2023 Peel Climate Change Performance Measurement System

Final Report

Prepared in Consultation with KPMG

May 2024

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1.0   Introduction

Since 2007, the Region of Peel has provided climate change special levy funding to its partner Conservation Authorities (CAs), Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC), to address unfunded and underfunded activities that combat the impacts of climate change.

In 2016, Peel Council approved the Peel-CA Climate Change Budget Risk Methodology (CCBRM). This multistep process determines the level of risk and priority for current and proposed programs/projects for a particular budget year. This information is reported by Peel-CAs to Council through the annual budget process using the categories Act, Invest, and Sustain.

Through the development of the CCBRM, the need to create a set of Key Performance Indicators (KPIs) was identified. The KPIs would assist with understanding the impact of the climate levy and provide feedback on program performance. KPMG Canada was retained to provide expertise in advancing the need to measure the effectiveness of the funded programs as contributors to the Region's desired Peel Climate Change Master Plan (CCMP) outcomes. The resulting Peel Climate Change Performance Measurement System (the "Measurement System") was created, together with KPIs, to systematically track and report on the performance of program areas on an annual basis. Specifically, the Measurement System is designed to answer:

- How well each of the program areas are performing.
- Where improvements can be made within the various program areas.

Through this annual report, the consistent Measurement System results are shared with Regional staff. These yearly reports support internal review of Peel-CAs budget submissions in an integrated way, increase alignment across agencies, and provide clarity on how regional investments are achieving shared climate change outcomes. This is the third annual report published to advance these goals.

1.1   Measurement System Development

In developing the Measurement System, a consistent methodology established shared Key Performance Indicators (KPIs) that measure the collective performance of TRCA and CVC climate change initiatives. It aligns 44 cost centres between TRCA and CVC into eight program areas (each with their own KPI), as well as calculating a greenhouse gas (GHG) emissions reduction/sequestration value.

The KPIs use a qualitative approach to provide information regarding the likelihood of a program area achieving defined outcomes. This is a recognized distinction from the certainty defined by program evaluation. The System uses various methodologies including expert panels, user reviews and participant surveys. It draws from best practices in the field of performance measurement, and places emphasis on ease of implementation by prioritizing annual replicability while minimizing subjectivity using templates and a defined scoring system. Methodologies use reviewers who are familiar with the activities and outputs being assessed and experts who are knowledgeable about the program area or specific outcome being measured. These experts and reviewers are from outside the program area and may represent staff from municipalities, agencies or other government organizations. The KPIs are presented as point-in-time scores, measuring performance relative to the established objective for each program area.

Improvements implemented during the 2023 reporting cycle include:

- Minor updates and improvements to program area methodologies and feedback forms to maintain consistency and gather user insights for improvements to outputs and to inform future projects.

- Refinement to the framework for the identification and reporting of co-benefits to ensure they are significant and separate from the program area objective. Consistent categories that align with the Region's CCMP ensure that co-benefits remain meaningful to the Region.

- Refinement of the review process for internal users of outputs and projects to minimize the potential for bias and ensure that ratings are fair and accurate.
- A renewed focus on sequestration in the mitigation performance report including the establishment of a new target for sequestration.

1.2 Measurement System Scoring

Consistent with past reports, the 2023 report provides an overall score for each program area, a summary of how well each of the program areas are performing and information that can be used to identify program improvements.

All indicators are calculated on a 1 to 5 scale, where 5 = Very Effective, and 1 = Not Effective (**Figure 1**).

0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Not Effective	Minimally Effective	Moderately Effective	Effective	Very Effective

Figure 1: Peel Climate Change Performance Measurement System Scale

2.0 2023 Performance Report

2.1 2023 Performance Report Highlights

- All of the eight (8) program areas scored as either Effective or Very Effective in achieving the program area objective. Seven (7) of the eight (8) programs scored as Very Effective.
- Scores ranged from 3.9 to 4.6 out of 5.0.
- There was little variation between the 2023 and 2022 scores for all program areas, resulting in no changes to the rating category on the Measurement System scale. Six (6) of the eight (8) PA scores were within 7% of their 2022 scores and the other two were within 10%.
- All scores were within the 20% acceptable variance from the previous year.

2.2 Performance Report Structure

The following performance report consists of two parts:

- **Part 1: Overview Performance Report (2.3)** – This section includes a one-page overview table which provides the KPI score as well as the rating and percent change for the main objectives of each of the eight program areas as well as GHG emissions reduction. The program areas are grouped and reported according to the three overarching Measurement System models: Adaptation, Knowledge and Awareness, and Mitigation.

- **Part 2: Program Area Performance Reports (2.4)** – This section includes a one-page summary report for each of the eight program areas, as well as one for GHG emissions reduction. These reports provide high-level information on program area actions and the main factors that affected the performance results. Detailed program area performance reports – including actions/activities undertaken, program area methodology, identified co-benefits and explanation of the rating can be found in Appendix A.

2.3 Overview Performance Report

Adaptation Performance

Program Area	Program Area Objective	Score / 5.0	Rating	% Change from 2022
Climate Science	Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).	4.6	Very Effective	+5% Non-significant change
Flood Management	Minimize the risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood minimization measures).	4.6	Very Effective	-2% Non-significant change
Erosion Management	Minimize the risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).	4.3	Very Effective	-10% Non-significant change
Restoration and Natural Heritage Science	Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).	4.6	Very Effective	+2% Non-significant change
Forest Management	Increased forest health and ability to withstand climate related extreme weather events (due to forest management and the removal of hazard trees).	4.5	Very Effective	+10% Non-significant change
Green Infrastructure	Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).	4.5	Very Effective	+2% Non-significant change

Knowledge and Awareness Performance

Program Area	Program Area Objective	Score / 5.0	Rating	% Change from 2022
School Programs	Positive changes in the behaviour of students regarding support for and participation in climate change adaptation and mitigation activities.	4.4	Very Effective	+7% Non-significant change
Community Engagement and Stewardship	Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.	3.9	Effective	+3% Non-significant change

Mitigation Performance

Program Area	Program Area Objective	Score / 5.0	Rating	% Change from 2022
Greenhouse Gas Emissions (GHG) Reduction / Sequestration	GHG emissions reduced or sequestered through climate change initiative programs that have significant activities directed toward GHG emissions reduction or have GHG emissions reduction/carbon sequestration as a tangible co-benefit. *			*A newly developed target has been established for sequestration values. Ongoing efforts focus on assessing performance effectiveness through scores and ratings for sequestration and tracking variable emissions reductions.

2.4   Program Area Performance Reports

Adaptation Performance Report

Climate Science

Objective	Score
Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).	**4.6** ▼ Very Effective

Actions

- Applied research and monitoring of climate change impacts, risk factors and adaptation measures with a focus on ecosystem and watershed health (water quality, flooding, erosion, extreme heat and ecosystem biodiversity).

- Knowledge dissemination, advice and training to support climate change related strategies and plans for external (municipalities) and internal (CAs) users (for example: risk assessments, screening tools, carbon offset plans).

Results

- Reviewers rated program outputs from highly useful to very highly useful in informing municipal and conservation authority decision making and resource management.

- Program outputs provided useful tools for recognizing climate change impacts, identifying solutions, and prioritizing implementation of climate change adaptation and resiliency actions.

- Reviewers acknowledged that data generated by the program would have direct and immediate impacts on existing programs including road salt management, water resource and watershed management, energy management, forest management and flood reduction.

Flood Management

Objective	Score
Minimize the risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood minimization measures).	**4.6** ▼ Very Effective

Actions

- Construction and maintenance of flood protection infrastructure (in some years).

- Development and dissemination of information regarding flood probabilities, potential flood impacts, and flood minimization options.

Results

- Reviewers found the program to be very highly useful overall in providing valuable real-time data for flood emergency response and mapping and monitoring data to inform planning and flood/climate adaptation.

- Program outputs produced useful and trustworthy data to inform municipal and Regional planning.

- The score is based on the development and dissemination of information only. There was no construction and maintenance of flood protection infrastructure in 2023.

Erosion Management

Objective	Score
Minimize the risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).	**4.3** ▼ Very Effective

Actions

- Inspection and maintenance of existing erosion control infrastructure.
- Construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

Results

- Implementation of the annual plan for the Region of Peel was successful, with remediation completed at two project sites and 558 infrastructure hazard monitoring sites inspected. Forty erosion control structures were also assessed and found to be in sound condition.

Restoration and Natural Heritage Science

Objective	Score

Reduced impacts of climate change related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).

4.6

▼

Very Effective

Actions

- A wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as the implementation of Low Impact Development (LID) and natural green infrastructure projects.

- Two research focused programs (urban natural heritage, and biodiversity conservation and management) that assess climate change vulnerability and the effectiveness of habitat management practices, mapping of significant wildlife habitat, and impact thresholds to guide the management and conservation of wildlife.

RESULTS

- All restoration projects were assessed as having a very high impact on climate change adaptation, specifically in four impact areas: reduced flooding, reduced erosion, reduced water quality degradation, and reduced negative impacts on species and natural features. Additionally, reviewers felt that projects had a positive impact on overall biodiversity and habitat connectivity.

- Applied research programs were rated as highly to very highly useful in increasing overall understanding of the current and predicted future conditions of natural heritage features and implementing meaningful actions to increase climate change resilience.

Forest Management

Objective	Score
Increased forest health and ability to withstand climate related extreme weather events (due to forest management and the removal of hazard trees).	**4.5** ▼ Very Effective

Actions

- A wide range of forest monitoring, inventory, management planning, outreach and stewardship activities.
- Active management projects and programs to address:
  - Forest health and disease prevention.
  - Canopy expansion.
  - Invasive species.
  - Hazard trees.
  - Resilience to extreme events.

Results

- Reviewers felt that the programs had a very high impact on the resiliency of forest systems.
- Component programs within the program area implemented a comprehensive and wide-ranging suite of management actions to produce a holistic approach towards forest management in the region.
- Actions which decreased the risk of forest fires were identified as particularly valuable.

Green Infrastructure

Objective	Score

Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).

4.5

▼

Very Effective

Actions

- Projects include:
    - Development of integrated stormwater asset management process and procedures for municipalities including design and construction reviews, rapid assessments, inspections and monitoring of green engineered infrastructure to support life cycle management.
    - Transferring knowledge on green stormwater infrastructure to increase adoption of integrated stormwater management (SWM) practices.
    - Neighbourhood stormwater management projects with a focus on Low Impact Development (LID) implementation.

Results

- Programs were rated from highly to very highly useful for providing training on the implementation, inspection and maintenance of LID and SWM projects.

- Reviewers were impressed with the applicability of training received to practical asset development and management.

- Program outputs had a direct influence on the development of regional stormwater infrastructure programs.

- Programs supported future green engineered infrastructure implementation and provided valuable guidance for a variety of stakeholders including municipalities, developers and landowners to influence regulatory decision-making, LID and SWM implementation, and municipal planning and budgeting.

Knowledge and Awareness Performance Report

School Programs

Objective	Score
Positive changes in the behaviour of students regarding support for and participation in climate change adaptation and mitigation activities	**4.4** ▼ **Very Effective**

Actions

- Planning and delivery of climate change related education and awareness programs for students and professional development training for teachers.

Results

- Programs were rated effective to very effective in encouraging students' participation in climate change adaptation and mitigation activities.

- The majority of teachers and students agreed or strongly agreed that the programs increased students' knowledge of nature, the environment, and the impacts of climate change.

- Teachers praised the return of in-person program delivery and expressed their preference for in-person programming over virtual alternatives.

Community Engagement and Stewardship

Objective	Score

Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.

3.9

▼

Effective

Actions

- Planning and delivery of climate change related education, engagement and stewardship programs to the community.

Results

- Community climate change adaptation and mitigation programming was rated by participants via exit survey. Participants rated all programs as effective to highly effective in educating on climate change impacts and encouraging future climate adaptation action.

- Reviewers felt that the program staff were well-prepared, professional and engaging, and that programming was successful in creating a welcoming and fun environment.

Mitigation Performance Report

Greenhouse Gas (GHG) Emissions Reduction/Sequestration

Objective	Interim Score
Reduction of GHG emissions in the Region of Peel.	Total GHG emissions reduction/sequestration* *An effectiveness score of GHG emissions reduction/ sequestration activities is under development.*

Actions

Measures GHG emissions reduction and sequestration activities in the following five program areas – Climate Science, Forest Management, Green Infrastructure, School Programs, and Community Engagement and Stewardship.

- Activities include:
  - Support for projects to reduce GHG emissions for CA-owned facilities within the Region of Peel (building retrofits, fleet electrification and fuel switching projects).
  - Engagement programs to facilitate community based GHG emissions reduction projects.
  - Atmospheric GHG removals through CA-led tree, shrub and seedling plantings (sequestration).

Results

- **770 Tonnes of CO2e** emissions reduced through building, solid waste and industry process retrofit projects in 2023.

- **487 Tonnes of CO2e** sequestration capacity was added in Peel Region in 2023 (Sequestration capacity refers to the amount of emissions that are able to be captured and stored through tree, shrub and seedling plantings).

- Cumulative annual sequestration capacity reached **1,514 Tonnes of CO2e** due to planting efforts executed in 2021, 2022 and 2023.

- A 2030 sequestration capacity target has been established at **6,137 Tonnes of CO2e**, based on projected annual capacity additions.

3.0 Adding Value Through Co-benefits

Co-benefits can be defined as the positive results that occur in addition to the benefits associated with the main program area objective. They are an important value-add to the core purpose of the work and are not accounted for in the current scoring framework. Co-benefits are often included in climate change discussions as they demonstrate the ways in which climate action can help advance other broader societal, environmental or economic goals in important, though more indirect, ways. While there is much research on the importance of communicating the full value of work through the identification of co-benefits, the methodology for identifying and reporting on co-benefits is still emerging.

As a pilot project, an approach to identify, define and integrate program area co-benefits was introduced at a high-level in the 2022 performance report. At that time, co-benefits were generated in a multitude of ways, through user feedback in some cases, and directly by program staff in others.

In 2023, the methodology for identifying and defining co-benefits was further refined to ensure consistency across all program areas. With additional guidance, program staff identified the most significant co-benefits, taking into consideration user feedback as well as their expertise. A co-benefit must meet two criteria to be included in the measurement system:

- First, the co-benefit is required to be a distinct value-add to the program area objective, meaning it is not already captured as an objective of the Program Area or scored per the existing methodology.

- Second, the co-benefit must be deemed **significant.** Co-benefits are significant when they are:

    o Attributable - must logically flow from the program area activities and would not have occurred in the absence of the program area activities.

    o Material - is an intended outcome of the program or is so important it could spur future initiatives.

The identified co-benefits that met the above criteria were then aligned to the application of co-benefits in the Region of Peel's CCMP. Co-benefits for each of the program areas can be found in the detailed reports in **Appendix A**. A few select examples of cited co-benefits are illustrated in **Figure 2**.

Figure 2: Examples of co-benefits cited by program areas showing alignment with the Region of Peel Climate Change Master Plan.

4.0 Next Steps

Continuous improvement considerations remain a priority for the ongoing development/refinement of this Measurement System. The overall goal of ensuring the integration and practical alignment with the Region's needs remains an area of focused dedication. To this end, the following next steps are recommended:

- Continue to advance the carbon/GHG sequestration definitions, targets and integration. This includes addressing scalability for greater impact and clearly delineate and define permanence considerations (measured at time scales of 100 years or more).

- Explore real-time roll out of performance results and feedback through different platform considerations that best suit user needs.

- Continue to deepen the integration of timely and detailed feedback across all program areas to best serve program planning and enable the execution of refinement opportunities.

- Continue to consider how best to assess and convey progress of scores over time, particularly through data visualization.

Appendix A: Detailed Program Area Reports

CLIMATE SCIENCE

OBJECTIVE: Reduced negative impacts of climate change (due to the implementation of useful and effective plans for protection and recovery measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning or implementing protection and recovery measures.	**4.6**
	Very Effective

1.0 Actions

- Applied research and monitoring of climate change impacts, risk factors and adaptation measures with a focus on ecosystem and watershed health (water quality, flooding, erosion, extreme heat and ecosystem biodiversity).
- Knowledge dissemination, advice and training to support climate change related strategies and plans for external (municipalities) and internal (CAs) users (for example: risk assessments, screening tools, carbon offset plans).

2.0 How the indicator score was calculated

The calculation was based on the ratings of three programs or parts of programs:

Research on water management:

CVC program(s)

(1) Water and Climate Change Risk Assessment (internal component only)
(2) Real Time Water Quality

Research on impacts to natural and human systems:

TRCA program(s)

(3) Climate Science Applications Program

Programs 1 and 2 each had two outputs selected and program 3 had four outputs selected for a total of eight outputs. A description was provided to an intended user of each output, who rated the usefulness (or potential usefulness) of the output to plan or implement adaptation measures on a 1-5 scale (5= Very highly useful or potentially useful, 1= of low or no potential usefulness). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

All of the reviewers responded positively to this program area, pointing to the practical value of the outputs. Most reviewers commented that the outputs felt fresh and relevant, and that the products of this program area had already been useful and would remain important tools into the future.

Overall, reviewers noted that outputs from this program area would be incorporated into existing Peel and/or conservation authority processes and would enable more effective evidence-based decision making and asset and resource management. Reviewers stated that the data and resources provided by the activities within this program area would be useful in recognizing harmful practices, identifying solutions, and prioritizing efforts to implement climate change adaptation and resiliency efforts.

Data provided by the component programs will help the Region meet legislative requirements, inform decision making and resource management, and enable strategic planning in areas including road salt management, asset management, water resource and watershed management, energy management, forest management, and flood risk reduction.

4.0 Co-benefits

1. **Environmental Benefit** – Applied research and monitoring of climate change impacts supports the development of positive actions such as increased tree planting and reduced use of road salt which benefit the natural environment.

2. **Health Benefit -** New data and knowledge of climate change impacts and nature-based climate solutions supports the development of better-informed decisions on how people and communities can adapt to climate change and improve their health outcomes.

3. **Social and Quality of Life Benefit** - The dissemination of knowledge and information about climate change issues, impacts and adaptation measures increases residents' understanding of environmental issues and their impact on their local natural environment which forms the basis for community action and behaviour change.

FLOOD MANAGEMENT

OBJECTIVE: Minimize the risk of flooding (due to the construction of protective infrastructure and the use of program area information for planning and implementing flood minimization measures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The usefulness of program area outputs for planning and implementing flood minimization measures and protective infrastructure.	**4.6**
	Very Effective

1.0 Actions

- Construction and maintenance of flood protection infrastructure (in some years).
- Development and dissemination of information regarding flood probabilities, potential flood impacts, and flood minimization options.

2.0 How the indicator score was calculated

The calculation was based on the ratings of 4 programs or parts of programs:

Research Programs:

CVC program(s)

(1) Climate Change Flood Risk Assessment
(2) Flood Forecasting and Warning
(3) Water and Climate Change Risk Assessment

TRCA program(s)

(4) Flood Remedial Works (non-infrastructure work only. Flood protection infrastructure work was not implemented in 2023) *

Programs 1 and 4 had 2 outputs selected and programs 2 and 3 had 3 outputs selected for a total of 10 outputs. A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for developing flood protection measures on a 1-5 scale (5 = very highly useful, 1 = of very little or no usefulness). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

* Flood protection infrastructure work is only implemented in some years. In those years, the program will be sub-divided into two parts – non-infrastructure work and flood protection infrastructure work. Each part will be rated separately.

3.0 Explanation of the rating

This program was rated very highly overall by reviewers, who indicated that the outputs helped them to better understand and respond to flood risks and more effectively plan for regional flood reduction and monitoring.

Reviewers noted that the flood alarms provided vital warning in flood emergencies and peace of mind otherwise. Data, mapping, and modelling from the program were likewise praised for their value in flood forecasting and capital planning. Specifically, reviewers responded positively to the breadth of data offered by the program, including future climactic modelling, regional level monitoring with implications for province-wide planning, and identification of social vulnerability within flood vulnerable areas.

Outputs from the program area will inform the development of city and regional emergency preparedness planning, climate change adaptation plans, and on-the-ground emergency flood response. Reviewers also noted their confidence in the data produced by the program and were overall very satisfied with the usefulness of the data.

4.0 Co-benefits

1. **Financial Benefit** - Modelling and mapping products identify locations of stormwater outfalls and municipally owned infrastructure at risk of erosion damage which inform efficient and effective emergency preparedness planning and prioritize asset management to meet provincial requirements.

2. **Financial Benefit** - Real-time monitoring stations provide high water alerts to municipalities that will support timely decisions and more efficient operations of wastewater plants during high water levels.

3. **Environmental Benefit** - Flood plain mapping updates identify areas suitable for protection and form the basis for the establishment of large natural corridors for flora and fauna.

EROSION MANAGEMENT

OBJECTIVE: Minimize the risk of erosion (reduced risk of damage to infrastructure from erosion due to the maintenance and construction of erosion control structures).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of implementation and maintenance of effective erosion risk reduction measures.	**4.3**
	Very Effective

1.0 Actions

- Inspection and maintenance of existing erosion control infrastructure.
- Construction of new erosion control structures to protect high priority sites where Region of Peel sanitary infrastructure or watermains may be at risk.

2.0 How the indicator score was calculated

The calculation was based on the rating of 1 program:

TRCA program(s)
(1)   Erosion Maintenance Projects

The calculation was carried out in two parts.

Part 1: This calculation involved determining the extent to which the erosion control plan for the year was implemented. This was done by assigning points to various categories of planned activities once the plan was finalized and then, at the end of the year, calculating the points associated with the actual projects that were carried out during the year. The score for part 1 is the ratio of the points achieved to the points planned, converted to a 5-point scale (5= 80% or more of plan score, 1=0-19% of plan score).

Part 2: Using a specific assessment methodology, erosion control structures implemented or remediated within the previous 5 years are inspected and given an asset condition score based on their current condition. The score for each structure inspected is converted to a 5-point scale (5 = very good condition, 1 = very poor condition). The score for part 2 is the average of the individual asset condition scores.

Overall indicator score: The score from part 1 and part 2 are averaged to calculate the overall indicator score.

3.0 Explanation of the rating

For Part 1, reviewers rated the Erosion Risk Management program as very effective based on the successful implementation of inspection, maintenance, and planned remedial work on erosion control structures.

Erosion Risk Management staff completed 558 of 580 scheduled inspections of Region of Peel infrastructure hazard monitoring sites planned for 2023. The remaining sites, which were inaccessible to staff, will be rescheduled for

inspection in 2024. Planned remedial works were completed at Bramalea Road and Queen Street East and Hazelwood Park, with both sites brought to a stabilized condition.

For Part 2, the 40 erosion control structures that were constructed or remediated since 2017 were assessed and found to be in sound condition.

4.0 Co-benefits

1. **Health Benefit** - Protecting buried linear infrastructure from erosion hazards also provides an opportunity to protect publicly accessible parklands and trails adjacent to these municipal assets during remediation work providing safe and secure access to outdoor activities and enabling positive physical and mental health outcomes in the community.

2. **Environmental Benefit** - the natural assets (e.g. tree, etc.) adjacent to Peel linear buried infrastructure threatened by erosion hazards, are also protected from failure caused by erosion during remediation work completed to protect the municipal asset themselves.

3. **Environmental Benefit** - Soils and restoration plantings implemented in areas adjacent to remediation work completed to protect municipal assets provide some carbon storage and sequestration benefits. However, this is offset by the fuels required to power the machinery used in remediation, so this third co-benefit requires further study. However, this GHG emission sequestration is offset by the fuels required to power the machinery used in remediation, so this co-benefit requires further study.

RESTORATION AND NATURAL HERITAGE SCIENCE

OBJECTIVE: Reduced impacts of climate change-related extreme weather events on flooding, erosion, water quality degradation, and species and natural features (due to restoration projects and the usefulness of restoration-related research).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced impacts of climate change-related extreme weather events through enhancements to the natural heritage system and the usefulness of research information for implementing climate change protection measures.	**4.6**
	Very Effective

1.0 Actions

- A wide range of restoration projects (aquatic and wetland restoration, riparian and valley restoration, stream and natural channel restoration, and terrestrial restoration), as well as the implementation of Low Impact Development (LID) and natural green infrastructure projects.

- Two research focused programs (urban natural heritage, and biodiversity conservation and management) that assess climate change vulnerability and the effectiveness of habitat management practices, mapping of significant wildlife habitat, and impact thresholds to guide the management and conservation of wildlife.

2.0 How the indicator score was calculated

The calculation was based on the ratings of nine (9) programs:

Restoration and Protection Programs:

CVC program(s)
(1) Aquatic and Wetland Restoration – Peel

TRCA program(s)
(2) Wetland – Climate
(3) Riparian and Valleyland - Climate
(4) Stream Restoration – Climate
(5) Terrestrial – Climate
(6) Natural Channel Project Implementation
(7) Green Infrastructure – Climate

Applied Research Programs:

CVC program(s)
(8) Urban Natural Heritage
(9) Biodiversity Conservation and Management

The calculation was carried out in two parts.

Part 1- 1 project intended to reduce the negative impacts of extreme weather events was selected from each of the 7 restoration and protection programs. A summary of each project was provided to a four-member expert panel, who developed a consensus rating on a 1-5 scale (5 = very high impacts on reducing negative impacts, 1 = very low impacts

on reducing negative impacts) of the overall impact of each project on reducing the negative impacts of extreme weather events. As part of the rating process, consideration was also given to the project impact on reduced flooding, reduced erosion, reduced water quality degradation, and reduced negative impacts on species and natural features.

Part 2 – 2 outputs were selected from program 8 and 3 outputs from program 9 for a total of 5 outputs. A description of each output was provided to an intended user of that output, who rated the usefulness (or potential usefulness) of the output for implementing climate change protection measures on a 1-5 scale (5 = very high impacts on reducing negative impacts, 1 = very low impacts on reducing negative impacts). The output ratings for each program were averaged.

Overall outcome indicator - The 9 ratings (7 impact ratings for programs 1 through 7 and 2 usefulness ratings for programs 8 and 9) were averaged after weighting them by the program budgets.

3.0 Explanation of the rating

Two distinct groups of programs were reviewed in this program area. Programs 1 through 7 comprised restoration implementation projects with direct impacts in the four key areas of flood reduction, erosion reduction, water quality improvement, and protection of species and natural features. Programs 8 and 9 comprised projects which collected and shared data on climate impacts on natural systems.

Programs 1 through 7 were unanimously assessed as highly impactful in reducing the impacts of climate change. Reviewers commented that the programs all addressed a broad range of climate change impacts and reduced negative effects on species, habitats, infrastructure, and other systems. In general, the programs met all criteria for reducing the negative impacts of climate change and increased habitat connectivity.

All outputs from programs 8 and 9 were rated as highly and very highly useful as critical inputs for implementing municipal climate change mitigation programs. Reviewers noted that the data and knowledge shared through these programs significantly increased their understanding of the current and predicted future conditions of natural heritage systems and provided actionable information. This enabled them to implement programs to meet legislative requirements, update asset management plans, and accurately review and implement development plans.

4.0 Co-benefits

1. **Social and Quality of Life Benefit** - Research that prioritizes conservation and the protection of trees and forests, as well as inventory and condition assessment of green infrastructure, supports actions that maintain and enhance natural habitat in urban areas. This provides the community with access to healthy green spaces which supports positive mental, emotional and cultural connections to nature and enhanced opportunities for recreation.

2. **Financial Benefit** – Implementation of restoration and natural green infrastructure projects can also provide the catalyst for the rehabilitation of failing infrastructure and the protection/realignment of publicly accessible trails during the restoration work itself which reduces the need for ongoing maintenance and repair.

3. **Health Benefit** - A thriving and protected natural system with restored natural features and safe trail systems connect park users with nature and encourage and facilitate exercise in green spaces.

FOREST MANAGEMENT

OBJECTIVE: Increased forest health and ability to withstand climate related extreme weather events (due to forest management and the removal of hazard trees).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Increased ability of forests to withstand climate change related extreme weather events through the implementation of forest management measures.	**4.5**
	Very Effective

1.0 Actions

- A wide range of forest monitoring, inventory, management planning, outreach and stewardship activities.

- Active management projects and programs to address:

  - Forest health and disease prevention.
  - Canopy expansion.
  - Invasive species.
  - Hazard trees.
  - Resilience to extreme events.

2.0 How the indicator score was calculated

The calculation was based on the ratings of five (5) programs:

CVC program(s)
(1) Invasive Species Control Program
(2) Peel Planting Programs

TRCA program(s)
(3) TRCA Forest Management – Peel
(4) Reforestation Program – Private Lands
(5) Invasive Species Management

A summary of each of the 5 programs was provided to an expert panel composed of forestry and ecosystem experts from four municipal partner organizations, who developed a consensus rating on a 1-5 scale (5 = very high impact on forest resilience, 1 = very little impact on forest resilience) of the overall impact of each project towards increasing forest resilience. These ratings were averaged, after weighting them by the program budgets, to calculate the indicator score.

3.0 Explanation of the rating

Ratings for this program area were consistent with previous years, with programs assessed as having a very high impact on the resiliency of regional forest systems.

Reviewers commented on the comprehensiveness, diversity and breadth of the management actions taken by the component programs within this program area. Through invasive species management, tree plantings, active management, planning and monitoring, the programs comprised a holistic and unified effort to reduce threats to forests, improve diversity, and build resilient forest systems throughout the Region. Reviewers specifically commented on the importance and effectiveness of actions to decrease the risk of fire.

The program area comprises collaborative forest management plans by both CVC and TRCA, which address both public and private lands through partnerships with a variety of stakeholders through stewardship and outreach programs.

4.0 Co-benefits

1. **Financial Benefit** - Forest management programs support the advancement of Conservation Authorities' knowledge, expertise and understanding of forest management practices and is used to leverage additional funding to support other municipal forest management programs and deliverables.

2. **Social and Quality of Life Benefit -** Healthy forests and expanded tree and forest canopy resulting from effective forest management practices help to reduce the urban heat island effect and provide an improved experience for the public when visiting local parkland and greenspaces.

3. **Environmental Benefit** - Strategic planning undertaken as an element of forest management programs, target key areas for forest health improvement and expansion and can result in improved ecosystem health for the larger system (e.g., enhanced biodiversity, improved corridor connectivity for significant species and soil stabilization in erosion-prone areas).

GREEN INFRASTRUCTURE

OBJECTIVE: Reduced risks of degradation of water resources and terrestrial natural systems (due to water quality and/or quantity problems such as floods and stormwater overload).

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Reduced risks of major water resource degradation.	**4.5**
	Very Effective

1.0 Actions

- Projects include:
    - Development of integrated stormwater asset management process and procedures for municipalities including design and construction reviews, rapid assessments, inspections and monitoring of green infrastructure to support life cycle management.
    - Transferring knowledge on green stormwater infrastructure to increase staff capacity and adoption of integrated stormwater management (SWM) practices.
    - Neighbourhood stormwater management projects with a focus on Low Impact Development (LID) implementation.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs or parts of programs:

SWM/LID Programs:

CVC program(s)
(1) SWM Infrastructure Performance Risk Assessment
(2) Integrated Water Management Implementation
(3) Integrated Water Management Guidance and Training

TRCA program(s)
(4) Sustainable Technologies (stormwater portion only)

Sustainable Neighbourhood Programs:

CVC program(s)
(5) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program) (stormwater portion only)

TRCA program(s)
(6) Sustainable Neighbourhood Action Program (SNAP) (stormwater portion only)

Ten representative projects were selected from the 6 programs that underlie this objective. (6 projects were selected from SWM/LID programs and 4 projects were selected from Sustainable Neighbourhoods programs). A description of each project was provided to an intended user of that project, who rated its usefulness (or potential usefulness) in

implementing or managing a SWM/LID project on a 1-5 scale (5 = very highly useful or potentially useful, 1 = very low or no potential useful). These ratings were averaged, after weighting them by the program budgets, to calculate the indicator.

3.0 Explanation of the rating

Reviewers rated all program outputs as highly or very highly useful towards implementing green infrastructure and guiding future implementation of green infrastructure within the Region. The joint TRCA and CVC Sustainable Technologies Evaluation Program (STEP) was specifically praised for its role in providing actionable training and sharing valuable expertise to guide a variety of stakeholders (including municipalities, developers and landowners) in the implementation of green infrastructure and future planning.

Program outputs not only provided Peel staff with data and guidance required to meet legislative requirements, but also provided needed training to relevant stakeholders regarding the construction, inspection and maintenance of green infrastructure including LID and SWM technologies. STEP guidance was cited as essential in the development of regional green infrastructure maintenance programs. The Sustainable Neighbourhood Action Program (SNAP) was also cited as a valuable tool in implementing SWM and LID technologies.

In general, reviewers felt that program outputs provided essential guidance to improve ecological and climate adaptation outcomes. Reviewers were all very positive regarding the knowledge and expertise of program leaders and encouraged the development of further training programs to address even more complex green infrastructure implementation in the future, given the success of existing training modules.

4.0 Co-benefits

1. **Social and Quality of Life Benefit** - Increased opportunities to participate in local climate action strengthens the community's connection to and appreciation for nature and enhances community cohesion by working together towards common goals.

2. **Environmental Benefit** - Improved stormwater management services provided by green infrastructure / LID assets (e.g., stormwater treatment, stormwater retention/infiltration, peak flow control) improves habitat for aquatic species because the amount of stormwater reaching rivers and streams is reduced which helps to maintain natural stream functions and healthy habitat for fish and other aquatic species.

3. **Environmental Benefit** – Knowledge/information sharing and capacity building between Conservation Authorities, municipalities, residents and businesses at the neighbourhood scale enables more tailored and effective solutions for the local natural environment.

SCHOOL PROGRAMS

OBJECTIVE: Positive changes in the behaviour of students regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
The extent of changes in knowledge, awareness, and attitudes of students.	**4.4**
	Very Effective

1.0 Actions

- Planning and delivery of climate change related education and awareness programs for students and professional development training for teachers.

2.0 How the indicator score was calculated

The following six (6) programs were planned to be rated in relation to the objective:

CVC program(s)

(1) Conservation Youth Corps
(2) Environmental Education

TRCA program(s)

(3) Albion Hills Environmental Weeks (Environmental Leaders of Tomorrow)
(4) Stewardship Partnership Services
(5) Conservation Youth Corps
(6) Ontario Eco Schools for Peel Region (Eco-Schools Expansion Program) *

Each program or part of a program was rated based on surveys that measured students' knowledge and attitudes toward climate change following their participation in a school program. Surveys were administered directly to the students where appropriate or to the teacher, who provided their opinions regarding the extent of their students' learning. 493 survey responses were received. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

*Ontario Eco Schools for Peel Region (Eco-Schools Expansion Program) was not included in the 2023 rating to support a new process for administering the survey questions. A program survey will now be administered at the end of the school year to allow time for teachers to implement knowledge gained at training and professional development workshops with their students at school.

3.0 Explanation of the rating

All programs in this program area were rated effective to very effective in changing students' behaviours regarding support for and participation in climate change adaptation and mitigation activities. The majority of teachers and

students agreed or strongly agreed that the programs increased their knowledge of nature, the environment, and the impacts of climate change.

Program participants continued to enjoy the ongoing reintroduction of in-person programming. With the return of overnight excursions, Environmental Leaders of Tomorrow transitioned to a blended learning model combining virtual pre and post programs with an environmentally themed curriculum-linked overnight field trip. Teachers offered mixed reviews of the program's hybrid delivery, preferring the pre-pandemic delivery of in-person pre and post programs.

Overall, reviewers enjoyed the range of experiential and hands-on programming including habitat enhancement (plantings, stream restoration, invasives removal), a youth climate resilience summit, outdoor classroom programming, and a variety of innovative school programs. Teachers expressed their gratitude to both CVC and TRCA for their fun and informative school programming.

4.0 Co-benefits

1. **Social and Quality of Life Benefit –** Outdoor education programs related to climate change awareness and education strengthening students' connection to, and appreciation for, nature and the natural environment and results in students having a broader perspective of the world they live in and their role in protecting the environment.
2. **Social and Quality of Life Benefit** - Educational programming related to climate change awareness and environmental education provide a foundation to advance a range of personal development skills such as leadership, mentorship, cooperation, and volunteerism that are valuable skills both for the student and in our society.
3. **Health Benefit** - Outdoor education programs related to climate change awareness and education provide an opportunity for students to be active and spend time outdoors in nature which provides physical and emotional health benefits that are important aspects of healthy growth.

COMMUNITY ENGAGEMENT AND STEWARDSHIP

OBJECTIVE: Positive changes in behaviour regarding support for and participation in climate change adaptation and mitigation activities.

OVERALL INDICATOR	OVERALL INDICATOR SCORE	
The extent of changes in knowledge, awareness, and attitudes of program participants.	**3.9**	
	Effective	

1.0 Actions

- Planning and delivery of climate change related education and engagement programs to the community.

2.0 How the indicator score was calculated

The calculation was based on the ratings of six (6) programs. All programs were rated:

CVC program(s)
(1) Peel Rural Stewardship
(2) Urban Outreach and Restoration
(3) Regional Community Outreach

TRCA program(s)
(4) West Humber Stewardship Program
(5) Etobicoke-Mimico Stewardship
(6) Etobicoke Headwaters Sub-watershed Regeneration

Each program was rated based on surveys of participants that measured their knowledge and attitudes toward climate change following their participation in a community engagement program or activity. 656 survey responses were received. The ratings were averaged and weighted by the program budgets to determine the overall indicator score.

3.0 Explanation of the rating

The six programs in this program area were rated from effective to very effective in encouraging support for and participation in climate change adaptation and mitigation activities.

Program participants – including community members, landowners, and corporate partners – engaged in a variety of community actions including tree plantings, land and water stewardship, and climate action and resilience projects on both public and private lands.

Participants indicated in post-program surveys that their experiences helped them to better understand the impacts of climate change and equipped them with the information and tools necessary to engage in meaningful community action towards climate adaptation and mitigation in the future. Multiple participants commented that the staff were well-prepared, knowledgeable, and created a welcoming and engaging environment.

4.0 Co-benefits

1. **Social and Quality of Life Benefit -** Participation in volunteer, hands-on nature-based programming that improves the natural environment and local resiliency against the impacts of climate change provides an opportunity for like-minded people to work together towards a common goal, supporting community cohesion, relationship building, networking, and increased landowner and community capacity.

2. **Environmental Benefit** – Volunteer and landowner actions such as tree planting help to create neighbourhoods, landscapes, and ecosystems that are more climate change resilient and biodiverse.

3. **Health Benefit -** Participation in physical hands-on climate change adaptation and mitigation activities such as tree planting provides an opportunity for people to spend time being active outdoors which supports improved physical, mental and emotional health.

GREENHOUSE GAS (GHG) EMISSIONS REDUCTION/SEQUESTRATION

OBJECTIVE: Reduction of GHG emissions in the Region of Peel.

OVERALL INDICATOR	OVERALL INDICATOR SCORE
Amount of GHG emissions reduced annually through emissions reduction measures and carbon sequestration.	Total GHG emissions reduction/sequestration *An effectiveness score of GHG emissions reduction/sequestration activities is under development.*

1.0 Actions

Measures GHG emissions reduction and sequestration activities in the following five program areas – Climate Science, Forest Management, Green Infrastructure, School Programs, and Community Engagement and Stewardship.

- Activities include:
  - Support for projects to reduce GHG emissions for CA-owned facilities within the Region of Peel (building retrofits, fleet electrification and fuel switching projects).
  - Engagement programs to facilitate community based GHG emissions reduction projects.
  - Atmospheric GHG removals through CA-led tree, shrub and seedling plantings (sequestration).

2.0 Main principles behind the calculations

The 15 programs or parts of programs included in this assessment include:

Emissions Reduction:

CVC program(s)

(1) Water and Climate Change Risk Assessment (internal component only)

TRCA program(s)

(2) Sustainable Technologies
(3) Sustainable Neighbourhood Action Program (SNAP)
(4) Sector-Based Climate Mitigation Programs
(5) Pearson Eco-Industrial Zone

Carbon Sequestration:

CVC program(s)

(6) Peel Planting Programs
(7) Sustainable Neighbourhoods (Sustainable Neighbourhood Action Program)
(8) Peel Rural Stewardship
(9) Urban Outreach and Restoration
(10) Regional Community Outreach
(11) Conservation Youth Corps

TRCA program(s)

(12) TRCA Forest Management – Peel
(13) Reforestation Program – Private Lands
(14) Sustainable Neighbourhood Action Program (SNAP)
(15) Conservation Youth Corps

Each year the GHG emissions reductions reflect a mixture of different actions depending on the priorities of the participating organizations. As a result, the magnitude of emissions reductions will vary as a result of the types of actions that are taken. In all cases, standard industry practices and associated published emissions factors are used.

For the emissions reductions, the calculation was based on an estimate of the emissions savings achieved in 2023 from the actions taken in 2023. In the case of tree and shrub plantings, tree planting activities for the current year (2023) are used for sequestration projections in future years, with current sequestration calculated based on planting in prior years.

3.0 Explanation of the results

The GHG emissions reduction and sequestration KPI is intended to provide a high-level assessment of the breadth of how Peel Climate Partnership Programs are contributing to the reduction of GHG emissions and the removal of atmospheric carbon. GHG emissions reductions continues to be the most important action toward achieving Intergovernmental Panel on Climate Change (IPCC) targets of a maximum of 1.5 to 2.0 degrees Celsius climate warming. However, in recent years there has been a recognition that without active atmospheric carbon removals (sequestration), there is little chance of limiting climate warming to 1.5 to 2 Celsius or achieving net zero carbon by 2050.

Conservation Authorities (CAs) have been working with organizations and communities in Peel to plant trees, shrubs and seedlings for more than 50 years. In recent years, this action has grown in importance with the recognition that ecosystems and in particular, forests, provide an important atmospheric carbon removal service. In addition, for the past 10 years, CAs have been working with organizations and communities to reduce or abate annual GHG emissions through energy efficiency and fuel switching activities. Given the need to explore all available avenues to reach the goal of net zero, it is useful to consider what gains are made through Peel climate change funded accounts.

How CAs address GHG emissions

CAs address emissions in three ways:

1) emissions reduction projects for their owned facilities (building retrofits, fleet electrification and fuel switching projects).
2) engagement programs to facilitate community-based emissions reduction projects.
3) atmospheric GHG removals through tree, shrub and seedling plantings (sequestration).

Three measures help convey the emissions reductions efforts of Peel Climate Change funded CA accounts:

- Tonnes of Carbon Dioxide Equivalent (CO_2e) reduced from emissions reduction projects.
- Tonnes of Carbon Dioxide Equivalent (CO_2e) sequestration capacity created each year.
- Cumulative annual sequestration capacity in Tonnes of Carbon Dioxide Equivalent (CO_2e).

A total GHG emissions reduction and total carbon sequestration value has been generated for 2023 to illustrate the emissions reductions and sequestration that are being achieved. Further, a third measure capturing the annual sequestration capacity was selected to best account for ongoing and cumulative impacts. It also best reflects the one-year lag in capturing the emissions sequestration resulting from the efforts of prior years. Further, this cumulative annual sequestration capacity measure enables improved tracking against a target. Using estimates of expected results for 10-year planting plans, a measure of actual plantings versus target plantings enables the calculation of both an annual emissions sequestration capacity target itself, and it also enables tracking progress towards the multi-year target.

2023 Results

- **770 Tonnes of CO2e** emissions reduced through building, solid waste and industry process retrofit projects in 2023.
- **487 Tonnes of CO2e** sequestration capacity was added in Peel Region in 2023 (Sequestration capacity refers to the amount of emissions that are able to be captured and stored through tree, shrub and seedling plantings).
- Cumulative annual sequestration capacity reached **1,514 Tonnes of CO2e** due to planting efforts executed in 2021, 2022 and 2023.

Measuring Emissions-Related Performance

The development of a suitable indicator scoring system to track performance advanced this year. New in 2023, a target has been established for the emissions sequestration capacity resulting from planting trees, shrubs and seedlings. Using estimates of expected results for 10-year planting plans (2021-2030), progress towards these targets will now be tracked. A measure of actual plantings versus target plantings enables the calculation of both an annual emissions sequestration capacity target itself, and it also enables tracking progress towards the multi-year target.

A 2030 annual sequestration capacity target has been established at 6,137 Tonnes of CO2e based on projected annual capacity additions. In 2023, planting efforts increased sequestration capacity by 445 Tonnes CO2e, bringing cumulative sequestration capacity to 1,514 Tonnes CO2e by the end of 2023. Per the trajectory (shown in **Figure 3** below), the current 2030 target is on track to be met as planned.
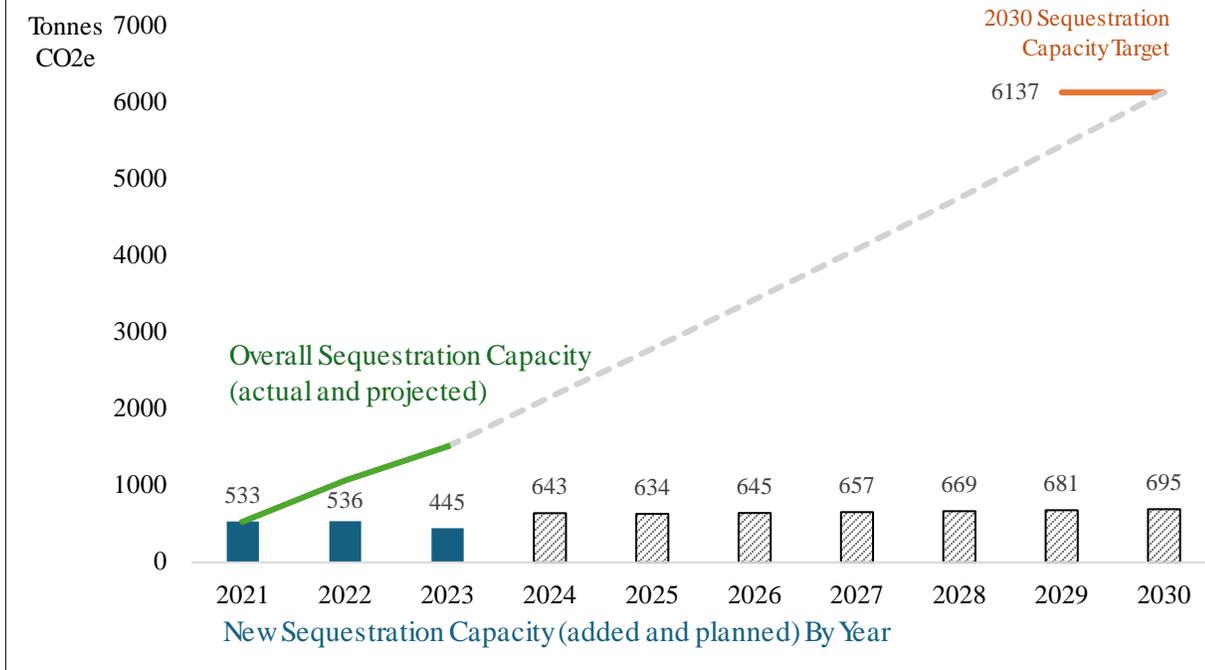
Figure 3: Achieved and projected CO2e sequestration capacity resulting from Region of Peel Climate Change funded accounts

Implemented carbon sequestration activities are scalable. Further, currently identified priority sites in Peel watersheds mean emissions sequestration can be easily scaled for more ambitious capacity targets and greater cumulative, lasting impact. At present, internal estimates show double the emissions could be captured with increased support through Peel-funded climate change accounts. While by design, planting is executed on parcels with long-term naturalization trajectories, if these planting are to be used as atmospheric carbon removals as part of a net zero pathway for the Region of Peel, there is a need to address sequestration permanence along with other criteria as defined by science-based targets.