



Prepared for: Rideau Lakes Township Council

Submitted by: Sustainable Drainage Working Committee

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Executive Summary

Natural water bodies in the Rideau Lakes Township have seen increased pressure through population growth and development. Preliminary data suggests that stormwater contributions from the region have exceeded the Provincial Water Quality Objectives (PWQO) for nutrients (Total Phosphorus) on several occasions, which may pose risks to long term water body health. The Township has responded by partnering with the Rideau Valley Conservation Authority, Cataraqui Region Conservation Authority, and Big Rideau Lake Association to research sustainable stormwater management techniques. This collaboration is called the Sustainable Drainage Committee. The recommended sustainable drainage and sustainable drainage-adjacent measures are as follows:

- **Bioswales:** priority given to retrofitting existing roadside ditches in close proximity to and draining into major water courses. Privately, may be part of a treatment train on agricultural properties. Secondary options are wet swales and infiltration grass swales.
- **Bioretention gardens:** suitable for private residences, public facilities such as community centers, incorporation into landscaping of commercial properties, and on rural properties receiving runoff from hardened surfaces.
- **Soakaway pits and infiltration trenches:** a non-vegetative option for the same sites as bioretention gardens.
- **Plastic or concrete grid paving:** appropriate for residential driveways, public or private parking lots, fire lanes, and pedestrian pathways.
- **Water harvesting:** rain barrels for residential use receiving water from downspouts.
- **Downspout disconnection and redirection:** residential downspouts can be extended, directed to a splash pad, and followed by a pervious area.
- **Rural clean water practices:** Partnering with the RVCA Clean Water program or initiating an ALUS Community partnership. Various strategies, including bioswales, ponds, sediment traps, cover crops, buffer strips, erosion control, livestock restriction, and tile drainage control.
- **Phosphorus targeting catch basin filters:** pilot installations receiving high fertilizer inputs and/or close to receiving water bodies.
- **Floating treatment wetlands:** appropriate for stormwater management ponds in new subdivision developments

The recommended next steps are as follows:

1. **Catch basin filter pilot sites:** install phosphorus targeting catch basin filters at strategic sites in fall of 2022. Continue monitoring for impact efficiency in spring of 2023.
2. **Rain garden demonstration sites:** 2 sites in urban areas with interpretive signage
3. **Educational resource production:** Sustainable Drainage Fact Sheets, Greening Your Grounds handbook, and social media outreach. Education should be a part of all other efforts as well.
4. **Media-marketing strategy:** a program name, slogan, and intentional, consistent language
5. **Swale demonstration site:** roadside ditch retrofit in a visible high-traffic area, with interpretive signage, and within a meaningful distance from a natural waterbody or watercourse.
6. **Rain barrel sale:** through rainbarrel.ca or independently with wholesale purchasing (Spring of 2023)

Introduction

Nestled along the picturesque Rideau Canal and waterway, Rideau Lakes Township (RLT) is home to several stunning lakes and multiple communities that rely on them. Over time, these lakes have seen increased pressure through development, changes in weather patterns, and various other sources. These changes have resulted in the need for an adaptive approach to stormwater management. Historical approaches have focused on removing water from a system at a rapid rate, while newer sustainable drainage approaches tend to be more adaptive and environmentally friendly. Preliminary data collected from two stormwater systems, one urban (catch basins) and one rural (natural drainage course), during the summer of 2022 suggests that stormwater contributions from the region have exceeded the Provincial Water Quality Objectives (PWQO) for nutrients (Total Phosphorus) on several occasions. Exceeding these guidelines may result in increased risk to the long-term health and protection of lakes and watercourses within the RLT.

To reduce the risk of watercourse degradation, the Township has partnered with the Rideau Valley Conservation Authority, Cataraqui Region Conservation Authority, and Big Rideau Lake Association representing local lake associations to better research methods and techniques that can be employed within the Township to reduce the risk of further water quality degradation. Based on research collected in a complimentary literature review, this document outlines potential courses of action the Township can take to improve stormwater management at the Township and lot level. This document also aims to outline recommendations for the Township in encouraging and promoting uptake of sustainable drainage methods by individual property owners.

Recommendations

Sustainable Drainage Practices

Swales

In the RLT, swales are already incorporated into stormwater management in the context of roadside ditching with basic grass swales. Existing swales can be retrofitted for better performance and roadside ditches in close proximity to and draining into major water courses should be prioritized. Swales are also ideal in an agricultural context along fields or as part of a treatment train (Duffy et al., 2016). They are one of the most affordable Sustainable Drainage methods on the life cycle assessment operation phase (TRCA & UT, 2013), making them a viable choice for both short- and long-term goals given limited resources. Flexible design options can help to balance costs and benefits.

The potential infiltration and filtration abilities of swales (including grass swales) can be maximized by designing them to have a low longitudinal slope, long length, and a low height to volume ratio (3:1 is the maximum) (Schueler, 1987; CVC & TRCA, 2010). Bioswales are the preferred swale subtype. Secondary options include wet swales and infiltration grass swales. Bioswales maximize infiltration and are considered to be the most effective in treating pollutants, phosphorus, and bacteria (CVC & TRCA, 2010; Ekka et al., 2021).

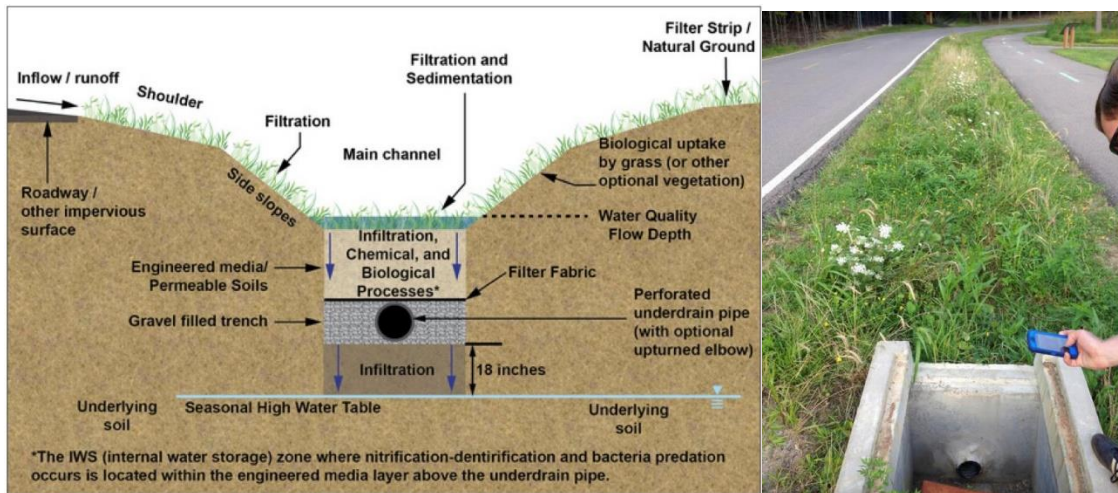


Figure 1: Typical bioswale cross section and stormwater treatment process (left) and Bioswale in Parma, Ohio with underdrain emptying to an outlet structure (Ekka & Hunt, 2020)

Plastic or Concrete Grid Paving Systems

While permeable pavements also provide many advantages, plastic or concrete grid paving systems, or grid pavers, would be most accessible in the RLT because of their low cost, durability, and easier maintenance requirements. Grid pavers offer substantial water storage potential, depending on design specifications, and varying infiltration rates based on the permeability of underlying soils. Grid pavers would be ideal in the RLT for residential driveways, public or private parking lots, fire lanes, and pedestrian pathways.



Figure 2: Concrete grid system with grass (left) and plastic grid system with aggregate (right) (CVC & TRCA, 2010)

Bioretention Gardens

Bioretention gardens, especially rain gardens, are an affordable, low-maintenance, accessible option for private residences, commercial or publicly owned properties. Their design can be customized based on aesthetic preferences or offer added benefits such as pollinator habitat. In the RLT, bioretention gardens would be suitable for private residences, public facilities such as community centers, incorporation into landscaping of commercial properties, and on rural properties receiving runoff from hardened surfaces such as the main residence, barns, storage shelters, parking areas, or sheds.

Considering life cycle assessment costs, bioretention gardens are one of the most affordable options for operation and have 62 to 98% less environmental impact than grey infrastructure (Xu et al., 2019). One model showed that up to 21% of impervious areas could be redirected to rain gardens (Autixier et al., 2014). Bioretention gardens can be efficiently used to reduce runoff and pollutant loads including nutrients.



Figure 3: Residential Rain Garden (left) and Commercial Rain Garden (right) (CVC & TRCA, 2010)

Soakaway Pits and Infiltration Trenches

Soakaway pits, or soakaways, and infiltration trenches (IT) are affordable options for residents who are not interested in vegetation-based infiltration solutions like bioretention gardens. Soakaways and IT offer water balance and quality benefits through infiltration. Soakaways are best for large areas and infiltration trenches for long, thin strips (CVC & TRCA, 2010). IT or Sustainable Drainage combinations involving IT are the most cost-efficient Sustainable Drainage techniques and they offered the greatest runoff reduction (Abdeljaber et al., 2022). IT have some of the lowest life cycle costs for operation (TRCA & UT, 2013). In the RLT, soakaways and IT are recommended as a non-vegetative option for the same sites as bioretention gardens.



Figure 4: Left: Residential soakaway pit (City of Ottawa, 2022). Right: Infiltration trench example from Cahill Associates (CVC & TRCA, 2010)

Water Harvesting – Rain Barrels

Rainwater harvesting is another simple, affordable, and accessible option that boasts a high cost-benefit ratio (Yang et al., 2020). This is one of the most affordable options in the operation

phase. Outdoor residential water use can make up 40% of domestic use of potable water during the summer months. Rain barrels can meet needs, reduce residential water bills, and reduce demands on municipal infrastructure and potable water supplies (CVC & TRCA, 2010). The extent of runoff and pollution reduction depends on the relationship between post-storage water use and the holding capacity of tanks (CVC & TRCA, 2010). In the RLT, rain barrels are recommended for residential use receiving water from downspouts.



Figure 5: Typical residential rain barrel set up (CVC & TRCA, 2010)

Downspout Disconnection & Redirection

Downspout disconnection and redirection is a simple and affordable solution to reduce the runoff that leaves residential properties. A “connected” downspout means that the water goes directly into the sewer system, often by pipe. In the RLT, it is more likely that downspouts are directed to sewers via the sump pump of a property or directed down a driveway to the street and into a catch basin. “Disconnecting” means changing the downspout so that it doesn’t go to a sump pump or sewer-connected pipe. “Redirection” means directing the downspout toward a permeable surface rather than a hard surface, like a driveway.

In Toronto, downspout disconnection is mandatory as a part of the stormwater management program (City of Toronto, 2022b). Runoff reduction ranges from 20-70% with conservative estimates for screening between 25-50% depending on native soil permeability (CVC & TRCA, 2010). In the RLT, residential downspouts can be extended and directed to a splash pad followed by a pervious area such as a lawn, vegetated filter strip, grass swale, or rain garden. Swales and rain gardens are more effective at soaking and filtering the water than a lawn but directing runoff to a lawn is much better than to a driveway.



Figure 6: Downspout disconnection, extender, and splash pad (Alliance for the Bay, 2022).

Rural Clean Water Practices

There are many Sustainable Drainage and Sustainable Drainage adjacent strategies that can be used to improve the water quality of receiving water bodies connected to agricultural lands. The goal of rural clean water practices is to prevent erosion, minimize nutrient loss, and avoid clean water contamination. A treatment train process works best to address water at various stages, including redirection, retention, and treatment. The following are recommended, commonly used strategies.

- Filter strips and bioswales
- Ponds, wetlands, and sediment traps with varying degrees of complexity and engineering
- Bioretention gardens serving buildings and paved areas
- Cover crop planting
- Buffer strips and wind breaks
- General erosion control in problem areas
- Properly retiring unused land
- Restricting livestock from natural waterbodies
- Precision farming through nutrient management
- Proper pesticide and manure management
- Tile drainage control structures
- Tile drainage filtering treatment train

Many of these strategies are supported by the Rural Clean Water Program (RVCWP, 2022), which is available to the Rideau Valley Watershed by the Rideau Valley Conservation Authority (RVCA). For areas outside this jurisdiction, Alternative Land Use Services (ALUS) should be contacted by the RLT to inquire about the potential to create an ALUS Community that can support agricultural clean water and Sustainable Drainage practices in the region. More information can be found below.

Other Strategies

Catch Basin Technology

Sustainable Drainage and Green Infrastructure are preferred to catch basin technologies, which are considered conventional treatment methods. Sustainable Drainage practices have comparable life cycle costs to an oil and grit separator option but are 35-77% more affordable when considering added stormwater treatment benefits (TRCA & UT, 2013). That being said, catch basin technology can complement a blended treatment train approach that incorporates both Sustainable Drainage and grey stormwater infrastructure. There are many options on the market for catch basin technology that targets various pollutants. The most common usually only target litter and sediment. Given the Township's proximity to major waterbodies (i.e., Big Rideau Lake), to maintain the long-term health of these systems, catch basin inserts specifically targeting phosphorus are recommended. Catch basin inserts are brand-based, so the specifications, effectiveness, and cost are specific to the product. The following are products that perform well for phosphorus removal and also target standard concerns such as total suspended solids:

- FabPhos by Fabco Industries (Fabco Industries, 2022)
- Filtrex Stormexx (Filtrex, 2022)
- Kraken Filter by Bio Clean (Bio Clean, 2022)



Figure 7: Fabco *StormBasin Cartridge Based Inlet Filtration System* that can be paired with FabPhos filters (Fabco Industries, 2022b).

Catch basin filters could be piloted at strategically positioned catch basins, but more information on this topic will need to be gathered from the manufacturers. The number of catch basins for a pilot project will likely be determined by cost. More information from various manufacturers is needed to make an informed comparison. However, to give a general idea, Table 1 outlines information from three manufacturer quotes.

Table 1: Manufacturer information and quotes for three catch basin inserts

Manufacturer	Fabco Industries	StormExx	CB Shield
Product	StormBasin body + FabPhos cartridge	StormExx System + Advanced Blend Filter	CB Shield single inserts

Targeted Pollutants	First stage: trash & debris, coarse sediments, coliform bacteria Second stage: Phosphorus (up to 80%, average 64%), Nitrogen Compounds (>30%), hydrocarbons, heavy metals	Heavy metals (99%), Hydrocarbons (99%), soluble P (94%), ammonium N and TKN (41% and 22%), bacteria (71-93%), and TSS (90%)	Total Suspended Solids (TSS) (50-60%) Sediments collected may contain other pollutants such as heavy metals, bacteria, oil & grease, or nutrients (P and N)
Quoted Cost	\$2243 - \$2378	\$1,065.50	\$1300
Maintenance Note: Maintenance and filter schedules may vary depending on where the catch basin is located and what the inputs are.	Inspection and cleaning every six months. Can be done manually. Filters should be changed roughly every one year. Replacement cartridges are \$489.	Inspection and cleaning of debris regularly. Can be done manually. Filters should be changed when standing water collects. This could be 1-4 times per year depending on sediment inputs. Replacement cartridges are \$250.	Regular cleaning and inspection along with usual catch basin maintenance. Cleaning done by hydrovac.

Floating Treatment Wetlands

Floating treatment wetlands (FTW) are an excellent way to enhance existing stormwater ponds or other water bodies treating or storing stormwater because they have flexible design and operation, they are environmentally friendly, and they do not increase demands on land use. They are not affected by water level changes and can be used in many scenarios, including existing stormwater management ponds, lakes, canals, and riverine estuary developments that are highly polluted and require additional treatment. Biofilms found under FTW in the rhizome layer increase their pollutant removal potential and function similarly to subsurface constructed wetlands (Perdana et al., 2018).

In a case where a new stormwater management pond is being planned for a new subdivision development, or where there is interest in retrofitting an existing pond or wetland, FTW are a flexible, affordable way to improve the performance of the system.

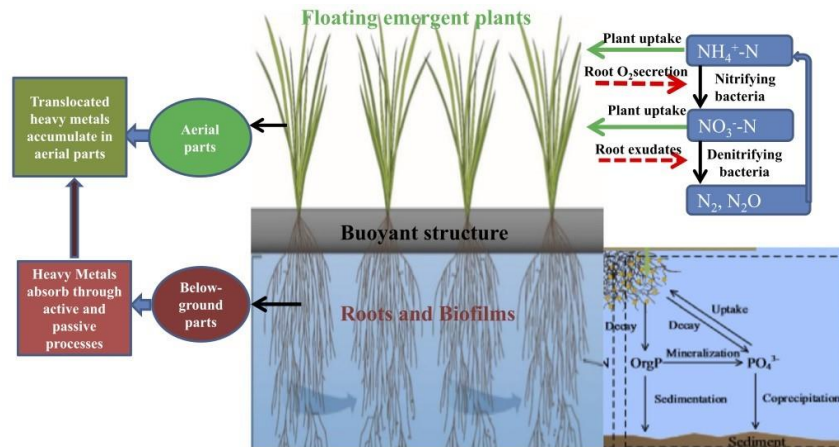


Figure 19: Floating Treatment Wetland diagram (Sharma et al., 2021)

Strategies to Advance Sustainable Drainage Initiatives

Education and Outreach

Education and awareness are critically important elements in Sustainable Drainage implementation and acceptance. A lack of education, understanding, and familiarity is one of the major barriers to Sustainable Drainage adoption and willingness or pay or participate. The following educational strategies are recommended.

Educational Resources

Physical and digital educational resources are important to make available for the public. Compelling data communicated to residents is recommended to improve environmental stewardship (Persaud et al., 2016). Water quality is the most motivating ecosystem service for support of Sustainable Drainage practices (Ureta et al., 2021). Water quality data information from the RLT should be communicated to residents along with data about the relationship between stormwater runoff, impermeable surfaces, and the water quality of receiving bodies.

Residents, landowners, and policy makers also need to have educational materials, workshops and events to change perceptions and beliefs about how stormwater should be managed and the other better opportunities that exist. Promoting public involvement in watershed activities, increasing awareness about how Sustainable Drainage practices work, and emphasizing the functional benefits of practices can be effective in motivating adoption (Gao et al., 2018). Outdated grey-infrastructure techniques including quick conveyance and removal of stormwater are accepted as the status quo in many cases, but the world is making a paradigm shift toward low-impact design and green infrastructure. The public should be familiarized with the concepts of stormwater infiltration and retention, natural water features, and natural hydrologic functions. The basic goal for the public to understand is that stormwater needs to be slowed down and kept on-property to avoid excessive runoff into sewers and natural waterways. We need to design with nature and reconnect the hydrologic cycle. Once the public begins to understand the concepts behind Sustainable Drainage and green infrastructure, they will need to be educated on what strategies are effective and how they can participate.

Fact Sheets

Fact sheets are a great way to deliver a digestible overview of a topic through a 1–2-page aesthetic design. The Sustainable Technologies Evaluation Program (STEP), organized by the Toronto Regional Conservation Authority (TRCA), has a fact sheet for most Sustainable

Drainage options. Additionally, a suite of fact sheets will be created through the Sustainable Drainage Committee.

Greening Your Grounds Handbook

For motivated residents who have adopted the theory of Sustainable Drainage and are ready to take action, we recommend the Greening Your Grounds Handbook, which is a 55-page homeowner's guide to stormwater landscaping projects created by the TRCA. Organizations can order 100-plus copies of the guide with their logo on the front cover. The guide is user-friendly but comprehensive and includes design specifications that homeowners can use to safely implement Sustainable Drainage techniques themselves. At this time, this would be the most cost-effective and time-efficient way to get this information into the hands of interested residents and could be viewed as a fundraising opportunity.

Demonstration Sites

Sustainable Drainage pilot projects and demonstrations are recommended as avenues for public education and outreach (Darnthamrongkul and Mozingo, 2021; Shin & McCann, 2018; Gao et al., 2016; Gao et al., 2018). Interpretive signs appear to be the preferable means for motivating stormwater education and producing positive public reactions to Sustainable Drainage sites (Darnthamrongkul and Mozingo, 2021), which work best at demonstration sites. When residents and landowners visit demonstration sites, they can begin to imagine how they can incorporate those ideas onto their own property.

At the community level, if expectations of naturalness and neatness are met (Darnthamrongkul and Mozingo, 2021), residents support the use of Sustainable Drainage techniques in public spaces (Gao et al., 2018) and prefer subdivisions that include explicit environmental benefits over those that do not (Bowman et al., 2012). It should be noted that public opinion tends to prefer aesthetically pleasing projects regardless of functionality, so the aesthetic appeal of Sustainable Drainage projects is an important player in public acceptance (Chaffin et al., 2022). In the RLT, demonstration sites should be considered in public parks, at community buildings, and as a part of the public landscaping for new subdivisions.

Incentives and Funding

An approach that involves education and financial incentives can transform public response to increase adoption and participation in Sustainable Drainage and sustainable stormwater management. Even small financial incentives are effective for adoption of Sustainable Drainage technology on private residential property (Thurston et al., 2010; Liu et al., 2020). Interestingly, reverse-auction has been demonstrated as effective for Sustainable Drainage cost and public participation, especially for smaller municipalities lacking resources (Thurston et al., 2010).

Co-benefits of Sustainable Drainage such as aesthetics, habitat creation, and quality of life improvements can garner support from funding organizations that typically deal with housing and human services. In this regard, it will be important to look for funding support beyond the typical avenues of environmental protection (Chaffin et al., 2022).

Cooperating with Local Contractors

Successful implementation of Sustainable Drainage practices will require a multidisciplinary approach and coordination between government agencies, community groups, and the private sector (Eckart et al., 2017). Contractors for Sustainable Drainage projects will likely have more experience with landscaping purely for aesthetic purposes than for functional sustainable

drainage design. Final Sustainable Drainage project construction must conform with approved, engineered designs or the ecosystem services promised may not function as intended (Chaffin et al., 2022).

For these reasons, local contractors should be encouraged to become certified in Sustainable Drainage designs and maintenance. As an example, Rain Ready Ottawa has partnered with the 'Fusion Landscape Professional' program. This program allows third-party landscaping companies to better meet the needs of clients who are looking for Sustainable Drainage practices to be installed on their property and is a useful screening tool for financial incentives. Fusion is a popular program throughout Ontario and there are already a handful of Fusion Certified landscaping contractors around the RLT area. This is easily searchable on the Fusion website. By connecting Sustainable Drainage professionals with residents, people have an appropriate place to go with their site-specific questions and concerns or have the option of hiring a contractor to do the job for them. This can therefore address some legitimate drainage concerns regarding basement seepage and effective design for maximum ecosystem benefit.

Collaborating with Organizations

Green Infrastructure Ontario

Green Infrastructure Ontario (GIO) is working with the Canadian federal government's plan to invest billions of dollars into green infrastructure over the next decade. The GIO website offers a Municipal Hub with Green Infrastructure resources specifically geared toward municipalities, including general resources, tool kits and guides, tools and calculators, guidelines, plans, and case studies (GIO, 2021).

Conservation Authority Clean Water Programs

Many conservation authorities have rural clean water programs that focus on improving water quality. The RVCA runs the Rideau Valley Clean Water Program (RVCWP). The RVCWP currently has funding available within the Rideau Valley Watershed.

Alternative Land Use Services

In lieu of or in addition to conservation authority clean water programs, Alternative Land Use Services (ALUS) is a Canadian charitable organization with an innovative community and farmer developed program that creates, enhances, and maintains ecosystem services on agricultural lands using nature-based solutions. Support is available to carry out projects such as wetland restoration, riparian buffer and windbreak planting, sustainable drainage systems, pollinator habitats, and more. Currently, there is no ALUS program available in the Rideau Lakes Township area, but new ALUS Communities can be proposed by contacting the regional hub manager (information available on their website).

Watersheds Canada

Within the Rideau Valley watershed, the RVCA offers a shoreline naturalization program, which is aimed at using similar techniques to sustainable drainage theory to stabilize shorelines and improve water quality runoff into waterways. This program should be promoted to waterfront residents within the RV watershed.

However, such a program does not exist through the CRCA. In lieu of this, the CRCA should continue to collaborate with Watersheds Canada through the "Natural Edge" shoreline naturalization program, with which they are already a partner, and to promote the "Love Your

Lake” program to the general public. The RLT as a whole can also work with the “Planning for Our shorelands” program, which is working on creating a policy toolkit for municipalities.

Next Steps

Educational Resource Production

Fact sheets can either be created for this project or sourced from the TRCA or STEP websites. Copies of the Greening Your Grounds handbook can be ordered and made available for the public either at cost or as a fundraiser.

The social media campaign can be continued based on what has been started by Emma Jackson from RVCA. This pertains to simple, shareable information that can be passively taken in by residents and landowners on platforms such as Facebook, Instagram, and YouTube.

A series of fact sheet mock-ups has been prepared through the Sustainable Drainage Committee, including: Sustainable Drainage (general information), Rain Barrels, Do-It-Yourself Rain Barrels (instructions), Downspout Disconnection and Redirection, Grid Paving, Rain Gardens, Rain Garden – Portland Bay CA (instructions), Soakaways, and Swales.

Media-Marketing Strategy

A media-marketing strategy can be put together to create a cohesive, recognizable, and consistent brand for the sustainable drainage outreach program. Consistent use of relevant terminology should be used to create an image to engage stakeholders and society and to build recognition and understanding. Outreach programs should make principles and objectives clear, while still cultivating inspiration through compelling language (Fletcher et al., 2014).

To build trust, recognition, and consistency, this pilot project will need a name and/or slogan and an accompanying logo that is simple, memorable, and inviting. For example, Rain Ready Ottawa is a memorable and relevant name for the pilot project. They use a fun and friendly brand text with a blue umbrella logo. The messaging is simple and consistently promotes their five choice Sustainable Drainage solutions.

Taking opportunities to let the public know about events and initiatives is an important part of building recognition and keeping the project in the mind’s eye of residents. For example, the Yellow Fish Road project earlier this summer served as an excellent photo opportunity and resulted in several media releases, including local papers.

Rain Barrel Sale

Rain barrels are a simple way to introduce the community to sustainable stormwater management. A sale provides an opportunity to fundraise, raise awareness, distribute educational materials, and to make connections in the community. Long term practice and maintenance of rain barrels by residents may be increased by including informational signage on the barrel itself that reminds the user of their commitment (Gao et al., 2016).

Rainbarrel.ca is an organization that offers fundraising partnerships. They offer ongoing support, a step-by-step guide, marketing materials, high financial returns, no risk, no inventory, and a customized web page for online orders. A sale with rainbarrel.ca has been booked for May 27, 2023 and will likely be hosted at the Portland Bay Conservation Area. Alternatively, a sale could be organized independently using wholesale ordering.

Rain Garden Demonstration Sites

As discussed, demonstration sites are an ideal way to introduce the community to Sustainable Drainage options that they can implement on their own. Demonstration sites paired with interpretive signage deliver the best response and are the most successful means of educating the public about Sustainable Drainage solutions. Between 1-3 rain garden demonstration sites should be installed in the urban sections of the Rideau Lakes Township accompanied by educational interpretive signage. These could be positioned on either public or private property, as long as the location receives good traffic and visibility. As an example, a home retrofit project was conducted by the Sustainable Neighborhood Action Plan home retrofit program in Brampton, ON. One residential home received a rain garden, permeable paving, and other retrofits. Among other things, the owners consented to informational signage and property tours (SNAP, 2019).

The first demonstration rain garden has been installed at the Portland Bay Conservation Area picnic shelter. An interpretive sign mock-up has been created through the Sustainable Drainage Committee. A fact sheet (mentioned above) has been made to compliment this specific rain garden.

Roadside Swale Demonstration Site

A demonstration site for a roadside swale can introduce the community to the concept of a swale, which may be entirely new to many people, and to help imagine how it could be incorporated onto their own property, whether that be a rural, urban, or agricultural property. It may also bolster support for public spending to retrofit ditches that are the responsibility of the municipality. As with rain gardens, the demonstration swale should be accompanied by educational signage. The swale can be strategically positioned somewhere visible with relatively high traffic and within meaningful proximity to a lake or watercourse.

Catch Basin Filter Pilot Installations

Catch basin (CB) filters should be installed as a pilot project in Portland. The CB where sampling took place this year is the last in a series of CBs on one sewer line that all lead to the same outlet into the lake. The water samples taken represent water from all CBs in the line. In order to make a meaningful comparison, as many filters as possible should be installed on CBs in the same line. The Fabco PhosFilter or StormExx filter are recommended for this purpose to specifically target the pollutant of concern, which is phosphorus.

However, there are many variables that affect sampling in CBs, including variations in stormwater inputs, runoff volumes and velocities of each storm event, changes in the landscape upstream of CBs, intermixing of water and sediments from past storm events, and many more. In an open system, a definitive before-and-after sampling protocol is not possible. Therefore, in order to gauge the performance of pilot CB filters, other monitoring methods could be considered. For example, sampling runoff from the roadway before it enters the CB, and sampling water as it exits the CB filter. Many variables and possibilities will need to be considered in order to determine the best method of meaningful comparison for the performance effectiveness and impact of any CB filter installations.

The Township could also consider installing one pilot CB Shield to compare to the nutrient filters (Fabco or StormExx). This could help to determine the cost-benefit of each based on their performance, initial and ongoing financial cost, and maintenance protocols.

Conclusion

In the interest of improving stormwater management in the Township of Rideau Lakes, Sustainable Drainage technologies offer affordable, realistic strategies that can reduce the negative effects of stormwater runoff, improve community aesthetics, and offer relief to aging grey infrastructure. In the future, Sustainable Drainage technology will become mainstream or possibly mandatory, so initiating Sustainable Drainage adoption and educating the public now will ensure a smooth transition away from outdated techniques as population rise and climate change continue to threaten natural spaces like Big Rideau Lake.

Residents are encouraged to incorporate sustainable drainage ideology and installations into their own lives and onto their properties. This is an opportunity to take care of the local environment and the lake that receives stormwater runoff. Public backing and participation are equally important, so individuals can help to spread the word to friends and neighbors and support sustainable drainage projects initiated at the community level.

The Township is encouraged to lead by example by providing educational opportunities, seeking funding, and pursuing sustainable drainage projects and installations on municipal properties and lands. Township participation in Sustainable Drainage initiatives is important to build public backing and buy-in. Furthermore, the Township should look for opportunities to improve the existing stormwater system as aging infrastructure comes up for renewal, keeping in mind the principles of sustainable drainage and the treatment train approach to stormwater management.

The recommended Sustainable Drainage measures are bioswales, bioretention gardens, soakaway pits and infiltration trenches, plastic or concrete grid paving, water harvesting, downspout disconnection and redirection, and rural clean water practices. Recommended Sustainable Drainage adjacent strategies include phosphorus targeting catch basin filters and floating treatment wetlands.

The recommended next steps are educational resource production, a media-marketing strategy, a rain barrel sale, rain garden demonstration sites, and a swale demonstration site. The primary strategy should be education, which should be incorporated into any other efforts made to expand the Sustainable Drainage agenda.

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Appendix 1

Short-Term Goal Setting

The following projects should be considered for a short-term timeline using existing funding and resources:

- Demonstration Rain Gardens including interpretive signage with a QR code that leads to the resources section of the website, including fact sheets
- A rain barrel sale
- Educational resource production: LID Fact Sheets and social media outreach
- Encouraging RLT homeowner and landowner adoption of recommended LID measures: swales, rain gardens, rain barrels, grid pavers, and soakaways
- Reach out to ALUS to inquire about creating an ALUS Community for the RLT
- Form a relationship and/or agreement with Fusion Landscaping or a similar certification program so that residents have an LID expert that they can consult with
- Continue to collaborate with RVCA, CRCA, and Watersheds Canada

Long-Term Goal Setting

The following projects should be considered on a longer timeline and with additional funding. Funding can be sourced through private and government grants.

- A complete media-marketing strategy: a program name, slogan, and intentional, consistent language. This will need to be someone's responsibility to continue social media posts on a regular basis. A potential slogan is "SLOW, STORE, SOAK"
- Pilot installation of phosphorus targeting catch basin filters
- Retrofitting of municipal drainage ditches into swales of varying performance capacity. In order of decreasing preference: bioswales (also called dry swales), wet swales, infiltration swales (with check dams)
- Through ALUS or another project, secure a long-term solution to agricultural sustainable drainage and other green infrastructure
- A grants or subsidies program for homeowners and landowners for LID installation measures, potentially through reverse auction
- Look for other partnerships and funding sources to continue to develop sustainable drainage practices
- Continue to have events such as rain barrel sales to keep promoting best management practices for sustainable drainage