

## Pilot Project Completion Report

### Collingwood Smart Stormwater Project

<b>GMF number</b>	15207
<b>Name of the lead applicant (municipality or other partner)</b>	Town of Collingwood
<b>Name, title, full address, phone, fax, e-mail of lead technical contact for this Pilot Project</b>	<b>Name:</b> Martin Rydlo <b>Title:</b> Director, Marketing & Business Development at the Economic Development Department of the Town of Collingwood <b>Address:</b> 105 Hurontario Street, Box 74, Collingwood, ON, L9Y 3Z4, <b>Phone:</b> 705-445-8441 Ext. 7421 <b>Fax:</b> 705-444-6082 <b>Email:</b> <a href="mailto:mrydlo@collingwood.ca">mrydlo@collingwood.ca</a>
<b>Date of the Report</b>	April 22, 2020

#### 1. Introduction

- a) Who was involved in doing the Pilot Project, and what are their affiliations? Please include name, title and contact information. Those involved could include municipal staff, engineering and other consultants, a representative from a nongovernmental organization, and others.

The organizations behind the Collingwood ‘Smart’ Stormwater Pilot Project were a collaborative Public, Private, Partnership (PPP) group from different industries and sectors. The successful implementation of our project objectives can be attributed to the multi-disciplinary team and their unique skill-set. These specific organizations include:

#### **Greenland International Consulting Ltd.**

- In coordination with the Town of Collingwood, Greenland International Consulting Ltd. (Greenland) served as project managers on the pilot project. Greenland has over 25 years of Canada-wide experience undertaking projects with an integrated watershed protection and infrastructure planning/design; information technology; and, public-private partnership focus. Greenland’s client base includes all levels of government; Indigenous Peoples; utility and resource sector industries; railways; and, land developers.
- Key personnel involved in this project:
  - **Name:** Eric Palmer, **Title:** Business Coordinator, **Role in Project:** Project Manager, **Contact info:** [epalmer@grnland.com](mailto:epalmer@grnland.com)
  - **Name:** Kirsten McFarlane, **Title:** Project Analyst, **Role in Project:** Project Analyst, **Contact info:** [kmcfarlane@grnland.com](mailto:kmcfarlane@grnland.com)
  - **Name:** Nicole Scott, **Title:** Software Programmer/Modelling Specialist, **Role in Project:** Project Programmer, **Contact info:** [nscott@grnland.com](mailto:nscott@grnland.com)

- **Name:** R. Mark Palmer, P. Eng, **Title:** President & CEO, **Role in Project:** Engineer of Record, **Contact info:** [mpalmer@grnland.com](mailto:mpalmer@grnland.com)
- **Name:** Jim Hartman, P. Eng., **Title:** Senior Associate, **Role in Project:** Advisor, **Contact info:** [jhartman@grnland.com](mailto:jhartman@grnland.com)

### SafeSump Inc.

- The SafeSump™ is an internet connected failsafe sump pump system making it superior to the conventional technology. It constantly updates a dashboard that owners can log into from anywhere and sends email alerts if any issue occurs. Other benefits include a custom sonar water sensor, variable speed pump, built in software contingencies and a backup battery.
- The SafeSump™ technology was crucial to quantify sump pump discharge in key Collingwood neighbourhoods. Data from residential installations was analyzed alongside flows from municipal sewers in order to examine potential “inflow” concerns. This comparison of data was needed to confirm a hypothesis that current extraneous flows (Inflow/Infiltration) may be responsible for seasonally high inflows at the Town’s waste treatment plant.
- Key personnel involved in this project:
  - **Name:** Daniel Correia, **Title:** CEO, **Role in Project:** Lead SafeSump™ System Solution & Data Provider, **Contact info:** [dcorreia@thesafesump.com](mailto:dcorreia@thesafesump.com)
  - **Name:** Doris Mittwollen, **Title:** VP of Business Development, **Role in Project:** SafeSump™ contact for project participants, **Contact info:** [dmittwollen@thesafesump.com](mailto:dmittwollen@thesafesump.com)
  - **Name:** Brian Correia, **Title:** Operations Coordinator, **Role in Project:** Site installation coordinator for the SafeSump™ systems, **Contact info:** [team@thesafesump.com](mailto:team@thesafesump.com)

### RainGrid Inc.

- RainGrid Inc. is a climate change adaptation company founded to design and build distributed networks of intelligent rain harvesting for residential properties, the largest source of urban stormwater runoff. Stormwater Smartgrids are designed to be reliable, measurable and effective community flood and drought resilience infrastructure that resolves the inherent social and operational barriers facing analog residential rain barrel programs.
- Key personnel involved in this project:
  - **Name:** Kevin Mercer, **Title:** CEO, **Role in Project:** Lead RainGrid System Solution & Data Provider, **Contact info:** [kevin.mercer@raingrid.com](mailto:kevin.mercer@raingrid.com)

### Environment Network

- The Environment Network is a non-profit organization working with communities, the public, and all levels of government to ensure a healthy and sustainable environment. Their team was a key part of the participant/community liaison strategy while also assisting with overall project coordination.
- Key personnel involved in this project:

- **Name:** Kerri MacDonald, **Title:** Manager, **Role in Project:** Participant & Community Liaison Contact, **Contact info:** [info@environmentnetwork.org](mailto:info@environmentnetwork.org)

### **Huronia Alarm & Fire Security Inc.**

- Huronia Alarms contributed on-site monitoring support for many SafeSump™ systems in the pilot project.
- Key personnel involved in this project:
  - **Name:** Rob Thorburn, **Title:** President & CEO, **Role in Project:** Oversight of Monitoring Operations, **Contact info:** [rthorburn@huroniaalarms.com](mailto:rthorburn@huroniaalarms.com)

### **Town of Collingwood**

- Collingwood is a bustling town filled with energy, creativity, and the natural beauty of South Georgian Bay. As one of the top places in Ontario to open and operate a small business, Collingwood boasts a growing population and a thriving business community. Municipal staff have taken a proactive approach to stormwater management and were very supportive of activities throughout the entire duration of the project. Findings from our project can also be integrated into their new stormwater masterplan to better prepare Collingwood for extreme weather (rain) events.
- Key municipal staff involved in the project:
  - **Name:** Martin Rydlo, **Title:** Director, Marketing & Business Development, **Role in Project:** Primary Municipal Contact and Advisor, **Contact info:** [mrydlo@collingwood.ca](mailto:mrydlo@collingwood.ca)
  - **Name:** John Velick, **Title:** Manager, Engineering, **Role in Project:** Advisor, **Contact info:** [jvelick@collingwood.ca](mailto:jvelick@collingwood.ca)
  - **Name:** Dennis Sloan, **Title:** Deputy Director Financial Planning and Policy Development, **Role in Project:** Financial Grant Administrator, **Contact info:** [dsloan@collingwood.ca](mailto:dsloan@collingwood.ca)

## **2. The Pilot Project**

- a) Please describe the project objectives and the approach used to meet these objectives. Include details on what technology or solution was tested during the Pilot Project. (Indicate relevant sections/pages of the Final Pilot Project Report)

This pilot project identified key homeowner initiatives that could reduce inflows of stormwater in to the sanitary sewer system, so that a broader municipal initiative can be implemented there-after. The scale of this broader project aims to reduce the 90<sup>th</sup> percentile of rainfall resulting from a 24-hour event by 50% – thereby, dramatically reducing the probability of overloading current infrastructure systems. For reference, the 90<sup>th</sup> percentile rainfall volume is approximately 30 mm.

One primary project objective was to examine two (2) concurrent/related residential and industrial/commercial/institutional (ICI) lot level (or at source) initiatives, namely:

1. Eliminating stormwater runoff from private properties that would normally drain uncontrolled to the Town’s aging sewer system and drainage infrastructure;
2. Reducing extraneous stormwater (inflows) to the Town’s Waste Water Treatment Plant and preventing the release of untreated sewage into Georgian Bay during extreme weather events. In terms of the latter, a release occurred in the spring of 2016 to the Collingwood Harbour and which is used for swimming, fishing, boating and other recreational activities. It is believed that these excessive inflows to the WWTP were because of non-compliant connected residential sump pumps draining high water table flows and discharging to the sanitary system.

The following activities were undertaken to best address the objectives outlined above:

- Non-compliant residential connections to the sanitary sewer system were discouraged, including homes that now have foundation drains (via “smart” data collecting sump pumps) discharging to sewer laterals;
- At source (lot level) rainwater harvesting (with data collection) and conservation, and when feasible, discharging outflows to onsite LID practices with groundwater infiltration capabilities.

Lastly, our overall pilot project objectives (both quantitative and qualitative) were:

**Environmental**

- More effective stormwater management at the lot level (private residential & commercial properties).
- Assessing the homeowner impact in terms of reduced risk of flooding.
- Improved fact-based decision-making regarding stormwater mitigation techniques.

**Economic**

- Mitigating the property damage from stormwater activity.
- Reducing stress on existing municipal systems.
- Provide an opportunity for local companies to help homeowners mitigate flooding damage.

**Social**

- Educate homeowners about basement flooding and stormwater risk prevention.
- Utilize advanced “smart” technologies and LID features to reduce flooding risk on a homeowner and municipal level.
- Remove non-compliant connections to the sanitary sewer to relieve pressure on Town assets.

b) Did the pilot project include a methodology or approach for verifying or testing the performance of the technology or solution? Please respond Yes or No.

Yes [ X ]

No [ ]

If you answered yes to Question #3, which methodology did you use in this pilot project for testing the performance of the technology or solution?

- Environmental Technology Verification Program - YES
- Engineering Consultant – YES

### 3. Pilot Project Results:

#### a) What are the Pilot Project’s recommendations? (You may point to the relevant sections/pages of the Final Pilot Project Report if relevant.)

The following are a list or recommendations from our Pilot Project team:

1. Based on our surveys and consultations with many Collingwood homeowners, we suggest that additional stakeholder engagement activities are necessary to inform residents of best practices and new technologies for basement flood preparedness. Our Pilot Project team identified a large knowledge gap with many residents in terms of having the appropriate knowledge to effectively manage their sump pump and other potential basement water risks. Our communication efforts with Collingwood residents has showed that there is an appetite and need for this as outlined in the conclusion section of the ‘Participant Survey – Executive Summary’ prepared by the Environment Network (see **Appendix 1**).

With that being said, organizing an education program around tangible basement flood preparedness tips would be very helpful for many residents in the Town of Collingwood. A program of this nature could be undertaken by the Town of Collingwood itself and/or through a local not-for-profit such as the Environment Network.

In order to address the above recommendation, the project team initiated another partnership process by introducing Town of Collingwood staff to other professionals affiliated with the insurance industry, including the Intact Centre for Climate Adaptation (ICCA). We recommended that both parties continue discussions to initiate a new post project program that would be of mutual benefit and scale to help more residents in the community. There is significant potential and value added for Collingwood residents if such a “basement flood preparedness program” could be offered in the municipality.

2. The project team also recommends to utilize the Pilot Project data as part of a concurrent stormwater masterplan project that the Town of Collingwood will be completing in 2020. This separate (and more comprehensive) project was initiated last year and compliments the scope of work for the pilot project. Together, these studies could lead to new insights about optimal stormwater management solutions in various neighbourhoods of the Town of Collingwood. Overall, the data points and initial findings of the Pilot Project would be relevant and provide helpful information to complete the stormwater masterplan.

If other municipalities were to initiate a similar pilot project with “smart” stormwater technologies, they should consider integrating the real-time data with stormwater masterplan initiatives. This would provide new insights for cost effective and sustainable solutions that address climate change concerns.

3. Given the support from FCM and positive feedback we received from seven (total) conferences over the course of the project, we feel this project is of merit to be introduced to other municipalities. Our project team understands that many communities across Canada are struggling with stormwater management during extreme weather events, aging stormwater infrastructure,

inflow/infiltration situations, and basement flooding. The insights and approach of our pilot project can be applied to help other municipalities.

4. There is potential to engage property owners for lot level technologies and conventional LID practices as part of a municipal stormwater plan. The pilot project's stormwater technologies can greatly compliment traditional stormwater practices given the proven reduction of private property stormwater runoff. In addition, we found that the majority of homeowners were receptive to implementing these technologies on their property when they knew their participation was part of a larger constructive community effort.
5. We identified new value-added insights, including use of the "smart" sump pump data for sanitary sewer system capacity analyses, and also to address side walk maintenance concerns. In terms of the latter, the Town was able to develop a standard for draining sump pumps across property owner lands so the sump discharge would not freeze on sidewalks. Earlier in the project we hypothesized that the variable speed pumping capabilities of the SafeSump™ system (allowing discharge to occur at a steady rate) have soil infiltration advantages (especially in freezing weather conditions) over traditional mechanical pumps. The combination of variable speed pumps and strategic infiltration areas (small pits filled with conducive soil/granular media) have the potential to reduce sump discharge freezing on nearby sidewalks. This insight is relevant to many municipalities and neighbourhoods that are experiencing this public safety issue.
6. If a municipality decides to implement a stormwater tax – similar to the City of Mississauga – the project's technologies (SafeSump™ and RainGrid) with conventional LID practices (permeable parking lots, etc.) can be effective to mitigate stormwater leaving private properties in both residential and commercial applications.

Also, if a stormwater tax policy is to be accepted by affected residents and businesses, verifiable data sources from these stormwater technologies should be utilized so results can be trusted by all stakeholders (municipal staff, utility providers, residents, etc.). For example, personalized taxes (based on impermeable surface areas on property) and credits (based on savings from "smart" stormwater mitigation technologies) are important components of a fair and justifiable stormwater taxing system.

In addition, the public-private-partnership concept of the Collingwood pilot project could also be replicated in deploying lot-level stormwater technology solutions for stormwater credits. The pilot project team found it was effective to have private technology suppliers working with municipal staff oversight and guidance. These dynamics and partnership roles also increased the credibility of project and gave confidence to prospective homeowners who were considering installing these new and innovative technologies on their property.

**b) Is the Pilot Project *technically feasible* for full-scale implementation? Please comment on why or why not.**

- Yes. The technology is valid and it could be incorporated into municipal programs that have concern for flooding events induced by climate change factors. However, we would recommend that these programs also include qualified professional engineering oversight so that municipal policies and expectations are achieved. Engineering oversight would also increase the credibility of the program and the activities within its scope.
- Secondly, all data capture/storage/privacy concerns can be adequately addresses based on our analysis of this pilot project. We would however recommend that a comprehensive plan is put in

place at the beginning of any other similar program to ensure that storage requirements and privacy concerns are properly managed – given the large amounts of data that would be gathered at full scale implementation.

- In addition, any full-scale implementation should be in conjunction with public awareness about basement flood solutions and property owner responsibilities to best maintain “smart” stormwater technologies on a periodic basis. In order for a program of this nature to be successful, property owners must be engaged and willing to work with the municipality. If the initial onboarding process (clarifying expectations/measures of success, educating property owners of their responsibilities, etc.) is not handled properly, then the municipality would have to take a greater level of responsibility for operation and maintenance. Ultimately, this would increase the costs and reduce the likely hood of success. In summary, outreach efforts and homeowner engagement activities would be critical for a successful full-scale implementation of a similar pilot project.

**c) What were the financial results of the Pilot Project and is the Pilot Project *financially feasible* for full-scale implementation? Please comment on why or why not.**

- Overall, the budget was adequate for the scope of work and level of effort by the project team (on a pilot project scale). If a project of this nature were to be scaled to full-scale implementation, we anticipate the costs of supplying the “smart” stormwater technologies would come down due to economies of scale. We would however recommend a larger budget component for homeowner outreach and education activities. These two changes together lead our team to believe that full-scale implementation is financially feasible.

**d) Please complete the following table that was part of your pilot project application with the actual results from your pilot project. Please also provide the page numbers where the environmental results of the pilot project can be found in the final report.**

Project parameter (energy, water, waste, other)		Units	Baseline performance before project	Anticipated performance after project completion
<b>Primary</b>	Add Primary Indicator			
	Stormwater Runoff Eliminated from 24-hour Rainfall Events (% by vol <input type="text"/> )	%	0	75
<b>Other</b>	Add Other Indicator			
Remove	Infiltration in rain garden (3 total) to be constructed and monitored during pilot project	%	0	75
Remove	Infiltration in constructed permeable parking lot (2 total) to be monitored during project	%	0	75
Remove	Groundwater inflows from lot level sump pump (75 total) to be installed and monitored during pilot project	%	0	100
Remove	Lot level stormwater runoff reduced by roof rainwater cistern (10 total) to be installed and monitored during pilot project	%	0	75

**Actual performance results for each project parameter in chart above:**

Primary:

- Stormwater Runoff Eliminated from 24-hour Rainfall Events (% by volume): **69-100% reduction**

Other:

- Infiltration in rain gardens: **69% reduction** (average)
- Infiltration in constructed permeable parking lots: **100% reduction** (average)
- Groundwater inflows from lot level sump pump: **100% infiltration** (average) at residential properties during non-winter period.
- Lot level stormwater runoff reduced by roof rainwater cisterns: **70% reduction** (average)

**e) Please describe all of the environmental results including any potential negative results or trade-offs that need to be considered.**

The full “Environmental Results” analysis can be found in **Appendix 2** – Data Analysis Report.

In terms of a general Environmental Results analysis, the following were the Environmental Objectives listed in our original GMF application. The **text in green** under each objective describes the latest results and analysis at the conclusion of the project.

**1. Better stormwater management**

- Based on the performance targets and final results listed in the above question (3 d.) The concept of our pilot project with the “smart” technologies and LID features **have** proved to be effective solutions to stormwater management. This not only applies to the Town of Collingwood, but could be replicated in other municipalities who are dealing with aging stormwater management infrastructure.

**2. Assessing the homeowner impact in terms of reduced risk of flooding**

- The initial homeowner consultation visits allowed the pilot project team to gain an understanding of the current condition of many sump pits & pumps. This task identified troubling issues related to poorly designed (and poorly maintained) sump pits. In addition, many of the conventional (A/C powered sump pumps) that were in operation were very old should have been replaced to offer better protection from a basement flood event (see **Appendix 3**) to see pictures of some sump pumps & pits we encountered during our homeowner consultations).
- Consequently, the pilot project team recommends that the Town of Collingwood should organize and offer basement flood preparedness resources so homeowners can educate themselves of best practices. Our conversations with homeowners at the beginning of the pilot project showed there was a significant knowledge gap on this topic.

**3. Improved fact-based decision making re. stormwater mitigation techniques**

- The data gathered from the pilot project activities has allowed our team (and municipal staff) to expand their perspective and understanding on various stormwater issues in the Town of Collingwood.
- For example, when comparing sewer flow records with sump pump activity in a monitored neighborhood, the pilot project team advised the Town of Collingwood that there could be another contributing factor to the persistent high-water level in a nearby stormwater pond. This insight allowed municipal staff to quickly correct an issue that they were unaware of.
- Another data-driven project activity was analyzing the effectiveness of various “smart” technologies and LID features using a new PCSWMM (storm water

management model) based lot level tool developed by Conservation Authorities in Ontario. The project team applied this model to multiple sites that were monitored in our pilot project. These results have helped our team communicate and quantify the benefits of the lot-specific technologies and low impact development (LID) features used in our project. The results are displayed and described in **Appendix 2**.

In terms of trade-offs, there could be one with how this overall public-private-partnership is structured. For example, when engaging homeowners directly and installing stormwater management technologies/LID features on private property, a municipality is dependant on the property owner’s cooperation for the environmental objectives of the project to be met. For example, all “smart” technologies and LID features included in our project do require some level of maintenance for them to function effectively. Since these are on private property, it is either the responsibility of the homeowner to properly maintain them or a cooperative agreement would need to be established to allow municipal employees to access them.

One thing to note is the data collection capabilities of the stormwater technologies helps to increase accountability. For example, the data feeds from these “smart devices” (both past and present) does allow for performance to be monitored against specific pre-determined benchmarks. If devices are not maintained (such as the cleaning of a rain cistern filter or sump pump battery replacement), these negligent behaviours could be identified in the data records. Early warnings could also be established to put both the homeowner and municipality on alert that action is required. A dedicated municipal team may need to be created to manage the activities of such a large-scale initiative.

In summary, the benefits of implementing private property lot level controls is dependent on proper maintenance and citizen engagement/cooperation or else the project may not be able to achieve the anticipated stormwater volume reduction metrics.

**f) Based on the experience gained in the pilot, please update the anticipated social and economic outcomes (community benefits) of full-scale implementation of the pilot project. Column B of the following tables shows the anticipated economic and social benefits you noted in your application.**

**Please complete the table below by describing in Column C the anticipated economic benefits of the pilot project at full scale implementation. Please complete for all that apply in the list below. If there are additional economic benefits, please describe these in the last row of the table.**

**Figure 1 – Economic benefits**

A	B	C
Economic benefit	As described in your GMF application	Anticipated economic benefits of the pilot project at full scale based on pilot experience. If the result is different than what was expected in the application form, please indicate why.

Increased return on investment		
Deferred or avoided capital expenditures		
Decrease in facility operating or maintenance costs	By decreasing stormwater stress on municipal sewer infrastructure, need for capital and operating cost increases can be avoided.	See text answer under this chart labeled: <b>Anticipated Economic Benefits: <u>Decrease in facility operating or maintenance costs.</u></b>
Extended lifespan for facility		
Increased municipal revenue streams (e.g. property tax, user fees, etc.)		
Lower taxes		
Stimulus for local economy (use of local business, capacity for local business development)	Project leverages local companies, providing with stimulus to innovate and become more competitive.	See text answer under this chart labeled: <b>Anticipated Economic Benefits: <u>Stimulus for local economy</u></b>
Increased employment options or job retention	By developing a new SMART Home segment of this exploring sector, new skilled trades and engineering employment opportunities will be created at companies like Huronia, Greenland and Safe Sump, to name just a few. The opportunity to give these companies a competitive technical advantage creates jobs locally and regionally.	See text answer under this chart labeled: <b>Anticipated Economic Benefits: <u>Increased employment options or job retention</u></b>
Increased transit ridership		
Attraction of new businesses	Guelph University Engineering department is keenly watching the role-out of this pilot project as it has potential of supporting several engineering projects and start-ups they are working on. This could result in start-ups setting up labs or permanent offices in Collingwood as they seek to find communities with complimentary companies and test environments. As ICCA and HAAP observe this pilot they bring with them additional credibility and awareness of the emerging water technology cluster in the region. Finally, Communitech (based in Kitchener and considered one of the top 10 tech incubators in North	See text answer under this chart labeled: <b>Anticipated Economic Benefits: <u>Attraction of new business</u></b>

	America, is interested in exposing its water related entrepreneurs to this innovative region which could bring further companies to set-up in Collingwood and create higher tech, higher salary employment opportunities.	
Other (please specify)		

- **Anticipated Economic Benefit: Decrease in facility operating or maintenance costs.**

Insights from the monitored subdivision draining to an existing stormwater pond, identified (using our PCSWMM model) that full-scale implementation would decrease stormwater capital and management costs for the municipality. By reducing the lot level run-off, municipalities would have lower water volumes to accommodate throughout their stormwater infrastructure, reducing both the cost of infrastructure and the investment need to maintain them if sudden ‘spikes’ in stormwater flow rates can be moderated. Insights from the monitored subdivision draining to an existing stormwater pond, identified (using a continuous hydrologic model) that full scale implementation of the RainGrid (rainwater harvesting) cisterns would significantly reduce frequent stormwater flows to the pond. Also, even though it was not a metric to be assessed during the project, we hypothesized this can also have a positive benefit for stormwater quality discharging to and from the pond.

Therefore, these observations support a conclusion that the use of lot level rainwater harvesting technologies, such as RainGrid, would be of benefit to reduce long term maintenance activities (and expenses) for stormwater ponds.

- **Anticipated Economic Benefit: Stimulus for local economy**

This project has been a key catalyst for the many local companies involved:

**SafeSump™ Inc.:** Being able to deploy and test numerous SafeSump™ systems in this pilot project was essential to validate their real-time data collection capabilities. Also, the sump pump/shallow ground water data gathered from installed units has been instrumental in assisting SafeSump™ market their product to other municipalities. At the moment, SafeSump™ is currently in discussions with other municipalities for similar projects that focus on reducing basement flooding and stress on municipal sewer systems (from sump discharge outlets).

This pilot project also helped validate the product/market fit of the innovative SafeSump™ features. In the final participant survey, 81% of participants would prefer to continuing using a SafeSump™ system (over a conventional sump pump) and 60% of participants noted that they would be willing to pay extra to continue accessing the real-time monitoring and alert capabilities. These survey results show the marketability of the SafeSump™ product and opportunity for growing the business going forward. The many positive testimonials we have gathered from these pilot SafeSump™ users to-date is also another significant factor that will help increase the credibility (and competitiveness) of SafeSump Inc. and their new sump pump technology. Overall, the relatively large number of local early adopters involved in this project is a great asset SafeSump Inc. can draw upon when marketing their product to others in the region.

**RainGrid Inc.:** This pilot project was also important for RainGrid Inc. to validate real-time data collection capabilities and autonomous features of its proprietary rain cistern. Given that many of the

project cisterns were installed in one neighborhood with stormwater and shallow ground water issues, the data from these units was extrapolated to a larger area using a PCSWMM model. These unique private property (roof run-off) stormwater mitigation insights (validated through real project data sets) was essential to validate the effectiveness of RainGrid’s innovative “smart” rain cistern.

As a result, the data and quantifiable stormwater insights from these RainGrid units have also been of interested to other municipalities. Current discussions involving RainGrid are now underway.

**Greenland Consulting Engineers:** As project engineers, Greenland has been able to develop and deliver a replicable business model to other municipalities interested in using “smart” technologies to address/reduce stormwater flows. Many municipalities in Ontario with aging stormwater infrastructure are challenged with managing flows from private and commercial properties (similar to concept of our pilot project) and are open to new ideas and technologies that could address these issues. This is a unique business opportunity that can provide Greenland with new opportunities to serve municipal clients across Canada. As a result, this is anticipated to be a growing business segment for Greenland with other local opportunities in Ontario too.

In addition, the numerous technology transfer forums (see **Appendix 4**) during the project has provided Greenland with new opportunities to promote its business that incorporate “smart” stormwater technologies. Being able to pursue new municipal opportunities with a climate change - stormwater mitigation focus has helped Greenland grow during the project. In particular, these pilot project promotional activities were important for this to happen.

Lastly, working with this innovative partnership business model (with a “smart” IoT focus) enabled Greenland to secure other collaborative agreements with companies that have complementary smart stormwater technologies. This included a Green Roof company in the Greater Toronto Area and a company in Norway. The experience and credibility that Greenland gained from the Collingwood stormwater pilot project was important in securing these collaborative agreements. There will also be new project opportunities (within the local South Georgian Bay economic region) that will occur over the coming years as these new collaborative efforts gain momentum.

**Environment Network:** The Environment Network (local NGO in the Collingwood area) is currently exploring options for an expanded public engagement program on sump pump and homeowner basement flood awareness. This opportunity would build on the momentum and success of the Collingwood stormwater pilot project and could allow the Environment Network to access additional funding so they can provide a much-needed flood awareness campaign to the Collingwood community.

- **Anticipated Economic Benefit: Increased employment options or job retention**

**SafeSump Inc.:** As mentioned in the answer above (SafeSump™ section), this pilot project allowed SafeSump Inc. to validate their technology so they can grow and pursue future (larger) opportunities. As a result, the company is currently in discussions with other municipalities for similar projects that focus on reducing basement flooding and stress on municipal sewer systems. SafeSump Inc. is also in discussions with larger “smart” IoT focused companies who are interested in partnering with them to leverage their proprietary sump pump technology. In order to meet the increased production targets for both of these opportunities, it is anticipated that additional jobs (both manufacturing and software development) would be needed. The SafeSump™ team has emphasized they would like to grow the business locally (within the South Georgian Bay region) which will help contribute to the local economy through these new employment opportunities.

**RainGrid Inc.:** Similar to SafeSump Inc., and as mentioned in the answer above (RainGrid section), this pilot project allowed RainGrid Inc. to validate their technology so they can grow and pursue future

(larger) opportunities. This includes a potential partner affiliated with the land development industry. In order to meet the increased production targets of these opportunities, it is anticipated that additional jobs (both manufacturing and software development) would be needed. These job openings would most likely occur within the GTA where the head office of RainGrid Inc. is located.

**Greenland:** Over the course of this pilot project Greenland hired additional employees that are assisting with similar projects addressing climate change concerns affecting municipal infrastructure systems. The experience gained from this pilot project and current discussions with other municipalities have the potential to provide new job openings. These new job positions will be located in Collingwood.

- **Anticipated Economic Benefit: Attraction of new business**

Throughout the pilot project, the Town of Collingwood has been very supportive of the activities and has expressed their willingness to be a “living lab” for local entrepreneurs to test their innovative technologies with a health and wellness (including water) focus. Having a successful experience with this pilot project, the Town will use the study in their marketing efforts to re-enforce the benefits of validating and growing new technology focused businesses in the community. Attracting entrepreneurs and offering the necessary support to grow a business is the priority of the Town of Collingwood’s Centre for Business and Economic Development. Staff from this department were key contributors over the timeline of our project.

In addition, this has directly helped formulate the Town of Collingwood’s new 5-year economic development strategy given the insights generated from this pilot project. It identified the opportunity to become a test location for other private-public ‘tech’ projects that address key municipal needs in partnership with several local companies and their broader network of partners. As a result, the following objective has been added to Collingwood’s draft 2020-2025 Economic Development Action Plan:

Objective 1.2: Promote sustainability projects in collaboration with cluster businesses that develop innovative products and services focused on sustainability are blossoming in Collingwood. We will support this growth by encouraging private-public partnerships that help our companies test their innovations here, where they are located.

An overview of the draft plan is available [here](#) as part of a public validation [survey](#) currently underway at the Town’s community engagement portal.

Implementation plans call for the sequenced launch of pilots in Collingwood’s “*Living Lab for Sustainable Innovation*”. These pilots would mirror the foundation set by this project:

- leverage the Internet of Things and Big Data,
- solve a real municipal problem related to sustainability (environmental, economic or social)
- help develop and test specific ownable and scalable technologies,
- provide real, quantified benefits to residents and businesses
- integrate funding from multiple partners.

One statistic that supports the Town’s efforts is 90% of Collingwood participants are interested to participate in other environmentally focused pilot projects with local organizations. This would be of interest to entrepreneurs needing to test their technologies in the community as it shows that the local population is supportive of participating in validation efforts. It also speaks to the success of the public private partnership (exhibited in this stormwater pilot project) that can be replicated in new pilot project applications.

Also, the recent article in Water Canada’s magazine called [Collaboration to Action](#) details the history of the Collingwood Stormwater Pilot Project and the successful public-private partnership model of the multi-disciplinary project team (see **Appendix 5**). Validation from this prestigious publication has helped the Town of Collingwood communicate the benefits and successful track record of assisting entrepreneurs test and validate their technologies in their community.

In addition, efforts to establish a Business Accelerator within the Town of Collingwood continues to progress ([see link to Town of Collingwood staff report](#)). One of the components of the program is to partner with post-secondary institutions so that students can validate and test new and innovative products/services in the Collingwood community. Discussions around this opportunity are now underway.

In terms of conventional promotional opportunities, Town of Collingwood staff (including Mayor and Director of Marketing/Business Development) were able to participate in conference speaking opportunities showcasing the pilot project public-private-partnership model. These presentations were great opportunities to communicate their focus and commitment to attracting new business and entrepreneurs – particularly in the technology industry. Overall, these speaking opportunities were effective in communicating the progressive and entrepreneurial nature of the Town of Collingwood and how it is successfully diversifying the local economy away from the predominate tourism industry.

- g) Please complete the table below by describing in Column C the anticipated social benefits of the pilot project at full scale implementation. Please complete for all that apply in the list below. If there are additional social benefits, please describe these in the last row of the table.

**Figure 2 - Social benefits**

<b>A</b>	<b>B</b>	<b>C</b>
<b>Social benefits</b>	<b>As described in your GMF application</b>	<b>Anticipated social benefits of the pilot project at full scale implementation based on pilot experience</b> If the result is different than what was expected in the application form, please indicate <b>why</b> .
Improvements to public health		<p><u><a href="#">New insight from pilot project:</a></u></p> <p>From a basement flooding point of view, new effective solutions (such as the SafeSump™ system) have the potential to <u>reduce anxiety and mental health issues</u> that homeowners experience when they are unsure about their flood preparedness. Many homeowners are anxious and worried that their unreliable conventional sump pumps won’t be able to handle a heavy rain event. The lack of real-time alert capabilities compounds this issue, especially when they are traveling away from home.</p> <p>As a result, there is potential to improve “public health” if communities can implement solutions that can assure homeowners that they are prepared when a sump pump issue does occur (through real-time monitoring/alerting capabilities).</p>

<p>Improvements to public safety</p>		<p><u>New insight from pilot project:</u></p> <p>Flooded basements can produce debris and mold problems that can put homeowners at risk. A significant amount of material also needs to be disposed at the landfill when a basement flood occurs. Therefore, the argument can be made that if there is a significant reduction in basement floods on a full-scale/community level, there could be significant improvements to public (and environmental) safety.</p>
<p>Improvements to community quality of life</p>	<p>Flooded basements have been a significant negative factor for hundreds of residents over the last few years. By introducing the Safe Sump internet technology in combination with water mitigation systems like rain gardens and permeable parking lots, these challenges to the home can drastically be reduced or eliminated.</p>	<p><u>Insight from GMF application has been reinforced. However, the SafeSump™ system seemed to be the most impactful out of all technologies and features used in the pilot project (with regards to a basement flood perspective).</u></p> <p>Below are a few results from our final participant project survey:</p> <ul style="list-style-type: none"> <li>- <i>Approximately 97% of respondents (with a SafeSump™ system installed) said they feel their basement is better protected from a flooding event with a SafeSump™ system installed.</i></li> <li>- <i>Approximately 81% of respondents (with a SafeSump™ system installed) said that the real-time monitoring and alert capabilities of the SafeSump™ system are interesting <u>and</u> essential to lowering a chance of a basement flood.</i></li> <li>- <i>Approximately 81% of respondents (with a SafeSump™ system installed) said if they had to replace their sump pump after the pilot project is finished, they would prefer a SafeSump™ system over a conventional sump pump.</i></li> <li>- <i>Approximately 8% of respondents who had a SafeSump™ system installed said that the real-time alerts explicitly helped avoid a basement flood during the pilot project. This is not a nominal statistic given that the average basement flood can be an expense greater than \$35,000.</i></li> </ul> <p>Our project team also has positive testimonials from participants who had an installed SafeSump™ system (see <b>Appendix 6</b>). These testimonials, along with conversations with participants, indicates that homeowners' quality of life has improved by having a SafeSump™ system installed. Overall, homeowners were appreciative of having access to this innovative technology as the real-time alert capabilities were effective at reducing the uncertainty of monitoring their sump pump.</p> <p>If these positive survey results were to be extrapolated across the entire community (to simulate a full-scale</p>

		<p>implementation scenario), there could be a tremendous benefit if homeowners were no longer anxious and worried about a basement flood occurring. By identifying and having a way to minimize this significant source of stress, it should not be overlooked from a community benefit perspective.</p> <p>In addition, the Environment Network (local NGO in the Collingwood area) is currently exploring options for an expanded public engagement program on sump pump and homeowner basement flood awareness. This opportunity would build on the momentum and success of the Collingwood Stormwater Pilot Project and could provide a much-needed flood awareness campaign to the Collingwood community.</p>
<p>Increased opportunities for community engagement</p>		<p><u>New insight from pilot project:</u></p> <p>On the final participant survey, approximately 90% of respondents noted that they are interested in continuing to participate in environmentally focused pilot projects with local partner organizations. This presents a great opportunity for local entrepreneurs to pilot test their environmentally focused product/services in the Collingwood community. Engaging the community and involving them in testing/validation efforts can be beneficial for both parties – as evidenced in this Collingwood stormwater technology project. This could ultimately be advantageous for local organizations as they can refine and iterate on their product designs quickly through wide-spread community participation and engagement.</p>
<p>Increased public education or awareness</p>	<p>Through the Environment Network efforts at the homeowner level, as well as a broader public awareness campaign pre, during and post the pilot, homeowners will learn about the risks of stormwater and tactics to help address and avoid being affected by this climate change factors.</p>	<p><u>Insight from GMF application has been reinforced.</u></p> <p>From our final participant survey, approximately <b>66%</b> of survey respondents said they are more aware and informed of actions they can take to reduce the impact of stormwater on their property and community.</p> <p>We feel this response was the result of the homeowner engagement activities our project team prioritized. Over the course of our project, many participants were given suggestions for better sump pump maintenance practices, as well as other technologies and LID practices that can be effectively used to retain stormwater on the property (such as RainGrid cisterns, rain gardens, and permeable parking lots). The quantifiable nature and real-time dashboard access of both the SafeSump™ systems and RainGrid cisterns also helped with credibility and buy-in from a homeowner perspective. These homeowner engagements and consultations were very helpful as many homeowners were unaware of the how their properties were contributing to the</p>

		<p>municipal stormwater infrastructure system (e.g. flows from sump pump discharge, eavestrough discharge, etc.) at the beginning of the project.</p> <p>However, our project team still foresees more work needs to be done by the municipality to educate and inform residents on basement flood best practices. There is still a significant knowledge gap that should be addressed as many homeowners are simply unaware of how to best mitigate a basement flooding event.</p> <p>Also, given the vulnerable position many homeowners are in, and the significant consequences that can arise from an increased flood risk (both from a costly repair and mental health perspective), this educational initiative is very important and should be prioritized by any municipality.</p> <p>The project team has also identified other organizations who could help contribute to such an educational campaign. For example, the Town of Collingwood could leverage the expertise and resources of the Intact Centre on Climate Adaptation (ICCA). Their existing basement flood preparedness resources and experience preparing such campaigns would be a great asset if the Town of Collingwood were to organize a similar effort within their community.</p>
Community revitalization		
New housing and infrastructure		
New or enhanced public space or public facilities		
Improved access to recreation and physical activities		
Reduced urban sprawl		
Increased civic pride, ownership and participation		
Improved quality and efficiency of service	A major focus of the pre and post surveys conducted by the Environment	<u>Overall the insight from GMF application has been reinforced</u> in terms of increased awareness and technological solutions in reducing the risk of a flooded basement - from a homeowner perspective. The survey results listed below

<p>provision to residents</p>	<p>Network will focus on assessing the impact of increased awareness and technological solutions in solving key challenges homeowners face in the region such as flooded basements.</p>	<p>focus on questions regarding SafeSump Inc. as their technology was installed to help address this issue.</p> <p><b>Questions related to SafeSump Inc:</b></p> <p>The results in the SafeSump™ portion of the final survey show that the innovative sump pump system used in the pilot project was very effective at easing homeowner’s anxiety regarding basement flood uncertainty and proper sump pump operation. The installation of a SafeSump™ and discussions about sump pump maintenance best practices were also very helpful in increasing awareness on how to better protect against a basement flooding event.</p> <ul style="list-style-type: none"> <li>- <i>Approximately 97% of respondents (with a SafeSump™ system installed) said they feel their basement is better protected from a flooding event with a SafeSump™ system installed.</i></li> <li>- <i>Approximately 81% of respondents (with a SafeSump™ system installed) said that the real-time monitoring and alert capabilities of the SafeSump™ system are interesting <u>and</u> essential to lowering a chance of a basement flood.</i></li> <li>- <i>Approximately 81% of respondents (with a SafeSump™ system installed) said they had to replace their sump pump after the pilot project is finished, they would prefer a SafeSump™ system over a conventional sump pump.</i></li> <li>- <i>Approximately 8% of respondents who had a SafeSump™ system installed said that the real-time alerts explicitly helped avoid a basement flood during the pilot project. This is not a nominal statistic given that the average basement flood can be an expense greater than \$35,000.</i></li> </ul> <p>Also, and as mentioned earlier, our project team has a number of positive testimonials from participants who had an installed SafeSump™ system. These positive testimonials, along with the conversations we have had with participants indicates that the vast majority are more aware and feel more confident in dealing with basement flooding risks because of their experience with a new SafeSump™ system. Overall homeowners were very appreciative of having access to this new technology as the real-time alert capabilities were effective at reducing the uncertainty of monitoring their sump pump.</p> <p>Lastly, if these positive survey results were to be extrapolated across the entire community (to simulate a full-scale implementation scenario), there would be a greater benefit if the majority of homeowners were more aware and able to deal with the risk of a basement flood. By identifying and</p>
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		having a way to minimize the risks associated with this key challenge facing residences and businesses in Collingwood, they would be better equipped to avoid a costly flooding event.
Reduced opportunities for crime		
Other (please specify)		

#### 4. Lead Applicant’s Next Steps

- a) What next steps does your municipality plan to take based on the findings and recommendations of the Pilot Project?

Key next steps aim to leverage the insights gained to inform, educate and accelerate stormwater reduction efforts at the lot level:

1. Inform Council on how the project came together and highlight partnership with FCM, in an effort to generate support for other Collingwood Pilot Projects focused on Sustainability Innovation.
2. Educate:
  - a. Broader community stakeholders, environmental organizations and urban designers on how this project has generated new insights on stormwater reduction via insights-sharing Webinar/event presentation.
  - b. Collingwood residents about lot level stormwater reduction measures they can take, highlighting basement flooding de-risking technologies available to them, via door to door & social media campaigns.
3. Accelerate search for funding partners to expand usage of stormwater reduction technologies in homes by reducing the cost of installation (incentives, tax rebates, insurance reductions, etc).

#### 5. Lessons Learned

In answering the questions in this section, please consider all aspects of the Pilot Project —from the initial planning through each of the essential task until the Final Report of the Pilot Project was prepared.

- a) What would you recommend to other municipalities interested in doing a similar Pilot Project? What would you do differently if you were to do this again?
  1. We would recommend the public engagement phase should be longer and more education materials and effort should be allocated at the onset of the project. An education campaign specifically around sump pit/pump maintenance and best practices to reduce the risk of a basement flood would have been particularly helpful for our project. This could also be a great opportunity for a team to partner directly with the municipality to help implement a sump pump education and awareness campaign.

2. Our team would also recommend increasing the lead time for promotional activities so we could spread the word further in our community at the beginning of the project. Although we did have a rapid uptake initially, we were only able to connect with a small fraction of the Collingwood community. This was unfortunate as we believe there were many more residents and businesses who may also have elevated basement flooding risks. The majority of project participants we spoke to also had a significant lack of awareness on the topic. Looking back, we perhaps underestimated the time it would take to reach out to the community, promote the project, and educate the public about stormwater flooding issues.
3. Thirdly, if we were undertaking our project again (or giving advice to someone in another community), it would be to engage the municipal Public Works and Engineering Department from the beginning of the application. We have since met with engineers from the Town of Collingwood and they were engaged after the project was underway. They were also helpful with providing comments about the workplan in order to help maximize overall project benefits.
4. In addition, we would caution against other municipalities relying on rain gardens as a stand-alone, on-site LID practice for broader implementation at the community scale. During the initial selection process, our team encountered physical barriers (including, suitable soil media, utility service constraints, etc.) to identify suitable sites to achieve an effective rain garden design. This was the case in relatively new subdivision areas as the lot sizes were much smaller than in older neighbourhoods. We anticipate that other (and growing) municipalities would also find it difficult to select a large number of residential properties that could meet the requirements of a successful rain garden installation. Therefore, a larger project budget would be needed for the selection/evaluation process. However, the end result may not yield enough suitable rain garden sites for a large-scale implementation program. This issue could be addressed by having a proactive discussion with developers before new subdivisions are designed so they can accommodate rain gardens in their original engineering plans.
5. After reviewing the final participant project survey, the following recommendations were made to the project partners based on user feedback:
  - **SafeSump:** It would be helpful to provide participants with a detailed user manual about the SafeSump system that would include instructions on the real time monitoring features, who to contact if there were questions, and how to disconnect the battery back-up. A hardcopy of this manual would be particularly helpful and should outline all the features of the connected smartphone app as well. Any additional training for the homeowner about the entire system would also be appreciated.
  - **RainGrid Cistern:** Participants would prefer to be able to customize the water release actions of the RainGrid cistern instead of having water drain automatically (controlled by system algorithms). For example, many homeowners did not want the cistern to drain fully after a precipitation event so they could use the captured rain water in their gardens. One potential solution could be for the RainGrid cistern to have customizable controls so the drain time could be delayed (assuming there is not a precipitation event in the near future).
    - With that being said, the project team understands there is a balance with such activities and stormwater management actions should always be prioritized over storing water solely for recreational garden purposes.
  - **Project Management:** In terms of overall project suggestions, periodically sharing data with participants would be appreciated by those involved. Even though conclusions cannot be

derived from preliminary results, any updates about the data being collected would be of interest to participants. Therefore, increasing the frequency of communication activities would be recommended to the project management team.

The above recommendations are helpful to the project partners and have been taken into consideration for future initiatives.

6. Lastly, it is recommended that the Environment Network should continue to explore options to organize an educational campaign that would address residential stormwater / basement flooding concerns in the Collingwood community. The two participant surveys during the project showed that homeowners felt this initial pilot project offered valuable resources on basement flood protection and stormwater management techniques. The numerous consultations with homeowners over the course of this project also showed the education efforts on basement flood preparedness were both appreciated and much needed by those involved. Therefore, organizing a larger scale project to educate Collingwood residents on residential stormwater / basement flood protection best practices would be a great asset to the local community. The Environment Network would be an ideal project partner to help organize such an initiative given their many connections and positive reputation in the local area.
- b) What barriers/challenges (if any) did you encounter in doing this Pilot Project? How did you overcome them?

1. A barrier we encountered was the many “unique” sump pit configurations encountered at some homes during the initial evaluation process. For example, our onsite inspections revealed installation deficiencies related to discharge piping outside of the homes. Many of these poor designs appeared to have an elevated risk of a frozen outlet pipe in the winter which would compromise data harvesting and increase the risk of installing a unit in a participant’s home. Nevertheless, in a few cases, the use of a SafeSump™ system notified homeowners of a frozen outlet pipe during extreme winter weather.

Another constraint we identified was sub-standard sump pit configurations that appeared to not comply with building code standards. Some of these issues included small pit sizes and questionable materials being used (see **Appendix 3** for some example pictures). This ultimately was a major factor to not select these sites for participation in the project because of limited space to install a SafeSump™ system and concerns of degrading sump pit materials.

In response to this apparent issue, we have recommended the Town of Collingwood organize a community wide program to educate homeowners on proper pit installation practices as well as how to best maintain a flood resilient sump pit. There could also be an opportunity to partner with other relevant stakeholders such as plumbing or insurance companies as they are knowledgeable and have an active interest in this area.

2. Another challenge encountered during the initial stages of the project was the rain garden selection process. Our original goal was to install four new rain gardens throughout the community but we ended up settling on two new installations due to site constraints. The lack of suitable sites was because of soil drainage parameters, as well as lot spacing complications. Therefore, we ultimately decided to only install two new rain gardens as our team was unwilling to approve a compromised design that would sacrifice infiltration capabilities.

However, we were able to find an additional (already constructed) rain garden on a property that received both an internet connected sump pump and rain cistern unit. This brings the total number of rain gardens in our project to **three**.

## 6. Knowledge Sharing

- a) Is there a website where more information about the Pilot Project can be found? If so, please provide the URL.

Our dedicated Pilot Project website and resource hub is: [www.collingwoodpilotproject.com](http://www.collingwoodpilotproject.com)

- b) In addition to the Pilot Project results, has your Pilot Project led to other activities that could be of interest to another municipality (for example, another pilot project, sharing of the results of this pilot project with other municipalities formally or informally, changes to existing policies and/or practices etc.)? If so, please list these outcomes and include copies of the relevant documents (or website links).

In late 2019, Greenland and RainGrid initiated conversations with other municipalities in Ontario. This was after Greenland was approached after its conference presentation to the AMO annual event in Ottawa. The municipalities that were engaged for further discussion included the City of St. Catharines, Town of Lincoln, City of Peterborough, City of Vancouver, City of Edmonton, and Town of Penetanguishene. In addition, efforts are underway to also approach the City of Stratford, City of Kitchener, and City of London but primarily with a SafeSump™ system and basement flood reduction focus.

Finally, Greenland has also initiated further discussions on behalf of the Town of Collingwood to implement a new partnership involving the ICCA team. If successful, further details will be announced at a further date.

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