Supplementary Information Tables: 2020–21 Departmental Results Report

Table of Contents

Reporting on Green Procurement

Context

The National Research Council of Canada (NRC) is now bound by the *Federal Sustainable Development Act* following legislative amendments. Prior to the amendments, the NRC voluntarily developed a 2020 to 2023 Departmental Sustainable Development Strategy (DSDS). The NRC has developed its corresponding 2020–21 DSDS Report, including applicable reporting on green procurement activities. This report can be found on the NRC's website.

Details on transfer payment programs

Assessed Contribution to the Bureau International des Poids et Mesures (BIPM)

Start date	Canada signed the Metre Convention and became a member state of BIPM in 1907
End date	Ongoing
Type of transfer payment	Contribution
Type of appropriation	Estimates
Fiscal year for terms and conditions	2018–19
Link to departmental result(s)	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Metrology
Purpose and objectives of transfer payment program	The assessed contribution to the BIPM is an obligation accepted by Canada as a signatory to the international treaty known as the Metre Convention. By representing Canada on the international metrology stage through its affiliation with the BIPM and associated regional metrology organization *Sistema Interamericana de Metrologia* (SIM), the NRC can more effectively and efficiently respond to its mandated responsibility for maintenance of national measurement standards, as articulated in the *NRC Act* and the *Weights and Measures Act*.
Results achieved	By maintaining international recognition in measurement science through its interactions with the BIPM and SIM, the NRC continues to provide metrology research and services that help transform ideas into market-ready technologies that benefit Canadian society, the economy, and the environment. In 2020–21 this included the presentation of the NRC Quality Management System to a regional task group to demonstrate the transition to a new standard and gain continued acceptance supporting its internationally recognized Calibration and Measurement Capabilities.
Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	The evaluation is scheduled for completion in 2021–22.

Engagement of applicants and recipients in 2020–21	The NRC participates in the activities and meetings relative to the Bureau international des poids et mesures and associated regional metrology organization *Sistema Interamericana de Metrologia* (SIM). The NRC provides professional expertise and laboratory facilities required to deliver its metrology program to achieve socio-economic impact for Canadian citizens and businesses. In 2020–21, this included attending virtual meetings of all the Consultative Committees and associated working groups, leading regional level workshops, leading pilot studies and key comparisons involving other international metrology institutes, as well as producing 148 publications in Chemical and Physical Metrology.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	-	-	-	-	-	-
Total contributions	625,479	612,603	659,000	650,198	650,198	(8,802)
Total program	**625,479**	**612,603**	**659,000**	**650,198**	**650,198**	**(8,802)**
Explanation of variances	Variance is immaterial.					

Collaborative Science, Technology and Innovation Program (CSTIP)

Start date	April 1, 2018
End date	Ongoing
Type of transfer payment	Grants & Contributions
Type of appropriation	Estimates
Fiscal year for terms and conditions	2018–19
Link to departmental result(s)	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Program: Collaborative Science, Technology and Innovation Program
Purpose and objectives of transfer payment program	Provides grant and contribution funding for external collaborators with complementary capabilities [e.g. small and medium-sized enterprises (SMEs), post-secondary institutions and non-profit research organizations]. The program comprises 1) NRC Collaborative Research & Development (R&D) initiatives – funding external collaborators working with NRC researchers on projects that make up a series of large-scale collaborative R&D programs in priority areas; 2) the Ideation Fund – funding external collaborators working with NRC personnel to encourage, test and validate transformative self-directed, exploratory research ideas; and 3) the Outreach Initiative – funding to support conferences, workshops, symposia or other outreach initiatives, in order to promote engagement of Canadians, particularly those in under-represented groups, interested in Science, Technology, Engineering and Mathematics (STEM).
Results achieved	The Collaborative R&D initiative, with the launch of the new Pandemic Response Challenge Program, supported 10 active challenge and supercluster support programs. 196 collaborative projects received funding for a total of $25,394,313 in grants & contributions to support these collaborative R&D programs. Ideation Fund: Three collaborative projects with 10 collaborators received funding, for a total of $1,052,158 in grant support through the Small Teams Initiative – Round 1. In addition, 84 collaborative projects received $1,073,000 in grant support under the New Beginnings Initiative. This included, support for 42 new projects selected under the program's Round 3 and top-up funding to 42 existing Round 2 projects impacted by COVID-19. 16 outreach projects were funded for a total of $258,000 in grants support, helping to provide many young Canadians and underrepresented groups with exposure to formative STEM learning opportunities and experiences.

Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	An evaluation is scheduled for 2022–23 (five year cycle).
Engagement of applicants and recipients in 2020–21	For NRC Collaborative R&D Initiatives, potential collaborators, stakeholders and eligible recipients are invited by the NRC to participate in designing the R&D focus as well as proposed projects intended to achieve outcomes for each specific initiative. External researchers are invited to work with NRC researchers to develop team proposals to compete for project funding. Projects are selected against criteria such as research excellence, impact, collaborations, and feasibility/probability of success. For the Ideation Fund, annual open calls within the NRC are launched for individuals or small teams to submit proposals to conduct exploratory research with collaborators. Projects are selected against criteria such as: research excellence, innovation/creativity, deliverables, collaboration and feasibility.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	1,011,870	6,997,744	7,994,965	20,004,697	18,359,497	10,364,532
Total contributions	8,090,335	7,115,625	24,561,545	14,882,072	9,542,593	(15,018,952)
Total program	**9,102,205**	**14,113,369**	**32,556,510**	**34,886,769**	**27,902,090**	**(4,654,420)**
Explanation of variances	The NRC converted grant funding into contribution funding during the year. Total program spending was lower than planned since both the NRC and its partners were affected by COVID-19 which impacted progress on R&D and access to facilities.					

Innovative Solutions Canada

Start date	2017–18 The first NRC challenge posted in December 2017, to coincide with the Program launch.
End date	2021–22
Type of transfer payment	Grant and Procurement
Type of appropriation	Estimates
Fiscal year for terms and conditions	The NRC received authority for the Innovation Science and Economic Development (ISED) led Ts&Cs for Innovative Solutions Canada (ISC) grants in 2017–18 (January 2018).
Link to departmental result(s)	ISC is an ISED-led program, with the NRC as one of twenty federal departments mandated to participate. Program results will be reported by ISED.
Link to the NRC's Program Inventory	ISC is an ISED-led program, with NRC as one of twenty federal departments mandated to participate. At the NRC, this ISED-led program is administered by NRC IRAP.
Purpose and objectives of transfer payment program	ISC is a grant and procurement program that enables participating departments and agencies to support the scale-up of Canadian small businesses through early-stage, pre-commercial R&D. The program allocates a portion of departmental funding to: • Fuel the development and adoption of technological innovation in Canada. • Grow Canadian companies through direct funding to support early stage, pre-commercial R&D, late stage prototypes, and to accelerate commercialization. • Encourage procurement from companies led by under-represented groups, such as women, Indigenous, youth, disabled individuals, LGBTQ+ and others. • Foster greater industry-research collaboration through the release of challenges for solutions that address key Government of Canada priorities. • Provide federal departments and agencies with opportunities to develop new capabilities to meet their research and development needs and thereby advance government priorities.
Results achieved	NRC IRAP posted six challenges which closed in 2020–21. NRC IRAP provided financial support for near-to-market solutions through ISED's ISC Challenge Program, investing $11.1M in 2020–21, to support 37 projects with Canadian SMEs. These results solidified the NRC's leadership position in ISC. In 2020–21, NRC IRAP also sponsored seven challenges for SMEs to develop near-to-market solutions that met a COVID-19 related need. Four of the seven challenges were jointly developed with other government departments (Environment and Climate Change Canada, Health Canada,

	Natural Resources Canada, Public Health Agency of Canada, and Public Services and Procurement Canada). Together these challenges resulted in the funding of 37 projects with Canadian SMEs. These results solidified the NRC's leadership position in ISC. When ranked against the 20 participating departments, the NRC ranked # 1 in number of challenges posted, # 2 in Phase 1 awards (second to the Department of National Defence), and #1 in Phase 2 awards.
Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	The Internal Audit Directorate at ISED is conducting an advisory review of the ISC program. Results are expected in fall 2021.
Engagement of applicants and recipients in 2020–21	As one of 20 participating federal government departments, the NRC submits challenges to ISED for posting. NRC IRAP works with NRC Research Leads to: • Assess and select proposals for funding. • Engage clients by developing and managing grants or contracts for proof of concept to prototype development.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	449,820	291,000	2,800,000	19,670,683	10,024,930	7,224,930
Total contributions	-	-	-	-	-	-
Total program	**449,820**	**291,000**	**2,800,000**	**19,670,683**	**10,024,930**	**7,224,930**
Explanation of variances	Variance due to increased funding and spending as a result of COVID-19. The NRC has also reprofiled $6.0M of its 2020–21 funding to 2021–22.					

Industrial Research Assistance Program (IRAP)

Start date	September 1, 2018 (T&Cs renewal date; original start date: April 1, 1965)
End date	Ongoing
Type of transfer payment	Contribution
Type of appropriation	Estimates
Fiscal year for terms and conditions	2018–19
Link to departmental result(s)	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Program: Industrial Research Assistance Program (IRAP)
Purpose and objectives of transfer payment program	The program contributes to the growth and prosperity of Canadian SMEs by stimulating innovation, adoption and/or commercialization of technology-based products, services, or processes in Canada. This is done through: 1) technical and related business advice and networking facilitated by a cross-Canada network of field professional staff; 2) cost-shared merit-based contributions; and 3) contributions supporting employment of post-secondary graduates. [This program has the following streams: Contributions to Firms; Contributions to Organizations; and Youth Employment Program (YEP)]. NRC IRAP supports the placement of graduates in SMEs through its participation in the delivery of YEP sponsored by Employment and Social Development Canada's Youth Employment and Skills Strategy (YESS). In 2020–21, NRC IRAP delivered the Innovation Assistance Program (IAP) in support of high growth firms in the innovation sector as a wage subsidy to assist Canadian SMEs struggling as a result of COVID-19 that did not qualify for other government wage subsidy programs. With the onset of COVID-19 pandemic, NRC IRAP established a suite of ten temporary Subject Expert Teams (SETs) to coordinate and accelerate support to Canadian SMEs who presented viable solutions for detection, prevention and treatment of the illness. NRC IRAP supported projects to further technology development, capacity building and manufacturing scale-up in response to COVID-19. Recipients are not required to repay funds obtained under this transfer payment program (TPP).
Results achieved	• Stimulation of innovation in SMEs in Canada. • Increased growth of innovative SMEs and creation of wealth for Canada. Results are described in detail in the NRC's 2020–21 Departmental Results Report; see main document.

Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	An Evaluation of IRAP was completed in 2017–18. The next evaluation is scheduled to begin in 2021–22.
Engagement of applicants and recipients in 2020–21	NRC IRAP is a national program managed on a regional basis delivered by a network of over 265 Industrial Technology Advisors (ITAs) located in approximately 110 communities across the country who provide customized advice to growth oriented technologically innovative SMEs. ITAs are engaged with client SMEs throughout the entire contribution management process, from building project proposals through to project completion. At the end of their funded project, recipients are required to complete an online Post-Project Report. This assessment captures information on the recipient's experience with NRC IRAP and, along with published service standards, is used by the program to develop continuous program improvements. NRC IRAP has an Advisory Board composed of 10 to 12 members from the industry sector and industry associations. This Board provides advice to NRC IRAP management and brings an external perspective on the strategic directions and management of the program. NRC IRAP is actively engaged with Treasury Board Secretariat (TBS) Grants and Contributions Reform. Participation in workshops and constant alignment with recent TBS policy and guidelines has enabled the program to steadily move toward principles such as a Recipient Engagement Strategy.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	-	-	-	-	-	-
Total contributions	275,470,812	335,412,426	307,214,000	788,646,854	715,902,634	408,688,634
Total program	**275,470,812**	**335,412,426**	**307,214,000**	**788,646,854**	**715,902,634**	**408,688,634**
Explanation of variances	The variance of $408,688,634 is due to additional funding received for COVID-19 initiatives, the Innovation Assistance Program, and vaccine and therapeutics.					

International Affiliations Program

Start date	1958
End date	Ongoing
Type of transfer payment	Grant
Type of appropriation	Estimates
Fiscal year for terms and conditions	2011–12
Link to departmental result(s)	Scientific and technological knowledge advances
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Program: International Affiliations
Purpose and objectives of transfer payment program	Canada's membership in international science and technology organizations promotes international research and innovation, networking, advocacy, leadership opportunities as well as access to benchmarking possibilities, enabling Canadian science, technology, and industry to remain competitive.
Results achieved	• Enhanced the NRC's international visibility and Canada's reputation as a global leader in science, technology and innovation (STI). • Enhanced Canadian influence in solidifying interdisciplinary science-based global policy making. • Contributed to Canadian STI leader development via ISC opportunities for leadership development and leadership opportunities implementing equity, diversity and inclusion (EDI) approaches. • Increased market-oriented innovation opportunities to Canadian SMEs and export growth via global value chains to ensure Canadian excellence and competitiveness.
Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	An evaluation was completed in 2019–20 (Evaluation of the NRC's Grants for International Affiliations Program).
Engagement of applicants and recipients in 2020–21	An in-depth engagement took place with representatives of each Canadian National Committee (CNC) that has assessed evolving priorities, most valued benefits of the program to participants and perceived needs of each international affiliation's CNC. Further ongoing dialogue has begun with existing CNCs to gauge their desired level of international participation as well as with other potential applicants.

	An Advisory Committee for the program has been established. It has now met through two full fiscal years, drawing on cross government science departments and agencies and deploying expertise to leverage Canadian international science objectives. A regular, frequent interaction will ensure continuous engagement and coordination. In addition, engagement with international affiliations management has intensified and will continue to better gauge impact and plans. This will inform the Canadian STI management community of the science diplomacy needs of Canadian practitioners in light of track records of international affiliations and of associated level of required support. Moreover, a regular engagement will continue to take place including completion of a reporting questionnaire.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	599,890	588,917	560,000	608,896	608,896	48,896
Total contributions	-	-	-	-	-	-
Total program	**599,890**	**588,917**	**560,000**	**608,896**	**608,896**	**48,896**
Explanation of variances	Variance is immaterial.					

International Astronomical Observatories Program

Start date	1978
End date	Ongoing
Type of transfer payment	Contribution
Type of appropriation	Estimates
Fiscal year for terms and conditions	2015–16
Link to departmental result(s)	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Program: Herzberg Astronomy & Astrophysics
Purpose and objectives of transfer payment program	Astronomy is a global science. The increasing cost of leading-edge observatories and the scarcity of ideal observation sites have led to a greater focus on international collaboration for large-scale astronomy projects which lead to advances in our knowledge and understanding of the universe. The NRC, in collaboration with other international bodies, provides financial contributions to support the management and operations of offshore ground-based observatories and their related facilities, including the Canada-France-Hawaii Telescope (CFHT), the twin telescopes of the Gemini Observatory and the Atacama Large Millimetre-submillimetre Array (ALMA). The NRC participates in the oversight and direction of these facilities and their research capabilities. The NRC also represents Canada in the Square Kilometre Array (SKA) consortium for the pre-construction phase of the telescope. In 2015, Canada joined the international partnership to participate in the Thirty Meter Telescope (TMT). The NRC, on behalf of Canada, provides both financial and in-kind contributions. International agreements governing these observatories are long-term commitments that specify contributions to support preconstruction design and development, construction, operation and maintenance, capital improvements (e.g., development of new astronomical instruments and other facility upgrades) and decommissioning of the international ground-based observatories and their related facilities. In addition, they include commitments to support the university-based user communities to ensure a fair and progressive use of these observatories. The NRC participates in the governance of these international facilities on behalf of the Canadian astronomy research community and provides appropriate support, including sophisticated data management services and instrumentation. Through the NRC's financial and in-kind contributions, the Canadian astronomy community is assured merit-based access to these facilities with appropriate support. Recipients are not required to repay funds obtained under this TTP.

Results achieved	• Demand by Canadian astronomers for international observatories continued to exceed time available, an indicator of the relevance of the observatories and their instrumentation. 227 scientific papers were published by users based on data obtained using the CFHT, 250 based on data from the Gemini Observatory, and 441 based on data from ALMA. • The NRC's astronomy and astrophysics researchers published 162 refereed journal articles, 53 non-refereed publications and made 53 presentations at national & international institutes, conferences and workshops. • The NRC's Canadian Astronomy Data Centre (CADC) houses over 1.6 petabytes (PB) of open science data from the world's astronomical telescopes. From these collections, the CADC delivered 4.9 PB of data (102 million distinct files, many delivered multiple times) to over 18,000 distinct network addresses around the globe. • Logan Francis, a graduate student co-supervised by an NRC researcher, and then-NRC postdoctoral fellow Nienke van der Marel published a noteworthy paper that mined the ALMA data archive for observations of forming solar systems. This comparative study allowed them to place very tight constraints on when in a disk's evolution, a forming planet could be detected. • NRC astronomer Doug Johnstone and visiting Korean graduate student Yong-Hee Lee published their analysis of a decade of repeating brightness bursts from a still-forming star. Aimed at uncovering the processes responsible for the recurrent dumping of material onto the star, these unique observational measurements are essential to motivate theoretical investigations into the formation of stars and planets. • NRC astronomer Christian Marois was awarded a Guggenheim Fellowship, enabling him to advance development of a new polychromatic imaging system in the NRC's NEW EARTH laboratory to search for Earth-like planets around other stars. An external review committee also selected Dr. Marois' proposal for funding under the NRC's Small Teams Ideation Program, providing support to work in collaboration with external researchers and graduate students. • CHIME (the Canadian Hydrogen Intensity Mapping Experiment), located at the NRC's DRAO (Dominion Radio Astrophysical Observatory) site, confirmed its dominant position in the exciting field of Fast Radio Bursts (FRBs) with two *Nature* articles, each cited more than 100 times, and an FRB catalog that increased the number of known FRBs more than tenfold. • The NRC was chosen to supply a critical component, a real-time controller that is the brain behind a next-generation adaptive optics system at the Gemini North telescope. This multiyear contract, leveraging design work done for the TMT, is valued at over $1M, and demonstrates how the NRC provides critical support for international observatories and ensures that Canadian astronomers have access to state-of-the-art facilities. • The NRC obtained a contract to supply the SKA MeerKAT observatory in South Africa with in-house designed critical components, called low-noise amplifiers, which enable highly sensitive radio receivers. To achieve this, the NRC relies heavily on Canadian suppliers to help it manufacture the

	state-of-the-art equipment, generating unique opportunities for its Canadian partners.
Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	An evaluation was completed in 2016–17 (Evaluation of the NRC Herzberg Astronomy and Astrophysics (HAA) Portfolio). The next evaluation is scheduled for completion in 2021–22.
Engagement of applicants and recipients in 2020–21	The NRC manages observatories established or maintained by the Government of Canada for the benefit of the Canadian astronomy research community, aligning its contributions to the priorities of the community's Long Range Plan for Astronomy and Astrophysics. The NRC participates on the Boards which oversee the observatories to ensure that the science directions and programs of the facilities reflect Canadian strengths and interests. In addition, the NRC ensures that these activities increase opportunities for Canadian researchers and firms to develop relevant instrumentation for the observatories. To carry out its roles effectively, the NRC provides current information about each observatory to research community-based committees of scientists, which provide expert advice on observatory operations and development. The NRC provides extensive support to the user community through numerous services extending from administering the time allocation process for Canadian researchers, to delivery of science-ready data (through the CADC).

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	-	-	-	-	-	-
Total contributions	27,723,107	29,044,279	58,703,501	63,899,394	25,495,440	(33,208,061)
Total program	**27,723,107**	**29,044,279**	**58,703,501**	**63,899,394**	**25,495,440**	**(33,208,061)**
Explanation of variances	The significant variance between planned spending and actual spending is primarily due to project delays associated with Canada’s participation in the construction of the TMT that are outside the NRC’s control. As a result, the NRC has reprofiled $33.0M of its 2020–21 funding related with Canada’s contribution to the TMT to future years.					

TRIUMF

Start date	April 1, 1977
End date	Ongoing
Type of transfer payment	Contribution
Type of appropriation	Estimates
Fiscal year for terms and conditions	2020–21
Link to departmental result(s)	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
Link to the NRC's Program Inventory	Core Responsibility: Science and Innovation Program: TRIUMF
Purpose and objectives of transfer payment program	TRIUMF is Canada's particle accelerator centre. The laboratory is one of Canada's key investments in large-scale research infrastructure. It provides world-class facilities for research in sub-atomic physics, accelerator science, life sciences, and materials science. A consortium of Canadian universities own and operate TRIUMF, which receives its federal operational funding through the NRC in five-year allocations via a contribution agreement. The NRC plays an important oversight and stewardship role for TRIUMF on behalf of the Government of Canada. Recipients are not required to repay funds obtained under this TPP.
Results achieved	• TRIUMF contributed to the publication of 317 manuscripts in scientific journals. • TRIUMF researchers involved in the ALPHA (Antihydrogen Laser Physics Apparatus) antimatter experiment at CERN (the European Organization for Nuclear Research) achieved a world's first breakthrough result with the laser cooling of anti-hydrogen. This is a major achievement, which will pave the way for the most precise test of matter and anti-matter behaviour. The results were published as a cover story in the journal *Nature*. • The team at TRIUMF's TITAN facility completed important studies on scandium isotopes (together with collogues from the radioactive beam facility at Michigan State University). The findings, including a complete theoretical description, were published in Physical Review Letters. • The Molecular and Material Science team at TRIUMF, together with researchers from the University of British Columbia, and ETH-Zurich, performed detailed muon spin rotation measurements in the classic antiferromagnet Fe_2O_3. This work uncovered new and important information about the material characteristics of this substance which will drive further research going forward. • The ARIEL facility construction project made significant progress despite the challenges of the COVID-19 pandemic. Major achievements include advancing the target hall shielding, achieving a successful factory acceptance of the hot cells, and completing the CANadian Rare isotope facility with Electron Beam ion source (CANREB) project. • CANREB delivered its first radioactive ion beams to experiments within

	TRIUMF's ISAC-II facility. CANREB's high-resolution separator demonstrated a resolution of 10,000 without correction elements – a milestone achievement in beam physics. • The ARIEL electron linear accelerator was successfully commissioned to deliver a 30 MeV beam at 1 kW beam power level; this achievement sets the stage for the future high power (10 kW) phases of the commissioning. • Despite the impact of the pandemic, TRIUMF was able to host 175 scientific visitors, students, and users, 48 of which came from international institutions. • TRIUMF trained more than 220 highly qualified personnel, including undergraduate and graduate students, and post-doctoral researchers. • Construction continued on the Institute for Advanced Medical Isotope facility, with the project on track for substantial completion in summer 2022. • TRIUMF continued to advance its plan to produce and commercialize a new isotope (Ac-225) that shows great promise as a treatment option for patients with late stage untreatable cancers. A funding and collaboration agreement was secured with Fusion Pharmaceuticals, a Canadian company that is a leader in Ac-225 drug development. • TRIUMF spinoff, ARTMS Products – created in collaboration with BC Cancer, the Centre for Probe Development and Commercialization, and Lawson Health Institute in response to the isotope crisis from the closing of the Chalk River reactor – received Health Canada approval. ARTMS also expanded its product line and formed new partnerships with Telix Pharmaceuticals and Isotopia Molecular Imaging. ARTMS was also awarded $300K in funding from Innovate BC to fund a new collaboration with TRIUMF to develop a new zirconium-89 product. • Another TRIUMF spinoff, Ideon (formerly CRM Geotomography), continues to advance the development and commercialization of proprietary detector technologies and artificial intelligence techniques to provide x-ray like imaging beneath the earth's surface. Ideon successfully developed a borehole sized detector and announced funding from NRC IRAP (EUREKA), as well as new partnerships with France's Orano Group and Canada's Fireweed Zinc Ltd. mining companies. • TRIUMF Innovations was selected as the co-lead for a $30M national Medical Isotope Innovation Ecosystem proposal for the Strategic Innovation Fund Stream 5 program. • Work began on a project to implement Workday, a new Enterprise Resource Planning system, which is on track to launch in July 2021. This modernization of core systems will result in the reduction of manual data entry, the mitigation of operational risk through retirement of unsupported legacy systems, and the creation of new efficiencies across the continuum of HR and Finance processes.
Findings of audits completed in 2020–21	Not applicable
Findings of evaluations completed in 2020–21	An evaluation was completed in 2018–19 (Evaluation of TRIUMF). The next evaluation is scheduled for 2022–23.

Engagement of applicants and recipients in 2020–21	The NRC chairs the Agency Committee on TRIUMF (ACT), which includes the federal agencies that fund and oversee activities at TRIUMF, providing TRIUMF management the opportunity to present progress and discuss future directions for the facility. The NRC also manages the Advisory Committee on TRIUMF (ACOT), composed of international experts within disciplines that span the research and technology activities of TRIUMF. ACOT reports its findings to the NRC and TRIUMF senior management twice annually, making recommendations on programs and management as well as reporting on the scientific and technological achievements of TRIUMF programs and facilities. Observer representatives from the National Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, the Canadian Institute of Nuclear Physics, the Canadian Institute of Particle Physics, the materials science community and TRIUMF's user community ensure that TRIUMF's directions are well aligned with the research community's needs and that TRIUMF is working with all its constituencies across Canada. The Committee considers all aspects of the TRIUMF program, with a particular emphasis on science and technological issues to ensure the relevance, impact, and world-class standing of TRIUMF's activities. Through NRC activities in ACT and ACOT, the NRC maintains a close relationship with TRIUMF. Dialogue ensures that investments are optimal, the NRC meets the needs of its recipient, and provides a vehicle for feedback on the transfer payment management process. TRIUMF has approximately 430 staff and students supported via the NRC's contribution agreement. An additional 128 positions are supported through other sources for specific designated purposes, including temporary funds to operate new capital infrastructure. In a typical year, TRIUMF provides training for more than 200 undergraduate, graduate students, and postdoctoral fellows. TRIUMF has numerous programs aimed at young people, students, teachers, and the general public to ensure that as many as possible share the wonder of discovery and experience the excitement generated by one of Canada's premier laboratories. In addition, TRIUMF offers a suite of programs to aide in the growth and development of professional skills for its graduate students and postdocs.

Financial information (dollars)

Type of transfer payment	2018–19 Actual spending	2019–20 Actual spending	2020–21 Planned spending	2020–21 Total authorities available for use	2020–21 Actual spending (authorities used)	Variance (2020–21 actual minus 2020–21 planned)
Total grants	-	-	-	-	-	-
Total contributions	57,280,490	55,162,800	58,643,659	59,443,659	59,443,659	800,000
Total program	**57,280,490**	**55,162,800**	**58,643,659**	**59,443,659**	**59,443,659**	**800,000**
Explanation of variances	Variance is immaterial.					

Gender-based analysis plus

Section 1: Institutional GBA Plus Capacity

The responsibility centre for GBA Plus at the NRC has been established in the Secretary General's division, with the NRC's Secretary General fulfilling the role of GBA Plus champion for the organization.

Although the NRC does not have a separate GBA Plus policy or statement of intent, GBA Plus is a central component of the NRC's Equity, Diversity and Inclusion (EDI) Strategy. The EDI Strategy is part of the NRC Strategic Human Resources Plan, which covers the five-year period from 2019-2024 and is a companion to the NRC Five-Year Strategic Plan.

The NRC has also integrated GBA Plus into many areas of its operations to assess potential impacts of its policies, programs, and initiatives on diverse groups. The intent is to use GBA Plus tools to help ensure an inclusive approach from ideation through to outcome measurement.

In keeping with this approach, the NRC has:

- Integrated GBA Plus into policy documents at the earliest possible stage in planning, including Memoranda to Cabinet (MCs), Treasury Board (TB) submissions, and budget proposals;
- Included EDI targets in the NRC Five-Year Strategic Plan, 2019-2024, to plan and track progress on representation and establish organization-wide accountability;
- Employed GBA Plus tools in annual operational plans at the research centre and program level to help in applying GBA Plus to existing and new R&D initiatives, program design, and monitoring and evaluation;
- Implemented the development of GBA Plus plans for NRC programs, such as NRC IRAP and the Collaborative Science, Technology and Innovation Program (Challenge Programs);
- Ensured that GBA Plus commitments are included in the all NRC operational plans;
- Set the expectation that GBA Plus and EDI strategies for NRC programs be updated on an evergreen basis;
- Included GBA Plus as part of its formal evaluation of the effectiveness of NRC programs and initiatives;
- Carried out training and other capacity building initiatives with program directors and planners across the organization, as well as a project team reviewing internal NRC processes;
- Had all members of the NRC's senior executive committee sign a Commitment of Action toward a Diverse, Inclusive and Anti-Racist NRC, a pledge that confirms a personal and collective commitment to learn, reflect and take steps to drive positive and enduring change;
- Launched three web portals with resources for employees, managers and supervisors: an anti-racism portal and an EDI portal, as well as one focused on supporting and improving mental health;
- Incorporated a GBA Plus lens into a pilot project to renew select internal NRC processes;
- Stemming from the Dialogue Action Plan, the NRC undertook a review and simplification of five internal business processes (project management, procurement, client agreements, hiring and onboarding), in an effort to make it easier to do business within the NRC. Seeking to recognize and address systemic bias in NRC processes, the team systematically

implemented the GBA Plus methodology to the process improvement projects. Actions included seeking input from diverse voices to validate preliminary findings, uncover existing barriers, identify innovative and inclusive solutions, and minimize unintended negative consequences of proposed changes. The team specifically invited participation from under-represented groups, including Indigenous people of Canada, persons with disabilities, LGBTQ2+, visible minorities, and other groups with intersecting identity factors; and

- For the hiring process, the team also analyzed hiring data to determine whether employment equity groups remain proportionately represented throughout recruitment process, and to identify factors that may influence employment equity group representation. The NRC has since been approached by external parties, including Deloitte and the Public Service Commission, as a thought-leader in the area and this body of work is under consideration to be published in 2021–22. In addition, this work has uncovered systemic barriers in the NRC's hiring process that can now be actively addressed, supporting the NRC's reputation and commitment to inclusivity, and leading to better innovation and research excellence.

Section 2: Gender and Diversity Impacts, by Program

Core Responsibility: Science and Innovation

Program Name: **Overall NRC**

Target Population: All Canadians

Distribution of Benefits:

		First group	Second group	Third group	Fourth group	Fifth group	
By gender	**Men**			●			**Women**
By income level	**Low**			●			**High**

		First group	Second group	Third group	
By age group	**Youth**		●		**Senior**

Key Impacts: As Canada's largest federal research and development organization, the NRC partners with Canadian industry to take research impacts from the lab to the marketplace, where people can experience the benefits. This approach delivers innovation faster, enhances people's lives and addresses some of the world's most pressing problems. It also fits with the NRC's mission to have an impact by advancing knowledge, applying leading-edge technologies, and working with other innovators to find creative, relevant and sustainable solutions to Canada's current and future economic, social and environmental challenges.

Within the organization, the NRC's EDI Strategy serves as a tool to increase diversity and inclusiveness in the NRC workforce and NRC engagements as a partner/collaborator. As part of this strategy, the NRC has developed two mandatory online courses for all staff in areas related to EDI, including a fundamentals course and unconscious bias training. A mandatory course on

managing bias in hiring was created for all supervisors and moving forward, plans are in development for training in targeted areas of the organization.

For internal communication, the NRC established an internal portal for EDI information, tools and resources; made progress in ensuring that diversity and inclusive language are reflected in NRC images, posters and materials; adopted inclusive practices such as land acknowledgements in formal gatherings; and supported the formation of grassroots networks and communities (e.g. LGBTQ2). Moving forward, the NRC is analyzing the organization's needs/approach to address anti-racism/discrimination, including providing additional training and awareness to address racism, and leveraging work underway in the federal public service, including the Black Federal Employee Caucus to provide tools to employees.

The NRC intends to continue implementing further programs and initiatives with a specific focus on women researchers and students from employment equity designated groups, such as an initiative that seeks to increase the percentage of women in STEM careers through the hiring of more women in post-doctoral positions. In 2020–21, the NRC launched a pilot mentoring program for Quebec-based women in STEM careers as an important component of ongoing efforts to support women in STEM at the NRC.

The NRC also hosted a symposium called Turning Challenges into Opportunities, held on the International Day of Women and Girls in Science (February 11, 2021) to celebrate the achievements of women in STEM. The virtual format allowed more than 1,400 participants from 40 organizations in the federal science and innovation community to attend, and the poster session featured close to 90 projects led by women from the NRC and other government agencies.

The NRC's Five-Year Strategic Plan, launched in 2019, includes employment equity targets for all research centres and NRC IRAP. These targets require each business unit to achieve at least labour market availability for each of the under-represented groups (women, Indigenous peoples, visible minorities, and persons with disabilities) by 2024.

Finally, in alignment with the Gender Results Framework, the NRC conducted GBA Plus analysis on Cabinet documents (e.g. MCs, TB submissions and budget two-pagers), as well as during program design and in the evaluation of initiatives.

Core Responsibility: Science and Innovation

Program Name: **NRC Research Centres (includes: Advanced Electronics and Photonics; Aerospace; Aquatic and Crop Resource Development; Automotive and Surface Transportation; Construction; Digital Technologies; Energy, Mining and Environment; Herzberg Astronomy & Astrophysics; Human Health Therapeutics; Medical Devices; Metrology; Nanotechnology; Ocean, Coastal and River Engineering; Security and Disruptive Technologies) and the Collaborative Science, Technology and Innovation Program**

Target Population: All Canadians

Distribution of Benefits:

		First group	Second group	Third group	Fourth group	Fifth group	
By gender	**Men**			●			**Women**
By income level	**Low**			●			**High**

		First group	Second group	Third group	
By age group	**Youth**		●		**Senior**

Key Impacts: The NRC research centres work to deliver the NRC's mission by advancing knowledge, applying leading-edge technologies, and working with other innovators to find creative, relevant and sustainable solutions to Canada's current and future economic, social and environmental challenges.

To build on GBA Plus initiatives within the organization in 2020–21, the NRC's research centres worked to meet the EDI targets included in the NRC Five-Year Strategic Plan. GBA Plus commitments were also included in the operational plans for each research centre, and training was conducted with all planners across the NRC. In addition, each research centre had the opportunity to have a representative participate in the NRC's Women in STEM committee, and to have their employees take part in the pilot mentoring program for women in STEM careers at the NRC.

For internal programs (staffed at the research centre level), the NRC National Program Office collected EDI data on applicants to the New Beginnings Initiative and included GBA Plus/EDI considerations in Ideation Fund proposals. Challenge and Supercluster Support programs were also required to have a GBA Plus plan and framework, for which the new NRC Challenge Program on quantum sensing engaged the Rotman School of Business Institute for Gender and the Economy at the University of Toronto for a thorough, professional GBA Plus analysis. The findings from this analysis will inform the GBA Plus approaches for other research at the NRC.

Finally, the NRC's new Environmental Research Strategy included a GBA Plus annex. Researchers developing projects in fields related to the environment were encouraged to use these tools to increase the impact of research on diverse groups.

Core Responsibility: Science and Innovation

Program Name: **NRC IRAP**

Target Population: All Canadians

Distribution of Benefits:

		First group	Second group	Third group	Fourth group	Fifth group	
By gender	**Men**		●				**Women**
By income level	**Low**				●		**High**

		First group	Second group	Third group	
By age group	**Youth**		●		**Senior**

Key Impacts: The mandate of NRC IRAP is to stimulate wealth creation for Canada through technological innovation. Financial support from NRC IRAP not only helps firms achieve their objectives but also benefits Canada through wealth creation. Benefits for Canada can take a variety of forms, including economic prosperity of firms, job creation, and creation of new products and services that benefit society.

SMEs represent more than 98 percent of businesses in Canada, and in 2017 SMEs employed 89.6 percent of the private sector workforce. In 2017, 63.5 percent of SMEs were majority-owned by men and 15.6 percent of SMEs were majority-owned by women, while 20.9 percent of SMEs were equally owned by men and women. Just over 40 percent of SMEs were majority owned by members of the same family, 12.2 percent by visible minorities, 1.4 percent by Indigenous peoples and 0.5 percent by person(s) with a disability.

NRC IRAP is designed so that no one particular group of firm owners is selected or favoured over any other. The program is sector agnostic, and subscribed firms represent a cross-section of the Canadian economy. However, the nature of the program permits it to, at times, choose to target initiatives, such as to serve Indigenous led SMEs, Indigenous entrepreneurship, and benefits to Indigenous communities.

In keeping with this ability, NRC IRAP began to set goals for diversifying participation in its programs and build on work already underway to provide support to women and Indigenous-led firms through a number of agreements with not-for-profit organizations. NRC IRAP also worked through considerations such as how best to support new classes of Indigenous recipients such as sole proprietorships and Indigenous communities.

NRC IRAP also focused EDI efforts on firm ownership and leadership teams. Firms that met EDI targets, or are actively working towards meeting them, will be positively impacted in their merit-based review of financial support. NRC IRAP expects that progress at the top of organizations will increase the likelihood that the EDI composition of a firm's total workforce would trend in a positive direction. NRC IRAP also committed to targeting 50 percent of its allocated Youth Employment and Skills Strategy funding to women, up from the current 34 percent.

Finally, NRC IRAP took steps to implement a recruitment system to build a diverse and representative workforce and continued to build EDI into development and advancement opportunities. NRC IRAP also participated in the Women Entrepreneurship Strategy Assistant Deputy Minister Committee.

Supplementary Information Sources:

The NRC's Equity, Diversity and Inclusion webpage

The NRC Strategic Plan 2019-2024

GBA Plus Data Collection Plan:

For the NRC, NRC research centres and internal NRC IRAP, NRC Human Resources monitors and tracks statistics on groups designated in the *Employment Equity Act*, as well as women in STEM specifically. To support these efforts, the NRC has created a streamlined set of EDI standards and performance indicators, and established a regular routine for reporting on EDI progress.

For external NRC IRAP, the program has indicators in place to collect and report data to meet the TB requirements as a grants and contributions-based program. Currently, data collection related to demographics is considered voluntary, and NRC IRAP's current client management system is not equipped to track and record this information. NRC IRAP has developed a measurement strategy to rectify this for under-represented groups, launching in 2021–22.

Section 3: Program Links to Gender Results Framework

Core Responsibility: Science and Innovation

Program name	Education and Skills Development	Economic Participation and Prosperity	Leadership and Democratic Participation	Gender-based Violence and Access to Justice	Poverty Reduction, Health and Well-Being	Gender Equality around the World
Overall NRC	☒	☒				
NRC Research Programs	☒	☒				
NRC IRAP	☒	☒				

Section 4: Program Links to Quality of Life Framework

Core Responsibility: Science and Innovation

	Prosperity	Health	Environment	Society	Good Governance
Overall NRC	☒	☒	☒	☒	
NRC Research Programs	☒	☒	☒	☒	
NRC IRAP	☒	☒	☒	☒	

Response to parliamentary committees and external audits

Response to parliamentary committees

4th Report of the Special Senate Committee on the Arctic "Northern Lights: A Wake-Up Call for the Future of Canada"

The mandate of the Special Senate Committee on the Arctic was to study the "significant and rapid changes to the Arctic and impacts on original inhabitants." As the Government of Canada prepares a new policy framework for the Arctic, this study recommends important changes for federal policy in areas such Canada's sovereignty and safety, devolution of federal programs and services and investments in infrastructure to support the well-being and future prosperity of Arctic communities. The committee strongly believes that the social, cultural and economic well-being of Arctic residents should be the cornerstone of the forthcoming federal policy framework for the Arctic and northern regions. Implementation of the recommendations put forward by this report will contribute to the effectiveness of that framework for the future of Canada.

Recommendation 6 – That the Government of Canada: 1) direct the National Research Council to complete a building code adapted to Arctic conditions and the effects of climate change; 2) implement an action plan to mitigate the effects of climate change on existing and new infrastructure, including housing; 3) take immediate measures to address the housing crisis in the Arctic by funding a complete continuum of Arctic housing; and 4) report on the effects of its investments on housing annually to local, Indigenous and territorial governments.

The NRC's corrective actions to address recommendation 6 included in the Government Response to the 4th Report of the Special Senate Committee on the Arctic "Northern Lights: A Wake-Up Call for the Future of Canada"

The NRC is working with the First Nations National Building Officers Association and an Indigenous Advisory group to develop a Technical Guide for Northern Housing, which will provide best practices for successful home construction in Northern areas. To develop this guide, the NRC consulted with First Nations, Métis, and Inuit communities and architects on home design specific to Indigenous and Northern housing needs. This four-year project is a collaboration between the NRC, Natural Resources Canada, the Canada Mortgage and Housing Corporation, and ISC.

The NRC is also collaborating in the development and review of the Standards Council of Canada's Northern Infrastructure Standardization Initiative for Northern buildings, including a reference to a new standard in the National Building Code of Canada;

working with Infrastructure Canada (INFC) to address the effects of climate change on both buildings and core public infrastructure, with some solutions adaptable to Northern communities; and extensively involved in research partnerships supporting adaptation measures for Northern infrastructure and housing.

Environment and Climate Change Canada, in collaboration with the NRC and the Pacific Impact Climate Consortium, published a report in October 2020 entitled Climate-Resilient Buildings and Core Public Infrastructure: an assessment of the impact of climate change on climatic design data in Canada. The report assesses how climatic design data relevant to users of the National Building Code of Canada and the Canadian Highway Bridge Design Code might change as the climate continues to warm. Assessments are made at the regional-to-national scale, including Canada's northern region.

The following related information was included in the NRC's 2020–21 Departmental Results Report:

In collaboration with INFC, the Climate Resilient Buildings and Core Public Infrastructure Initiative completed national guidance documents for the climate change resiliency of infrastructure and buildings, most notably national guidance for wildland urban interface fires and flood resilient buildings, and produced future climatic design data for use by Canadian codes and standards.

The first version of the Technical Guide for Northern Housing, which has been developed by the NRC in collaboration with the First Nations National Building Officials Association, Natural Resources Canada, an Indigenous advisory group and specialized engineering and Indigenous architectural consultants, is nearing completion and is expected to be published in 2021.

Response to audits conducted by the Office of the Auditor General of Canada (including audits conducted by the Commissioner of the Environment and Sustainable Development)

There were no audits in 2020–21 requiring a response.

Response to audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages

There were no audits in 2020–21 requiring a response.