groups organizing return to campus activities.

<table>
<thead>
<tr>
<th></th>
<th>2018 Jan-Dec</th>
<th>2019 Jan - Dec</th>
<th>2020 (Jan- Aug)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost Time Claims</td>
<td>20</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>Lost Time Days</td>
<td>127</td>
<td>363</td>
<td>23</td>
</tr>
<tr>
<td>Health Care Claims</td>
<td>69</td>
<td>69</td>
<td>26</td>
</tr>
</tbody>
</table>

In addition to the above 2020 lost time claims, additional lost time days emerging from incidents originating in previous calendar years are being tracked:
Continued to offer virtual meetings and education programs to help supervisors engage team members, create a psychologically safe space and manage workload in support of the National Standard.

Continued to develop and update online resources on our psychological well-being during COVID-19 [website](#).

Offered free weekly virtual yoga sessions for McMaster employees.

Developed and delivered challenges or campaigns related to: World No Tobacco Day, Journaling Challenge, Healthy Habit Building Challenge, Summer Photo Challenge, etc.

Distributed monthly Homewood Health Newsletters and additional supports related to COVID-19.

Managed the increase of Healthy Workplace Committee meetings to support the demand for new and changing community needs. The committee now meets virtually on a weekly basis instead of monthly.

Organized the development of new virtual nutrition classes in collaboration with Hospitality Services and in support of the Okanagan Charter. Sessions will be launched this Fall.

Supported McMaster research on remote work during COVID-19.
Looking Forward: Challenges and Priorities for the 2020/21 Year

As I highlighted at the Board Retreat in September, this is once again a highly unusual academic year, although for quite different reasons to the 2019/20 year of leadership transition. As Board members are well aware from receiving the various letters and updates from the University leadership, we continue to navigate our way through the COVID-19 pandemic, with a focus on providing the best possible teaching, learning, research and working environment, while working to respect Public Health guidelines and keep our community safe.

Against the backdrop of responding effectively to the global pandemic, we are also working through the visioning process launched last year. As you will have seen, following a range of consultations involving individuals from across the campus during the Spring and Summer, we have now begun a broader social media campaign: #ShapeTheFuture. This campaign invites faculty, students, staff and alumni to provide their thoughts on five big questions intended to help shape the future of McMaster. The feedback we receive will help determine a new vision statement and longer-term vision for the University, and will be followed by a shorter-term strategic plan intended to chart the course for McMaster over the next 2-3 years.

Priorities
In the meantime, as discussed at the Board Retreat, I am focused on the following seven priorities for the coming year:

Inclusive Excellence
The University has a robust EDI Strategy and Action Plan in place, and advancing and implementing the various elements of this plan will be a key priority over the coming year and beyond. Particular areas of focus include putting in place initiatives to address anti-Black racism, in collaboration with the African-Caribbean Faculty Association of McMaster University (ACFAM), including a program of strategic, targeted hiring; enhanced supports for Black faculty, staff and students; and the formalization of a mentoring program. Alongside this, we remain focused on Indigenous education and research and supporting the University’s Indigenous Education Council as they develop strategies to guide Indigenous learning and scholarship at McMaster.

Student Learning
Clearly, our response to COVID-19 has necessitated major changes to the teaching and learning environment. The University leadership is extremely mindful of the impact on students as they undertake their academic studies in this largely virtual environment, and is equally concerned by the additional burden placed on faculty and staff as they work to adapt pedagogical techniques and program content to the virtual environment. While we remain focused on ensuring that faculty, staff and students have the technological and other supports they need to succeed in this changed learning environment, and have developed a Virtual Learning Task Force to assist with this, we are also keen to harness the positive aspects and technological advances that have been made as we focus on active learning and ensuring the best possible educational experience.
Research and Scholarship
The ongoing pandemic has brought into sharp focus the importance of accurate data and research, and the need for interdisciplinary approaches to solve the biggest problems facing our world. McMaster has the ability to make a huge and positive impact at the local, regional and global level in areas ranging from pandemic preparedness to climate change, social justice, Indigenous Ways of Knowing and advanced manufacturing (to name just a few). The impact of our research and scholarship, particularly as it relates to the UN Sustainable Development Goals, is accordingly a key area of focus over the coming year. The launch of the Brighter World Research Initiative with the initial focus on The Global Nexus for Pandemics and Biological Threats provides a means to focus our revenue-generation efforts in support of our researchers and demonstrate the global impact of the work undertaken in labs and offices across our campus.

Community Engagement
As a leading institution within the City of Hamilton, McMaster has a critically important role to play in the transformation of Hamilton and our region. Our research and scholarship has direct local impact, as does the engagement of our students and scholars in initiatives such as CityLAB, McMaster Innovation Park and The Forge. Throughout the pandemic we have positioned the University as a key partner and support, working closely with our hospital partners, as well as with the City and Public Health Hamilton. Looking to the future, the University will continue to perform this role and will no doubt be an important part of the economic and social recovery of Hamilton. Working closely with McMaster Innovation Park, we seek to position Hamilton as a recognized hub for innovation and knowledge translation. In addition, as part of our access strategy we are focused on enabling access to the University for members of our local community, and developing pathways for those who may not otherwise have seen a University education as a viable option.

Commercialization
As mentioned above, the translation of research and generation of revenue are critically important to the success of the University and our region. We are developing a broad conception of commercialization focused on ensuring the maximum impact, in terms of positive societal benefit, as well as revenue generation, of the research undertaken on our campus. As we build closer relations with McMaster Innovation Park and develop a clearer working partnership, we have the opportunity to support the commercial and entrepreneurial ambitions of our faculty and students at the same time as providing economic benefit to the University, the City and the region. Extra-curricular initiatives such as The Forge, as well as dedicated programming relating to commercialization and knowledge translation, continue to be extremely valuable to the growth and advancement of our students.

International Engagement
The restrictions on travel arising as a direct result of COVID-19 have changed the way we collaborate and engage at an international level. Nonetheless, international research collaborations and partnerships continue to flourish as our researchers and scholars find ways to connect and continue their research in the virtual environment. McMaster remains focused on building effective international partnerships and on raising the standing and profile of the University at a global level. Promoting the impact of our research through our participation in the UN Sustainable Development Goals Impact rankings has been extremely valuable in this regard.
We are also reviewing our international enrolment activities and are focused this year on ensuring the best possible support for our graduate and undergraduate international students, whether they are located on campus, or joining us remotely.

**Operational Excellence**
Building on the HR Review and the IT Services Review before that, we are committed to modernizing and streamlining administrative systems and processes across the University. To ensure the best possible support for our faculty, staff and students it is vital that we have professional and efficient administrative processes in place. A great deal of positive progress has been made in implementing the recommendations of the HR Review and our ongoing work with Uniforum provides the opportunity to review current working practices and benchmark against our peers with regard to a detailed range of key administrative services and supports.

**Challenges**
I have already touched on some of the challenges, many of which are focused around finding effective ways to operate the University in a largely virtual environment, ensuring that our faculty, students and staff have the supports, guidance and technology they need to learn, work and study effectively, as well as the social, mental and emotional supports needed to manage the remote teaching, learning and working environment. The mental and emotional toll of the last few months on members of our community cannot be overestimated; the level of fatigue as we grapple with managing the pandemic at the same time as we all undertake our regular duties in a completely changed environment is a particular cause for concern.

Aside from operating the University on a day to day basis, we are also working to manage and contain COVID-19 outbreaks in our communities, and continuing to monitor our budget, ongoing financial planning and risk profile so that we can understand the overall impact of the pandemic and make any adjustments as they are needed.

Alongside this, our focus on EDI has been amplified and accelerated by broader societal events affecting the Black and Indigenous communities, in particular, and we are working as an institution to understand and address systemic inequities and effect positive and concrete change across the Institution. Board Members received the letter I sent to the community over the summer outlining plans to address some of these issues and ensure that we are making positive progress to address racism and all other forms of discrimination on our campus.

In an effort to understand better the climate on campus and, in particular, the experiences of racialized and marginalized students, the University is also preparing to undertake a climate survey, which will be led by Arig al Shaibah and Sean Van Koughnett. The goal is to review the holistic student experience to ensure that the University has the programs and services in place to support a positive experience for students across our diverse community.

As Board Members may be aware, linked to the Black Lives Matter movement and as part of the broader societal campaign to defund Police Services, the University has received calls to remove Special Constables from our campus, end our working partnership with Hamilton Police Services, remove the current Director of Security and Parking Services, divert funding from Security Services to racially and culturally diverse mental health support, harm reduction
programs, food and housing security for students, commit to not hiring private security services and develop a reimagined security plan.

Since McMaster’s Security and Parking Services provide a wide range of services and supports, that are not necessarily well publicized or understood, I attach to this report an Addendum providing additional details about the role, mandate, training and funding of Security Services for the information of Board Members.

CAMPUS UPDATE

Rankings Update
McMaster has been ranked 69th in the world by the 2021 Times Higher Education rankings, and is one of only four Canadian universities in the world’s top 70. McMaster advanced three spots over last year, and continues the University’s steady path of improvement, moving from 113 to 69 in just four years.

Building on the Institution’s overall performance, McMaster’s Clinical and Health programs are now ranked 11th in the world, moving up from 26th in last year’s rankings. McMaster ranked 79th globally in Life Sciences. Other subject areas, including Engineering, Physical Sciences and Social Sciences, also experienced significant improvements.

McMaster was also top-ranked in Canada in the areas of citation impact and industry income.

This year’s Times Higher Education World Ranking measured the performance of 1,527 universities from 93 countries using a number of performance indicators in the areas of teaching, research, citations, international outlook and industry income.

Awards and Accolades
Mark Loeb and Dawn Bowdish, both Professors of Pathology and Molecular Medicine in the Faculty of Health Sciences, are being honoured by the Royal Society of Canada.

Dr. Loeb, who is internationally recognized in the field of infectious diseases clinical trials and epidemiological studies, is a new Fellow of the Royal Society. He is known for his work on influenza vaccination and herd immunity in Canadian Hutterite communities, and for a pivotal trial on respiratory mask protection against influenza. He has also conducted influential clinical trials on prevention and management of infections in nursing home residents.

Dr. Bowdish is a new Member of the College of New Scholars, Artists and Scientists. She studies how the immune system changes with age and how these changes impact healthy or unhealthy aging and susceptibility to infections. She and her team work to uncover how the aging immune system and the microbes that live in and on us, known as microbiota, interact in order to prevent infections and give older adults more years of healthy, independent living. She holds the Canada Research Chair in Aging and Immunity.
Research Funding
As we look to the priorities and challenges of the upcoming academic year, McMaster remains at the forefront of COVID-19 related research.

McMaster to create and lead new International Nexus for Pandemics and Biological Threats
McMaster has launched The Global Nexus for Pandemics and Biological Threats, to ensure Canada and the world are better able to manage the human and economic devastation of COVID-19, avert future pandemics and mitigate global health threats like antimicrobial resistance. The Nexus will be an international network of scientists, clinical health and medical specialists, engineers, social scientists, history and policy researchers, economics and business experts. This work has been accelerated by a $2M investment from Canadian philanthropist and entrepreneur, Stephen Jarislowsky, which will enable the creation of a new research chair in pandemic research and prevention at McMaster and act as a cornerstone of The Global Nexus.

McMaster HealthLabs, Air Canada and Greater Toronto Airports Authority to conduct a voluntary COVID-19 study of International Travellers
McMaster HealthLabs, Air Canada and the Greater Toronto Airports Authority are partnering on a voluntary COVID-19 study of international travellers arriving at Toronto Pearson International Airport. The study’s core purpose is to gather information to explore the effectiveness of various quarantine periods for travellers. McMaster HealthLabs is a non-profit organization that develops COVID-19 research initiatives and testing solutions to accelerate business recovery during the pandemic.

McMaster heads Network to study deadly Blood Infections
A new McMaster University-based network will bring together researchers and patients to tackle sepsis—a leading cause of death in COVID-19. Hamilton MP Filomena Tassi announced an investment of $5.7M by the federal government, through the Canadian Institutes of Health Research (CIHR), to support Sepsis Canada.

Community Engagement

Socrates Project hosts three-day Festival of Ideas
The SHIFT 2020 festival, which ran from September 23 to 25, included virtual panel discussions, conversations, concerts and other events and featured contributions from community members from all ages and walks of life. High profile guests and panellists included Margaret Atwood, Naomi Klein, and Jeremy Dutcher.

iPadsforPatients connects people in hospital with their loved ones
Inspired by a similar campaign in New York City, Biochemistry Student, Aaron Hou, and friends decided to collect refurbished iPads and other devices to donate to local hospitals and help connect isolated patients with their loved ones.
Student Success

**Data on Archway Program show that first-year students are making connections**
Since it started this summer, the Archway Program has connected more than 8,000 first-year students with mentors. More than 200 communities, which include a coach, a mentor and about 40 students, are active on Microsoft Teams, and more than 4,000 one-to-one conversations between students and mentors have been logged so far.

**Letters of inspiration to welcome the Class of 2024**
Since 2018 McMaster’s Alumni Association has reached out to alumni each year to send inspiring words to the incoming class of students. This year, the Alumni Association is donating $1 to the Access Strategy Fund for every piece of advice. To date there have been over 900 messages submitted from 18 countries, including notes from graduating classes as far back as the 1950s.

**Virtual Learning Task Force Established**
A dedicated group to assess and address issues arising from the virtual learning environment has been established. Reporting to the Provost and Co-chaired by the Deans of Engineering and Social Sciences, the Virtual Learning Task Force will bring together the MacPherson Institute, technology experts, faculty members and others to support the best possible online learning experience. The Task Force is charged with identifying a coherent process for collecting feedback from both students and faculty, seeking solutions, sharing best practices and preparing a report to inform virtual teaching and learning best practices for the Winter 2021 term.
ADDENDUM TO PRESIDENT’S REPORT TO
McMASTER UNIVERSITY’S BOARD OF GOVERNORS:
OVERVIEW OF SECURITY SERVICES

Overall Mission
The mission of McMaster University Security Services is to create a safe and secure place to live, work, study and conduct research, and to protect lives and property. The Department is committed to a community-based approach, which promotes shared responsibility for preserving peace, preventing crime and enhancing community safety.

As Board Members know, the University is a large campus, with roughly 300 acres of property and over 60 buildings, including over 4,200 residence spaces for students living on campus. On a typical day in a regular academic year there are upwards of 30,000 people on our main campus. Security Services patrols campus and campus facilities and offers education, training and support to all students, faculty and staff, in addition to visitors.

Security Services is the first response system for campus, providing help when first aid is needed, supporting students who are at risk, creating safety plans for anyone on campus whose personal safety is at risk, acting as the first responder for any fire alarms, and protecting the security of campus facilities and property.

McMaster’s Security Services call centre also acts as a 9-1-1 system for campus.

Priorities
The Department articulates three key priorities:

1. Preventing Violence, Sexual Violence and Violence Against Women on Campus – in undertaking this work, Security Services works closely with the Sexual Violence Prevention and Response Office, the Student Wellness Centre and Human Resources Services;
2. Providing Mental Health and Wellness Support to Students, Faculty and Staff – Security Services provides a 24/7 service as first responder, which involves responding to calls and providing support, education, referral to services, and other actions as needed. All officers are trained in mental health, de-escalation and intervention and work closely with the Student Wellness Centre and other campus units; and
3. Addressing Drug and Alcohol Use and Abuse – including connecting community members with appropriate on and off-campus supports and resources.

The Role of Security Services at McMaster
Security Services responded to more than 4,000 campus incidents in 2019. These included more than 700 first aid calls, in addition to a wide range of incidents on campus ranging from people requiring assistance, service malfunctions, incidents involving safety and liability, motor vehicle incidents and alarms, reports of theft, property damage, complaints of harassment,

As a brief overview, Security Services undertakes the following work on campus on an ongoing basis:

- Conducts safety/security reviews
- Enforces Federal and Provincial Laws, Municipal by-laws
- Enforces traffic violations on campus with the aid of laser radar
- Investigates, makes arrests and lays charges if necessary
- Liaises with Hamilton Police and other Policing Agencies
- Maintains communications with local police, fire and ambulance services
- Monitors campus CCTV cameras
- Operates campus lost and found services
- Patrols the campus 24 hours a day, 365 days a year
- Provides escorts outside of Student Walk Home Attendant Team (SWHAT) hours
- Provides medical assistance and transportation
- Provides crime prevention programs
- Responds to and investigate all offences and emergencies on the campus

Security Services does not request or track demographic data, and does not have information regarding the race of individuals with whom they interact.

During the COVID-19 pandemic, Security Services staff have been instrumental in ensuring both the security and safety of campus as we accommodate essential services and support the limited return to campus for faculty, staff and students who need access to campus for their research, work or studies.

**Staffing and Funding**

McMaster Security Services has around 30 staff including a Director, Security Manager, an Administrator, four Sergeants, one Investigator, ten full-time Special Constables, eight part-time Special Constables, two technology specialists, one part-time Customer Service Clerk, and three Dispatchers. The Security Services office is located in the E.T. Clarke Centre and is staffed 24/7.

The total security budget in 2020/21 is $3.69 million, or a little less than 0.5% of the operating budget of the University. This pays for all of the services provided by the Department, including salaries and benefits; equipment; all security information technology on campus such as the swipe card entry system for buildings, labs and teaching spaces, emergency phones and elevator emergency phone systems, radio systems; education programs run for the campus and training. The Department has also developed and operates the University’s Safety App and Emergency Text and emergency alarm systems. In order to provide a balanced budget in fiscal 2021/22, Security Services has made deferred several purchases and will keep a number of Special Constable positions vacant during 2020/21.
In addition, the budget covers the cost of contracted security at off-campus McMaster locations (One James North, David Braley Health Sciences Centre and the Ron Joyce Centre in Burlington). These locations contract services from private security firms that employ security guards. Hamilton Police Service or Burlington Police Service are more involved in the day-to-day incidents in these locations.

**Special Constable Status**

McMaster security staff are Special Constables, also known as sworn peace officers. They are employees of McMaster and receive Special Constable status under the Police Services Act. This status helps support the safety of the McMaster campus and community as it allows security staff to enforce the Criminal Code of Canada, Federal and Provincial statutes, as well as municipal by-laws on the University campus.

All Special Constables are accountable to the policies and codes of conduct at McMaster and they are also accountable to the province’s Office of the Independent Review Director. Complaints can be filed with this office. This is a higher level of accountability than that imposed on a traditional security guard.

This model is used on some, but not all, University campuses. With the exception of Newfoundland, New Brunswick and British Columbia, every province in Canada has sworn Special Constables working on university campuses. Ontario has the highest concentration of universities in Canada and the largest number of campuses with Special Constables with approximately 200 Special Constables in Ontario employed at nine universities and one college: Brock University, Carleton University, Guelph University, McMaster University, University of Toronto (Mississauga, St George, and Scarborough campuses), University of Waterloo, University of Windsor, Western University, Wilfrid Laurier University and Fanshawe College.

Within the U15 group of universities, Alberta, Montreal, Saskatchewan, Toronto, Waterloo and Western, along with McMaster, utilize the Special Constable model.

**Training**

Security Staff and Special Constables undergo extensive training every year. This training is done in partnership with internal offices, including the Equity and Inclusion Office, as well as external organizations.

Mandatory training includes a wide range of safety and security topics:

- Ethics and accountability
- Victim’s rights
- Recognizing and using trauma-informed sexual assault approaches to reduce the impact of trauma and enhance recovery
- Crisis intervention and de-escalation
- Mental health awareness
- Hate crime awareness
- Partnering with the Indigenous community
• Discrimination and harassment
• Violence and harassment in the workplace
• Domestic violence
• Management of public demonstrations
• Respect in the workplace

Crisis intervention training is a 40-hour course focused on support and service to persons in crisis and responding to mental health issues. This course is taught by mental health professionals, psychiatrists and mental health workers. Special Constables are required to take annual recertification training which includes a variety of topics including trauma-informed sexual assault approaches and domestic violence-criminal harassment.

Training for supervisors is supplemented with courses in addressing critical incidents, supervision, leadership, self-managing supervisors, and suicide awareness.

Working Together

Security Services addresses issues of safety, including those that intersect with harassment, discrimination and sexual violence, in consultation and collaboration with the Equity and Inclusion Office (EIO). Security Services partners with the EIO, as well as Student Affairs, and Human Resources Services, when there is imminent risk to the safety and security of campus community members. The partnership with these units is essential and Security Services has committed to a robust ongoing training program to ensure their staff team is trauma-informed and culturally-responsive.

McMaster Special Constables have partnered with Interval House in relation to protecting women from sexual violence. Thirteen current members have been trained in its Be More Than a Bystander program focused on men talking to men about issues of consent, responsibility for behaviour, protecting vulnerable women and support. In addition, Security Services led the initiative for Athletics and Recreation staff to receive this training as well.
REPORT TO THE BOARD OF GOVERNORS

from the

AUDIT AND RISK COMMITTEE


The Audit and Risk Committee now recommends,

that the Board of Governors approve the Annual Financial Report 2019-2020, which includes the Audited Financial Statements for the year ended April 30, 2020.

ii. Appointment of External Auditor for 2020-2021

At its meeting on October 1, 2020, the Audit and Risk Committee reviewed and approved the re-appointment of KPMG LLP as the external auditors for McMaster University for 2020-2021.

The Audit and Risk Committee now recommends,

that the Board of Governors approve the re-appointment of KPMG LLP Chartered Accountants as the Auditors for McMaster University for the 2020-2021 fiscal year.
Inside Cover Theme:
The 2019/20 Annual Financial Report focuses on the unprecedented global pandemic event that unfolded during the academic year. Throughout this report, images capture some of the many ways that the University has responded to the challenge. It highlights key University researchers and student contributors in the fight to address the novel coronavirus disease 2019 (COVID-19).

Additionally, images capture the support provided to the community by some of the University’s essential workers and donations made by the University to our Hamilton healthcare partners, as well as the ingenuity of faculty and students in adapting to the new teaching and learning environment.
Results of 2019/20 financial year demonstrate the initial impact of the global pandemic declared on March 12, 2020, just 49 days before McMaster’s financial year-end. The impact of COVID-19 during this reporting period mainly affected the ancillary support services such as housing, hospitality, campus stores, parking and more, due to the physical campus shutdown. Key decisions made resulted in partial refunds for services not able to be performed and waivers for charges, such as parking fees, not being used. Further, additional funding was invested into student financial aid while other decisions such as interest-free periods and other student fee waivers or eliminations will mainly affect the 2020/21 fiscal year. In parallel to these financial impacts, the University transitioned to a virtual working environment for all non-essential staff. The University initiated its Crisis Management Committee, which has transitioned to a “Back to the Future” team composed of key academic and administrative personnel from across the University. While shutting down operations across campus, including most research activities, the University donated a significant amount of personal protective equipment (PPE) to the Hamilton hospitals. Overall, March and April demonstrated McMaster’s significant commitment to the safety of its students, faculty and staff, and its collaborative support responding to broader Hamilton community needs. Finally, significant recognition and thanks go to the University’s essential workers who remained on campus throughout the closure to provide services for stranded students and maintain core essential operations. McMaster’s consolidated revenues remained just under $1.2 billion, despite being 2.7% lower than 2018/19 results. Consolidated revenues include the activities across operating, capital, research, trusts, and ancillary funds. Revenue increases were realized in the Operating Fund, mainly driven by increased domestic enrolment and a growing international participation of 15.1% (2018/19: 13.1%), which more than offset the 10% domestic tuition reduction. Contributing to improved tuition revenue are increases in fees for non-government-funded programs not subject to the legislative cap, notably the McMaster English Language Development diploma program for prospective international students. Overall, academic revenues increased due to enrollment while the domestic operating grant remains relatively flat to 2016/17 levels. Market volatility due to COVID-19 resulted in a -1.9% return on investments compared to 6.0% last year, or $44.4 million less investment income, which is the most significant income impact to the 2019/20 results. Ancillary revenues dropped $2.2 million due to closures and refunds. Finally, research revenues were slightly lower as a result of closures.

Annual expenditures primarily relate to faculty and staff who advance, sustain, and support McMaster’s academic and research mission. In 2019/20, the University continued plans to increase the faculty complement, reflecting needs associated with student growth and the increased capacity delivered by the opening of the Peter George Living and Learning Centre in the fall of 2019. Employee expenditures remain over 60% of the University’s annual costs and include pension and other non-pension costs. During the year, McMaster elected to contribute an additional $4.7 million into the closed hourly pension plan and file early on January 1, 2020 to transition the plan to a more sustainable annual payment schedule. The salaried plans continue to have large funding deficits, with most notable impacts resulting from the Bank of Canada interest rate decline totalling 0.75% during the reporting period. The large non-pension plan deficit has an internal reserve being funded to fully service this obligation in the future.

Each year, McMaster monitors reserve funds against future obligations and liabilities while also ensuring internal funds are available to invest in strategic and capital priorities. Each reserve held by the University has a specific purpose and full disclosure of each balance is provided in the notes to the financial statements. Redirection or spending of any reserve for a different purpose than intended increases the risk that funding for committed obligations may not otherwise be available.

**Tracking Coronavirus Outbreaks with Wastewater**

Scientists hope testing wastewater will address the current limitations of clinical COVID-19 testing which include the availability of reliable test kits, false positives, cost logistics and lingering issues of identifying those who may be mildly symptomatic or asymptomatic.
when needed. Further, reserves established for existing obligations promote intergenerational equity so that future generations are not burdened by historically created liabilities. Reserves held within the Faculties are used for strategic and capital investments, however these reserve balances are only a partial and temporary financial offset to existing pension and non-pension deficits associated with these areas. During the year, due to COVID-19 some intended transfers to capital projects were held back awaiting a better understanding of the operational challenges in the year ahead. These transfer deferrals do not impact any of the approved capital projects due to delays occurring on non-essential construction work. Reserves held will help the University achieve strategies associated with changing needs of students driven by fluctuating circumstances affecting how McMaster will operate in the future. Further, some reserves are intended to help the University achieve strategies and milestone targets associated with the gradual implementation of the third Strategic Mandate Agreement, delayed due to COVID-19.

The 2019/20 excess revenues over expenditures was $92.1 million compared to $157.0 million in the previous year. This figure includes a $28.9 million surplus in the Operating Fund, with total appropriations predominantly held by the Faculties or within the Provost’s academic priorities envelope. Excess revenues over expenditures are a result of McMaster’s prudent approach to budgeting and financial planning for the University to ensure availability of funds for both current and future obligations. As such, McMaster has maintained strong and stable credit ratings of AA from both Standard and Poors and DBRS.

This 2019/20 Annual Financial Report includes new climate-related financial disclosures for the long-term investment pool (Investment Pool) aligned with the University’s early adoption of the Task Force Recommendations for Climate-Related Financial Disclosures (TCFD). Future reports will include additional disclosures beyond the governance, risk management and carbon footprint, adding base year measurement disclosure relative to further carbon reduction targets. Since 2016, the University has continually transitioned toward lower carbon. Additional work is underway to factor in sustainable development goals (SDGs) with the belief that organizations that operate with higher environmental, social and governance requirements linked to SDGs will be more profitable and sustainable in the future. The new disclosures in this report demonstrate continued progress related to the recommendations of the President’s Advisory Committee on Fossil Fuel Divestment.

Research income of $173.7 million is slightly lower than prior year income of $178.0 million. Income reflects current year research expenditures, which were impacted with campus shutdowns due to COVID-19. Research funding received in the year increased to $196.5 million compared to $193.7 million in 2018/19, which includes new funds received at the end of the year for COVID-19 research. Research otherwise remained relatively steady and stable.

The information contained in this Annual Financial Report is intended to provide the reader with financial information for the fiscal year ended April 30, 2020. While the focus of this document is the consolidated operations of all funds on an accrual basis, extended variance analysis information regarding the Operating Fund results, which operates on a modified cash basis for budgeting and accounting purposes, has been included on page 21.

Other documents to which the reader can refer to provide a more in-depth discussion of the University include:

- Strategic Mandate Agreement Goals and Priorities
- Consolidated Budget – June 2020
- University Fact Book

“Every municipality is unique in terms of size, processes, resources, and technical expertise. What we really need is an agile system-wide approach to ensure we understand these challenges and collectively identify feasible and cost-effective rapid testing technologies and methods which can be employed as part of the existing testing framework for Ontario’s wastewater systems.” – Zobia Jawed, Professor, W. Booth School of Engineering Practice and Technology
By the Numbers

$598,300,000
Available expendable resources vs. $607,700,000 last year

$1,161,000,000
Total revenue vs. $1,193,000,000 last year

$1,068,900,000
Total expenses vs. $1,036,000,000 last year

$28,900,000
Excess of revenues over expenses vs. $25,000,000 last year

$127,900,000
Capital spending vs. $148,000,000 last year

$92,100,000
Excess of revenues over expenses vs. $157,000,000 last year

$1,068,900,000
Total expenses vs. $1,036,000,000 last year

$22,800
Endowment per FTE students vs. $24,500 last year

$36,200
Revenue per FTE students vs. $38,600 last year

$1,185,400,000
Total net assets vs. $1,220,900,000 last year

$(277,200,000)
Non-pension employee future benefit unfunded obligation vs. $(274,700,000) last year

$(171,200,000)
Pension employee future benefit unfunded obligation vs. $(82,600,000) last year

$28,900,000
Excess of revenues over expenses operating fund only vs. $25,000,000 last year

32,063
Enrolment (full time equivalent (FTE)) vs. 30,894 last year

7,954
Staff and Faculty head count vs. 7,772 last year
TOTAL REVENUES
- Revenues decreased 2.7% to $1,161.0 million from $1,193.0 million.
- Investment income decreased by $44.4 million (-62.7%) due to a -1.9% rate of return in the Investment Pool compared to 6.0% in the prior year.
- Tuition income increased by $19.0 million (5.6%) despite the 10% tuition rate cut for domestic students due to increased enrolment at both the graduate and undergraduate level, rate changes for international students, and new programs.
- Enrolment-based operating grants remained frozen at 2016/17 levels. A small increase in graduate funding was offset by the international student recovery.
- Ancillary sales & other fees decreased by $6.6 million (-2.3%) primarily due to operational closures effective mid-March as a result of COVID-19.

TOTAL EXPENSES
- Expenses increased 3.2% to $1,068.9 million from $1,036.0 million.
- Salaries and wages increased by $22.7 million (4.4%) due to the addition of faculty members and staff along with negotiated pay increases.
- Employee benefits increased by $12.0 million (9.9%) primarily due to increased benefits costs and enhanced funding requirements for pension plans.
- Supplies and services decreased by $7.2 million (-2.3%) due to mid-March operational closures related to COVID-19 and Ministry of Colleges and Universities (MCU) mandated changes to undergraduate scholarships.

TOTAL ASSETS
- Total assets increased 1.4% to $2,937.3 million from $2,896.6 million.
- Capital assets increased by $49.7 million (4.3%) related to $127.9 million in capital additions for new buildings and equipment less $78.2 million in amortization.
- Investment holdings decreased by $36.2 million (-2.4%) due to the -1.9% return on investments, with gains on short- and medium-term investments offset by losses on long-term investments.

TOTAL LIABILITIES
- Liabilities increased 4.5% to $1,751.9 million from $1,675.7 million.
- Employee future benefit liabilities increased by $91.2 million (25.5%) primarily due to a lower interest rate and return on asset expectation (due to COVID-19) used to measure the pension liability as at April 30, 2020.
- Current liabilities decreased by $9.0 million (-4.9%) related to a decrease in accounts payable and accrued liabilities, attributed to decreased activity at year-end as a result of COVID-19.
- Deferred contributions and long-term obligations remained relatively flat year over year with additions and deductions resulting in small balance changes.

NET ASSETS
- Net assets decreased 2.9% to $1,185.4 million from $1,220.9 million.
- Employee future benefit reserves decreased by $72.2 million (25.1%) due to market volatility affecting pension plan returns, partially offset by transfers from other internal reserves as part of the funding strategy for post-retirement benefits.
- Equity in capital assets increased by $70.9 million (17.8%) mostly related to the capital plan approved investments.
- Internal and external endowments decreased by $33.9 million (-5.2%) due to market volatility and the net negative return on investments.
LONG-TERM DEBT
- Long-term debt primarily relates to two $120.0 million bonds maturing in 2052 and 2065, respectively. Two sinking funds (reserves), currently valued at $34.0 million, exist to repay these debts upon maturity.
- The debt service coverage ratio worsened to 10.8 from 15.4 due to the decrease in net income.
- Total long-term debt decreased due to the $0.7 million principal re-payment on the bank loan maturing in May 2033.

AVAILABLE EXPENDABLE RESOURCES (AER)
- AER represents funds held that are not externally committed, such as unrestricted net assets, specific purpose reserves, faculty and department appropriations, and internally restricted endowments.
- AER remained relatively flat as it decreased 1.6% to $598.3 million from $607.7 million.
- AER is internally restricted for specific purposes such as future financial obligations to settle debt, fund pensions and non-pension liabilities, and invest in strategic and capital priorities. The financial statement notes provide full descriptions of each reserve held for future cost requirements.

TRUSTS AND ENDOWMENTS
- McMaster’s internal and external trusts and endowments decreased 3.4% to $731.9 million from $757.7 million as a result of the investment losses in the long-term investment pool.
- Endowment funds per student declined as student enrolment increased.

DEFERRED MAINTENANCE
- McMaster has been addressing its deferred maintenance backlog with funding from multiple sources.
- In both 2019 and 2020, changes to methodology were implemented to harmonize with colleges, including implementation of a soft cost multiplier, generation of automatic maintenance requirements, and calculation based on three years instead of five years.
- The new approach is considered more accurate across the Ontario higher education sector, but it is not comparable to prior years’ assessments. An additional reassessment cycle is expected to further substantiate maintenance requirements.
- Where required, asbestos abatement is conducted by external contractors as part of building renovations and is not included in the deferred maintenance backlog.

OPERATING FUND – NET EXPENDITURES BY ENVELOPE
- Operating Fund net expenditures increased 1.4% to $703.2 million from $693.6 million.
- Academic and student support increased 1.4% as a result of support for increased enrolment, with some savings due to delayed spending and the impacts of COVID-19.
- Facilities support decreased 2.9% with reduced maintenance costs and gas savings, and a reduction in loan payments, partially offset by increased investment in deferred maintenance.
- Institutional support increased 8.9% due to increased legal expenses and provision for bad debts, and a reduction in recoveries for telecommunication equipment.
- Institutional priorities decreased 2.0% due to additional base support for marketing.
Revenues

Total revenues decreased by $32.0 million (-2.7%) to $1,161.0 million (2018/19: $1,193.0 million) reflecting revenue per student of $36,209 (2018/19: $38,617). Revenue decreases relate to a $44.4 million decrease in net investment income, mainly offset by a $19.0 million increase in tuition fees. McMaster continues to focus on new revenue generation opportunities with increased research spin-off and real estate investments, public-private partnerships, and other non-traditional areas.

Within the academy, revenue growth and diversification across international student participation is a key priority, while actively managing existing revenue streams to optimize investments in the student experience, academic and research mission.

OPERATING GRANTS INCOME

Operating grants from the Ministry of Colleges and Universities (MCU) remains relatively flat for domestic undergraduate enrolment at 2016/17 levels under MCU’s corridor funding model. In real terms, the operating grant amount reflects lower grant revenue per year due to inflation not factored into the annual funding amount.

RESEARCH GRANTS AND CONTRACTS

Research revenue is recognized as income in the year related expenditures occur. Unspent research funding is reflected as deferred contributions. McMaster’s research revenue does not include funding received and administered by affiliated hospitals or Networks of Centres of Excellence. Research funding receipted in the year increased by $2.7 million (1.4%) to $196.4 million (2018/19: $193.7 million) as shown in Figure 1, including new grants received at the end of the year for COVID-19 research. Research expenditures decreased by $4.3 million (-2.4%) due to suspension of on-campus activity in March, resulting in $173.7 million in research revenue recognized (2018/19: $178.0 million).

Figure 1: RESEARCH REVENUE: RECEIPTED VS RECOGNIZED IN INCOME – $ THOUSANDS

RESEARCH OVERHEAD GRANTS

Research overhead grants increased slightly by $0.2 million (1.1%) to $15.6 million (2018/19: $15.4 million) related to more overhead-eligible awards received. Overhead grants assist the University in defraying indirect costs associated with hosting research activities. The federal and provincial governments contribute indirect costs based upon a portion of the total direct federal research grants and eligible provincial research programs.

“For our industry partners, we’re looking at improving their productivity, reducing their costs, and helping them improve their products. That was something we were naturally doing, and now with COVID-19, we’ve been able to really focus on medical applications.” – Steven Veldhuis, Director, McMaster Manufacturing Research Institute

USING MANUFACTURING EXPERTISE TO PRODUCE PERSONAL PROTECTIVE EQUIPMENT

When the COVID-19 pandemic made its way to Hamilton in mid-March, the McMaster Manufacturing Research Institute (MMRI) team immediately shifted their manufacturing expertise to work within the medical supply chain.
TUITION FEES
Revenue from tuition fees increased by $19.1 million (5.6%) to $360.7 million (2018/19: $341.6 million). Domestic enrolment increased 1.7% in 2019/20, however the 10% tuition cut mandated by MCU resulted in a $17.0 million (7.4%) decline in domestic tuition revenue. International students pay higher fees than domestic tuition rates since there is no domestic operating grant to support or defray the costs of these students. The combination of a 19.7% increase in international enrolment and higher international fees increased international tuition revenue by $32.7 million (33.4%). International students now account for approximately 15.1% (2018/19: 13.1%) of the total student population. Contributing to improved tuition revenue are increases in fees for non-government-funded programs not subject to the legislative cap, notably the McMaster English Language Development diploma program for prospective international students.

ANCILLARY OPERATIONS
Ancillary operations provide essential support services across the University, such as housing, food services, parking, campus stores, continuing education, and media/print production. Ancillary units are responsible for providing efficient and affordable services while covering all related operating and capital expenditures. Additionally, ancillaries contribute approximately 4.5% on sales toward direct student support and the Operating Fund while also providing employment opportunities to students.

A summary of ancillary sales by unit is shown in Table 1. Ancillary sales were impacted by the pandemic mid-March closure, with lost sales and student refunds decreasing revenue by $2.2 million (-2.9%) to $76.0 million (2018/19: $78.2 million). Hospitality Services experienced the greatest revenue decline, decreasing sales by $1.5 million (-5.7%) due to location closures as a result of COVID-19. Parking Services sales dropped $0.9 million (-14.1%) resulting from eliminating parking charges mid-March and raising of parking gates for essential workers starting in the latter part of March. Campus Store sales declined $0.9 million (-6.0%) as a result of shifting from traditional course materials to digital and open educational resources content as well as moving away from technology hardware. Media Production Services decreased total sales $0.1 million (-3.2%) due to the one-time wayfinding project completed last year.

Table 1: SALES BY ANCILLARY OPERATIONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing and Conference Services</td>
<td>24,849</td>
<td>26,110</td>
<td>27,231</td>
<td>27,792</td>
<td>28,440</td>
</tr>
<tr>
<td>Hospitality Services</td>
<td>23,764</td>
<td>25,303</td>
<td>27,641</td>
<td>27,240</td>
<td>25,696</td>
</tr>
<tr>
<td>Campus Store</td>
<td>15,552</td>
<td>16,364</td>
<td>15,897</td>
<td>14,978</td>
<td>14,073</td>
</tr>
<tr>
<td>Continuing Education</td>
<td>6,740</td>
<td>7,006</td>
<td>7,183</td>
<td>7,759</td>
<td>8,342</td>
</tr>
<tr>
<td>Parking</td>
<td>5,016</td>
<td>5,252</td>
<td>5,821</td>
<td>6,222</td>
<td>5,345</td>
</tr>
<tr>
<td>Media Production Services</td>
<td>3,958</td>
<td>3,742</td>
<td>4,190</td>
<td>4,331</td>
<td>4,194</td>
</tr>
<tr>
<td></td>
<td>79,879</td>
<td>83,777</td>
<td>87,963</td>
<td>88,322</td>
<td>86,090</td>
</tr>
<tr>
<td>Less internal sales</td>
<td>(9,573)</td>
<td>(9,504)</td>
<td>(10,851)</td>
<td>(10,120)</td>
<td>(10,131)</td>
</tr>
<tr>
<td></td>
<td>70,306</td>
<td>74,273</td>
<td>77,112</td>
<td>78,202</td>
<td>75,959</td>
</tr>
</tbody>
</table>

Since March, more than 50 companies have worked with McMaster’s Centre of Excellence in Protective Equipment and Materials (CEPEM) to set up production facilities, test PPE designs or modify materials needed to make new designs. Two of these companies, Whitebird and Niko Apparel, are now producing about 65,000 face shields and 20,000 face masks each day for healthcare workers, respectively.
INVESTMENT INCOME
The long-term investment pool (Investment Pool), consisting of both endowed and non-endowed funds, earned a total rate of return of -1.9% (2018/19: 6.0%). This return is net of investment management fees approximating 0.3%. The Investment Pool achieved a total rate of return before investment management fees of -1.65% (2018/19: 6.3%) compared to the investment policy benchmark return of -1.1% (2018/19: 7.3%). The April 30, 2020 four-year annualized return for the Investment Pool is 6.4% which is better than the investment policy benchmark return of 5.7%.

Ongoing uncertainty regarding the medium- and long-term impact of COVID-19 increased market volatility and reduced investment returns during the reporting period. Market volatility and low interest rates remain key management concerns; as such, a broad geographic and asset class diversification strategy within the long-term investment pool exists to help mitigate some volatility and protect capital. The Investment Pool is managed by external investment managers in accordance with the Statement of Investment Policy and Guidelines, which incorporates environmental, social and government considerations into its hiring and review practices. The Investment Pool is overseen by the Investment Pool Committee, a sub-committee of the Board of Governors, and involves an investment consultant and a number of investment managers noted in Table 2.

McMaster is committed to implementing the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) across all invested portfolios. TCFD recommendations were issued in June 2017 providing recommendations for disclosing clear, comparable, and consistent reporting of financial information related to climate change. TCFD phased-in adoption will enable McMaster to report information consistent with the Greenhouse Gas (GHG) Protocol Corporate Accounting and Reporting Standard using globally aligned reporting standards, measurement and baseline selection, and target setting to enable comparability with other TCFD adopting organizations. In 2019, the Government of Canada issued the Final Report of the Expert Panel on Sustainable Finance: Mobilizing Finance for Sustainable Growth endorsing TCFD for voluntary adoption over two timeline phases linked to investment portfolio size with phases ending in 2026. McMaster is committed to early TCFD adoption across all invested assets enhancing public reporting and working with other TCFD universities internationally on refining practice comparability.

McMaster’s invested assets include the Investment Pool, salaried pension plan assets, and hourly pension plan assets. The phased implementation plan is shown in Table 3.

Table 2: INVESTMENT POOL CONSULTANT AND INVESTMENT MANAGERS as at April 30, 2020

<table>
<thead>
<tr>
<th>Investment Consultant</th>
<th>Investment Managers</th>
</tr>
</thead>
</table>

1Integrated Asset Management Corp. merged with Fiera Real Estate in 2020.

Table 3: TCFD IMPLEMENTATION PHASES

<table>
<thead>
<tr>
<th>Investment Portfolio</th>
<th>Phase 1 Adoption</th>
<th>Phase 2 Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Pool (consisting of both endowed and non-endowed assets)</td>
<td>April 30, 2020</td>
<td>April 30, 2021</td>
</tr>
<tr>
<td>Pension Trust (consisting of defined benefit pension plan assets of both Plan 2000 (open to new entrants) and Original Plan (closed to new entrants))</td>
<td>April 30, 2021</td>
<td>April 30, 2022</td>
</tr>
<tr>
<td>Hourly Pension Trust (consisting of defined benefit pension plan assets of the closed hourly plan)</td>
<td>April 30, 2022</td>
<td>April 30, 2023</td>
</tr>
</tbody>
</table>
Table 4 summarizes McMaster’s Investment Pool TCFD Phase 1 reporting.

### Table 4: INVESTMENT POOL TCFD PHASE 1 REPORTING

<table>
<thead>
<tr>
<th>Area</th>
<th>Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance</td>
<td>Board’s oversight of climate-related risks and opportunities Climate risk scenario modelling is incorporated into McMaster’s annual multi-year financial projection analysis used to summarize an annual Debt Strategy Report for the Planning and Resources Committee and Board of Governors. Beginning in 2021, investment and pension sub-committees* will additionally be provided these reports (see below – this simplified, abbreviated version of the applicable Board structure is not intended to capture all Board-related sub-committees). A Financial Risk Report is produced annually incorporating climate-related risks. This report is provided to the Audit and Risk Committee, the Planning and Resources Committee and the Board of Governors annually, accompanying the Annual Financial Report. In direct relation to the Investment Pool representing approximately $1.0 billion in assets under management, holdings are diversified across asset classes, investment managers, and geography whereby environmental, societal, and governance (ESG) issues are routinely discussed with investment managers and the Investment Pool consultant. Additional analysis to support climate risks and opportunities is obtained through a third-party service (MSCI), which provides carbon emissions and carbon intensity information by holding, as well as other information where available (either from MSCI or in some cases the investment manager), addressing other broader issues of watershed, energy consumption, waste tonnage, land repatriation in partnership with Indigenous peoples, diversity, equity and more. MSCI reporting identifies the top ten contributors to McMaster’s portfolio carbon footprint. Proxy voting is delegated to investment managers hired with approaches aligned to McMaster’s investment statement of beliefs. Annual proxy voting summaries are reviewed and discussed at the Investment Pool Committee.</td>
</tr>
</tbody>
</table>

[Diagram of Board structure]

---

2 ESG – Environmental, Social and Governance refers to the three central factors in measuring the sustainability and ethical impact of an investment in a company or business. These criteria help to better determine the future financial performance of companies (return and risk).

---

"We are enthusiastic to work with Woodbridge to assist in the design and testing of their products. Woodbridge is a recognized company able to pivot quickly and deliver excellent quality control and reproducibility." – John Preston, Associate Dean, Engineering
Table 4: INVESTMENT POOL TCFD PHASE 1 REPORTING

<table>
<thead>
<tr>
<th>Area</th>
<th>Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance</td>
<td>Management’s role in assessing and managing climate-related risks and opportunities</td>
</tr>
<tr>
<td></td>
<td>The University is the administrator of the Investment Pool and the Board of Governors is responsible for the overall management. The Board of Governors has delegated certain duties and responsibilities (including the power to sub-delegate) to the Planning and Resources Committee which, in turn, has delegated certain duties and responsibilities to the Investment Pool Committee and the Treasury Department and to various agents it has retained to assist in carrying out its duties in respect to the Investment Pool. For the Investment Pool, management assesses climate-related risks and opportunities for the overall portfolio using investment manager, investment consultant and other third-party service reports. Management assesses investment manager performance against policy benchmarks, along with ESG scores assigned by the investment consultant, and actively discusses climate-related risks related to regulatory risks (such as carbon tax regimes), physical risks (including stranded assets), and technological risks (such as innovations in renewable and solar technology disrupting traditional fuel). Management’s role with the Investment Pool Committee is to actively monitor investment manager approaches, review any specific holdings along with justification and rationale for any Carbon Underground 200 (CU200) holdings, and assess routinely whether both the investment managers’ performance and investment beliefs are aligned with McMaster’s Statement of Investment Policies and Objectives. Management is required to make recommendations for replacement of underperforming or misaligned investment managers during routine meetings (occurring at minimum quarterly).</td>
</tr>
<tr>
<td>Strategy</td>
<td>Processes for identifying and assessing climate-related risks</td>
</tr>
<tr>
<td></td>
<td>Annual multi-year projections are prepared holistically incorporating all capital and strategic plans. Key risks, including climate- and pandemic/epidemic-related risks, are factored into scenario modelling. Scenarios are formed based on consultation with University stakeholders and reviewed with the President and Vice-Presidents to refine further before finalizing for Board of Governors and sub-committees. Results of scenario modelling defines the University’s annual Debt Strategy Report that consolidates all findings.</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Processes for identifying and assessing climate-related risks</td>
</tr>
<tr>
<td></td>
<td>Climate-related risks are factored into reporting updates by investment managers and discussed during Investment Committee presentations to ensure valuations used by managers in the investment decision process consider climate-related risks where appropriate.</td>
</tr>
</tbody>
</table>

The newly opened Centre of Excellence in Protective Equipment and Materials (CEPEM) aims to create an ecosystem of local expertise to build domestic supply chains for PPE and innovate existing products, including face masks and shields. “We established the Centre to be a hub of companies interested in this area, enable a research and development program and translate those findings into products that Canadian industry would put out into the world.”

– Ravi Selvaganapathy, Director, CEPEM
Table 4: INVESTMENT POOL TCFD PHASE 1 REPORTING

<table>
<thead>
<tr>
<th>Area</th>
<th>Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrics and Targets</td>
<td>McMaster completes a third-party measurement of its carbon footprint relative to its policy benchmark annually. As at April 30, 2019, the Investment Pool carbon footprint was 128.7 tCO2e/$1 million invested (2017/18 – 142.0 tCO2e/$1 million invested) relative to the fund policy benchmark of 169.7 tCO2e/$1 million invested (2017/18 – 178.5 tCO2e/$1 million invested). The primary measure used to track McMaster’s Investment Pool Carbon footprint is tCO2e/$1 million invested for public equity investments which has data availability in excess of 90%. Total Investment Pool Carbon measurements, which include both public equity and fixed income, have lower data availability and are less reliable. McMaster will continue to incorporate the best available measures and data to track and monitor its carbon footprint.</td>
</tr>
<tr>
<td>Scope 1 and 2 GHG emissions</td>
<td></td>
</tr>
</tbody>
</table>

INVESTMENT POOL – EQUITY AND FIXED INCOME
Weighted Average Carbon Intensity (tCO2e / $1 million Sales)

INVESTMENT POOL – PUBLIC EQUITIES
Carbon Footprint (tCO2e / $1 million Invested)

McMaster monitors and reports scope 1 and scope 2 greenhouse gas emissions due to the lack of complete and reliable data availability for scope 3 greenhouse gas emissions. As more reliable, comparable, and complete data becomes available, McMaster will track scope 3 greenhouse gas emissions as appropriate.

McMaster further specifically monitors its investment holdings in the Carbon Underground 200™ (CU200). The following table summarizes the investments in the CU200 expressed as a percentage of total investments in the Investment Pool.

INVESTMENT POOL – SECURITY AND FIXED INCOME
Weighted Average Carbon Intensity (tCO2e / $1 million Sales)

<table>
<thead>
<tr>
<th>Carbon Intensity Data Availability (Equity and Fixed Income)</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Pool</td>
<td>81.5%</td>
<td>78.1%</td>
</tr>
<tr>
<td>Investment Policy Benchmark</td>
<td>72.3%</td>
<td>76.4%</td>
</tr>
<tr>
<td>MSCI Global Equities ex Fossil Fuels</td>
<td>72.5%</td>
<td>76.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>MV ($ millions)</th>
<th>Investment Pool (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Suncor Energy Inc</td>
<td>11.0</td>
<td>1.9</td>
</tr>
<tr>
<td>2 Canadian Natural Resources</td>
<td>10.4</td>
<td>1.9</td>
</tr>
<tr>
<td>3 Imperial Oil Ltd</td>
<td>5.6</td>
<td>0.5</td>
</tr>
<tr>
<td>4 Husky Energy Inc</td>
<td>4.7</td>
<td>0.4</td>
</tr>
<tr>
<td>5 Glencore plc</td>
<td>3.8</td>
<td>0.4</td>
</tr>
<tr>
<td>Subtotal - Top 5 CU200 Exposure</td>
<td>35.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Total CU200 Exposure</td>
<td>47.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

McMASTER CARBON UNDERGROUND 200 TOP 5 EXPOSURE

<table>
<thead>
<tr>
<th>Company</th>
<th>MV ($ millions)</th>
<th>Investment Pool (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Canadian Natural Resources</td>
<td>7.7</td>
<td>0.7</td>
</tr>
<tr>
<td>2 Suncor Energy Inc</td>
<td>7.4</td>
<td>0.7</td>
</tr>
<tr>
<td>3 Husky Energy Inc</td>
<td>3.8</td>
<td>0.3</td>
</tr>
<tr>
<td>4 Imperial Oil Ltd</td>
<td>3.3</td>
<td>0.3</td>
</tr>
<tr>
<td>5 Glencore plc</td>
<td>3.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Subtotal - Top 5 CU200 Exposure</td>
<td>25.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Total CU200 Exposure</td>
<td>37.6</td>
<td>3.3</td>
</tr>
</tbody>
</table>

2 Carbon Measurement of Investment Pool Public Equity and Public Infrastructure Investments (excludes investments in Bonds and Real Estate).
Additional TCFD phase 2 reporting will be introduced in the 2021 Annual Financial Report. Phase 2 reporting will include identification of McMaster’s baseline year for setting and measuring further carbon reduction strategies.

Sensitivity analysis is performed to highlight the significance of possible variances in investment income associated with market fluctuations. The endowment funds are invested based on a benchmark asset mix of 60.0% equities and 40.0% fixed income, real estate, and infrastructure.

Total investment earnings are allocated as either income in the Statement of Operations or direct changes to endowment balances as preservation of capital adjustments in the Statement of Changes in Net Assets (Table 5). The amounts posted directly to external endowments are a function of net annual returns, whereas the amounts posted to income are a function of both net returns and revenue recognition associated with required annual spending on some of the trust funds.

Investment returns for endowed funds are used for purposes set out by donors or by the Board of Governors, where gifts are for discretionary purposes. Annual endowment spending is 4.0%, along with a 1.0% allowance for trust administration costs. Spending is monitored using a five-year average rate of return. Any returns in excess of spending and other expenses go toward capital preservation. Approximately $23.4 million (2018/19: $26.1 million) of expenses were funded from the external endowment of which a significant portion is directed towards student scholarships, bursaries and funding of Chairs and Professorships.

### Table 5: ALLOCATION OF INVESTMENT INCOME EARNED

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized in income</td>
<td>12,865</td>
<td>98,432</td>
<td>52,275</td>
<td>70,820</td>
<td>26,392</td>
</tr>
<tr>
<td>Amount posted directly to external endowments</td>
<td>(31,467)</td>
<td>44,799</td>
<td>2,718</td>
<td>7,266</td>
<td>(33,302)</td>
</tr>
<tr>
<td>Total earned</td>
<td>(18,612)</td>
<td>143,231</td>
<td>54,993</td>
<td>78,086</td>
<td>(6,910)</td>
</tr>
</tbody>
</table>
Compensation and Benefits

McMaster University provides compensation and various benefit plans for faculty and staff for both career and retirement phases of life. McMaster manages both current and future costs associated with total compensation plans to ensure long-term financial sustainability. Salary and wage expenses are shown together in the Statement of Operations, with related employee benefit costs identified separately. The employee benefit expenses include statutory benefit costs, other current benefit costs, and accruals for pension and other non-pension benefits (primarily medical benefits and dental care) that are earned in relation to service in the current year. Additional information related to the current year expenses, pension and non-pension liabilities and unfunded deficits are included in this section.

EXPENSE

Total compensation (salary and wage along with benefit costs) accounts for 63.3% of total expenditures (2018/19: 62.0%). Figure 2 shows the count of 7,954 permanent faculty and staff members at October 2019 (October 2018: 7,772).

Salary and wage expenses increased 4.4% due to the addition of faculty members and permanent staff and negotiated pay increases. Benefit expenses increased 9.9% primarily due to increased pension financing costs. Total compensation expenses of $676.5 million are up 5.4% (2018/19: $641.8 million) representing a net 3.0% increase on a per employee basis.

EMPLOYEE FUTURE BENEFIT COSTS

Included in total compensation expenses are defined benefit pension, group RRSP and non-pension benefit costs. The non-pension benefit costs include extended health, dental and life insurance for most employees of the University. Under the Canadian accounting standards for not-for-profit organizations, annual remeasurements, investment gains and losses, and other items specifically related to employee future benefits are recorded directly in the Statement of Changes in Net Assets. Only current year benefit costs are expensed in the Statement of Operations.

The pension and non-pension plan obligations continue to be a significant draw on University resources (Figure 3), increasing by $91.1 million (25.5%) to $448.4 million (2018/19: $357.3 million). Although the obligation for non-pension benefits was almost unchanged, the lower interest rates and year-end return on assets resulted in an increase to the pension obligation. Over the last few years, several cost-balancing measures have been taken including plan eligibility, design changes, and increased employee contributions. The benefit costs could be eased in future years by interest rate improvements. However, changing mortality tables used to measure the liability, resulting from individuals living longer, are a permanent and ongoing increase to future benefit obligations.

The pension and non-pension obligations continue to receive ongoing management monitoring and long-term strategic financial planning, including building an internal reserve to offset the non-pension liability. McMaster continues to deploy a cost-smoothing approach to charging benefit expenses to faculties and departments. Benefits are charged at an average rate of approximately 30.0% of salaries each year, although annual benefit cash outflows can vary year over year.
PENSION PLANS

Steps taken over the last few years to manage the pension liability have included revised eligibility rules for some groups, increased employee contributions, and the introduction of a group RRSP plan for new employees in some groups. The group RRSP now includes 504 full time employees (2018/19: 388).

McMaster filed an updated valuation for the Salaried Pension Plan as of July 1, 2018 under new pension rules which resulted in a negative remeasurement adjustment in the 2018/19 financial statements. The valuation includes a new funding requirement for a Provision for Adverse Deviation (PfAD), which is based on the plan’s open or closed status and its asset mix. The initial regulations identified the University’s large salaried plan as closed. Since filing, the definition of a closed plan has changed and the large salaried plan is now under the open plan definition for the PfAD calculation methodology, which will reduce the University’s PfAD liability at the next valuation (July 2021).

The last valuation of the Hourly Pension Plan as of July 1, 2019 resulted in a solvency ratio below the minimum 85% required threshold. As a result, the University elected to provide an additional one-time contribution of $4.7 million to bring the solvency above 85%. Further, McMaster re-filed this Plan as of January 1, 2020 (before interest rate declines) in order to improve the required payments over the next three years.

Management continues to monitor the solvency funded status and future PfAD payments for both plans. The current benefit rate funding strategy continues to be effective despite the negative remeasurement adjustment, and the anticipated decrease in required payments for the salaried plans has enabled a reduction in the long-term smoothed benefit rate charged to faculties and departments.

In addition to the above, the province has passed enabling legislation for a jointly sponsored pension plan to be developed for the higher-education sector. The University Pension Plan Ontario (UPP) has achieved the required consent threshold for each of the five existing pension plans in three universities, and the conversion to the UPP is expected to proceed for these universities. The UPP, as designed, is more expensive than McMaster’s current plans, however management is monitoring UPP design and transition planning.

The change in the funded status of the defined benefit pension plans is summarized in Table 6.

A $116.1 million negative pension remeasurement adjustment was made in the Statement of Net Assets (2018/19: -$131.6 million) primarily related to the negative return on plan assets. Since remeasurements are adjusted directly in reserves, the remeasurement adjustment had no impact on 2019/20 expenses.

Table 6: CHANGE IN FUNDED STATUS OF PENSION BENEFIT PLANS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funded status, opening balance</td>
<td>(63.3)</td>
<td>(169.3)</td>
<td>(3.5)</td>
<td>19.1</td>
<td>(82.6)</td>
</tr>
<tr>
<td>Current service and finance cost</td>
<td>(36.3)</td>
<td>(43.3)</td>
<td>(33.3)</td>
<td>(32.3)</td>
<td>(38.8)</td>
</tr>
<tr>
<td>Remeasurements</td>
<td>(134.4)</td>
<td>143.8</td>
<td>(10.6)</td>
<td>(131.6)</td>
<td>(116.1)</td>
</tr>
<tr>
<td>University contributions</td>
<td>64.7</td>
<td>65.3</td>
<td>66.5</td>
<td>62.2</td>
<td>66.3</td>
</tr>
<tr>
<td>Funded status, closing balance, net</td>
<td>(169.3)</td>
<td>(3.5)</td>
<td>19.1</td>
<td>(82.6)</td>
<td>171.2</td>
</tr>
</tbody>
</table>

McMASTER-LED GUIDELINES ISSUE FOR COVID-19 TREATMENT

“Our international guideline panel has given only a weak recommendation that remdesivir be given for treatment of severe COVID-19 in adult patients. Most patients with severe COVID-19 would likely choose remdesivir as there may be a potential shorter time to get better, but at this time we strongly support continued research about this drug.”

– Bram Rochwerg, Associate Professor, Michael G. DeGroote School of Medicine
NON-PENSION POST-RETIREMENT AND POST-EMPLOYMENT BENEFIT PLANS

These plans provide extended health benefits to retirees and to employees on long-term disability leave. The deficit status of the plans increased by $2.5 million (0.9%) to $277.2 million (2018/19: $274.7 million). Management continues to actively work with eligible employee groups to reduce the deficit and ongoing liability. A long-term funding strategy for these obligations includes annual contributions to an internally restricted reserve monitored annually and reassessed by actuaries on an annual basis. As part of this strategy, in 2020 a total of $15.0 million was transferred to the post-retirement benefits reserve from an internally restricted specific purpose reserve established in part to supplement other funding sources.

In 2019/20, non-pension employee benefit expenses increased by $1.5 million (7.2%) to $22.9 million (2018/19: $21.4 million) primarily due to interest on the liabilities (Table 7). Payments by the University for claims from the plans decreased by $0.2 million (-3.6%) to $7.1 million (2018/19: $7.3 million) due to shutdowns of some benefit providers in the final months of the year.

Table 7: CHANGE IN FUNDED STATUS OF NON-PENSION BENEFIT PLANS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funded status, opening balance</td>
<td>(217.2)</td>
<td>(208.0)</td>
<td>(220.3)</td>
<td>(247.7)</td>
<td>(274.7)</td>
</tr>
<tr>
<td>Current service and finance cost</td>
<td>(19.9)</td>
<td>(19.7)</td>
<td>(20.4)</td>
<td>(21.4)</td>
<td>(22.9)</td>
</tr>
<tr>
<td>Remeasurements</td>
<td>22.3</td>
<td>0.2</td>
<td>(14.9)</td>
<td>(12.9)</td>
<td>13.3</td>
</tr>
<tr>
<td>University contributions</td>
<td>6.8</td>
<td>7.2</td>
<td>7.9</td>
<td>7.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Internally restricted reserve</td>
<td>(208.0)</td>
<td>(220.3)</td>
<td>(247.7)</td>
<td>(274.7)</td>
<td>(277.2)</td>
</tr>
<tr>
<td>Funded status, closing balance, net</td>
<td>(147.6)</td>
<td>(146.7)</td>
<td>(164.5)</td>
<td>(180.9)</td>
<td>(161.0)</td>
</tr>
</tbody>
</table>

EMPLOYEE FUTURE BENEFITS IN INTERNALLY RESTRICTED NET ASSETS

In order to promote innovation and accountability in departments, it is McMaster’s policy to allow unspent surpluses to be carried forward from year to year, segregated as part of internally restricted net assets. In 2013, there was recognition that charging departments for the full cost of benefits (both current service costs and any unfunded past service costs) was constraining efforts to achieve strategic priorities and reducing McMaster’s competitiveness for research funding. As a result, McMaster charges only current service costs to departments, and funds past service costs separately. Under this practice, fluctuations in the reserve for past employee future benefit costs do not impact the funding available to departments and are tracked separately within McMaster’s internally restricted net assets.

In order to obtain a complete picture of the net operating department reserves including all related employee future benefits, the reserves for employee future benefits must be netted against the total departmental funds carried forward. Table 8 demonstrates the true net position of McMaster’s department reserves after all employee benefit costs are applied.

Table 8: NET OPERATING FUND DEPARTMENTAL RESERVES

<table>
<thead>
<tr>
<th></th>
<th>2019/20</th>
<th>2018/19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faculties</td>
<td>Support/Ancillary</td>
</tr>
<tr>
<td>Departmental reserves</td>
<td>128.1</td>
<td>78.8</td>
</tr>
<tr>
<td>Pensions</td>
<td>(154.9)</td>
<td>(43.4)</td>
</tr>
<tr>
<td>Other post-employment benefits</td>
<td>(117.7)</td>
<td>(44.3)</td>
</tr>
<tr>
<td>Employee benefit reserve</td>
<td>5.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Net departmental reserves</td>
<td>(138.7)</td>
<td>(3.3)</td>
</tr>
</tbody>
</table>
Capital Projects and Financing

McMaster University is committed to building spaces with an emphasis on both purpose and technology, while also renewing existing infrastructure to ensure its research-focused, student-centered identity is maintained to support an environment of excellence.

The McMaster Campus Plan and annual Capital Plan provide a comprehensive framework guiding campus capital development. The University’s capital objectives are to preserve and enhance a high-quality campus while meeting McMaster’s changing needs.

CAPITAL PROJECTS

Construction of the Peter George Centre for Living and Learning (PGCLL), a 518-bed undergraduate residence on campus adjacent to the Ron Joyce Stadium, was substantially completed in 2019/20. The PGCLL also includes teaching and learning spaces, expanded study and collaborative student spaces, a new home for both the Student Wellness Centre, a child care centre, underground parking, and new hospitality services. This multi-purpose building maximizes the use of campus lands.

Other capital projects underway in 2019/20 included the Student Activity and Fitness Expansion (SAFE), infrastructure projects that support research commercialization, and a new transformer.

In addition to these capital building projects, the University spent approximately $40.7 million on equipment, software, and furnishings. This represents an increase of $13.4 million (49.1%) over last year primarily due to the application of a new accounting standard requiring separate accounting for equipment previously capitalized as part of buildings, as well as an increase in research-related acquisitions.

The University’s total capital expenditures totalled $127.9 million (2018/19: $148.0 million) and are summarized in Table 9. Expenditures on buildings and construction in process have decreased largely due to the substantial completion of PGCLL, the Arthur N. Bourns Building retrofit and expansion, the change in accounting policy noted above, as well as the provincially mandated halt to construction due to COVID-19 in the final months of fiscal 2020.

Table 9: CAPITAL ASSET ADDITIONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Land, Completed Building Projects &amp; Construction in Progress</td>
<td>44,631</td>
<td>76,317</td>
<td>102,446</td>
<td>110,835</td>
<td>77,150</td>
</tr>
<tr>
<td>Computers, Software, Furniture and Other Equipment</td>
<td>31,502</td>
<td>27,673</td>
<td>33,367</td>
<td>27,342</td>
<td>40,694</td>
</tr>
<tr>
<td>Library Materials</td>
<td>18,264</td>
<td>9,497</td>
<td>9,778</td>
<td>9,833</td>
<td>10,078</td>
</tr>
<tr>
<td>Total Expenditures</td>
<td>94,397</td>
<td>113,487</td>
<td>145,591</td>
<td>148,010</td>
<td>127,922</td>
</tr>
</tbody>
</table>

McMASTER RESEARCHERS RACE TO CREATE A HOME-BASED COVID-19 TESTING KIT

A team of 11 senior researchers at McMaster’s Biointerfaces Institute, led by the institute’s director John Brennan and Professor Yingfu Li from the Department of Biochemistry & Biomedical Sciences and the Institute for Infectious Disease Research at McMaster, and including professors Fred Capretta, Carlos Filipe and Leyla Soleymani, is now working to create a test for COVID-19 that consumers could use from the safety of self-isolation, without needing to visit a doctor’s office, hospital or lab.
CAPITAL FINANCING

Completed building projects with long-term funding sources such as user fees, parking levies, and future fundraising continued to be financed through internal central bank loans. In 2019/20, all scheduled loan repayments were received. The internal central bank capital loans increased to $110.5 million in 2019/20 from $69.9 million last year as a result of financing for PGCLL. The loans have varying repayment terms and interest rates, which reflect the date of issue and the project’s income stream.

The University’s Debt Policy ratios provide a framework for monitoring the ability to undertake additional external or internal debt to carry out strategic investments. The University has two long-term bonds outstanding, each for $120.0 million, one maturing in 2052 at 6.15% and the other maturing in 2065 at 4.105%. McMaster holds two sinking funds accumulating the required repayment of each bond. Debt is considered a perpetual component of the University’s capital financing structure; as such, additional debt is contemplated annually in conjunction with the Capital Plan updates and other strategic projects within the multi-year financial projections. McMaster’s weighted average cost of capital used for internal loans is 5.75%, including administration costs.

FINANCIAL HEALTH AND SUSTAINABILITY METRICS

The MCU has incorporated financial health metrics into the Strategic Mandate Agreement and its annual reporting requirements. The inclusion of financial health metrics recognizes that financial health and sustainability are critical to achieving institutional mandates. McMaster’s strong financial health, as indicated also by its strong credit rating, is supported by the MCU metrics outlined in Table 10. Although the key ratios have declined compared to 2019, they are still strong and well above minimum recommended values.

Table 10: FINANCIAL HEALTH AND SUSTAINABILITY METRICS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt Management Policy Ratios</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expendable Net Assets to Debt (Target &gt; 1.0x)</td>
<td>1.6x</td>
<td>1.9x</td>
<td>2.0x</td>
<td>2.2x</td>
<td>2.2x</td>
</tr>
<tr>
<td>Interest Burden (Target &lt; 4.0%)</td>
<td>1.3%</td>
<td>1.5%</td>
<td>1.4%</td>
<td>1.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Debt per FTE (Target &lt; $12,000)</td>
<td>$10,057</td>
<td>$9,575</td>
<td>$9,321</td>
<td>$8,898</td>
<td>$8,525</td>
</tr>
<tr>
<td>Debt Management Monitoring Ratios</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Income/(Loss) Ratio (McMaster Target &gt; 1.0%)</td>
<td>3.0%</td>
<td>10.4%</td>
<td>9.6%</td>
<td>13.2%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Net Operating Revenues (McMaster Target &gt; 2.0%)</td>
<td>7.1%</td>
<td>14.3%</td>
<td>12.0%</td>
<td>15.7%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Primary Reserves Ratio (McMaster Target &gt; 91 days)</td>
<td>176</td>
<td>200</td>
<td>205</td>
<td>214</td>
<td>204</td>
</tr>
<tr>
<td>Viability Ratio (McMaster Target &gt; 1.0)</td>
<td>1.7</td>
<td>2.0</td>
<td>2.1</td>
<td>2.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>

1 Measures cash flow from operating activities as a proportion of revenues
2 Measures the number of days University reserves can cover operating expenses
3 Measures the proportion of long-term debt that could be settled using unrestricted assets

“We’re looking down the road at the next wave of testing, which we expect is going to be home-based self-testing. We want to get a self-administered test out the door as quickly as we can. It could be really important for identifying new clusters and stopping community spread by asymptomatic carriers.”

– John Brennan, Director, BioInterfaces Institute
Enterprise Risk Management

A number of initiatives were undertaken during 2019/20 focused on the ongoing evolution and enhancement of the Enterprise Risk Program while continuing to action existing program processes.

Enhancements have focused on areas such as alignment with the updated Audit and Risk Committee Terms of Reference incorporating augmented Audit and Risk Committee and Board of Governors oversight roles and responsibilities; updated Risk Appetite to include additional quantification and detailed guidance related to categories of risk; maturing of the risk assessment process steps; and an updating of our risk strategy template to facilitate additional context, assessment, mitigation detail and effectiveness measures.

Detailed review sessions led by identified risk leaders continued in 2019/20. Sessions were held with the President and Vice Presidents (PVP) group and the Audit and Risk Committee for Mental Wellness Risk and Pandemic Risk.

The annual Opportunities and Risks Review and Assessment session was held by the Enterprise Risk Steering Committee (PVP) in January 2020. As well as the review, discussion and update of the University’s Opportunity and Risk Registers, the Steering Committee reviewed documentation including key opportunity and key risk maps from the 2019 assessments, emerging risks scan and the key risk mitigation strategies summary authored by key risk leaders.

The Risks Review and Assessment resulted in nineteen key risks being identified and assessed based on residual (net) risk levels. Key risks from 2019 were retained, and pandemic risk was included (Table 11). Several modifications were made to various key risk rankings for 2020 as a result of factors including the higher education strategic and operational environment, current government initiatives and priorities, as well as the impacts that various risk mitigation strategies and other strategic and operational initiatives underway have had on the University.

In addition to the above risk management approach, opportunities are incorporated into discussions with priorities established and aligned into strategic plans.

Table 11: 2020 KEY RISKS

<table>
<thead>
<tr>
<th>Attract Graduate Students</th>
<th>Information Availability &amp; Quality</th>
<th>Reputation and Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Readiness</td>
<td>Information Security</td>
<td>Research</td>
</tr>
<tr>
<td>Financial</td>
<td>Leadership</td>
<td>Research Infrastructure</td>
</tr>
<tr>
<td>Geopolitical</td>
<td>Mental Wellness</td>
<td>Student Experience, Retention &amp; Satisfaction</td>
</tr>
<tr>
<td>Government Policy</td>
<td>Pandemic</td>
<td>Technology</td>
</tr>
<tr>
<td>Human Capital</td>
<td>Partnership</td>
<td>Undergraduate Student Enrolment</td>
</tr>
<tr>
<td>Physical Infrastructure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

“Our team from around the world scours the literature every day to find all of the latest randomized trials of treatments for COVID-19.” – Reed Siemieniuk, PhD candidate, Department of Health Research Methods, Evidence, and Impact
Supplemental Information: Variances to Plans

The audited financial statements are prepared as required by statute in accordance with accounting standards for not-for-profit organizations as prescribed by the Chartered Professional Accountants of Canada using the deferral method of accounting and consolidation of all activity. For external reporting under the deferral method, all funds are consolidated in a single column on the Statement of Operations.

McMaster University’s daily finances are managed pursuant to the concepts of fund accounting. Under this method, budgets are established for each fund, which is comprised of assets, liabilities, revenues, and expenses. Fund accounting enhances accountability over resources ensuring restricted grants and contributions are spent only for the purposes intended. McMaster uses the following segregated funds: Operating, Specifically Funded, Research, Capital, Externally Restricted Trusts and Endowments, Internally Restricted Endowments, and Ancillary Operations. The University budget model focuses on the allocation of resources within the Operating Fund; however, the consolidated Statement of Operations and Statement of Financial Position represent the results of all funds combined.

The 2019/20 Operating Fund financial results compared to the approved budget on a modified cash basis are presented in this section as well as a comparison to the consolidated results on a full accrual basis.

**OPERATING FUND SUMMARY**

The Operating Fund represents approximately 65.8% of the consolidated budget and includes all revenue and expenses for faculties and support departments, such as offices of the President and Provost, student affairs, libraries, finance, human resources, facilities, and information technology. The 2019/20 Operating Fund budget included a number of strategic funding priorities, such as wireless network expansion and other IT initiatives, inflationary journal cost and collection support for libraries, research operations support, and entrepreneurship support. Overall, the budget supported McMaster’s Strategic Mandate Agreement objectives, including key differentiation goals, enrolment targets, and other targeted program outcomes. The Operating Fund ended 2019/20 in a more favourable position compared to the budget and projection due to both greater funding and lower expenditures (Table 12).

---

**McMASTER FACULTY HELP LEAD NATIONAL RESPONSE TO COVID-19**

Deborah Cook, professor of medicine and health research methods, evidence, and impact, is a member of the multidisciplinary COVID-19 Expert Panel which will advise Mona Nemer, chief science advisor to the prime minister, on the latest scientific developments related to the disease.

Charu Kaushic, professor of pathology and molecular medicine and scientific director of the Institute of Infection and Immunity, has been asked to serve on the COVID-19 Immunity Task Force announced by Prime Minister Justin Trudeau. The task force is charged with establishing priorities and overseeing the coordination of a series of country-wide blood test surveys that will tell how widely the virus has spread in Canada and provide reliable estimates of potential immunity and vulnerabilities in Canadian populations.
Table 12: OPERATING FUND SUMMARY $ thousands

<table>
<thead>
<tr>
<th></th>
<th>2019/20 Budget</th>
<th>2019/20 Projection</th>
<th>2019/20 Actual</th>
<th>Variance</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019/20</td>
<td>2019/20</td>
<td>2019/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Actual vs. Budget</td>
<td>Actual vs. Projection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provincial grants</td>
<td>235,868</td>
<td>235,684</td>
<td>236,942</td>
<td>1,074</td>
<td>1,268</td>
</tr>
<tr>
<td></td>
<td>0.5%</td>
<td>0.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuition</td>
<td>326,962</td>
<td>342,732</td>
<td>342,745</td>
<td>15,783</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>4.8%</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Overhead income</td>
<td>27,470</td>
<td>30,111</td>
<td>28,581</td>
<td>1,111</td>
<td>(1,520)</td>
</tr>
<tr>
<td></td>
<td>4.0%</td>
<td>-5.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment income</td>
<td>12,634</td>
<td>12,634</td>
<td>12,634</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other income</td>
<td>106,008</td>
<td>109,368</td>
<td>111,183</td>
<td>5,175</td>
<td>1,815</td>
</tr>
<tr>
<td></td>
<td>4.9%</td>
<td>1.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total revenues</td>
<td>708,942</td>
<td>730,529</td>
<td>732,085</td>
<td>23,143</td>
<td>1,556</td>
</tr>
<tr>
<td></td>
<td>3.3%</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries, wages and benefits</td>
<td>496,875</td>
<td>498,272</td>
<td>484,332</td>
<td>12,543</td>
<td>13,940</td>
</tr>
<tr>
<td></td>
<td>2.5%</td>
<td>2.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities and maintenance</td>
<td>38,638</td>
<td>40,900</td>
<td>38,857</td>
<td>(219)</td>
<td>2,044</td>
</tr>
<tr>
<td></td>
<td>-0.6%</td>
<td>5.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment and renovations</td>
<td>52,030</td>
<td>68,955</td>
<td>65,124</td>
<td>(13,094)</td>
<td>3,831</td>
</tr>
<tr>
<td></td>
<td>-25.2%</td>
<td>5.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scholarships, bursaries, and work study</td>
<td>38,739</td>
<td>34,178</td>
<td>34,597</td>
<td>4,143</td>
<td>(419)</td>
</tr>
<tr>
<td></td>
<td>10.7%</td>
<td>-1.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library acquisitions</td>
<td>13,249</td>
<td>14,053</td>
<td>14,745</td>
<td>(1,496)</td>
<td>(692)</td>
</tr>
<tr>
<td></td>
<td>-11.3%</td>
<td>-4.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt and financing charges</td>
<td>18,220</td>
<td>18,836</td>
<td>18,551</td>
<td>(330)</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td>-1.8%</td>
<td>1.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All other expenses</td>
<td>81,096</td>
<td>65,319</td>
<td>46,958</td>
<td>34,138</td>
<td>18,362</td>
</tr>
<tr>
<td></td>
<td>42.1%</td>
<td>28.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total expenses</td>
<td>738,848</td>
<td>740,513</td>
<td>703,162</td>
<td>35,686</td>
<td>37,351</td>
</tr>
<tr>
<td></td>
<td>4.8%</td>
<td>5.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess of revenues over expenses</td>
<td>(29,906)</td>
<td>(9,984)</td>
<td>28,923</td>
<td>58,829</td>
<td>38,907</td>
</tr>
<tr>
<td></td>
<td>196.7%</td>
<td>389.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fund balance, beginning of year</td>
<td>145,168</td>
<td>167,657</td>
<td>167,657</td>
<td>22,489</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>15.5%</td>
<td>-0.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fund balance, end of year</td>
<td>115,262</td>
<td>157,673</td>
<td>196,580</td>
<td>81,318</td>
<td>38,907</td>
</tr>
<tr>
<td></td>
<td>70.6%</td>
<td>24.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Operating Fund surplus highlights McMaster’s continuing strong academic reputation and resulting enrolment growth as well as the impacts on planned strategic and operational spending impacted by the transition to a remote environment in March 2020 due to COVID-19 (Figure 4).

Figure 4: OPERATING FUND REVENUE AND EXPENSES TREND
Figure 5: OPERATING FUND REVENUE TREND BY TYPE

SOURCEs OF FUNDING
Total Operating Fund revenues were $732.1 million as compared to the budgeted funding of $708.9 million or to the projected funding of $730.5 million. Growth in overall revenue continues to come from tuition through increased enrolment, international tuition rate increases, and other revenue related to English language programs for international students, while other sources of revenue remain relatively flat (Figure 5).

McMASTER RESEARCHER CONTRIBUTES TO WORLD HEALTH ORGANIZATION GUIDELINES FOR COVID-19 VACCINE TESTING
As laboratories worldwide have raced to develop COVID-19 vaccines, ethicists and other experts, including McMaster's Claudia Emerson, director & associate professor of philosophy, have been working urgently to establish World Health Organization guidelines for testing the efficacy of vaccines using human challenge studies – clinical trials where healthy human volunteers are given a test vaccine and then infected with the pandemic virus.
PROVINCIAL GRANTS
In 2017/18, MCU introduced a corridor funding model, which limits enrolment-based funding to the 2016/17 grant level, while allowing universities to be plus or minus 3.0% (corridor) of the funding mid-point. MCU funding is now flowed to universities via funding envelopes defined as follows:

- Enrolment Envelope: enrolment-based funding that is based on a revised weighted grant unit (WGU) value;
- Differentiation Envelope: funding based on performance and/or achievement of priorities as set out in the Strategic Management Agreement; and
- Special Purpose Envelope: grants based on government priorities such as improving access for Indigenous learners and students with disabilities.

Additionally, a Graduate Expansion Grant funded growth in graduate students over the 2016/17 level (Table 13). Total provincial grant funding was slightly favourable to projection by $1.3 million (0.5%) due to a higher than expected Graduate Expansion Grant and $0.4 million in COVID-19 emergency funding. The International Student Reduction, a $750 decrease in grant funding per student, continues to grow with increased international enrolment, increasing to $2.9 million in 2019/20 from $2.4 million the prior year.

Table 13: PROVINCIAL GRANTS

<table>
<thead>
<tr>
<th></th>
<th>2019/20 Budget $ thousands</th>
<th>2019/20 Projection $ thousands</th>
<th>2019/20 Actual $ thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolment Envelope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Operating Grant</td>
<td>215,371</td>
<td>215,371</td>
<td>215,374</td>
</tr>
<tr>
<td>Graduate Expansion Grant</td>
<td>3,245</td>
<td>3,316</td>
<td>4,113</td>
</tr>
<tr>
<td></td>
<td>218,616</td>
<td>218,687</td>
<td>219,488</td>
</tr>
<tr>
<td>Differentiation Envelope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance/Student Success Grant</td>
<td>19,169</td>
<td>19,169</td>
<td>19,168</td>
</tr>
<tr>
<td>Graduate Expansion – Performance</td>
<td>293</td>
<td>299</td>
<td>371</td>
</tr>
<tr>
<td></td>
<td>19,462</td>
<td>19,468</td>
<td>19,539</td>
</tr>
<tr>
<td>Special Purpose Envelope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grant for Clinical Programs</td>
<td>429</td>
<td>457</td>
<td>458</td>
</tr>
<tr>
<td>COVID-19 – Emergency Funding for Universities</td>
<td>-</td>
<td>-</td>
<td>400</td>
</tr>
<tr>
<td>International Student Recovery</td>
<td>(2,639)</td>
<td>(2,928)</td>
<td>(2,942)</td>
</tr>
<tr>
<td>Total Provincial Grants</td>
<td>235,868</td>
<td>235,684</td>
<td>236,942</td>
</tr>
</tbody>
</table>

"When people have recovered from COVID-19 infection, we are hoping they will donate a unit of plasma which is essentially the clear portion of blood where all the antibodies are." – Donald Arnold, Director, McMaster Centre for Transfusion Research

McMASTER CLINICAL TRIAL TESTS “OLD” PLASMA THERAPY FOR COVID-19
The Convalescent Plasma for COVID-19 Research (CONCOR) trial is a collaboration between McMaster and academic partners across the country looking for a treatment for COVID-19.
TUITION
Actual tuition increased compared to budget due to higher enrolment than budgeted from both domestic and international students (Table 14).

Table 14: UNDERGRADUATE AND GRADUATE ENROLMENT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate FTEs – Domestic</td>
<td>23,446</td>
<td>23,968</td>
<td>24,070</td>
<td>624</td>
<td>2.7%</td>
<td>102</td>
</tr>
<tr>
<td>Undergraduate FTEs – International</td>
<td>3,138</td>
<td>3,514</td>
<td>3,533</td>
<td>395</td>
<td>12.6%</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>26,584</td>
<td>27,482</td>
<td>27,603</td>
<td>1,019</td>
<td>3.8%</td>
<td>121</td>
</tr>
<tr>
<td>Graduate FTEs – Domestic</td>
<td>3,105</td>
<td>3,126</td>
<td>3,140</td>
<td>35</td>
<td>1.1%</td>
<td>14</td>
</tr>
<tr>
<td>Graduate FTEs – International</td>
<td>1,255</td>
<td>1,316</td>
<td>1,320</td>
<td>65</td>
<td>5.2%</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>4,360</td>
<td>4,442</td>
<td>4,460</td>
<td>100</td>
<td>2.3%</td>
<td>18</td>
</tr>
<tr>
<td>Total UG &amp; G Combined – Domestic</td>
<td>26,551</td>
<td>27,094</td>
<td>27,210</td>
<td>693</td>
<td>2.5%</td>
<td>116</td>
</tr>
<tr>
<td>Total UG &amp; G Combined – International</td>
<td>4,393</td>
<td>4,830</td>
<td>4,853</td>
<td>460</td>
<td>10.5%</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>30,944</td>
<td>31,924</td>
<td>32,063</td>
<td>1,119</td>
<td>3.6%</td>
<td>139</td>
</tr>
</tbody>
</table>

“McMaster researcher, Jeremy Hirota, explores why COVID-19 impacts patients differently.”

“We think it is the lung immune system that differs between COVID-19 patients, and by understanding which patients’ lung immune systems are helpful and which are harmful, we may be able to help physicians pro-actively manage the most at risk-patients.”

– Jeremy Hirota, Assistant Professor, Medicine
Overall enrolment increased in accordance with the Strategic Mandate Agreement and the enrolment management targets (Figure 6 and Table 15), enabled by the completion of Wilson Hall in 2016/17. In 2019/20, a new provincial tuition framework resulted in a domestic tuition rate cut of 10%. This was mitigated by increasing the domestic and international enrolment above initial target levels, as well as continuing to increase international tuition rates to cover the increased costs of support.

Figure 6: TUITION AND FTE ENROLMENT

Table 15: TUITION AND FTE ENROLMENT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate – Domestic</td>
<td>160.9</td>
<td>173.4</td>
<td>181.2</td>
<td>192.6</td>
<td>177.1</td>
<td>22,545</td>
<td>23,265</td>
<td>23,265</td>
<td>23,759</td>
<td>24,070</td>
</tr>
<tr>
<td>Undergraduate – International</td>
<td>36.5</td>
<td>48.6</td>
<td>65.9</td>
<td>84.1</td>
<td>114.3</td>
<td>1,523</td>
<td>1,803</td>
<td>2,344</td>
<td>2,815</td>
<td>3,533</td>
</tr>
<tr>
<td>Total</td>
<td>197.4</td>
<td>222.1</td>
<td>247.1</td>
<td>276.7</td>
<td>291.4</td>
<td>24,068</td>
<td>25,068</td>
<td>25,609</td>
<td>26,575</td>
<td>27,603</td>
</tr>
<tr>
<td>Graduate – Domestic</td>
<td>27.9</td>
<td>31.8</td>
<td>34.6</td>
<td>36.6</td>
<td>35.1</td>
<td>2,904</td>
<td>2,980</td>
<td>2,928</td>
<td>3,080</td>
<td>3,140</td>
</tr>
<tr>
<td>Graduate – International</td>
<td>14.4</td>
<td>11.7</td>
<td>12.6</td>
<td>13.8</td>
<td>16.3</td>
<td>838</td>
<td>964</td>
<td>1,108</td>
<td>1,238</td>
<td>1,320</td>
</tr>
<tr>
<td>Total</td>
<td>42.3</td>
<td>43.5</td>
<td>47.3</td>
<td>50.3</td>
<td>51.3</td>
<td>3,742</td>
<td>3,944</td>
<td>4,036</td>
<td>4,319</td>
<td>4,460</td>
</tr>
<tr>
<td>Total UG &amp; G – Domestic</td>
<td>188.7</td>
<td>205.2</td>
<td>215.8</td>
<td>229.1</td>
<td>212.1</td>
<td>25,449</td>
<td>26,245</td>
<td>26,193</td>
<td>26,840</td>
<td>27,210</td>
</tr>
<tr>
<td>Total UG &amp; G – International</td>
<td>50.9</td>
<td>60.4</td>
<td>78.5</td>
<td>97.9</td>
<td>130.6</td>
<td>2,361</td>
<td>2,767</td>
<td>3,452</td>
<td>4,054</td>
<td>4,853</td>
</tr>
<tr>
<td>Total</td>
<td>239.6</td>
<td>265.6</td>
<td>294.3</td>
<td>327.1</td>
<td>342.7</td>
<td>27,810</td>
<td>29,012</td>
<td>29,645</td>
<td>30,894</td>
<td>32,063</td>
</tr>
</tbody>
</table>
RESEARCH OVERHEAD

Research overhead income was $1.1 million (4.0%) favourable to budget and $1.5 million (-5.1%) unfavourable to projection, primarily due to variances in royalties and research contract overheads. Overhead is levied as a percentage of research grants and contracts where allowed, with the objective of recovering the full amount of indirect costs. Royalty income is payment for commercial use of intellectual property owned by McMaster as a result of research discoveries. Both contract overhead and royalties fluctuate depending on activity (Figure 7).

INVESTMENT INCOME

The investment income attributed to the Operating Fund is predominantly fixed. Any differences between the budget and actual returns are absorbed in the University’s specific purpose reserve. The specific purpose reserve is used to ensure the Operating Fund receives investment income each year regardless of returns in the year. The annual fixed transfer is $9.5 million, which beginning in 2015/16 and ending in 2019/20, was increased by five one-time $3.0 million per year transfers. This additional funding assists in balancing the Operating Fund during years following the policy lever implementation, which resulted in a permanent $3.4 million funding cut, and transition to the corridor model whereby the operating grant is fixed at the 2016/17 level.

OTHER INCOME

Higher student enrolment contributed more than expected to other income. The favourable variance of $5.2 million (4.9%) compared to budget was primarily due to:

- higher fees from non-degree programs; and
- higher recoveries for utilities from external affiliates due to increased usage.

McMASTER RESEARCHERS’ ACT OF KINDNESS COMES FULL CIRCLE

In February, Yingfu Li, professor of biochemistry and biomedical sciences, and his research team raised money and bought N95 masks and goggles for Chinese hospitals during the COVID-19 crisis in that country. In April, his colleagues in China pitched in to buy protective gear for front-line medical workers in Hamilton.
EXPENDITURES

Total Operating Fund expenditures were $703.2 million (Figure 8 and Figure 9) compared to budget and projected expenditures of $738.8 million and $740.5 million, respectively. The favourable variances are small as a percentage of both the original budget (4.8%) and projection (5.0%) and are caused by the impacts of the COVID-19 pandemic on spending plans and the normally observed effect of conservative budgeting.

Under the current budget model, faculties (activity units) are allocated all central revenue net of support unit costs. Early finalization of support unit projections in the fall allows for more certain inputs to activity unit budgets, which are prepared in the spring. However, this means that there is greater chance that support unit plans will change during the remainder of the year. This greater variability is not considered a significant risk to planning and will continue for 2020/21 and beyond.

Figure 8: 2019/20 TOTAL OPERATING FUND ACTUAL EXPENSE BY TYPE $ Millions

- Academic Salaries $178.6, 25.4%
- Teaching Assistants $21.7, 3.1%
- Non-academic Salaries $169.7, 24.1%
- Benefits $114.4, 16.3%
- Total salaries, wages and benefits $484.3, 68.9%
- Non-salary expenses $218.8, 31.1%

Figure 9: 2019/20 OPERATING FUND ACTUAL NON-SALARY EXPENSE BY TYPE $ Millions

- Utilities and maintenance $38.9, 5.5%
- Equipment and renovations $65.1, 9.3%
- Scholarships, bursaries and work study $34.6, 4.9%
- Library acquisitions $14.7, 2.1%
- Debt and financing charges $18.6, 2.6%
- All other expenses $47.0, 6.7%

“As most people rush to distance themselves from COVID-19, Canadian researchers have been waiting eagerly to get our (gloved) hands on the hated virus.”

– Karen Mossman, Vice-President, Research
Total expenses were favourable by $35.7 million (4.8%) compared to budget:

- Salaries, wages, and benefits were favourable by $12.5 million (2.5%) primarily due to unfilled staff vacancies.
- Equipment and renovations were unfavourable by $13.1 million (-25.2%) due to higher investment in strategic capital projects such as the greenhouse renovation, the School of Interdisciplinary Science 5th floor build, the McLean Centre project, and the Canada Foundation for Innovation Small Angle Neutron project, as well as additional transfers for maintenance projects such as the Nuclear Reactor roof replacement and a new boiler for the main campus.
- Scholarships, bursaries, and work study were favourable by $4.1 million (10.7%) due to Student Access Guarantee (SAG) requirements lower than projected.
- Library acquisitions were unfavourable by $1.5 million (-11.3%) due to journal cost inflation and extra acquisitions.
- All other expenses were favourable by $34.1 million (42.1%) primarily due to savings or delayed spending on expenses such as materials and supplies, special projects, and travel.
- Variances were insignificant in utilities and maintenance, as well as debt and financing charges.

Total expenses were favourable by $37.4 million (5.0%) compared to projection:

- Salaries, wages, and benefits were favourable by $13.9 million (2.8%) primarily due to unfilled staff vacancies.
- Utilities and maintenance were favourable by $2.0 million (5.0%) due to lower utility rates and consumption than projected, along with some delayed maintenance expenditures due to the campus closure.
- Equipment and renovations were favourable by $3.8 million (5.6%) due to deferred investment in capital projects as a result of the COVID-19 pandemic.
- All other expenses were favourable by $18.4 million (28.1%) primarily due to savings or delayed spending across multiple categories mainly due to COVID-19, as well as lower royalty expenses reflecting the lower royalty income.
- Variances were insignificant in scholarships, bursaries and work study, library acquisitions, and debt and financing charges.

“We’re renowned for innovation and interdisciplinary collaboration. This is a fine example of how our creativity and partnerships can quickly come up with solutions.” – Paul O’Byrne, Dean and Vice-President, Faculty of Health Sciences

McMaster Helps Health Care Providers with Donated Supplies

The Faculties of Engineering, Health Sciences and Science donated masks, gloves, goggles, sanitizer and other vital medical supplies from labs across McMaster to help local hospitals combat COVID-19.
McMaster’s COVID-19 Research Funds Supports 36 Research Projects

McMaster University, with additional support from its generous donors, has invested nearly $3 million toward 36 projects through the McMaster COVID-19 Research Fund. In total, more than 150 researchers (including internal and external collaborators) will benefit from the funds, with project awards ranging from $10,000 to $250,000. The research fund, designed to support immediate and longer term pandemic-related research, attracted 160 applications from across all Faculties.
McMaster has launched a new fundraising campaign, led by Faith Ogunkoya, Team Lead, Registrar’s Office, aimed at supporting students needing aid because of the pandemic and advancing COVID-19 related research. The McMaster COVID-19 Fund encompasses two funds: a Student Emergency Relief Fund and a COVID-19 Research Fund. For each of these funds, the first $100,000 will be matched to double the impact of these gifts.

Table 16: APPROPRIATION/ENVELOPE ANALYSIS, YEAR ENDED APRIL 30, 2020

<table>
<thead>
<tr>
<th>Faculties and Academic Programs</th>
<th>Appropriations May 1, 2019</th>
<th>Net Surplus (Deficit)</th>
<th>Appropriations April 30, 2020</th>
<th>Net Surplus (Deficit) Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>3,455</td>
<td>6,172</td>
<td>9,627</td>
<td>9,627</td>
</tr>
<tr>
<td>Engineering</td>
<td>24,248</td>
<td>9,024</td>
<td>33,272</td>
<td>1,016</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>41,243</td>
<td>5,867</td>
<td>47,110</td>
<td>8,149</td>
</tr>
<tr>
<td>Humanities</td>
<td>2,578</td>
<td>3,301</td>
<td>5,879</td>
<td>1,581</td>
</tr>
<tr>
<td>Science</td>
<td>20,363</td>
<td>1,228</td>
<td>21,591</td>
<td>11,339</td>
</tr>
<tr>
<td>Medical Radiation – Mohawk Share</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>6,276</td>
<td>2,915</td>
<td>9,191</td>
<td>1,054</td>
</tr>
<tr>
<td>Arts &amp; Science</td>
<td>1,564</td>
<td>(178)</td>
<td>1,386</td>
<td>(23)</td>
</tr>
<tr>
<td>Sub-total</td>
<td>99,728</td>
<td>28,328</td>
<td>128,056</td>
<td>32,744</td>
</tr>
<tr>
<td>Academic Priorities</td>
<td>43,887</td>
<td>(5,548)</td>
<td>38,340</td>
<td>(8,066)</td>
</tr>
<tr>
<td>Academic Support</td>
<td>12,291</td>
<td>74</td>
<td>12,365</td>
<td>2,695</td>
</tr>
<tr>
<td>Research Support</td>
<td>3,665</td>
<td>1,399</td>
<td>5,064</td>
<td>2,660</td>
</tr>
<tr>
<td>Student Support</td>
<td>9,960</td>
<td>80</td>
<td>9,940</td>
<td>3,325</td>
</tr>
<tr>
<td>Facilities Support</td>
<td>3,948</td>
<td>(2,713)</td>
<td>1,235</td>
<td>(2,569)</td>
</tr>
<tr>
<td>Institutional Support</td>
<td>14,058</td>
<td>2,723</td>
<td>16,781</td>
<td>6,550</td>
</tr>
<tr>
<td>Institutional Priorities*</td>
<td>(19,780)</td>
<td>4,579</td>
<td>(15,201)</td>
<td>1,567</td>
</tr>
<tr>
<td><strong>Total Operating Fund</strong></td>
<td><strong>167,657</strong></td>
<td><strong>28,923</strong></td>
<td><strong>196,580</strong></td>
<td><strong>38,907</strong></td>
</tr>
</tbody>
</table>

*Includes the approved funding for the Mosaic project, which will be repaid by 2023/24
The consolidated financial statements are prepared on the accrual accounting basis for accounting standards compliance and auditing purposes. Adjustments from McMaster’s modified cash basis budgeting approach to accrual accounting involve the following key changes (Table 17):

- Net capital expenditures within fund units or departments are reversed and only one year of asset use is amortized. Asset lives vary between 1 and 40 years.
- Share of investment income/loss on internal endowments and not already assigned to the Operating Fund and earned/lost on non-operating funds is booked to revenue.
- Non-cash adjustments for pension and non-pension employee accrued future benefit costs measured at April 30 are recorded.
- Adjustments eliminating internal revenue and expense transactions between funds occur.

Table 17: RECONCILIATION OF OPERATING FUND SURPLUS TO CONSOLIDATED STATEMENT OF OPERATIONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess (deficiency) of Operating Fund revenues over expenses</td>
<td>(29,906)</td>
<td>(9,984)</td>
<td>28,923</td>
<td>58,829</td>
<td>38,907</td>
</tr>
<tr>
<td>Capital expenditures net of amortization</td>
<td>91,155</td>
<td>43,943</td>
<td>30,240</td>
<td>(60,915)</td>
<td>(13,703)</td>
</tr>
<tr>
<td>Investment income (loss) on internal endowments</td>
<td>2,647</td>
<td>(33,587)</td>
<td>(9,077)</td>
<td>(11,724)</td>
<td>(24,510)</td>
</tr>
<tr>
<td>Pension and non-pension adjustments</td>
<td>(8,106)</td>
<td>14,355</td>
<td>30,579</td>
<td>38,685</td>
<td>16,224</td>
</tr>
<tr>
<td>Changes in other reserves</td>
<td>4,659</td>
<td>(63,984)</td>
<td>11,406</td>
<td>6,746</td>
<td>75,389</td>
</tr>
<tr>
<td>Total accrual adjustment</td>
<td>90,356</td>
<td>(39,272)</td>
<td>63,148</td>
<td>(27,208)</td>
<td>102,420</td>
</tr>
</tbody>
</table>

Excess (deficiency) of revenues over expenses

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Budget</td>
<td>Projection</td>
<td>Actual</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60,450</td>
<td>(49,256)</td>
<td>92,070</td>
<td>31,621</td>
<td>141,327</td>
</tr>
</tbody>
</table>

The 2019/20 projection was completed at the beginning of the COVID-19 pandemic and employed a conservative approach as the situation was evolving daily. As a result, some of the projected impacts were not realized by the end of the year, most notably the impact on investment returns. The total 2019/20 positive accrual adjustment of $63.1 million compared to a negative $39.3 million projected results in a $102.4 million favourable variance is explained by:

- Better returns of -1.9% compared to a projected loss of -18.0%, which was a conservative estimate based on the -18.9% investment loss experienced in the 2008/09 financial crisis;
- Lower adjustment for capital expenditures due to end of year delays on capital spending as construction sites were shut down; and
- Smaller unfavourable effects on other reserves as both Operating Fund and consolidated net income were greater than expected.

NEW McMASTER HEALTH SCIENCES COURSE FOCUSES ON INFECTIOUS DISEASES LIKE COVID-19
Padman Jayaratne, associate professor of pathology and molecular medicine, and Hartley Jafine, a facilitator with the BHSc program and lecturer with the department of family medicine at McMaster, have created a new online course called Emerging Infectious Diseases.
Total revenues were slightly less than budget. Higher than expected enrolment created a favourable variance in tuition fees, offsetting the provincially mandated 10% tuition cut that was built into the budget. Unfavourable variances were experienced in investment income due to widespread market declines at year-end, and lower ancillary sales due to the campus shutdown beginning in March 2020. Actual results for both investment income and ancillary sales were better than projected.

Total expenses were less than budget due to unfilled vacancies throughout the year, as well as reduced supplies and services expense due to the campus closure. Increased employee benefits expense reflects utilization of reserves as part of the long-term strategy to fund post-retirement benefits. Variances to projection were caused by similar factors.

“The perspective I hope students develop is an understanding of emerging infectious diseases like COVID-19, and how all of the conversations we are presently having on this topic are deeply interconnected.”

– Hartley Jafine, Professor, Faculty of Health Sciences
### Table 19: CONSOLIDATED STATEMENT OF FINANCIAL POSITION

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>30,994</td>
<td>31,228</td>
<td>17,408</td>
<td>(13,586)</td>
<td>(13,819)</td>
<td></td>
</tr>
<tr>
<td>Short-term investments</td>
<td>154,972</td>
<td>156,138</td>
<td>183,222</td>
<td>28,250</td>
<td>27,084</td>
<td></td>
</tr>
<tr>
<td>Investments</td>
<td>1,341,194</td>
<td>1,153,806</td>
<td>1,313,986</td>
<td>(27,208)</td>
<td>(160,180)</td>
<td></td>
</tr>
<tr>
<td>Capital assets</td>
<td>1,333,324</td>
<td>1,247,805</td>
<td>1,208,455</td>
<td>(124,869)</td>
<td>(39,350)</td>
<td></td>
</tr>
<tr>
<td>Other assets</td>
<td>158,680</td>
<td>161,460</td>
<td>214,201</td>
<td>55,521</td>
<td>52,741</td>
<td></td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>3,019,165</td>
<td>2,750,437</td>
<td>2,937,272</td>
<td>(81,893)</td>
<td>186,835</td>
<td></td>
</tr>
<tr>
<td><strong>Liabilities and deferred contributions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td>180,552</td>
<td>193,330</td>
<td>172,959</td>
<td>(7,593)</td>
<td>(20,371)</td>
<td></td>
</tr>
<tr>
<td>Deferred contributions for future expenses</td>
<td>852,108</td>
<td>862,592</td>
<td>862,762</td>
<td>10,654</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>Long-term debt</td>
<td>342,700</td>
<td>267,194</td>
<td>267,697</td>
<td>(75,003)</td>
<td>502</td>
<td></td>
</tr>
<tr>
<td>Employee future benefits and pension</td>
<td>247,839</td>
<td>364,436</td>
<td>448,446</td>
<td>200,607</td>
<td>84,010</td>
<td></td>
</tr>
<tr>
<td><strong>Total liabilities and deferred contributions</strong></td>
<td>1,623,198</td>
<td>1,687,552</td>
<td>1,751,864</td>
<td>128,665</td>
<td>64,312</td>
<td></td>
</tr>
<tr>
<td><strong>Net assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unrestricted</td>
<td>9,781</td>
<td>10,755</td>
<td></td>
<td>(9,781)</td>
<td>(10,755)</td>
<td></td>
</tr>
<tr>
<td>Internally restricted</td>
<td>224,523</td>
<td>41,423</td>
<td>97,679</td>
<td>(126,843)</td>
<td>56,256</td>
<td></td>
</tr>
<tr>
<td>Equity in capital assets</td>
<td>514,657</td>
<td>499,364</td>
<td>470,378</td>
<td>(44,278)</td>
<td>(28,986)</td>
<td></td>
</tr>
<tr>
<td><strong>Endowments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>150,028</td>
<td>116,823</td>
<td>141,333</td>
<td>(8,696)</td>
<td>24,510</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>496,978</td>
<td>394,520</td>
<td>476,018</td>
<td>(20,960)</td>
<td>81,498</td>
<td></td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td>1,395,966</td>
<td>1,062,885</td>
<td>1,185,408</td>
<td>(210,558)</td>
<td>122,523</td>
<td></td>
</tr>
<tr>
<td><strong>Total liabilities and net assets</strong></td>
<td>3,019,165</td>
<td>2,750,437</td>
<td>2,937,272</td>
<td>(81,893)</td>
<td>186,835</td>
<td></td>
</tr>
</tbody>
</table>

The Statement of Financial Position is the University’s consolidated balance sheet. Variances to budget and projection both show the influence of COVID-19, as the budget was prepared under a normal set of assumptions, while the projection built in conservative assumptions as the pandemic was beginning.

McMASTER LIBRARY RESOURCES MOVE ONLINE

“With the doors closed for the foreseeable future, the library has moved the bulk of its resources online. When you’re new to university, you can start to feel overwhelmed, but we can help navigate to the appropriate resources, or just be a friendly voice,” says Ariel Stables-Kennedy, the First-Year Experience Librarian. “Come to our virtual front desk and get that friendly experience.”
ASSETS
Cash requirements are estimated to cover an average of 10 days of expenses. The lower level of expenses incurred in 2019/20 allowed maintenance of a lower cash balance.

Despite lower investment income than budgeted, the combined balance of short-term and longer-term investments was close to budget. The balance increased compared to projection due to significantly better investment returns than anticipated.

Actual capital assets were less than both budget and projection due to lower spending as construction was shut down at year-end.

The increase in other assets is a combination of greater outstanding receivables and a higher balance of other investments. Receivables include student accounts (net of an increased provision for doubtful accounts) and government funders, as well as loans extended to McMaster Innovation Park to support its operations and increase capacity. The investment in McMaster Innovation Park is accounted for by the equity method, and the increase reflects the surplus earned in the year ended December 31, 2019.

LIABILITIES
The drop in current liabilities compared to budget and projection is due to a lower level of outstanding invoices as activity was reduced at the end of the year.

Deferred contributions for future expenses reflect contributions for future expenses and capital that have not yet been expended or met the test to expense. Although funding for research and capital had been received during 2019/20, spending was cut short by the closure, increasing the balance deferred.

The 2019/20 budget originally included plans to issue new long-term debt, however this was deferred a year with the announcement of the new President, Dr. David Farrar, and his objective to update the University's strategic plan. The new debt is delayed to 2020/21, decreasing the amount of actual long-term debt in 2019/20 compared to the original budget.

The liability for employee future benefits increased compared to both budget and projection due to lower interest rates and the negative return on plan assets.

NET ASSETS
The lower balance of net assets compared to budget reflects the reduced investment return, decreased capital spending, and lower surplus of revenues over expenses. Conversely, the greater balance of net assets compared to budget is the result of higher than expected investment returns. During the year, the balance of unrestricted net assets was internally restricted to the specific purpose reserve in order to supplement endowment funding and support student bursaries, scholarships, and other expenditures.

“Although our campus remains physically closed to students, that doesn’t mean the quality of our students’ learning will be diminished in any way. Faculty and instructors have the ability and enthusiasm to teach our students in diverse and creative ways and are exploring new approaches for bringing in-person courses to our students using remote teaching tools.”

— Kim Dej, Acting Vice-Provost, Faculty

McMaster Faculty Finding Diverse and Creative Ways to Deliver High-Quality, Virtual Courses
## STATEMENT OF CASH FLOWS

### Table 20: CONSOLIDATED STATEMENT OF CASH FLOWS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess of revenues over expenses</td>
<td>60,450</td>
<td>(49,256)</td>
<td>92,070</td>
<td>31,621</td>
<td>141,327</td>
</tr>
<tr>
<td><strong>Adjustments for non-cash items:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amortization of deferred capital contributions</td>
<td>(45,743)</td>
<td>(45,963)</td>
<td>(40,773)</td>
<td>4,970</td>
<td>5,190</td>
</tr>
<tr>
<td>Amortization of capital assets</td>
<td>88,181</td>
<td>87,556</td>
<td>78,260</td>
<td>(9,291)</td>
<td>(9,296)</td>
</tr>
<tr>
<td>Employee future benefits</td>
<td>2,427</td>
<td>3,664</td>
<td>(11,578)</td>
<td>(14,004)</td>
<td>(15,242)</td>
</tr>
<tr>
<td>Increase in decommissioning obligation</td>
<td>1,088</td>
<td>1,056</td>
<td>665</td>
<td>(423)</td>
<td>(392)</td>
</tr>
<tr>
<td>Net change in deferred contributions</td>
<td>34,721</td>
<td>48,149</td>
<td>(6,027)</td>
<td>(40,747)</td>
<td>(54,176)</td>
</tr>
<tr>
<td><strong>Financing and investing activities:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of capital assets</td>
<td>(234,558)</td>
<td>(176,567)</td>
<td>(127,922)</td>
<td>106,636</td>
<td>48,646</td>
</tr>
<tr>
<td>Net change in investments</td>
<td>12,593</td>
<td>247,610</td>
<td>36,235</td>
<td>23,642</td>
<td>(211,375)</td>
</tr>
<tr>
<td>Net change in external endowments</td>
<td>8,195</td>
<td>(106,299)</td>
<td>(24,801)</td>
<td>(32,996)</td>
<td>81,498</td>
</tr>
<tr>
<td>Issuance of long-term debt</td>
<td>75,000</td>
<td>-</td>
<td>(75,000)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Principal repayments on long-term obligations</td>
<td>(630)</td>
<td>(665)</td>
<td>(665)</td>
<td>(35)</td>
<td>-</td>
</tr>
<tr>
<td>Increase/(decrease) in cash</td>
<td>1,723</td>
<td>9,284</td>
<td>(4,536)</td>
<td>(6,259)</td>
<td>(13,820)</td>
</tr>
<tr>
<td>Cash, beginning of year</td>
<td>29,271</td>
<td>21,944</td>
<td>21,944</td>
<td>(7,327)</td>
<td>-</td>
</tr>
<tr>
<td>Cash, end of year</td>
<td>30,994</td>
<td>31,228</td>
<td>17,408</td>
<td>(13,586)</td>
<td>(13,820)</td>
</tr>
</tbody>
</table>

The impacts of COVID-19 and strategic decision to delay debt issuance as discussed above are reflected in the variances on the Statement of Cash Flows.

---

**THE ARCHWAY PROGRAM SUPPORTS FIRST-YEAR STUDENTS**

The Archway program has 200 upper-year students to assist incoming first-year students and in just two months received an overwhelming 5,000 responses from first-years who are keen to participate in newly created virtual communities.

---

"The Archway program is designed to support first-year students through their entire first year, starting in the summer and continuing through to final exams in the Winter term." – Sean Van Koughnett, Associate Vice-President (Students & Learning), Dean of Students
McMASTER RESIDENCES PROVIDE SAFE QUARANTINE FACILITIES
McMaster is making rooms available to people in high-risk environments or who need to quarantine through a collaboration with Hamilton Public Health, Hamilton Health Sciences and St. Joseph’s Hamilton Healthcare. The collaboration includes establishing ways to support safe isolation, contactless meal delivery, cleaning and the protection of staff.

Financial Statements

STATEMENT OF MANAGEMENT RESPONSIBILITY ..........................................................38
INDEPENDENT AUDITOR’S REPORT ........................................................................39
FINANCIAL STATEMENTS .........................................................................................42
• Statement of Financial Position
• Statement of Operations
• Statement of Changes in Net Assets
• Statement of Cash Flows
• Notes to Financial Statements

McMASTER STUDENTS DONATE PERSONAL PROTECTIVE EQUIPMENT TO FRONT-LINE HEALTH WORKERS
Medical students from McMaster University and the University of Toronto have joined forces to create 3D-printed face shields for front-line health-care workers impacted by the pandemic. A campaign called 3D PPE for GTHA supports workers in hospitals and community medical clinics in Hamilton, Toronto and the Niagara Region.
Statement of Management Responsibility

Management of the University is responsible for the preparation of the financial statements, the notes thereto and all other financial information contained in this Annual Financial Report.

Management has prepared the financial statements in accordance with Canadian accounting standards for not-for-profit organizations. Management believes the financial statements present fairly the University’s financial position as at April 30, 2020 and the results of its operations, changes in net assets and its cash flows for the year ended April 30, 2020. In order to achieve the objective of fair presentation in all material respects, the use of reasonable estimates and judgements were employed. Additionally, management has ensured that financial information presented elsewhere in this Annual Financial Report has been prepared in a manner consistent with that in the financial statements.

In fulfilling its responsibilities and recognizing the limits inherent in all systems, management has developed and maintains a system of internal controls designed to provide reasonable assurance that University assets are safeguarded from loss and that the accounting records are a reliable basis for the preparation of financial statements.

Mercer (Canada) Limited has been retained by the University in order to provide an estimate of the University's current year position for pension and other employee future benefits. Management has provided the valuation actuary with the information necessary for the completion of the University's report and retains ultimate responsibility for the determination and estimation of the pension and other employee future benefits liabilities reported.

The Board of Governors carries out its responsibility for review of the financial statements and this Annual Financial Report principally through the Planning and Resources Committee and its Audit and Risk Committee. No members of the Audit and Risk Committee are officers or employees of the University. The Audit and Risk Committee meets regularly with management, as well as the internal auditors and the external auditors, to discuss the results of the audit examinations and financial reporting matters, and to satisfy itself that each party is properly discharging its responsibilities. The auditors have full access to the Audit and Risk Committee with and without the presence of management.

The financial statements for the year ended April 30, 2020 have been reported on by KPMG LLP, Chartered Professional Accountants, the auditors appointed by the Board of Governors. The Independent Auditors’ Report outlines the scope of their audit and their opinion on the presentation of the information included in the financial statements.

Vice-President, Administration            President            AVP (Administration) & CFO
October 8, 2020
INDEPENDENT AUDITORS’ REPORT

To the Board of Governors of McMaster University

Opinion

We have audited the accompanying financial statements of McMaster University (the "University"), which comprise:

- the statement of financial position as at April 30, 2020
- the statement of operations for the year then ended
- the statement of changes in net assets for the year then ended
- the statement of cash flows for the year then ended
- and notes to the financial statements, including a summary of significant accounting policies

(Hereinafter referred to as the "financial statements").

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the University as at April 30, 2020, and its results of operations, its changes in net assets and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the “Auditors’ Responsibilities for the Audit of the Financial Statements” section of our auditors’ report.

We are independent of the University in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada and we have fulfilled our other responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.
**Other Information**

Management is responsible for the other information. Other information comprises:

- the information, other than the financial statements and the auditors’ report thereon, included in the Annual Financial Report document.

Our opinion on the financial statements does not cover the other information and we do not and will not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information identified above and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit and remain alert for indications that the other information appears to be materially misstated.

We obtained the information, other than the financial statements and the auditors’ report thereon, included in Annual Financial Report document as at the date of this auditors’ report.

If, based on the work we have performed on this other information, we conclude that there is a material misstatement of this other information, we are required to report that fact in the auditors’ report.

We have nothing to report in this regard.

**Responsibilities of Management and Those Charged with Governance for the Financial Statements**

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the University’s ability to continue as a going concern, disclosing as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the University or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the University’s financial reporting process.

**Auditors’ Responsibilities for the Audit of the Financial Statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors’ report that includes our opinion.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists.

Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.
As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit.

We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion.

  The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the University's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the University's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditors' report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditors' report. However, future events or conditions may cause the University to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

- Communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Chartered Professional Accountants, Licensed Public Accountants

Hamilton, Canada
October 8, 2020
### Assets

<table>
<thead>
<tr>
<th>Category</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>$17,408</td>
<td>$21,944</td>
</tr>
<tr>
<td>Short-term investments (note 2)</td>
<td>183,222</td>
<td>203,902</td>
</tr>
<tr>
<td>Government grants and other accounts receivable (note 3)</td>
<td>43,387</td>
<td>34,107</td>
</tr>
<tr>
<td>Research grants receivable</td>
<td>94,680</td>
<td>104,083</td>
</tr>
<tr>
<td>Loans receivable (note 4)</td>
<td>12,892</td>
<td>-</td>
</tr>
<tr>
<td>Inventories</td>
<td>6,379</td>
<td>5,571</td>
</tr>
<tr>
<td>Prepaid expenses and deposits</td>
<td>26,154</td>
<td>13,781</td>
</tr>
<tr>
<td>Investments (note 2)</td>
<td>1,313,986</td>
<td>1,329,541</td>
</tr>
<tr>
<td>Other investments (note 4)</td>
<td>30,012</td>
<td>24,111</td>
</tr>
<tr>
<td>Other assets (note 5)</td>
<td>697</td>
<td>752</td>
</tr>
<tr>
<td>Capital assets (note 6)</td>
<td>1,208,455</td>
<td>1,158,793</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$384,122</td>
<td>$383,388</td>
</tr>
</tbody>
</table>

| Investments                                                              |          |          |
| Investments                                                              | $1,313,986| 1,329,541|
| Other investments                                                        | 30,012   | 24,111   |
| Other assets                                                             | 697      | 752      |
| Capital assets                                                           | 1,208,455| 1,158,793|
| **Total**                                                                | $2,937,272| $2,896,585|

### Liabilities, Deferred Contributions and Net Assets

<table>
<thead>
<tr>
<th>Category</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current liabilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities (note 7)</td>
<td>$150,058</td>
<td>$157,702</td>
</tr>
<tr>
<td>Deferred revenue</td>
<td>22,192</td>
<td>23,555</td>
</tr>
<tr>
<td>Current portion of long-term obligations (note 8)</td>
<td>709</td>
<td>665</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>172,959</td>
<td>181,922</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accrued employee future benefits (note 9)</td>
<td>448,446</td>
<td>357,290</td>
</tr>
<tr>
<td>Long-term obligations (note 8)</td>
<td>267,697</td>
<td>267,741</td>
</tr>
<tr>
<td>Deferred contributions (note 10):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deferred for future expenses</td>
<td>371,100</td>
<td>363,168</td>
</tr>
<tr>
<td>Deferred capital contributions</td>
<td>491,662</td>
<td>505,591</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>862,762</td>
<td>868,759</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Net assets</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>-</td>
<td>10,755</td>
</tr>
<tr>
<td>Internally restricted (note 11)</td>
<td>97,679</td>
<td>159,426</td>
</tr>
<tr>
<td>Equity in capital assets (note 12)</td>
<td>470,378</td>
<td>399,463</td>
</tr>
<tr>
<td>Endowments (note 13):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>141,333</td>
<td>150,410</td>
</tr>
<tr>
<td>External</td>
<td>476,018</td>
<td>500,819</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,185,408</td>
<td>1,220,873</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commitments and contingencies (note 14)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>$2,937,272</td>
<td>$2,896,585</td>
</tr>
</tbody>
</table>

On behalf of the Board of Governors:

__________________________  Chair, Board of Governors
__________________________  Chair, Audit and Risk Committee

See accompanying notes to financial statements
McMASTER UNIVERSITY
Statement of Operations
Year ended April 30, 2020, with comparative figures for 2019
(thousands of dollars)

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating grants</td>
<td>275,906</td>
<td>273,587</td>
</tr>
<tr>
<td>Research grants and contracts</td>
<td>173,720</td>
<td>178,022</td>
</tr>
<tr>
<td>Tuition fees</td>
<td>360,665</td>
<td>341,629</td>
</tr>
<tr>
<td>Other (note 15)</td>
<td>122,183</td>
<td>128,619</td>
</tr>
<tr>
<td>Ancillary sales and services</td>
<td>75,959</td>
<td>78,202</td>
</tr>
<tr>
<td>Investment income, net</td>
<td>26,392</td>
<td>70,820</td>
</tr>
<tr>
<td>Donations and other grants</td>
<td>69,809</td>
<td>67,906</td>
</tr>
<tr>
<td>Research overhead grants</td>
<td>15,563</td>
<td>15,390</td>
</tr>
<tr>
<td>Amortization of deferred capital contributions</td>
<td>40,773</td>
<td>38,835</td>
</tr>
<tr>
<td></td>
<td>1,160,970</td>
<td>1,193,010</td>
</tr>
<tr>
<td><strong>Expenses:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries and wages</td>
<td>543,930</td>
<td>521,219</td>
</tr>
<tr>
<td>Employee benefits</td>
<td>132,576</td>
<td>120,623</td>
</tr>
<tr>
<td>Supplies and services</td>
<td>300,877</td>
<td>308,107</td>
</tr>
<tr>
<td>Interest on long-term obligations</td>
<td>13,257</td>
<td>13,300</td>
</tr>
<tr>
<td>Amortization of capital assets</td>
<td>78,260</td>
<td>72,769</td>
</tr>
<tr>
<td></td>
<td>1,068,900</td>
<td>1,036,018</td>
</tr>
<tr>
<td><strong>Excess of revenues over expenses</strong></td>
<td>$ 92,070</td>
<td>$ 156,992</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements
## McMASTER UNIVERSITY

**Statement of Changes in Net Assets**

Year ended April 30, 2020, with comparative figures for 2019

(thousands of dollars)

<table>
<thead>
<tr>
<th></th>
<th>Unrestricted</th>
<th>Internally restricted</th>
<th>Equity in capital assets</th>
<th>Endowments</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Internal</td>
<td>External</td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net assets,</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>beginning of year</td>
<td>$10,755</td>
<td>$159,426</td>
<td>$399,463</td>
<td>$150,410</td>
<td>$500,819</td>
<td>$1,220,873</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$150,410</td>
<td>$500,819</td>
<td>$1,220,873</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess (deficiency) of revenues over expenses</td>
<td>129,557</td>
<td>-</td>
<td>(37,487)</td>
<td>-</td>
<td>-</td>
<td>92,070</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External endowment contributions:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions (note 13)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8,501</td>
<td>8,501</td>
</tr>
<tr>
<td>Protection of capital (note 13)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(33,302)</td>
<td>(33,302)</td>
</tr>
<tr>
<td>Transfers and adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfers for specific purposes</td>
<td>(40,987)</td>
<td>40,987</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Capital transactions from operating (note 12)</td>
<td>(108,402)</td>
<td>-</td>
<td>108,402</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Transfer from internal endowments (note 13)</td>
<td>9,077</td>
<td>-</td>
<td>-</td>
<td>(9,077)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Remeasurements and other items (note 9)</td>
<td>-</td>
<td>(102,734)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(102,734)</td>
</tr>
<tr>
<td></td>
<td>(10,755)</td>
<td>(61,747)</td>
<td>70,915</td>
<td>(9,077)</td>
<td>(24,801)</td>
<td>(35,465)</td>
</tr>
<tr>
<td><strong>Net assets, end of year</strong></td>
<td>$ -</td>
<td>$ 97,679</td>
<td>$ 470,378</td>
<td>$ 141,333</td>
<td>$ 476,018</td>
<td>$ 1,185,408</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements

8
McMASTER UNIVERSITY  
Statement of Cash Flows  
Year ended April 30, 2020, with comparative figures for 2019  
(thousands of dollars)

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash provided by (used in):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating activities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess of revenues over expenses</td>
<td>92,070</td>
<td>156,992</td>
</tr>
<tr>
<td>Adjustments for non-cash items:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amortization of deferred capital contributions</td>
<td>(40,773)</td>
<td>(38,835)</td>
</tr>
<tr>
<td>Amortization of capital assets</td>
<td>78,260</td>
<td>72,769</td>
</tr>
<tr>
<td>Employee future benefits</td>
<td>(11,578)</td>
<td>(15,815)</td>
</tr>
<tr>
<td>Equity earnings of other investments</td>
<td>(5,548)</td>
<td>(973)</td>
</tr>
<tr>
<td>Increase in decommissioning obligation</td>
<td>665</td>
<td>596</td>
</tr>
<tr>
<td></td>
<td>113,096</td>
<td>174,734</td>
</tr>
<tr>
<td>Net change in contributions deferred for future expenses</td>
<td>7,932</td>
<td>3,977</td>
</tr>
<tr>
<td>Net change in other non-cash working capital</td>
<td>(22,065)</td>
<td>9,085</td>
</tr>
<tr>
<td></td>
<td>98,963</td>
<td>187,796</td>
</tr>
<tr>
<td>Financing and investing activities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of capital assets</td>
<td>(127,922)</td>
<td>(148,010)</td>
</tr>
<tr>
<td>Net change in loans receivable</td>
<td>(12,892)</td>
<td>-</td>
</tr>
<tr>
<td>Net change in investments</td>
<td>36,235</td>
<td>(86,940)</td>
</tr>
<tr>
<td>Net change in other investments</td>
<td>(353)</td>
<td>-</td>
</tr>
<tr>
<td>Net change in other assets</td>
<td>55</td>
<td>478</td>
</tr>
<tr>
<td>Net change in external endowments</td>
<td>(24,801)</td>
<td>17,484</td>
</tr>
<tr>
<td>Deferred capital contributions</td>
<td>26,844</td>
<td>33,124</td>
</tr>
<tr>
<td>Principal repayments on long-term obligations</td>
<td>(665)</td>
<td>(624)</td>
</tr>
<tr>
<td></td>
<td>(103,499)</td>
<td>(184,488)</td>
</tr>
<tr>
<td>Net (decrease) increase in cash</td>
<td>(4,536)</td>
<td>3,308</td>
</tr>
<tr>
<td>Cash, beginning of year</td>
<td>21,944</td>
<td>18,636</td>
</tr>
<tr>
<td>Cash, end of year</td>
<td>$17,408</td>
<td>$21,944</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements
McMaster University (the "University"), which operates by authority of The McMaster University Act, 1976, is governed by a Board of Governors (the "Board") and Senate, the powers and responsibility of which are set out in the Act. The University is a comprehensive research institution offering a broad range of undergraduate, graduate and continuing education programs and degrees. The University is exempt from income taxes.

1. Significant accounting policies:

The financial statements have been prepared by management in accordance with Canadian accounting standards for not-for-profit organizations in Part III of the CPA Canada Handbook.

(a) Basis of presentation:

These financial statements include the accounts, transactions and operations for which the University has jurisdiction. They do not include the accounts, transactions and operations of the following entities which are independently governed and managed, and certain other related entities which carry out fundraising and other activities and are not material to these financial statements:

Independent entities:
- McMaster Divinity College
- McMaster Students Union, Inc.
- McMaster University Centre Incorporated
- McMaster Children’s Centre, Inc.
- McMaster Association of Part-Time Students (MAPS)
- Graduate Students Association (GSA)

Other entities:
- The McMaster University Trust
- Friends of McMaster Incorporated

McMaster Innovation Park:

The investment in the related entity, McMaster Innovation Park ("Park") relates to two Trusts, The Gore District Land Trust (GORE) and The First Longwood Innovation Trust (FLIT). GORE is controlled by the University based on Board composition, whereas FLIT is not controlled by the University. The investment is accounted for by the equity method (note 4) as permitted by accounting standards for not-for-profit organizations. Since the Trusts which form the Park have fiscal year ends of December 31st, the University records its share of the operating results effective on that date.

Other investments in for-profit entities subject to significant influence are accounted for using the equity method, whereby the investment is initially recorded at cost, net of any impairment and adjusted thereafter for the University’s share of the entity’s net surplus or deficit and any further impairments. Any distributions received are accounted for as a reduction in the investment.

- Adiga Life Sciences Inc. ("ALS"):

These financial statements include the University’s 50% interest in ALS (note 4). ALS is a joint venture with an unrelated pharmaceutical research company to commercialize intellectual property. ALS has a fiscal year end of August 31st and the University records its share of the operating results on that date.

- Halton McMaster Family Health Centre:

These financial statements include the University’s 50% contribution to the Halton McMaster Family Health Centre (note 4). This joint venture is a project with Joseph Brant Hospital involving the construction and establishment of a family health centre and hospital clinical and administration building. The joint venture is in the process of registering the constructed building as a leasehold condominium corporation.
1. Significant accounting policies (continued):

(a) Basis of presentation (continued):

OSCAR EMR:

OSCAR EMR ("OSCAR") is a not-for-profit technology/software company incorporated under the Ontario Corporations Act, controlled by McMaster University. OSCAR has a fiscal year end of December 31st. Financial information is disclosed in note 4. OSCAR has not been consolidated in the University's financial statements.

(b) Revenue recognition:

The University follows the deferral method of accounting for contributions which include donations and government grants. The principles under this method are summarized as follows:

- Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.
- Contributions externally restricted for purposes other than endowment and capital assets are deferred and recognized as revenue in the year in which the related expenses are recognized.
- Contributions externally restricted for capital asset purchases are deferred and amortized to operations on the same basis as the related capital asset.
- External endowment contributions, income preserved and activity under the endowment capital protection policy (note 1(m)) are recognized as a direct increase (decrease) in endowment net assets. Income earned from the investment thereof, to the extent it is allocated, is recorded as deferred contributions and recorded as revenue in the periods in which the related expenses are incurred.

Tuition fees which relate to academic terms or parts thereof occurring after April 30th are recorded as deferred revenue. Gifts-in-kind are recorded at their fair market value on receipt, or at nominal value when fair market value cannot be reasonably determined. Pledges from fundraising and other donations are recorded in the period in which they are collected. Ancillary sales and services revenue is recognized at point of sale or when the service has been provided.

(c) Financial instruments:

Financial instruments are recorded at fair value on initial recognition. Freestanding derivative instruments that are not in a qualifying hedging relationship and equity instruments that are quoted in an active market are subsequently measured at fair value. All other financial instruments are subsequently recorded at cost or amortized cost, unless management has elected to carry the instruments at fair value. The University has elected to carry investments in equity instruments, fixed income and other securities at fair value.

Transaction costs incurred on the acquisition of financial instruments measured subsequently at fair value are expensed as incurred. All other financial instruments are adjusted by transaction costs incurred on acquisition and financing costs, which are amortized using the straight-line method.

Financial assets are assessed for impairment on an annual basis at the end of the fiscal year if there are indicators of impairment. If there is an indicator of impairment, the University determines if there is a significant adverse change in the expected amount or timing of future cash flows from the financial asset. If there is a significant adverse change in the expected cash flows, the carrying value of the financial asset is reduced to the highest of the present value of the expected cash flows, the amount that could be realized from selling the financial asset or the amount the University expects to realize by exercising its right to any collateral. If events and circumstances reverse in a future period, an impairment loss will be reversed to the extent of the improvement, not exceeding the initial impairment charge.
1. Significant accounting policies (continued):

(d) Derivative financial instruments:

The University is party to an interest rate swap agreement which is used to manage the exposure to fluctuations in interest rates. The University uses the accrual basis of accounting for hedges. Gains or losses realized on the settlement of the hedging item are deferred until the settlement of the hedged item.

At the inception of the hedging relationship, the University designates that hedge accounting will be applied. The University formally documents the hedging relationship between the hedging instruments and hedged item. At the inception of the hedge and throughout its term, the terms of the hedging item and hedged item are the same.

Hedge accounting is used only when the notional amount of the swap matches the principal amount of the hedged item, the fair value of the swap at the inception is $nil, the fixed rate is the same throughout the swap and the variable rate is based on the same index and includes the same or no adjustment and the debt instrument cannot be settled before maturity and the swap matures within two weeks of the maturity date of the debt.

(e) Investments:

Short-term investments are investments with a remaining term to maturity of one year or less and are intended to be converted to cash within one year. Short-term investments recorded at cost plus accrued income which together approximates fair value. Short-term investments includes cash and short-term investments held within pooled fund investments.

Long-term investments are carried at fair values. Changes in fair values are included in investment income.

Investments in publicly traded research entities not subject to significant influence are carried in investments at fair values. Changes in fair values are included in other income. Investments in private research entities are carried in other assets at cost, net of any impairment.

Externally restricted investment income to the extent it is allocated is included with deferred contributions and recognized as revenue when the related expenses are incurred.

Unrestricted investment income is recognized as revenue during the period in which it is earned. Investment income from internal endowments is recorded as unrestricted revenue and transferred to internal endowments.

(f) Inventories:

Campus stores, scientific stores, and the nuclear reactor inventories are recorded at the lower of cost and net realizable value. Other inventories are recorded at cost which is a reasonable estimate of net realizable value.

(g) Capital assets:

Capital assets are recorded at cost, or if donated, at fair value on the date of receipt. Amortization is recorded on the straight-line basis at the following annual rates:

<table>
<thead>
<tr>
<th>Capital Asset</th>
<th>Annual Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings and building components</td>
<td>2.5% to 10%</td>
</tr>
<tr>
<td>Decommissioning retirement costs</td>
<td>4%</td>
</tr>
<tr>
<td>Site improvements</td>
<td>5%</td>
</tr>
<tr>
<td>Library materials</td>
<td>20%</td>
</tr>
<tr>
<td>Computing systems</td>
<td>5% to 10%</td>
</tr>
<tr>
<td>Equipment, furnishings and vehicles</td>
<td>20%</td>
</tr>
<tr>
<td>Computing equipment</td>
<td>33.3%</td>
</tr>
<tr>
<td>Leasehold improvements</td>
<td>term of lease</td>
</tr>
</tbody>
</table>

Capital assets in progress are carried at cost, with no amortization recorded until such time as the assets are available for their intended use.
1. Significant accounting policies (continued):

(h) Collections and works of art:

The value of collections has been excluded from the statement of financial position except for a nominal value of $1. Donations of works of art are recorded as revenue at values based on appraisals and are expensed in the year received. Purchased collections are expensed in the year of acquisition.

(i) Contributed services:

The University acknowledges the receipt of donated services. Because of the difficulty of determining their fair value, donated services are not recognized in the financial statements.

(j) Ancillary enterprises:

Ancillary enterprises are self-sustaining operations which fund their own replacements and renovations of equipment and facilities. Substantially all of the net operating results are transferred annually from unrestricted net assets to internally restricted net assets.

(k) Employee future benefits:

The University maintains defined benefit registered and non-registered pension plans, a retirement incentive program and group registered retirement savings plans. Non-pension post-retirement and post-employment benefits plans are also provided. Financial information is disclosed in note 9.

- The University accrues its obligations for the defined benefit plans as the employees render the services necessary to earn the benefits. The current service cost and the finance cost for the year are charged to excess of revenues over expenses. The actuarial method of determining the accrued benefit obligations for the defined benefit plans uses the funding valuation method, which reflects the long-term nature of the plan and reflects management's estimates of investment yields, salary inflation, benefit cost trends and other factors.

- The University has elected to accrue its obligations and related costs for unfunded plans on a basis consistent with funded plans.

- Remeasurement and other items are recognized as a direct increase (decrease) to net assets and are not reclassified to the statement of operations in subsequent periods. Remeasurement and other items comprise the aggregate of: the difference between the actual return on plan assets and the return calculated using the discount rate used to determine the defined benefit obligation; the actuarial gains and losses; the effect of any valuation allowance in the case of a net defined benefit asset; past service costs; and any gains and losses arising from settlements and curtailments.

The University also makes regular contributions to its Group Registered Retirement Savings Plan (“RRSP”), administered by a third party, on behalf of each eligible employee. Group RRSP contributions are expensed in the year made.
1. Significant accounting policies (continued):

   (l) Net assets:

   Net assets are classified as follows:

   Unrestricted: excess of revenues over expenses without specific restrictions.

   Internally restricted:
   - Employee future benefits: unfunded portion of pension and other non-pension retirement and post-
     employment benefits, net of funds set aside to meet estimated future obligations.
   - Other internal reserves: as approved by the Board, amounts include unexpended departmental carry
     forward amounts for future expenditures or amounts set aside to settle future oriented obligations.

   Equity in capital assets: funds invested in capital assets, exclusive of capital assets financed through long-term
   obligations or deferred capital contributions.

   Internal endowments: unrestricted contributions including unspent investment income which have been
   restricted by action of the Board.

   External endowments: external contributions, the principal of which is non-expendable pursuant to the
   restrictions by the donor, and income retained under the endowment capital protection policy.

   (m) Endowment capital protection policy:

   In order to protect the capital value of endowment investments, an endowment capital protection policy limits the
   amount of investment income allocated for spending to 4%, plus 1% administration spending, and requires the
   reinvestment of excess income earned (interest, dividends, realized and unrealized capital gains, net of investment
   expenses).

   Should endowment spending commitments exceed allocated income, amounts will be drawn from accumulated net
   investment income balances to fund deficiencies.

   For endowments without sufficient accumulated investment income, temporary encroachment on capital is permitted.
   The encroached amounts will be recovered from future investment returns.

   (n) Decommissioning obligation:

   The fair value of a future asset retirement obligation is recognized when a legal obligation for the retirement of
   tangible long-lived assets is incurred and a reasonable estimate thereof can be determined. Concurrently, the
   associated decommissioning costs are capitalized as a part of the carrying amount of the asset and amortized
   over its remaining useful life. The liability and the related asset may be adjusted periodically due to changes in
   estimates until settlement of the obligation.

   (o) Foreign currency translation:

   The University accounts for transactions in foreign currencies at the exchange rates in effect at the time of the
   transactions. At year end, monetary assets and liabilities in foreign currencies are translated at year end exchange
   rates. Foreign exchange gains and losses on investments have been included in investment income.

   (p) Use of estimates:

   The preparation of the financial statements requires management to make estimates and assumptions that affect
   the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the
   financial statements and the reported amounts of revenues and expenses during the year. Significant items
   subject to the use of management estimates and assumptions include the valuation of financial instruments, the
   carrying amount of capital assets, the valuation allowance for receivables, the valuation of pension and other
   employee future benefits, provisions for contingencies, and the decommissioning obligation. Actual results could
   differ from those estimates.
1. Significant accounting policies (continued):

(q) Changes in accounting policies:

In March 2018, the Accounting Standards Board issued “Basis for Conclusions - Accounting Standards Improvements for Not-for-Profit Organizations” resulting in the introduction of three new handbook sections in the Accounting Standards for Not-for-Profit Organizations Part III of the Handbook, two of which applied to the University:

- Section 4433, Tangible capital assets held by not-for-profit organizations, which directs organizations to apply the accounting guidance of Section 3061, Property Plant and Equipment in Part II of the Handbook. In so doing, the new section requires that organizations annually assess for partial impairment of tangible capital assets, to be recorded where applicable, as a non-reversible impairment expense. In addition, where practical, to componentize capital assets when estimates can be made of the useful lives of the separate components. This new accounting standard policy was applied prospectively. The change did not have a material impact on these financial statements.

- Section 4441, Collections held by not-for-profit organizations, which defines a collection and directs organizations to record such assets on the statement of financial position at either cost or nominal value. This new accounting standard policy was adopted retrospectively. Collections will continue to be recorded at nominal value. The changes did not have a material impact on these financial statements.

- During the year, management has modified the accounting related to deferred contributions for capital acquisitions. All external contributions for capital programs and projects are initially recorded as Deferred Capital Contributions (note 10(b)) and are no longer recorded as Deferred Contributions. In addition, for capital acquisitions completed in 2020 and future years, amortization of Deferred Capital Contributions is allocated on the related asset rather than allocated based on proportionate spending on class of assets. The impact to prior years is not material and as such, this accounting policy change has been treated on a prospective basis.

2. Investments:

Details of investments are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fair value</td>
<td>Cost</td>
</tr>
<tr>
<td>Equities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canadian</td>
<td>127,871</td>
<td>136,824</td>
</tr>
<tr>
<td>United States</td>
<td>297,946</td>
<td>159,434</td>
</tr>
<tr>
<td>Non-North American</td>
<td>212,248</td>
<td>192,286</td>
</tr>
<tr>
<td></td>
<td>638,065</td>
<td>488,544</td>
</tr>
<tr>
<td>Fixed income</td>
<td>616,174</td>
<td>597,230</td>
</tr>
<tr>
<td>Other</td>
<td>59,747</td>
<td>47,279</td>
</tr>
<tr>
<td></td>
<td>1,313,986</td>
<td>1,133,853</td>
</tr>
<tr>
<td>Short-term investments</td>
<td>183,222</td>
<td>183,195</td>
</tr>
<tr>
<td></td>
<td>$ 1,497,208</td>
<td>$ 1,316,248</td>
</tr>
</tbody>
</table>

Investments are exposed to foreign currency risk, interest rate risk, and market volatility. The University manages these risks through policies and procedures in place governing asset mix, equity and fixed income allocations, and diversification among and within categories.
3. Government grants and other accounts receivable:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government grants</td>
<td>$7,938</td>
<td>$6,975</td>
</tr>
<tr>
<td>Other</td>
<td>41,436</td>
<td>32,548</td>
</tr>
<tr>
<td><em>Less allowance for doubtful accounts</em></td>
<td>5,987</td>
<td>5,416</td>
</tr>
<tr>
<td><em>Balance, end of year</em></td>
<td>$43,387</td>
<td>$34,107</td>
</tr>
</tbody>
</table>

4. Other investments:

Details of other investments are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster Innovation Park (a)</td>
<td>$23,867</td>
<td>$19,271</td>
</tr>
<tr>
<td>Halton McMaster Family Health Centre (b)</td>
<td>4,720</td>
<td>4,720</td>
</tr>
<tr>
<td>Knightstone Capital Management IV Inc. (c)</td>
<td>750</td>
<td>-</td>
</tr>
<tr>
<td>Adiga Life Sciences Inc. (d)</td>
<td></td>
<td>120</td>
</tr>
<tr>
<td><em>Other investments (e)</em></td>
<td>675</td>
<td>-</td>
</tr>
<tr>
<td><em>Total</em></td>
<td>$30,012</td>
<td>$24,111</td>
</tr>
</tbody>
</table>

(a) McMaster Innovation Park:

The First Longwood Innovation Trust and The Gore District Land Trust ("Park") were created by the University in 2006 to develop an entity for research, education, training, innovation and commercialization.

Details of the investment are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$19,271</td>
<td>$17,234</td>
</tr>
<tr>
<td>Equity earnings</td>
<td>5,668</td>
<td>2,037</td>
</tr>
<tr>
<td>Distribution</td>
<td>(1,072)</td>
<td>-</td>
</tr>
<tr>
<td><em>Balance, end of year</em></td>
<td>$23,867</td>
<td>$19,271</td>
</tr>
</tbody>
</table>

Included in loans receivable are the following items:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gore Hamilton Spectator building acquisition loan</td>
<td>$11,549</td>
<td>-</td>
</tr>
<tr>
<td>Gore demand loan</td>
<td>1,043</td>
<td>-</td>
</tr>
<tr>
<td>FLIT payroll deferral loan</td>
<td>300</td>
<td>-</td>
</tr>
<tr>
<td><em>Total</em></td>
<td>12,892</td>
<td>-</td>
</tr>
</tbody>
</table>

During the year, the University provided a demand loan to The Gore District Land Trust in the amount of $11,500,000 (2019 - $nil). The loan bears interest at a fixed rate of 2.54% and repayment is due in full by February 28, 2021.

The University provided a demand loan during the year to The Gore District Land Trust in the amount of $1,042,809 (2019 - $nil). The demand loan is interest free and is payable at any time at the sole discretion of the lender.
4. Other investments (continued):

(a) McMaster Innovation Park (continued):

During the year, the University provided a non-revolving demand loan to First Longwood Innovation Trust, operating as McMaster Innovation Park, in the amount of $1,500,000 (2019 - $nil). The amounts drawn shall be limited to $150,000 per month for a period of ten months. The loan bears interest at a fixed rate of 1.65% and repayment is due in full by December 31, 2020.

Included in Other assets in note 5 is a loan receivable from McMaster Innovation Park in the amount of $482,219 at April 30, 2020 (2019 - $500,000).

The University is party to a Debt Service Deficiency Agreement as disclosed in note 14(c). As part of the agreement, the University receives a fee of 0.5% on the monthly outstanding balance. For the year ended April 30, 2020, $99,371 (2019 - $103,192) in income was recorded by the University.

Included in rent expense for the University for the year ended April 30, 2020 is $2,996,570 (2019 - $2,966,570).

Included in accounts receivable at April 30, 2020 is $820,495 (2019 - $648,020) receivable from the Park. Included in note 14(f) are $11,387,268 (2019 - $11,445,021) in operating lease commitments with the Park.

During the year the University provided payroll services at a fee which amounted to $13,200 (2019 - $13,200) and earned interest income of $28,950 (2018 - $22,548) on the accounts receivable balance.

Pertinent information from the Park's combined financial statements are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>December 31, 2019</th>
<th>December 31, 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets</td>
<td>$113,785</td>
<td>$110,889</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>$88,319</td>
<td>$89,041</td>
</tr>
<tr>
<td>Total deferred capital grants</td>
<td>$1,599</td>
<td>$2,606</td>
</tr>
<tr>
<td>Total trusts’ equity</td>
<td>$23,867</td>
<td>$19,241</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results of operations:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenues</td>
<td>$14,034</td>
<td>$12,900</td>
</tr>
<tr>
<td>Total expenses</td>
<td>$12,260</td>
<td>$10,863</td>
</tr>
<tr>
<td>Earnings before the undernoted item</td>
<td>$1,774</td>
<td>$2,037</td>
</tr>
<tr>
<td>Gain on exchange of land</td>
<td>$2,089</td>
<td>-</td>
</tr>
<tr>
<td>Other revenue</td>
<td>$1,805</td>
<td>-</td>
</tr>
<tr>
<td>Net earnings</td>
<td>$5,668</td>
<td>$2,037</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cash flows:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Provided by operating activities</td>
<td>$1,645</td>
<td>$204</td>
</tr>
<tr>
<td>Used in financing and investing activities</td>
<td>(1,531)</td>
<td>(16)</td>
</tr>
</tbody>
</table>

| Increase in cash                           | $114              | $188              |

(b) Halton McMaster Family Health Centre:

The investment in the Halton McMaster Family Health Centre represents the University's contribution of the base costs to construct the building.
4. Other investments (continued):

(c) Knightstone Capital Management IV Inc.:

The $750,000 is McMaster's equity contribution to the partnership for the Graduate Student Residence Development at 191 King Street West, Hamilton. The contribution is to fund various pre-construction development costs of the project that have been incurred for the mutual benefit of the partnership.

(d) Adiga Life Sciences Inc.:

During the year, the investment in Adiga Life Sciences Inc. (“Adiga”) of $120,000 was written off. Adiga has ceased operations and distributed its remaining net assets in 2019. The University’s share of dividends from Adiga during the year ended April 30, 2020 amounted to $nil (2019 - $883,000). McMaster has no financial liability associated with the Adiga wind-up.

Financial information from Adiga Life Sciences Inc.’s financial statements are as follows:

<table>
<thead>
<tr>
<th></th>
<th>August 31, 2019</th>
<th>August 31, 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets</td>
<td>$11</td>
<td>$246</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>$17</td>
<td>$6</td>
</tr>
<tr>
<td>Total equity</td>
<td>(6)</td>
<td>$240</td>
</tr>
<tr>
<td></td>
<td>$11</td>
<td>$246</td>
</tr>
<tr>
<td>Results of operations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total revenue</td>
<td>$2</td>
<td>$10</td>
</tr>
<tr>
<td>Total expenses</td>
<td>63</td>
<td>370</td>
</tr>
<tr>
<td>Net loss</td>
<td>(61)</td>
<td>(360)</td>
</tr>
</tbody>
</table>

(e) Other investments:

Other investments consist of shares in privately held companies in which McMaster does not have significant control or influence, recorded at cost.

(f) OSCAR EMR:

Financial information from OSCAR EMR’s financial statements are as follows:

<table>
<thead>
<tr>
<th></th>
<th>December 31, 2019</th>
<th>December 31, 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets</td>
<td>$226</td>
<td>$294</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>$1,685</td>
<td>$1,766</td>
</tr>
<tr>
<td>Net deficiency</td>
<td>(1,459)</td>
<td>(1,472)</td>
</tr>
<tr>
<td></td>
<td>$226</td>
<td>$294</td>
</tr>
<tr>
<td>Results of operations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total revenue</td>
<td>$636</td>
<td>$682</td>
</tr>
<tr>
<td>Total expenses</td>
<td>623</td>
<td>594</td>
</tr>
<tr>
<td>Net earnings</td>
<td>$13</td>
<td>$88</td>
</tr>
</tbody>
</table>
4. Other investments (continued):

(f) OSCAR EMR (continued):

Oscar EMR (the "Organization") has a plan in place to dissolve prior to the end of its upcoming fiscal year. This plan has been approved by the Directors of the Organization and is expected to be carried out during fiscal 2020. Based on the nature of the Organization's remaining assets and liabilities, there are no indications that would suggest impairment indicators exist. The amounts owing to McMaster from the Organization have either been repaid or expensed in prior years. McMaster's investment in the Organization has been carried at a zero value, and there is no liability as a result of the Organization's dissolution. Any amount realized on dissolution is not expected to be material.

5. Other assets:

Details of other assets are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans receivable (a)</td>
<td>$697</td>
<td>$752</td>
</tr>
<tr>
<td>Collections (b)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(a) Loans receivable:

The University has a loan receivable from a lessee in the amount of $214,912 for lease fit out costs as at April 30, 2020 (2019 - $251,754). The loan bears interest at a rate of 0% per annum and is payable over 10 years beginning in February 2016.

The University has a loan receivable from McMaster Innovation Park in the amount of $482,219 (2019 - $500,000). The loan bears interest at a fixed rate of 5.75% and is repayable in monthly payments of $4,113 over 15 years, beginning in May 2019.

(b) Collections:

The McMaster Museum of Art has significant collections of works of art and coins. Donations of works of art during the year amounted to $5,000 (2019 - $170,000).

6. Capital assets:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>Cost</th>
<th>Accumulated amortization</th>
<th>2020 Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>$87,040</td>
<td>-</td>
<td>$87,040</td>
</tr>
<tr>
<td>Buildings and building components</td>
<td>1,407,219</td>
<td>486,154</td>
<td>921,065</td>
</tr>
<tr>
<td>Decommissioning retirement costs</td>
<td>3,214</td>
<td>968</td>
<td>2,246</td>
</tr>
<tr>
<td>Site improvements</td>
<td>30,128</td>
<td>15,632</td>
<td>14,496</td>
</tr>
<tr>
<td>Leasehold improvements</td>
<td>62,500</td>
<td>21,364</td>
<td>41,136</td>
</tr>
<tr>
<td>Library materials</td>
<td>199,418</td>
<td>174,874</td>
<td>24,544</td>
</tr>
<tr>
<td>Equipment, furnishings and vehicles</td>
<td>414,500</td>
<td>351,484</td>
<td>63,016</td>
</tr>
<tr>
<td>Computing systems and computing equipment</td>
<td>145,510</td>
<td>90,598</td>
<td>54,912</td>
</tr>
</tbody>
</table>

$2,349,529 $1,141,074 $1,208,455
6. Capital assets (continued):

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>Cost</th>
<th>Accumulated amortization</th>
<th>2019</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>$84,389</td>
<td>-</td>
<td></td>
<td>$84,389</td>
</tr>
<tr>
<td>Buildings building components</td>
<td>1,336,490</td>
<td>456,823</td>
<td>879,667</td>
<td></td>
</tr>
<tr>
<td>Decommissioning retirement costs</td>
<td>3,188</td>
<td>858</td>
<td>2,330</td>
<td></td>
</tr>
<tr>
<td>Site improvements</td>
<td>29,166</td>
<td>14,434</td>
<td>14,732</td>
<td></td>
</tr>
<tr>
<td>Leasehold improvements</td>
<td>59,691</td>
<td>16,530</td>
<td>43,161</td>
<td></td>
</tr>
<tr>
<td>Library materials</td>
<td>189,618</td>
<td>165,609</td>
<td>24,009</td>
<td></td>
</tr>
<tr>
<td>Equipment, furnishings and vehicles</td>
<td>409,650</td>
<td>356,876</td>
<td>52,774</td>
<td></td>
</tr>
<tr>
<td>Computing systems and computing equipment</td>
<td>143,236</td>
<td>85,505</td>
<td>57,731</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2,255,428</td>
<td>$1,096,635</td>
<td>$1,158,793</td>
<td></td>
</tr>
</tbody>
</table>

Included in buildings is $62,576,000 (2019 - $152,125,000) representing buildings currently under construction and not available for use or subject to amortization. Included in computing systems and computing equipment is $nil (2019 - $1,770,000) representing software currently under development and not available for use or subject to amortization.

7. Accounts payable and accrued liabilities:

Included in accounts payable and accrued liabilities are government remittances payable, which includes amounts payable for payroll related taxes of $3,257,000 (2019 - $4,415,000).

8. Long-term obligations:

Details of long-term obligations are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity</td>
<td>Interest rate</td>
<td>Current portion</td>
</tr>
<tr>
<td>Long term debt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank term loan (a)</td>
<td>May 2033</td>
<td>floating</td>
</tr>
<tr>
<td>Debentures (b)</td>
<td>Oct 2052</td>
<td>6.15%</td>
</tr>
<tr>
<td>Debentures (c)</td>
<td>Nov 2065</td>
<td>4.105%</td>
</tr>
<tr>
<td>Decommissioning obligations (d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Principal payments due in each of the following five years are as follows (in thousands of dollars):

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>$709</td>
</tr>
<tr>
<td>2022</td>
<td>756</td>
</tr>
<tr>
<td>2023</td>
<td>805</td>
</tr>
<tr>
<td>2024</td>
<td>858</td>
</tr>
<tr>
<td>2025</td>
<td>915</td>
</tr>
</tbody>
</table>

(a) The bank term loan is unsecured and is being amortized over 30 years. The outstanding loan amount is subject to a 30 year interest rate swap agreement on an original notional principal of $20,954,441 with the banker whereby the University receives a floating interest rate while paying a fixed (10 year) rate of 6.384%.
8. Long-term obligations (continued):

(b) The debentures, which are unsecured, bear interest at 6.15% payable semi-annually in April and October. The proceeds of the issue are being used to finance various capital projects.

A voluntary sinking fund in internally restricted net assets, under other internal reserves (note 11(k)), has been established to provide funds to repay the debenture principal upon maturity. An annual increase to the sinking fund is charged to operations and other annual increases represent interest income of the fund. The value of the fund at April 30, 2020 amounted to $21,531,000 (2019 - $22,021,000).

(c) The debentures, which are unsecured, bear interest at 4.105% payable semi-annually in May and November. The proceeds of the issue are being used to finance various capital projects.

A voluntary sinking fund in internally restricted net assets, under other internal reserves (note 11(k)), has been established to provide funds to repay the debenture principal upon maturity. An annual increase to the sinking fund is charged to operations and other annual increases represent interest income of the fund. The value of the fund at April 30, 2020 amounted to $12,421,000 (2019 - $12,712,000).

(d) It is expected that the nuclear reactor will be decommissioned at some undeterminable future date. Under an agreement with the Canadian Nuclear Safety Commission (CNSC), a trust fund has been established which requires annual funding contributions to provide for the decommissioning costs. As at April 30, 2020, the fair value of the trust funds amounted to $11,701,000 (2019 - $11,697,000). The net present value of the estimated cost for decommissioning at April 30, 2020 is $13,594,000 (2019 - $12,955,000) using risk free rates ranging between 4.0% and 5.1%.

During fiscal 2015, an additional decommissioning obligation related to non-reactor radioactive materials was recognized. The obligation was recognized based on an estimated useful life of 25 years and using a risk free rate of 4.0%. At April 30, 2020, the amount of the obligation was $798,000 (2019 - $763,000), an increase of $26,000 to reflect changes in the number of non-reactor radioactive materials in service. The CNSC does not require that a trust fund be established to satisfy this obligation, however, an internal reserve to offset this obligation is included in Other internal reserves.

(e) The University has in place an interest rate swap agreement for 30 years which expires in 2033. Under the terms of the agreement, the University agrees to receive a floating interest rate on the loan (note 8(a)) while paying a fixed rate of 6.384%. The use of the agreement effectively enables the University to convert the floating rate interest obligation of the loan into a fixed rate obligation and thus manage its exposure to interest rate risk.

The notional and fair values of the interest rate swap agreement is as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional value</td>
<td>Fair value</td>
<td>Notional value</td>
</tr>
<tr>
<td>30-year interest rate swap</td>
<td>$14,023</td>
<td>$(5,468)</td>
</tr>
</tbody>
</table>

The change in fair value of the swap for the year ended April 30, 2020 is ($859,000) (2019 - ($168,000)).

9. Employee future benefits:

The University maintains three contributory defined benefit registered pension plans, one for full-time hourly employees and two for salaried employees (Plan 2000 and Original Plan). The plan for hourly employees was closed to new members on March 15, 2010. The Original Plan was closed to new members on January 14, 2003 and Plan 2000 remains open to new members. The defined benefit registered pension plans provide a pension for life based on the best average earnings of the member and years of pensionable service in the plan. The University also maintains both defined contribution and non-contributory defined benefit supplementary non-registered pension plans, a retirement incentive program and a group RRSP.
9. Employee future benefits (continued):

The University additionally maintains a non-pension post-retirement benefit plan which provides health, dental and life insurance benefits to retirees, a post-employment benefit plan which provides health benefits to employees on long-term disability and a special retirement arrangement for some senior administrators.

The accrued benefit obligations are determined by independent actuaries and the fair values of the plans’ assets are recorded as at April 30th.

(a) Information on the accrued benefit liability is as follows:

| (thousands of dollars) | 2020 |  
|------------------------|------|------|------|------|
|                        | Pension |     |     |      |
|                        | Registered | Supplemental | Other | Total |
| Accrued benefit obligation | $2,317,672 | $72,237 | $277,215 | $2,667,124 |
| Fair value of plan assets | 2,218,678 | - | - | 2,218,678 |
| Funded status - deficiency | $(98,994) | $(72,237) | $(277,215) | $(448,446) |

(b) Information on the benefit expense is as follows:

| (thousands of dollars) | 2020 |  
|------------------------|------|------|------|------|
|                        | Pension |     |     |      |
|                        | Registered | Supplemental | Other | Total |
| Current service cost | $34,104 | $35 | $7,675 | $41,814 |
| Interest cost, net | 886 | 3,816 | 15,274 | 19,976 |
| Total | $34,990 | $3,851 | $22,949 | $61,790 |

| (thousands of dollars) | 2019 |  
|------------------------|------|------|------|------|
|                        | Pension |     |     |      |
|                        | Registered | Supplemental | Other | Total |
| Current service cost | $33,373 | $37 | $7,631 | $41,041 |
| Interest (income) cost, net | (4,493) | 3,458 | 13,769 | 12,734 |
| Total | $28,880 | $3,495 | $21,400 | $53,775 |
9. Employee future benefits (continued):

(c) Information on remeasurements and other items is as follows:

<table>
<thead>
<tr>
<th></th>
<th>2020 (thousands of dollars)</th>
<th>2019 (thousands of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment loss</td>
<td>$(112,877)</td>
<td>$44,427</td>
</tr>
<tr>
<td>Actuarial gain (loss) on accrued benefit obligation</td>
<td>3,399</td>
<td>$(167,128)</td>
</tr>
<tr>
<td></td>
<td>(6,590)</td>
<td>(8,918)</td>
</tr>
<tr>
<td></td>
<td>$13,334</td>
<td>(12,907)</td>
</tr>
<tr>
<td></td>
<td>$10,143</td>
<td>(188,953)</td>
</tr>
<tr>
<td></td>
<td>$109,478</td>
<td>$122,701</td>
</tr>
<tr>
<td></td>
<td>($6,590)</td>
<td>($8,918)</td>
</tr>
<tr>
<td></td>
<td>$13,334</td>
<td>$12,907</td>
</tr>
<tr>
<td></td>
<td>$102,734</td>
<td>$144,526</td>
</tr>
</tbody>
</table>

(d) Information on the pension plan assets includes the following:

<table>
<thead>
<tr>
<th></th>
<th>Percentage of fair value of total plan</th>
<th>Target allocation percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity securities</td>
<td>64.7%</td>
<td>65.0%</td>
</tr>
<tr>
<td>Debt securities</td>
<td>34.8%</td>
<td>35.0%</td>
</tr>
<tr>
<td>Other</td>
<td>0.5%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

(e) The significant actuarial assumptions adopted in measuring the accrued benefit obligations are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Pension</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate</td>
<td>5.58%</td>
<td>5.54%</td>
</tr>
<tr>
<td>Rate of compensation increase</td>
<td>3.98%</td>
<td>-</td>
</tr>
</tbody>
</table>

(f) The significant actuarial assumptions adopted in measuring the net benefit expense are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Pension</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate</td>
<td>5.58%</td>
<td>5.56%</td>
</tr>
<tr>
<td>Rate of compensation increase</td>
<td>3.98%</td>
<td>-</td>
</tr>
</tbody>
</table>
9. Employee future benefits (continued):

(g) Details of annual contributions and benefits paid are as follows:

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pension</td>
<td>Other</td>
</tr>
<tr>
<td>Employer contributions</td>
<td>66,306</td>
<td>7,081</td>
</tr>
<tr>
<td>Employee contributions</td>
<td>28,286</td>
<td>-</td>
</tr>
<tr>
<td>Benefits paid</td>
<td>115,221</td>
<td>7,081</td>
</tr>
</tbody>
</table>

(h) For measurement purposes, a 4.61% annual rate of increase in per capita medical cost was assumed for 2019, grading down to 4.0% per annum in and after 2031. For per capita dental costs, an annual rate of increase of 4.0% per annum was assumed.

(i) Details of actuarial valuation completion for funding purposes and filing dates of the respective plans are as follows:

- hourly rated employee pensions: completed as at July 1, 2019. An additional valuation was completed as at January 1, 2020 to include additional employer contributions and improve required payments over the next three years.
- salaried employees’ pensions: completed as at July 1, 2018, the next required filing date is July 1, 2021.
- other (post-retirement benefit): completed as at March 31, 2019; the next valuation date is March 31, 2022.
- other (post-employment and retirement allowance): completed as at April 30, 2020.

The results of valuations not completed as of April 30, 2020, have been extrapolated to April 30, 2020, which is the measurement date used to determine the accrued benefit obligation for all employee future benefit plans.

The July 1, 2018 valuation of salaried plans was completed using the Pension Benefit Act definition of closed plan. The definition of closed plan was amended under the Act in 2019 such that Plan 2000 no longer meets the closed plan definition and will be filed as an open plan at July 1, 2021. This change is expected to reduce the plan liabilities and the funding requirements for the Provision for Adverse Deviation upon filing the next actuarial valuation.

(j) In 2008, the University created a group RRSP for certain types of new employees. University and employees’ contributions in 2020 amounted to $4,144,000 (2019 - $3,356,000).

(k) The University has internal reserves set aside in the amount of $116,252,000 (2019 - $93,816,000) for the accrued benefit obligation of the non-pension post-retirement benefit plan included in note 11(b).
10. Deferred contributions:

(a) Deferred for future expenses:

Deferred contributions represent external contributions restricted for research and trust expenses to be incurred in subsequent fiscal years. Details of the change in deferred contributions are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$363,168</td>
<td>$359,191</td>
</tr>
<tr>
<td>Deferred and capital contributions (2019 only) received</td>
<td>334,774</td>
<td>345,175</td>
</tr>
<tr>
<td>Less:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amounts recognized as revenue</td>
<td>(304,637)</td>
<td>(308,074)</td>
</tr>
<tr>
<td>Deferred capital contributions transfer</td>
<td>(22,205)</td>
<td>(33,124)</td>
</tr>
<tr>
<td>Balance, end of year</td>
<td>$371,100</td>
<td>$363,168</td>
</tr>
</tbody>
</table>

Deferred contributions consist of the following:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research grants and contracts</td>
<td>$233,612</td>
<td>$226,036</td>
</tr>
<tr>
<td>Donations, other grants and investment income</td>
<td>114,511</td>
<td>106,505</td>
</tr>
<tr>
<td>Capital grants and donations</td>
<td>-</td>
<td>7,911</td>
</tr>
<tr>
<td>Other restricted funds</td>
<td>22,977</td>
<td>22,716</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$371,100</strong></td>
<td><strong>$363,168</strong></td>
</tr>
</tbody>
</table>

(b) Deferred capital contributions:

Deferred capital contributions represent the unamortized amount of donations and grants received for the purchase of capital assets. Unspent deferred capital contributions are recorded as amounts not subject to amortization until such time as the capital expenditures are incurred. Details of the change in the unamortized deferred capital contributions are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$505,591</td>
<td>$511,302</td>
</tr>
<tr>
<td>Add: contribution received and transfers</td>
<td>28,844</td>
<td>33,124</td>
</tr>
<tr>
<td>Less: amount amortized to revenue</td>
<td>(40,773)</td>
<td>(38,835)</td>
</tr>
<tr>
<td>Balance, end of year</td>
<td>$491,662</td>
<td>$505,591</td>
</tr>
</tbody>
</table>

Deferred capital contributions consist of the following:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amounts subject to amortization</td>
<td>$484,980</td>
<td>$505,591</td>
</tr>
<tr>
<td>Amounts not subject to amortization</td>
<td>6,682</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$491,662</strong></td>
<td><strong>$505,591</strong></td>
</tr>
</tbody>
</table>
11. Internally restricted net assets:

Details of internally restricted net assets are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pensions (a)</td>
<td>$(198,301)</td>
<td>$(106,244)</td>
</tr>
<tr>
<td>Other retirement and post employment benefit plans (net) (b)</td>
<td>(160,963)</td>
<td>(180,865)</td>
</tr>
<tr>
<td>Employee future benefits</td>
<td>(359,264)</td>
<td>(287,109)</td>
</tr>
<tr>
<td>Unexpended departmental carryforwards (c)</td>
<td>196,580</td>
<td>167,657</td>
</tr>
<tr>
<td>Unexpended research funds (d)</td>
<td>44,836</td>
<td>44,271</td>
</tr>
<tr>
<td>Employee benefit (e)</td>
<td>10,360</td>
<td>11,630</td>
</tr>
<tr>
<td>Ancillaries (f)</td>
<td>10,300</td>
<td>9,642</td>
</tr>
<tr>
<td>Specific purpose (g)</td>
<td>82,787</td>
<td>98,497</td>
</tr>
<tr>
<td>Research investments (h)</td>
<td>4,965</td>
<td>-</td>
</tr>
<tr>
<td>Employee benefit (i)</td>
<td>14,834</td>
<td>14,491</td>
</tr>
<tr>
<td>Sinking funds (k)</td>
<td>33,952</td>
<td>34,860</td>
</tr>
<tr>
<td>Internally financed capital projects (l)</td>
<td>(110,535)</td>
<td>(69,525)</td>
</tr>
<tr>
<td>Capital reserves (m)</td>
<td>64,495</td>
<td>112,444</td>
</tr>
<tr>
<td>Facilities services projects (n)</td>
<td>102,600</td>
<td>19,625</td>
</tr>
<tr>
<td>Other internal reserves</td>
<td>456,943</td>
<td>446,535</td>
</tr>
<tr>
<td></td>
<td>$ 97,679</td>
<td>$ 159,426</td>
</tr>
</tbody>
</table>

(a) Pensions: the net unfunded pension liabilities, determined by a third party actuary, using the funding methodology.

(b) Other retirement and post employment benefit plans (net): unfunded portion of health, dental and life insurance benefits for retirees and employees on long term disability of $277,215,000 (2019 - $274,681,000), net of internal reserves of $116,252,000 (2019 - $93,816,000) for the accrued benefit obligation of the non-pension post-retirement benefit plan (note 9(k)).

(c) Unexpended departmental carryforwards: departmental operating reserves available for spending by faculties to protect against possible adverse circumstances such as changes in student enrolment (tuition fee impacts) and/or operating grant reductions.

Departmental and ancillary carryforwards in (c) and (f) do not reflect the share of future obligations to the related employees for settlement of pensions and other post-employment benefits costs as outlined in items (a) and (b). Allocation of these obligations to the related carryforward would reduce the available balances as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpended departmental carryforwards (c)</td>
<td>$ 196,580</td>
<td>$ 167,657</td>
</tr>
<tr>
<td>Ancillaries (f)</td>
<td>10,300</td>
<td>9,642</td>
</tr>
<tr>
<td>Employee benefit (e)</td>
<td>10,360</td>
<td>11,630</td>
</tr>
<tr>
<td>Pensions (a)</td>
<td>(198,301)</td>
<td>(106,244)</td>
</tr>
<tr>
<td>Other retirement and post employment benefit plans (b)</td>
<td>(160,963)</td>
<td>(180,865)</td>
</tr>
<tr>
<td></td>
<td>$(142,024)</td>
<td>$(98,180)</td>
</tr>
</tbody>
</table>

(d) Unexpended research funds: represent research residual funds and other research contributions specifically to fund research operations, facilities and projects.

(e) Employee benefit: funds collected from departments toward benefit related pension and non-pension payments not yet due in the fiscal period.

(f) Ancillaries: funds accumulated to maintain existing infrastructure and/or invest in new infrastructure or projects associated with ancillary operations.
11. Internally restricted net assets (continued):

(g) Specific purpose: funds to mitigate the risks associated primarily with volatility in income from equity investments, representing accumulated realized and unrealized investment earnings (losses) after commitments to the operating fund. The primary use of this reserve is to supplement endowment funding to support student bursaries, scholarships, and other expenditures when investment income is insufficient. It may also be used to fund other strategic reserves such as the post-retirement benefits and capital reserves. In fiscal 2020, $15 million was transferred to each of the post-retirement benefit reserve and capital reserve as part of the long term funding strategy for these commitments.

(h) Research investments: represents the fair value of publicly held research entities, including accumulated realized and unrealized investment earnings, as well as the cost of privately held research entities.

(i) MIP investment: represents accumulated investment earnings from the investment in MIP.

(j) Other: Non-cash reserve which primarily represents timing differences between cash accounting and accrual accounting.

(k) Sinking funds: funds set aside to settle debt bullet repayments of $120 million due in each of 2052 and 2065.

(l) Internally financed capital projects: long term loans for capital projects which have been internally financed by capital reserves as outlined in note 11(m).

Details of the internally financed capital projects which have various recovery terms and periods are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>April 30, 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stadium and Parking Project</td>
<td>Parking fees, pledges, fundraising</td>
</tr>
<tr>
<td>Les Prince Residence</td>
<td>Ancillary operations</td>
</tr>
<tr>
<td>David Braley Athletic Centre</td>
<td>Student levies, pledges, fundraising</td>
</tr>
<tr>
<td>Peter George Centre for Living and Learning</td>
<td>Ancillary operations</td>
</tr>
<tr>
<td>McMaster Automotive Resource Centre (MARC)</td>
<td>Various</td>
</tr>
<tr>
<td>McMaster University Medical Centre (MUMC)</td>
<td>Various</td>
</tr>
<tr>
<td>Comprehensive Energy Reduction Program</td>
<td>Various</td>
</tr>
<tr>
<td>Biomedical Engineering and Advanced Manufacturing (BEAM)</td>
<td>Various</td>
</tr>
<tr>
<td>Other</td>
<td>Various</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project</th>
<th>April 30, 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stadium and Parking Project</td>
<td>Parking fees, pledges, fundraising</td>
</tr>
<tr>
<td>Les Prince Residence</td>
<td>Ancillary operations</td>
</tr>
<tr>
<td>David Braley Athletic Centre</td>
<td>Student levies, pledges, fundraising</td>
</tr>
<tr>
<td>McMaster Automotive Resource Centre (MARC)</td>
<td>Various</td>
</tr>
<tr>
<td>McMaster University Medical Centre (MUMC)</td>
<td>Various</td>
</tr>
<tr>
<td>Comprehensive Energy Reduction Program</td>
<td>Various</td>
</tr>
<tr>
<td>Biomedical Engineering and Advanced Manufacturing (BEAM)</td>
<td>Various</td>
</tr>
<tr>
<td>Other</td>
<td>Various</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(m) Capital reserves: funds for planned capital projects committed and confirmed by governance approvals, as outlined in note 14(d).

(n) Facilities services projects: holding accounts for temporarily unspent funds for construction projects in progress.
12. Equity in capital assets:

The equity in capital assets is calculated as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital assets</td>
<td>$1,208,455</td>
<td>$1,158,793</td>
</tr>
<tr>
<td>Less amounts financed by:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net long-term obligations</td>
<td>(253,097)</td>
<td>(253,739)</td>
</tr>
<tr>
<td>Deferred capital contributions subject to amortization</td>
<td>(484,980)</td>
<td>(505,591)</td>
</tr>
<tr>
<td></td>
<td>$470,378</td>
<td>$399,463</td>
</tr>
</tbody>
</table>

Details of the transfer for capital transactions are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repayment of long-term debt</td>
<td>$665</td>
<td>$624</td>
</tr>
<tr>
<td>Capital asset purchases from operating, net of disposals</td>
<td>107,737</td>
<td>114,894</td>
</tr>
<tr>
<td></td>
<td>$108,402</td>
<td>$115,518</td>
</tr>
</tbody>
</table>

13. Endowments:

(a) Internal:

Details of the change in internally restricted endowments are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$150,410</td>
<td>$145,777</td>
</tr>
<tr>
<td>Donations</td>
<td>248</td>
<td>142</td>
</tr>
<tr>
<td>Investment (loss) income</td>
<td>(3,840)</td>
<td>8,029</td>
</tr>
<tr>
<td>Net transfers and expenses</td>
<td>(5,485)</td>
<td>(3,538)</td>
</tr>
<tr>
<td>Balance, end of year</td>
<td>$141,333</td>
<td>$150,410</td>
</tr>
</tbody>
</table>

Included in internal endowments is an amount of $64,392,000 (2019 - $68,977,000) reflecting the legacy of Dr. H. L. Hooker and $60,435,000 (2019 - $64,141,000) related to the Salaried Pension Plan surplus withdrawal from 2003. A portion of annual investment income generated from this capital is used to fund programs that enrich the academic achievements of the University as approved annually by the Board.
13. Endowments (continued):

(b) External:

Details of the change in externally restricted endowments are as follows:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$500,819</td>
<td>$483,335</td>
</tr>
<tr>
<td>External contributions</td>
<td>8,501</td>
<td>10,218</td>
</tr>
<tr>
<td>Income (withdrawn) retained - capital protection policy</td>
<td>(33,302)</td>
<td>7,266</td>
</tr>
<tr>
<td>Balance, end of year</td>
<td>$476,018</td>
<td>$500,819</td>
</tr>
</tbody>
</table>

Investment loss on external endowments amounted to $14,671,000 (2019 - $24,240,000 income). In accordance with the endowment capital protection policy, this loss/income is withdrawn from/added to net endowment assets, together with reduction of the amount made available for spending of $18,759,000 (2019 - $17,680,000), plus net transfers of $129,000 (2019 - $706,000). The amount made available for spending is recorded as investment income in the statement of operations.

14. Commitments and contingencies:

(a) Canadian Universities Reciprocal Insurance Exchange:

The University is a member of the Canadian Universities Reciprocal Insurance Exchange "CURIE", a self-insurance cooperative comprised of approximately sixty Canadian universities and colleges. CURIE insures property damage, general liability and errors and omissions risks. If premiums collected are insufficient to cover expenses and claims, the University may be requested to pay additional amounts.

(b) Legal claims:

The University is involved in certain legal matters and litigation in the normal course of operations, the outcomes of which are not presently determinable. The loss, if any, from these contingencies will be accounted for in the periods in which the matters are determined. Management is of the opinion that these matters are mitigated by adequate insurance coverage.

(c) Debt Service Deficiency Agreement:

The University has guaranteed the scheduled principal and interest payments, up to $23 million of long-term debt extended to The First Longwood Innovation Trust, in the event of default. The total amount of debt outstanding and subject to the Debt Service Deficiency Agreement at April 30, 2020 was $19.3 million (2019 - $20.2 million). Since the agreement may expire without being drawn upon, it does not necessarily represent future cash requirements. As of April 30, 2020, no obligation exists under the agreement and as a result, no amount has been recognized as a liability on the statement of financial position.

(d) Capital commitments:

The estimated cost to complete approved major capital and system projects amounted to $294.4 million at April 30, 2020 (2019 - $276.3 million). The major commitments are as follows: DeGroote School of Business expansion ($81.4 million), Athletics and Recreation expansion ($48.7 million) and Commercialization of Research ($42.7 million).
14. Commitments and contingencies (continued):

(e) Energy Retrofit Agreement:
In 2007, the University signed a multi-year agreement with Hamilton Health Sciences Corporation ("HHSC") when HHSC undertook a significant energy retrofit project at the McMaster University Medical Centre. Under the terms of the agreement, the University is required to pay approximately 40% of the related costs of the retrofit project. At April 30, 2020, the University's remaining share of the costs are estimated to be $8.6 million (2019 - $9.5 million). Payments to HHSC will take place up to 2029.

(f) Leases:
The University has entered into operating lease agreements for office equipment and buildings. The total annual minimum lease payments in each of the next five years are approximately as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Dollars (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>$4,341</td>
</tr>
<tr>
<td>2022</td>
<td>2,933</td>
</tr>
<tr>
<td>2023</td>
<td>3,629</td>
</tr>
<tr>
<td>2024</td>
<td>3,701</td>
</tr>
<tr>
<td>2025</td>
<td>3,707</td>
</tr>
</tbody>
</table>

(g) McMaster Main Street Student Residence:
The University is working with a private developer to provide an approximately 1,400 bed undergraduate residence that includes learning, research and additional ancillary university spaces along Main Street West on lands McMaster owns. The project land once developed will be an extension of main campus. At April 30, 2020, $16.3 million (2019 - $16.3 million) is recorded in land. The project is expected to be completed by 2023/24. The residence will be managed, operated and used by the University to support its mission.

(h) Grad Residence and Parking Garage:
The University is working with a private developer to provide a new graduate residence with approximately 630 beds and a 265 space parking garage in downtown Hamilton. The residence project is designed to be a public-private partnership project, for which the University is in ongoing negotiations. The project is expected to be completed by 2022/23. To support this project the University has entered into a 99 year land lease effective October 1, 2019, with four 25 year renewal options.

(i) Research Commercialization:
In June 2017 the Board approved an investment of up to $25 million in facilities at MIP, including up to $5 million in in-kind rental space and rent subsidies over the next five years in exchange for leases and other financial arrangements, which may include equity interest in one or more of the entities renting the space. The Board approved additional investments of up to $25 million in June 2018 and up to $13 million in June 2020. These facilities investments are in support of research commercialization opportunities for early stage commercialization and established businesses. Construction on this space has begun and third party tenants will begin to move into the space in 2020. $17.3 million of the total $63 million approved investment has been spent as of April 30, 2020 (2019 - $4.3 million).
15. Other income:

Details of other income are as follows:

<table>
<thead>
<tr>
<th>Major Sources</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Health Sciences</td>
<td>$57,821</td>
<td>$58,963</td>
</tr>
<tr>
<td>Other Faculties</td>
<td>10,218</td>
<td>10,542</td>
</tr>
<tr>
<td>Academic Services</td>
<td>10,724</td>
<td>14,098</td>
</tr>
<tr>
<td>Student Services</td>
<td>20,237</td>
<td>21,533</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>19,800</td>
<td>22,510</td>
</tr>
<tr>
<td>Other Investment Income</td>
<td>3,383</td>
<td>973</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$122,183</strong></td>
<td><strong>$128,619</strong></td>
</tr>
</tbody>
</table>

16. Related party transactions:

In addition to certain transactions and balances disclosed in note 4, the University received funds of approximately $2,142,000 (2019 - $1,199,000) during the year from fundraising entities.

17. Financial risks and concentration of credit risk:

(a) Liquidity risk:

Liquidity risk is the risk that the University will be unable to fulfill its obligations on a timely basis or at a reasonable cost. In managing liquidity risk, the University focuses on liquid resources available for operations. The University's objective is to have sufficient liquid resources to continue operating even if adverse financial events were to occur and to provide it with the flexibility to take advantage of opportunities that will advance its mission. The need for sufficient liquid resources is considered in the preparation of its annual and capital budgets and by monitoring and forecasting of cash flows. The University has a $75 million line of credit. The credit facility can be used for general corporate purposes including shorter term funding in the event of a short-term deficiency in cash flow. The line of credit was not used in 2020. In addition, the University could issue unsecured debentures or enter into other long term debt to assist in the financing of capital projects. There has been no material change to the risk exposure from 2019.

(b) Credit risk:

Credit risk refers to the risk that a counterparty may default on its contractual obligations resulting in a financial loss. The University is exposed to credit risk with respect to accounts receivable. The University assesses, on a continuous basis, accounts receivable and provides for any amounts that are not collectible in the allowance for doubtful accounts (note 3).

(c) Interest rate risk:

The University is exposed to interest rate risk on its fixed interest rate financial instruments. Further details about the fixed rate investments are included in note 2 and the long-term obligations are included in note 8.

(d) Currency risk:

Investments denominated in foreign currency are exposed to currency risk as the price in local terms in foreign markets is converted to Canadian dollars to determine fair value. The University's overall currency positions are monitored on a daily basis by the portfolio manager. There has been no material change to the risk exposure from 2019.
18. Ontario student opportunity trust fund:

External endowments include grants for funding student aid provided by the Government of Ontario's Student Opportunity Trust Fund matching program. Under the program, the Province has matched qualifying external endowment donations received with equal contributions.

(a) Ontario Student Opportunity Trust Fund - Phase I

The following schedule represents the changes for the years ended April 30th, in the first phase of the Ontario Student Opportunity Trust Fund (OSOTF I) balance:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment balance, beginning of year</td>
<td>$32,163</td>
<td>$32,147</td>
</tr>
<tr>
<td>Investment income retained for protection of capital</td>
<td>540</td>
<td>333</td>
</tr>
<tr>
<td>Investment income transferred to expendable income</td>
<td>(432)</td>
<td>(317)</td>
</tr>
<tr>
<td>Endowment balance, end of year</td>
<td>32,271</td>
<td>32,163</td>
</tr>
<tr>
<td>Funds available for awards, beginning of year</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Investment income</td>
<td>1,583</td>
<td>1,546</td>
</tr>
<tr>
<td>Bursaries awarded (2020 - 1,993 awards; 2019 - 1,775 awards)</td>
<td>(2,015)</td>
<td>(1,863)</td>
</tr>
<tr>
<td>Investment income transferred from endowment balance</td>
<td>432</td>
<td>317</td>
</tr>
<tr>
<td>Funds available for awards, end of year</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total funds at book value</td>
<td>$32,271</td>
<td>$32,163</td>
</tr>
</tbody>
</table>

The market value of the endowment as at April 30, 2020 was $37,157,000 (2019 - $39,727,000).

(b) Ontario Student Opportunity Trust Fund - Phase II

The Ontario government requires separate reporting of balances as at April 30th, and details of the changes in the balances for the period then ended with respect to the second phase of the Ontario Student Opportunity Trust Fund (OSOTF II) of McMaster University including Divinity College.

The following is the schedule of changes for the years ended April 30th:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment balance, beginning of year</td>
<td>$6,178</td>
<td>$6,143</td>
</tr>
<tr>
<td>Investment income (transferred to) retained for protection of capital</td>
<td>(160)</td>
<td>35</td>
</tr>
<tr>
<td>Endowment balance, end of year</td>
<td>6,018</td>
<td>6,178</td>
</tr>
<tr>
<td>Funds available for awards, beginning of year</td>
<td>72</td>
<td>69</td>
</tr>
<tr>
<td>Investment income for expenditures</td>
<td>289</td>
<td>279</td>
</tr>
<tr>
<td>Bursaries awarded (2020 - 377 awards; 2019 - 353 awards)</td>
<td>(305)</td>
<td>(276)</td>
</tr>
<tr>
<td>Funds available for awards, end of year</td>
<td>56</td>
<td>72</td>
</tr>
<tr>
<td>Total funds at book value</td>
<td>$6,074</td>
<td>$6,250</td>
</tr>
</tbody>
</table>

The market value of the endowment as at April 30, 2020 was $6,894,000 (2019 - $7,398,000).
19. Ontario trust for student support:

External endowments include grants for funding student aid provided by the Government of Ontario’s Ontario Trust for Student Support (OTSS) matching program. Under the program, the Province will provide an equivalent matching contribution for external endowment contributions made to a specified ceiling.

The following is the schedule of changes in the endowment and expendable balances for the years ended April 30th:

<table>
<thead>
<tr>
<th>(thousands of dollars)</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment balance, beginning of year</td>
<td>$39,915</td>
<td>$39,539</td>
</tr>
<tr>
<td>Investment income (transferred to)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>retained for protection of capital</td>
<td>(893)</td>
<td>376</td>
</tr>
<tr>
<td>Endowment balance, end of year</td>
<td>39,022</td>
<td>39,915</td>
</tr>
</tbody>
</table>

Funds available for awards, beginning of year
Investment income for expenditures
Bursaries awarded (2020 - 774 awards; 2019 - 732 awards)
Funds available for awards, end of year

Total funds at book value

$39,863 $40,850

The market value of the endowment as at April 30, 2020 was $49,994,000 (2019 - $53,051,000).

20. Pledges:

Outstanding but unrecorded pledges for donations and other fund raising amounted to approximately $79,062,000 (2019 - $78,871,000).

21. COVID-19:

In March 2020, the World Health Organization declared the spread of coronavirus (“COVID-19”) to constitute a global pandemic. This has resulted in governments worldwide enacting emergency measures to combat the spread of the virus including travel restrictions in and out of and within Canada, barring gathering of people and requirements to stay at home. These restrictions impacted the operations of the University and resulted in the closure of physical premises of all post-secondary institutions. The impact of COVID-19 also adversely impacted global commercial activity and contributed to the significant volatility in certain equity and debt markets. This led to significant volatility and declines in the global public equity markets and it is uncertain how long this volatility will continue.

The extent of such adverse effects on the University’s business and financial and operational performance are uncertain and difficult to assess. The financial impacts will depend on future developments, including the duration, spread and severity of the outbreak, physical distancing requirements, the duration and geographic scope of related travel advisories and restrictions, and the extent of disruptions to businesses globally and its related impact on the economy.

As at April 30, 2020, the University did not have significant adjustments to reflect the possible future impact of COVID-19. Investments are recorded at fair value which included the impact on financial markets as at year-end and extra emphasis was put on the collectability of receivables and other estimates within the financial statements as at April 30, 2020. Management has assessed the going concern assumptions and believes there are no issues, given the University has a strong working capital base and access to liquid resources to support operations in the coming year. Given the outcome and timeframe to a recovery from the current pandemic is highly unpredictable, it is not practicable to estimate and disclose its financial effect on future operations at this time.

22. Comparative figures:

Certain comparative figures for 2019 have been reclassified to conform with the financial statement presentation adopted in the current year.
Preamble: Understanding the Annual Financial Report

Slides 2 - 5 Are ONLY orientation slides to aid non-financial readers about the Report and financial statements and how they relate Not a part of the meeting presentation
What’s in the Annual Financial Report?

**Year In Review:** financially focused executive summary of the year

**Financial Analysis:** key performance indicators (using 5-year trends)

**Revenues:** explaining where our funds came from this year vs. last year

**Expenses:** focusing on people costs, which are >60% of annual expenses

**Capital Projects & Financing:** explaining the next largest annual costs

**Enterprise Risk Management:** highlighting our top risks as assessed annually (whereas opportunities are integrated into strategy)

**Supplemental Information:** compares the annual results to the Strategic Mandate Agreement linked operating budget (with variance explanations)

The last section is the annual audited financial statements with notes.

This presentation works to provide a high-level explanation of the financial statement results, with trend information and key highlights.
Aka the “BALANCE SHEET” where: \[ A = B + C + D \]

**McMaster’s resources on hand (cash), receivable, or invested in market or assets**

<table>
<thead>
<tr>
<th>Assets</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>$17,408</td>
<td>$21,944</td>
</tr>
<tr>
<td>Government grants and other accounts receivable (note 3)</td>
<td>43,387</td>
<td>34,107</td>
</tr>
<tr>
<td>Research grants receivable</td>
<td>94,880</td>
<td>104,083</td>
</tr>
<tr>
<td>Loans receivable (note 4)</td>
<td>12,882</td>
<td>-</td>
</tr>
<tr>
<td>Inventories</td>
<td>6,379</td>
<td>5,571</td>
</tr>
<tr>
<td>Prepaid expenses and deposits</td>
<td>26,154</td>
<td>13,781</td>
</tr>
<tr>
<td>Investments (note 2)</td>
<td>1,313,686</td>
<td>1,328,541</td>
</tr>
<tr>
<td>Other investments (note 4)</td>
<td>30,012</td>
<td>24,111</td>
</tr>
<tr>
<td>Other assets (note 5)</td>
<td>697</td>
<td>752</td>
</tr>
<tr>
<td>Capital assets (note 6)</td>
<td>1,208,455</td>
<td>1,158,783</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$2,897,272</td>
<td>$2,986,585</td>
</tr>
</tbody>
</table>

**McMaster’s current obligations that are mostly liabilities (payments owned) and some revenues received but not yet earned**

<table>
<thead>
<tr>
<th>Liabilities, Deferred Contributions and Net Assets</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current liabilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current portion of long-term obligations (note 8)</td>
<td>$172,408</td>
<td>$181,922</td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities (note 7)</td>
<td>$150,058</td>
<td>$157,702</td>
</tr>
<tr>
<td>Deferred revenues</td>
<td>22,192</td>
<td>23,838</td>
</tr>
<tr>
<td></td>
<td><strong>Total current liabilities</strong></td>
<td>$194,250</td>
</tr>
<tr>
<td>Acausal employee future benefits (note 9)</td>
<td>448,446</td>
<td>367,200</td>
</tr>
<tr>
<td>Deferred for future expenses</td>
<td>257,697</td>
<td>267,461</td>
</tr>
<tr>
<td>Deferred contributions (note 10):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deferred for future expenses</td>
<td>371,100</td>
<td>363,168</td>
</tr>
<tr>
<td>Deferred capital contributions</td>
<td>491,662</td>
<td>505,391</td>
</tr>
<tr>
<td><strong>Total liabilities and deferred contributions</strong></td>
<td>$1,163,701</td>
<td>$1,113,359</td>
</tr>
</tbody>
</table>

**McMaster’s future and long-term obligations not due within 12 months. This includes funds received for specific purposes that are not earned until related expenses are incurred.**

**McMaster’s net assets are our resources less our obligations and deferred contributions, at McMaster the net amounts tie to reserves linked to units, obligations, or endowments.**

<table>
<thead>
<tr>
<th>Net assets:</th>
<th>2020</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrict</td>
<td>10,775</td>
<td>-</td>
</tr>
<tr>
<td>Internally restricted (note 11)</td>
<td>97,679</td>
<td>168,426</td>
</tr>
<tr>
<td>Equity in capital assets (note 12)</td>
<td>470,378</td>
<td>389,463</td>
</tr>
<tr>
<td>Endowments (note 13):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>141,333</td>
<td>150,410</td>
</tr>
<tr>
<td>External</td>
<td>476,016</td>
<td>500,019</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td>$1,185,408</td>
<td>$1,220,873</td>
</tr>
</tbody>
</table>

\[ $2,897,272 - 2,986,585 = -99,313 \]

**Orientation ONLY**
The Statement of Operations (also referred to as an income statement more commonly in for-profit organizations)

The Statement of Operations shows a breakdown of revenues and expenses (by category of revenue and expense item) for both the current and prior year.

An “excess” means a positive bottom-line figure or revenues were greater than expenses for that year.

A “deficiency” would mean that revenues were less than expenses for that year.

The net excess or deficiency is distributed across different internal funds (reflecting our net assets) on the next statement called The Statement of Changes in Net Assets.
From the Statement of Operations, net excess or deficiency from Operations and Capital. These amounts reflect both gifts received in the year and investment income earned on trusts. These transfers between funds reflecting net earnings allocated to units, reserves, or internal endowments. It includes allocations to capital. These are non-cash adjustments for current market conditions for pension obligations. This amount carries onto the Statement of Changes in Net Assets (Balance Sheet) under the Net Assets heading.
PRC/Board View: Financial Information Cycle

September/October
- Annual Financial Report
- With Variance Analysis to Budget/Projections
- Annual Financial Risk Report

May/June
- University Consolidated Budget
- With linkages to strategic priorities

February/March
- Capital Plan (Annual priority setting)
- Multi-Year Financial Projections & Debt Strategy Report
- With Scenarios: Pandemic, Climate-Crisis, & Economic Crisis events

New re:COVID-19: November/December
- Updated Budget w/fall enrolment counts

Key financial reports are prepared throughout the year for Board and sub-committee members;
Documents demonstrate strategic resource allocation plans in parallel to financial health monitoring and financial risk management.
Key Executive Updates

• COVID-19 impacts are limited (mid-March – April 30, 2020)
  – Most notable Investment Income -1.9% (projected -18%).
• New Task Force Recommendations for Climate-related Financial Disclosures affecting the investment pool included in the Audited Financial Report (1st University adoption in Canada).
• Due to COVID-19 several planned activities related to capital expenditures were delayed affecting reserve balances in these results.
## Year in Review Highlights 2019/20

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Change</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidated Surplus</td>
<td>$92.1 million</td>
<td>-41.4%</td>
<td></td>
</tr>
<tr>
<td>Total Revenue</td>
<td>$1,161.0 million</td>
<td>-2.7%</td>
<td></td>
</tr>
<tr>
<td>Tuition Revenue</td>
<td>$360.7 million</td>
<td>+5.6%</td>
<td></td>
</tr>
<tr>
<td>Operating Grants</td>
<td>$275.9 million</td>
<td>+0.8%</td>
<td></td>
</tr>
<tr>
<td>Research Grants</td>
<td>$173.7 million</td>
<td>-2.4%</td>
<td></td>
</tr>
<tr>
<td>Investment Income, net</td>
<td>$26.4 million</td>
<td>-62.7%</td>
<td></td>
</tr>
<tr>
<td>Ancillary sales</td>
<td>$76.0 million</td>
<td>-2.9%</td>
<td></td>
</tr>
<tr>
<td>Total Expenses</td>
<td>$1,068.9 million</td>
<td>+3.2%</td>
<td></td>
</tr>
<tr>
<td>Salaries and Wages</td>
<td>$543.9 million</td>
<td>+4.4%</td>
<td></td>
</tr>
<tr>
<td>Employee Benefits</td>
<td>$132.6 million</td>
<td>+9.9%</td>
<td></td>
</tr>
<tr>
<td>All Other Expenses</td>
<td>$392.4 million</td>
<td>-0.5%</td>
<td></td>
</tr>
</tbody>
</table>
## 2019/20 Balance Sheet Highlights

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Change</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets</td>
<td>$2,937.3 million</td>
<td>+1.4%</td>
<td></td>
</tr>
<tr>
<td>Total Liabilities</td>
<td>$1,751.9 million</td>
<td>+4.5%</td>
<td></td>
</tr>
<tr>
<td>Long-Term Debt</td>
<td>$254.0 million</td>
<td>-0.3%</td>
<td></td>
</tr>
<tr>
<td>Accrued Employee Future Benefits</td>
<td>$448.4 million</td>
<td>+25.5%</td>
<td></td>
</tr>
<tr>
<td>Net Assets</td>
<td>$1,185.4 million</td>
<td>-2.9%</td>
<td></td>
</tr>
<tr>
<td>Equity in Capital Assets</td>
<td>$470.4 million</td>
<td>+17.8%</td>
<td></td>
</tr>
<tr>
<td>Endowments/Deferred Contributions</td>
<td>$731.9 million</td>
<td>-3.4%</td>
<td></td>
</tr>
<tr>
<td>Available Expendable Resources</td>
<td>$598.3 million</td>
<td>-1.6%</td>
<td></td>
</tr>
</tbody>
</table>
## Operating Fund

### Results vs. Budget and Projection

|----------------------|----------------|--------------------|----------------|-------------------|-----------------------|
### Revenues
#### Provincial grants
|                      | 235,868        | 235,684            | 236,942        | 1,074             | 1,258                 |
### Tuition
|                      | 326,962        | 342,732            | 342,745        | 15,783            | 13                    |
### Research Overhead income
|                      | 27,470         | 30,111             | 28,581         | 1,111             | (1,530)               |
### Investment income
|                      | 12,634         | 12,634             | 12,634         | 0                 | 0                     |
### Other income
|                      | 106,008        | 109,368            | 111,183        | 5,175             | 1,815                 |
### Total revenues
|                      | 708,942        | 730,529            | 732,085        | 23,143            | 1,556                 |
### Expenses
#### Salaries, wages and benefits
|                      | 496,875        | 498,272            | 484,332        | 12,543            | 13,940                |
#### Utilities and maintenance
|                      | 38,638         | 40,900             | 38,857         | (219)             | 2,044                 |
#### Equipment and renovations
|                      | 52,030         | 68,955             | 65,124         | (13,094)          | 3,831                 |
#### Scholarships, bursaries, and work study
|                      | 38,739         | 34,178             | 34,597         | 4,143             | (419)                 |
#### Library acquisitions
|                      | 13,249         | 14,053             | 14,745         | (1,496)           | (692)                 |
#### Debt and financing charges
|                      | 18,220         | 18,836             | 18,551         | (330)             | 286                   |
#### All other expenses
|                      | 81,096         | 65,319             | 46,958         | 34,138            | 18,362                |
### Total expenses
|                      | 738,848        | 740,513            | 703,162        | 35,686            | 37,351                |
### Excess of revenues over expenses
|                      | (29,906)       | (9,984)            | 28,923         | 58,829            | 38,907                |
### Fund balance, beginning of year
|                      | 145,168        | 167,657            | 167,657        | 22,489            | 0                     |
### Fund balance, end of year
|                      | 115,262        | 157,673            | 196,580        | 81,318            | 38,907                |
### Operating Fund Revenues

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Provincial Grants</td>
<td>$226.9</td>
<td>$233.8</td>
<td>$235.9</td>
<td>$236.0</td>
<td>$236.9</td>
</tr>
<tr>
<td>Tuition</td>
<td>$239.6</td>
<td>$265.6</td>
<td>$294.3</td>
<td>$327.1</td>
<td>$342.7</td>
</tr>
<tr>
<td>Research Overhead Income</td>
<td>$29.1</td>
<td>$28.6</td>
<td>$29.7</td>
<td>$31.0</td>
<td>$28.6</td>
</tr>
<tr>
<td>Investment Income</td>
<td>$12.9</td>
<td>$13.4</td>
<td>$13.2</td>
<td>$12.9</td>
<td>$12.6</td>
</tr>
<tr>
<td>Other Income</td>
<td>$80.6</td>
<td>$91.3</td>
<td>$104.0</td>
<td>$111.6</td>
<td>$111.2</td>
</tr>
</tbody>
</table>
• Total enrolment grew 3.8% in 2019/20
• International tuition is 38.1% of total tuition (21.2% in 2015/16) due to both enrolment increases and tuition rate changes
### Consolidated Results
#### Accrual Basis

<table>
<thead>
<tr>
<th>($ thousands)</th>
<th>2019/20 Budget</th>
<th>2019/20 Projection</th>
<th>2019/20 Actual</th>
<th>Variances Favourable (Unfavourable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess (deficiency) of Operating Fund revenues over expenses</td>
<td>(29,906)</td>
<td>(9,984)</td>
<td>28,923</td>
<td>58,829</td>
</tr>
<tr>
<td>Capital expenditures net of amortization</td>
<td>91,155</td>
<td>43,943</td>
<td>30,240</td>
<td>(60,915)</td>
</tr>
<tr>
<td>Investment income (loss) on internal endowments</td>
<td>2,647</td>
<td>(33,587)</td>
<td>(9,077)</td>
<td>(11,724)</td>
</tr>
<tr>
<td>Pension and non-pension adjustments</td>
<td>(8,106)</td>
<td>14,355</td>
<td>30,579</td>
<td>38,685</td>
</tr>
<tr>
<td>Changes in other reserves</td>
<td>4,659</td>
<td>(63,984)</td>
<td>11,406</td>
<td>6,746</td>
</tr>
<tr>
<td><strong>Total accrual adjustment</strong></td>
<td>90,356</td>
<td>(39,272)</td>
<td>63,148</td>
<td>(27,208)</td>
</tr>
<tr>
<td>Excess (deficiency) of revenues over expenses</td>
<td>60,450</td>
<td>(49,256)</td>
<td>92,070</td>
<td>31,621</td>
</tr>
</tbody>
</table>

- **Impacts of COVID-19**
  - Lower capital expenditures
  - Better investment income and overall surplus than conservative projection (which was based on 2008/09)
Consolidated Results
Statement of Operations

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating grants</td>
<td>273,528</td>
<td>273,961</td>
<td>275,906</td>
<td>2,378</td>
<td>1,945</td>
</tr>
<tr>
<td>Research grants and contracts</td>
<td>176,061</td>
<td>180,692</td>
<td>173,720</td>
<td>(2,340)</td>
<td>(6,972)</td>
</tr>
<tr>
<td>Tuition fees</td>
<td>338,962</td>
<td>352,477</td>
<td>360,665</td>
<td>21,703</td>
<td>8,188</td>
</tr>
<tr>
<td>Ancillary sales and services</td>
<td>80,227</td>
<td>64,908</td>
<td>75,959</td>
<td>(4,268)</td>
<td>11,052</td>
</tr>
<tr>
<td>Other revenues</td>
<td>189,749</td>
<td>206,879</td>
<td>207,555</td>
<td>17,806</td>
<td>676</td>
</tr>
<tr>
<td>Investment income, net</td>
<td>62,452</td>
<td>(59,877)</td>
<td>26,392</td>
<td>(36,059)</td>
<td>86,269</td>
</tr>
<tr>
<td>Amortization of deferred capital contributions</td>
<td>45,743</td>
<td>45,963</td>
<td>40,773</td>
<td>(4,970)</td>
<td>(5,190)</td>
</tr>
<tr>
<td><strong>Total revenues</strong></td>
<td><strong>1,166,722</strong></td>
<td><strong>1,065,003</strong></td>
<td><strong>1,160,970</strong></td>
<td><strong>(5,752)</strong></td>
<td><strong>95,968</strong></td>
</tr>
<tr>
<td><strong>Expenses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries and wages</td>
<td>562,575</td>
<td>539,566</td>
<td>543,930</td>
<td>18,465</td>
<td>(4,364)</td>
</tr>
<tr>
<td>Employee benefits</td>
<td>123,842</td>
<td>126,654</td>
<td>132,576</td>
<td>(8,734)</td>
<td>(5,922)</td>
</tr>
<tr>
<td>Supplies and services</td>
<td>316,936</td>
<td>347,287</td>
<td>300,878</td>
<td>16,058</td>
<td>46,409</td>
</tr>
<tr>
<td>Interest on long-term obligations</td>
<td>14,739</td>
<td>13,196</td>
<td>13,257</td>
<td>1,482</td>
<td>(61)</td>
</tr>
<tr>
<td>Amortization of capital assets</td>
<td>88,181</td>
<td>87,556</td>
<td>78,260</td>
<td>9,921</td>
<td>9,296</td>
</tr>
<tr>
<td><strong>Total expenses</strong></td>
<td><strong>1,106,273</strong></td>
<td><strong>1,114,259</strong></td>
<td><strong>1,068,900</strong></td>
<td><strong>37,373</strong></td>
<td><strong>45,359</strong></td>
</tr>
<tr>
<td><strong>Excess (deficiency) of revenues over expenses</strong></td>
<td><strong>60,450</strong></td>
<td><strong>(49,256)</strong></td>
<td><strong>92,070</strong></td>
<td><strong>31,621</strong></td>
<td><strong>141,327</strong></td>
</tr>
</tbody>
</table>

- Tuition revenue increased with greater international enrolment
- Investment income below budget but above projection
- Expenses lower due to staff vacancies/reduced expenses after COVID-19 shut-down
Consolidated Investment Income
Five Year History – Returns vs. Income

- Investment returns have a large impact on net income
## Consolidated Reserves

### Internally restricted net assets

<table>
<thead>
<tr>
<th>($ thousands)</th>
<th>2018/19 Actual</th>
<th>2019/20 Actual</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee future benefits</td>
<td>(287,109)</td>
<td>(359,264)</td>
<td>-25.1%</td>
</tr>
<tr>
<td>Unexpended departmental carryforwards</td>
<td>167,657</td>
<td>196,580</td>
<td>17.3%</td>
</tr>
<tr>
<td>Research</td>
<td>44,271</td>
<td>44,836</td>
<td>1.3%</td>
</tr>
<tr>
<td>Employee benefit</td>
<td>11,630</td>
<td>10,360</td>
<td>-10.9%</td>
</tr>
<tr>
<td>Ancillaries</td>
<td>9,642</td>
<td>10,300</td>
<td>6.8%</td>
</tr>
<tr>
<td>Specific purpose</td>
<td>101,902</td>
<td>82,787</td>
<td>-18.8%</td>
</tr>
<tr>
<td>Other</td>
<td>14,491</td>
<td>21,568</td>
<td>48.8%</td>
</tr>
<tr>
<td>Sinking funds</td>
<td>34,733</td>
<td>33,952</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Internally financed capital projects</td>
<td>(69,860)</td>
<td>(110,535)</td>
<td>-58.2%</td>
</tr>
<tr>
<td>Capital reserves</td>
<td>112,444</td>
<td>64,495</td>
<td>-42.6%</td>
</tr>
<tr>
<td>Facilities services projects</td>
<td>19,625</td>
<td>102,600</td>
<td>422.8%</td>
</tr>
<tr>
<td><strong>Total internally restricted net assets</strong></td>
<td>159,426</td>
<td>97,679</td>
<td><strong>-38.7%</strong></td>
</tr>
</tbody>
</table>

---

*McMaster University*
# Operating Fund Reserves by Envelope

($ thousands)

<table>
<thead>
<tr>
<th>Faculties and Academic Programs</th>
<th>Appropriations May 1, 2019</th>
<th>Net Surplus (Deficit)</th>
<th>Appropriations April 30, 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>3,455</td>
<td>6,172</td>
<td>9,627</td>
</tr>
<tr>
<td>Engineering</td>
<td>24,248</td>
<td>9,024</td>
<td>33,272</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>41,243</td>
<td>5,867</td>
<td>47,110</td>
</tr>
<tr>
<td>Humanities</td>
<td>2,578</td>
<td>3,301</td>
<td>5,879</td>
</tr>
<tr>
<td>Science</td>
<td>20,363</td>
<td>1,228</td>
<td>21,591</td>
</tr>
<tr>
<td>Medical Radiation - Mohawk share</td>
<td>1</td>
<td>(0)</td>
<td>1</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>6,276</td>
<td>2,915</td>
<td>9,191</td>
</tr>
<tr>
<td>Arts &amp; Science</td>
<td>1,564</td>
<td>(178)</td>
<td>1,386</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>99,728</strong></td>
<td><strong>28,328</strong></td>
<td><strong>128,056</strong></td>
</tr>
<tr>
<td>Academic Priorities</td>
<td>43,887</td>
<td>(5,548)</td>
<td>38,340</td>
</tr>
<tr>
<td>Academic Support</td>
<td>12,291</td>
<td>74</td>
<td>12,365</td>
</tr>
<tr>
<td>Research Support</td>
<td>3,665</td>
<td>1,399</td>
<td>5,064</td>
</tr>
<tr>
<td>Student Support</td>
<td>9,860</td>
<td>80</td>
<td>9,940</td>
</tr>
<tr>
<td>Facilities Support</td>
<td>3,948</td>
<td>(2,713)</td>
<td>1,235</td>
</tr>
<tr>
<td>Institutional Support</td>
<td>14,058</td>
<td>2,723</td>
<td>16,781</td>
</tr>
<tr>
<td><strong>Institutional Priorities</strong>*</td>
<td><strong>(19,780)</strong></td>
<td><strong>4,579</strong></td>
<td><strong>(15,201)</strong></td>
</tr>
<tr>
<td><strong>Total Operating Fund</strong></td>
<td><strong>167,657</strong></td>
<td><strong>28,923</strong></td>
<td><strong>196,580</strong></td>
</tr>
</tbody>
</table>

*Includes the approved funding for the Mosaic project, which will be repaid by 2023/24
Internally Restricted Reserves
Allocation of Employee Future Benefits to Departments

- Only employees’ current service costs are charged to departments.
- Allocation of reserves for past service costs would reduce funding available to departments for operations.
- Department reserves are used to advance McMaster’s mission, including capital related initiatives.
- These reserves do not exceed the related pension and non-pension shortfalls in plan funding (on a going concern basis).
- Funding shortfalls would be greater than shown if McMaster was no longer a going concern, in this case solvency deficits would require funding by liquidating assets.

<table>
<thead>
<tr>
<th></th>
<th>2019/20</th>
<th></th>
<th>Total</th>
<th>2018/19</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departmental reserves</td>
<td>128.1</td>
<td>78.8</td>
<td>206.9</td>
<td>99.7</td>
<td>77.6</td>
<td>177.3</td>
</tr>
<tr>
<td>Pensions</td>
<td>(154.9)</td>
<td>(43.4)</td>
<td>(198.3)</td>
<td>(85.4)</td>
<td>(20.8)</td>
<td>(106.2)</td>
</tr>
<tr>
<td>Other post-employment benefits</td>
<td>(117.7)</td>
<td>(43.3)</td>
<td>(161.0)</td>
<td>(136.6)</td>
<td>(44.3)</td>
<td>(180.9)</td>
</tr>
<tr>
<td>Employee benefit reserve</td>
<td>5.8</td>
<td>4.6</td>
<td>10.4</td>
<td>6.5</td>
<td>5.1</td>
<td>11.6</td>
</tr>
<tr>
<td>Net departmental reserves</td>
<td>(138.7)</td>
<td>(3.3)</td>
<td>(142.0)</td>
<td>(115.8)</td>
<td>17.6</td>
<td>(98.2)</td>
</tr>
</tbody>
</table>
### Pension Plans

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funded status, opening balance</td>
<td>(63.3)</td>
<td>(169.3)</td>
<td>(3.5)</td>
<td>19.1</td>
<td>(82.6)</td>
<td></td>
</tr>
<tr>
<td>Current service and finance cost</td>
<td>(36.3)</td>
<td>(43.3)</td>
<td>(33.3)</td>
<td>(32.3)</td>
<td>(38.8)</td>
<td></td>
</tr>
<tr>
<td>Remeasurements</td>
<td>(134.4)</td>
<td>143.8</td>
<td>(10.6)</td>
<td>(131.6)</td>
<td>(116.1)</td>
<td></td>
</tr>
<tr>
<td>University contributions</td>
<td>64.7</td>
<td>65.3</td>
<td>66.5</td>
<td>62.2</td>
<td>66.3</td>
<td></td>
</tr>
<tr>
<td>Funded status, closing balance, net</td>
<td>(169.3)</td>
<td>(3.5)</td>
<td>19.1</td>
<td>(82.6)</td>
<td>(171.2)</td>
<td></td>
</tr>
</tbody>
</table>

### Non-Pension Benefit Plans

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Funded status, opening balance</td>
<td>(217.2)</td>
<td>(208.0)</td>
<td>(220.3)</td>
<td>(247.7)</td>
<td>(274.7)</td>
<td></td>
</tr>
<tr>
<td>Current service and finance cost</td>
<td>(19.9)</td>
<td>(19.7)</td>
<td>(20.4)</td>
<td>(21.4)</td>
<td>(22.9)</td>
<td></td>
</tr>
<tr>
<td>Remeasurements</td>
<td>22.3</td>
<td>0.2</td>
<td>(14.9)</td>
<td>(12.9)</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>University contributions</td>
<td>6.8</td>
<td>7.2</td>
<td>7.9</td>
<td>7.3</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Internally restricted reserve</td>
<td>(208.0)</td>
<td>(220.3)</td>
<td>(247.7)</td>
<td>(274.7)</td>
<td>(277.2)</td>
<td></td>
</tr>
<tr>
<td>Funded status, closing balance, net</td>
<td>(147.6)</td>
<td>(146.7)</td>
<td>(164.5)</td>
<td>(180.9)</td>
<td>(161.0)</td>
<td></td>
</tr>
</tbody>
</table>
## Consolidated Results

### Financial Health and Sustainability Metrics

• Financial ratios in target ranges should maintain McMaster’s AA credit rating

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expendable Net Assets to Debt (Target &gt; 1.0x)</td>
<td>1.6 x</td>
<td>1.9 x</td>
<td>2.0 x</td>
<td>2.2 x</td>
<td>2.2 x</td>
</tr>
<tr>
<td>Interest Burden (Target &lt; 4.0%)</td>
<td>1.3%</td>
<td>1.5%</td>
<td>1.4%</td>
<td>1.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Debt per FTE (Target &lt; $12,000)</td>
<td>$10,057</td>
<td>$9,575</td>
<td>$9,321</td>
<td>$8,898</td>
<td>$8,525</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income/(Loss) Ratio (McMaster Target &gt; 1.0%)</td>
<td>3.0%</td>
<td>10.4%</td>
<td>9.6%</td>
<td>13.2%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Net Operating Revenues (McMaster Target &gt; 2.0%)</td>
<td>7.1%</td>
<td>14.3%</td>
<td>12.0%</td>
<td>15.7%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Primary Reserves Ratio (McMaster Target &gt; 91 days)</td>
<td>176</td>
<td>200</td>
<td>205</td>
<td>214</td>
<td>204</td>
</tr>
<tr>
<td>Viability Ratio (McMaster Target &gt; 1.0)</td>
<td>1.7</td>
<td>2.0</td>
<td>2.1</td>
<td>2.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>

1. Measures cash flow from operating activities as a proportion of revenues
2. Measures the number of days University reserves can cover operating expenses
3. Measures the proportion of long-term debt that could be settled using unrestricted assets
## Statement of Operations

### Revenues

<table>
<thead>
<tr>
<th>($ thousands)</th>
<th>2018/19 Actual</th>
<th>2019/20 Actual</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating grants</td>
<td>273,587</td>
<td>275,906</td>
<td>0.8%</td>
</tr>
<tr>
<td>Research grants and contracts</td>
<td>178,022</td>
<td>173,720</td>
<td>-2.4%</td>
</tr>
<tr>
<td>Tuition fees</td>
<td>341,629</td>
<td>360,665</td>
<td>5.6%</td>
</tr>
<tr>
<td>Other</td>
<td>128,619</td>
<td>122,183</td>
<td>-5.0%</td>
</tr>
<tr>
<td>Ancillary sales and services</td>
<td>78,202</td>
<td>75,959</td>
<td>-2.9%</td>
</tr>
<tr>
<td>Investment income, net</td>
<td>70,820</td>
<td>26,392</td>
<td>-62.7%</td>
</tr>
<tr>
<td>Donations and other grants</td>
<td>67,906</td>
<td>69,809</td>
<td>2.8%</td>
</tr>
<tr>
<td>Research overhead grants</td>
<td>15,390</td>
<td>15,563</td>
<td>1.1%</td>
</tr>
<tr>
<td>Amortization of deferred capital contributions</td>
<td>38,835</td>
<td>40,773</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total revenues</strong></td>
<td><strong>1,193,010</strong></td>
<td><strong>1,160,970</strong></td>
<td><strong>-2.7%</strong></td>
</tr>
</tbody>
</table>

- Tuition up 5.6% despite 10% domestic tuition cut
- Investment return -1.9% vs 6.0%
Salaries and wages grew 4.4% due to the addition of 182 faculty and permanent staff and negotiated pay increases.

Employee benefits grew 9.9% mainly due to increased pension financing costs.

- Salaries and wages grew 4.4% due to the addition of 182 faculty and permanent staff and negotiated pay increases.
- Employee benefits grew 9.9% mainly due to increased pension financing costs.
Statement of Operations
Salaries and Wages

Operating & Specifically Funded
Ancillary
Research
Trust

$ Millions

2018/19
$521.2 million
2019/20
$543.9 million
Statement of Operations
Supplies and Services

Operating & Specifically Funded
Ancillary
Research
Trust
Capital Adjustment

<table>
<thead>
<tr>
<th></th>
<th>2018/19</th>
<th>2019/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies</td>
<td>$308.1 million</td>
<td>$300.9 million</td>
</tr>
<tr>
<td>Services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
i. Revisions to Board By-Laws – Appendix B – Banking Resolution Changes

On September 16, 2020, the Executive and Governance Committee reviewed and approved, for recommendation to the Board of Governors, revisions to Appendix B – Banking Resolution within the Board of Governors By-Laws. Details of the proposed revisions are contained in the attached report.

It is now recommended,

that the Board of Governors approve in principle, revisions to Appendix B – Banking Resolution within the Board of Governors By-Laws, as set out in the attached.

ii. Revisions to Board By-Laws – University Student Fees Committee Membership

On October 1, 2020, the Executive and Governance Committee reviewed and approved via electronic vote, for recommendation to the Board of Governors, revisions to the University Student Fees Committee Membership. Details of the proposed revisions are contained in the attached report.

It is now recommended,

that the Board of Governors approve in principle, revisions to the membership of the University Student Fees Committee within the Board of Governors By-Laws, as set out in the attached.
Appendix B

BANKING RESOLUTION

The Board hereby resolves:

1. THAT the banking business of the University, or any part thereof, may be transacted with any one or more of the banks or other corporations (hereinafter referred to as "institutions") named in Schedule 1 hereto.

2. THAT all such banking business may be transacted on the University's behalf by the Planning and Resources Committee of the Board.

3. THAT the Planning and Resources Committee further delegate to any officer holding the position and having the title listed in Schedule 2 authority to transact any part or parts of such banking business on behalf of the University, subject to the limitations of such authority as may be imposed in such instructions.

4. THAT in this resolution the expression "banking business" includes, without limitation, the operation of the University's accounts; the making, signing, drawing, accepting, endorsing, negotiating, lodging, depositing or transferring of any cheques, promissory notes, drafts, acceptances, bills of exchange and orders for the payment of money; the giving of receipts for and orders relating to any property of the University; the execution of any agreement relating to any such banking business and defining the rights and powers of the parties thereto; and the authorizing of any officer of such institution to do any act or thing on the University's behalf to facilitate such banking business.

5. THAT this resolution and any instructions given pursuant to paragraph 3 hereof to any institution shall remain in force until written notice to the contrary shall have been given to such institution.

6. THAT this resolution shall, from the time of its communication to any institution, supersede any previous resolutions and instructions respecting the transaction of banking business between the University and such institutions.

Schedule 1: McMaster University Banks

- Canadian Imperial Bank of Commerce
- Bank of Montreal
- National Bank of Canada
- Bank of Nova Scotia
- Royal Bank of Canada
- TD Canada Trust

Board of Governors
April 18, 2019
Schedule 2: McMaster University Authorized Bank Signers

The primary currencies used by the University are the Canadian dollar and U.S. dollar. For the purposes of amounts noted in Schedule 2, limits are applicable to either currency.

(1) With respect to bank accounts held at institutions noted in Schedule 1 above:

   (a) Cheques up to $100,000.00 require any one of the following signatures:
       - President and Vice-Chancellor
       - Vice-President (Administration)
       - Associate Vice-President (Students and Learning) and Dean of Students
       - Assistant Vice-President (Administration) and CFO
       - Assistant Vice-President and Chief Human Resources Officer (payroll account(s) only)
       - Controller
       - Executive Director, Strategic Projects, Financial Affairs
       - Treasurer
       - Senior Manager, Accounting & Financial Reporting
       - Manager, Financial Reporting
       - Manager, Financial Affairs Business Office
       - Senior Investment Accounting Analyst
       - Senior Investment Analyst
       - Senior Accountant
       - Director, HR, Strategic Partnerships and Initiatives, Services and Systems (Payroll Account(s) only)
       - Senior Manager, Payroll Services, Tax and Data Compliance (Payroll Account(s) only)
       - Senior Manager, HR Projects, Analytics, and Payroll (Payroll Account(s) only)
       - Senior ULR Payroll Analyst, Reporting and Control (Payroll account(s) only)

   (b) Cheques over $100,000.00 require any two of the signatures in (a).

   (c) The following facsimile signatures are acceptable on cheques drawn on any account, however, when a second signature is required by virtue of the amount being over $100,000.00, the second signature must be any one of the signatures in (a) applied manually:
       - President and Vice Chancellor
       - Vice-President (Administration)

   (d) All electronic payment services, such as Wires, EFTs, Bill payments and Government Payments require electronic approvals as follows:

       (i) System generated batch payments up to $12,000,000.00 require electronic approval from any one of the positions listed in (a) above; over $12,000,000.00 require electronic approval from any two of the positions listed in (a) above.

       (ii) All other payments up to $100,000.00 require electronic approval from any one of the positions listed in (a) above; over $100,000.00 require electronic approval from any two of the positions listed in (a) above.
(e) All bank transfers between bank accounts held by McMaster require any one of the following signatures or electronic approvals:

- President and Vice-Chancellor
- Vice-President (Administration)
- Assistant Vice-President (Administration) and CFO
- Controller
- Executive Director, Strategic Projects Financial Affairs
- Treasurer
- Senior Manager, Accounting & Financial Reporting
- Manager, Financial Reporting
- Manager, Financial Affairs Business Office
- Senior Investment Accounting Analyst
- Senior Investment Analyst
- Senior Accountant
- Investment Operations Analyst
- Financial Analyst – Trust Funds
- Director, HR Strategic Partnerships and Initiatives (Payroll Account(s) only)
- Senior Manager, Payroll Services, Tax and Data Compliance (Payroll Account(s) only)
- Senior Analyst Reporting and Control (Payroll account(s) only)

(2) Foreign electronic payments:

(a) Up to $100,000.00 require any one of the following signatures and/or electronic approvals:

- President and Vice-Chancellor
- Vice-President (Administration)
- Assistant Vice-President (Administration) and CFO
- Controller
- Executive Director, Strategic Projects Financial Affairs
- Treasurer
- Senior Manager, Accounting & Financial Reporting
- Manager, Financial Reporting
- Senior Investment Accounting Analyst
- Senior Investment Analyst
- Senior Accountant

(b) Over $100,000.00 require any two of the signatures or electronic approvals in (a).
Appendix B

BANKING RESOLUTION

The Board hereby resolves:

1. THAT the banking business of the University, or any part thereof, may be transacted with any one or more of the banks or other corporations (hereinafter referred to as “institutions”) named in Schedule 1 hereto.

2. THAT all such banking business may be transacted on the University's behalf by the Planning and Resources Committee of the Board.

3. THAT the Planning and Resources Committee further delegate to any officer holding the position and having the title listed in Schedule 2 authority to transact any part or parts of such banking business on behalf of the University, subject to the limitations of such authority as may be imposed in such instructions.

4. THAT in this resolution the expression "banking business" includes, without limitation, the operation of the University's accounts; the making, signing, drawing, accepting, endorsing, negotiating, lodging, depositing or transferring of any cheques, promissory notes, drafts, acceptances, bills of exchange and orders for the payment of money; the giving of receipts for and orders relating to any property of the University; the execution of any agreement relating to any such banking business and defining the rights and powers of the parties thereto; and the authorizing of any officer of such institution to do any act or thing on the University's behalf to facilitate such banking business.

5. THAT this resolution and any instructions given pursuant to paragraph 3 hereof to any institution shall remain in force until written notice to the contrary shall have been given to such institution.

6. THAT this resolution shall, from the time of its communication to any institution, supersede any previous resolutions and instructions respecting the transaction of banking business between the University and such institutions.

Schedule 1: McMaster University Banks

Canadian Imperial Bank of Commerce
Bank of Montreal
National Bank of Canada
Bank of Nova Scotia
Royal Bank of Canada
TD Canada Trust

Board of Governors
April 18, 2019
Schedule 2: McMaster University Authorized Bank Signers

The primary currencies used by the University are the Canadian dollar and U.S. dollar. For the purposes of amounts noted in Schedule 2, limits are applicable to either currency.

(1) With respect to bank accounts held at institutions noted in Schedule 1 above:

(a) Cheques up to $100,000.00 require any one of the following signatures:

- President and Vice-Chancellor
- Vice-President (Administration)
- Associate Vice-President (Students and Learning) and Dean of Students
- Assistant Vice-President (Administration) and CFO
- Assistant Vice-President and Chief Human Resources Officer (payroll account(s) only)
- Controller
- Treasurer
- Senior Manager, Accounting & Financial Reporting
- Manager, Financial Reporting
- Manager, Financial Affairs Business Office
- Senior Investment Accounting Analyst
- Senior Investment Analyst
- Senior Accountant
- Director, HR Strategic Partnerships and Initiatives (Payroll Account(s) only)
- Senior Manager, Payroll Services, Tax and Data Compliance (Payroll Account(s) only)
- Senior Analyst Reporting and Control (Payroll account(s) only)

(b) Cheques over $100,000.00 require any two of the signatures in (a).

(c) The following facsimile signatures are acceptable on cheques drawn on any account, however, when a second signature is required by virtue of the amount being over $100,000.00, the second signature must be any one of the signatures in (a) applied manually:

- President and Vice Chancellor
- Vice-President (Administration)

(d) All electronic payment services, such as Wires, EFTs, Bill payments and Government Payments require electronic approvals as follows:

(i) System generated batch payments up to $12,000,000.00 require electronic approval from any one of the positions listed in (a) above; over $12,000,000.00 require electronic approval from any two of the positions listed in (a) above.

(ii) All other payments up to $100,000.00 require electronic approval from any one of the positions listed in (a) above; over $100,000.00 require electronic approval from any two of the positions listed in (a) above.
(e) All bank transfers between bank accounts held by McMaster require any one of the following signatures or electronic approvals:

- President and Vice-Chancellor
- Vice-President (Administration)
- Assistant Vice-President (Administration) and CFO
- Controller
- Treasurer
- Senior Manager, Accounting & Financial Reporting
- Manager, Financial Reporting
- Manager, Financial Affairs Business Office
- Senior Investment Accounting Analyst
- Senior Investment Analyst
- Senior Accountant
- Investment Operations Analyst
- Financial Analyst – Trust Funds
- Director, HR Strategic Partnerships and Initiatives (Payroll Account(s) only)
- Senior Manager, Payroll Services, Tax and Data Compliance (Payroll Account(s) only)
- Senior Analyst Reporting and Control (Payroll account(s) only)

(2) Foreign electronic payments:

(a) Up to $100,000.00 require any one of the following signatures and/or electronic approvals:

- President and Vice-Chancellor
- Vice-President (Administration)
- Assistant Vice-President (Administration) and CFO
- Controller
- Treasurer
- Senior Manager, Accounting & Financial Reporting
- Manager, Financial Reporting
- Senior Investment Accounting Analyst
- Senior Investment Analyst
- Senior Accountant

(b) Over $100,000.00 require any two of the signatures or electronic approvals in (a).
DATE: September 29, 2020

TO: Executive and Governance Committee

FROM: Susan Tighe
Provost and Vice President (Academic)

RE: Change in University Student Fees Committee membership due to the dissolution of the AVP IRA position

The position of Associate Vice President, Institutional Research and Analysis no longer exists. As such, the role’s participation in governance committees needs to be revised. Please accept the following changes:

1. University Student Fees Committee:
   a. **Voting member status** - AVP Finance and Planning Academic role (who is currently consultant) will replace Associate Vice President, Institutional Research and Analysis
   b. **Committee Chair status** – Associate Vice-President (Students and Learning) and Dean of Students and Vice-Provost and Dean of Graduate Studies will Co-Chair
   c. Housekeeping changes to update titles
The **University Student Fees Committee** shall be a sub-committee of the University Planning Committee with the following membership:

**Ex Officio**
- Associate Vice-President (Institutional Research and Analysis) – Chair
- Vice-Provost (Faculty)
- Associate Vice-President (Students and Learning) and Dean of Students – Co-Chair
- Vice-Provost and Dean of Graduate Studies – Co-Chair
- Associate Vice-President, Finance and Planning (Academic), Office of the Provost and Vice-President (Academic)
- Executive Director, Education Services, Faculty of Health Sciences
- Director of Finance, Controller, Financial Services
- University Registrar

**Student Members**
- Graduate Student Representative – selected from applicants for a one-year term
- Full-time Undergraduate Student Representative – selected from applicants for a one-year term
- Part-time Undergraduate Student Representative – selected from applicants for a one-year term

*Student positions are renewable once.*

**Consultants**
- Assistant Dean, Student Affairs and Director of the Student Success Centre
- Director, Finance and Administration, Student Affairs
- Associate Registrar and Graduate Secretary, School of Graduate Studies
- Assistant Registrar, Government Aid Programs, Registrar’s Office
- Executive Director, Finance and Administration (Academic), Office of the Provost and Vice-President (Academic)
- Manager, Receipts and Receivables, Accounts Receivable, Financial Services
- Budget Manager, Budgeting Services
- Director, Student Financial Aid and Scholarships
- Senior Project Analyst, Institutional Research and Analysis
- Two staff members from Financial Affairs (approved by the Committee annually)
- Two staff members from Institutional Research and Analysis (approved by the Committee annually)

The University Student Fees Committee shall:

(i) recommend all revisions to tuition (undergraduate and graduate degree, diploma and certificate) and supplementary fees to the Budget Committee;
(ii) establish deadlines for the submission of all proposed tuition and supplementary fees to the University Student Fees Committee;
(iii) recommend policy guidelines to the Budget Committee that outline services and materials for which fees can be charged;
(iv) recommend policy guidelines to the Budget Committee for charging fees for existing and new programs that are not funded through grants from the Ministry of Training, Colleges and Universities;
(v) ensure that all proposed changes to existing student fees and all proposed new fees are reasonable, conform to government regulations and have been approved through appropriate processes within the University; and
(vi) ensure that proposed changes to student fees are feasible and do not involve undue complications to calculate and administer; where appropriate, determining the most tax efficient method for students who are being charged these fees.
The University Student Fees Committee shall be a sub-committee of the University Planning Committee with the following membership:

*Ex Officio*
Associate Vice-President (Students and Learning) and Dean of Students – Co-Chair
Vice-Provost and Dean of Graduate Studies – Co-Chair
Associate Vice-President, Finance and Planning (Academic), Office of the Provost and Vice-President (Academic)
Executive Director, Education Services, Faculty of Health Sciences
Controller, Financial Services
University Registrar

**Student Members**
Graduate Student Representative – selected from applicants for a one-year term
Full-time Undergraduate Student Representative – selected from applicants for a one-year term
Part-time Undergraduate Student Representative – selected from applicants for a one-year term
*Student positions are renewable once.*

**Consultants**
Director, Finance and Administration, Student Affairs
Associate Registrar and Graduate Secretary, School of Graduate Studies
Assistant Registrar, Government Aid Programs, Registrar’s Office
Manager, Accounts Receivable, Financial Services
Two staff members from Financial Affairs (approved by the Committee annually)
Two staff members from Institutional Research and Analysis (approved by the Committee annually)

The University Student Fees Committee shall:

(i) recommend all revisions to tuition (undergraduate and graduate degree, diploma and certificate) and supplementary fees to the Budget Committee;
(ii) establish deadlines for the submission of all proposed tuition and supplementary fees to the University Student Fees Committee;
(iii) recommend policy guidelines to the Budget Committee that outline services and materials for which fees can be charged;
(iv) recommend policy guidelines to the Budget Committee for charging fees for existing and new programs that are not funded through grants from the Ministry of Training, Colleges and Universities;
(v) ensure that all proposed changes to existing student fees and all proposed new fees are reasonable, conform to government regulations and have been approved through appropriate processes within the University; and
(vi) ensure that proposed changes to student fees are feasible and do not involve undue complications to calculate and administer; where appropriate, determining the most tax efficient method for students who are being charged these fees.
Executive Summary

Overview

The closure of Canada’s National Research Universal (NRU) reactor has created a neutron gap in Canada, curtailing much of its Nobel Prize winning neutron beam research program and restricting its role in supplying medical isotopes. This comes at a time when new commercial and research demands for neutron-based capabilities are developing quickly. The McMaster Nuclear Reactor (MNR) is now the only operating Canadian research reactor capable of supporting these programs.

McMaster’s capacity to fill this gap is currently limited by the availability of the MNR, which runs at 3 MW for 16 hours per day and five days per week (16x5). This capacity could be increased with investment and increased operating budgets. The MNR sits within a broader infrastructure of related assets managed by the Nuclear Operations and Facilities (NO&F) group.

This study takes a holistic view of the NO&F’s operations, and seeks to inform the University on:

- The economics of the MNR operation and its potential to increase its commercial income
- The value of the research opportunities
- Appropriate governance structures that would allow the University to achieve its objectives

Primary Findings

1. The MNR has a potential to become an extremely valuable national research asset, that uniquely:
   - Positions McMaster to become a leader in the growing field of radiopharmaceutical research that could transform the region into an international research and production hub;
   - Allows McMaster to create a future for Canada’s national neutron scattering research; and,
   - Places McMaster at the centre of renewed interest in nuclear research and education.
2. The developing markets for new radioisotopes, notably Holmium-166 and Lutetium-177, are large enough to allow NO&F to develop product lines that could pay for the increased capacity. The payback period for the investment needed to expand capacity would be less than six years.
3. The MNR, almost uniquely for an asset of its type, pays for its operation with commercial income while simultaneously meeting its current research demands. Its governance is working well. However, it will be necessary to create a greater academic focus on the research missions if the MNR asset is to realize its full potential.

Primary Recommendations

McMaster University should:

1. Develop a detailed business plan to increase the capacity of the reactor to 5 MW on a 24x5 schedule. This would facilitate production of new isotopes, while minimising investment risk and not prejudicing a further increase to 24x7 operation at a later date.
2. Create appropriate governance structures within the University to maximize research opportunities, possibly by creating academic leadership and/or institutes focused specifically on radioisotope use in healthcare and the national neutron beam program.
Detailed Summary

Purpose

McMaster University commissioned this study to assess the market opportunities of McMaster’s NO&F and the investment considerations related to expanding the MNR operations from 16 hours per day, five days per week (16x5) to potentially operating 24 hours per day, five or seven days per week (24x5 or 24x7). The notion of expanding the operational capabilities of the MNR stems from opportunities on two fronts: (1) a “neutron gap” has emerged in Canada primarily as a result of the closure of the Atomic Energy of Canada Limited (AECL) NRU reactor at the Canadian Nuclear Laboratories (CNL) in Chalk River; and (2) the NO&F team has been exploring several new radiopharmaceutical applications that are showing commercial promise.

The University’s objectives for this study were two-fold:

1. Understand the commercial and academic research potential of expanding MNR operations to both capture the isotope opportunities and fill the neutron gap; and
2. Identify options available to effectively govern and manage the facilities/activities in the future.

In response to the University objectives, this project set out to:

1. Assess the commercial opportunities for leveraging the MNR and the related NO&F facilities;
2. Acquire market data specifically for radiopharmaceuticals, including how the supply chain operates, the value created at various stages of the supply chain, and any risks/opportunities that may exist;
3. Describe the competitive landscape as it may relate to the opportunities that are identified;
4. Identify the research enabled by NO&F and its value to the University and to Canada;
5. Develop costing models to support financing and trade-off decisions;
6. Explore governance considerations for balancing the tension and priorities between commercial and academic research use of the NO&F; and
7. Provide recommendations to the University to best capture the opportunities.

Key Findings

This study uncovered seven key findings:

1. **The MNR stands out among effectively used university research reactors.**

The NO&F’s multi-functional MNR is among the most effectively used university-based research reactors in the world. The MNR has a broader suite of capabilities and instruments that enable it to be diversely applied. Benchmarking has shown that the MNR is the only university-based research reactor that can claim to recover all its costs through its revenue, primarily from medical isotopes. Sustained customer relationships in general, and isotope markets in particular, are viewed as necessary functions for enabling university research reactors to become economically viable for their host institutions. The MNR has several reliable ongoing commercial customers in iodine production, mining and aerospace.
Market Study for McMaster’s Nuclear Operations and Facilities

2. 24 hour operation enables commercial opportunities in three areas: radiopharmaceuticals, neutron beams, and irradiations.

- **Radiopharmaceuticals** - The emerging radiotherapies associated with Holmium and Lutetium are the most significant opportunity, potentially contributing $20 million/year of revenue. There is some limited new potential in the NO&F’s already established globally dominant Iodine operations. Additional opportunities may exist to complement the revenues above by acting as backup sources to existing Yttrium and Molybdenum supply chains.

- **Beam lines** - McMaster has a long-term relationship with Nray, which is using two of the MNR’s beam lines. Nray has a confirmed need for the greater beam time that would be enabled by 24x5 operations. Furthermore, McMaster is proposing to have the neutron beam instruments of the former Canadian Neutron Beam Centre (CNBC) at AECL’s Chalk River site relocated to McMaster. As part of this migration of capabilities, there may be additional commercial revenues from former CNBC customers through research or services.

- **Irradiations** – McMaster has a long-term relationship with Actlabs and other customers for neutron activation analysis (NAA) and other material irradiations. Actlabs would make greater use of the MNR if operations are increased to 24x5. If of interest to McMaster, there may be a market for silicon doping services to the semiconductor industry. While no commercial need for the MNR by the nuclear energy sector was identified, several developments with Small Modular Reactors (SMRs) and the CNL may alter this perspective or enable collaborative research funding if nurtured.

3. Overall, the competitive commercial and academic landscape is favourable to McMaster.

- **The competitive landscape.** Other university-based research reactors do not present material threats to any of McMaster’s expected sources of revenues. These reactors are generally not involved in the activities of interest to McMaster.

- **Radiopharmaceutical revenue risk.** The biggest risk to McMaster’s radiopharmaceutical expansion plans is the Bruce Power initiative to also pursue Lutetium production. Fortunately, McMaster is already participating in discussions with Bruce Power, which could mitigate those risks.

- **Managing academic vs. commercial conflicts.** McMaster’s experience has been that the MNR has successfully accommodated research needs. Going forward, the facility may be much more highly subscribed, raising risks that the available beam lines and irradiation zones could be insufficient to accommodate both commercial applications and expand research applications. Fortunately, given the flexible nature of the MNR design, many of these risks can be mitigated by capital investments.

4. Managing financial considerations can mitigate risk to McMaster.

- **The overall revenue from existing and potential sources could exceed $27 million/year.** The commercial isotope opportunities represent over $20 million/year. To capture them requires shifting the MNR to 24x5 operation (Holmium production) and full power higher flux output (Lutetium production).
Market Study for McMaster’s Nuclear Operations and Facilities

- **Requisite increase in operations will cost money and entail risk.** Shifting MNR operation to 24x5 and high flux will double operating costs and require committed capital investments. While McMaster already has significant commercial revenues, these are currently insufficient to cover the new costs and investment cash flows. The University may have to invest $13 million to $19 million over three years in order to capture the new revenue streams. The expected new positive margins should pay back these investments within six years, but competitive risks from Bruce Power could impact this.

- **24x5 operation is supported.** The cost/benefit potential suggests increasing MNR operation to 24x5 is the logical first step. If identified risks materialize, there should still be sufficient funds to cover most of McMaster’s costs. The decision to move to 24x7 can be deferred until the opportunities are more established and the cost risk of 24x7 operation is mitigated.

- **Cost sharing would reduce McMaster risk.** Due to the multi-purpose use of the MNR by beam line, irradiation, and isotope production users and researchers outside of McMaster, the operating costs should be shared by these groups. Cost sharing helps users recognize the value of the MNR and reduces the financial risk to McMaster.

- **Adopting a full-costing approach will protect the value of McMaster’s Intellectual Property (IP).** To help users of the MNR recognize the costs associated with their use, costs should be communicated on a full cost accounting basis. The fully loaded costs to support the beam line instruments for academic users beyond McMaster can be the basis for a major science infrastructure (MSI) application to the Canadian Foundation for Innovation (CFI). At the same time, seeking fully loaded cost recovery from the isotope production business would reduce the cost of science and research activities, and allow McMaster to retain the additional margin earned from its commercial ventures. Delineating these definitions would provide an important financial basis for the MNR to be structured as a national MSI asset.

5. **The MNR provides McMaster with academic growth opportunities in three research program areas.**

Leveraging the capabilities of the MNR fits with McMaster’s vision and reputation as a research-focused university. Building on the MNR-enabled opportunities could position McMaster as a leader in three areas of academic research.

- **Radiopharmaceuticals developed in the MNR coupled with McMaster’s Health Sciences leadership** offer a unique combination that, if effectively leveraged, can position McMaster as a global leader in reactor-based radiotherapies, and potentially make Hamilton a hub for radiopharmaceuticals.
  
  - McMaster’s leading health research offerings pair nicely with NO&F’s status as a North American center of excellence, and could potentially unlock significant value in the University’s IP.
  
  - Supplementing this research mission are commercial opportunities for isotope production which can not only fund the costs of expanded MNR operations, but also generate funding to support McMaster’s overall research program.
There is an opportunity for significant value creation in emerging commercial opportunities if McMaster pursues vertical integration of the radiotherapy research and development (R&D), production, and delivery capabilities of the MNR, McMaster’s Health Sciences faculty, the Centre for Probe Development (CPDC) and other spinoffs. McMaster should consider its role in the radiopharmaceutical life cycle as it navigates partnership opportunities.

- **The neutron beam ports to be added to the MNR** will be a critical research infrastructure for supporting materials science research for all universities in Canada.
  - McMaster is leading a multi-university CFI application to relocate the state-of-the-art neutron scattering instruments from AECL’s former CNBC, which was closed with the shutdown of the NRU reactor. These world-class materials science instruments will establish McMaster as the only such facility in Canada, and one of the best equipped in North America. McMaster could become Canada’s leading institution for collaborating with the U.S. National Laboratories at Oak Ridge and Idaho.

- **The MNR, combined with McMaster’s Centre for Advanced Nuclear Systems (CANS) facilities**, McMaster’s well-established nuclear engineering heritage, and its hosting of the University Network for Excellence in Nuclear Engineering (UNENE) places McMaster at the centre of nuclear research and education in Canada.
  - There is a growing need for nuclear design and engineering expertise, resulting from the drive to innovate solutions to climate change and the ensuing interest in developing SMRs in Canada.

6. **The MNR has the characteristics of a national MSI asset.**

- **The MNR has value as a national MSI asset.** Through the three above-mentioned important research areas, the MNR forms a highly valued piece of infrastructure that supports multiple universities in different research fields. McMaster can combine its prestige in these areas to become a national research facility on the level of TRIUMF and the Canadian Light Source (CLS). The breadth of MNR’s users is as expansive as that of TRIUMF and CLS. McMaster should not be expected to provide these services for free to other universities.

- **The MNR is recognized as the centre piece for multi-university collaboration.** On nuclear energy, McMaster has already led multi-university collaborative CFI applications to create the Centre for Advanced Nuclear Systems (CANS) within the NO&F, which is an important synergistic facility to the MNR. McMaster is leading a multi-university CFI application to bring the CNBC instruments to the MNR. The Canadian Centre for Electron Microscopy at McMaster is already an MSI and the new MNR beam line instruments complement those capabilities.

- **The MNR has demonstrated commercial partnerships and revenues.** One of the important government criteria in awarding MSI funding is the attraction of commercial revenues to offset the

---

1 UNENE is sponsored by Canada’s nuclear power sector.
costs of science infrastructure. McMaster’s track record of having commercial revenues cover the MNR’s costs far exceeds that of TRIUMF and CLS, whose commercial revenues are less than 2% of their costs.

- **Important industry and government partners may support the academic research.** Bruce Power is investing in a Nuclear Innovation Institute (NII) and is seeking McMaster’s participation for both radiopharmaceuticals and nuclear energy. Natural Resources Canada (NRCan) is looking to secure Canada’s role in SMR development, and CNL sees academic research capabilities as a pillar. These organizations may be sources of infrastructure funding, industrial research chairs, and collaborative R&D grants.

7. **NO&F governance is working well, but additional governance practices will be needed to advance the research mission.**

- **Managing the NO&F.** Operationally, the University is best served to retain the NO&F operating structure as it is currently, under the direction of the Vice President of Research (VPR).

- **The research mission would benefit from an Academic Priorities Review Board.** The potential for leveraging the MNR research benefits across McMaster’s faculty warrants attention to how the research and commercialization agenda is developed, and how access to the facility is managed. A senior governance body could address the perceived gap by reflecting the University’s ambitions for the facility, establishing research priorities for the University, and ensuring the maximum research potential is realized. The NO&F team, as part of the office of the VPR, would continue to be an essential part of that structure to ensure operational and commercial considerations are included in the decision-making process.

- **Governing the MNR as a national research facility.** With the recognition of McMaster as a multi-university national research asset, additional governance challenges may present themselves, the most significant of which is ensuring that McMaster retains ultimate control over how the NO&F is leveraged. As such, the governance structure of the CLS may provide some guidance since it engages the nationwide research community in its research setting agenda, but provides the host university a greater influence over the activities conducted. McMaster would require a governance structure that ensures it can best leverage its significant historical investment in the MNR infrastructure and in its own IP. In support of that segregation of value, the full costing approach described above could be used to clearly segregate user costs from the value of university-created innovations.

### Conclusions and Recommendations

**Conclusion: McMaster has an unprecedented opportunity**

- The radiopharmaceutical opportunity is significant, the neutron scattering capability will be world leading, and nuclear power research is moving to the forefront of climate action. The commercial opportunities and potential academic partnerships will cover the costs and provide substantial returns to McMaster for its IP. McMaster should further explore the potential opportunities and benefits described above and develop a strategy to build on the MNR asset.
Recommended next steps will establish the basis for a strategy

- **Explore a McMaster radiopharmaceutical research centre.** The potential synergies between the MNR and McMaster’s health sciences specialization warrants the development of a vision and strategic plan.

- **Initiate a strategic plan for staging growth.** McMaster should set its ambitions for leading-edge research in materials science, radiopharmaceuticals, and nuclear energy, and develop a vision for how the University can leverage the value of the MNR. With that vision, McMaster should develop a roadmap to success, and consider the possibility of becoming a National Research Institute based on either the TRIUMF or CLS model. This roadmap may warrant a communication plan to address how the value of the MNR could be recognised by the University administration, the University’s researchers, the Canadian nuclear industry and/or the nation.

- **Develop the operational plans to proceed with 24x5 and high flux operations.** Confirm costs, expected revenues, cash flows, risks and, most importantly, decision gates. Develop a human resource plan for the additional shift and defer 24x7 planning until further validation is performed. McMaster can validate its opportunities in a staged progression before committing to the higher cost 5 MW 24x5 or 24x7 operations.

- **Develop isotope capabilities to enable capture of the potential revenue.** McMaster should pursue Holmium production opportunities and develop the Lutetium options with McMaster’s partners to set a schedule for operating 24x5 at high flux. It should finalize terms with the CPDC, which may depend on how McMaster presents a collaborative market-facing approach for the NO&F and the CPDC vis-a-vis Bruce Power.

- **Discuss collaborations with Bruce Power.** Bruce Power sees potential roles for McMaster in its radiopharmaceutical commercial vision, the Canadian Nuclear Isotope Council (CNIC), and the NII. McMaster must resolve its approach to the Lutetium opportunity with respect to the CPDC versus Bruce Power/Kinectrics roles. This relationship is pivotal to McMaster’s future decisions and may be an enabling transition to national research facility status.

- **Reframe the Neutron Scattering CFI application.** McMaster should reframe the neutron scattering CFI application by emphasizing the need for funds to operate the MNR, which will be necessary to mitigate McMaster’s risk of carrying the costs. Doing so would ensure that the role of the MNR is recognized within the application, and lays the foundation for a future MSI application. McMaster should use this opportunity to establish the principles of full cost recovery, factor in the capital costs of mitigating Nray and Actlabs’ operational conflicts with isotope production, and position the future governance options in the context of McMaster’s vision. As an important justification of the expanded operation, every effort should be made to make this proposal as compelling as possible.

- **Develop a federal engagement strategy.** McMaster should hold discussions with NRCan, AECL, and/or CNL around whether partnerships for nuclear research are warranted. These potential partnerships may lead to both infrastructure and collaborative research funding.
Contents

Executive Summary ............................................................................................................................................... i
1. Introduction .................................................................................................................................................. 1
   1.1. Methodology ....................................................................................................................................... 2
   1.2. Structure of the Document ................................................................................................................. 3
2. NO&F Today .................................................................................................................................................. 4
   2.1. NO&F Facilities ................................................................................................................................... 4
   2.2. Commercial Use of the NO&F ............................................................................................................ 6
   2.3. Academic Use of the NO&F ............................................................................................................... 7
   2.4. NO&F Financials and Cost Recovery ................................................................................................. 8
      2.4.1. A Special Note on Decommissioning Funding ........................................................................... 9
   2.5. MNR Benchmarks with University Research Reactors ...................................................................... 10
   2.6. Capability Implications of NO&F Operating Profile ........................................................................ 13
   2.7. Summary............................................................................................................................................. 14
3. Market Opportunities ................................................................................................................................... 15
   3.1. Radiopharmaceuticals ....................................................................................................................... 15
      3.1.1. Iodine-125 ..................................................................................................................................... 16
      3.1.2. Holmium-166 ............................................................................................................................... 16
      3.1.3. Lutetium-177 ............................................................................................................................... 17
      3.1.4. Yttrium-90 .................................................................................................................................... 17
      3.1.5. General Dispensing and Distribution ........................................................................................ 18
   3.2. Materials Science .............................................................................................................................. 18
   3.3. Irradiation Opportunities ................................................................................................................... 20
   3.4. Nuclear Energy Sector Collaboration ............................................................................................... 20
   3.5. Competitive Landscape ..................................................................................................................... 22
      3.5.1. Commercial Competition ......................................................................................................... 22
      3.5.2. Managing Academic and Commercial Conflicts ...................................................................... 23
   3.6. Summary............................................................................................................................................. 24
4. Financial Implications of 24x5 Operation ................................................................................................. 26
   4.1. Revenue and Cost Forecast .............................................................................................................. 27
   4.2. Opportunity Risk/Reward Profiles ................................................................................................... 28
   4.3. Cash Flow Implications of 24x5 Operation ...................................................................................... 30
4.4. Mitigating Risks to McMaster through Valuing Research and Commercial Benefits .............. 33
   4.4.1. The Context of McMaster Financials – Impact on Faculty Budgets ........................................ 34
   4.4.2. Financial Implications of Full Cost Allocation ........................................................................ 36
   4.4.3. Commercial Risk Implications to Faculty ............................................................................ 37
   4.4.4. Full Cost Allocation to NO&F Provided Services ............................................................... 37
   4.4.5. Cost Allocation Implications ................................................................................................ 39
4.5. Summary of Financial implications ............................................................................................. 39
5. Strategic Opportunities for McMaster............................................................................................. 41
   5.1. The MNR in McMaster’s Research-focused Vision ..................................................................... 41
   5.2. Radiopharmaceuticals Health Research .................................................................................... 42
   5.3. Materials Science ....................................................................................................................... 44
   5.4. Nuclear Energy .......................................................................................................................... 45
   5.5. McMaster as a National Research Facility ............................................................................... 48
   5.6. Bruce Power – An Important Collaboration Relationship ...................................................... 49
   5.7. Summary of Strategic Opportunities ....................................................................................... 50
6. Governance Options and Considerations ....................................................................................... 52
   6.1. Background ................................................................................................................................. 52
   6.2. Operating Business Model Structures ...................................................................................... 52
   6.3. Research Agenda Leadership .................................................................................................... 53
   6.4. National Research Facility Governance .................................................................................. 55
   6.5. Summary of Governance Implications ..................................................................................... 57
7. Recommendations and Next Steps ................................................................................................. 58
Appendix A – List of Abbreviations ...................................................................................................... 60
Appendix B - References ..................................................................................................................... 62
List of Figures

Figure 1 NO&F Facilities ................................................................. 4
Figure 2 Detailed Overview of NO&F Facilities ........................................ 5
Figure 3 Revenue Breakdown by NO&F Application and Component ................................. 6
Figure 4 NO&F Facility Use by Academic Principle Investigators ........................................ 8
Figure 5 Historical Decommissioning Trust Fund and Liability Balances ............................... 10
Figure 6 Implications of Increasing MNR Operating Profile ................................................. 13
Figure 7 General Steps in a Radiopharmaceutical Production Process ................................. 15
Figure 8 Participating Canadian Institutions .......................................................................... 19
Figure 9 Total Revenue, Cost and Margin by Operating Phase ............................................. 27
Figure 10 Incremental Revenue, Cost and Margin by Operating Phase ................................. 28
Figure 11 24x5 Low Flux Future Margin Risk ......................................................................... 29
Figure 12 24x5 High Flux Future Margin Risk .......................................................................... 30
Figure 13 24x5 Low Flux Revenue Forecast ............................................................................ 31
Figure 14 24x5 Low Flux Expenditure Forecast ....................................................................... 32
Figure 15 Total Annual Revenue vs. Expenses ......................................................................... 32
Figure 16 Cumulative Financing by Year .................................................................................... 33
Figure 17 University Budgeting Framework ............................................................................. 34
Figure 18 Full NO&F Direct, Indirect, and University Overhead Costs ................................. 35
Figure 19 Future NO&F Direct, Indirect, and University Overhead Costs ............................. 35
Figure 20 Financial Balance of Commercial vs Academic Use .............................................. 36
Figure 21 Potential Future Commercial Margin Contribution to University and Research ........ 37
Figure 22 Fully Loaded Revenue and Cost of NO&F .................................................................. 38
Figure 23 Research Funding per Faculty Member, NO&F Users vs. Rest of McMaster .......... 41
Figure 24 Research Radiopharmaceutical Value Chain at McMaster ...................................... 43
Figure 25 Commercial Radiopharmaceutical Value Chain at McMaster ............................... 44
Figure 26 Potential Nuclear Energy Research Ecosystem ......................................................... 46
Figure 27 TRIUMF and CLS Organizational Structures ............................................................. 56
List of Tables

Table 1 List of Interviews ................................................................. 2
Table 2 NO&F Commercial and Research Users ................................................. 7
Table 3 NO&F Budget Actuals FY2017-2018 ...................................................... 9
Table 4 Comparison of University-based Reactor Facilities ..................................... 11
Table 5 Comparison of Commercial Services at University-based Reactor Facilities ................ 12
Table 6 Other Reactor Operating Cost Benchmarks ............................................ 13
Table 7 Competitive Risks and Mitigation Strategies for New McMaster Initiatives .......... 23
Table 8 Potential Conflicts and Conflict Mitigation Options ..................................... 24
Table 9 Operating Business Model Structure Options ......................................... 53
Table 10 Research Agenda Setting Structure Options ......................................... 54
1. Introduction

McMaster University is a world-renowned, research-intensive university based in Hamilton, Ontario. It is home to a suite of nuclear facilities, operated by the Nuclear Operations and Facilities (NO&F) group that reports to the office of McMaster’s Vice President of Research (VPR). The NO&F provide commercial services and research capabilities, many of which are unique in Canada.

The central component of the NO&F is the McMaster Nuclear Reactor (MNR). The cost of the reactor’s operation is supported by commercial activities, which include radioisotope production and neutron radiography. Neutrons from the MNR are also used to support a wide range of research. In addition to the commercial activities and research mission, these facilities are also valuable educative tools that provide experiential learning for nuclear scientists and engineers, and allow the public unique access to an operating nuclear reactor.

The closure of the Atomic Energy of Canada Limited (AECL) National Research Universal (NRU) reactor at the Canadian Nuclear Laboratories (CNL) facility in Chalk River has created a neutron gap in Canada, curtailing much of its Nobel Prize winning neutron beam research program and restricting its role in supplying medical isotopes. This comes at a time when new commercial and research demands are developing quickly. The closure of NRU, which happened to coincide with the expiry of an international access agreement to Oak Ridge National Laboratory’s (ORNL) Spallation Neutron Source (SNS), has left MNR as the only major source of neutrons for research use in Canada, and the only research facility in Canada where reactor-based radioisotopes can be produced. The NO&F team has been exploring several new radiopharmaceutical applications that are showing commercial promise.

These circumstances place NO&F at a crossroads, and provide considerable opportunity for it to expand and grow its research activities and commercial services. McMaster’s capacity to fill the neutron gap is currently limited by the availability of the MNR, which runs at 60% of its power capability for 16 hours per day and 5 days per week (16x5). This capacity could be increased with investment and an expanded operating budget to extend the hours of operation of the MNR and raise the power of the reactor.

McMaster University commissioned this study under contract to Morson International to assess the market opportunities of McMaster’s NO&F, identify the investment considerations related to expanding the MNR operations to potentially operate 24 hours per day, seven days per week (24x7), and inform the University on appropriate governance structures that would allow it to achieve its objectives.

In response to the University’s objectives, the team of Strategic Policy Economics and Bucephalus Consulting set out to:

1. Understand the commercial and academic research potential of expanding MNR operations, to both capture the isotope opportunities and to fill the neutron gap. Steps included:
   - Assessing the commercial opportunities for leveraging the MNR and the related NO&F facilities;
   - Acquiring market data specifically for radiopharmaceuticals to understand how the supply chain operates, the value created at various stages of the supply chain, and any risks and opportunities that may exist;
   - Describing the competitive landscape as it relates to the opportunities identified; and
   - Identifying the research enabled by the NO&F and its value to the University and to Canada.
2. Identify options available to effectively govern and manage the facilities/activities in the future.
   - Develop costing models to support University financing and accounting treatment.
   - Explore governance considerations for balancing the tension and priorities between commercial and academic research use of the NO&F.

3. Provide recommendations to the University to best capture the opportunities.

1.1. Methodology

The overall approach to this study was to gather information through a combination of stakeholder interviews (both internal to McMaster but also external academic and commercial interests), background research, workshops with the McMaster University executives that formed the steering committee, and consultants’ analysis. Table 1 summarises the stakeholder interviews conducted as part of this process.

<table>
<thead>
<tr>
<th>Position</th>
<th>Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster (Internal)</td>
<td></td>
</tr>
<tr>
<td>Professor</td>
<td>John Lusat</td>
</tr>
<tr>
<td></td>
<td>Bruce Gaulin</td>
</tr>
<tr>
<td></td>
<td>Fiona McNair</td>
</tr>
<tr>
<td></td>
<td>John Valliant</td>
</tr>
<tr>
<td>NO&amp;F Staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Karin Stephenson</td>
</tr>
<tr>
<td></td>
<td>Rob Penuta</td>
</tr>
<tr>
<td></td>
<td>Scott McMillan</td>
</tr>
<tr>
<td></td>
<td>Andrea Armstrong</td>
</tr>
<tr>
<td></td>
<td>Alice Pilczursky</td>
</tr>
<tr>
<td></td>
<td>Susan Jack</td>
</tr>
<tr>
<td>Other McMaster Resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thor Zic</td>
</tr>
<tr>
<td></td>
<td>Ian Clemons</td>
</tr>
<tr>
<td></td>
<td>Lou Mitten</td>
</tr>
</tbody>
</table>

**Table 1 List of Interviews**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Energy Operations and Need for Hot Cells</td>
<td></td>
</tr>
<tr>
<td>ARCEL</td>
<td>Steve Bushby</td>
</tr>
<tr>
<td>Brook Power</td>
<td>Frank Saunders</td>
</tr>
<tr>
<td>CNSC</td>
<td>Jason Cameron</td>
</tr>
<tr>
<td>COG</td>
<td>Peter Elder</td>
</tr>
<tr>
<td>COG SMR participant</td>
<td>Natalie Alderson</td>
</tr>
<tr>
<td>INL</td>
<td>Amy Lantza</td>
</tr>
<tr>
<td>Independent/Kinetics</td>
<td>Rory Kennedy</td>
</tr>
<tr>
<td>NRCan</td>
<td>Dan Brady</td>
</tr>
<tr>
<td>UNINS</td>
<td>Jerry Maspohl</td>
</tr>
<tr>
<td>Materials Science Opportunities</td>
<td>Dan Banks</td>
</tr>
<tr>
<td>Former CNBC</td>
<td></td>
</tr>
<tr>
<td>University Based Research Reactor Models</td>
<td></td>
</tr>
<tr>
<td>MURR</td>
<td>Jackie (Jack) Toyra</td>
</tr>
<tr>
<td>OPAL</td>
<td>Tanja Karine</td>
</tr>
<tr>
<td>Oregon State</td>
<td>Kathy Highay</td>
</tr>
<tr>
<td>TU Delft</td>
<td>Steve Reeme</td>
</tr>
<tr>
<td>UC Davis</td>
<td>Was Foy</td>
</tr>
<tr>
<td>Customers, Potential Partners &amp; Competitors</td>
<td></td>
</tr>
<tr>
<td>Act Labs</td>
<td>Roy McCallum</td>
</tr>
<tr>
<td>CNL</td>
<td>Kathy McCarthy</td>
</tr>
<tr>
<td>Kinetics</td>
<td>Christina Van Drunen</td>
</tr>
<tr>
<td>NRC</td>
<td>Jan Cut</td>
</tr>
<tr>
<td>NRC</td>
<td>Musain Mahidi</td>
</tr>
<tr>
<td>SNC Lavalin</td>
<td>Raklin MacMillay</td>
</tr>
<tr>
<td>SNC Lavalin</td>
<td>Igor Blagojevic</td>
</tr>
<tr>
<td>SNC Lavalin</td>
<td>Zaid Karzani</td>
</tr>
<tr>
<td>SNC Lavalin</td>
<td>Catherine Cottrell</td>
</tr>
</tbody>
</table>

To help prioritize the project’s efforts to best develop the information required for decision making, the research was conducted in three phases that each culminated with a workshop/discussion with the steering committee.
Market Study for McMaster’s Nuclear Operations and Facilities

- **Phase 1 – Current State Analysis.** The first phase focused on gathering information on the current state of NO&F markets and operations. Using this information, a database of operational information was created and used to model the NO&F’s financials.

- **Phase 2 – Market Analysis.** The second phase involved market research on the supply chain structures, pricing practices and the overall competitive environment including opportunities and threats. Three different market areas relevant to the NO&F were examined:
  1. Radiopharmaceuticals/Radioisotopes
  2. Materials Science/Neutron Beam Services
  3. Nuclear Energy

The research also involved a benchmarking study of university-based research reactors in terms of their costs, capabilities, and applications.

- **Phase 3 Governance and Preliminary Recommendations.** The third phase examined the pros and cons of different governance models for the NO&F, set the University’s overall research agenda to best leverage the MNR, and optimized the portfolio of commercial and other academic collaborations that had been uncovered. Research included governance structures of other national research facilities and the potential roles for McMaster in other Canadian nuclear initiatives.

1.2. **Structure of the Document**

This report has been structured into the following sections:

- Section 2 summarizes the state of the NO&F today, focusing on the facilities it oversees and the cost of operations, and presents the results of the benchmarking research.

- Section 3 describes the commercial and academic market opportunities for the NO&F that could result from expanded operations of the MNR. This section includes a discussion of the competitive environment, both commercially and academically.

- Section 4 presents the financial implications of expanding the MNR’s operating hours, focusing in on 24x5 operation, and addresses market and research mission risks.

- Section 5 describes the potential synthesis of the commercial and research opportunities enabled by expanded operations of the MNR that could lead to a broader vision of McMaster’s research leadership. Leadership potential is described in three areas: radiopharmaceuticals, materials science, and nuclear energy. With this combination, the basis for a national major science infrastructure (MSI) research facility is explored.

- Section 6 considers changes to the governance structure of the NO&F and related research agendas that could be considered with expanded applications of the MNR and or an MSI status.

- Finally, Section 7 summarizes the findings and offers recommendations.
2. NO&F Today

This section examines the state of the NO&F today, focusing on the facilities it oversees and the cost of operations. It begins by outlining the five NO&F facilities, and situates the MNR as the core of these facilities. It compares the capabilities of the MNR to other university research reactors, and compares the operating costs of the MNR and NO&F to those other reactors. Lastly, it outlines how operating hour extensions would impact the MNR’s operations.

2.1. NO&F Facilities

Five distinct facilities make up the core capabilities of the NO&F, as shown in Figure 1.

![Figure 1 NO&F Facilities](image)

Each of the NO&F facilities has distinct characteristics:

a) **The MNR** is a 5 MW research reactor that provides neutrons for research, medical isotope production, and neutron radiography. Its reactor core enables irradiation for materials research and isotope production, and instruments can be attached to the reactor’s beam ports for other materials science applications.

b) **The High-Level Laboratory Facility (HLLF)** is a large laboratory space licensed and equipped for research involving radiation. It houses facilities which make use of the MNR, including isotope development and neutron activation analysis (NAA). NAA is used to verify the composition of experimental medical devices, analyze biological tissues, and determine the provenance of archaeological artifacts. NAA is applied to thousands of samples each year for Canada’s natural resources sector.

c) **The Centre for Advanced Nuclear Systems (CANS)** is a new facility for examining the effects of irradiating materials, and is still being prepared for operation. Expected applications include
Market Study for McMaster’s Nuclear Operations and Facilities

safety monitoring of components from in-service nuclear reactors and investigation of fundamental material properties.

d) **The McMaster Accelerator Lab (MAL)** houses particle accelerators and a gamma irradiator. It is used by researchers in radiation biology, detector physics, and medical science.

e) **The McMaster University Cyclotron Facility (MUCF)** is a medically focused facility with a cyclotron and hot cells. It is currently used solely by the Centre for Probe Development and Commercialization (CPDC) that pays rent for its access primarily to generate radioisotopes for medical use.

The NO&F facilities are located in three buildings. There is the MNR itself, which is adjacent to the Nuclear Reactor Building (NRB). The NRB houses the HLLF and several other laboratories managed by other departments, such as health physics and the radiochemistry and radiation biology groups. The CPDC offices are also located within the NRB. The Accelerator Building houses the MAL, CANS, and MUCF.

While the purpose of each facility is distinct, there are operational and application dependencies, as illustrated in Figure 2. The MNR directly supports Iodine-125 production and Nray’s use of the beam lines for neutron radiography of aerospace turbine blades. The MNR’s other beam lines support neutron scattering instruments for academic materials science research. Currently only the McMaster Alignment Diffractometer (MAD) beam instrument is operational, but the Small Angle Neutron Scattering (SANS) instrument and McMaster Intense Positron Beam Facility (MIPBF) are being integrated this year as part of a CFI funded project.

![Figure 2 Detailed Overview of NO&F Facilities](image_url)

2 Since the MUCF is dedicated to the CPDC, it is not illustrated in Figure 2 nor discussed further in this report.
The commercial and research applications of the MNR and the HLLF are highly integrated. To undertake NAA in the HLLF, a pneumatic system operated from the HLLF enables researchers to have samples irradiated by the MNR. The centre for NAA also makes use of an MNR neutron beam line with a prompt gamma instrument and performs analyses in support of Iodine-125 production. The Isotope Development Laboratory uses the MNR to produce research isotopes.

There is currently no identified direct research or commercial application dependency between the MAL and CANS nor between them and the operating profile of the MNR.

2.2. Commercial Use of the NO&F

The NO&F has commercial operations at all of its facilities. The “Revenue by NO&F Component” chart in Figure 3 shows that the vast majority of NO&F’s revenue arises directly from the MNR. Most HLLF revenue relies on the MNR as well. CANS and MAL are currently independent of MNR operations, but are responsible for only 3% of NO&F revenue.\(^3\)

From a commercial business perspective, commercial isotopes, beam line usage, most materials irradiations, and isotope development are dependent on the MNR, which together represent 99% of NO&F’s revenue. Commercial isotopes provide 73% of NO&F revenue for which McMaster has a 50% share of the global market for Iodine-125.

The customer breakdown of these commercial revenues is summarized in Table 2 below. The NO&F’s customers for Iodine-125 include isoSolutions, but the NO&F also ships direct to other customers. Nray

\(^3\) The MNR’s hot cell will be linked to projects related to the larger CANS pressure tube work.
provides all of the beam line commercial revenue. The materials irradiation category includes services to irradiate materials directly in the MNR core, as well as irradiation to support NAA of materials in the HLLF or by customers at their own facilities. Major customers include Actlabs, Becquerel, and Mirion.

MNR isotope development is a service that provides small quantities of research isotopes primarily to researchers at McMaster but also to other universities. Other universities pay small sums for the research isotopes.

<table>
<thead>
<tr>
<th>NO&amp;F Application</th>
<th>Balance of Commercial/Research %</th>
<th>Commercial Users</th>
<th>Revenue ($000s)</th>
<th>Research Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Isotopes</td>
<td>100/0</td>
<td>IsoSolutions and others</td>
<td>$4,973</td>
<td>N/A</td>
</tr>
<tr>
<td>Isotope development</td>
<td>0/100</td>
<td>N/A</td>
<td>$39</td>
<td>MNR Isotope Development</td>
</tr>
<tr>
<td>Beam lines</td>
<td>33/67</td>
<td>Nray</td>
<td>$970</td>
<td>Engineering Physics; Physics and Astronomy; others expected in future</td>
</tr>
<tr>
<td>Materials irradiation</td>
<td>10/90</td>
<td>I-125; Actlabs; Nray; Becquerel</td>
<td>$715</td>
<td>Engineering Physics; Physics and Astronomy; Psychology, Neuroscience and Behaviour</td>
</tr>
<tr>
<td>CANS</td>
<td>0/100</td>
<td>N/A</td>
<td>$120</td>
<td>Chemistry and Chemical Biology; various Engineering</td>
</tr>
</tbody>
</table>

2.3. **Academic Use of the NO&F**

A wide variety of researchers make use of the diverse NO&F facilities as shown in Figure 4 below. Academic users of the NO&F are concentrated in Engineering Physics and Physics & Astronomy, with 10 and seven Principal Investigators (PIs) respectively. Engineering Physics PIs have more than five times as many engineering graduate students working with NO&F, despite only having twice as many PIs as other engineering users. In contrast, while Physics & Astronomy has the highest concentration of NO&F users, the total of all other science PIs is slightly larger with a proportionately equivalent number of graduate students.

NO&F also attracts users from other universities, both in Canada and from abroad. PIs from other universities represent over 20% of NO&F researchers.

Researcher groups use multiple NO&F facilities, pointing to the value of the portfolio of capabilities offered by the NO&F. Reactor core irradiations are used only by the Engineering Physics PIs but also by other Canadian and international researchers. Similarly, other engineering and science PIs make use of the CANS facility (which in FY18/19 was only the Scanning Electron Microscope (SEM/FIB)), and it also

---

4 Researchers from Canadian institutions included: Queen’s University, Ryerson University, University of Manitoba, University of Manitoba, Université de Montréal, University of Winnipeg, Western University, Acadia University, and McGill University. Researchers from foreign institutions included: University of Michigan, Open University, University of Alaska, University of Rennes, Williams College, and Bern University. These figures are based on use between 2012 and 2018.
attracted users from other universities. The use of these facilities by students from other universities speaks to their unique value in Canada. Currently the only research users of the MAD beam line instruments are from McMaster’s Department of Physics & Astronomy and researchers from other universities. The upcoming Small Angle Neutron Scattering (SANS) and the McMaster Intense Positron Beam Facility (MIPBF) instruments will expand the diversity of research use of the MNR's beam lines.

The MAL supports PI activities of many McMaster faculties. Not illustrated in the figure is the production of research quantities of radioisotopes by the isotope development laboratory within the HLLF. These research isotopes are used by many researchers, both within McMaster and outside McMaster.

Figure 4 NO&F Facility Use by Academic Principle Investigators

2.4. NO&F Financials and Cost Recovery

Revenues to the NO&F have been typically offsetting its operating budget. In FY17/18, the NO&F delivered a positive contribution of $230,000 to the VPR’s budget. The NO&F operating budget reflects the costs of operating each of the facilities and/or business lines, and separately includes the cost of overall management and various support services that are shared amongst the departments. The FY17/18 cost and revenue actuals attributable to each area are summarized in Table 3.

The irradiation and beam line revenues of the MNR as well as the Iodine-125 production revenues and the NAA and isotope development revenues provide the positive contribution that offsets the costs of operating the MNR and other NO&F management and support services. The negative contribution from the MAL/CANS/MUCF in Table 3 is somewhat misleading. They have only been grouped to simplify the
The majority of the revenues come from the MAL, while the MNR department itself is run at a large operating loss, the NO&F’s Iodine-125 operations, which depend on the MNR, earns a profit exceeding its own expenses as well as that of the MNR. NAA, the only other department which earned an operating profit in FY2017-2018, also depends on the MNR. The NO&F management costs include shared components such as depreciation of all assets, the costs of Health Physics, and other costs (including several accounting provisions).

Table 3 NO&F Budget Actuals FY2017-2018

<table>
<thead>
<tr>
<th></th>
<th>NO&amp;F Management</th>
<th>MNR</th>
<th>I-125 Ops</th>
<th>NAA &amp; Iso Dev.</th>
<th>MAL/CANS/ MUCF</th>
<th>Other NO&amp;F Support</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income:</td>
<td>$ -</td>
<td>$ 1,320</td>
<td>$ 4,973</td>
<td>$ 405</td>
<td>$ 246</td>
<td>$ -</td>
<td>$ 6,943</td>
</tr>
<tr>
<td>Expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries, Wages &amp; Benefits</td>
<td>$ 827</td>
<td>$ 1,431</td>
<td>$ 731</td>
<td>$ 332</td>
<td>$ 241</td>
<td>$ 522</td>
<td>$ 4,085</td>
</tr>
<tr>
<td>Fuel Usage &amp; Disposal</td>
<td>$ -</td>
<td>$ 1,221</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 1,221</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$ 296</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 296</td>
</tr>
<tr>
<td>Health Physics</td>
<td>$ 254</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 10</td>
<td>$ -</td>
<td>$ 264</td>
</tr>
<tr>
<td>Administrative</td>
<td>$ 224</td>
<td>$ 170</td>
<td>$ 184</td>
<td>$ 32</td>
<td>$ 17</td>
<td>$ 41</td>
<td>$ 667</td>
</tr>
<tr>
<td>Other</td>
<td>$ 178</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 178</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>$ 1,778</td>
<td>$ 2,822</td>
<td>$ 915</td>
<td>$ 365</td>
<td>$ 268</td>
<td>$ 563</td>
<td>$ 6,711</td>
</tr>
<tr>
<td>Net Operating Profit (Loss)</td>
<td>$(1,778)</td>
<td>$(1,502)</td>
<td>$ 4,058</td>
<td>$ 40</td>
<td>$(22)</td>
<td>$(569)</td>
<td>$ 233</td>
</tr>
</tbody>
</table>

2.4.1. A Special Note on Decommissioning Funding

All nuclear facilities in Canada are regulated by the Canadian Nuclear Safety Commission (CNSC). A requirement of the CNSC is that owners of nuclear facilities provide for the funds required to eventually decommission the facility. The McMaster annual reports acknowledge that it is expected that the MNR will be decommissioned at some undeterminable future date. Under agreement with the CNSC, a trust fund has been established which requires annual funding contributions to provide for the decommissioning costs.

Figure 5 shows how the liability fund and present value of the anticipated future decommissioning costs have evolved in the last 10 years.

---

5 The majority of the revenues come from MAL, while the majority of expenses, mostly staffing costs, are associated with CANS.
6 Health physics runs the radiation protection activities for not only the MNR, but also all users of the NO&F and the rest of the university.
7 Provisions are the amount of money set aside for future obligations of the NO&F. The majority of provisions are for fuel disposal for the MNR, which is included in ‘fuel usage & disposal’. The ‘other’ category includes provisions for pensions, loan repayment, a lawsuit payment, and decommissioning.
8 McMaster Annual reports FY 2009-2018
Prior to reconciling the need for a fund with the CNSC, the University was concerned about how this historic liability was to be paid for. The University and its faculty were liable for these costs. In order to address this liability, the NO&F was looked to for commercial margins that could finance the decommissioning fund to offset the historical decommissioning cost liability. As part of the decision to sustain the ongoing operations of the MNR and make use of the contributions from the NO&F towards the liability fund, the University acknowledged that it would cover the overhead and occupancy costs associated with hosting the facility on campus. This funding from the NO&F was required to top up the funds until FY2012/13 after which the fund has been exceeding the liability as shown in Figure 5. Since that time, the University approach to overheads has also evolved which is explained more fully in Section 4.4.

2.5. MNR Benchmarks with University Research Reactors

A benchmarking of university-based research reactors shows that the operations and capabilities of the MNR compare favourably. Three general subjects were benchmarked:

a) Governance and capabilities
b) Commercial services
c) Operating costs

**Governance and Capabilities**

Table 4 summarizes the benchmarking results across several relevant features. Benchmarking included four research reactors in the U.S. – Oregon State University (OSU), the University of Missouri Research

---

*McMaster Annual Reports*
Reactor (MURR), Massachusetts Institute of Technology (MIT), University of California Davis (UC Davis) – and also the research reactor at the Technical University in Delft (TU Delft), the Netherlands.

**Table 4 Comparison of University-based Reactor Facilities**

<table>
<thead>
<tr>
<th>Feature</th>
<th>McMaster Current</th>
<th>Oregon State University Direct to VP Research</th>
<th>University of Missouri Direct to Vice Chancellor Research</th>
<th>MIT Direct to VP Research</th>
<th>University of California Davis Direct to Vice Chancellor Research</th>
<th>TU Delft Unit within single Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance Structure</td>
<td>Direct to VP Research</td>
<td>Direct to VP Research</td>
<td>Direct to Vice Chancellor Research</td>
<td>Direct to VP Research</td>
<td>Direct to Vice Chancellor Research</td>
<td>Unit within single Faculty</td>
</tr>
<tr>
<td>Power</td>
<td>3 MW</td>
<td>5 MW</td>
<td>1 MW with short pulse</td>
<td>10 MW</td>
<td>6 MW</td>
<td>2 MW with short pulse</td>
</tr>
<tr>
<td>Operating Schedule</td>
<td>16x5</td>
<td>24x5 or 24x7</td>
<td>8x5</td>
<td>24x6.5</td>
<td>24x7</td>
<td>7.5x5</td>
</tr>
<tr>
<td>Research/commercial split*</td>
<td>30/70</td>
<td>50/50</td>
<td>70/30</td>
<td>50/50</td>
<td>N/A</td>
<td>30/70</td>
</tr>
<tr>
<td>Beam Port Instruments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffractometer</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Prompt Gamma</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>SANS and MIPBF</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Reflectometer</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Powder diffractometer</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Spectrometer</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Stress Scanner</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Instrumented Beam Ports / Total Beam Ports</td>
<td>6/6</td>
<td>6/6</td>
<td>7/7 future</td>
<td>2/4</td>
<td>4/6</td>
<td>3/9</td>
</tr>
<tr>
<td>Supporting Facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclotron</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Accelerator</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>Positron Facilities</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
<tr>
<td>PIE Facilities</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
<td>X</td>
</tr>
</tbody>
</table>

*The research/commercial split is very subjective, based on feedback during interviews.

All U.S. research reactors are governed similarly to the NO&F, and report to their university’s equivalent of the VPR. TU Delft stands out as being the only one that is managed within a faculty. Interviews suggest the VPR governance structure lends itself to maximizing the diversity of university researchers that access the facility. At 3 MW, McMaster is currently in the middle of the pack in terms of operating power, but will be in the league of MIT and MURR if it increases its power to 5 MW. As with those universities, higher power at the MNR is associated with 24-hour operation.

Most of the research reactors have a greater proportion of academic research use than is reflected by McMaster user statistics. This is highly influenced by the importance of seeing commercial revenues. UC Davis has a mandate to achieve 100% commercial funding, but has not yet achieved that goal. The U.S. Department of Energy (DOE) funds fuel costs for research reactors if they maintain a minimum of 50% usage by academia, and MURR has a 50-50 split primarily in order to benefit from this policy.

Compared to these facilities, the NO&F offers a much greater variety of nuclear capabilities to its user base. The MNR’s focus on beam port instruments for materials science applications stands out when compared to the U.S. research reactors, particularly with the incoming additions of the SANS and the MIPBF instruments. Only TU Delft is equivalently equipped. However, if McMaster’s current CFI application for a Canadian neutron scattering capability is approved (see Section 3.2), the MNR’s set of beam port instruments would go beyond that of TU Delft as well. With the new instruments, the academic use of the MNR is expected to greatly increase.
Market Study for McMaster’s Nuclear Operations and Facilities

The NO&F is the only university research reactor-based operation that also includes all three additional facilities: cyclotrons, accelerators, and positron facilities.

Commercial Services

The commercial service offerings of each facility are shown in Table 5. The MNR’s commercial service offerings are generally more diverse than those of other university-based research reactors. Interviews generally support the notion that the financials for reactors generally depend on radioisotope production. A common theme that was strongly communicated is the need to have core anchor clients for whom reactor services can be reliably assumed to continue.

OSU and UC Davis have a similar breadth of commercial services, while the others offer fewer. TU Delft stood out as having the fewest commercial services and hence the greatest reliance on its host university for funding.

Silicon doping is the only service that the MNR is missing as compared to other facilities, but those facilities are in turn missing other services offered by McMaster, including gamma irradiation and radiography. There may be value in considering silicon doping as a future commercial service.

Table 5 Comparison of Commercial Services at University-based Reactor Facilities

<table>
<thead>
<tr>
<th>Commercial Service</th>
<th>McMaster</th>
<th>Oregon State University</th>
<th>University of Missouri</th>
<th>MIT</th>
<th>University of California Davis</th>
<th>TU Delft</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAA and Core Irradiations</td>
<td>✔</td>
<td>✔</td>
<td>✔ minor</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Gamma Irradiations</td>
<td>✔</td>
<td>✔</td>
<td>X</td>
<td>✔</td>
<td>✘</td>
<td>✔</td>
</tr>
<tr>
<td>Radioisotope Production</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✘</td>
<td>✔</td>
</tr>
<tr>
<td>Radiography</td>
<td>✔</td>
<td>✔</td>
<td>X</td>
<td>✔</td>
<td>✔</td>
<td>X</td>
</tr>
<tr>
<td>Silicon Doping</td>
<td>X</td>
<td>X</td>
<td>✔</td>
<td>✔</td>
<td>✘</td>
<td>X</td>
</tr>
</tbody>
</table>

Operating Costs

The MNR operating costs compare favourably to other institutions as shown in Table 6, suggesting that the NO&F is operated cost-effectively. Cost benchmarks are compared on two bases: simple reactor operating costs for single day operations; and full operating costs for 24x5 operations. Interviews disclosed that U.S. research reactor operators discuss costs in terms of costs per hour of operation.

For simple reactor operations, excluding fuel, McMaster’s total costs per operating hour are $400/hour, half that of OSU and UC Davis. When full costs are considered, including those of the commercial operations, the hourly NO&F costs are half that of TU Delft and MURR, even though MURR’s costs do not include fuel.
### 2.6. Capability Implications of NO&F Operating Profile

A key research objective for this study is to determine the benefits of increasing the MNR’s operating profile from its current 16x5 operation to a potential 24x7 operation. A research reactor’s benefit is measured by the availability of neutrons that can be used for experimentation. Two factors impact the availability of neutrons:

1. The operating profile (how many hours a day); and
2. The operating power (colloquially how many neutrons per second) which is also referred to as the “flux”.

Figure 6 illustrates the implications on the MNR’s relative productive use of increasing the operating profile for both hours and flux for the 24x5 and 24x7 scenarios, compared to its current operation. With the MNR’s current 5x16 operation, the MNR starts up and shuts down every day. The daily startup and shutdown processes impact on the quality of the neutron environment, as it takes time for the reactor’s core to stabilize as it transitions from off to on. Due to this transition, the available time during which experiments can be conducted under a stable neutron environment is estimated at only 11 hours a day. This means that the MNR’s current operation offer 55 hours a week of useful “experiment time”.

#### Figure 6 Implications of Increasing MNR Operating Profile
24x5 Operation

Moving to 24x5 operation implies that the operation of the reactor will shift from 16 hours a day to 24 hours a day. These terms generally refer to the need to run three operator shifts a day versus two. However, from a reactor productivity perspective, the available productive hours shift from 11 hours per day described above to practically a full 24 hours per day. The five hours of powering on and off transition time lost daily under 16x5 operation, is only lost once per week. The net effect is that the operating hours increase from 55 hours per week to 114 hours per week, a 107% increase.

With a 24x5 operating profile, the MNR can increase its operating power from 3 MW to 5 MW providing 60% of additional flux. Additional flux shortens the time required for many experiments, potentially improving equivalent available “productive hours” by 60%.

The net effect of the two changes is that under 24x5 operation at 5 MW, the MNR’s equivalent experimental capacity could increase by 230% from 55 hours per week to 182 hours per week.

24x7 Operation

In a similar fashion, operating seven days a week instead of five could add up to 40% more operating hours. However, it is anticipated that under 24x7 operation a shutdown of about seven days will be required every two months in order to undertake routine maintenance that is otherwise achieved on weekend or other downtime in the other scenarios. The resulting availability will be about 150 effective operating hours per week.¹⁰

Similar to the 24x5 case, the impact of moving to 5 MW adds 60% higher flux from the 3 MW today, which would lead to 90 additional equivalent productive operating hours per week, totaling 240.

The net effect of the two changes is that under 24x7 operation at 5 MW, the MNR’s equivalent experimental capacity could increase by 336% over current operation, and by 32% over 24x5 5 MW operation.

2.7. Summary

The assessment of the NO&F components and their financials has underscored the importance of the MNR to the NO&F’s commercial and research applications.

Growth considerations should focus on the MNR. The best course of action is to focus on the direct use of the MNR capabilities and on how the HLLF services may be enhanced by an expansion of MNR operations.

The MNR has the potential to deliver greater value. The fact that the MNR is cost effectively operated, is equipped with a wide variety of capabilities, and is unique in its ability to commercially fund its operations all provide a solid basis for considering future operational enhancements that may increase the value of the MNR to the University.

¹⁰ 24x7 availability is based on 61 days in two months, less 7 days of down time or 54/61=89%. 89% of 168 hours in a week is 150 hours.
3. Market Opportunities

This section examines the market opportunities that could result from expanding the MNR’s operations. These markets are Radiopharmaceuticals, Materials, and Irradiation. It ends with an overview of the overall competitive landscape.

3.1. Radiopharmaceuticals

The production and use of a radiopharmaceutical typically involves several stages. It starts with bulk irradiation of a target which is then processed to recover the radioisotope. This radioisotope is then turned into the product, dispensed, and distributed for use. The general process is illustrated in Figure 7.

![Figure 7 General Steps in a Radiopharmaceutical Production Process](image)

The supply chain for each radiopharmaceutical varies because they place different demands on each supply route. For example, some isotopes such as Iodine-125 are made and distributed in bulk, as a radiochemical that is then made into proprietary devices before being dispensed for treatment. Others such as Holmium-166 demand that the device itself is irradiated, and Lutetium must be made as a radiopharmaceutical right from the start.

The market opportunities for a bulk irradiator such as the MNR vary depending on the supply route and the amount of processing the product requires. Even though there are many research reactors around the world, factors, including their configurations and power, restrict the kinds of radioisotopes they can produce. The need for a process to turn the irradiated target into a vendible product creates a further restriction. For these reasons, with the possible exception of Iodine-125 and Molybdenum-99 (as a precursor to Technetium-99m), there is no competitive, open, market for radiopharmaceuticals. Instead, there are a series of bespoke, typically long-term, trading agreements/supply contracts.
The design of the MNR, its accompanying facilities, and the capabilities of its staff allow NO&F to produce a wide variety of radioisotopes, develop bespoke radiochemicals for research and specific demands, and produce some radioisotopes on a commercial scale.

For this study, it was necessary to select a set of isotopes for detailed review. In creating this selection, isotopes were chosen based on their value, the market opportunity they represented, and the MNR’s ability to produce them. The chosen opportunities were:

- Iodine-125
- Holmium-166
- Lutetium-177
- Yttrium-90
- General Dispensing and Distribution

Notably, Molybdenum-99/Technecium-99m, the most common medical radioisotope, was excluded. McMaster previously determined that the MNR would not be an effective producer of Molybdenum-99 even at higher power, given the other operational needs and emerging competition in the marketplace.

3.1.1. **Iodine-125**

At about $5 million in FY17/18, the production of Iodine-125 is a significant part of NO&F’s income, constituting over 70% of its total revenue. This demonstrates the potential for commercial operations to contribute to the cost of operation of the reactor without impacting research capacity. The income has grown steadily over the years, from $2.5 million in 2014.

NO&F has consistently supplied about 50% of the world market for Iodine-125 since production ceased at the NRU. The market is constantly developing as new suppliers enter and customers make alternative buying decisions, but there is some stability as customers are reluctant to move from a supplier that has maintained consistent quality and reliability of supply. NO&F has a strong reputation for quality and reliability. There are multiple customers, with a normal distribution of a small number of large purchasers and a large number of small ones.

Iodine-125 is typically used in Brachytherapy sources. It is supplied in bulk as a radiochemical and is then encapsulated, using proprietary processes, before being dispensed and distributed to hospitals.

The target for Iodine-125 production is Xenon gas, and the need to handle gases limits the number of reactors that can irradiate the target. Processing of the gas to recover the Iodine is also not easy and NO&F has a proprietary and reliable technique for production, which now fits comfortably into the operations of the reactor. Substantive changes in the supply base are possible but unlikely.

Market research suggests that moving to a 24x5 operating profile could enable greater Iodine-125 sales for the NO&F. The 24x5 revenue forecast includes a conservative assumption of 10% revenue growth ($500,000) and a 25% optimistic target ($1.2 million).

3.1.2. **Holmium-166**

Holmium-166 is being used in a new therapy, Quiremspheres, and supply chains are presently being established. The new therapy is a radio-embolizing microsphere to be used for selective internal radiotherapy. Unlike its precursors that use glass beads and Yttrium-90, many reactors are unable to irradiate the Quiremspheres without destroying them due to the spheres’ heat-sensitivity. As a result of
both the chemical stability of the spheres and the half-life of the Holmium-166, it is best to irradiate, dispense and distribute them from the same location. This allows a producer to be involved in much more of the supply chain, effectively becoming both a contract manufacturer and distributor.

Quiremspheres have the advantage that they can be visualized with single-photon emission computed tomography and magnetic resonance imaging. They will progressively grow market share with Quirem, the owner of the Quiremspheres technology, anticipating sales of 15,000 doses per year in North America.

NO&F has been working with Quirem to prove that MNR can be used for the irradiations, and to demonstrate a capability to suspend the spheres in a carrier, and dispense and distribute them to an acceptable clinical standard. In June 2019, the first shipment of an approved product was made. Quirem estimates that the NO&F would earn revenues of $0.6 – $1.2 million annually as a supplier during a trial period from 2020 to 2025. During full production, revenues could increase to $12 million on the conservative side or up to $22 million on the optimistic side, representing 25% to 40% of the North American market share. Both of these large production volumes would require expansion of the processing capability at McMaster. While the production of Quiremspheres requires neither an increase in power nor increased operating times to get the desired product, meeting the full production delivery schedule requires at least 24x5 operation.

3.1.3. Lutetium-177
The market for Lutetium-177 is rapidly emerging following the success of the first therapy, Lutathera. Lutetium-177 is easily attached to existing probes, allowing the development of many new therapies. The CPDC is also running trials with other probes both for itself and other parties.

This ease of attachment means that the radiopharmaceutical involves minimal processing, and so Lutetium is not being regarded as a raw material but rather as a deliverable radiopharmaceutical. As a result, Lutetium-177 must be processed as a clinical product using current good manufacturing practice (cGMP) throughout the production process. This adds value to the irradiator’s income even if the Lutetium is provided in bulk. CPDC presently spends $525,000 a year on Lutetium for their existing trials. Future planned trials will raise this to $2 million a year. If the therapy goes into production, the CPDC anticipates buying $175 million worth of Lutetium a year, even if competition causes a decline in Lutetium prices.

The commercial production of Lutetium at MNR would require at least 24x5 operation and higher power to achieve production volumes. It would also occupy at least one valuable high flux site. Based on McMaster estimates, the conservative financial forecast has assumed potential Lutetium sales of $5 million/year based on a production volume of 25 Ci/month. Optimistically this could be $10 million/year but may require additional investments in processing.

3.1.4. Yttrium-90
Yttrium-90 is primarily used in radio-embolizing microspheres. This market is fairly mature, though still growing, and dominated by SIRtex, an Australian company owned by a Chinese equity company; and BTG, who bought the rights to Therasphere from Nordion, though the latter still manages production. While both have well-established supply chains, BTG is looking to expand its supply chain to make it more resilient to reactor shut downs.
NO&F has not historically produced Yttrium-90 because it requires higher power and longer operating schedules. However, it could be produced commercially at 24x5, 5 MW operation. NO&F has been in discussion with BTG, and with the developer of a new Yttrium-90 based radio-embolysis device, ABK Medical, but could not conclude discussions until NO&F committed to higher power operations. In the meantime, ABK Medical has selected an alternative provider.

The glass spheres used in Therasphere could be irradiated in many of the world's reactors. The role of the irradiator is to receive in bulk, irradiate, and return in bulk, often referred to as dip and ship. This is the least valued of the processing actions: the total market for irradiations is estimated at $15 million. Yttrium-90 would occupy a valuable high flux location, which may displace Lutetium production.

Even if NO&F did gain significant market penetration, the expected income would be less than $0.7 million annually, an amount insufficient to justify high flux operations on its own. As a result, this revenue has been assumed only in the optimistic scenario. No revenue has been assumed in the conservative scenario on the basis that the NO&F should only pursue opportunities to produce Yttrium-90 when it is clear they will not impact on other opportunities that could justify the high flux needed.

3.1.5. General Dispensing and Distribution
It is conceivable that the NO&F can develop new irradiation and processing techniques to deliver bespoke, dispensed products. These productions provide a much higher margin than for bulk products. Further expansion of these productions would not require changes in the reactor’s operations since the limit is in dispensing, rather than the quantity of irradiation. However, growth in production would require investments in new automated dispensing equipment. Creating a dispensary could create an opportunity for further income, but this would require investment and could distract from the research mission. Further exploration of this opportunity was de-prioritized for this project.

3.2. Materials Science
There is the potential for the NRU’s world-class materials science instruments to be brought to McMaster, in order to leverage the MNR’s neutron scattering capability. The national community of users of these instruments has developed a grant application to the CFI to this end, entitled “Building a Future for Canadian Neutron Scattering”. The application has been prepared by McMaster’s PI, Professor Bruce Gaulin from Physics and Astronomy.

The objectives of the participating Canadian institutions are:

- To have the MNR replace the now-closed NRU as Canada’s main source for neutron scattering;
- To maintain and build the research strength of Canada’s substantial neutron scattering user community that would otherwise progressively decline;
- To ensure the MNR is used by highly qualified researchers who deliver strong results; and
- Build on the earlier investments in infrastructure made by both CFI and the University.

The user community consists of professors from 17 universities and 10 disciplines as shown in Figure 8.
The goal of the CFI grant application is to secure funding to:

- Establish a national user program for scientists from across Canada who form the neutron scattering community;
- Relocate three surplus CNBC instruments from AECL’s (now closed) NRU facility to the MNR, in order to complement the MNR’s existing beam line instruments;
- Open a new MNR beam port and refurbish two of its existing beam lines in order to accommodate the new instruments; and
- Develop partnerships with international institutions such as ORNL to enable priority access for Canadian researchers.

If successful, the expected outcome of these efforts is the output of 50 to 60 high quality publications per year from the user community.

This facility is expected to become highly subscribed immediately upon completion. While the proposal is not contingent on changing the MNR’s operating cycle from 16x5 to 24x5, the additional bandwidth will increase the available research time. It is expected that additional bandwidth will also rapidly become oversubscribed as it substitutes for the 24x7 NRU capacity.

The implication of this initiative on the NO&F is that it will significantly increase the research mission activity and the number of users that are attracted to McMaster. Based on the benchmarks described earlier, with the proposed transfer of the former CNBC instruments, McMaster will become a university-based research facility for materials science research unique in North America.

Commercially, it is anticipated that the previous commercial work undertaken by the CNBC could migrate to McMaster. This work is estimated at $100,000 annually.
3.3. Irradiation Opportunities

Neutron beams, NAA, and sample irradiations are existing applications for key customers of the NO&F. NO&F currently has two large customers that would make use of the MNR’s additional capacity if operations were moved to 24x5:

**Nray**

Nray uses the MNR’s beam lines for neutron radiography of turbine blades in the growing aerospace market. Nray anticipates exceeding McMaster’s existing capacity within two years and already requests McMaster to operate one-weekend a month to meet its demand. They already have a second supplier (North Carolina), and are looking for a third to sustain the growth in their business. If informed quickly, Nray could increase their use of McMaster by 60% ($300,000) if they don’t seek a third supplier. If Nray does seek a third supplier, the NO&F could realize a 20% loss in revenue ($100,000).

**Actlabs**

Actlabs is a laboratory specialized in analyzing core samples for the mining industry. They make use of the NO&F’s NAA services, and also have samples irradiated directly within the MNR for analysis by their own laboratories. They would like to increase the number of samples they irradiate at McMaster by 40%.

The expected increase in annual revenue from moving operations to 24x5 for these two customers is in excess of $500,000.

3.4. Nuclear Energy Sector Collaboration

McMaster’s role within the nuclear energy sector is well established. McMaster is a member of the University Network of Excellence in Nuclear Engineering (UNENE) which sponsors Industrial Research Chairs (IRC) and Collaborative R&D (CRD) grants, and McMaster has directly funded research from multiple players. This research is leveraged with National Science and Engineering Research Council funds. McMaster has developed a strong relationship with Kinectrics, the former R&D arm of Ontario Hydro. The two have worked together to increase Kinectrics’ use of McMaster’s MNR and CANS hot cells for examining irradiated materials, with the goal of providing the market with a competitive alternative to the hot cells at CNL.

Opportunities in the nuclear energy sector were explored on two dimensions:

1) Commercial opportunities to leverage the facilities
2) Educative and research applications

**Commercial Opportunities**

No concrete needs have been identified within the existing Canadian nuclear power sector for the MNR’s irradiation capabilities. All interviewees expressed recognition that the MNR is a valuable asset to Canada, however, none had concrete needs that would lead to commercial funding. NRCan agrees that there are needs for irradiation that align with federal objectives, however their agent, AECL, has delegated the mandate on irradiation options to CNL who is now directly investigating with the NO&F.
Opportunities may remain to leverage the MNR in the nuclear sector, but will require more time to develop. Small modular reactor (SMR) developers recognize the need for irradiation of materials to support licensing, however it is unclear whether the MNR suits their needs; some SMR vendors want additional applications that would require upgrades and many have indicated they will reach out directly to the NO&F team.

**Educative and Research Applications**

Nuclear-based education is needed, particularly in energy. With the refurbishment of Canada’s nuclear fleet of CANDU power reactors, the sector will need Highly Qualified Professionals (HQPs)\(^\text{1}\) for 40 years. Both regulators and the sector itself need independent experts to support public discourse in Canada, which is a recognized role of UNENE, of which McMaster is a central part. SMR developers are coming to Canada and a global shortage of trained HQPs has been identified with some specialized expertise currently being hired from abroad to make up for domestic shortages. An initiative has been created by the International Atomic Energy Agency (IAEA), UNENE, and CANDU Owners Group (COG) with the express purpose of addressing HQP education needs for emerging nuclear countries. Reactors, such as the MNR, are perceived to be underused as teaching tools. Additional opportunities for McMaster may include: virtual training with hands on supplement; Health Physics training; a role in public perception of nuclear; and science of communications and making nuclear understandable.

With the attention on new nuclear and SMRs, there is an emerging need for educated reactor design and other nuclear technology skills in North America as a whole. A prominent role in nuclear energy combined with the neutron gap in North America could enable a relationship with the Idaho National Laboratory (INL) Nuclear Science User Facility (NSUF) in addition to those enabled with ORNL through the neutron scattering CFI. INL is interested in McMaster as a partner within its research oriented NSUF program but “considerations” would have to be explored, likely under government to government memorandum of understanding (MOU) arrangements. Such MOUs would have to be entered into by NRCan, AECL, and/or CNL on their behalf.

**Implications**

Notwithstanding the NO&F’s competing position with the CNL over the NO&F’s development of commercial hot cell opportunities, CNL may be a valuable partner to have in advancing several other funding and research opportunities. CNL could:

- Use irradiation capabilities;
- Act as a potential fuel supplier, and a channel for federal science and technology (S&T) dollars;
- Provide access to INL’s NSUF;
- Act as a conduit to SMR developers in Canada; and
- Support McMaster in approaching AECL, NRCan, and completing a CFI/MSI request.

---

\(^1\) HQPs are generally defined to include graduates holding Master or Doctorate degrees.
3.5. Competitive Landscape

The competitive landscape implications for the opportunities identified above have been assessed from two perspectives:

1) What are the commercial competitive pressures?
2) What are the potential conflicts between academic research and commercial missions?

3.5.1. Commercial Competition

The competitive landscape for the MNR based services discussed above consists primarily of other university-based research reactors, but also new emerging power reactor interests such as Bruce Power.

Canada’s SLOWPOKE reactors and the facilities at CNL, such as the ZED-II research reactor, are not capable of the identified commercial functions, making the MNR the only research reactor in Canada that can contemplate the opportunities. Research into other university-based research reactors discussed earlier suggests that these reactors do not presently pose any material threats to McMaster’s potential sources of revenue. These reactors are generally not involved in these opportunities and are already highly utilized by the distinct applications they are currently engaged in. McMaster’s strong financial position and breadth of capabilities distinguish it from the others.

An assessment of each potential opportunity area is summarized in Table 7.

The most significant risk to McMaster’s 24x5 plans lies in commercial isotopes. Not surprisingly, this opportunity has attracted much attention, with Bruce Power announcing an intention to irradiate for both the European producer ITG, and for Kinectrics, who are planning to establish a radiopharmaceutical business in Ontario on the back of this new opportunity. Similar announcements have been made by other organizations such as SHINE, based in the U.S., who intend to use a sub-critical homogeneous reactor for the irradiations.

NO&F has formed a joint venture with CPDC to set-up the commercial production of Lutetium. Both CPDC and NO&F are assisting Kinectrics with the development of their business and are in discussions with Bruce Power as well.

If the MNR moves to 24x5 high flux operation, the NO&F/CPDC joint venture can likely get product to market before any of the other organizations, since SHINE and Bruce Power have yet to develop and install their technologies. In the meantime, competitive tensions could interfere with the willingness of Kinectrics and Bruce Power to ask McMaster for research assistance.

Fortunately, McMaster is already participating in discussions and has the opportunity to mitigate those risks. McMaster has several desired sources of value including its ability to move quicker on Holmium and Lutetium, and its full supply chain offer in development. Most importantly however, it brings the health science research capabilities of the University which Bruce Power and Kinectrics have both indicated are desirable features for a potential partnership. To mitigate commercial risks, McMaster should conclude appropriate commercial arrangements with Bruce Power and Kinectrics.
Table 7 Competitive Risks and Mitigation Strategies for New McMaster Initiatives

<table>
<thead>
<tr>
<th>Line of Business</th>
<th>Perceived Competitive Risks</th>
<th>Risk Mitigation Strategies</th>
</tr>
</thead>
</table>
| Commercial Isotopes  | • Little risk from other reactors; no processing facilities or have other priority work (e.g., MURR Mo-99)  
• Bruce Power/kinetics initiative  
• Potential IP challenges with Travis over own production | • 1st mover advantage opportunity in Holmium, Lutetium  
• CPDC, IP, full supply chain participation  
• McMaster's Health Science capabilities offer a radio-pharmaceutical research potential  
• Develop role with Bruce Power initiative |
| Isotope Development  | • Under developed synergies with the facility limit available expertise  
• Bruce Power Canadian Nuclear Isotope Council (CNIC) initiative clouding the space | • McMaster's focus on Health provides the leverage of an advanced university that no other university reactors have |
| Beam Lines           | • CFI does not get approved  
• Il-defined governance model and role of McMaster as a national user facility could impact research success  
• Long term operating cost exposures may linger after the CFI IOP expires | • Characterize initial Neutron Scattering CFI funding to mitigate financial risks  
• Ensure a MSI application is prepared  
• McMaster has best university equipment with no competing sources outside international labs that are oversubscribed  
• Reliable partner (e.g., Nray) with steady local business |
| Neutron Activation   | • Most universities offer NAA, but to select market segments with little interest in growing  
• Labour limited at McMaster leaves market untapped | • Actlabs represents a steady ongoing reliable local partner  
Prepare appropriate resource plan |
| Other Materials Irradiations | • Demand is low, funding may not materialize | • Alternative revenue opportunities could be pursued such as silicon doping  
• If Govt of Canada recognizes value, then some cost mitigation may be enabled  
• Margins from above could offset research cost if University so chooses |

McMaster is generally resource limited in its ability to grow the isotope development opportunities. This pertains both to the number of resources available and the ability of the University to maximize the synergies between the NO&F staff and the rest of McMaster’s Heath Sciences faculty. Furthermore, the Bruce Power-sponsored CNIC opportunity may bring additional players into the space. McMaster could mitigate these measures by leveraging its Health Sciences capability and developing an enhanced resource base accordingly.

The possibility of housing Canada’s neutron scattering at McMaster is a significant opportunity. McMaster’s existing NO&F makes it the logical choice for this necessary infrastructure in Canada. The major risk lies in the lack of a well-defined governance structure and long-term funding arrangement within the CFI application as it stands. This could potentially put McMaster at risk of being the funder for what is essentially a national MSI asset. This can be mitigated somewhat by ensuring the CFI application considers these long-term issues, emphasizes the value of the MNR in it, and by McMaster taking the necessary steps to build up the case to ensure MSI funding will follow.

There is significant growth potential in NAA which can be supported by creating an appropriate staffing plan for the required skilled resources. The NO&F’s existing customer base provides the necessary security to build from.

3.5.2. Managing Academic and Commercial Conflicts
McMaster’s experience so far has been that research needs have been largely accommodated within the NO&F’s managed operational priorities. Some delays in work have been experienced but no research objectives have been declined.

Going forward, the facility may be much more highly subscribed, raising additional risks in two areas:
1) Available beam lines and irradiation zones could be insufficient or improperly sized to accommodate both commercial and research applications. These risks can be accommodated by capital investments thanks to the flexible nature of the MNR design.

2) NO&F staffing levels could limit growth opportunities. The current labour limiting areas must be addressed by establishing an appropriate staffing plan.

Table 8 summarizes these and other risks that have been discussed with the NO&F team.

<table>
<thead>
<tr>
<th>Line of Business</th>
<th>Perceived Conflicts</th>
<th>Risk Mitigation Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Isotopes</td>
<td>Lutetium may occupy the highest flux site in reactor</td>
<td>Create a new irradiation site to ensure research access</td>
</tr>
<tr>
<td></td>
<td>Iodine, Holmium would not introduce conflict</td>
<td>Commercial production could facilitate access to lutetium for other research purposes</td>
</tr>
<tr>
<td>Beam Lines</td>
<td>Neutron Scattering instruments and need for beam ports vs. Nray as a long-standing customer</td>
<td>Provide flexible instrument installations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run 24x5 will maximize Nray revenue but not free up a beam port.</td>
</tr>
<tr>
<td>Neutron Activation</td>
<td>Few</td>
<td>In general there is much physical capacity</td>
</tr>
<tr>
<td></td>
<td>Additional labour resources would address ActLabs would have desired access at 24x5</td>
<td>Proper staff resourcing to ensure continuity of capability</td>
</tr>
<tr>
<td>Other Materials irradiations</td>
<td>None anticipated beyond Lutetium risk identified above and due to low demand for irradiations</td>
<td>24x5 or 24x7 creates even more capacity</td>
</tr>
<tr>
<td>Hot Cells</td>
<td>When materials analysis campaigns are ongoing, the hot cells will be dedicated for extended periods</td>
<td>Moving the Cobalt-60 source mitigates one conflicted area</td>
</tr>
<tr>
<td></td>
<td>Cleaning hot cells to support multiple uses imposes time constraints for commercial/research access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not clear what the research demand is for the hot cells</td>
<td></td>
</tr>
</tbody>
</table>

Table 8 Potential Conflicts and Conflict Mitigation Options

Of special note is the accommodation of the potential growth in services to Nray. Nray has expressed concern with 5 MW operation and was adamant that they need both of the beam lines they currently have. Some capital investments may be required for such things as mitigating the effects of too much flux if the MNR operates at 5 MW for Lutetium. The CFI applications should consider options for flexible instrument installations to mitigate the risk of conflicting demand on the beam lines currently used by Nray.

3.6. Summary

The market research has identified that there are three main opportunity areas before McMaster:

- **Commercial isotopes.** Expanding to 24x5 MNR operation offers several opportunities in the market of radioisotopes/radiopharmaceuticals. It is recommended that McMaster develop a business plan for moving to 24x5 operation based on the growth in Iodine-125 sales and the addition of Holmium-166 and Lutetium-177 sales, postpone pursuing Yttrium-90 production until it is clear it will not impact on other work, and consider expanding the capability to develop new approaches to irradiation and processing. Developing that income will require business development effort and the concluding of appropriate commercial arrangements with customers, including Bruce Power and Kinectrics.
### Market Study for McMaster’s Nuclear Operations and Facilities

- **Neutron beam instruments and materials science research opportunities.** McMaster should support the submission of the CFI application, but ensure adequate recognition is given to the MNR, future governance, and basis for ongoing operational funding under an MSI framework.

- **Irradiation services.** The remaining opportunities to enhance existing business in Iodine-125, neutron beams, and NAA are relatively risk-free and provide some security against the commercial risks of expanding operations to address the isotope opportunities.

**Contributions to the nuclear energy sector should be further explored.** Leveraging McMaster’s existing role within the nuclear power sector may lead to greater research-based opportunities and international collaborations as nuclear energy takes on greater importance in the battle against climate change and the need for HQPs in the nuclear sector continues to rise. These opportunities would need to be developed further in order to assess any investment implications. McMaster should explore senior relationships with CNL to investigate how CNL may help advance McMaster’s role in nuclear energy research.
4. Financial Implications of 24x5 Operation

This section examines the financial implications for the NO&F resulting from the opportunities identified in the previous sections. It presents a forecast of the revenue and cost profiles expected for 24x5 operation, for both low and high flux capabilities. The opportunities, risks, and cash flow implications of expanded operations are also assessed, and risk mitigation measures are provided. An examination of how costs could be attributed to the various commercial services as well as academic users is provided to support subsequent discussions on funding opportunities and governance.

Methodology

The financial implications presented in this section have been developed through:

1. Compiling the market research results;
2. Reviewing the existing NO&F budget and the context under which the NO&F financials are managed within the University budget overall; and
3. Conducting a review of cost estimates (provided by the NO&F) for MNR 24x5, high flux, and 24x7 operations.

All revenue and cost assumptions were examined and validated with the NO&F team, with modifications made based on consensus. As a result, these projections are illustrative, but deemed sufficiently valid for directional decision making at this time.

Financial Forecast

The financial assessment compares the cost for each mode of MNR operation against the expected revenue and illustrates the associated commercial risk. This risk-informed assessment leads to the conclusion that McMaster should pursue 24x5 low flux operations and plan for high flux operations as the nature of the Lutetium opportunity is finalized. An examination of the cash flow implications of the low flux 24x5 operations is presented which shows that $13 million to $19 million of investment could be required to offset cash flow requirements as the opportunities are developed.\(^\text{12}\)

Valuing Research and Commercial Benefits

The MNR and the NO&F facilities are both commercial and research assets within McMaster with value provided for both purposes. The future opportunities may increase McMaster’s role as a national research facility serving multiple universities and organizations. As such, consideration of the MNR costing and funding model options is warranted to best reflect the value of the research conducted. A cost allocation methodology illustrates the implications for commercial pricing, and illuminates the value of the research being conducted at NO&F facilities. Managing to such a methodology could further contribute to reducing McMaster’s financial risk exposure.

\(^{\text{12}}\) Net of CANS margins
4.1. Revenue and Cost Forecast

The opportunities for leveraging the MNR arise from expanding operations from the existing 16x5 mode of operation to 24x5 operation with either a low flux capability (e.g. existing 3 MW power level) or high flux operation (e.g. 5 MW power level). The revenue and cost implications forecast for each operating profile are illustrated in Figure 9. Early revenue opportunities from CANS that arise under the existing 16x5 mode of operation set the stage for creating a risk buffer against future margins and are being pursued today independent of changing the MNR operating profile. The low flux 24x5 scenario not only enables increased revenue from existing customers such as Nray, Actlabs, and Iodine-125 production, but also enables the dominant revenue driver of this mode which is represented by Holmium. Lutetium (and Yttrium if pursued) requires high flux operations, which comes at an additional fuel cost.

In the long run, the $27 million of annual revenue for 24x5 high flux operation could yield almost $13 million of margin over the expected operating costs of the NO&F of $14 million.

While 24x7 operation could allow for greater Lutetium production, there are currently no expectations for such additional revenue. As a result, moving to 24x7 operations without any new revenue would reduce the margin contribution to the University to $11 million. Should the potential for higher Lutetium production materialize, the benefit of 24x7 operation can be revisited at that time.

For greater clarity of the cost-benefit contributions, Figure 10 shows the anticipated steady state incremental revenue, cost, and margin associated with each reactor operating profile for 16x5, 24x5 (low and high flux), and 24x7 high flux. 24x5 low flux offers a sizeable ($7.8 million) margin against the majority of the expected incremental cost associated with the increased operating hours. Lutetium sales enabled by the 24x5 high flux operation would add an additional $3.8 million in margin against the additional fuel and operating costs. It is clear that margins from the assumed Lutetium forecast are insufficient to cover the costs of going to 24x5 if the Holmium opportunity does not materialize.
From this financial outlook, it is recommended that McMaster begin planning for 24x5 operations with, as a minimum, a low flux power output as may be required to capture the Holmium opportunity. Contingency provision for high flux operations should be developed as the approach to the Lutetium opportunity matures and the need for large production volumes is established.

4.2. Opportunity Risk/Reward Profiles
Market research of other research reactors confirmed that having an ongoing, reliable base of commercial partners is important to help manage the finances of the reactor. With the NO&F’s steady base of revenue from existing clients, the NO&F is set up to have a secure financial foundation from which to absorb incremental cost and revenue risk. The risks to McMaster in committing to greater MNR operations lie in whether the new isotopes will be successful. Commercial ventures inherently have more risk than the publicly funded activities typically experienced at a university. For example, isotopes have pricing risk: in the case of Iodine-125, pricing is competitive and very price sensitive. This price sensitivity is exacerbated by the fact that supply and demand is closely linked with highly perishable products, and many suppliers are using contribution and not fully costed approaches to pricing. When presented with financial risk in such an environment, increasing pricing may not uncover greater revenue toward reducing risk.

Revenues from McMaster’s long-term clients (Nray, Actlabs, and Iodine-125 production) are all expected to benefit from greater operating hours. Furthermore, should the Kinectrics partnership for work in CANS develop as expected, which McMaster will know shortly, solid contribution margins for the use of CANS will also provide a steady revenue stream. These revenues are considered to have relatively low risk profiles.
The risk profile associated with new isotopes, however, is reflected by the margin sensitivity shown in Figure 11 and Figure 12 for the 24x5 low flux and 24x5 high flux scenarios, respectively. For moving to 24x5 low flux, the Holmium product line revenue forecast has a plus or minus $10 million uncertainty. The market could either result in double the forecast revenues, or the revenues could evaporate if the new commercial relationship is unsuccessful. However, given the expected revenue from CANS and McMaster’s long-term clients, even the low revenue forecast scenario shown in Figure 11 may not impact greatly on the existing annual operating contribution of the NO&F – represented by an absolute worst case incremental loss of $600,000/year.

The high flux scenario is not the same. The risks are dominated by Lutetium and the associated incremental costs are material and primarily due to fuel consumption. In this case, in the presence of downside risk, the additional revenue may not cover costs and may introduce negative margins (approximately $1 million a year). Fortunately, since much of the cost risk exposure is due to fuel, if it is determined at any point in time that the need for high flux operation disappears, then the fuel can be inventoried and the costs partially recovered from future operating years. Yttrium potential is illustrated in the upside case to highlight that it could offer additional revenues in the event that Lutetium volumes allow for it. However, the forecast Yttrium revenue potential is less than the incremental fuel costs to proceed to high flux operations. As such, if sufficient Lutetium potential is not realized, then high flux operation should not be pursued for commercial purposes based on Yttrium sales alone. Similarly, if the Holmium opportunity becomes less than anticipated, then the financial basis for increasing MNR operations may get undermined even for Lutetium.
Based on the risk identified, developing the Holmium opportunity is the key enabler for expanding MNR operations and should be explored as much as possible to provide the best certainty for supporting the investment decision. At the same time, if the Lutetium opportunity is confirmed to be closer to the higher potential estimated, it may be the basis for moving forward with increased MNR operating profiles all on its own. It is recommended that confirmations of these opportunities and partnerships be advanced expeditiously.

4.3. Cash Flow Implications of 24x5 Operation

McMaster’s cash flow requirements for supporting the transition to greater operations are determined by when the NO&F expects to start receiving commercial revenues and when its expected costs are realized to both prepare for and to operate at the new MNR operating profile.

Revenues associated with the 24x5 low flux scenario are assumed to grow over time as shown in Figure 13. The cash flow projections are provided for the 24x5 low flux scenario, because it represents the first decision and much of the financial risks of the high flux scenario can be mitigated operationally. CANS hot cell work is assumed to arrive in Year 1 because the associated potential work is unrelated to the MNR decision.

Nray, Actlab, and Iodine-125 revenue growth is assumed to arrive in the first year of 24x5 operations. Holmium revenues are assumed to ramp up over the three years following the start of 24x5 operations.
Incremental costs begin with the decision to prepare for 24x5 as shown in Figure 14 and include additional labour costs, operating expenditures, contingency allowance, and capital improvements.

Labour costs arise from the staffing plans for recruitment and training of new operators to supply a new third shift to operate the reactor overnight and provide the depth of redundancy required for safe operation. Incremental technicians are needed to support each business line, and scientists and researcher staff should be built up to advance the enabled research agendas and support users with beam line instruments.

The additional operating hours will necessarily correlate with increased maintenance and repair activities and the new markets will require additional business development, outreach and administrative staff to capture and support the needs of new opportunities. Fuel must be purchased two years before it is needed.

A contingency of $500,000/year is added to the operating costs for the purpose of conservatively modeling cash flow, and represents approximately 10% of the incremental costs. Capital costs reflect upgrades to accommodate the new isotope activities and include a $200,000 provision for making beam line adjustments to accommodate the service quality needs of Nray.13

---

13 Capital illustrated reflects an approximate share reflecting an estimated removal of 24x7 implications.
To highlight the cash flow implications, the expected annual revenue and expenses are overlaid in Figure 15 with Year 5 representing the anticipated steady state margin. Expenses will exceed revenue for the first three years of preparing for 24x5 low flux operations. These years represent periods of required investment to supplement cash flows.

However, it is arguable that margins from the CANS work should be segregated from the MNR business case. Yet, given the current governance model of the NO&F reporting to the VPR, McMaster may choose to use CANS margins to help finance the MNR transition. The cumulative cash flow for the low flux 24x5.
scenario, both with and without the use of CANS margins, are shown in Figure 16. The cumulative cash flows represent the net new capital that must be financed by the University. McMaster will have to separately finance approximately $13 million over the first three years, but can expect these investments to be paid back by Year 6. If the University does not use the CANS generated margin, financing needs could be $19 million by year three and the payback deferred until early in Year 7. The high flux scenario, illustrated in Figure 16 as the dotted line, will involve greater expenses in Years 3 and 4 but higher revenue in Years 5 and 6, maintaining the payback period by Year 6.

![Figure 16 Cumulative Financing by Year](image)

4.4. Mitigating Risks to McMaster through Valuing Research and Commercial Benefits

The NO&F not only supports commercial work, on which the preceding business case discussion has been focused, but also provides an important asset to McMaster’s research community. Understanding the value that the NO&F provides to the research community, and how that value is paid for illustrates another element in the decision-making process. This is particularly important to understand if the NO&F is used by researchers outside of McMaster as there may be a basis for seeking related external funding.

This section first examines how the University budgeting process determines or estimates the contributions that faculties make to the research infrastructure at McMaster. The resulting faculty costs are then compared to the costs of the NO&F operations that could be attributed to the research activities that are conducted today. The importance of this budgeting view is then cast in the context of how it can mitigate McMaster’s financial risk. Considering the full cost allocation for the future potential research and commercial activities can illuminate where some costs should be recoverable from faculty or even multi-university programs, such as the neutron scattering community, or other collaborative research ventures.
4.4.1. The Context of McMaster Financials – Impact on Faculty Budgets

McMaster’s budgeting process recovers the costs of the University overheads from its faculties, including the costs for Research Support as illustrated the overall University budgeting framework in Figure 17. The NO&F financials are reported within “Research Support”. The VPR manages, within its Research Support budgetary constraints, the implications to the University of annual variances of the NO&F profit or loss contributions. Historically, the NO&F has been recovering its costs, and in fact provided a small contribution in FY17/18 as shown in Table 3 earlier.

![Figure 17 University Budgeting Framework](image)

However, the “full costs” of the NO&F are not captured by the NO&F operating budget. There are two surcharges that recover components of the University overhead and are related to the NO&F operations:

1) **Occupancy costs**, such as building heating and maintenance, allocated on a per square foot basis; and
2) **Support costs**, including benefits and other costs of employees, allocated on a dollar per full-time employee (FTE) basis.

These two surcharges are, in effect, an implied fee to the faculties for the privilege of accessing the NO&F facilities for research and educative purposes. For the N&OF, these two allocated overhead costs
amounted to approximately $800,000 in FY17/18 and would be properly included as part of the NO&F’s “full cost” to the University as shown in Figure 18.

One implication of the enhanced NO&F operations is that the space needed by the NO&F may increase and the number of FTEs deployed will go up. This will increase the costs that the faculty are covering through the surcharges in the budget. The cost implications to the faculty are shown in Figure 19. Faculty can expect to incur an additional $100,000 in charges due to MNR operation expansion.

These budgetary perspectives raise two questions for Faculties:
1) Are the Faculties deriving a commensurate value for their research and educative use of the NO&F facilities?
2) How does this value equation extend to NO&F users from other universities?

If value is equated to cost, then determining the cost of provided the service could act as a proxy and can be informed through a full cost allocation approach.

4.4.2. Financial Implications of Full Cost Allocation

An examination of the NO&F activities and use of resources provides a basis for allocating the NO&F costs to each of the NO&F facilities and for identifying how the use of those facilities are shared between commercial and academic purposes. Academic purposes include both research and educative activities.

Figure 20 illustrates the results of a preliminary cost allocation applied to the FY17/18 actuals. The figure separates the commercial margins created against the allocated costs, and compares that to the share of allocated academic costs remaining after accounting for the implied and direct faculty supported expenditures. This perspective suggests that the NO&F commercial margins are currently directly subsidizing $1 million of research activity, and are also providing a $400,000 margin benefit to the VPR that is indirectly reducing the overall University overhead to be recovered from the faculties.

**Figure 20 Financial Balance of Commercial vs Academic Use**

($M, FY17/18)

Figure 21 provides a similar depiction for the forecast 24x5 low flux operating scenario. Faculties will pay for $900,000 of NO&F research usage, including occupancy and support cost recovery, and accelerator user fees. Future NO&F commercial work could subsidize the remaining $2.2 million of allocated research costs, including faculty costs and provide an $11 million annual contribution to the University.
4.4.3. Commercial Risk Implications to Faculty

While McMaster has a potential upside, it also faces downside risk. Figure 21 shows that while McMaster may earn $11 million/year of additional margin, some of this identified margin could be at risk, and in fact could become negative if the Holmium and Lutetium opportunities do not emerge as expected. With the NO&F being financially managed within the VPR budget and variances recovered from faculty, these risks are effectively vested with the faculty.

In the long run, it should be considered whether the McMaster faculty should be solely responsible for the full costs and risks of this facility, as would be the case under the current University budgeting framework. While this risk could remain within the VPR, it could also be broadened to be better shared amongst NO&F users. This is particularly relevant when those users are outside of McMaster, as is the case with commercial customers, other university stakeholders, and other government interests. As such, the risk mitigation discourse involves three issues:

1) Considering the full costs of serving customers and ensuring pricing is adequately addressing those costs;
2) Appropriately funding the NO&F to recognize where others benefit; and
3) Recognizing the value of McMaster’s vested IP and invested commercial innovations and spin-off activities.

All three of these perspectives are informed by a full cost allocation methodology.

4.4.4. Full Cost Allocation to NO&F Provided Services

With an appropriate accounting system, cost allocation helps set the boundaries for cost-sharing and the framework for the University to capture value.

Fully loaded costing involves identifying the relevant cost areas and assigning them to the services provided to users. It is an accounting approach, not a management structure recommendation.
loaded’ costs include: University administrative costs; NO&F overhead costs; individual facility costs, of which the MNR is the most significant cost allocation question; and direct costs incurred in support of the services (e.g. Iodine-125 production activities). Allocating the fully-loaded costs considers two factors: (1) cost cross-pollination of NO&F facility operating budgets, which is the degree to which individual NO&F facility managers support each other with resources; and (2) identifying how much of each facility’s resources are used by each user group or customer.

MNR costs are the most significant cost area and are appropriately allocated among (1) isotopes, (2) beam lines and materials science applications, and (3) other irradiations including NAA and other commercial irradiations.

The results of the preliminary cost allocation are illustrated in Figure 22.\textsuperscript{14} Commercial isotope application is clearly the largest potential source for revenue and margin, and attracts the greatest amount of cost. Other areas may be under-recovering: NAA commercial revenues appear lower than commercial costs suggesting that pricing perhaps should be revisited. Similarly, commercial beam line use by Nray may have a basis for price re-negotiation depending on market pricing pressures they may see.

Of important significance is the $2 million/year cost allocated to beam line neutron scattering research. This makes up the greatest share of the allocated academic costs shown in Figure 21 above.

\textbf{Figure 22 Fully Loaded Revenue and Cost of NO&F ($M, 24x5 Low Flux)}

\textsuperscript{14} The cost allocation illustration is based on a number of approximations and assumptions that warrant a due diligence evaluation to set the parameters appropriately before any decisions such as suggested above are undertaken.
4.4.5. Cost Allocation Implications

The preliminary cost allocation results highlight three important issues:

1) As the majority of the proposed neutron scattering beam line use will not be by McMaster researchers, it is arguable that McMaster faculty should not be subsidizing the use of the facility by researchers from other institutions. User fees could be introduced to pay for research, but this approach would not work with the planned international collaboration environment. McMaster should inform its current neutron scattering CFI application and plan for an application for MSI funding to recover these fully allocated costs.

2) CANS activities are unrelated to the use and operation of the MNR. The expected margins are clearly established through the cost allocation. These margins should be for McMaster to use at its discretion, not committed in the long run to support other users of MNR related activities.

3) The commercial isotopes activities will pay for the majority of the MNR costs. However, as McMaster is making the investment and taking the risks on it, it should benefit from the rewards. Margins from specific commercial ventures should be managed by the University at its discretion, after they have paid for their full costs.

The underlying philosophy of the last two items is to protect the value of McMaster’s IP and not let it leak into academic support to other institutions or commercial customers. Margins from CANS, value of spinoffs, and IP royalties belong to McMaster. This is an important premise along with establishing a cost allocation approach for McMaster as it advances the strategic opportunities enabled by the MNR as addressed in the next section.

4.5. Summary of Financial implications

The financial assessment presented in this section highlights the following implications for McMaster

- **The overall revenue from existing and potential sources could exceed $27 million/year.** The commercial isotope opportunities represent over $24 million/year. To capture them requires shifting the MNR to 24x5 operations (Holmium production) and full power higher flux output (Lutetium production).

- **Requisite increase in operations will cost money and entail risk.** Shifting MNR operations to 24x5 and high flux will double the operating costs and require committed capital investments. While McMaster already has significant commercial revenues, these are currently insufficient to cover the new costs and investment cash flows. The University may have to invest $13 million to $19 million over three years in order to enable the future capture of new revenue streams. The expected new positive margins should pay back these investments within six years.

- **24x5 operation is supported.** The cost/benefit potential suggests increasing MNR operation to 24x5 is the logical first step. If identified risks materialize, there should still be sufficient funds to cover most of McMaster’s costs. The decisions to move to 24x7 can be deferred until the opportunities are more established and the cost risk of 24x7 operation is mitigated.
• **Cost sharing would reduce McMaster risk.** Due to the multi-purpose use of the MNR by beam line, irradiation, and isotope production users and researchers outside of McMaster, the operating costs should be shared by these groups or paid centrally by a funding body through the support of the MNR as a national facility. Cost sharing helps users recognize the value of the MNR and reduces the financial risk to McMaster.

• **Adopting a full-costing approach will protect the value of McMaster’s IP.** To help users of the MNR recognize the cost of their use, these costs are best communicated on a full cost accounting basis. The fully loaded costs to support the beam line instruments for academic users beyond McMaster can be the basis for an MSI application to the CFI. At the same time, seeking fully loaded cost recovery from the isotope production business both reduces the cost of the science and research activities while allowing the additional margins earned from McMaster’s commercial ventures to be retained by McMaster. Delineating these definitions is an important financial basis for structuring the MNR as a national MSI asset, or for charging researchers appropriately for access to the asset.
5. Strategic Opportunities for McMaster

The research shows that there may be significant academic leadership opportunities for McMaster that align with its vision as Canada’s pre-eminent research university. This section summarizes that vision, and presents the research opportunities in radiopharmaceuticals, materials science, and nuclear energy. With each of these three areas being premised on the MNR, there is the possibility that the creation of new MSI will transform it into a national research asset. Finally, this section presents synergies with Bruce power as a major industrial collaborator.

5.1. The MNR in McMaster’s Research-focused Vision

McMaster’s “Research for a Brighter World” Strategic Plan for Research 2018 – 2023 seeks to “take the institution’s research excellence to an even higher level”. McMaster prides itself as being one of Canada’s most research-intensive universities, and the objective of Research for a Brighter World is to leverage these research capabilities, especially fundamental research, to bring about social good. Nuclear research at McMaster through the NO&F is highlighted in the plan, both for the value of nuclear energy in acting to prevent climate change, and for the MNR’s role as a central research platform that supports biological and medical research, materials science, nuclear safety, and commercial aerospace work. The document explicitly mentions the opportunity to increase the MNR’s capacity in light of the closure of the NRU.

The findings of this study build on what is highlighted in the Strategic Plan, further demonstrating the contributions of NO&F and the MNR to McMaster’s Research for a Brighter World. Users of NO&F excel when it comes to funding for research; NO&F users receive nearly three times more research funding per researcher than does the rest of McMaster, as shown in Figure 23. What follows in this section shows that expanding MNR operations would build on key areas of fundamental research to serve the social good: health research, materials, and nuclear power.

![Figure 23 Research Funding per Faculty Member, NO&F Users vs. Rest of McMaster](image-url)
5.2. Radiopharmaceuticals Health Research

There has recently been a renewed interest in radiopharmaceuticals, notably in targeted alpha-particle therapies (TAT) and in theranostics (radiopharmaceuticals that can both identify and treat disease, allowing careful targeting of treatments). This interest has resulted in the development of valuable products. Novartis, recognizing the value of Lutetium therapies, acquired Advanced Accelerator Applications (AAA) for $5.1 billion, as a route to the production of Lutetium-177 and the rights to Lutathera, a Lutetium-based cancer therapy. AAA developed out of research at the European Organization for Nuclear Research (CERN). Novartis also acquired Endocyte, the owner of a range of Lutetium-based therapies from research out of Purdue University, for $2.8 billion.

Money is also moving in the development stages, with companies like ABK Medical (who are developing a Yttrium-90 based therapy known as eye-90) recently receiving $30 million in Series B funding from Eprime Capital and Varian.

McMaster has its own experience with spin-off opportunities through the funding success of Fusion Pharmaceuticals, which secured $105 million in an oversubscribed Series B financing round for its development of a TAT. CPDC is presently undertaking trials of new radiopharmaceuticals, and is looking for funding for its subsidiary Nugeneris and the opportunity to create a new radiopharmaceutical manufacturing and distribution hub.

Ontario, in particular, has recognized the opportunity in radiopharmaceuticals, with Bruce Power, Kinectrics, BWXT and Nordion (in its various current forms) all having active programs. Bruce Power is especially interested in the public relations value for the nuclear industry of positive healthcare benefits that derive from radiopharmaceutical usage. To pursue maximum benefit from the opportunity, Bruce Power has initiated the creation of the Canadian Nuclear Isotope Council. TRIUMF and CNL are collaborating to develop the use of alpha therapies.

Radiopharmaceutical research is more challenging than many other forms of research both because the isotopes are short-lived, and because their radioactivity requires special processing equipment and handling, as well as specific radiochemistry knowledge. Typically, the research must be located close to the irradiation source and requires access to radioactive materials handling expertise. In the development of new radiopharmaceuticals, research may need to be carried out on:

- Developing a new way to irradiate the targets
- New ways to process the targets
- The development of cGMP production capabilities
- New chemistry for tagging the radiochemical to the probes
- Disease research
- Clinical trials

The development of new irradiation techniques, separation processes and the dispensing of small quantities for research purposes are all a critical part of the research mission. In all likelihood, the demand for these services will increase if there is a growth in the research mission.

There are few research institutes in the world, let alone Canada, that are strong in all these aspects of the research. McMaster has a reactor and a cyclotron, radioactive materials handling facilities and cGMP processing facilities for radiopharmaceutical production; it also specializes in health care research.
Market Study for McMaster’s Nuclear Operations and Facilities

expertise includes reactor and cyclotron operation, radioactive materials handling, radiochemistry, specialists in medical research, and the capability to run clinical trials.

Benefiting from that research also requires the capacity to translate it into commercial applications, something McMaster is demonstrating through Fusion Pharmaceuticals, and has access to through the work of the CPDC which it has been hosting. Figure 24 shows McMaster’s research involvement through the radiopharmaceutical value chain.

![Figure 24 Research Radiopharmaceutical Value Chain at McMaster](image)

McMaster therefore has all the ingredients necessary for a fully vertically integrated centre for the development and commercialization of radiopharmaceuticals. McMaster has the potential to become an international radiopharmaceutical research hub, and potentially initiate the creation of an international commercial radiopharmaceutical hub in Ontario.

Such a centre should be attractive to the federal and provincial government, which have overseen a substantial decline in Canada’s role in the pharmaceutical industry. It should also be attractive to Bruce Power, as it will substantially increase the value to them of being involved in radioisotope production. The centre would also have the capacity to support the growing Ontario radiopharmaceutical industry and organizations such as BWXT and Kinectrics.

Figure 25 shows options for how McMaster may be involved in the commercial development of the Lutetium radiopharmaceutical value chain. These roles may be portable to other radiopharmaceuticals.
As discussed earlier, the roles of Bruce Power and Kinectrics present some risks to the potential NO&F revenues. They also represent new possibilities that can support McMaster’s research objectives.

Recommendation:

McMaster should explore a vision for developing a vertically integrated centre of radiopharmaceutical research and seek support from Canadian industrial organizations such as Bruce Power.

5.3. Materials Science

The purpose of the McMaster-led “national proposal” for neutron scattering is to establish the infrastructure for a national user community at McMaster and to build a strong base of Canadian expertise. The role would make McMaster a leading international university research institute in neutron scattering and materials sciences.

The CFI application that is currently being developed is to construct two beam lines at the MNR, relocate equipment from AECL’s former CNBC, and establish a precedent of university partnerships with foreign labs in France and the US. Under the now expired CNBC partnership with ORNL, funds were provided to McMaster to acquire an alignment diffractometer for installation at the MNR. This critical piece of infrastructure allows Canadian researchers to prepare for larger neutron measurement experiments that could only take place at the specialized and oversubscribed SNS facility at ORNL.

The current CFI also builds upon a recent CFI grant to McMaster to add new instruments to the MNR’s beam ports. These instruments include a SANS instrument and an investment by McMaster in a neutron beam hall that enabled expansion of the neutron beam laboratory. The new instruments that will be relocated from the CNBC have been selected for optimal application by Canada’s researchers given the capabilities of the MNR. As such, McMaster, through its MNR, will be well positioned to be an important collaborator to ORNL.

The new MNR beam instruments will complement McMaster’s leadership in materials science, as represented by the MSI at the Brockhouse Institute for Materials Research and the related but distinct Canadian Centre for Electron Microscopy, both of which are located at McMaster.

With these endowments, McMaster will have state-of-the-art capabilities in high demand from Canada’s neutron scattering research user community, as well as a vehicle for advancing research in a wide range of materials science applications.
variety of materials science applications. The researchers that used the CNBC benefited from significant collaborative industrial research chairs and grants from across Canada’s economy. Such potential will exist for McMaster researchers.

The CFI proposal in its current form both sets up McMaster to fund the $2 million operating costs on behalf of the other universities, and through failing to recognise the value of the reactor to the program downplays the reactor’s significance (thereby making requests for other funding more difficult) and diminishes the chances of the proposal being successful.

Recommendation:

McMaster should pursue the CFI application, reframing it to recognize the value of the MNR and to explore how an MSI application can best be developed to fund the allocated operating costs and grow the future scope of the McMaster’s neutron scattering and materials science capabilities.

5.4. Nuclear Energy

Extensive interviews were conducted over the course of this study with stakeholders in Canada’s nuclear energy sector. The general view that emerged from these interviews is that there is an emerging need for nuclear engineering capabilities, and that McMaster could leverage this need into leading research and international collaborations.

Context

The emerging need for nuclear engineering capabilities is being driven by four factors:

- Canada’s CANDU fleet is being refurbished and will remain part of Ontario’s electricity infrastructure until the 2060s.
- SMRs have been attracting growing interest. Canada and nuclear sector stakeholders developed an SMR roadmap for Canada, with much interest and activity taking place to advance this vision. SMRs are also being supported by the U.S. as their value in the future energy supply is becoming more and more recognized. The U.S. DOE has been providing funding for new nuclear R&D, including $98 million for over a dozen projects between April and November 2018.
- Canada’s largest nuclear research reactor, the NRU was permanently shutdown in 2018.
- There is a general view that nuclear-related HQPs are in short supply, and there are no focused nuclear reactor design curricula in Canada.

Interviews have confirmed a general recognition that the MNR is a unique asset for Canadian research and should be better leveraged. Due to the nature of the MNR, McMaster has the potential to enhance its academic leadership in nuclear energy research and education.

With its reactor suite of hot cells (CANS), and proposed materials science beam line instruments, the NO&F at McMaster is a unique facility with capabilities that are both rare in North America and particularly suited to R&D in the nuclear power sector. The CANS CFI award was premised on the notion of transforming Canada and McMaster into a research and knowledge leader in the emerging nuclear technology space. The proposed neutron scattering CFI would bring several beneficial materials science capabilities that are desired by the nuclear sector, both domestically and internationally.
Many stakeholders within Canada’s nuclear energy sector have existing or potential relationships with McMaster as shown in Figure 26.

Many of these stakeholders have shown interest in enhancing the research capabilities around nuclear power, and have begun several initiatives to that effect:

- The utilities, through COG and under the leadership of Bruce Power, commissioned an assessment of opportunities to enhance the effectiveness of university/industry collaborations and evaluated several research center models. These included the notion of a national collaborative institute unique to Canada. McMaster participated in this study. After this COG study, Bruce Power initiated the Nuclear Innovation Institute (NII) and UNENE and CNL volunteered to explore the concept further. While their next steps are not clear, the grounds for a dialog may exist.

- UNENE wishes to create an education and research capability in nuclear design and engineering that embraces the capabilities across Canada.

- Bruce Power’s NII initiative includes advancing nuclear energy development in areas of interest to Bruce Power and is seeking McMaster’s participation.

- Idaho National Laboratory (INL) in the U.S. has a National Science User facility (NSUF) program and sees merit in having access to the unique suite of McMaster’s capabilities to help augment the infrastructure available and mitigate the degree to which the program is subscribed by users.
Market Study for McMaster’s Nuclear Operations and Facilities

There are many industry partners that may offer financial support to McMaster to support the growth of its nuclear energy research capability:

- McMaster has already had research chairs and CRDs sponsored by COG and the utilities, not only through UNENE but also directly with industry.
- Kinectrics is in discussion with McMaster over the use of CANS.
- CNL is courting the SMR community to bring a demonstration unit to Canada.
  - While CNL has substantial capability to support the SMR developers directly, McMaster is well equipped to provide university level facilities for research topics appropriate to university led research chairs.
  - A relationship with CNL may lead to research chairs and facilitate additional research access to that facility. Note that CNL nurtures academic relationships and their use of its assets.
- The involvement of McMaster in Bruce Power’s NII and collaboration with CNL could very well lead to new research chairs.

The federal government may also have interests in supporting McMaster in the creation of a research institute through NRCan, AECL, and the CNSC:

- All recognize the value of McMaster as a Canadian capability and may offer policy support, if not financial support.
  - The CNSC relies on the operators to ensure they have adequate access to facilities, but it does see a role for academia and is involved in sponsoring university led research.
  - AECL looks to CNL to cost effectively meet the objectives of the federal nuclear S&T program.
  - NRCan is very interested in the benefits to Canada of a domestic SMR development program, not a small component of which is the involvement of Canada’s universities.
- Supporting international collaborations such as with the INL is an objective of AECL and NRCan.
- The value of CNL as a research partner was emphasized earlier in this report.

Recommendation:

- Develop a strategy to approach NRCan, AECL, and CNL to discuss how McMaster’s nuclear research capability can support their objectives, including relationships with INL and the interests of CNSC, and the potential for this support to attract funding.
- Explore with UNENE how McMaster can center the objective for a Canada-wide nuclear engineering and design curriculum.
- Follow up with Bruce Power on the role for McMaster within its NII.
5.5. McMaster as a National Research Facility

The research opportunities discussed above establish that the underpinnings provided by the MNR endow McMaster with the potential to be placed at the apex of university research in three fields:

- Radiopharmaceuticals and Life Sciences, leveraging McMaster’s endowment of Health Research excellence;
- Materials Science and Beam Lines, leveraging McMaster’s Brockhouse Institute legacy; and
- Nuclear Energy, leveraging McMaster’s participation with UNENE, IRCs in nuclear safety and the CANS facilities.

With the combination of these three leadership opportunities centered around the common capabilities of the MNR, McMaster could propose forming a national research institute. Several factors suggest that the MNR could be successful as such a recognized national asset:

- TRIUMF has a similar triad or research objectives in physics, astronomy and life sciences that form the basis for its status.
- McMaster has and is establishing Multi-university collaborations around its assets.
  - Both the CANS CFI application and the current neutron scattering CFI application, if effectively compiled, establish the degree to which McMaster’s assets are leveraged and supported by Canada’s universities.
- Its anticipated capabilities provide the basis for extensive international collaborations, including with the two preeminent user research facilities in the U.S.
  - The neutron scattering CFI applications established the premise for collaborations with LLA of France and the U.S. DOE ORNL.
  - The nuclear energy agenda could provide a basis for international collaborations with the U.S. DOE and INL.
- McMaster’s commercial activities with the MNR offset the costs for researchers.
  - One of the important government criteria in awarding MSI funding is the attraction of commercial revenues to offset the costs of science infrastructure.
  - McMaster’s track record of having commercial revenues covering the MNR’s costs far exceeds that of Canada’s other two national research centres, TRIUMF and the Canadian Light Source (CLS). TRIUMF and CLS commercial revenues are less than 2% of their costs.

By implementing a full cost allocation to each area, all commercial users will pay their fair share of the costs, minimizing the costs to be supported for research purposes. Seeking national research institute status would enable McMaster to apply for comprehensive MSI funding for the research activities that make use of the NO&F assets. Stable MSI funding could cover such items as the $2 million/year for research use of the MNR beam lines. This appropriate cost support would reduce McMaster’s burden of supporting the MNR’s use by other institutions, both domestic and international. This additional funding
would in turn mitigate some of the commercial risks of committing to a 24x5 operation. With a wellconstructed MSI governance model, McMaster could protect the retained value of its own MNR leveraged IP.

Recommendation:

McMaster should explore the potential benefits and implications of establishing the MNR as the centre of a national research institute.

5.6. Bruce Power – An Important Collaboration Relationship

Bruce Power is actively involved in programs to demonstrate the broader value of the operation of nuclear power plants and to increase the value that it adds to its stakeholder communities. Three of its initiatives may directly impact McMaster University and the NO&F. These are:

- The creation of NII;
- The announcement that they will be configuring their reactors for the irradiation of targets for radioisotope production, and will be working to support Kinectrics in setting up a radiopharmaceutical production and distribution company; and
- The creation of the Canadian Nuclear Isotope Council (CNIC).

Through private discussions, Bruce Power has indicated an interest in supporting research at McMaster, possibly through the creation of research chairs. They have recently contributed $1 million to support a chair at Laurentian University to study the sustainability of power production at resource extraction sites. McMaster has research being undertaken in relevant fields, and is also one of the closest tier 1 universities to the Bruce Power facility.

The NII will be a community hub centred in Kincardine near Bruce Power’s plant that will promote collaboration and continuous learning, encourage active enquiry and research, and foster creative and dynamic ideas. It will bring together industry and municipal leaders to use their collective expertise and knowledge to identify opportunities to advance new technologies and applications. Funding for this research will come from multiple sources and could include matched government funds through academia.

The centre is presently virtual, as it establishes the necessary relationships and practices to support its operation, but will include five hubs: a centre for environmental and global warming, a centre for excellence in operational efficiencies, a centre for artificial intelligence and digital technology, a centre for health and medical isotopes and a centre for advancing future technologies. McMaster is expected to be an academic research partner in the centre for environmental and global warming, while both CPDC and NO&F could be significant partners in the centre for health and medical isotopes. The institute will also host a talent development and training coordination hub that will include a centre for enhanced education.

Bruce Power has recognized that the production of medical isotopes is a vital role for the nuclear industry, and has broader support than nuclear energy generation itself. They are therefore seeking to optimize their role in production. Configuring all eight of the Bruce Power reactors for target irradiations
would create an unprecedented increase in neutron availability for isotope production and would provide its partner, Kinectrics, with a substantial and reliable resource to produce raw materials for radiopharmaceutical production. Lutetium-177 is one of the initial target isotopes. However, setting up production requires the development of production methods and cGMP facilities, skills held by NO&F and CPDC respectively. The joint venture between CPDC and NO&F, also setting up production of Lutetium-177, may however be considered to be a competition to the Bruce Power/Kinectrics initiative.

CNIC is an independent organization that has been convened by Bruce Power for the express purpose of advocating for Canada’s role in the production of the world’s supply of radioisotopes. It consists of representatives from various levels within the Canadian health sector, nuclear industry and research bodies, and includes McMaster University. The mission of CNIC is aligned with the possibility of McMaster becoming a research hub for all aspects of radiopharmaceutical research. The creation of such a hub would support the missions of both CNIC and the NII.

Recommendation:

McMaster should initiate senior-level discussions with Bruce Power to form a strategic partnership. There is considerable overlap between Bruce Power’s objectives and those of McMaster. The development of a strategic relationship would enable the pursuit of mutual benefits for McMaster that could include:

- The potential for financial support of a centre for radiopharmaceutical research at the University or at least for support of that research; and
- The opportunity to become involved, as academic research partner, in the running of the research and training missions of the NII.

5.7. Summary of Strategic Opportunities

Leveraging the capabilities of the MNR fits with McMaster’s vision and reputation as a research-focused university. Building on the MNR-enabled opportunities could position McMaster as a leader in three areas of academic research.

- **Radiopharmaceuticals developed in the MNR coupled with McMaster’s Health Sciences leadership** offer a unique combination that, if effectively leveraged, can position McMaster as a global leader in reactor-based radiopharmaceutical research.

- **The neutron beam ports to be added to the MNR** will be a critical research infrastructure for supporting materials science research for all universities in Canada.

- **Combined with the MNR**, McMaster’s CANS facilities, well-established nuclear engineering heritage, and hosting of UNENE15 places the University at the centre of nuclear research and education in Canada.

---

15 UNENE is sponsored by Canada’s nuclear power sector.
The MNR has value as a national MSI asset. Through the above-mentioned three important research areas, the MNR supports multiple universities in different research fields that all leverage its highly valued infrastructure. Combining the prestige in these areas could elevate McMaster to a national research facility similar to TRIUMF and the CLS. The breadth of users is as expansive as TRIUMF and CLS. McMaster should not be expected to be the sole bearer of the costs to support this facility.

Important industry and government partners may support the academic research. Bruce Power is investing in the N II and is seeking McMaster’s participation for both radio-pharmaceuticals and nuclear energy. NRCan is looking to secure Canada’s role in SMRs and CNL sees academic research capabilities as a pillar. These organizations may be sources of both infrastructure funding and IRCs and CRD grants.
6. Governance Options and Considerations

This section considers how the NO&F governance structures can be modified to best meet the emerging commercial, research and new venture opportunities discussed thus far. It presents several possible governance models, and assesses how they balance research and commercial priorities, with an emphasis on research agenda leadership. This section also examines how McMaster might model the governance structure for a national research facility, based on the existing governance models of TRIUMF and the CLS.

6.1. Background

While the current governance structure of the NO&F has been meeting the current objectives of the VPR, the potential growth in commercial, research, and new venture opportunities warrants an examination of governance to ensure it evolves in concert with McMaster’s goals and enables the desired growth in the research mission.

In Section 4, recommendations were made to restructure how the costs of NO&F operations were viewed from a cost allocation perspective. No direct implications on governance arose from these cost accounting policy recommendations. To best balance the priorities of research against commercial use of the NO&F, three factors are considered:

1. An operating business model structure that reflects research and commercial priorities
2. Research agenda leadership that maximizes the academic leverage of the NO&F
3. National research user facility governance (should McMaster choose to explore this option)

6.2. Operating Business Model Structures

The initial impetus for moving to 24x5 operation was motivated by the anticipation of significant commercial potential from the MNR. This perspective raises the question, “does McMaster want to look at the MNR as a commercial or research asset?” To explore this question, several operating business model structures were evaluated, on a spectrum that ranges from whether the structures would yield a greater research priority or a greater commercial priority. The following four structures are evaluated, as shown in Table 9:

1. Disaggregate the NO&F into operational areas that are independently managed
2. Maintain the same business model as today
3. Give the MNR to a spin-off business that is owned by McMaster but managed separately
4. Sell or lease the MNR to a commercial operator
In the current Status Quo structure whereby the NO&F reports to the VPR, the commercial and research priorities are balanced in an ad-hoc manner. This arrangement works relatively well, as discussed previously. Changing the NO&F operating business model structure by spinning it off or selling to a commercial operator could monetize the commercial potential with less risk to McMaster, but this would entail losing flexibility in managing the research agenda as the commercial interest would prioritize returns over research activity. Conversely, to disaggregate the NO&F was deemed to be unacceptably less effective at achieving a commercial benefit.

The consensus in the steering committee discussions was that the status quo model of retaining the MNR within the governance of the University as a centralized facility remains the preferred solution to balancing the research and commercial objectives. Changes to the structure did not warrant much further exploration.

6.3. Research Agenda Leadership

Changing the MNR’s operating profile to 24x5 will increase the availability of the MNR’s capabilities, notionally for commercial reasons. However, with the increase in operations, the University has an opportunity to augment the research leverage of the facility as well. The governance structures were evaluated against their ability to encourage this.

Three options for McMaster’s research governance were assessed along a scale that varies from an entrepreneurial approach to a more structured approach to research agenda setting. These three options are shown in Table 10.
Table 10 Research Agenda Setting Structure Options

<table>
<thead>
<tr>
<th>Decision Structure</th>
<th>Status Quo – Governance Unaltered</th>
<th>Focus on Research – Create Academic Lead(s)</th>
<th>University Board with Research Representation</th>
</tr>
</thead>
</table>
| **Description**    | • Access decisions rest with single party who responds to demands from both commercial and research users  
• It is currently working  
• Researchers individually determine their research direction and request use of facility  
• NO&F manager accountable to VPR for balancing the commercial and research objectives  
| • Accountability for advancing research agenda will be assigned to academic leads(s)  
• May allow directly attracting of research funding by creating a leader to go out and get it  
• Operational access is managed by NO&F  
| • Elevates balancing of commercial vs. research objectives to higher body  
• Decision making would further emphasize greater research use of asset  
• Research community feels enabled |
| **Entrepreneurial Research Priority** | **Structured Research Priority** |

**Status Quo – Governance unaltered**

Currently, the NO&F Manager is accountable to the VPR to achieve a balance between commercial activities and research use of the NO&F with the objective of minimizing the cost of research. The NO&F supports the scheduling of the use of the facility, but some aspects are scheduled by the researchers’ organizations themselves (e.g. access to the MAD instrument) where there are no commercial users. The system is currently working in that research needs have been accommodated to date.

Researchers individually determine their research direction and request use of the facility. As a result, there is no established governance framework for encouraging leadership direction to enhance the research program in any particular area. It is a very entrepreneurial system reliant on the creativity and drive of individual researchers. The steering committee expressed concern that this approach will not achieve the maximum research potential being envisioned for the facility.

**Focus on Research – Create Academic Lead(s)**

This governance model has the University assigning one or more academic leads that would be accountable for advancing the research agenda in their fields of influence. Academic leads could better align research priorities in their fields with the University mission and be accountable for an outward looking role to pursue research funding opportunities through other avenues. However, they would need to have a background in a number of disciplines so that they fully appreciate the range of research opportunities, enable the most efficient research outcomes, and be effective at overseeing which research to support. A peer review process would likely be required to support each academic lead.
The NO&F manager would still be accountable, under a management structure similar to today, for managing MNR access and balancing between the commercial and research objectives of the VPR.

Steering committee discussions suggested that while there are a few identifiable leaders today, selecting these leads alone may not fully enable the possible research potential of the MNR.

University Board with Research Representation

A more formal governance structure could involve the formation of a board that oversees the long to medium term capture of value from the NO&F capabilities. Such a board could consist of the VPR, impacted Deans, the NO&F director, and the Vice President of Administration. Together, the board would keep the prioritization setting at the strategic level for the University, guide the research priorities for the future, frame forward looking needs for expansion, and, through the Deans, encourage research activities of the affected faculty accordingly. The Deans may choose to appoint academic leads as appropriate. The role of the VPR, NO&F director, and VP Administration will be to ensure that the commercialization benefits are achieved along with the research objectives.

The NO&F manager would still be accountable to managing facility usage balancing between the commercial and research objectives of the board while still being operationally accountable to the VPR.

The advantages of this approach include providing visibility for the University on the importance this strategic asset has to the University’s vision and, through an annual reporting mechanism against goals, the transparency of how both research value and commercial value are being created.

Recommendation:

To take full academic advantage of the MNR, McMaster should convene a governing body to help establish research priorities for the University, especially if they pursue ambitions to become a national research facility.

6.4. National Research Facility Governance

The MNR has the potential to become a national research facility. There are two multi-university research opportunities that could be considered if McMaster wishes to explore this opportunity. Most notable is the role that McMaster can play as the national neutron scattering user facility, as well as the central nuclear university in Canada. The asset that the MNR represents to radiopharmaceuticals will likely have much national interest as well, as indicated by the radiopharmaceutical researchers aligned with TRIUMF and CLS.

The governance structures for TRIUMF and the CLS may serve as models, as both are Canadian national research facilities funded through the CFI. Figure 27 compares the governance structures of each organization. There are two important features:

Research agenda
Both institutions have committees to advise on the research agenda. These committees use peer reviewed processes to award access priorities to researchers based on proposed experiments. TRIUMF has three such committees, one for each of its specializations. CLS has only one such committee. Given the diversity of McMaster’s potential three research areas, the TRIUMF model may be more appropriate.

**Board structure**

Both TRIUMF and CLS have an external board of directors that is made up of researchers from several academic and private institutions. This allows a broad range of opinions and stakeholders to take part in the decision-making process, leading to more informed choices and efficient operation. TRIUMF’s board is made up of representatives from the involved universities, making them the top decision makers for the organization.

CLS’s board is more diverse than TRIUMF’s. The board includes two directors that are executives from the University of Saskatchewan, the VPR and the VP of Finance and Resources. Three other universities are represented by professors. The board also includes several industry members and the Chief Operating Officer of Innovations Saskatchewan, a provincial government agency which has representatives from the University of Saskatchewan on the board. The University of Saskatchewan has a significant amount of influence over the mandate and mission of the CLS.

If McMaster wishes to seek national research facility status, it should determine whether it prefers the type of influence that the CLS model provides or the type of multi-university involvement that TRIUMF provides.

**Figure 27 TRIUMF and CLS Organizational Structures**

Note: TRIUMF research setting is done through three Experimental Evaluations Committees specializing in a specific field. CLS research setting and beam time utilization process is done by a Scientific Advisory Committee.

Given that McMaster can leverage its significant historical investment in the MNR infrastructure and in its own IP in its new ventures, the value of maintaining influence over the overall mandate suggests that that CLS governance structure may have appeal.
McMaster should consider the TRIUMF approach for experimental committees to prioritize the research activities that access the MNR. In all cases, McMaster should ensure that a full costing approach for the NO&F is deployed to clearly segregate user costs from the value of university-created innovations.

6.5. Summary of Governance Implications
The findings of this section point to three themes

- **Managing the NO&F.** Operationally, the University is best served to retain the NO&F operating structure as it is currently, under the direction of the VPR.

- **The research mission would benefit from an Academic Priorities Review Board.** The potential for leveraging the MNR research benefits across McMaster’s faculty warrants attention to how the research and commercialization agenda is developed, and how access to the facility is managed. A senior governance body could address the perceived gap by reflecting the University’s ambitions for the facility, establishing research priorities for the University, and ensuring the maximum research potential is realized. The NO&F team, as part of the office of the VPR, would continue to be an essential part of that structure to ensure operational and commercial considerations are included in the decision-making process.

- **Governing the MNR as a National Research Facility.** With the recognition of McMaster as a multi-university national research asset, additional governance challenges my present themselves, the most significant of which is ensuring that McMaster retains ultimate control over how the NO&F is leveraged. As such, the governance structure of the CLS may provide some guidance since it engages the nationwide research community in its research setting agenda, but provides the host university a greater influence over the activities conducted. McMaster would require a governance structure to ensure that it can best leverage its significant historical investment in the MNR infrastructure and in its own IP. In support of that segregation of value, the full costing approach described above could be used to clearly segregate user costs from the value of university-created innovations.
7. Recommendations and Next Steps

The findings of this study show that McMaster has an unprecedented opportunity to establish research leadership in this country in three significant areas. The radiopharmaceutical opportunity is significant, the neutron scattering capability will be world leading, and nuclear power research is moving to the forefront of climate action. The commercial spinoff value in radiopharmaceuticals and potential academic partnerships will cover the costs and provide substantial returns to McMaster for its IP. McMaster should explore further the potential opportunities and benefits described above and develop a strategy to build on the MNR asset.

To further develop any McMaster ambitions in these areas and establish the basis for a strategy, seven recommendations are provided.

- **Explore a McMaster radiopharmaceutical research centre.** The potential synergies between the MNR and McMaster’s Health Sciences specialization warrants the development of a vision and strategic plan.

- **Initiate a strategic plan for staging growth.** McMaster should set its ambitions for leading-edge research in materials science, radiopharmaceuticals, and nuclear energy and consider and develop a vision for how the University can leverage the value of the MNR. With that vision, it should develop a roadmap to success that includes whether or not to become a national research institute based on either the TRIUMF or CLS model. This roadmap may warrant a communication plan to address how the value of the MNR may currently be unrecognized by the University administration, the University’s researchers, the Canadian nuclear industry and/or the nation.

- **Develop the operational plans to proceed to 24x5 and high flux operations.** Confirm costs, expected revenues, cash flows, risks and, most importantly, decision gates. Develop the human resource plan for the additional shift and defer 24x7 planning until further validation is performed. McMaster can validate its opportunities in a staged progression before committing to the higher cost 24x5 5 MW and/or 24x7 operations.

- **Develop isotope capabilities to enable capture of the potential revenue.** Pursue Holmium production opportunities to set a schedule for going 24x5. Develop the Lutetium options with McMaster’s partners to set a schedule for operating 24x5 with high flux. Finalize the terms with the CPDC, which may depend on how McMaster presents a collaborative market facing approach for the NO&F and the CPDC vis-a-vis Bruce Power.

- **Discuss collaborations with Bruce Power.** Bruce Power sees potential roles for McMaster in its radiopharmaceutical commercial vision, the CNIC, and the NII. McMaster must resolve the approach to the Lutetium opportunity with respect to the CPDC vs. Bruce Power/Kinectrics roles. This relationship is pivotal to McMaster’s future decisions and may be an enabling transition to national research facility status.

- **Reframe the Neutron Scattering CFI application.** McMaster should reframe the neutron-scattering CFI application by emphasizing the contribution from the reactor and the need for operating funds, which will be necessary to mitigate McMaster’s risk of carrying the costs. Doing so would ensure
Market Study for McMaster’s Nuclear Operations and Facilities

that the role of the MNR is recognized within the application and lay the foundation for a future MSI application should the university decide this is important.

• **Develop a Federal engagement strategy.** Discussions with NRCan, AECL, and/or CNL around partnerships for nuclear research are warranted and may lead to both infrastructure and collaborative research funding.
Appendix A – List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>Advanced Accelerator Concepts</td>
</tr>
<tr>
<td>AECL</td>
<td>Atomic Energy Canada Limited</td>
</tr>
<tr>
<td>CANDU</td>
<td>Canada Deuterium Uranium</td>
</tr>
<tr>
<td>CANS</td>
<td>Centre for Advanced Nuclear Systems</td>
</tr>
<tr>
<td>cGMF</td>
<td>current Good Manufacturing Practice</td>
</tr>
<tr>
<td>CLS</td>
<td>Canadian Light Source</td>
</tr>
<tr>
<td>CNBC</td>
<td>Canadian Neutron Beam Centre</td>
</tr>
<tr>
<td>CNL</td>
<td>Canadian Nuclear Laboratories</td>
</tr>
<tr>
<td>CNIC</td>
<td>Canadian Nuclear Isotope Council</td>
</tr>
<tr>
<td>COG</td>
<td>CANDU Owners Group</td>
</tr>
<tr>
<td>CFI</td>
<td>Canada Foundation for Innovation</td>
</tr>
<tr>
<td>CPDC</td>
<td>Centre for Probe Development</td>
</tr>
<tr>
<td>CRD</td>
<td>Collaborative R&amp;D</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Employee</td>
</tr>
<tr>
<td>HLLF</td>
<td>High Level Laboratory Facility</td>
</tr>
<tr>
<td>HQP</td>
<td>Highly Qualified Professional</td>
</tr>
<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td>INL</td>
<td>Idaho National Laboratory</td>
</tr>
<tr>
<td>IRC</td>
<td>Industrial Research Chair</td>
</tr>
<tr>
<td>IP</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>MAD</td>
<td>McMaster Alignment Diffractometer</td>
</tr>
<tr>
<td>MAL</td>
<td>McMaster Accelerator Laboratory</td>
</tr>
<tr>
<td>MIPBF</td>
<td>McMaster Intense Positron Beam Facility</td>
</tr>
<tr>
<td>MIT</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>MNR</td>
<td>McMaster Nuclear Reactor</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>MSI</td>
<td>Major Science Infrastructure</td>
</tr>
<tr>
<td>MUCF</td>
<td>McMaster University Cyclotron Facility</td>
</tr>
<tr>
<td>MURR</td>
<td>University of Missouri Research Reactor</td>
</tr>
<tr>
<td>NAA</td>
<td>Neutron Activation Analysis</td>
</tr>
<tr>
<td>NII</td>
<td>Nuclear Innovation Institute</td>
</tr>
<tr>
<td>NO&amp;F</td>
<td>Nuclear Operations and Facilities</td>
</tr>
<tr>
<td>NRB</td>
<td>Nuclear Reactor Building</td>
</tr>
<tr>
<td>NRCan</td>
<td>Natural Resources Canada</td>
</tr>
<tr>
<td>NRU</td>
<td>National Research Universal</td>
</tr>
<tr>
<td>NSUF</td>
<td>Nuclear Science User Facility</td>
</tr>
<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
</tr>
<tr>
<td>OSU</td>
<td>Oregon State University</td>
</tr>
<tr>
<td>PI</td>
<td>Principal Investigator</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
</tbody>
</table>
Market Study for McMaster’s Nuclear Operations and Facilities

SANS – Small Angle Neutron Scattering
SEM – Scanning Electron Microscope
SNS – Spallation Neutron Source
SMR – Small Modular Reactor
S&T – Science and Technology
TAT – Targeted Alpha-particle Therapy
TU Delft – Technical University in Delft
UC Davis – University of California Davis
UNENE – University Network of Excellence in Nuclear Engineering
VPR – Vice President of Research
Appendix B - References


Dow Wilson, Varian. Acquisition of SIRTeX. 2018


IAEA. The Applications of Research Reactors. 1999

IAEA. Neutron Transmutation Doping of Silicon at Research Reactors. 2012

ITG. Quote for Lutetium. 2013


McMaster Nuclear Reactor MSI 2015 NOI

McMaster University. Budget Model Drivers.

McMaster University. 2018/19 Consolidate Budget. 2018

McMaster University. CANS Facility and Equipment.


McMaster University. MNR Interim Costing Document.

McMaster University. Nuclear Operations: Reactor Business Plan Overview. 2018


McMaster University. Nuclear Reactor Building Floor Plan.

McMaster University. Neutron and Gamma Irradiation Capabilities

McMaster University. Operating Occupancy Rates Breakdown March 2019.

McMaster University. NO&F Organization Chart and employed personnel statistics.

McMaster University. Planning Financials for the MNR Interim Costing Document.

McMaster University. Project Execution Plan: Centre for Advanced Nuclear Systems. 2010

McMaster University. Reactor Visitor Log Book. 2018

McMaster University. Space Inventory 2018-2019 NRB TA Reactor.

MIT. Report of the Committee on the Future of the MIT Nuclear Reactor Laboratory. 2015
MURR. Consider a MURR Collaboration.

Nuclear Reactor Commercial Fee Schedule. 2018


Oregon State University. Retrieved from: https://oregonstate.edu/

Oregon State University. Radiation Center Strategic Plan 2012

Perkin Elmer. Quote for Lutetium. 2014


TRIUMF. Summary Financial Statements. 2018


University of California, Davis: Retrieved from: https://www.ucdavis.edu/

University of Missouri. Retrieved from: https://missouri.edu/

Zhuikov, B.L. Production of Medical Radionuclides in Russia: Status and Future – a review. Journal of Applied Radiation and Isotopes. 2013

World Nuclear News. Shine to use 'novel' method for Lutetium production. 2019

IsoSolutions. Marketability of Iodine -125. 2017

Varian. Acquisition of SIRTeX. 2018

Fierce Biotech. BTG PLC Proposed Acquisition of Therasphere. 2013