**REPORT 3**
**26 JUNE 2019**

**RAPPORT 3**
**LE 26 JUIN 2019**

**1. EASTERN SUBWATERSHEDS STORMWATER MANAGEMENT RETROFIT STUDY**

**ÉTUDE SUR LA MODERNISATION DE LA GESTION DES EAUX PLUVIALES DES SOUS-BASSINS HYDROGRAPHIQUES DE L'EST**

**COMMITTEE RECOMMENDATIONS**

**That Council:**

1. **Approve the preferred Eastern Subwatersheds Stormwater Management Retrofit Plan as described herein and listed as Document 8; and**

2. **Approve the filing of the Eastern Subwatersheds Stormwater Management Retrofit Study for the 30-day public review period in accordance with the *Ontario Environmental Assessment Act.***

**RECOMMANDATIONS DU COMITÉ**

**Que le Conseil :**

1. **approuve le Plan privilégié de modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est comme il est décrit dans la présente et présenté dans le document 8;**

2. **approuve le dépôt de l'Étude de modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est pour la période d'examen public de 30 jours conformément à la *Loi sur les évaluations environnementales de l'Ontario.***

DOCUMENTATION / DOCUMENTATION

1. Director's Report, Infrastructure Services Planning, Planning, Infrastructure and Economic Development Department dated 5 June 2019 (ACS2019-PIE-IS-0002).

   Rapport du Directeur, Services de l'infrastructure, Services de la planification, l'infrastructure et du développement économique daté le 5 juin 2019 (ACS2019-PIE-IS-0002).

2. Extract of Draft Minute, 18 June 2019.

   Éxtrait de l'ébauche du procès-verbal, le 18 juin 2019.

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**26 JUNE 2019**

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**Report to**
**Rapport au:**

**Environment Committee**
**Comité de l'environnement**
**18 June 2019 / 18 juin 2019**

**and Council**
**et au Conseil**
**26 June 2019 / 26 juin 2019**

**Submitted on June 5, 2019**
**Soumis le 5 juin 2019**

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**Ward**: ORLÉANS (1), INNES (2), GLOUCESTER-SOUTHGATE (10), BEACON HILL-CYRVILLE (11), RIDEAU-ROCKCLIFFE (13), ALTA VISTA (18), CUMBERLAND (19)

**File Number**: ACS2019-PIE-IS-0002

**SUBJECT: Eastern Subwatersheds Stormwater Management Retrofit Study**

**OBJET: Étude sur la modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est**

**REPORT RECOMMENDATIONS**

**That Standing Committee on Environmental Protection, Water and Wastewater Management recommend Council:**

1. **Approve the preferred Eastern Subwatersheds Stormwater Management Retrofit Plan as described herein and listed as Document 8; and**
2. **Approve the filing of the Eastern Subwatersheds Stormwater Management Retrofit Study for the 30-day public review period in accordance with the *Ontario Environmental Assessment Act.***

**RECOMMANDATIONS DU RAPPORT**

**Que le Comité permanent de la protection de l'environnement, de l'eau et de la gestion des déchets recommande au Conseil :**

1. **d'approuver le Plan privilégié de modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est comme il est décrit dans la présente et présenté dans le document 8;**
2. **d'approuver le dépôt de l'Étude de modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est pour la période d'examen public de 30 jours conformément à la *Loi sur les évaluations environnementales de l'Ontario.***

## EXECUTIVE SUMMARY

### Background and Analysis:

In 2010, City Council adopted the Ottawa River Action Plan (ORAP). Key objectives of ORAP are to:

i) optimize recreational use and economic development of the river, with a focus on reducing beach closures; and

ii) maintain a healthy aquatic ecosystem, with a focus on addressing challenges presented by existing infrastructure.

To achieve these objectives, ORAP identified 17 separate projects that are intended to reduce the impact of the City's drainage systems on the river and its tributaries. Two of these projects involve the development of Stormwater Management (SWM) retrofit plans for areas of the City that were developed with little or no stormwater management. The first of these plans, presented in the Pinecrest Creek/Westboro SWM Retrofit Study report, has been completed. It identifies a range of long-term retrofit programs/capital projects, monitoring and outreach efforts aimed at reversing the historical impacts of development on Pinecrest Creek and the local reach of the Ottawa River. This study was endorsed by City Council on October 26, 2011.

The second retrofit study identified by ORAP is the Eastern Subwatersheds SWM Retrofit Study. The study area is comprised of approximately 15,000 hectares within the urban boundary of the City of Ottawa (see Document 1). It includes five different subwatersheds in the eastern part of the City of Ottawa, extending from the urban tributaries of Green's Creek to the eastern boundary of the Taylor Creek subwatershed at Trim Road. Most of the urban development within the study area took place prior to stormwater management being a requirement to control urban runoff.

Stormwater management (SWM) Retrofit refers to the construction of various measures into established, older communities that were originally built without the infrastructure needed to mitigate the impacts of uncontrolled stormwater runoff. The consequences of this historical lack of stormwater management include:

- Poor water quality in local creeks and rivers;

- Contribution to closures of Petrie Island Beach during wet weather;
- On-going erosion in local creeks, impacting infrastructure and fish habitat.

Infill, redevelopment and intensification is also occurring in the study area, contributing further to these problems. Unlike greenfield development, where SWM measures are incorporated as a matter of course, the challenge of SWM retrofit is to identify effective measures that can be implemented after development has already taken place and limited land is available to implement conventional SWM facilities.

The Combined Sewage Storage Tunnel (CSST) is another ORAP project intended to significantly reduce the frequency of CSOs from the Ultimate Combined Sewer Area (UCSA). The CSST is not designed to eliminate Combined Sewer Overflows (CSOs) from the UCSA but will significantly reduce the overall impact of CSOs to the Ottawa River.

Per the Ottawa River water quality model update completed for the study, once the Combined Sewage Storage Tunnel (CSST) is in place (anticipated to be commissioned in 2020), uncontrolled runoff from the Eastern Subwatersheds will become the largest contributor of *E.coli* to Petrie Island Beach. While there may be expectations that water quality problems at Petrie Island will be fully addressed with the CSST coming on-line, there will be a risk of on-going water quality issues for the foreseeable future as the study recommendations will take many decades to have measurable benefits at Petrie Island.

With respect to Petrie Island Beach, it is important to note that "wet weather," while a key contributor to the high number of beach closures, is not the only factor. Other "dry weather" factors, such water fowl, wildlife, illicit discharges, etc., are addressed by other City programs. This study addresses only the wet weather aspects of beach closures.

To develop the Eastern Subwatersheds SWM Retrofit Plan, the following key steps were undertaken:

i) Characterization of Existing Conditions;

ii) Evaluation of Alternative Scenarios and Selection of the Preferred SWM Retrofit Scenario;

iii) Public Consultation; and

iv) Preparation of an Implementation Plan.

These steps were also completed to ensure consistency with the requirements of the Municipal Class Environmental Assessment (MCEA) given the anticipated identification of various capital projects. Existing conditions were described, problems, opportunities and a range of solutions were identified, and the various solutions were evaluated to arrive at a preferred approach: the recommended Retrofit Plan. Public consultation requirements of the MCEA were also fulfilled.

Following City Council adoption of the recommended Retrofit Plan, it will be made available for a 30-day public review period as required by the MCEA process.

The preferred Retrofit Plan consists of:

i) Lot level measures: A target of 30 per cent has been set for the percentage of private properties (industrial, commercial, institutional and residential) that will undergo stormwater retrofit. The first 5 years of implementation will focus on the design and initial implementation of a community engagement plan to promote lot level measures on private residential properties. Lot level measures will also be implemented on City property on an opportunistic basis, i.e., when City buildings and parking lots are in need of renewal. In this way, the cost of retrofitting will represent only a portion of the total cost of replacing existing infrastructure.

ii) Conveyance measures: A target of 50 per cent has been set for the percentage of Right-of-Ways (ROW) that will undergo stormwater retrofit. Similar to the approach for lot level measures on City property, conveyance measures will be implemented in conjunction with the lifecycle road reconstruction program. The majority of the streets within the Eastern Subwatersheds contain underground infrastructure that is in relatively good condition. As a result, widespread implementation of conveyance measures in conjunction with road reconstruction is not expected in the study area until beyond 2060.

iii) Remediation of priority creek erosion sites: Four high priority sites, four high to medium priority sites and nine medium priority sites were identified. In order to

fulfil the MCEA requirements for Schedule B projects, assessments completed in 2012/2013 for this study will be updated to confirm the status and priority of erosion sites, functional designs will be developed, and the preliminary cost estimates updated prior to proceeding with detailed design and construction.

More than a 50-year time frame is anticipated to complete implementation of the preferred Retrofit Plan. This will allow for retrofits within the rights-of-way and on City-owned properties to be completed "opportunistically," i.e., when roadways, City buildings and parking lots come to the end of their life cycle. Due to the relatively good conditions of underground infrastructures within the study area, it is anticipated that the majority of conveyance measures will be implemented in the second half of the 50-year plan and will extend beyond that in order to achieve the 50 per cent target. This time frame also recognizes the considerable challenge of engaging sufficient participation from residential and other private property owners.

**Financial Implications:**

Funds are available within existing Stormwater Management Retrofit accounts to fund the $4.23M priority projects for the initial five years, as identified in Table 5. The long-range financial plan will be updated to reflect the current estimates for the post-five-year requirements, and budget will be brought forward for Council consideration through future-year capital budgets.

**Public Consultation/Input:**

Public consultation and communication included the following:

Technical Advisory Committee: The Technical Advisory Committee (TAC) was comprised of City staff from a variety of departments, and representatives from the National Capital Commission, Ministry of the Environment, and the Rideau Valley Conservation Authority. The TAC met five times during the study - on November 14, 2012, June 17, 2013, May 20, 2014, May 30, 2017 and April 23, 2018 and provided advice and guidance to the study team on a range of issues.

Public Advisory Committee: In October 2012, an invitation to participate in the Eastern Subwatersheds Study was sent to Councillors' assistants and all Community Associations located within the study area. Due to limited response, no formal Public Advisory Committee (PAC) was formed. Instead, direct communication via a study mailing list was established with interested parties, including 29 Community Associations, Ecology Ottawa and other interested members of the public.

Public Consultation:

- The preliminary results of the study were presented at City Hall on June 14, 2014 during the Water Round Table event. A questionnaire was provided during this event and the boards were posted on the City's website for consultation. No comments were received.
- The results of the existing condition assessment were presented on the City's web-site via an on-line information sessions held between July 31 and September 19, 2014. A detailed questionnaire was posted on the study web page but no written responses were provided.
- The draft final results of the study were presented on the City's website via a second on-line information session held between June 15 and July 13, 2018. Despites many attempts to reach out to Community Associations and interested members of the public, no comments were received.

The limited public feedback may be due to the high-level nature of the study. It provides long-term recommendations and implies limited short-term impacts on residents. Direct

communication was established with Ecology Ottawa throughout the study but no formal comments were received (see Document 6).

Advertisements for the Water Round Table and the on-line Information Sessions (including the Notice of Study Commencement) were placed in Le Droit and the Ottawa Citizen, and on the City's Facebook page. Notices of public consultation were sent by email to study area ward Councillors and Community Associations. A status update email was sent to area ward Councillors on January 11, 2019.

Website: A website was created to provide access to more detailed information about the study: ottawa.ca/eastsubwatersheds.

The notices of public consultation, the email distribution list as well as email communication with Ecology Ottawa is included in Document 6. The boards from the second on-line information session are included in Document 7.

**RÉSUMÉ**

**Contexte et analyse**

En 2010, le Conseil municipal a adopté le Plan d'action de la rivière des Outaouais (PARO), dont les principaux objectifs sont les suivants :

i) Optimiser le développement économique de la rivière et son utilisation à des fins récréatives, notamment par la diminution des fermetures de plages.

ii) Maintenir un écosystème aquatique sain, en se consacrant surtout aux difficultés que posent les infrastructures existantes.

Pour les réaliser, le PARO prévoit 17 projets distincts visant à réduire les incidences du système de drainage de la Ville sur la rivière et ses affluents. Parmi ceux-ci, deux portent sur la conception de plans de modernisation de la gestion des eaux pluviales (GEP) pour les secteurs de la Ville bâtis avec peu ou pas d'installations ayant cette fonction. Le premier de ces plans, présenté dans le rapport sur l'Étude de modernisation de la gestion des eaux pluviales du ruisseau Pinecrest/Westboro, est maintenant au point. Il cible divers programmes de modernisation et projets d'immobilisations à long terme ainsi que des activités de surveillance et d'information pour renverser les répercussions historiques de l'aménagement autour du ruisseau

Pinecrest et de la section locale de la rivière des Outaouais. L'Étude a été approuvée par le Conseil le 26 octobre 2011.

Le second plan prévu par le PARO vise la modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est. L'étude réalisée vise un secteur comprenant cinq sous-bassins hydrographiques et couvrant environ 15 000 hectares de zones urbaines dans la partie est du territoire d'Ottawa (document 1), entre les affluents urbains du ruisseau Green et la limite est du sous-bassin hydrographique du ruisseau Taylor à la hauteur du chemin Trim. La plupart de l'aménagement urbain dans ce secteur a eu lieu avant que des mesures de GEP soient exigées pour contrôler le ruissellement urbain.

La modernisation de la GEP consiste à mettre en place diverses mesures dans les secteurs établis et anciens qui ont été bâtis sans l'infrastructure requise pour atténuer les effets du ruissellement incontrôlé de l'eau pluviale. Parmi les conséquences de cette absence historique de mesures de GEP, citons :

- la mauvaise qualité de l'eau des rivières et ruisseaux locaux;
- les fermetures de la plage de l'île Petrie par temps de pluie;
- l'érosion continue dans les ruisseaux locaux, qui endommage les infrastructures et l'habitat des cours d'eau.

L'aménagement intercalaire, le réaménagement et la densification aggravent ces problèmes dans le secteur à l'étude. À la différence de l'aménagement de sites nouveaux, qui comprend systématiquement des mesures de GEP, la modernisation implique la tâche difficile de déterminer ce qui pourra être mis en œuvre de façon efficace dans un secteur déjà construit, où peu de terrains sont disponibles pour la construction des installations de GEP habituelles.

Le tunnel de stockage des égouts unitaires (TSEU) est un autre projet du PARO dont l'objectif est de réduire considérablement la fréquence des surverses de la zone définitive des égouts unitaires. Il ne vise pas à les éliminer, mais il en diminuera l'effet global sur la rivière des Outaouais.

Selon le Modèle d'analyse de la qualité de l'eau de la rivière des Outaouais révisé dans le cadre de l'étude, le ruissellement incontrôlé des sous-bassins hydrographiques de l'Est deviendra la plus importante source d'*E.coli* sur la plage de l'île Petrie après la mise en service du TSEU (prévue à la fin de 2020). Si certains s'attendent à ce que le TSEU règle tous les problèmes de la qualité de l'eau à l'île Petrie, les risques demeureront présents dans un avenir prévisible, car les mesures recommandées par l'étude n'auront des effets positifs mesurables que d'ici de nombreuses décennies.

En ce qui concerne les fermetures de la plage de l'île Petrie, il est important de noter que le temps de pluie, bien qu'il ait contribué à en augmenter le nombre, n'est pas le seul facteur en cause. Il conviendrait peut-être d'examiner d'autres facteurs associés au temps sec, comme les oiseaux aquatiques, la faune et les déversements illégaux. La présente étude ne traite que de ce qui a trait au temps de pluie.

Le processus d'élaboration du Plan de modernisation de la gestion des eaux pluviales des sous-bassins hydrographiques de l'Est comprenait les grandes étapes suivantes :

i) Caractérisation des conditions actuelles;

ii) Évaluation des scénarios de modernisation de la GEP et choix du scénario privilégié;

iii) Consultation publique;

iv) Préparation du plan de mise en œuvre.

Ces étapes visaient aussi à assurer la conformité du plan aux lignes directrices sur les évaluations environnementales municipales de portée générale, étant donné qu'il était prévu d'y définir divers projets d'immobilisations. Le personnel a donc caractérisé les conditions actuelles, déterminé les problèmes, les possibilités et plusieurs solutions, et évalué ces solutions pour établir une approche privilégiée : le plan de modernisation recommandé. Le processus a également respecté les exigences de consultation publique des lignes directrices.

Le plan recommandé, une fois adopté par le Conseil, sera mis à la disposition du public pour la période de 30 jours exigée par les lignes directrices.

Ce plan se compose des mesures suivantes :

i) Mesures à la source : Le plan a pour cible la modernisation de la GEP sur 30 % des propriétés privées (industrielles, commerciales, institutionnelles et résidentielles). Les cinq premières années de mise en œuvre viseront la conception et le lancement initial d'un plan de mobilisation communautaire pour promouvoir l'application de mesures à la source sur les propriétés résidentielles privées. Sur les terrains municipaux, ces mesures seront appliquées à mesure que l'occasion s'y prêtera, par exemple lorsque les édifices et parcs de stationnement auront besoin d'une réfection. De cette manière, le coût de la modernisation ne représentera qu'une fraction du coût total de remplacement des infrastructures existantes.

ii) Mesures au niveau de l'acheminement : Le plan a pour cible la modernisation de la GEP sur 50 % des emprises. Selon une approche similaire à celle choisie pour les mesures à la source sur les propriétés municipales, les mesures au niveau de l'acheminement seront mises en œuvre conjointement au programme de reconstruction de routes suivant le cycle de vie. Comme l'infrastructure souterraine de la plupart des rues dans les sous-bassins hydrographiques de l'Est est en plutôt bon état, il ne devrait pas y avoir de mise en œuvre à grande échelle avant 2060.

iii) Mesures de remise en état des sites d'érosion prioritaires dans le ruisseau : Quatre sites à priorité élevée, quatre sites à priorité moyenne à élevée et neuf sites à priorité moyenne ont été relevés. Afin de respecter les lignes directrices pour les projets décrits à l'annexe B, les évaluations réalisées en 2012-2013 devront être revues pour confirmer l'état et la priorité des sites. Il faudra ensuite élaborer un plan fonctionnel et mettre à jour l'estimation des coûts préliminaire avant d'entamer les activités de conception détaillée et de construction.

La mise en œuvre du plan de modernisation privilégié s'échelonne sur 50 ans, pour tenir compte du fait que la Ville réalisera les travaux sur ses propriétés et les emprises à mesure que le moment sera propice, c'est-à-dire lorsque les chaussées, édifices et parcs de stationnement auront atteint la fin de leur vie utile. Comme les infrastructures souterraines dans le secteur à l'étude sont en plutôt bon état, la mise en œuvre de la majorité des mesures au niveau de l'acheminement n'est prévue que pendant la seconde moitié de cette période de 50 ans, et pourrait même se prolonger au-delà pour

que soit atteinte la cible de 50 %. Le choix de cette période tient aussi compte de la difficulté considérable que représente la mobilisation des propriétaires privés.

**Répercussions financières**

Les comptes actuels pour la modernisation de la GEP peuvent financer les projets prioritaires pour les cinq premières années, au coût de 4,23 millions de dollars, comme le montre le tableau 5. Le personnel intégrera au Plan financier à long terme les estimations à jour des besoins après cette période et présentera le budget à l'examen du Conseil dans de futurs budgets des immobilisations.

**Consultation publique et commentaires**

Les mesures de communication et de consultation publique mises en œuvre sont présentées ci-dessous.

Comité consultatif technique : Il était formé d'employés municipaux de plusieurs directions générales et de représentants de la Commission de la capitale nationale, du ministère de l'Environnement, de la Protection de la nature et des Parcs, et de l'Office de protection de la nature de la vallée Rideau. Il s'est réuni cinq fois au cours de l'étude, les 14 novembre 2012, 17 juin 2013, 20 mai 2014, 30 mai 2017 et 23 avril 2018. Il a fourni des conseils et de l'encadrement sur diverses questions à l'équipe chargée de l'étude.

Comité de consultation publique : En octobre 2012, la Ville a envoyé aux adjoints des conseillers et aux associations communautaires du secteur à l'étude une invitation à participer à l'étude sur les sous-bassins hydrographiques de l'Est. Vu le peu de réponses, aucun comité de consultation publique officiel n'a été formé. La Ville a plutôt établi une liste d'envoi pour communiquer directement avec les parties intéressées, notamment 29 associations communautaires, Écologie Ottawa et d'autres membres du public.

Consultation publique :

- Les résultats préliminaires de l'étude ont été présentés lors de la Table ronde sur l'eau tenue le 14 juin 2014 à l'hôtel de ville. Un questionnaire a été fourni pendant l'événement et les affiches ont été publiées sur le site Web de la Ville. Aucun commentaire n'a été reçu.

- Les résultats de l'évaluation des conditions actuelles ont été présentés sur le site Web de la Ville dans le cadre d'une séance d'information tenue entre le 31 juillet et le 19 septembre 2014. Un questionnaire détaillé a été publié sur la page de l'étude, mais aucune réponse écrite n'a été reçue.

- Les conclusions préliminaires de l'étude ont été présentées sur le site Web de la Ville dans le cadre d'une deuxième séance d'information, tenue entre le 15 juin et le 13 juillet 2018. Malgré les nombreuses occasions de consultation offertes aux associations communautaires et aux membres intéressés du public, aucun commentaire n'a été reçu.

L'absence de rétroaction de la population pourrait être due à la nature très générale de l'étude : ses recommandations à long terme n'ont que peu d'effets à court terme pour les résidents. La Ville est demeurée en communication directe avec Écologie Ottawa tout au long de l'étude, mais l'organisme n'a pas fourni de commentaires officiels (voir le document 6).

La Table ronde sur l'eau et les séances d'information en ligne (y compris l'avis de début d'étude) ont fait l'objet d'annonces dans *Le Droit* et l'*Ottawa Citizen* ainsi que sur la page Facebook de la Ville. Des avis de consultation publique ont été envoyés par courriel aux associations communautaires et aux conseillers des quartiers du secteur à l'étude. Un courriel de mise à jour a ensuite été envoyé aux conseillers le 11 janvier 2019.

Page Web ottawa.ca/bassinshydroest : Elle a été créée pour donner des renseignements détaillés sur l'étude.

Les avis de consultation publique, la liste d'envoi et les courriels échangés avec Écologie Ottawa figurent dans le document 6. Les fiches de la deuxième séance d'information en ligne sont incluses dans le document 7.

**BACKGROUND**

In 2010, City Council adopted the Ottawa River Action Plan (ORAP). Key objectives of ORAP are to optimize recreational use and economic development of the river, with a focus on reducing beach closures; and to maintain a healthy aquatic ecosystem by addressing challenges presented by existing infrastructure.

As documented in the ORAP staff report, comments received from the public in the fall of 2009 about ORAP objectives and projects identified three key themes (emphasis added):

- The City must address impacts of uncontrolled stormwater runoff as well as combined sewer overflows (CSOs). Several ORAP projects address urban stormwater; however, it is recognized that stormwater pollution is as important an issue as combined sewer overflows.
- Residents and businesses must take responsibility for their discharges to the environment (i.e., source control).
- A watershed approach is needed to ensure that the full range of pollutant sources and impacts are addressed.

Public consultation for ORAP included an on-line questionnaire that was also available at the ORAP Open Houses. From the results of the questionnaire, some 300 of which were completed, most respondents expressed the desire that the plan address stormwater pollution to the same degree as CSOs; and to involve residents and businesses in reducing pollution of surface waters at the lot level.

This Retrofit Study is an initial step toward addressing the impacts of uncontrolled stormwater on the Ottawa River and its many tributaries. It identifies a long-term plan composed of a range of programs, capital projects and outreach efforts aimed at reversing or partially reversing the historical impacts of development on the creeks and local reach of the Ottawa River.

Stormwater management (SWM) retrofit refers to the construction of various measures into established, older communities that were originally built without the infrastructure

needed to mitigate the impacts of uncontrolled stormwater runoff. The consequences of this historical lack of stormwater management include:

- Poor water quality in local creeks and rivers;
- Contribution to closures of Petrie Island Beach during wet weather;
- On-going erosion in local creeks, impacting infrastructure and fish habitat.

Infill, redevelopment and intensification is also occurring in the study area, contributing further to these problems.

With respect to Petrie Island Beach, it is important to note that "wet weather," while a key contributor to the high number of beach closures, is not the only factor. Other "dry weather" factors, such water fowl, wildlife, illicit discharges, etc., are addressed by other City programs. This Study addresses only the wet weather aspects of beach closures.

**DISCUSSION**

SWM retrofit measures are categorized by the location where they operate within the drainage system and include:

- Lot level: These measures are located at the source of runoff, i.e., "on the lot." They function to reduce the amount or volume of rainfall that runs off and prevent pollutants from being picked up and conveyed off the lot. Lot level measures are therefore considered to be the first line of protection in maintaining or rehabilitating the health of a watershed. Though each lot (public or private) may be relatively small in size, the use of lot level practices on a large number of lots and properties in urbanized areas can be combined to provide a positive cumulative effect. Typical lot level measures include: rain barrels or cisterns that harvest rainfall for later use on the property; rain gardens and other absorbent landscaping measures that capture and infiltrate or evapotranspirate runoff; the use of various pervious or permeable materials for the construction of driveways and parking lots; green roofs, etc.
- Conveyance: Conveyance measures provide the means by which stormwater runoff is transported from one location to another. These measures collect and

accumulate runoff from individual lots and convey it to the drainage system's outlet, typically the closest stream or river. Conveyance measures include drainage ditches and swales, storm sewers and the right-of way itself, which conveys flows that exceed the capacity of the storm sewer system overland to the receiving stream.

- End-of pipe: End-of-pipe (EoP) measures are larger scale facilities that receive the accumulated runoff collected by the conveyance system. EoP facilities can provide treatment to improve the quality of runoff before it is discharged to the receiving watercourse and/or can reduce the rate at which runoff is discharged to reduce or avoid flooding impacts. EoP measures include both surface (e.g. wet ponds) and subsurface facilities (e.g. infiltration galleries).

- Stream rehabilitation: When the implementation of retrofit measures within the watershed is not sufficient to address erosion and stability impacts, it may be necessary to undertake stream rehabilitation measures. Such measures are undertaken to improve the stream's ability to withstand urbanized flows while maintaining or improving its natural features and functions. In other words, stream rehabilitation is not intended to provide hardened erosion protection (although sometimes that is unavoidable to protect existing infrastructure that was built too close to the stream or in inappropriate locations) but to improve the stream's overall resiliency. Such measures can include re-building sections of the stream, creating off-line pools for floodplain storage, cutting down banks to re-connect a downcut or eroded channel with its floodplain, etc.

The overall purpose of the Retrofit Study is to recommend a particular combination of the above measures for the study area, considering a number of economic, environmental and social factors.

To develop such a Retrofit Plan for the study area, the following key steps were undertaken:

i. Existing Conditions;

ii. Selection of the Preferred Scenario;

iii. Implementation and Monitoring Plan; and

iv. Public Consultation and Communications.

This Study has been carried out as a Master Plan in accordance with the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment.

As a Master Plan, the Retrofit Study was completed at a broad level of assessment. More detailed investigations will be required in order to fulfil the MCEA requirements for Schedule B projects identified in the recommended Retrofit Plan.

**i) Existing Conditions:**

An overview of existing conditions within the study area was completed, documenting the impacted condition of Taylor Creek, Bilberry Creek, Voyageur Creek, and Green's Creek tributaries Cyrville Drain, Mather Award Drain and McEwan Creek.

The urban area within the study area is almost completely built-out, with only minor undeveloped areas remaining. Land use within the Eastern Subwatersheds has changed over the last century or so from forest, to agriculture, to the current predominantly urban character. Those changes have altered the amount and quality of surface runoff reaching the creeks, resulting in increased erosion and flooding problems, as well as degraded aquatic habitat.

To document the existing conditions of the study area creeks, fluvial geomorphic assessments were completed including field investigations. Fluvial geomorphology is the study of the processes associated with streams and rivers, including stream hydraulics and sediment movement. The investigations identified four high priority erosion sites, four high to medium priority erosion sites, nine medium priority erosion sites, and 24 erosion sites as medium to low priority. A detailed inventory of erosion sites and their relative priority is provided in Document 2.

The fish community in the Eastern Subwatersheds is limited either by access to and from the Ottawa River/Green's Creek, or by the physical limitations in the stream structure, a general lack of instream vegetation, and poor water quality. Generally low numbers of fish have been collected in sampling studies.

Water quality models were developed to quantify the impact of stormwater runoff on the Eastern Subwatersheds tributaries that flow to the Ottawa River. The results showed

that water quality is degraded with regular exceedances of the Provincial Water Quality Objectives (PWQO) for various pollutants, Bilberry Creek being the major contributor to the Ottawa River from an *E.coli* concentration point of view.

Historically, Petrie Island Beach has been closed on average for about 30 per cent (or 21 days) of the swimming season (mid-June to late August). Only the bacterial plumes from Green's, Bilberry and Voyageur Creek impact the beach cells located on the river side of Petrie Island (i.e. Petrie Island Beach). Queenswood and Taylor Creek East and West discharge to the river south of the island and therefore do not impact the beach but do impact local receiving waters.

Following the overview of existing conditions, an assessment of the retrofit potential within the study area was undertaken. Existing storm sewer outfalls were assessed for the potential to construct new EoP facilities and land use and rights-of-way were characterized to assess the opportunities to implement lot level and conveyance retrofits.

**ii) Selection of the Preferred SWM Retrofit Scenario:**

The next steps involved:

a) determining objectives and targets to be met by the Retrofit Plan;

b) deriving various "retrofit scenarios" to consider;

c) evaluating the "retrofit scenarios" by their ability to meet the identified objectives and targets; and

d) selecting the preferred retrofit scenario to carry forward as the Retrofit Plan.

a) Objectives and targets: The retrofit objectives, listed in Table 1, provide direction to achieve the overall goal of healthier creeks and river and reduced closures at Petrie Island Beach. Associated targets (see Document 3) are numerical benchmarks that represent the desired condition to be achieved, for example, reducing *E.coli* concentration at outlets to the Ottawa River to the Provincial Water Quality Objectives of 200cts/100mL.

Table 1: Objectives of the SWM Retrofit Plan*

| | | |
|---|---|---|
| 1 | Reduce Erosion Impacts: | a) Maintain, enhance or restore natural stream processes to achieve a balance of flow and sediment transport. |
| | | b) Manage stream flow to reduce erosion impacts on habitats and property. |
| 2 | Preserve and Re-establish the Natural Hydrologic Cycle: | a) Increase infiltration and evapotranspiration, and decrease surface runoff. |
| | | b) Maintain groundwater levels and baseflows (groundwater discharge to streams) to sustain watershed functions and human use. |
| 3 | Improve Water Quality: | a) Improve surface runoff water quality and reduce nutrient and contaminant levels through pollution prevention. |
| | | b) Maintain or enhance water and sediment quality to achieve ecological integrity |
| 4 | Reduce Impact of Runoff on the Beach: | a) Improve water quality in the Ottawa River and reduce impact of runoff on the beach. |
| | | b) Improve water aesthetics including odour, turbidity and clarity. |
| 5 | Reduce Flooding and Minimize Risk to Human Life and Property due to Flooding | |

* Note: the numbering does not indicate priority

b) Retrofit scenarios: Three SWM retrofit scenarios, made up of different combinations and levels of implementation of retrofit measures, were considered for evaluation and comparison to the existing condition:

- **Scenario 1**: 30% Lot level Implementation:

Thirty per cent has been assumed to be a reasonable long-term uptake rate for lot level measures that private landowners will 'voluntarily' implement based on social marketing studies that have been completed for other jurisdictions.

- **Scenario 2**: 50% Conveyance Implementation:

  Over the long term, it was assumed that 50 per cent of the Right-of-Way (ROW) length would be retrofitted with conveyance measures. The implementation of such measures would be done in conjunction with the scheduled road reconstruction works.

- **Scenario 3:** 30% Lot Level and 50% Conveyance Implementation:

  This scenario represents the sum of Scenario 1 and Scenario 2.

The 30 per cent lot level and 50 per cent conveyance target represent a preliminary target that was selected based on the expected benefits that could be achieved in the receivers and at the beach. This high-level target will be re-evaluated over time as the City gains more experience with SWM retrofit projects in constrained areas.

The potential for implementation of retrofit end-of-pipe facilities was determined through a screening process. Potential sites were screened for sufficient space to implement a new facility, upstream drainage area, existing servicing conflicts, presence of mature tree cover and property ownership to identify feasible sites to carry forward. The results of this process concluded that there are no feasible locations for end-of-pipe measures, given numerous constraints and relatively small drainage areas that could be treated.

Modeling was undertaken to predict the relative benefits of each scenario in terms of reducing pollution, erosion impacts, flood risk, and *E.coli* counts at Petrie Island Beach. Table 2 summarizes the results of the modeling exercise indicating the predicted reduction of pollutants for each retrofit scenario at the outlet to the Ottawa River. Total suspended solids (TSS), total phosphorous (TP) and *E.coli* were the representative pollutants modelled.

Table 2: Water Quality Results at the Outlets to the Ottawa River

| Subwatershed | 30% Lot Level | | | 50% Conveyance | | | 30% Lot Level & 50% conveyance | | |
|---|---|---|---|---|---|---|---|---|---|
| | *E.Coli* | TP | TSS | *E.Coli* | TP | TSS | *E.Coli* | TP | TSS |
| | Percent Reduction Relative to Existing Conditions | | | | | | | | |
| Bilberry | 22 | 14 | 17 | 12 | 6 | 8 | 30 | 20 | 23 |
| Green's | 21 | 13 | 15 | 5 | 5 | 6 | 30 | 18 | 20 |
| Queenswood | 16 | 15 | 17 | 8 | 7 | 8 | 24 | 21 | 24 |
| Taylor | 17 | 16 | 19 | 11 | 8 | 9 | 25 | 23 | 25 |
| Voyageur | 17 | 15 | 17 | 9 | 7 | 8 | 25 | 21 | 24 |

The results for *E.coli* were then input into a hydrodynamic model of the Ottawa River to simulate the resulting peak *E.coli* counts at Petrie Island Beach. The stormwater control scenarios reduced bacterial loads to the river by 11 per cent using conveyance control only, and 32 per cent assuming lot level control only. Loads were reduced by 43 per cent when both control strategies were applied together.

c) Scenario evaluation: The three scenarios were then evaluated and ranked according to their predicted ability to meet all of the study's objectives and targets (as per Table 1 and Document 3) and a number of other criteria. The evaluation addressed five main criteria categories, including:

- Study Objectives and Targets;
- Social and Cultural;
- Natural Environment;
- Timing and Ease of Implementation; and

- Total Life Cycle Cost

An overall scoring method was developed to capture the benefits and/or limitations of each of the three scenarios evaluated. The resulting detailed evaluation is provided in Document 4 and summarized in Table 3.

Table 3: Summary of Evaluation of Scenarios

| Scenario | Capital Cost [$M] | Overall Score* | | Rank |
|---|---|---|---|---|
| | | Not including cost | Including Cost | |
| 30% Lot level | 13 | 84 | 96 | 2 |
| 50% Conveyance | 109 | 72 | 63 | 3 |
| 30% Lot Level & 50% Conveyance | 122 | 108 | 114 | 1 |

* Higher score is better (see detailed evaluation in Document 4)

d) Selecting the preferred scenario: Based upon the evaluation completed, the "30 per cent Lot level and 50 per cent Conveyance Implementation" retrofit scenario was selected as the preferred Retrofit Plan. Despite the results of the evaluation of scenarios, a primary consideration was the degree of "uptake" or the extent of implementation that could reasonably be anticipated. With respect to lot level measures on private property (approximately 49,000 properties within the study area), actual uptake will ultimately depend on a number of factors, for example:

- Acceptance: Will the homeowner be willing to implement one or more lot level measures and will they actually do it? Will commercial establishments be willing to participate with retrofit measures when rehabilitating properties and buildings?
- Feasibility: Are the lot level conditions for each individual property physically suitable for the various lot level measures considered?

To promote the implementation of lot level measures on private properties, an engagement plan will be developed that builds on the recommendations from the Pinecrest Neighbourhood Rain pilot project (expected to be completed by the end of 2019), best practice from across North America, and market analysis in Eastern Subwatersheds. The Pinecrest Rain pilot project uses community-based social marketing approaches to build awareness and encourage homeowners to adopt practices that manage rainwater on their property. By identifying barriers and motivators to behaviour change, the engagement plans will include a combination of education, incentives, demonstrations and building capacity of local organizations.

With respect to conveyance measures, most of the neighbourhoods within the Eastern Subwatersheds study area have roads and sewers that are relatively new. Most of the historical development occurred in the 1970s and 1980s, meaning that the utilities and roads are less than 50 years old. Significant rehabilitation will not take place for a number of decades. Therefore, there is limited opportunity to combine roadway renewal projects with conveyance control retrofit in the short term. It is also worth noting that there are some neighbourhoods in Cyrville and Mather Award drains and McEwan Creek subwatersheds that were built in the 1960s. These areas might be candidates for earlier retrofits when infrastructure renewal is needed.

In addition to lot level and conveyance measures, the implementation of stream rehabilitation measures will be required in the short term to address existing erosion issues identified under the Existing Conditions (see Document 2). The required stream rehabilitation work is common to all retrofit scenarios.

**iii) Implementation and Monitoring Plan:**

The Retrofit Plan was prepared based a long-term strategy for retrofitting the study area and includes the following considerations and priorities for implementation:

a) Lot level and conveyance measures on public (City) property:

While a 30 per cent and 50 per cent level of uptake for lot level and conveyance measures is identified in the preferred retrofit scenario, retrofits within the rights-of-way and on City-owned properties will be completed "opportunistically," i.e., when roadways, City buildings and parking lots come to the end of their life cycle.

In this way, the cost of retrofitting will represent only a portion of the total cost of replacing existing infrastructure and physical plant. For example, green roofs should be considered when roof areas need to be replaced, permeable materials should be considered when parking lots are re-surfaced, roof drainage disconnected if feasible when related work is undertaken, etc.

The same approach should be applied to road rehabilitation projects, i.e., as sections of road come up for rehabilitation, consideration should be given to implementing conveyance retrofits where feasible and appropriate. This would ideally occur at or near life cycle end, as noted above.

b) Lot level measures on private property:

Per the preferred retrofit scenario, the objective is to retrofit 30 per cent of existing private development with lot level measures. Promotion of the implementation of lot level measures is essential to engage various communities and to realize the benefits of retrofitting private property, which constitutes the vast majority of the study area. Engagement of study area residents and business owners will be achieved through an on-going education, outreach and engagement program. While there is limited experience with the adoption of widespread lot level controls in Canada, most municipalities that have invested in a lot-level control program have used a combination of social marketing and incentive programs.

c) Stream restoration and enhancement opportunities:

In addition to the recommended retrofit measures, the implementation plan includes the remediation of priority erosion sites and restoration of the natural landscape environment within the creek corridors, including natural channel characteristics. There are no opportunities for implementing stream daylighting within the study area as most potential daylighting is constrained by property limitations created by historical development. Stream daylighting and restoration for areas where streams have been enclosed by storm sewers would be very expensive and logistically difficult to execute.

The proposed Retrofit Plan is intended to provide direction to achieve a long-term vision. The suggested 50-year implementation provides a timeframe that is commensurate with the broad scope of the overall undertaking and recognizes the considerable challenges associated with retrofitting existing communities. Given the limited experience that the City has with LID measures, the cost estimates provided above will need to be revised as the City gains experience with these projects.

Notwithstanding the suggested total 50-year timeframe, the initial focus will be on moving forward in five-year increments. Based upon what is learned from the first five years of implementation, the 50-year timeframe would be re-revisited. The intent is to report back to committee by 2024 with monitoring results and provide an update to the implementation plan and timeframe. Table 5 provides a summary of proposed priority projects for the first five years of implementation.

Table 5: Priority Projects for Initial Five Years of Implementation

| Project | Description | Year of Implementation | Lead (Dept./Branch) | Estimated Cost |
|---|---|---|---|---|
| 1. Remediation of priority erosion sites | • The 2013 assessment will be updated to confirm the status of the 15 priority erosion sites listed in Document 2. Functional designs will be prepared, and preliminary cost estimates updated prior to detailed design proceeding. This update will include an assessment of valley slope stability, where required. Schedule B Class EA requirements will be addressed as part of this work. | 2019-2021 | PIED/Asset Mgmt | $100K |
| | • Remediation of the priority erosion sites (detailed design and construction). | 2022-2023 | PIED/Design& Construction | $1.9M* |
| 2. Demographic analysis, social market research, and development of comprehensive outreach program to support implementation of lot level controls | • Completion of a demographic analysis to identify specific neighborhoods where the City should focus efforts in the short term. The analysis will include a review of housing types and ownership, socio-economic profiles, opportunities for lot level measures, as well as local groups and businesses as potential partners.<br>• Social marketing research to understand local motivators and barriers to installing lot level measures.<br>• Development and initial implementation of a community outreach and engagement plan that builds on the recommendations from the Pinecrest Neighbourhood Rain pilot project and market analysis in Eastern Subwatersheds. | 2019-2023 | PIED/Policy Planning | $875K |
| 3. Rain garden demonstrations | • Installation of 3-5 demonstration rain gardens on widely-used City or other public properties within the target neighbourhoods. | 2020-2023 | PIED/Policy Planning | $150K |
| 4. Investigations to improve understanding of sources of *E.coli* at Petrie Island Beach | • Retrofitting this large study area will take a number of decades to achieve as roads and other City facilities and properties are renewed at the end of their life cycle. In the short to medium term, additional monitoring efforts are required to improve the current understanding of sources of E.coli affecting Petrie Island Beach. The investigations will largely focus on understanding the impacts of stormwater discharges in the creeks within the study area. | 2020-2023 | PWESD/Stormwater Mgmt | $1.2M** |
| | | | Total | $4.23M |

* Construction cost for the remediation of the priority erosion sites presented in Document 2. Does not include any required slope stability works that may be identified

** Preliminary – actual cost will be subject to results of the field investigations.

**Monitoring Plan:**

The intent of the Monitoring Plan is to track the effects of the retrofit implementation in order to assess the overall progress in achieving the Study's objectives and targets. In other words, based upon data measured in the field as the implementation proceeds over a number of years, is water quality improving? Are flood and erosion risks being reduced? Are wet weather impacts on Petrie Island beach being reduced? Monitoring the "on the ground" results of the retrofit implementation is essential to evaluate the effectiveness of the proposed Plan and to adjust it accordingly if it is not achieving the projected (i.e., modeled) benefits. This type of approach is known as "adaptive management" and is particularly applicable given the uncertainties and complexities associated with the rehabilitation of urban subwatersheds and their receiving watercourses.

Adaptive management provides a means of working toward achieving desired outcomes while managing uncertainties through an iterative learning process. Successful adaptive management requires the clear articulation of the desired outcomes (objectives and targets) and the ability to adjust actions if/as monitoring results deem this necessary. The desired outcomes of the Retrofit Plan, discussed earlier in this report, were identified based on current understanding and knowledge. As the Retrofit Plan is implemented over time, field monitoring of the resulting effects and the use of the improved knowledge so gained will guide adjustments to future actions and continued implementation, if required. Document 5 provides a summary of the proposed monitoring framework.

**iv) Public Consultation and Communications:**

The public consultation undertaken for the study is described in detail in the CONSULTATION section of this report.

**Linkages to Other City Initiatives and Projects**

The findings and recommendations of the Eastern Subwatersheds SWM Retrofit Study have potential linkages to a number of on-going City initiatives and projects including:

LID Screening Tool: In 2017, the City of Ottawa initiated the development of a screening tool that will be used to screen the City's road reconstruction program to identify

candidates for the implementation of SWM retrofit measures. The automated GIS-based tool will also identify preferred LID measure(s) for the selected sites. The screening tool is expected to be operational by September 2019 and will be integrated with existing business processes associated with the road renewal program.

Hydro-Geological Workshop: In 2019, the City will be hosting a ½ day workshop to provide guidance to the local industry on the application of LID measures in areas with hydro-geological constraints (e.g. low permeability soils and high groundwater conditions). This work will supplement the three-day LID workshop organized by the local Conservation Partners and delivered in November 2018.

City-Wide Stormwater Management Retrofit Master Plan: The extension of SWM retrofit master planning across the City was identified in the 2015-2018 Term of Council Priorities and is described in the current Infrastructure Master Plan. The City-wide plan will cover the majority of the urban area (excluding those areas that have developed or will develop with current stormwater management measures in the West, South Urban and portions of the East Urban communities).

Provincial Directions: The Ministry of the Environment, Conservation and Parks (MECP, formerly MOECC) is currently promoting approaches to reduce runoff volume, in order to better mimic a pre-development water budget (or hydrologic cycle) which is generally characterized by high levels of rainfall infiltration, and limited runoff volume. These objectives can be achieved with Low Impact Development (LID) measures designed to retrofit existing developed areas. The MECP is now preparing an LID SWM Guidance Manual (release date currently unknown). A key deliverable of this exercise will be the setting of minimum Runoff Volume Control targets, not just for new development but also for renewal projects.

## RURAL IMPLICATIONS

There are no rural implications

## CONSULTATION

Public consultation and communication efforts undertaken included the following:

Technical Advisory Committee: The Technical Advisory Committee (TAC) was comprised of City staff from a variety of departments, and representatives from the National Capital Commission, Ministry of the Environment, Rideau Valley Conservation Authority. The TAC met five times during the study - on November 14, 2012, June 17, 2013, May 20, 1014, May 30, 2017 and April 23, 2018 and provided advice and guidance to the study team on a range of issues.

Public Advisory Committee: In October 2012, an invitation to participate to the Eastern Subwatersheds Study was sent to Councillor's assistants and every Community Associations located within the Study area. Because of the lack of response, no formal Public Advisory Committee (PAC) was formed. Instead, direct communication was established with the interested parties, including 29 Community Associations, Ecology Ottawa and other interested members of the public.

Public Consultation:

- The preliminary results of the study were presented at City Hall on June 14, 2014 during the Water Round Table event. A questionnaire was provided during this event and the boards were posted on the City's website for consultation. No written response was received.

- The results of the existing condition assessment were presented on the City's web-site via an on-line information sessions held between July 31 and September 19, 2014. A detailed questionnaire was posted on the study webpage, but no written response was received.

- The draft final results of the study were presented on the City's website via a second on-line information session held between June 15 and July 13, 2018. Despites many attempts to reach out to Community associations and interested members of the public, no written response was received.

The limited feedback from the public might be attributed to the high-level nature of the study that provides long-term recommendations and have limited impacts on the residents. Direct communication was established with Ecology Ottawa throughout the study but no formal comments were received.

Advertisements for the Water Round Table and the on-line Information Sessions (including the Notice of Study Commencement) were placed in Le Droit and the Ottawa Citizen, and on the City's Facebook web page. Over the course of the study, new Councillors were elected within the study area. Notices of public consultation were sent by email to re-elected and new Councillors and to any Community Associations located within the study area. A status update email was sent to current Councillors on January 11, 2019 to advise them of the subject report going to Committee.

Website: A website was created to provide access to more detailed information about the study: ottawa.ca/eastsubwatersheds.

The notices of public consultation, the email distribution list as well as email communication with Ecology Ottawa is included in Document 6. The boards from the second on-line information session are included in Document 7.

## COMMENTS BY THE WARD COUNCILLORS

Councillor Luloff, Councillor Dudas, Councillor Deans, Councillor Tierney, Councillor Nussbaum, Councillor Cloutier, Councillor Blais and ECPC Chair, Councillor Moffatt are aware of this report. No comments were received. Similarly, no comments were provided by former Councillor Monette, Councillor Bloess, Councillor Clark, Councillor Hume, and Councillor Mitic.

## LEGAL IMPLICATIONS

There are no legal impediments to Committee and Council's approval of the Recommendations of this Report.

## RISK MANAGEMENT IMPLICATIONS

There are no risk management implications associated with this report as it represents an overall Retrofit Plan that will guide various projects and programs. Risks associated with specific projects and programs will be identified and managed as they come forward for implementation.

## ASSET MANAGEMENT IMPLICATIONS

Implementation of the proposed Retrofit Plan will contribute to achieving the following objectives in the City's Strategic Plan:

i) 2015-2018 Term of Council Strategic Objective and Initiative 21: *Develop a city-wide Stormwater Management retrofit master plan to improve water quality, reduce runoff and improve stream health in older urban areas that developed before current SWM requirements were in place.* The retrofit plan developed as part of the Eastern Subwatershed Stormwater Management Retrofit Study will feed into the City-wide Storm Water Management Retrofit Master Plan.

ii) Solid Waste and Environment Objective 3: *Protect the water environment and source water supply*. The Retrofit Plan will protect the water environment by improving water quality, reducing flood and erosion risks, and improving the overall health of the creeks within the Eastern Subwatersheds area and the Ottawa River.

*iii)* Solid Waste and Environment Objective 4: *Meet the intent of the Leadership in Energy and Environmental Design (LEED) standard by 2020 for existing City-owned buildings to support the implementation of Council-approved environmental goals and targets.* Implementing SWM retrofit measures at City-owned buildings will contribute to achieving this objective.

## FINANCIAL IMPLICATIONS

Funds are available within existing Stormwater Management Retrofit accounts to fund the $4.23M priority projects for the initial five years, as identified in Table 5. The long-range financial plan will be updated to reflect the current estimates for the post-five-year requirements, and budget will be brought forward for Council consideration through future-year capital budgets.

## ACCESSIBILITY IMPACTS

The Eastern Subwatersheds Stormwater Management Retrofit Study has no accessibility impacts as it will provide a long-term Retrofit Plan that will guide various projects and programs. Accessibility impacts that may be associated with individual

retrofit projects and programs will be identified and addressed as they come forward for implementation.

## ENVIRONMENTAL IMPLICATIONS

The implementation of the preferred Retrofit Plan will result in the following benefits to the local environment of the study area creek corridors, the Ottawa River and Petrie Island Beach:

- improved water quality in the creeks and River;
- reduced *E.coli* counts at Petrie Island Beach; and
- reduced flood and erosion risk within the creeks and associated reduced impacts on City infrastructure.

## TERM OF COUNCIL PRIORITIES

The project is consistent with the long-term sustainability goals for stormwater management. Implementation of the SWM retrofit projects and stream rehabilitation measures will ensure that flooding and erosion risks are appropriately managed and will maintain or improve the health of the creeks. Completion of the Eastern Subwatersheds Stormwater Management Retrofit Study was also identified as a strategic initiative in the 2015-2018 Term of Council Priorities.

## SUPPORTING DOCUMENTATION

Document 1 Study Area

Document 2 Priority Erosion Sites

Document 3 Study Objectives and Targets

Document 4 Criteria and Scoring Used for Scenario Evaluation

Document 5 Monitoring Program Framework

Document 6 Notices of Public Consultation
*(Distributed separately and held on file with the City Clerk)*

Document 7 Boards from the Second On-line Information Session
*(Distributed separately and held on file with the City Clerk)*

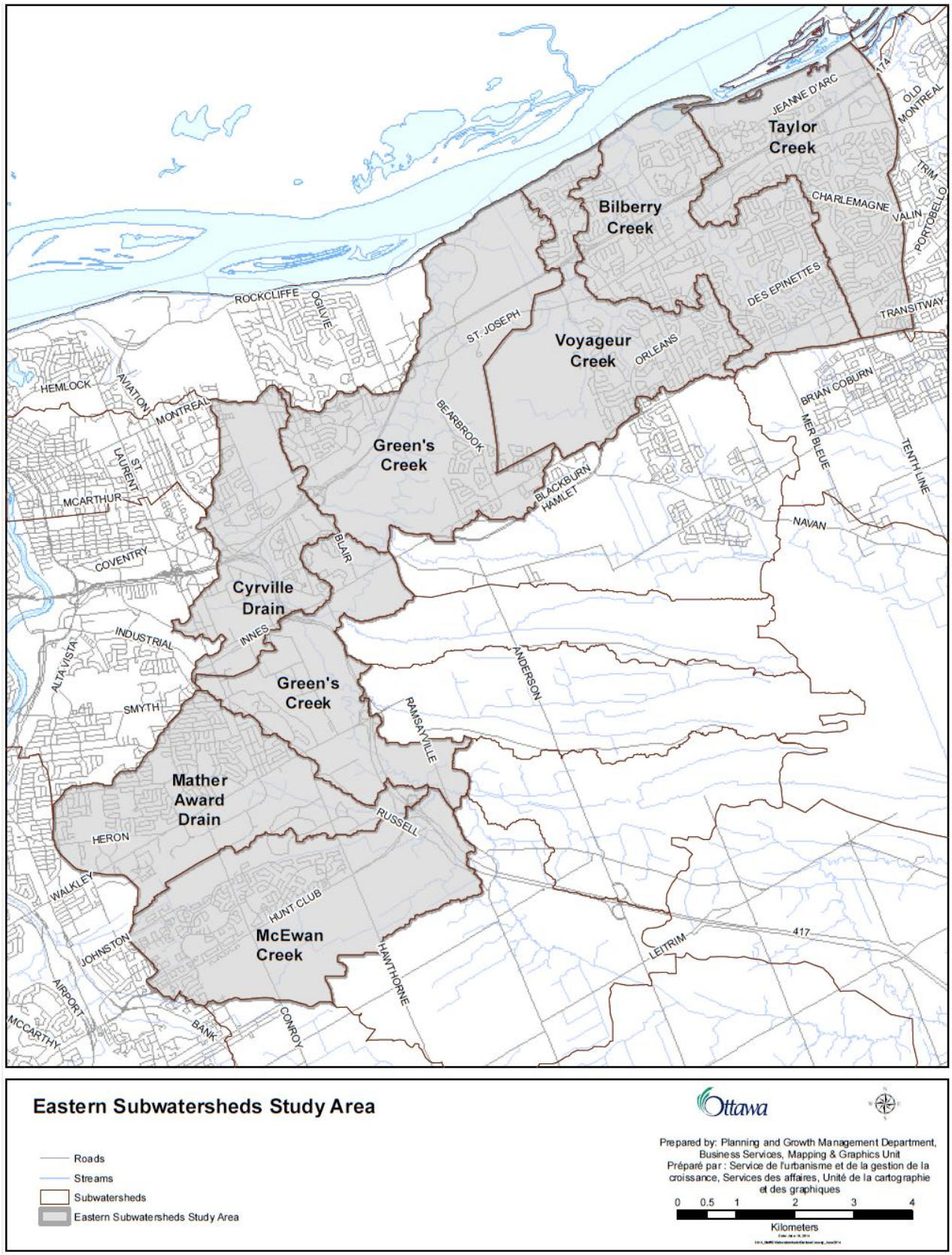
Document 8 Eastern Subwatersheds SWM Retrofit Study (December 2018)
*(Distributed separately and held on file with the City Clerk)*

**DISPOSITION**

Following Committee and Council approval, the Eastern Subwatersheds Stormwater Management Retrofit Study report (see Document 8), will be made available to the public for a 30-day review period in accordance with the Ontario Municipal Class Environmental Assessment Schedule "B" process.

Infrastructure Policy Serviceswill work with Public Works and Environmental Services to undertake the priority projects identified for the first five years of implementation and to confirm departmental responsibilities for the longer-term implementation of specific components of the Retrofit Plan.

**Document 1 – Study Area**



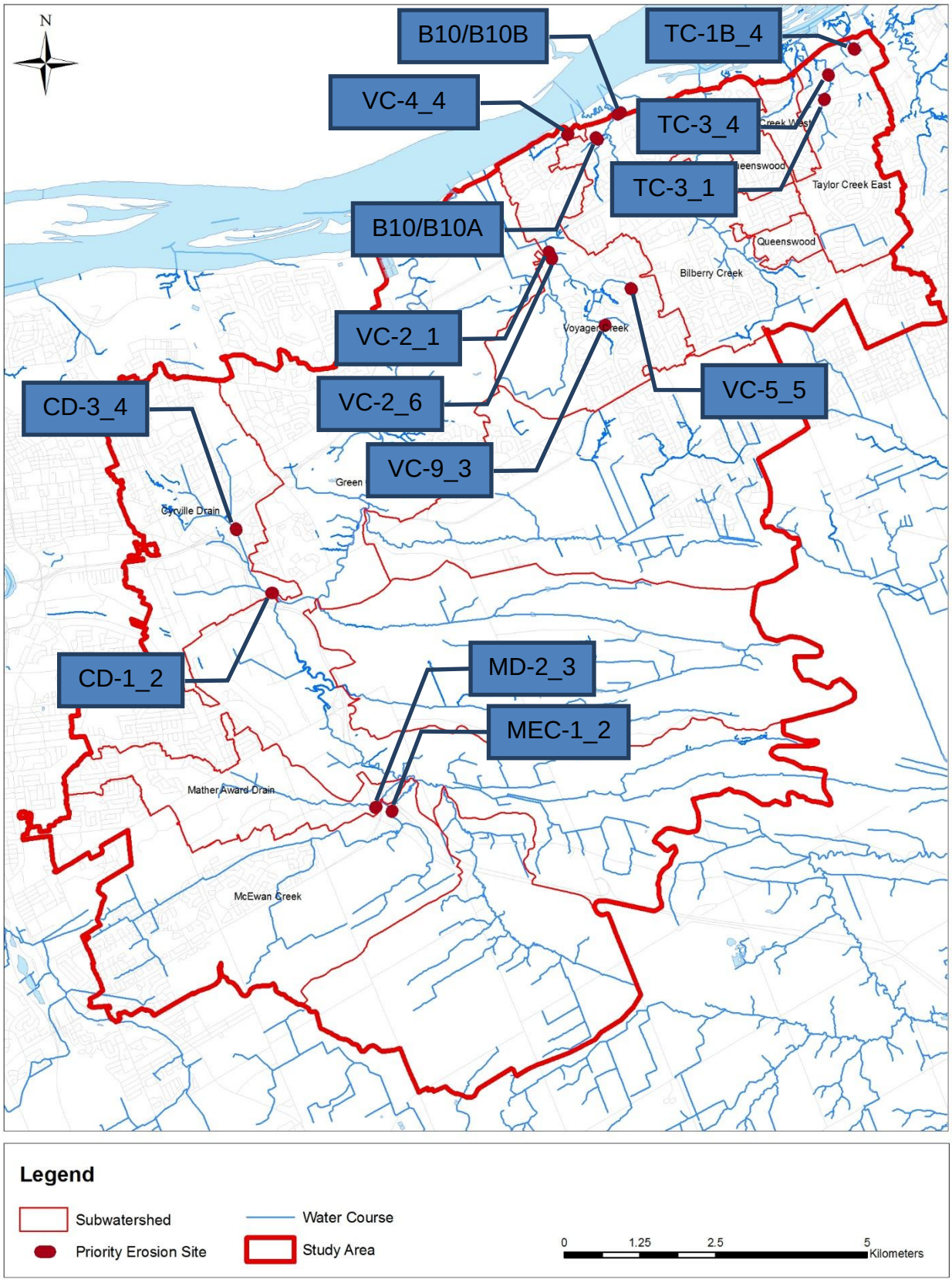
**Document 2 – Priority Erosion Sites**

| Reach | Erosion Site No. | Description | Risk | Priority |
|---|---|---|---|---|
| MEC-1 | 2 | Bank erosion identified near construction of new road bridge, channel bend is bare, roots exposed, and is slightly undercut | Newly constructed bridge | High |
| B10A* | - | Eroding storm outlet along valley slope, valley wall erosion and undermining of pedestrian crossings. Refer to Geomorphic Systems Master Implementation Plan for Bilberry Creek, GHD, 2014, for details. | Erosion at outlet and valley wall | High |
| B10/B10 A* | - | Woody debris jam and beaver dam upstream of the pedestrian bridge. Require minor realignment downstream of crossing. Refer to Geomorphic Systems Master Implementation Plan for Bilberry Creek, GHD, 2014, for details. | Debris jam and beaver dam combined may restrict the flow | High |
| B10/B10 B* | - | Channel degradation and known presence of a sanitary sewer crossing under both reaches. Refer to Geomorphic Systems Master Implementation Plan for Bilberry Creek, GHD, 2014, for details. | Valley wall failure threatens a sanitary manhole along the top of slope | High |
| VC-1 | 4 | ~5cm diameter pipe with constant flow of water exiting pipe, water flow down the bank slope as well | Municipal Infrastructure Failure | Medium – High (Investigation Required) |
| TC-3 | 1 | Failure of armourstone wall at upstream end of structure, structure is undercut | Private / Commercial Property | Medium - High |
| CD-3 | 4 | ~1200 storm sewer outlet, baffles, ~2m drop to channel bed, exposed stone all the way down, creation of plunge pool | Storm sewer outlet | Medium to High |

| Reach | Erosion Site No. | Description | Risk | Priority |
|---|---|---|---|---|
| MD-2 | 3 | Meander bend at location of newly constructed road bridge, erosion scars and exposed roots present | Newly constructed bridge | Medium to High |
| VC-2 | 1 | Concrete ramp is undercut and broken causing drop into pool, knickpoints present ~5-6m downstream from ramp | Culvert under Youville Road Upstream | Medium |
| VC-2 | 6 | Erosion scar extends to toe of bank, riprap and concrete have been dumped on slope, exposed storm sewer outlet, broken gabion baskets upstream, riprap and small knickpoints on bed | Parking lot less than 10m from top of scar | Medium |
| VC-5 | 5 | Steep valley slope, properties less than 5m from top of slope; large woody debris in channel causing right bank to be undercut | Private property less than 5m from top of slope | Medium |
| VC-9 | 3 | Gabion baskets have detached from banks, riprap and gabion in channel, geotextile material exposed | Culvert upstream | Medium |
| CD-1 | 2 | Concrete portion along bed drops into plunge pool to native bed, is undercut, riprap exposed underneath | Gabion baskets line channel baskets, storm sewer outlet downstream | Medium |
| TC-1B | 4 | Bank Repair: Exposed material on right bank, 50cm drop on bed, geotextile exposed on bed and banks | Bank failure | Medium |
| TC-3 | 4 | Failure of gabion baskets on bed creating 0.5m drop, exposed geotextile, undercut and broken gabion | Bank failure | Medium |

*Per Bilberry Creek Geomorphic Systems Master Implementation Plan, GHD May 2014)

Priority Erosion Sites – Location Plan



**Document 3 – Study Objectives and Targets**

| Objective | Indicator | Measurable Parameter | Target |
|---|---|---|---|
| a. Reduce Erosion Impacts | In-stream erosion potential | Flow Duration from Flow Duration Curve (FDC) Analysis | Reduction in time of threshold flow exceedance |
| b. Natural Hydrologic Cycle | a. Runoff threshold event(1)<br>b. Watershed peakiness(2) | (1) Hydrologic Cycle Volumes at Outlets to Ottawa River<br>(2) Bankfull Flow Compared to Baseflow ($Q_{Bankfull}/Q_{baseflow}$) | (1) Decrease surface runoff volume and increase in infiltration + evaporation<br>(2) $Q_{Bankfull}/Q_{baseflow} \leq 16$ (3) |
| c. Improve Water Quality | Total suspended solids (TSS) and Total Phosphorus | TSS and TP Loadings and Concentrations at Outlets to Ottawa River | TSS less than 25 mg/L, (Federal Canadian Council of Ministers of the Environment Guidelines (CCME))<br>TP less than 0.03mg/L (Pinecrest Creek/Westboro Stormwater Management Retrofit Study (JFSA, 2011)) |
| d. Reduce impact of runoff on the beach | Instream *E.coli* at outfall to Ottawa River | *E.coli* Loadings and Concentrations at Outlets to Ottawa River | PWQO or cts/100mL |
| e. Flood Risk | Frequency of overtopping of watercourse crossings | Flow Rate ($m^3/s$) and Floodline Elevation | Maintain or reduce flood elevations for all storm events from 2- to 100-year |
| f. Public awareness of stormwater management and increase public involvement | Public's response to questionnaire | Response indicating awareness of stormwater issues | 25% positive response |

1) Runoff Threshold Event is the rainfall event required to generate a runoff response in a watercourse.
2) Watershed Peakiness is the measure of runoff response to rainfall measured as the ratio of bankfull flow to baseflow.
3) Source: City of Toronto Wet Weather Flow Master Plan, 2003.

**Document 4 – Criteria and Scoring Used for Scenario Evaluation**

| ID | Criteria | Indicator | 30% Lot Level | 50% Conveyance | 30% Lot Level and 50% Conveyance |
|---|---|---|---|---|---|
| **1** | Reduce Erosion Impacts | In-stream erosion potential | 2 | 1 | 3 |
| **2** | Natural Hydrologic Cycle | Runoff threshold event | 2 | 1 | 3 |
| | | Watershed peakiness | 2 | 1 | 3 |
| **3** | Improve Water Quality | Total Suspended Solids (TSS) | 2 | 1 | 3 |
| **4** | Reduce impact of runoff on the beach | Instream *E.Coli* at outfall to Ottawa River | 2 | 1 | 3 |
| **5** | Reduce Flooding | Frequency of overtopping of watercourse crossings | 2 | 1 | 3 |
| | | ***Category A Total (Score x Weighting Factor of 4)*** | ***48*** | ***24*** | ***72*** |
| **6** | Timing to implement | Estimated implementation time for strategy to be operational | 2 | 1 | 2 |
| **7** | Degree of Control | Degree of implementation which City has control over | 1 | 3 | 2 |
| **8** | Community/User Health and Safety | Risk to community health and safety | 3 | 2 | 2 |
| **9** | Public /User Acceptance | Public acceptance | 2 | 3 | 2 |
| **10** | Open Space | Impact on open | 4 | 4 | 4 |

| ID | Criteria | Indicator | 30% Lot Level | 50% Conveyance | 30% Lot Level and 50% Conveyance |
|---|---|---|---|---|---|
| | Areas/Parks | spaces/parks | | | |
| | | ***Category B Total (Score x Weighting Factor of 3)*** | ***36*** | ***39*** | ***36*** |
| **11** | Total Annual (Lifecycle) Costs | Relative total cost | 4 | 3 | 2 |
| | | ***Category C Total (Score x Weighting Factor of 3)*** | ***12*** | ***9*** | ***6*** |
| | | **OVERALL SCORE (Sum of Category Totals)** | **96** | **72** | **114** |

**Document 5 – Monitoring Program Framework***

| Component | Indicator | Recommended Frequency |
|---|---|---|
| Erosion and Deposition Impacts and Channel Stability | Cross-sectional form and area from repeated survey data | (to be determined at a later stage) |
| Aquatic Habitat | Average pool depth | |
| | Bank stability | |
| | Percent cover | |
| Hydrologic Cycle | Peak flows | |
| | Runoff volume | |
| | Effective imperviousness | |
| Water Quality | TSS | |
| | Total phosphorus | |
| | *E.coli* | |
| Natural Features | Riparian vegetation | |
| | Tree canopy | |
| | Corridor encroachments | |
| SWM Retrofits | Areas with SWM retrofit | |
| | Number of SWM measures | |
| Development Intensification | Total infill and redevelopment area | |

* this framework was extracted from the Pinecrest Creek/Westboro SWM Retrofit Study (JFSA, 2011)