

UTQAP Cyclical Review: Final Assessment Report and Implementation Plan

1. Review Summary

Programs Reviewed:	Geology, HBSc: Specialist Environmental Geosciences, HBSc: Specialist Geophysics, HBSc: Specialist Geoscience, HBSc: Major, Minor Earth and Environmental Systems: HBSc: Major Earth Sciences: MSc, MAsc, PhD
Unit Reviewed:	Department of Earth Sciences
Commissioning Officer:	Dean, Faculty of Arts & Science
Reviewers (Name, Affiliation):	<ul style="list-style-type: none">• Professor Stephen Johnston, Department of Earth & Atmospheric Science, University of Alberta• Professor Rebecca Lange, Department of Earth and Environmental Sciences, University of Michigan• Professor Victoria Remenda, Department of Geological Sciences and Geological Engineering, Queen's University
Date of Review Visit:	April 21-22, 2021 (conducted remotely)
Date Reported to AP&P:	February 16, 2023

Previous UTQAP Review

Date: February 7, 2013

Summary of Findings and Recommendations

Significant Program Strengths

- Leading programs with broad research strengths
- Strong student satisfaction and positive faculty morale
- Numerous student research opportunities and notable accomplishments of graduates
- Excellent outreach to external stakeholders, resulting in successful fundraising and development of valuable relationships

Opportunities for Program Enhancement

- Addressing undergraduate curriculum and program delivery challenges, including expanding senior undergraduate course offerings
- Reducing doctoral time-to-completion and increasing enrolment
- Increasing international student enrolment by removing barriers
- Increasing transparency of decision-making processes
- Strengthening relationships with cognate units
- Examining plans for the Jack Satterly Geochronology Laboratory (JSGL)
- Further developing scholarship and research in Geophysics and other areas
- Reviewing the departmental workload policy, faculty teaching loads and research productivity

Current Review: Documentation and Consultation

Documentation Provided to Reviewers

Terms of reference; Self-study & Appendices; Previous review report including the administrative response; Access to all course descriptions; Access to the *curricula vitae* of faculty.

Consultation Process

Dean, Faculty of Arts & Science, Vice-Dean, Academic Planning, and Associate Dean, Unit-Level Reviews; Department Chair; Associate Chair Undergraduate; Associate Chair Graduate; Administrative & Technical Staff; Post-doctoral Fellows and Research Assistants; Undergraduate Students; Graduate Students; Senior and Junior Faculty; Chairs of Cognate Units: Chemistry, Geography & Planning, Near & Middle Eastern Civilizations, Civil Engineering, Anthropology, Physics, Chemical & Physical Sciences.

Current Review: Findings and Recommendations

1. Undergraduate Program(s)

Unless otherwise noted, all bulleted comments apply to all programs reviewed.

The reviewers observed the following **strengths**:

- Objectives
 - ▶ Graduates are prepared for a variety of career paths; some programs provide the knowledge requirements for professional registration with the Association of Professional Geoscientist Ontario
- Admissions requirements
 - ▶ Admission requirements are appropriate and clearly stated
- Curriculum and program delivery
 - ▶ Commendable commitment to excellent and varied opportunities for field learning
 - ▶ Intentional curriculum design in each undergraduate program builds skills and knowledge through successive years of study
 - ▶ Course delivery methods are consistent with practice in the Geosciences and include a mix of lectures, labs, and field work
 - ▶ Recent improvements to equipment and conditions for microscope work will enhance the learning environment
 - ▶ Flipped classroom teaching used to good effect, particularly under the conditions created by the pandemic
 - ▶ Faculty apply for and receive funding for teaching enhancements, indicating a departmental climate of support for improving student learning
- Accessibility and diversity
 - ▶ Recent program modifications intended to attract students from diverse backgrounds and interests
- Assessment of learning
 - ▶ Assessment strategies are appropriate for programs in the earth sciences
- Student engagement, experience and program support services
 - ▶ Program requirements are clearly communicated to students
 - ▶ Outstanding opportunities for subsidized international field trips are greatly valued by students
 - ▶ International field trips for second-year students build students' knowledge and interest in Earth Sciences, and support a sense of community among students and within the department
 - ▶ Students commented that they have many opportunities for meaningful interactions with faculty
 - ▶ Departmental workshops on mental health, unconscious bias, accessibility and sexual harassment indicate a climate conducive to improving the student experience
 - ▶ Undergraduate Club supports a tight community of students

- Quality indicators – undergraduate students
 - ▶ Rates of student participation in High Impact Practices (HIP) exceed that of comparator institutions and programs, indicating departmental commitment to incorporating HIP into programs
 - ▶ Student course evaluations are positive, with ratings increasing as students progress from introductory to advanced courses
 - ▶ Student satisfaction survey results indicate that most senior students rated their experiences as good or excellent
 - ▶ Reviewers note that students’ final year GPAs have remained consistent and that there has been little to no grade inflation
- Quality indicators – alumni
 - ▶ Very high graduate employment indicates the strengths of the curriculum, instruction and students
- Quality indicators – faculty
 - ▶ Commendable commitment to undergraduate teaching among faculty, with five faculty members indicating Geoscience Pedagogy as an area of focus
- Student funding
 - ▶ Department prioritizes field learning in fundraising activities
 - ▶ Financial support for field learning enables all students to participate

The reviewers identified the following **areas of concern**:

- Objectives
 - ▶ Reviewers note that the lack of distinct program-level learning outcomes and course-specific learning outcomes is not considered best practice
 - ▶ Reviewers note that the undergraduate program curriculum maps do not provide information about how learning levels are assigned to courses
- Curriculum and program delivery
 - ▶ Requirement that students take biology, chemistry, math and physics in their first year is “problematic and clearly disadvantages other programs that are not represented in these offerings”
 - ▶ Students indicated that they would like more 4th year courses to select from, particularly a course focusing on ethics and environmental issues in Canadian mining
 - ▶ Students commented that course offerings were overly concentrated on “hard-rock” topics, with far fewer available for students with a focus on surficial processes, including Earth’s climate through time
 - ▶ Students expressed concern that core courses do not introduce enough quantitative applications in lab exercises
- Quality indicators – undergraduate students
 - ▶ Reviewers note that final year GPAs for ES students are lower than they would have expected, particularly in light of students’ greater opportunities to engage with High Impact Practices

The reviewers made the following **recommendations**:

- Objectives
 - ▶ Reviewers recommend seeking assistance with development of learning outcomes
 - ▶ Learning outcomes should be written at the three levels of learning (Introductory, Developed and Advanced) with appropriate verbs and descriptors to make clear what the level of learning implies
 - ▶ Complete full curriculum maps for each program illustrating the overall progression of learning
- Curriculum and program delivery
 - ▶ Revisit requirement for first year students to take introductory science courses at the expense of courses such as physical geography and earth sciences
 - ▶ Consider offering topics-based courses, e.g., “Topics in Geochemistry” or “Topics in Ethics in the Earth Sciences” that can change focus with the instructor
 - ▶ Students would like to gain more experience with MATLAB, Python, etc. in upper-level courses to better prepare them for postgraduate work or employment in industry
 - ▶ Engage in discussions with earth science programs at other universities to develop joint courses
 - ▶ Investigate indigeneity within program curricula
 - ▶ Consider incorporating more opportunities for “flipped classroom” instruction
- Student engagement, experience and program support services
 - ▶ Considering “check sheets” listing courses and options to assist students in managing their programs
 - ▶ Continue supporting undergraduate student field trips
 - ▶ Explore opportunities for outreach (e.g., hosting high school teacher workshops) to raise the profile of earth sciences and geology programs

2. Graduate Program(s)

Unless otherwise noted, all bulleted comments apply to all programs reviewed.

The reviewers observed the following **strengths**:

- Overall quality
 - ▶ Department’s consistently excellent international standing is an excellent proxy for the strength of their graduate program
 - ▶ Exceptionally high employability, quality one on one teaching and supervision, experiential learning, and the ability to participate in well-funded field-based research programs are all factors that explain the success of the graduate program
- Admissions requirements
 - ▶ Consistent admission offer rates and enrolments over time indicate that admission requirements for the MSc and PhD program are appropriate
- Student engagement, experience and program support services
 - ▶ Graduate students expressed an overall high satisfaction with their advisors and their overall relationship with faculty

- ▶ Graduate students have a strong and highly active student organization
- Quality indicators – graduate students
 - ▶ Department attracts excellent and productive graduate students, indicated by number of student-authored publications in high impact refereed journals
 - ▶ Programs attract significant contributions from donors
- Student funding
 - ▶ Students appreciate funding-raising efforts directed at research support

The reviewers identified the following **areas of concern**:

- Admissions requirements
 - ▶ Reviewers attribute the MASc program’s variable admission offer rate (including some years with no offers made) to a number of factors, including low demand and challenges posed by the program’s funding structure
 - ▶ Reviewers comment on the underutilization of the MASc and part-time program options, and note that one or both options might support a more diverse range of students
- Curriculum and program delivery
 - ▶ Students expressed concerns regarding the need for more course offerings on topics that support their research areas
- Student engagement, experience and program support services
 - ▶ Modest/declining rates of student satisfaction seemingly not addressed by steps taken since the previous review to offer courses with broader appeal
 - ▶ Reviewers note lack of connection between faculty and graduate students as a likely cause for declining student satisfaction indicators
 - ▶ Reviewers note student comments regarding unequal treatment of graduate students from the UTM and UTSC campuses, including receiving less financial and technical support, as well as disparities in research lab space available for UTM students
 - ▶ Graduate students voiced a desire for improved communication regarding issues related to the pandemic, including whether teaching requirements will be in-person or remote, and funding extensions due to pandemic-related delays
- Quality indicators – graduate students
 - ▶ Students’ program evaluations have decreased in the past three to five years, with declines in ratings for course content and the learning atmosphere and experience
- Student funding
 - ▶ University funding model limits the number of graduate students that can be admitted into the department each year

The reviewers made the following **recommendations**:

- Admissions requirements
 - ▶ Department is encouraged to better understand who is applying for the MASc program and to determine why it is that this program is underutilized; department

- ▶ may consider closing the MASc program if admission offer rates continue at current levels
 - ▶ Department is encouraged to either determine the reason for the decline in part-time graduate students, or to discontinue the part-time graduate program
- Student engagement, experience and program support services
 - ▶ Reviewers strongly encourage the department to work to remove structural and financial disparities in the treatment of graduate students from the UTM and UTSC campuses
 - ▶ Make clear a policy and method by which graduate students may apply for extensions to their degree program owing to covid-related delays
- Student funding
 - ▶ Consider introducing some flexibility into graduate student funding model to enable departments to take on more graduate students

3. Faculty/Research

The reviewers observed the following **strengths**:

- Overall Quality
 - ▶ Research and teaching activities of ES faculty are “well placed to train the next generation of undergraduate and graduate students in vital skills needed to combat the major challenges related to energy, climate change, and sustainability”
- Research
 - ▶ ES research is of high quality and the department is highly ranked in both Canada and North America
 - ▶ Faculty in several subfields are engaged in research with clear and direct societal relevance
 - ▶ Disciplinary subfields are well represented, with faculty approximately evenly divided between research focused on the Solid Earth vs. Hydrosphere/Biosphere at Earth’s Surface
 - ▶ Departmental laboratories and instruments enable extensive research activities
 - ▶ ES is highly ranked among Canadian and North American institutions in various metrics of grant application success, research productivity, and publications, reflecting the high quality of research being conducted
- Faculty
 - ▶ Newly-added faculty members add strength in experimental geochemistry/petrology and mineral resources
 - ▶ Department has rebuilt key strength in the areas of Geophysics and Petrology/Economic Geology through hires over the past decade
 - ▶ Reviewers project that departmental strengths in Environmental Sciences and Geochemistry/Geophysics will continue to grow
 - ▶ Laudable efforts made by related departments and campuses to build shared strength in Geophysics will foster collaborations across diverse subfields and academic units

- ▶ Junior faculty conveyed a broad, overall satisfaction with the Department, noting that most have found their assigned mentor very helpful

The reviewers identified the following **areas of concern**:

- Research
 - ▶ Reviewers note that the departmental website does not communicate the larger questions driving faculty research, nor does it highlight synergies or collaborations between faculty members
- Faculty
 - ▶ Current faculty complement shows a “skewed pattern between faculty career stage and broad area of research” with younger faculty members focused on Solid Earth topics and most mid-to-late career colleagues working on the Hydrosphere/Biosphere at Earth’s Surface
 - ▶ Faculty expressed concern that there may be a developing bifurcation among the faculty based on area of expertise (between solid earth and surficial processes)
 - ▶ Junior faculty raised concerns regarding the impacts of the pandemic on their teaching, and uncertainty in how their teaching is evaluated for promotion; they expressed concern that their teaching assignments sometimes include courses that they will only teach once prior to tenure
 - ▶ Faculty colleagues at UTM and UTSC raised concerns about the lack of suitable workspace for them on the St. George campus, despite needing to be there for seminars, meetings, and thesis defenses
 - ▶ UTM and UTSC faculty do not have access to the same resources and facilities as faculty on the St George campus, which hinders research collaboration across the combined tri-campus graduate program
 - ▶ Limit to the number of international graduate student admits “induces an unhealthy competition for access to this pool of graduate students”

The reviewers made the following **recommendations**:

- Research
 - ▶ Begin discussions about long-term planning of departmental research directions
 - ▶ Update the ES website to accurately reflect the lists of departmental faculty members, better describe larger questions driving the research being conducted within the various subfields, and describe the synergies and collaborations between faculty/subfields/cognate units
- Faculty
 - ▶ Begin discussions and develop a long-term faculty hiring plan well ahead of retirements, irrespective of enrolments
 - ▶ Provide clear feedback to junior faculty on teaching evaluations, and how such evaluations are used in the pre-tenure period
 - ▶ Avoid assigning courses to junior faculty that will not be re-taught prior to their evaluation for promotion

- ▶ Junior faculty all expressed support for converting one of the department's technician positions into a teaching-support staff member
- ▶ Consider using H-index as a metric of the cumulative impact of an author's scholarly output
- ▶ Encourage faculty members to update their information in Google Scholar to be available for academic peers and prospective graduate students

4. Administration

Note: Issues that are addressed through specific University processes and therefore considered out of scope for UTQAP reviews (e.g., individual Human Resources issues, specific health and safety concerns) are routed to proper University offices to be addressed, and are therefore not included in the Review Summary component of the Final Assessment Report and Implementation Plan.

The reviewers observed the following **strengths**:

- Relationships
 - ▶ Morale and sense of community in the unit has been largely positive over the last decade, in part due to the leadership of the departmental chair
 - ▶ Administrative staff expressed a positive relationship with faculty and students.
 - ▶ The faculty were largely positive in their assessment of morale in the department
 - ▶ Reviewers note optimism that new faculty hires would bring more inclusion, more interdisciplinary collaborations, and support positive relationships in the department
- Organizational and financial structure
 - ▶ Jack Satterly Geochronology Laboratory (JSGL) is central to the success and reputation of the Department of Earth Sciences, with notable achievements developing methods within the discipline and producing high quality research
 - ▶ Recent renovations support the department's research endeavours
- Long-range planning and overall assessment
 - ▶ Department's academic mission is consistent with the mission of the university
 - ▶ Positive steps in departmental EDI initiatives include the addition of a Diversity, Inclusion, and Acceptance Coordinator to the graduate student association, and incorporation of EDI principles in search committees and hiring
- International comparators
 - ▶ Department is consistently ranked at or very near the top of Canadian Earth Science departments on all international rankings, despite its comparatively small number of faculty

The reviewers identified the following **areas of concern**:

- Relationships
 - ▶ Postdoctoral fellows are currently not well integrated into the department; they are commonly not included in departmental mailings, do not receive key departmental

- information directly, and are provided with little or no formal mentoring (outside their own faculty advisor) within the department
- ▶ Staff members expressed concern about receiving last-minute requests from faculty
 - ▶ Technical staff concerns include being seen or treated as the lowest tier of a hierarchy within the Department, with specific concerns regarding the absence of regular meetings with their group and limited communications about key departmental decisions regarding research and teaching
 - ▶ Cognate units expressed concern that the degree of collaboration with ES faculty members “waxes and wanes depending on individual faculty and their career stage”
 - ▶ UTM faculty members expressed concerns that they consistently feel excluded and marginalized; reviewers note this as “an issue that urgently needs to be addressed”
 - Organizational and financial structure
 - ▶ Reviewers note challenges of having one Associate Chair of Graduate Studies serving graduate students across all three campuses; students expressed concern about slow response times, lack of adequate access to the Associate Chair, and failures to comprehend some of the challenges facing Earth Science graduate students
 - ▶ Jack Satterly Geochronology Laboratory operates primarily on 'soft-funding'; reviewers note that this is “a high-risk way to administer a lab that has been key to the success and high ranking” of the department
 - ▶ Limited departmental space for teaching and research
 - Long-range planning and overall assessment
 - ▶ “Significant concerns” that the department is not active in making progress on EDI issues, and unresponsive to initiatives brought forward by graduate students

The reviewers made the following **recommendations**:

- Relationships
 - ▶ Improving efforts to integrate and communicate with key groups critical to the Department’s overall research and teaching mission
 - ▶ Investigate better ways of integrating postdoctoral fellows into the department, including improved communications, a designated faculty point of contact, and invitations for postdocs to give a department-wide seminar on their research during their first year
 - ▶ Investigate the use of annual reports for staff (including technical staff), where they can both receive and provide feedback on their work and the department
 - ▶ Include staff on department-wide emails
 - ▶ Ensure students and faculty from the UTM/UTSC campuses have opportunities to interact and collaborate effectively with those on the St. George campus; “There is an urgent need for a series of meetings devoted to this topic, with all stakeholders allowed to fully communicate their concerns”
 - ▶ Strengthen collaborative interactions and relationships with cognate units
 - ▶ Collaborate with other earth science and geology departments through the CCCESD to undertake outreach to prospective students and to facilitate cooperative course delivery

- Organizational and financial structure
 - ▶ Address the challenge associated with one Chair of Graduate Studies serving the graduate students across the tri-campuses; consider appointing separate faculty members responsible for graduate students on each campus
 - ▶ Consider hosting a “townhall” meeting with all graduate students each semester, to convey key information and field questions
 - ▶ Explore ways to secure funding for the Jack Satterly Geochronology Laboratory, including from the University, a fundraising campaign, or by seeking an industrial donor
 - ▶ Continue fundraising to support the department’s current level of research
- Long-range planning and overall assessment
 - ▶ “It is the view of the external reviewers that the University of Toronto should recognize the extraordinary quality of the faculty and the programs, and ensure they continue to be nurtured.”
 - ▶ Strike an EDI standing committee that reports to the departmental council
 - ▶ Create a departmental EDI committee with representation from all constituents, with responsibilities to include “suggesting plans, structures, and codes of conduct to improve EDI in the classroom, in the field, in research labs, and during recruitment of students and faculty”



2. Administrative Response & Implementation Plan

UNIVERSITY OF TORONTO
FACULTY OF ARTS & SCIENCE

December 15, 2022

Professor Susan McCahan
Vice-Provost, Academic Programs
University of Toronto

Re: UTQAP cyclical review of the Department of Earth Sciences

Dear Prof. McCahan,

Along with the faculty, staff, and students of the Department of Earth Sciences, I am pleased with the external reviewers' assessment of the Department and its undergraduate and graduate programs: Geology (BSc Hons) Specialist; Environmental Geosciences (BSc Hons) Specialist; Geophysics (BSc Hons) Specialist; Geoscience (BSc Hons) Major, Minor; Earth and Environmental Systems (BSc Hons) Major; Earth Sciences: MSc, MASc, PhD. The reviewers noted the Department's high rankings and complimented "the extraordinary quality of the faculty and the programs."

The quality of this program notwithstanding, as per your letter dated August 16, 2022, the review report raises a number of issues and challenges. I am writing to address the areas of the review report that you identify as key and as outlined in the attached table of Review Recommendations. The responses to these items and implementation plan are separated into immediate- (six months), medium- (one to two years), and longer- (three to five years) term, along with who will take the lead in each area. Where appropriate, I have identified any necessary changes in organization, policy or governance; and any resources, financial and otherwise, that will be provided, and who will provide them. The Dean's office has discussed the reviewers' comments through consultation with the Chair of the Department to develop the following implementation plan incorporating the reviewers' recommendations.

Implementation Plan

Noting declining enrolments in both the MASc program and in the MSc part-time option, the reviewers recommended examining recruitment strategies, admission practices, and aspects of the program structures, to understand why they are currently underutilized; the reviewers suggested that they be closed if there is little faculty support to pursue opportunities for growth.

Immediate-term response: The Department has indicated that closing the MASc is not a departmental priority. The Department of Earth Sciences offers two Master's Programs (the MSc and the MASc). The MSc is a funded 1-year program requiring a research report (not a full

thesis). This is a doctoral-streaming MSc. Alternatively, the MASc is a 2-year program with a full-length thesis requirement. While considered a research stream Master's program, it is viewed as a terminal Master's program as most students generally do not continue on to a PhD, and work in industry or government after graduation. The first year of the MASc is funded, in line with A&S funded research Master's practices, but the second year is not funded, and therefore requires a larger funding commitment from the unit and supervisor to provide a two-year funded program. Because the MASc is a longer commitment and requires significant supervisor funding, it is less frequently used. However, it is the Department's position that continuing to offer this program is important as a terminal research-based Master's program that can be a highly relevant credential for some students, and in some circumstances such as when faculty supervisors have grants from industry or government to support the student in collaboration and training. Some of the Department's new faculty are engaged in such collaborations so it now sees some potential growth in this program. The administration of the program is not administratively taxing. Furthermore, the MASc can be a draw for fully-funded international students coming to U of T with recognized scholarships from their home countries. The Department notes that the enrollment in the MASc is variable but is not consistently declining.

In terms of funding part-time MSc students, structurally, there is no provision at U of T to provide UTF funding for this group. Thus, there is a significant financial barrier to increasing the numbers of part-time MSc students, which may explain the low enrolment. As its administration is also not taxing, the Department prefers to retain the part-time option as well.

Medium-term response to Longer-term response: SGS policy does not allow part-time PhD students, except under unique flex-time options, which are currently not available in Earth Sciences. The Department will consult with its internal Graduate Affairs committee as well as with SGS on the option of proposing flex-time PhDs, and if feasible, take this proposal through governance.

The reviewers recommended that department consider investigating Indigeneity within their curriculum.

Immediate-term response: In 2021, the Department established the Reconciliation, Equity, Diversity and Inclusion (REDI) committee. The committee's initial work involved assembling resources for reconciliation and indigenization in Departmental activities, including its curriculum. Curricular changes related to indigeneity and reconciliation have also been discussed in Graduate and Undergraduate Affairs committees and some changes are already being implemented. For example, in the core course taken by all incoming graduate students, focused discussions around land and place are taking place (using sources such as: Wong et al., 2020. Towards reconciliation: 10 Calls to Action to natural scientists working in Canada. *FACETS*. <https://doi.org/10.1139/facets-2020-0005>). Undergraduate courses are also implementing indigeneity by, for example, including Indigenous authors and perspectives on reading lists, and developing land acknowledgements for all field study areas.

Medium-term to Longer-term response: The REDI committee will continue discussions on additional mechanisms to be implemented, whether through currently existing courses or possible new one. At the Faculty level, the Indigenous Research, Teaching and Learning Committee is focused on meeting the commitments undertaken by Arts & Science in response to the Truth and Reconciliation Commission. This includes work on restructuring our curricula to recognize the contributions, histories and perspectives of Indigenous peoples.

The reviewers made a number of detailed recommendations regarding the sequencing of courses in the curriculum, and ways in which program curricula could better be analyzed and communicated.

□ **They recommended reconsidering the requirement that first-year students take several courses they may already have taken in high school.**

Immediate-term response: The Department does not plan to reconsider its first-year requirements, which are consistent with other science programs in Arts & Science and elsewhere. The core sciences are prerequisites for upper-level courses and for professional accreditation. Students are assisted within the Department with course selection to minimize any perceived overlap with high school courses already taken, while ensuring students have the university-level foundation they need to successfully complete their program of study.

□ **They noted undergraduate student concerns that course offerings are overly concentrated on Solid Earth topics, with far fewer courses available with a focus on surficial processes such as Earth's climate; they also noted concerns that core courses do not introduce enough quantitative applications in lab exercises.**

Immediate-term response: The Department's Undergraduate Affairs Committee is reviewing the Earth and Environmental Systems program (where courses on surficial processes, climate, hydrosphere and biosphere are located) to consider ways to improve course offerings on these topics. The Department notes that it was pleased to learn that students requested more quantitative application in labs. Recent faculty hires in 2021 are actively teaching using platforms specified in the review such as Python, R/R Studio or MATLAB, as well as others. The Department plans on developing more quantitative elements in all courses once the Undergraduate Affairs Committee examines this issue thoroughly.

Medium-term to Long-term response: Two new searches in 2022-23 specifically mention quantitative applications or data science in the job posting, so the Department anticipates strong growth in these areas. Given the timelines required for new courses or changes to existing courses, as well as expected timelines related to the expected new faculty hires, it is anticipated that the earliest these changes could be seen will be 2024-25.

□ **They recommended creating full curriculum maps for each program, as well as distinct program-level and course-specific learning outcomes.**

Immediate-term to Medium-term response: Degree-level expectations and program learning outcomes at the three levels of learning were provided in the self-study; however, the Department will revisit how this information was presented and how it depicts student progress through the programs. The Department is encouraged to consult with the Curriculum Development Specialist in the Office of the Vice-Provost, Innovations in Undergraduate Education, and the Dean's office will facilitate that meeting.

The reviewers strongly recommended addressing “structural and financial disparities in the treatment of graduate students from the UTM and UTSC campuses,” and further recommended ensuring that students and faculty from the UTM/UTSC campuses have opportunities to interact and collaborate effectively with those on the St. George campus.

Immediate-term response: The new tri-campus MOA will facilitate improvement in this issue. Allocation of graduate funding is not campus dependent. All graduate students in the tri-campus graduate program have the same base funding (\$33,555, less tuition and fees for PhD students this year, approximately \$28,000 net). The funding package is generated through the combined use of university funds, TA-ships, and a RA contribution from supervisors. The Department tops up all graduate students' funding using restricted awards that are not campus specific. Some additions, such as conference travel funds, can, however, be campus specific.

In ensuring that faculty and students from UTM and UTSC have opportunities to interact and collaborate with their colleagues at UTSG, the Department has several practices already in place. The Chair undertakes a yearly visit to UTM for lab tours and consults at minimum yearly with the Chair of DPES at UTSC, and regularly meets with faculty and graduate students. The Chair also engages in yearly meetings with UTM and UTSC Chairs to discuss faculty progress and PTR (the tri-campus graduate program consists of 4.5 faculty at UTM, 2 at UTSC and 18.8 at UTSG).

New and ongoing initiatives include offering hybrid options for all Departmental council meetings and UTSG seminars. For graduate students, the core course for all incoming students promotes interactions among new students across all campuses. As well, office space at UTSG for graduate students with supervisors based at UTM/UTSC has been provided. The relevant departments at UTM and UTSC already have appointed staff members to assist graduate students on those campuses. There is also tri-campus representation on the Graduate Affairs committee to ensure that any campus-specific issues can be addressed. While having one Chair of Graduate Studies to serve all students across the three campuses can be challenging in the tri-campus arrangement, several measures including the more regular meetings of tri-campus Chairs triggered by the development of the MOA, and a new Associate Chair (Graduate) since 2021 who is prioritizing inclusion and graduate student well-being, and who is also the instructor for the graduate core course, are now in place to ensure all graduate students have access to administrative and academic support.

Medium-term to Longer-term response: A Departmental retreat held in September 2022 for all tri-campus Earth Sciences faculty discussed its core vision and uniting the three campuses,

and specific initiatives were discussed to foster more collaboration that could be realized over the coming years. These proposed initiatives included developing collaborative grants, shared analytical facilities or instrumentation, holding workshops or “brown bag lunches” on topics of interest to the whole graduate program, or promoting cross-campus co-supervision options. While the development of any of these ideas will take time, the Sept 2022 retreat was an important first step.

The reviewers recommended providing clear feedback to early career faculty members regarding teaching evaluations, in particular how they are used in the pre-tenure period.

Immediate-term response: Beginning in Spring 2022, the PTR process is more transparent with scores broken down by category (Research/Teaching/Service). This provides to all faculty more detail on the assessment of their teaching, with teaching evaluations just one element of this assessment.

Medium-term response: The PTR document sent to all faculty explaining assessment criteria will be modified to highlight that point for the 2023 PTR process.

The reviewers recommended that the department begin discussing long-term planning of faculty research directions and made suggestions regarding how best to describe research activities on the departmental website; they also recommended that the department develop a long-term faculty complement plan as well as a plan to ensure stability and continuity for the Jack Satterly Geochronology Laboratory.

Immediate-term response: The Department’s faculty retreat was held in September 2022 to specifically develop a common vision for the Department and use that vision for long-term departmental and faculty planning. There was strong consensus in the Department on the need to maintain a tradition of excellence in Hydrosphere/Biosphere aspects of Earth Sciences. Key areas for future faculty hires identified at the retreat include climate change, critical zone science/soils, critical metals/minerals, geomorphology/surface processes, hydrogeology, and geo-statistics/data science. The Department currently has two tenure-track searches underway, and the job postings have been designed to address aspects of these key priorities. For example, a current search in Near-Surface Geophysics is targeting scholars with expertise in critical zone science, soils, hydrogeology, cryosphere/permafrost or archaeological/forensic applications. All of these relate to environmental themes as well as to human-environment interactions. A second search in Mineral Systems lists a potential area of specialization relating to critical minerals and the green energy transition. Furthermore, the Department has ensured that its requests to the Faculty Appointments Committee are supported by a consensus of faculty members and informed by the Departmental vision, as articulated at the retreat.

A complete overhaul of the Departmental website has been underway since early 2022. The Department has spent considerable time developing new content and has specifically re-designed the presentation of the faculty research areas to include the key areas of Biogeosciences; Earth

and Planetary Materials; Earth Surface Processes; Environmental Sciences; Geophysics and Tectonics; Paleoceanography and Paleoclimatology; and Geoscience Pedagogy.

Medium-term to Longer-term Response: Progress has been slow on the website overall due to staff workload. Arts & Science Administrative HR has been working with the Department to explore how it might be assisted in this project and with other staffing needs. The Department has received approval from Administrative HR for a short-term casual hire with expertise in content development for the Web. We are currently reviewing resumés and anticipate progress on the website accelerating over the first 6 months of 2023. The Faculty notes that the Department has already been engaged for some time with the Arts & Science offices of Communications and also Information & Instructional Technology (IIT) on a website project.

The Department's recent retreat also identified priorities for long-term faculty hiring, and it anticipates over the next five years it will request another two positions as faculty retirements occur. The Department will also undertake a five-year Unit-Level Academic Planning process in early 2023. The unit-level academic plan is a forward-looking document that both articulates a department's academic plans over the following five years and also highlights progress made on the implementation plan identified in the UTQAP administrative response. Complement planning and resource allocation are two key elements addressed in the unit-level academic plan. Senior academic and administrative leadership within the Dean's Office will meet with the Department's leadership to discuss their unit-level academic plan and provide guidance and feedback. With respect to faculty complement requests, those are brought forward to the Faculty Appointments Committee (FAC), which includes representation across the three sectors (Humanities, Social Sciences and Sciences) and from the Colleges. The FAC reviews all requests for new positions once per year and makes recommendations to the Dean regarding which requests should be granted. The FAC's broad perspective is important as it is necessary to consider all requests relative to the needs of the entire Faculty, not a single department on its own.

The Jack Satterly Geochronology Laboratory (JSGL) facility is very highly regarded internationally, and its current staffing consists of a 0.25 of a CLTA position and 0.5 of a technical position from the Department; the remaining staff are funded by grants and contracts through international collaborations and research projects to the JSGL. We note that the staffing model and financial support had been raised in the previous Department UTQAP review. Department support for the JSGL includes the provision of considerable space as well as the staff/faculty lines mentioned in the reviewers' comment. At present, it is difficult to do more without a greater share of a tenure-stream faculty line associated with this lab; however, any changes or additions to faculty lines would have to be approved through the Arts & Science Faculty Appointments Committee, as noted earlier. The Chair is in frequent communication with the JSGL leadership to discuss ways to support it. As well, the Vice-Dean Research and Infrastructure in Arts & Science is available to meet with the Department regarding this facility.

The reviewers observed that inter-departmental collaboration “waxes and wanes depending on individual faculty and their career stage,” and recommended the development of initiatives to strengthen collaborative interactions with cognate units.

Immediate-term response: The Department noted that it already has a large number of cognate units, including in Arts & Science the School of the Environment, the Departments of Archaeology, Chemistry, Physics, Ecology & Evolutionary Biology, in the Faculty of Applied Science and Engineering, and the Royal Ontario Museum, where its faculty are deeply engaged in collaborative research. The Department also engages in graduate co-supervisions and other opportunities with U of T collaborators through, for instance, ISIs and the Data Sciences Institute.

Medium-term response: Collaboration, including co-supervision and joint funding opportunities, was discussed at the Department’s recent retreat, with several faculty showing interest in further “internal” collaboration and exploring other possibilities. The Department will endeavor to maintain its existing collaborations and explore other possibilities in the future as they arise.

The reviewers recommended that the department strike a standing committee, with representation from all constituents, to support initiatives and address concerns regarding equity, diversity, and inclusion.

Immediate-term response: A Departmental committee (REDI, discussed above) was established in September 2021 with representatives from faculty, staff, graduate, and undergraduate students. Updates to Departmental Council from this committee have included topics such as development of a land acknowledgement and EDI statement, a list of REDI-related resources to educate the Earth Sciences community, once monthly open meetings of the REDI committee, and event ideas such as film screenings, reading groups, and invited workshops to the Department, on topics such as how to be anti-racist and unconscious bias and field accessibility. While the Department is still implementing these events, there is strong interest and engagement from all constituents, including staff, faculty, graduate and undergraduate students, and postdoctoral fellows.

Medium-to Long-term response: As a strategic priority of the Faculty’s five-year plan (2020-2025), Arts & Science is firmly committed to improving equity, diversity and inclusion among students, staff and faculty. To that end, the Faculty added new training for chairs and directors in 2020-21 to ensure that EDI is supported within departments. Furthermore, as a new component of the annual activity report, chairs and directors are now evaluated on their progress in enhancing EDI within their unit. Many units have established EDI committees, including the REDI committee in Earth Sciences. The Faculty of Arts and Science hired a Director of Equity, Diversity and Inclusion in early 2022. The new Director is well-positioned to offer guidance to the Department on how to best implement EDI initiatives at the departmental level as well as advise of divisional plans.

The reviewers observed that postdoctoral fellows are not well-integrated within the department, commenting that this “represents a lost opportunity to build bridges between faculty and graduate students”; and made a number of recommendations to improve their visibility and connections within the department.

Immediate-term response: The implementation of this recommendation is already underway. The return to in-person activities in fall 2022 has made meetings and integration into the Earth Sciences community much easier for postdoctoral fellows than it was in 2020, all of 2021 (when the reviewers visited) and the first half of 2022. The Chair and Associate Chair Graduate held a meeting in Fall 2021 with all postdocs for introductions and to learn more about the post-doc experience. A postdoc email list is in place and used for communications, including profiling post-docs in the Department’s weekly e-newsletter. All postdocs are invited to present at the weekly “RockFest” series. Postdocs also have their own email listserv to minimize email overload. The Associate Chair, Graduate takes on the role as the Departmental Post-Doctoral Fellow point of contact.

Medium-term response: The Department is reviewing departmental communications strategies to and for postdoctoral fellows for further refinement.

The reviewers made a number of recommendations to improve departmental communication with administrative and technical staff.

Immediate-term response: When the new Chair started in 2021, they met with all staff one-on-one to discuss their work and the Department. All-staff group meetings have been held at least once a year to discuss as a team how to address challenges. With regard to including staff on department-wide emails, the Department notes that staff are meant to be included on department-wide email and it is currently reviewing this issue to better understand why this may not have been happening in the past. As of September 2022, all staff are included in updates from the Chair, invitations to Department Council meetings, and on emails disseminating the Minutes from the Department meetings.

Medium-to-Longer term response: The Chair will consult with A&S Administrative HR regarding how to implement the reviewers’ recommendation about annual reports and feedback for staff to ensure that collective agreements are respected. Likewise, the Department will continue to be attuned to making sure all staff receive relevant communications and updates.

The Dean’s office will monitor the implementation of recommendations through ongoing meetings with the Chair, as well as the A&S unit-level planning process. An Interim Monitoring Report to the Office of the Vice-Provost, Academic Programs, midway between the April 21-22, 2021 site visit and the year of the next site visit, will be prepared.

The year of the next review will be no later than the 2028-29 review cycle.

To conclude, we appreciate that the external reviewers identified the Department of Earth Sciences' strengths and noted a few areas for development. The Department has already begun to move forward with plans to address the recommendations as presented by the reviewers.

Sincerely,

A handwritten signature in black ink that reads "M Woodin". The letters are cursive and fluid, with a large initial "M" and a long, sweeping underline.

Melanie Woodin
Dean, Faculty of Arts & Science
Professor, Department of Cell & Systems Biology

cc.

Sarah Finkelstein, Chair, Department of Earth Sciences, Faculty of Arts & Science
Alison Chasteen, Acting Associate Dean, Unit-Level Reviews, Faculty of Arts & Science
Daniella Mallinick, Director, Academic Programs, Planning & Quality Assurance, Office of the
Vice-Provost, Academic Programs
Andrea Benoit, Academic Review Officer, Office of the Dean, Faculty of Arts and Science

2020-21 UTQAP Review of FAS Earth Sciences - Review Recommendations

Please do the following for each recommendation in the table:

- If you **intend** to act on a recommendation, please provide an **Implementation Plan** identifying actions to be taken, the time frame (short, medium, long term) for each, and who will take the lead in each area. If appropriate, please identify any necessary changes in organization, policy or governance; and any resources, financial and otherwise, that will be provided, and who will provide them.
- If you **do not** intend to act on a recommendation, please briefly explain why the actions recommended have not been prioritized.
- In accordance with the UTQAP and Ontario's Quality Assurance Framework, "it is important to note that, while the external reviewers' report may include **commentary** on issues such as faculty complement and/or space requirements when related to the quality of the program under review, **recommendations** on these or any other elements that are within the purview of the university's internal budgetary decision-making processes must be tied directly to issues of program quality or sustainability" (emphasis added)
- You may wish to refer to the sample table provided by the Office of the Vice-Provost, Academic Programs

Request Prompt <i>verbatim from the request</i>	Rec. #	Recommendations from Review Report <i>verbatim from the review report</i>	Program Response	Dean's Response
<p>Noting declining enrolments in both the MASc program and in the MSc part-time option, the reviewers recommended examining recruitment strategies, admission practices, and aspects of the program structures, to understand why they are currently underutilized; the reviewers suggested that they be closed if there is little faculty support to pursue opportunities for growth.</p>	<p>1</p>	<p>"The department is encouraged to better understand who is applying for the MASc program and to determine why it is that this program is underutilized. Failing that, the department should consider terminating the MASc program"</p>	<p>This recommendation is not being prioritized. Explanation: The Department of Earth Sciences offers 2 Masters Programs. The MSc is a funded 1-yr program requiring a research report (not a full thesis). This is a doctoral-streaming MSc. The MASc is a 2-yr program with a full-length thesis requirement. This is most often a terminal Masters program, where students go onto employment in industry, government or other sector. The 1st yr of the MASc is funded by UofT but the second year is not funded by the University, thus requiring a funding commitment of \$32k from the supervisor (our baseline MSc funding is \$25k + tuition). Because the MASc is a longer commitment and requires significant supervisor funding, it is less frequently used. However, it is our position that continuing to offer this program is important as a terminal research-based Masters that can be a highly relevant credential for some students, and in some circumstances, when faculty supervisors have grants from industry or government to support the student in the</p>	<p>The Faculty recognizes that the review report recommendations to terminate the MASc program, and to discontinue the part-time option for the MSc, are not departmental priorities at this time, and as outlined in the Program Response, the Department wishes to retain the current arrangements for each program. The Dean's response notes that the Department has indicated it will explore flex-time options for PhD students.</p>

			<p>collaboration and training. Some of our new faculty are engaged in collaborations such as these so we see some potential growth in this program. The administration of the program is not overly taxing from a staff point of view.</p> <p>Further, the MASc can be a draw for fully funded international students coming to UofT with recognized scholarships from their home countries. Currently we have two students from Turkey in this program who have full funding from the Turkish government for a 2-yr MASc. We have long-standing collaborations with leading geosciences institutions in Turkey, so we expect these opportunities will continue. In addition, we are actively trying to recruit students from China with China Scholarships and the MASc could also be a good fit for those students.</p> <p>The enrollment in the MASc is variable, but is not consistently declining: 2017/2018: 1 2018/2019: 1 2019/2020: 2 2020/2021: 6 2021/2022: 7 2022/2023: 3 (these number refer to total numbers of registered MASc students).</p>	
	2	<p>“The department is encouraged to either determine the reason for the decline in part-time graduate students, or to discontinue the part-time graduate program.”</p>	<p>This recommendation is not being prioritized. Explanation: SGS policy does not allow part-time PhD except under unique flex-time options, which are currently not available in Earth Sciences. We could propose flex-time PhDs through governance; we will consult with our internal Graduate Affairs committee as well as with SGS on this option.</p>	

			<p>In terms of part-time MSc students, structurally, at UofT, there is no provision to provide UTF funding for this group. Thus, there is a significant financial barrier to increasing the numbers of part-time MSc students. This explains the low numbers. There can be exceptional circumstances where a part-time option works for students and supervisors. As the administration of this option is not taxing from a staff point of view, we prefer to retain the part-time option.</p>	
<p>The reviewers recommended that department consider investigating indigeneity within their curriculum.</p>	<p>3</p>	<p>“The department may wish to consider investigating indigeneity within their curriculum”</p>	<p>This recommendation is being implemented. We established in 2021 the Reconciliation, Equity, Diversity and Inclusion (REDI) committee. The committee’s initial work involved assembling resources for reconciliation and indigenization in Departmental activities, including curriculum. Curricular changes related to indigeneity and reconciliation have also been discussed in Graduate and Undergraduate Affairs committees and some changes are already being implemented. For example, in the core course taken by all incoming graduate students, focussed discussion around land and place are taking place using sources such as: Wong et al., 2020. Towards reconciliation: 10 Calls to Action to natural scientists working in Canada. <i>FACETS</i>. https://doi.org/10.1139/facets-2020-0005 Undergraduate courses are also implementing indigeneity through for exempling including Indigenous authors and perspectives on reading lists and developing land acknowledgements for all field study areas. The REDI committee will further discussions on additional mechanisms for implementation.</p>	<p>At the Faculty level, the Indigenous Research, Teaching and Learning Committee is focused on meeting the commitments undertaken by Arts & Science in response to the Truth and Reconciliation Commission. This includes work on restructuring our curricula to recognize the contributions, histories and perspectives of Indigenous peoples.</p>

<p>The reviewers made a number of detailed recommendations regarding the sequencing of courses in the curriculum, and ways in which program curricula could better be analyzed and communicated.</p> <ul style="list-style-type: none"> • They recommended reconsidering the requirement that first-year students take several courses they may already have taken in high school. • They noted undergraduate student concerns that course offerings are overly concentrated on Solid Earth topics, with far fewer courses available with a focus on surficial processes such as Earth’s climate; they also noted concerns that core courses do not introduce enough quantitative applications in lab exercises. • They recommended creating full curriculum maps for each program, as well as distinct program-level and course-specific learning outcomes. 	4	<p>It is recommended that “the department (faculty or university) revisit the decision to have first year students take these same courses that they are exposed to in high school, at the expense of courses like physical geography and earth sciences that are, for the most part, absent in high school.”</p>	<p>Our program requires core sciences in the first year and those requirements are well in line with those of other science programs in FAS and comparable Earth science programs at other Canadian universities. These core sciences are essential not only for professional accreditation but for required preparation for our upper year courses. Students CAN also receive program credit for first year physical geography and earth sciences. Our student advisor and Associate Chair, Undergraduate are available to assist students with course selection to minimize any perceived overlap with high school courses taken, while ensuring students have the preparation they need. Therefore, we do not plan any actions on this item.</p>	<p>The Department is encouraged to consult with the Curriculum Development Specialist in the Office of the Vice-Provost, Innovations in Undergraduate Education, and the Dean’s office will facilitate that meeting.</p>
	5	<p>“The main concern raised by the undergraduates were that course offerings were overly concentrated on ‘hard-rock’ topics (i.e., Solid Earth), with far fewer available for students with a focus on surficial processes, including Earth’s climate through time (i.e., Hydrosphere/Biosphere at Earth’s Surface).”</p>	<p>We recognize this concern, and it also relates to faculty demographics and complement planning (see below). The Undergraduate Affairs Committee is reviewing the Earth and Environmental Systems program (where courses on surficial processes, climate, hydrosphere and biosphere are located) with an eye to improving these offerings and implementing the recommendation. Given the timelines required for new courses or changes to existing courses, it is anticipated that the earliest these changes could be seen would be 2024/2025.</p>	
	6	<p>“Another concern is that the core courses in the major do not introduce enough quantitative applications in lab exercises. They [undergraduates] would like to gain more experience with MATLAB, Python, etc. in these upper-level courses to better prepare them for postgraduate work and/or employment in industry.”</p>	<p>We agree with this point and are happy to hear that the students raised it. We are implementing this recommendation by actively developing more quantitative elements in all courses. New faculty hires in 2021 and 2022 (since the visit from the reviewers) are actively teaching using the platforms mentioned and others. We have two searches ongoing this year and specifically mention quantitative applications</p>	

			or data science in the posting so we anticipate strong growth in this area. This topic is also being discussed by the Undergraduate Affairs Committee. We expect more action on this item for 2024/2025 academic year.	
	7	“At the very least, the 10 DLO need to be written at the three levels of learning (Introductory, Developed and Advanced) using appropriate verbs and descriptors to make clear what the level of learning implies...Should the department wish to undertake a curriculum review, obtaining assistance with learning outcomes is recommended.”	There was some confusion about the presentation of this material in the self-study. We do have the DLOs at the three levels of learning and this was shown in Table 1.4 of our self study. We take the reviewer’s point about revisiting the presentation of this information and we will seek further guidance on codifying our learning outcomes.	
	8	“An approach more helpful to the reader would be complete full curriculum maps for each program so that the reader can grasp more easily the overall progression of learning, and the justification for students having reached the level of learning.”	Curriculum maps were presented in Table 1.6 of the self-study. We take the reviewers’ point that we can improve on the presentation to better explain how learning progresses through our program. As above, we will seek further guidance on the presentation of this material.	
The reviewers strongly recommended addressing “structural and financial disparities in the treatment of graduate students from the UTM and UTSC campuses,” and further recommended ensuring that students and faculty from the UTM/UTSC campuses have opportunities to interact and collaborate effectively with those on the St. George campus.	9	“UToronto and the department of Earth Science are strongly encouraged to work to remove structural and financial disparities in the treatment of graduate students from the UTM and UTSC campuses.”	<p>This recommendation is being implemented and the tri-campus MOA will facilitate this. Allocation of graduate funding is not campus-dependent. All graduate students in the tri-campus graduate program have the same target funding level (approximately \$28k take-home for PhD students this year). This is generated through the combined use of university funds, TAships, and a RA contribution from supervisors. We top up all grad students using restricted awards that are not campus specific.</p> <p>Add-ons to graduate funding (ie. Conference travel funds) can be campus specific. While we don’t have jurisdiction over choices made</p>	The Dean’s response notes that the new tri-campus MOA will facilitate improvement in this issue.

			<p>by UTM and UTSC, we do ensure frequent communication (see below).</p> <p>We recognize that students on different campuses have different experience and different needs. A number of measures are in place to ensure that students at UTM and UTSC feel welcome and included on UTSG, where the numbers of graduate students are significantly higher. These measures include:</p> <ul style="list-style-type: none"> - Provision of office space at UTSG for graduate students with supervisors based at UTM/UTSC - Yearly visit to UTM by the Chair which includes a meeting with graduate students - We are currently developing a MOA with the tri-campus chairs in the Earth Sciences graduate program and this will specifically codify our guiding principle of funding equity between students on each campus. 	
	10	<p>“Ensure students and faculty from the UTM/UTSC campuses have opportunities to interact and collaborate effectively with those on the St. George campus.”</p>	<p>This recommendation is being implemented. Our tri-campus graduate program consists of 4.5 faculty at UTM, 2 at UTSC and 18.8 at UTSG. To foster collaboration, new and ongoing initiatives include:</p> <ul style="list-style-type: none"> - Hybrid options for tri-campus council meeting attendance and some UTSG seminars - Yearly visit to UTM by the Chair (scheduled 11 AM – 5 PM to ensure adequate time for lab tours, meetings with faculty and students) - Yearly meetings with Chairs at UTM and UTSC at the time of PTR to discuss faculty progress - Retreat held on Sept 6/22 for tri-campus Earth Sciences faculty to discuss core vision uniting the three campuses and specific initiatives were discussed to foster more collaboration 	

			- core course for all incoming graduate students promotes interactions of these students from all campuses	
	11	“The department is encouraged to appoint separate faculty members responsible for Graduate Students in each campus.”	- The relevant departments at UTM and UTSC have appointed staff members to assist graduate students on those campuses. - There is tri-campus representation on the Graduate Affairs committee to ensure that any campus-specific issues can be addressed	
	12	“Address the challenge associated with one Chair of Graduate Studies serving the graduate students across the tri-campuses”	- See above. While this can be a challenge given our tri-campus arrangement, a number of measures are now in place to ensure all graduate students have access to administrative and academic support.	
The reviewers recommended providing clear feedback to early career faculty members regarding teaching evaluations, in particular how they are used in the pre-tenure period.	13	“Provide clear feedback to junior faculty on teaching evaluations, and how such evaluations are used in the pre-tenure period.”	This recommendation is being implemented. Beginning in Spring 2022, the PTR process is more transparent with scores broken down by category (Research/Teaching/Service). This provides to all faculty more detail on the assessment of teaching. Teaching evaluations are just one element of the assessment. The PTR document sent to all faculty explaining assessment criteria will be modified to highlight that point for the 2023 PTR process.	The Dean recognizes that the Department is addressing this review report recommendation.
The reviewers recommended that the department begin discussing long-term planning of faculty research directions and made suggestions regarding how best to describe research activities on the departmental website; they also recommended that the department develop a long-term faculty complement plan as well as a plan to ensure stability and continuity for the Jack Satterly Geochronology Laboratory.	14	“It is therefore our strong recommendation that the Department begin to discuss this issue (long-term planning of research directions) sooner than later, while it has the expertise of the current senior faculty with expertise on the Hydrosphere/Biosphere at Earth’s Surface to inform that discussion.”	This recommendation is being implemented. A faculty retreat was held Sept 6/22 to discuss this point, specifically to develop a common vision for the department and use that vision for long-term planning. There was strong consensus on the need to maintain our tradition of excellence in Hydrosphere/Biosphere aspects of Earth Sciences. Key areas for future faculty hires identified at the retreat include climate change, critical zone science/soils, critical metals/minerals, geomorphology/surface processes, hydrogeology, and geo-statistics/data science. We are currently searching for 2 tenure-track positions, and	Arts & Science Administrative HR has been working with the Department to explore how it might be assisted in this project and with other staffing needs. The Department has received approval from Administrative HR for a short-term casual hire with expertise in content development for the Web. They are currently reviewing resumés and anticipate progress on the website accelerating over the first 6 months of 2023. The Faculty notes that the Department has already been engaged for some time with the Arts & Science offices of Communications and also Information &

			<p>job postings have been designed to address aspects of these key priorities. For example, our current search in Near-Surface Geophysics is targeting scholars with expertise in critical zone science, soils, hydrogeology, cryosphere/permafrost or archaeological/forensic applications. All of these relate to environmental themes and also to human-environment interactions. Our second in-progress search in Mineral Systems lists a potential area of specialization relating to critical minerals and the green energy transition. Thus, we are acting on this concern already and anticipate over the next 5 years, requesting another 2 positions related to faculty retirements in these fields. Further, we have ensured that our requests are supported by a consensus of faculty members and informed by our departmental vision as articulated at a Sept 2022 retreat.</p>	<p>Instructional Technology (IIT) on a website project.</p> <p>The Department will also undertake a five-year Unit-Level Academic Planning process in early 2023. The unit-level academic plan is a forward-looking document that both articulates a department's academic plans over the following five years and also highlights progress made on the implementation plan identified in the UTQAP administrative response. Senior academic and administrative leadership within the Dean's Office will meet with the Department's leadership to discuss their unit-level academic plan and provide guidance and feedback.</p> <p>With regard to the Jack Satterly Geochronology Laboratory (JSGL) facility, the Dean's response notes that the staffing model and financial support had been raised in the previous Department UTQAP review. Any changes or additions to faculty lines would have to be approved through the Arts & Science Faculty Appointments Committee. The Vice-Dean Research and Infrastructure in Arts & Science is available to meet with the Department regarding this facility.</p>
15		<p>"We recommend that the Dept. website be updated to better describe research questions driving the research within the various subfields. There should also be a description of the synergies and collaborations between faculty/subfields/cognate units, etc."</p>	<p>This recommendation is being implemented. A complete re-do of the departmental website is underway. We have been working on this since early 2022. Owing to staff workload issues, progress has been slow. We have reached out to FAS for more guidance on how to get the help we need to launch our new website. We have spent considerable time developing new content and have specifically re-designed the presentation of the research areas to include the following key areas:</p> <ul style="list-style-type: none"> • Biogeosciences • Earth and Planetary Materials • Earth Surface Processes • Environmental Sciences • Geophysics and Tectonics • Paleoceanography and Paleoclimatology 	

			<ul style="list-style-type: none"> • Geoscience Pedagogy 	
	16	“We recommend that the Department develop a long-term faculty hiring plan well ahead of retirements... irrespective of enrolments.”	See above. A retreat was held Sept 6/22 to identify priorities for long-term faculty hiring.	
	17	“...the JSGL has only 0.25 of a CLTA position and 0.5 of a technical position from the Department; the remaining staff are on soft-money. This is a precarious position for such an important facility, and the department and the faculty need to find ways to provide stability.”	We agree that this is a precarious situation and that the facility is very highly regarded internationally. This point has been raised in many (all?) former Department reviews. Department support for JGSL includes the provision of considerable space as well as the staff/faculty lines mentioned in the comment. The Chair is in frequent communication with JGSL leadership to discuss ways to support and will also request a meeting in with the Vice Dean Research to seek advice.	
The reviewers observed that inter-departmental collaboration “waxes and wanes depending on individual faculty and their career stage,” and recommended the development of initiatives to strengthen collaborative interactions with cognate units.	18	“Several initiatives could be developed to strengthen these ties including a UT internal competition for research proposals to fund shared graduate students and/or postdoctoral fellows between units, or to host a workshop or seminar series devoted to a topic of interdisciplinary interest.”	We are very fortunate at UofT to have a large number of cognate units where faculty are deeply engaged in collaborative research. We have many examples of such collaborations among our faculty members in units such as the School of the Environment, the Departments of Archaeology, Chemistry, Physics, EEB, numerous departments in the Faculty of Applied Science and Engineering, and the Royal Ontario Museum. We do avail ourselves of graduate co-supervisions and opportunities to engage with UofT collaborators through ISIs, the Data Sciences Institute etc. I can provide many examples of these if needed. Collaboration, including co-supervision and joint funding opportunities, was discussed at the dept retreat, with several faculty showing interest in further “internal” collaboration.	The Dean’s response acknowledges currently existing relationships with cognate units both within Arts & Science and beyond.

The reviewers recommended that the department strike a standing committee, with representation from all constituents, to support initiatives and address concerns regarding equity, diversity, and inclusion.	19	“We recommend that the department strike an EDI standing committee that reports to the departmental council.”	This recommendation is being implemented. This committee was established in Sept 2021 with representatives from faculty, staff, graduate and undergraduate students. Updates to Dept Council from this committee have included topics such as development of a land acknowledgement and EDI statement, a list of REDI-related resources to educate ourselves, event ideas.	As a strategic priority of the Faculty’s five-year plan (2020-2025), Arts & Science is firmly committed to improving equity, diversity and inclusion among students, staff and faculty. The Faculty added new training for chairs and directors in 2020-21 to ensure that EDI is supported within departments. Furthermore, as a new component of the annual activity report, chairs and directors are now evaluated on their progress in enhancing EDI within their unit. Many units have established EDI committees, including the REDI committee in Earth Sciences. The Faculty of Arts and Science hired a Director of Equity, Diversity and Inclusion in early 2022. The new Director is well-positioned to offer guidance to the Department on how to best implement EDI initiatives at the departmental level as well as advise of divisional plans.
	20	“Create a departmental EDI committee with representation from all constituents.”	This committee was established in Sept 2021 with representatives from faculty, staff, graduate and undergraduate students.	
The reviewers observed that postdoctoral fellows are not well-integrated within the department, commenting that this “represents a lost opportunity to build bridges between faculty and graduate students”; and made a number of recommendations to improve their visibility and connections within the department.	21	“Investigate better ways to integrating post docs into the department, including communications.”	This recommendation is being implemented. The Chair and Associate Chair (Graduate) held a meeting in Fall 2021 with all postdocs for introductions and to learn more about the post-doc experience. A postdoc email list is in place and used for communications. We are also profiling post-docs in our weekly e-newsletter. We intend to promote connections amongst post-doc’s through these kinds-of meetings; the return to in-person activities as of Sept 2022 has also made integration much easier than it was through most of 2020, all of 2021 and the first half of 2022.	The Dean’s response notes a number of actions taken by the Department to implement these review report recommendations, as outlined in the Program Response.
	22	“The department should consider appointing one faculty member as the departmental Post-Doctoral Fellow point of contact.”	The Associate Chair, Graduate takes on this role.	
	23	“Another suggestion is to invite all postdocs to give a department-wide seminar on their research during their first year ...”	All postdocs are invited to present at our weekly “RockFest” series.	

	24	"Postdocs should be included on all department-wide emails to students and faculty."	Postdocs have their own email listserv to minimize email overload and we aim to ensure postdocs are included on all relevant communications. We are currently reviewing departmental communications strategies.	
The reviewers made a number of recommendations to improve departmental communication with administrative and technical staff.	25	"Investigate the use of annual reports for staff, where they can both receive and provide feedback on their work and the department."	The Chair will consult with HR about how to implement this recommendation. When the new Chair started in 2021, they met with all staff one-on-one to discuss their work and the Department. All-staff group meetings have been held at least once a year to discuss as a team how to address challenges.	The Chair will consult with A&S Administrative HR regarding how to implement the reviewers' recommendation about annual reports and feedback for staff to ensure that collective agreements are respected.
	26	"Include staff on department-wide emails"	Staff are meant to be included on department-wide email. We are currently reviewing departmental communications strategies to understand why this was perhaps not happening in the past. As of Sept 2022, staff are included in updates from the Chair, invitations to the Department meetings, and on emails disseminating the Minutes from the Department meetings.	
Other recommendations not prioritized in the Request for Administrative Response	27	"The use of 'check sheets' that list the courses and options might further assist students in managing their programs."	Our student advising team regularly points students to the FAS calendar and the Degree Explorer.	The Dean recognizes that the Department is addressing this review report recommendation.
	28	"The department might consider offering 'topics-based' courses, for example 'Topics in Geochemistry' or 'Topics in Ethics in the Earth Sciences' that can change focus with the instructor."	We do have a special topics course in place. This year the topic is "Meteoritics" (Winter 2023). We are offering three geochemistry courses this year. The Ethics suggestion is interesting and will be discussed by the Undergraduate Affairs committee.	The Dean recognizes that the Department has addressed this review report recommendation and is exploring new options.
	29	"Continue the excellent involvement of and support for undergraduates on multiple fieldtrips during their time in the Department."	This is an active priority. For example, we have two groups involving 4 different courses participating in International Course Modules in Chile and in Turkey during November 2022. The Department has also supported several student field trips in Ontario since in-person activities have become more feasible again,	The Dean recognizes that the Department is prioritizing this review report recommendation.

			for example to the Abitibi region in Spring 2022 and to Parry Sound in Fall 2022.	
30	“The department is encouraged to engage in discussions with earth science programs at other universities to develop joint courses that could include, for example, common virtual lecture components and local laboratory components. With our experience in the pandemic, such arrangements may be easier to design and deliver.”		We can explore this option through Undergraduate and Graduate Affairs committees. Some preliminary discussions have already been held with other Canadian Earth Sciences Departments related to online field courses.	The Dean recognizes that the Department is addressing this review report recommendation.
31	“Make clear a policy and method by which graduate students may apply for extensions to their degree program owing to covid-related delays is needed.”		We have established a clear process as of Sept 2021 to request extensions and to assist students financially outside of the funded cohort. Since Fall 2021, we have implemented a graduate supplementary funding program to address program delays related to the pandemic. We now have a process to provide financial support to graduate students who are beyond the funded cohort, such as those impacted by COVID-related delays.	The Dean recognizes that the Department has addressed this review report recommendation.
32	“UToronto is encouraged to appropriately value these aspects of Earth Science graduate education (employability, direct teaching & mentoring, experiential learning, field-based research).”		Yes, we value those and are very engaged with FAS and SGS on graduate professional development. We are taking steps to improve acquisition at the graduate level, of “transferrable skills” such as communication. The Graduate Core course is strongly skills-focussed with new content on proposal development and science communication added in Fall 2022. Further, we are currently working on a new initiative to propose a change to the PhD defense to include a department-wide seminar.	The Dean recognizes that the Department is addressing this review report recommendation.
33	“UToronto is encouraged to introduce some flexibility into its graduate student funding model as this would enable departments to take on more graduate students.”		Graduate funding and intake caps are a matter of intense discussion in FAS. We are very engaged in those discussions and actively pursuing all options to maximize our potential graduate enrollment. Given very	The Dean recognizes that this review report recommendation regarding graduate funding is an ongoing concern.

			high cost of living and very high rates of inflation in Toronto, we have prioritized supporting our graduate students above the baseline guaranteed by the University to ensure they are earning a living wage and can adequately focus on their research and studies.	
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3. Committee on Academic Policy & Programs (AP&P) Findings

The reviewers found the programs in the Department of Earth Sciences to be positive. The Reading Group members found the summary to accurately reflect the full review. The reviewers suggested some improvements to the programs including expanding senior undergraduate course offerings, clearer learning outcomes, equal treatment of graduate students across the tri-campus, and examining plans for the Jack Satterly Geochronology Laboratory (JSGL).

Professor Alison Chasteen, Acting Associate Dean, Unit-Level Reviews noted that regarding the Jack Satterly Geochronology Laboratory (JSGL), the Dean would commission a unit level strategic plan to address complement planning and resource allocation, administrative staffing and graduate and undergraduate programming. A meeting with the Vice-Dean, Research & Infrastructure in FAS was planned to discuss the role of the lab and how best to support it.

No follow-up report was needed.

4. Institutional Executive Summary

The reviewers praised the department for their commitment to incorporating high-impact practices in Earth Sciences programs, and to providing excellent and varied opportunities for field learning; they commented that opportunities for subsidized international trips are greatly valued by students. They noted that undergraduate and graduate students alike spoke well of their interactions and relationships with faculty, and that both groups have strong and active student organizations. They commended the high-profile research being conducted in the Department, noting that faculty are engaged in research and teaching activities with “clear and direct societal relevance.” Finally, they praised the recent emphasis on using joint faculty hires across departments and campuses to build strength in Geophysics and to foster collaborations across diverse subfields and academic units.

The reviewers recommended that the following issues be addressed: examining recruitment strategies, admission practices, and aspects of the MASc and part-time MSc program structures, to understand why they are currently underutilized; investigating Indigeneity within program curricula; reconsidering the requirement that first-year students take courses they may already have taken in high school; engaging with concerns and recommendations regarding the sequencing of courses in the curriculum, and ways in which program curricula could better be analyzed and communicated; addressing concerns related to the “structural and financial disparities in the treatment of graduate students from the UTM and UTSC campuses” and ensuring that students and faculty from the UTM/UTSC campuses have opportunities to interact and collaborate effectively with those on the St. George campus; providing clear feedback to early career faculty members regarding teaching evaluations; beginning discussions regarding long-term planning of faculty research directions and better describing faculty research activities on the departmental website; developing a long-term faculty complement plan as well as a plan to ensure stability and continuity for the Jack Satterly

Geochronology Laboratory; developing initiatives to strengthen collaborative interactions with cognate units; striking a standing committee to support initiatives and address concerns regarding equity, diversity, and inclusion; improving postdoctoral fellows' visibility and connections within the department; and improving departmental communication with administrative and technical staff. The Dean's Administrative Response describes the Faculty and unit responses to the reviewers' recommendations, including an implementation plan for any changes necessary as a result.

5. Monitoring and Date of Next Review

The Dean's office will monitor the implementation of recommendations through ongoing meetings with the Chair, as well as the A&S unit-level planning process. An Interim Monitoring Report to the Office of the Vice-Provost, Academic Programs, midway between the April 21-22, 2021 site visit and the year of the next site visit, will be prepared.

The year of the next review will be no later than the 2028-29 review cycle.

6. Distribution

On June 30, 2023, the Final Assessment Report and Implementation Plan was posted to the Vice-Provost, Academic Programs website and the link provided by email to the Dean of the Faculty of Arts & Science, the Secretaries of AP&P, Academic Board and Governing Council, and the Ontario Universities Council on Quality Assurance. The Dean provided the link to unit/program leadership.