March 16, 2026

Alloa Landowners Group
c/o Glen Schnarr & Associates Inc.
700-10 Kingsbridge Garden Circle
Mississauga, Ontario, L5R 3K6

Attn: **Jason Afonso, MCIP, RPP**
Partner

Re: **Erosion Mitigation Assessment**
Alloa Secondary Plan Area - Phase 1 Lands
Town of Caledon, Ontario
GEO Morphix Project No. PN24018

GEO Morphix Ltd. (GEO Morphix) was retained to complete a geomorphological assessment in support of Phase 1 of the Alloa Secondary Plan Area in the Town of Caledon, Ontario. This letter provides a summary of previously determined erosion thresholds for the receiving watercourses and an erosion exceedance analysis along a section of Etobicoke Creek downstream of the subject lands. The overall objective of this assessment is to evaluate changes in downstream erosion potential that may occur as a result of the land use changes associated with the proposed development.

The Phase 1 Lands, hereafter referred to as the subject lands, are generally bounded by the future Highway 413 right-of-way to the north, Mayfield Road to the south, Creditview Road to the west, and Chinguacousy Road to the east. The subject lands are located within the Etobicoke Creek watershed and the Credit River watershed. The Alloa Drain flows generally northeastward through the central portion of the subject lands and drains into Etobicoke Creek downstream of Chinguacousy Road. The headwaters of a subwatershed of the Credit River, Fletchers Creek, are located in the southern extent of the subject lands. Headwater drainage features generally flow from northwest to southeast, exiting the subject lands at Mayfield Road.

The following activities were completed as part of the erosion exceedance analysis:

- Review of previously completed studies and compilation of previously accepted erosion thresholds along the relevant watercourses downstream of the Phase 1 lands
- Delineation of representative cross-sections along relevant reaches using a LiDAR-derived digital terrain model (DTM)
- Erosion exceedance analysis for the relevant locations downstream of the subject lands to assess post-development changes in erosion potential and inform stormwater mitigation strategies to address erosion mitigation requirements

Summary of Previous Studies

Currently accepted erosion thresholds and unit discharge rates for reaches along Etobicoke Creek and Fletchers Creek downstream of the subject lands were determined through multiple studies, including:

- Environmental Implementation Report Mount Pleasant Sub-Area EIR 51-1 within the Mount Pleasant Secondary Plan Area Northwest Brampton (Stonybrook Consulting et al., 2011)
- Mayfield West, Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan, Part A: Existing Conditions and Characterization, Final Report, Town of Caledon, December 2014 (AMEC, 2014)

Reaches MEC-R05 and **MEC-R02** along Etobicoke Creek and **Reach SW4** along Fletchers Creek are located downstream of the subject lands. These reaches were selected for the assessment as they were previously determined to be erosion-sensitive reaches downstream of the proposed development (Stonybrook Consulting et al., 2011; AMEC, 2014). Erosion thresholds for **Reaches MEC-R05** and **MEC-**

R02 were determined through the Mayfield West Phase 2 Secondary Plan EISMP (AMEC, 2014). A unit discharge rate was determined for **Reach SW4** through the Mount Pleasant Sub-Area 51-1 EIR (Stonybrook Consulting et al., 2011). A map showing the locations of these previously accepted channel erosion threshold sites in relation to the subject lands is provided in **Appendix A, Figure 1.**

In the context of the present study, an erosion threshold is defined as the theoretical value, typically expressed as a critical discharge or shear stress, at which entrainment of sediment would occur based on the morphology of the channel and characteristics of the bed and bank materials. A theoretical erosion threshold is an inherently conservative value as it represents the force required to initiate sediment motion rather than the force needed for systemic erosion of the bed and/or banks of the channel (Chow, 1959; Fischenich, 2001; Julien, 1994; Komar, 1987; Miller et al., 1977). Channel characteristics and erosion thresholds measured and modelled for **Reaches MEC-05** and **MEC-02** through previous studies are provided in **Table 1** below.

Table 1: Bankfull channel characteristics and erosion threshold results

Channel Parameter	Etobicoke Creek Watershed	
	MEC-R05*	MEC-R02*
Average bankfull width (m)	6.94	5.92
Average bankfull depth (m)	0.45	0.70
Channel gradient (%)	0.04	0.14
D_{50} (mm)	1.6	3
D_{84} (mm)	8	17.8
Manning's n roughness coefficient	0.025	0.029
Average bankfull discharge (m^3/s)	1.59	5.18
Average bankfull velocity (m/s)	0.41	0.92
Drainage area (h)	2161†	2373†
Material	Fine bed sediments	Fine bed sediments
Reference	N/A	N/A
Critical velocity (m/s)	0.41	0.72
Threshold shear stress (N/m^2)	1.56††	5.26††
Threshold depth (m)	0.39††	0.38††
Critical discharge (m^3/s)	**0.56**	**0.68**
Unitary threshold ($m^3/s/ha$)	**0.000259**	**0.000287**

* Mayfield West Phase 2 Secondary Plan EIS-MP Part A (AMEC, 2014)
† Drainage area provided by Urbantech, 2026
†† Calculated based on channel morphological characteristics

The unitary threshold values for **MEC-R05** and **MEC-R02** are estimated to be 0.000259 $m^3/s/ha$ and 0.000287 $m^3/s/ha$, respectively. These values are comparable to those accepted for nearby watercourses with similar characteristics within neighbouring conservation authority jurisdictions, such as the Credit River and the Humber River. A pre-development and post-development erosion exceedance analysis is presented below to further assess whether proposed conceptual stormwater mitigation strategies and erosion mitigation measures are sufficient to address potential downstream impacts along Etobicoke Creek.

In contrast to receiving reaches immediately downstream and to the east of the Phase 1 lands (Etobicoke Creek watershed), the reaches immediately downstream and to the south of the Phase 1 lands (i.e., Fletchers Creek watershed) have undergone channel realignment and restoration associated with previous development to the south of Mayfield Road and to the east and west of Chinguacousy Road.

Restoration of these receiving reaches included hydraulically-sized substrate for increased erosion resistance and to accommodate post-development flows. The nearest previously defined unit discharge rate for an erosion-sensitive reach within the receiving watercourses is located approximately 5,500 m downstream of the Phase 1 Lands along Fletchers Creek immediately south of Highway 7 (i.e., **Reach SW4**). A unit discharge rate for **Reach SW4** of 0.000409 m^3/s/ha was determined from a range of field-measured discharges, as detailed in the Mount Pleasant EIR 51-1 report (Stonybrook Consulting, 2011). This value was used to guide erosion mitigation strategies for proposed SWM facilities outletting to Fletchers Creek and its tributaries.

Erosion Exceedance Analysis – Etobicoke Creek Watershed

In support of the proposed SWM Plan, an erosion exceedance analysis was completed for the receiving watercourse (CVC, 2015; TRCA, 2012). The application of erosion threshold analysis for evaluating the effectiveness of SWM facilities in mitigating changes in downstream erosion potential is a concept developed with support from a co-author of the present report (P. Villard) and detailed in the guidelines prepared on behalf of the Credit Valley Conservation Authority and Toronto and Region Conservation Authority and in Villard and Parish (2003).

Our understanding is that runoff will largely be directed to Etobicoke Creek via four (4) SWM Ponds discharging to Alloa Drain within the Phase 1 Lands. The remaining runoff will be directed to Fletcher's Creek and will consist of less than 10% of the total drainage area at the crossing with Highway 7. The relatively minor contributions and the hydraulically sized substrate within the realigned corridors indicate that development within the Phase 1 Lands is unlikely to alter erosion processes within Fletchers Creek. Additionally, flows to Fletchers Creek will be controlled according to a unit discharge rate previously defined as part of the East Huttonville Creek and Fletcher's Creek EIRs for the Mount Pleasant Sub-Areas 51-1 and 52-1 (Stonybrook Consulting et al., 2011). Thus, an erosion exceedance assessment was not necessary for the Fletchers Creek Subwatershed.

The proposed SWM strategy for the ponds directing flow to Etobicoke Creek includes interception and infiltration of runoff via LIDs and constructed offline wetlands. The post-development scenario includes 7.6 mm of initial abstraction over the impervious area for the Phase 1 Lands to account for the interception of volumetric storage provided by the offline wetlands. Continuous hydrological data for reaches **MEC-R02** and **MEC-R05** along Etobicoke Creek were provided by Urbantech (2026) at 15-minute increments over 40 years from 1960-1999 (Urbantech, 2026). To account for potential uncertainty in the uncalibrated catchment-wide continuous hydrological model, a sensitivity analysis was undertaken to analyze hydrological conditions under a high runoff scenario (runoff coefficient of 0.47), a baseline scenario (runoff coefficient of 0.28) and a low runoff scenario (runoff coefficient of 0.11).

Using the previously described erosion thresholds for **Reaches MEC-R05** and **MEC-R02** and the results from the aforementioned hydrological simulation modelling (Urbantech, 2026), an erosion exceedance analysis was conducted to evaluate pre- to post-development changes in erosion potential within the receiving watercourses. The exceedance analysis was completed using our in-house erosion exceedance model. This numerical model generates a series of hydrologic and geomorphic indices that are useful for evaluating how changes in hydrology may alter the magnitude of erosion within a channel. The key metrics used for assessing erosion potential are summarized below:

1) Cumulative time of exceedance
2) Number of exceedance events
3) Cumulative effective discharge volume
4) Cumulative effective work index (i.e. cumulative effective stream power)

These indices have been applied elsewhere in numerous jurisdictions, such as Conservation Halton and Toronto and Region Conservation Authority and have been widely accepted by Ontario Conservation Authorities. They provide an evaluation of the number, duration, and magnitude of exceedance events. We note that the most relevant indicator is the cumulative effective work index, as this value reflects both the duration and magnitude of erosion exceedance events.

Time of exceedance, number of exceedances, and cumulative effective discharge volume can be calculated from the discharge record and the established critical discharge value (i.e., erosion threshold). The cumulative time of exceedance is simply the summed duration of time where discharge exceeds the established erosion threshold, and the number of exceedances is the count of erosion exceedance events throughout the discharge record. The cumulative effective discharge represents the average magnitude of discharge exceeding the erosion threshold during a given erosion event, whereas the cumulative effective volume represents the total discharge volume that exceeds the erosion threshold throughout the modelled discharge record. Specific details about how each of these key erosion metrics are calculated are provided in the following subsection.

For more relevant indicators, namely the cumulative effective work index, hydraulic information is required. Our model applies pre- and post-development discharges to a characteristic cross-section. Using Manning's approach, the discharge at each time step in the continuous hydrological model is converted into a velocity, depth of flow, shear stress, and/or stream power. This provides analysis that is appropriate to the specific site conditions.

The post- and pre-development hydrological modelling reflects changes in the hydrological regime resulting from changes in land use within the catchment. Continuous flow data were provided by Urbantech (2026) at 15-minute intervals from 1960 to 1999 for existing and future conditions with proposed LID mitigation measures. The hydrological modelling was analyzed to calculate the erosion indices and identify changes in erosion potential within the erosion-sensitive reaches **MEC-R02** and **MEC-R05** of the receiving watercourse. A selection of pre- and post-development hydrographs overlain with the respective erosion thresholds is provided in **Appendix B**.

Methods

To calculate erosion indices, both velocity and shear stress were calculated at each time step during the model simulation. Through an iterative process, water depth and velocity were calculated for each discharge passing through a representative cross-section. Cross-sections for **Reaches MEC-R05** and **MEC-R02** were delineated using a LiDAR-derived DTM obtained from a publicly available dataset maintained by OMNRF (2014/2016). Representative cross-sections were delineated by sampling elevation values from the DTM at intervals of 0.5 m horizontally across the watercourse in the vicinity of the erosion threshold locations for each respective reach. A map of the watercourse in the vicinity of **MEC-05** and **MEC-02** overlayed on a hillshade model generated using the DTM is provided in **Appendix A**, **Figure 2.**

The cross-section that the calculated discharge passes through in the model is divided into floodplain and bankfull sections. The cross-section is further broken into panels. Velocity, U, is calculated for each panel using Manning's approach. This is a conservative approach as it allows dissipation of flood energy in the floodplain. The total discharge, Q_T at each time step is based on the summation of the discharge of all panels, Q_i, such that:

$$Q_{T=}\sum Q_i \qquad \text{[Eq. 1]}$$

Q_i is discharge through a panel (which is set at 10 percent of the cross-section). Q_i is defined as:

$$Q_i = U_i w_i d_i \qquad \text{[Eq. 2]}$$

where, w_i and d_i are width and depth of each panel. The discharge from each panel was then summed to obtain the total discharge. This is more accurate than using average cross-sectional dimensions for a simple trapezoidal channel, since the bed is usually irregular, and a panel approach better represents the true cross-sectional area.

For each event, the discharge is converted into a maximum depth and average velocity. The maximum depth is used to calculate a maximum bed shear stress, $\tau_{o_{\max}}$ based on:

$$\tau_{o_{\max}} = d_{\max}\rho g S_{\text{bed}} \qquad \text{[Eq. 3]}$$

where, $d_{\max}$ is the maximum water depth, ρ is water density, g is acceleration due to gravity, and S_{bed} is the channel bed slope.

Cumulative total work, ϖ_{tot} is defined as:

$$\varpi_{\text{tot}} = \sum \tau_{0_{\max}} . U_{\text{avg}} . \Delta t \qquad \text{[Eq. 4]}$$

where, U_{avg} is average velocity (Q_{tot}/A_{tot}, where A_{tot} is wetted area), while cumulative effective work index (ϖ_{eff}) is defined by:

$$\varpi_{\text{eff}} = \sum \tau - \tau_{cr} . U . \Delta t, \varpi < 0 = 0 \qquad \text{[Eq. 5]}$$

where, τ_{cr} is the critical shear stress.

Time of exceedance t_{ex} defined as:

$$t_{\text{ex}} = \sum \Delta t \ \text{ for } (Q_T > Q_{\text{threshold}}) \qquad \text{[Eq. 6]}$$

where, $Q_{\text{threshold}}$ is the discharge at the erosion threshold.

The cumulative effective discharge volume (CEV) is defined as:

$$\text{CEV} = \sum Q \text{ (for } Q > Q_{threshold}) \qquad \text{[Eq. 7]}$$

Similarly, the cumulative effective discharge (CED) is defined as:

$$\text{CED} = \text{CEV}/t_{ex} \qquad \text{[Eq. 8]}$$

Results

Erosion exceedance modelling results indicate that the proposed SWM plan for the Phase 1 Lands, including LID strategies, effectively mitigates the risk of increases in erosion potential within the receiving watercourse. The erosion exceedance modelling results indicate a negligible decrease in erosion potential under the high runoff and baseline scenarios, and a minor increase in erosion potential under the low runoff scenario for both assessed reaches. We note that the cumulative effective work index (ϖeff; CEWI) is considered the most relevant index for erosion potential, as it reflects both the flow magnitude and exceedance duration of a given erosion event. Results over ±5% are potentially significant enough to result in a measurable change in erosion potential within the receiving watercourse when the absolute change in the erosion metric is significant. Relative changes in erosion potential of approximately ±5% are within the uncertainty envelope of the modeling approach and should therefore be interpreted as no meaningful change. Of secondary relevance is the cumulative effective discharge volume (CEV) indicator, representing the total discharge volume that exceeds the established critical discharge throughout the modelling record. A representative selection of pre-development and post-development hydrographs is included in **Appendix B**. **Table 2** and **Table 3** summarize the erosion exceedance assessments for reaches **MEC-R02** and **MEC-R05**, respectively, under all three assessed runoff conditions (i.e., low, baseline and high flow scenarios).

Table 2. Erosion exceedance results for Reach MEC-R02

MEC-R02					
Scenario Cumulative (1960-1999)		CEV (m^3)	Ω_{eff} (N/m)	t_{ex} (hrs)	# Of Exceedances
Baseline	**(PRE)**	6.00E+07	24,032	8,361	857
	(POST)	5.96E+07	24,017	8,639	838
	Change (%)	**-0.84**	**-0.06**	**3.32**	**-2.22**
High runoff	**(PRE)**	1.55E+08	58,224	16,008	1,449
	(POST)	1.49E+08	56,588	16,161	1,412
	Change (%)	**-3.77**	**-2.81**	**0.96**	**-2.55**
Low runoff	**(PRE)**	1.39E+07	6,081	2,939	351
	(POST)	1.53E+07	6,716	3,372	369
	Change (%)	**9.70**	**10.44**	**14.72**	**5.13**

The cumulative effective discharge volume (CEV) and cumulative effective work index (CEWI) modelled using the baseline runoff scenario demonstrate decreases of 0.84% and 0.06%, respectively. The number of exceedances is also predicted to decrease by 2.22%, while the duration of exceedances increases by 3.32%. These results are within 5% of existing conditions for all four erosion indices, demonstrating that under baseline runoff conditions, changes in erosion potential within Etobicoke Creek at the downstream flow node (**MEC-R02**) are not anticipated.

A sensitivity analysis using the high- and low-runoff scenarios was also conducted to account for uncertainty in the catchment-wide continuous hydrological simulation model. Results from the high runoff exceedance modelling are consistent with those from the baseline scenario, with CEV and CEWI remaining within 5% of existing conditions, indicating that changes in erosion potential at **MEC-R02** are not predicted under post-development conditions. Conversely, results from the low runoff scenario demonstrate a minor increase in CEV and CEWI of 10%. While the relative modelled increases in CEV and CEWI under post-development conditions exceed 5%, the absolute increases in CEWI over the 40 modelled years are minor compared to the baseline and high runoff scenarios, accounting for approximately 16 N/m^2 per year. Therefore, results from the sensitivity analysis indicate that, across a broad range of hydrological scenarios, the proposed development within the Phase 1 Lands is not expected to negatively affect erosion processes at **MEC-R02**.

Results from **Reach MEC-R05** are generally consistent with those from **MEC-R02**, with the baseline scenario effectively addressing potential increases in erosion resulting from the proposed development. **Table 3** summarises the results of the erosion exceedance assessment for **MEC-R05**.

Table 3. Erosion exceedance results for Reach MEC-R05

MEC-R05					
Scenario Cumulative (1960-1999)		CEV (m^3)	Ω_{eff} (N/m)	t_{ex} (hrs)	# Of Exceedances
Baseline	**(PRE)**	5.90E+07	5,972	8,084	963
	(POST)	5.83E+07	5,948	8,560	951
	Change (%)	**-1.27**	**-0.40**	**5.88**	**-1.25**
High runoff	**(PRE)**	1.5E+08	14,073	14,929	1,604
	(POST)	1.44E+08	13,648	15,310	1,558
	Change (%)	**-4.27**	**-3.02**	**2.55**	**-2.87**
Low runoff	**(PRE)**	1.41E+07	1,531	3,066	421
	(POST)	1.55E+07	1,695	3,661	453
	Change (%)	**9.86**	**10.69**	**19.41**	**7.60**

The cumulative effective discharge volume (CEV) and cumulative effective work index (CEWI) modelled using the baseline runoff scenario demonstrate decreases of 1.27% and 0.40%, respectively. The number of exceedances will decrease by 1.25%, and the duration of exceedance will increase by 5.88%. The two most relevant erosion indices, CEV and CEWI, are within 5% of existing conditions. These results demonstrate that erosion potential within **MEC-R05** will remain unchanged under post-development conditions.

The two sensitivity scenarios (high and low runoff) were also analyzed for **MEC-R05**, with results consistent with those for **MEC-R02**. Negligible decreases in CEV and CEWI within 5% of existing conditions are anticipated under the high runoff scenarios, demonstrating no detectable change in erosion potential. Under the low runoff scenario, CEV will increase by 10% and CEWI will increase by 11%. The relative increases in post-development erosion potential under the low runoff scenario are associated with an additional 4 N/m annually. Thus, the minor relative increase in erosion potential is not expected to alter the pattern and rates of erosion along **MEC-R05**.

Overall, results from the erosion exceedance modelling demonstrate that development within the Phase 1 Lands is not expected to impact channel form and function within the receiving reaches of Etobicoke Creek. The baseline and high runoff scenarios result in negligible changes in erosion potential under post-development conditions. The low runoff scenario results in minor increases in cumulative effective work of up to 16 N/m per year, which are not anticipated to alter geomorphic processes within the watercourse.

We note that the baseline scenario, with a runoff coefficient of 0.28, is the most representative of existing conditions as previous studies conducted in Caledon demonstrate that typical runoff coefficients for sites located on agricultural fields with surficial geology consisting of clay to silt-textured till range from 0.25 to 0.55 (Chapi et al., 2015; IBI, 2021; MTO, 2023). While runoff coefficients vary throughout the year, an average coefficient of 0.11 (low-flow scenario) is considered low and likely unrepresentative of actual conditions in the Etobicoke Creek Subwatershed. Additionally, a review of the 2025 monitoring data demonstrated that peak flows within Alloa Drain (upstream at Chinguacousy Road) align more closely with the baseline scenario than the low runoff scenario. Peak flows within the Alloa drain ranged from 0.54 m^3/s in the fall to 6.43 m^3/s in the spring, and modelled average annual peak flows derived from the baseline scenario within Etobicoke Creek were approximately 14.38 m^3/s. Note, that 2025 was a very dry year, and that average annual peak flows are likely higher. Conversely, over the modelling period (1960-1999) the average annual peak flow under the low runoff scenario was approximately 6.95 m^3/s at **MEC-R05** under existing conditions. The drainage area to Etobicoke Creek at **MEC-R05** is significantly larger than that to the downstream monitoring station along Alloa Drain (i.e., 2161 ha vs. 981 ha). Thus, peak flows of a similar magnitude in Alloa Drain and Etobicoke Creek are unrealistic given the differences in drainage areas. Thus, further supporting the idea that the predicted streamflows from the baseline scenario are likely more representative than those from the low-flow scenario.

Based on the flow comparison and runoff coefficients for sites with similar characteristics, the low runoff scenario is considered overly conservative and reliance on it to guide SWM would likely result in overcontrol of post-development runoff. Daily rainfall data was collected by GEO Morphix from March 2025 to December 2025, and a total precipitation of 476.5 mm. A review of historical rainfall data from 1962 to 1993 at the Brampton MOE Station, approximately 10 km southeast of the subject lands, showed an average rainfall of 695 mm from March to November. This further supports that the low runoff scenario is not representative of the average hydrological conditions within the modelled catchment, with peak flows lower than those measured in the upstream Alloa Drain during a very dry year. Therefore, in the absence of a calibrated hydrological simulation model, the results from the low runoff scenario provide a lower-bound estimate of the runoff from the modelled catchment. In sum, our analysis indicates that this lower-bound condition is not representative of the existing average hydrological conditions along the receiving watercourse and would therefore be overly conservative for use in pre- to post-development erosion exceedance analysis and optimization of SWM facilities to mitigate downstream erosion risk.

Summary and Recommendations

This letter summarizes the erosion exceedance analysis completed to support stormwater management and erosion mitigation strategies for Phase 1 of the Alloa Secondary Plan Area in the Town of Caledon, Ontario. Currently accepted erosion threshold values and flows modelled under pre-development and proposed post-development conditions were used to evaluate changes in erosion potential at locations along Etobicoke Creek downstream of the subject lands, to determine whether stormwater mitigation strategies and erosion mitigation measures are sufficient to address potential downstream impacts. A unit discharge rate was previously defined for the tributaries of Fletchers Creek, which can be used to guide release rate planning for the proposed SWM facilities outletting to the realigned headwater tributaries of Fletchers Creek.

Results of the erosion exceedance analysis for the reaches downstream and to the east of the Phase 1 Lands, Etobicoke Creek, show that the proposed stormwater management plan is effective in mitigating downstream erosion impacts within the receiving watercourse under the three assessed runoff scenarios. Specifically, results show that post-development erosion potential within the receiving watercourse remains unchanged under the baseline and high runoff scenarios, with negligible absolute increases in CEWI under the low runoff scenario. A review of peak flows in the Alloa Drain and local runoff coefficients suggests that the baseline scenario best represents existing conditions. Thus, the erosion exceedance analysis demonstrates that the stormwater mitigation measures are sufficient to mitigate downstream impacts associated with the development.

We trust this letter meets your current requirements. Should you have any questions or concerns, please contact the undersigned.

Respectfully submitted,

Paul Villard, Ph.D., P.Geo., CAN-CISEC, EP, CERP
Director, Principal Geomorphologist

Jan Franssen, Ph.D.
Senior Watershed Scientist

References

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Appendix A:

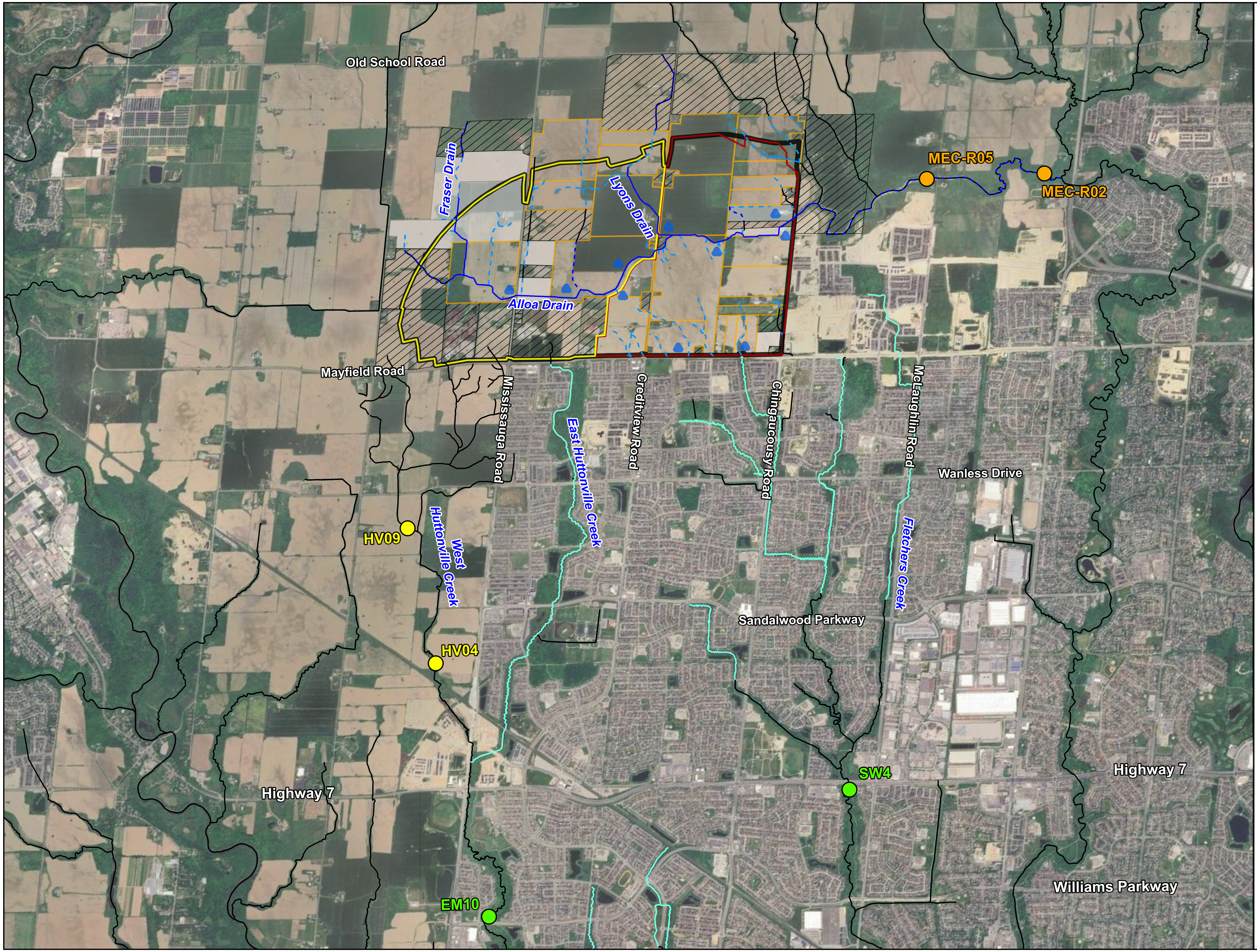
Figures

GEO MORPHIX™

Figure 1

Proposed Stormwater Management Ponds and Established Erosion Threshold Locations

Caledon, Ontario



Imagery: Google Earth, 2022. Waterbody, Watercourse: MNRF, 2023. Alloa Phase 1 & 2 Lands, Alloa Secondary Plan Area:Crozier, 2024. HDFs, Watercourse, Surface Water Quality Monitoring Station: GEO Morphix Ltd., 2024. 1 m Contour: Peel Region, 2022. Print Date: December 2025. PN24009. Drawn By: G.U., M.O., S.S.O.

GEO MORPHIX™

Figure 2

Terrain Analysis and Established Erosion Threshold Locations

Phase 1 Alloa Secondary Plan Area

Caledon, Ontario

Legend

- ● Erosion Threshold Locations (AMEC, 2014)
- 〰 Watercourse
- ╌ Headwater Drainage Feature
- 〰 Not Field Assessed

N

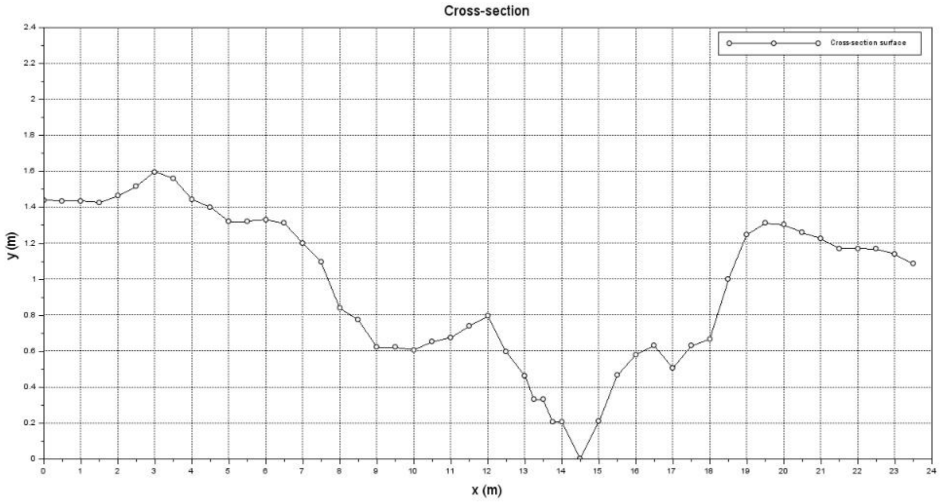
0 200 400

Metres

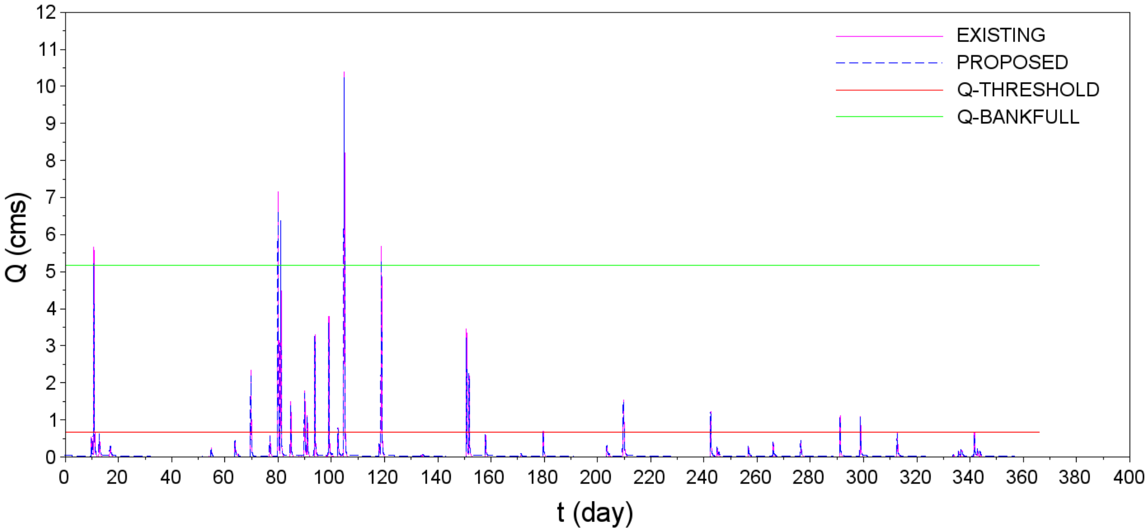
Imagery: Google Earth, 2022. Waterbody, Watercourse: MNRF, 2023. HDFs, Watercourse: GEO Morphix Ltd., 2024.
Hillshade: MNRF, 2014-2016.
ET Locations: Urgantech, 2016 and AMEC, 2014.
Print Date: September 2024. PN24009. Drawn By: M.O., K.Se.

Appendix B:
Erosion Exceedance Hydrographs

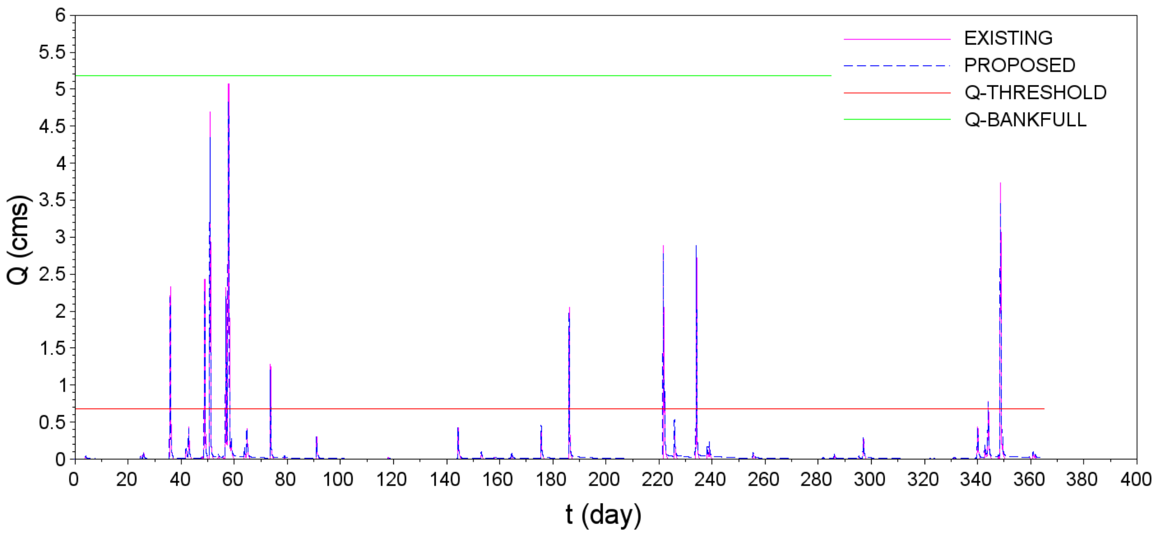
MEC-R02 Cross-section



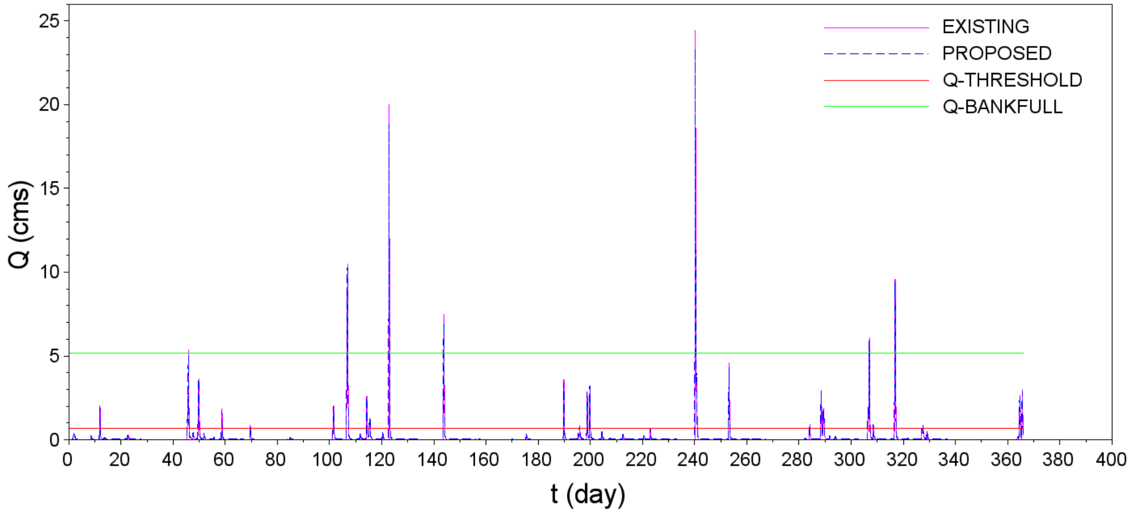
MEC-R02
Baseline Scenario



Average year (1980)

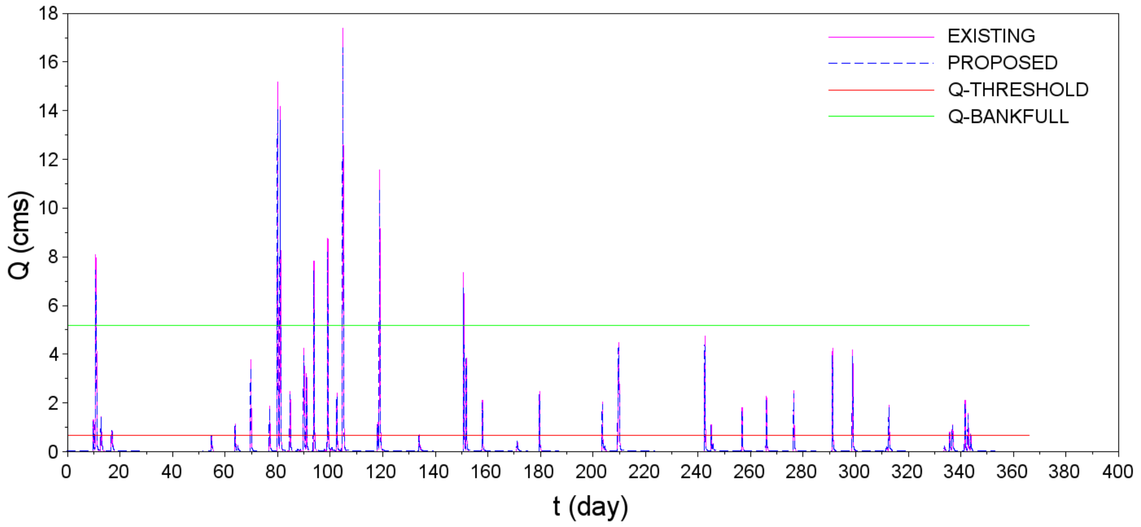


Low flow year (1971)

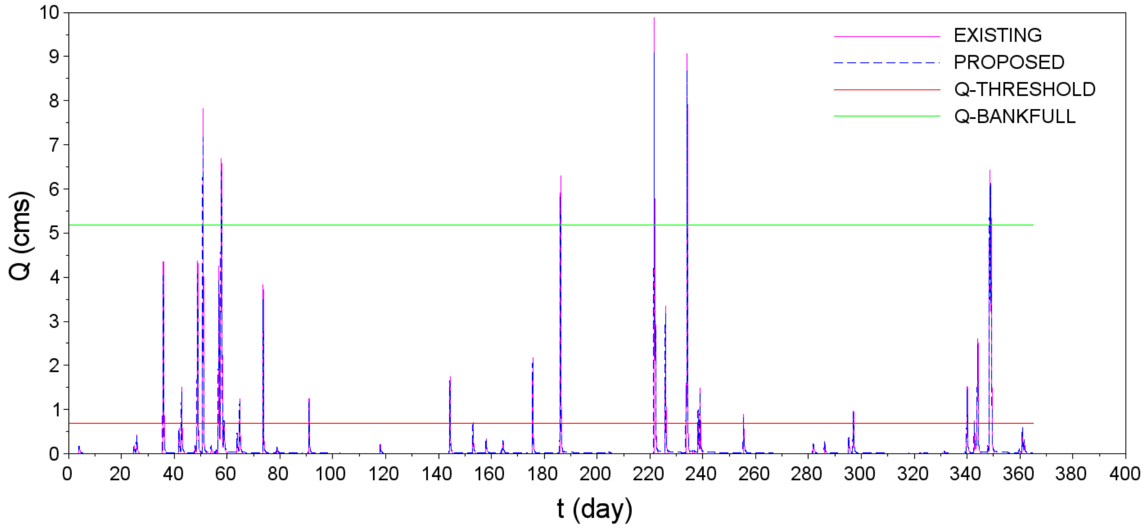


High flow year (1992)

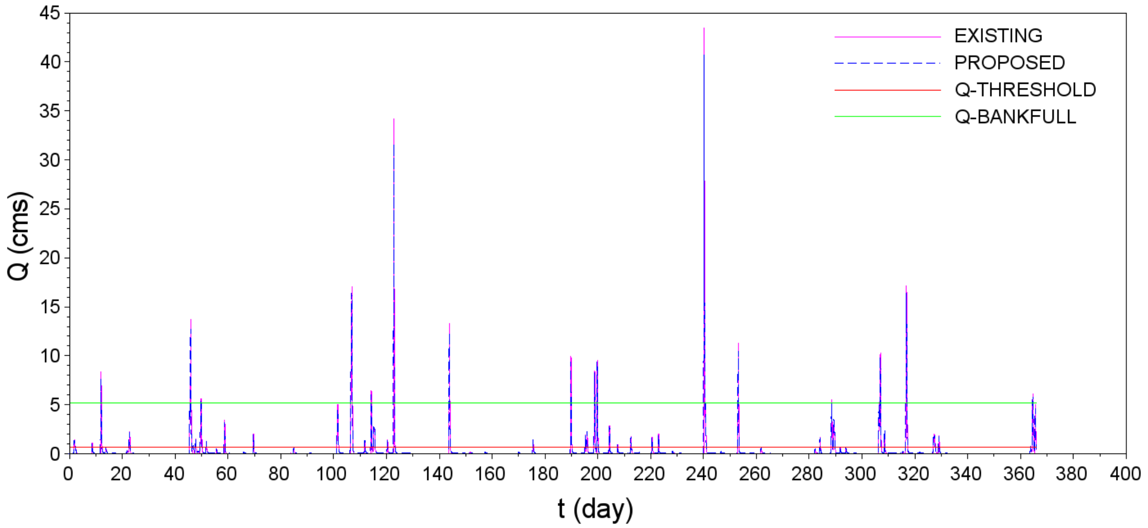
MEC-R02
High Runoff Scenario



Average year (1980)

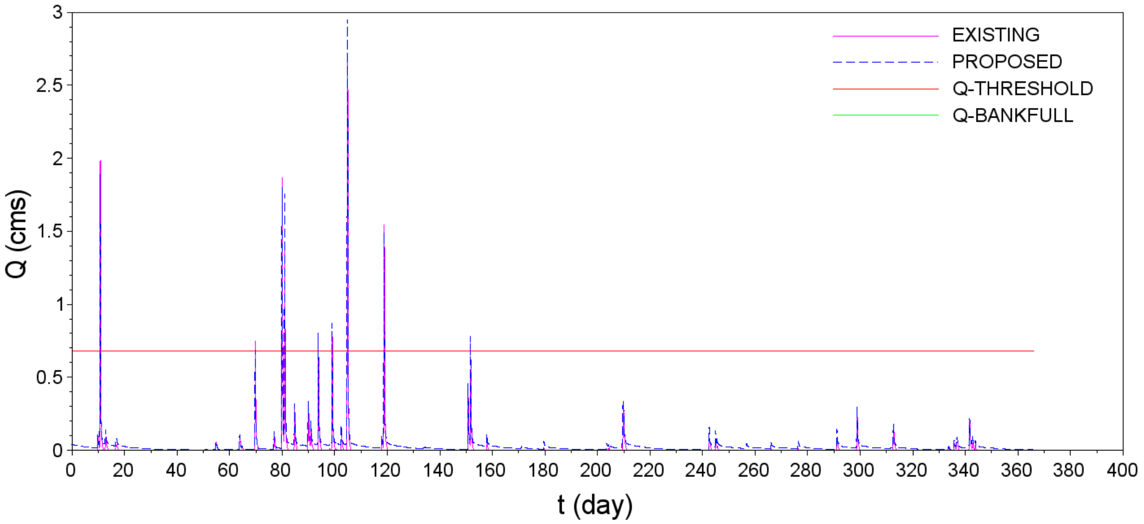


Low flow year (1971)

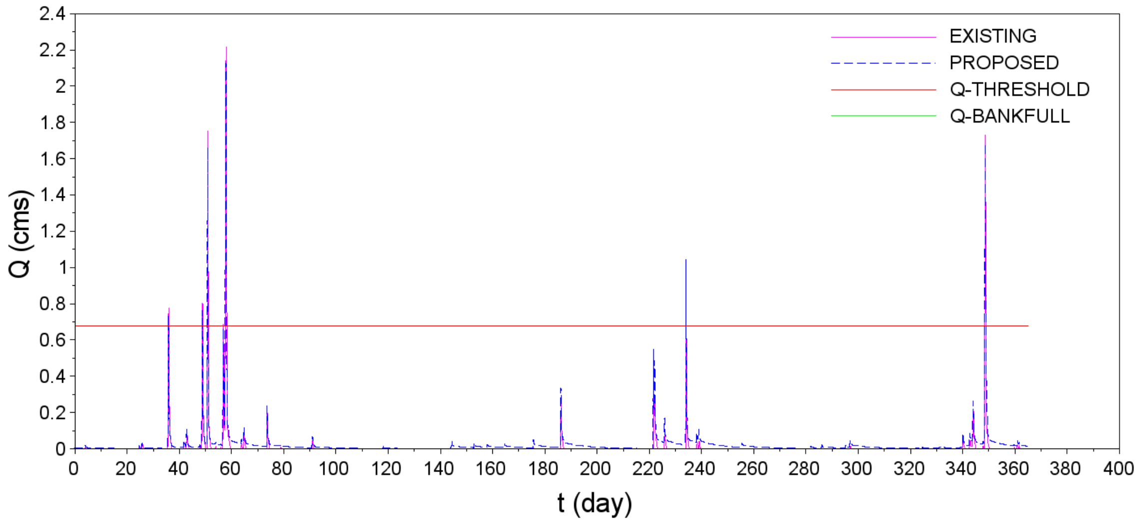


High flow year (1992)

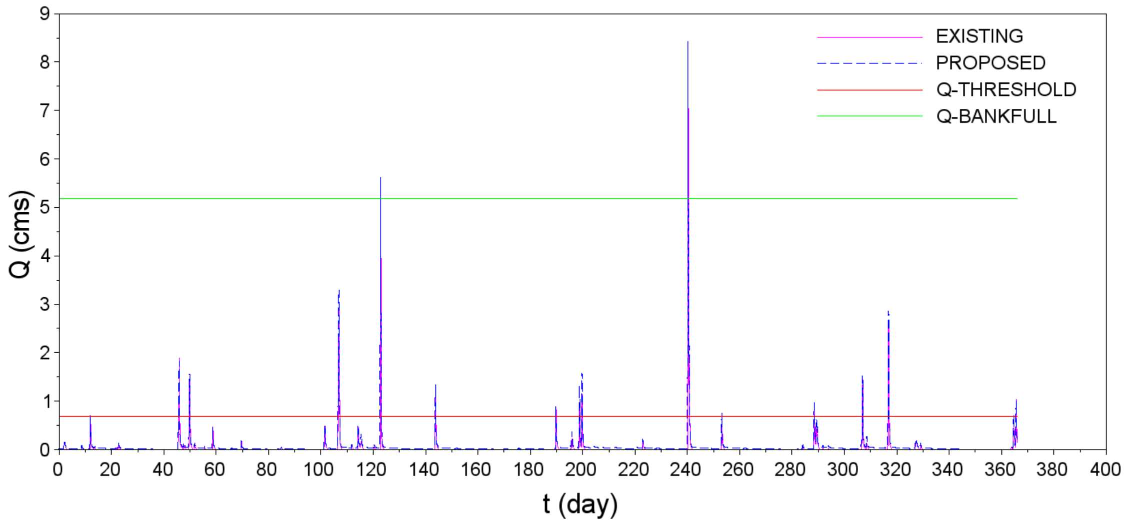
MEC-R02
Low Runoff Scenario



Average year (1980)

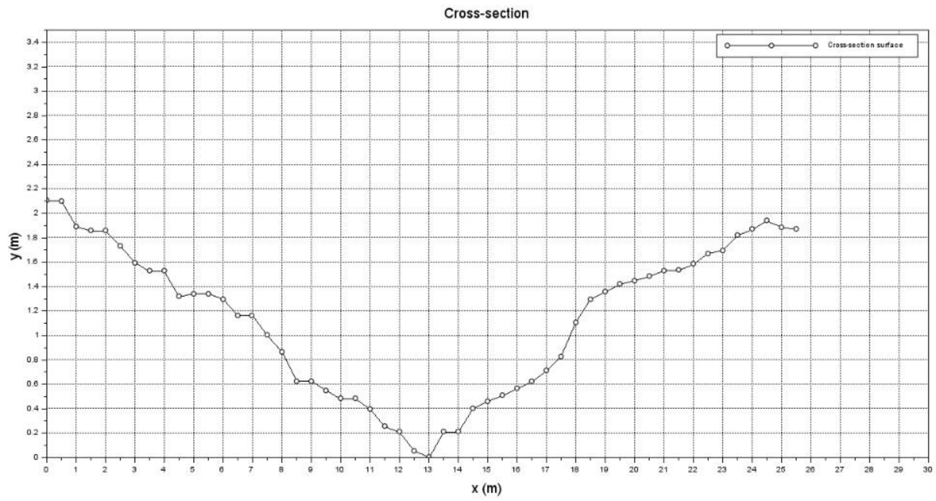


Low flow year (1971)

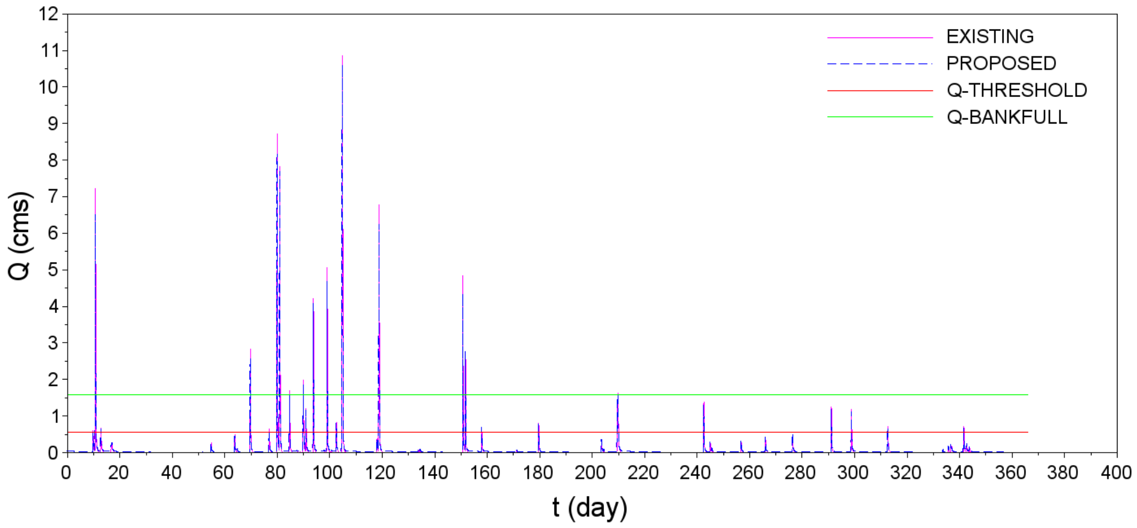


High flow year (1992)

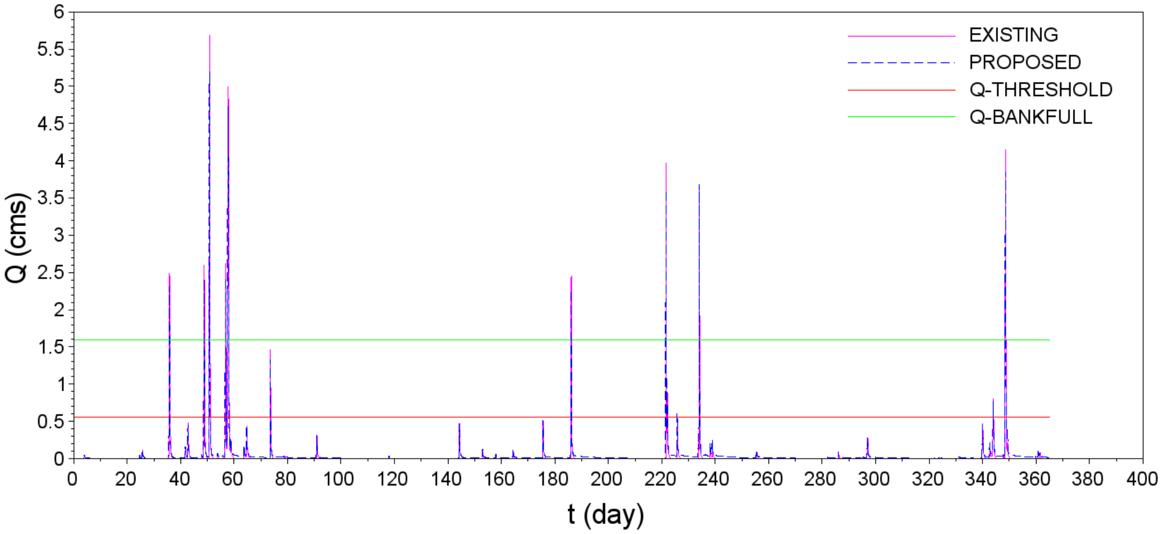
MEC-R05 Cross Section



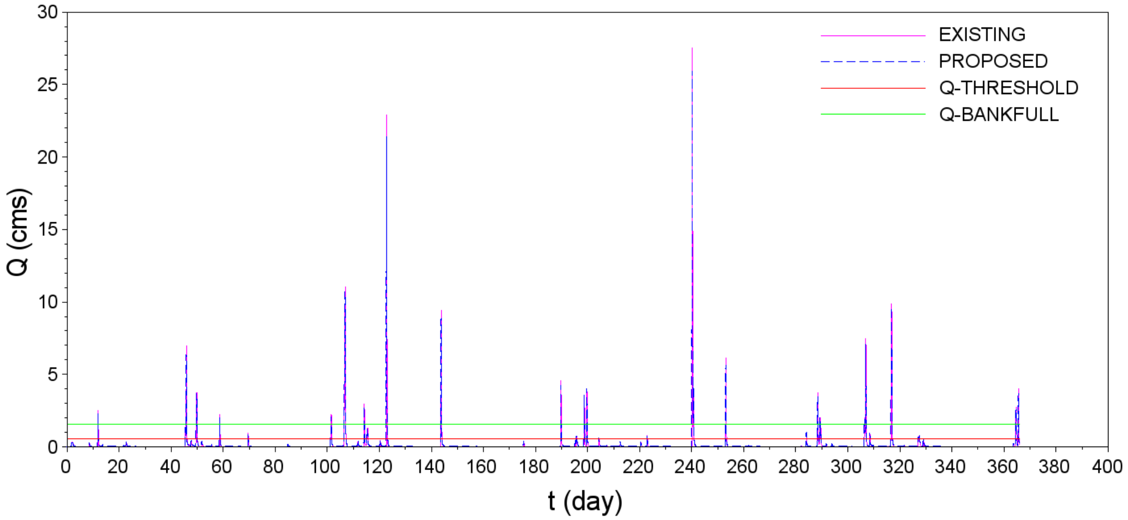
MEC-R05
Baseline Scenario



Average year (1980)

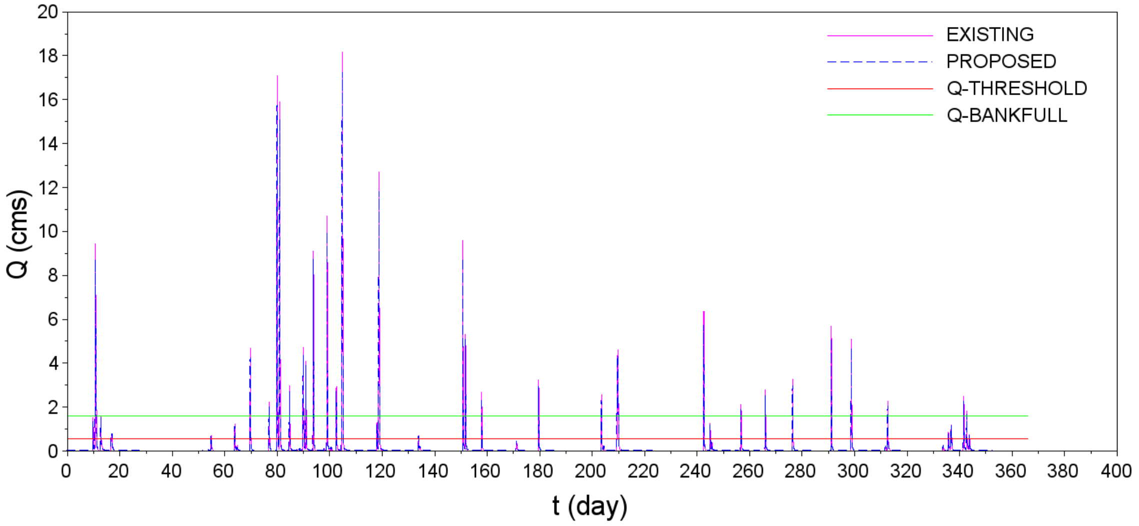


Low flow year (1971)

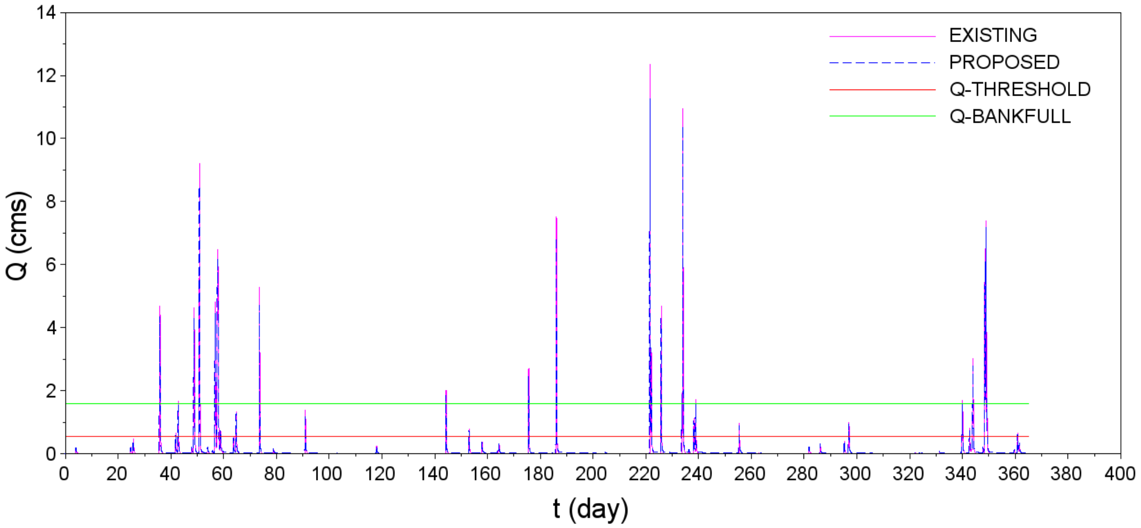


High flow year (1992)

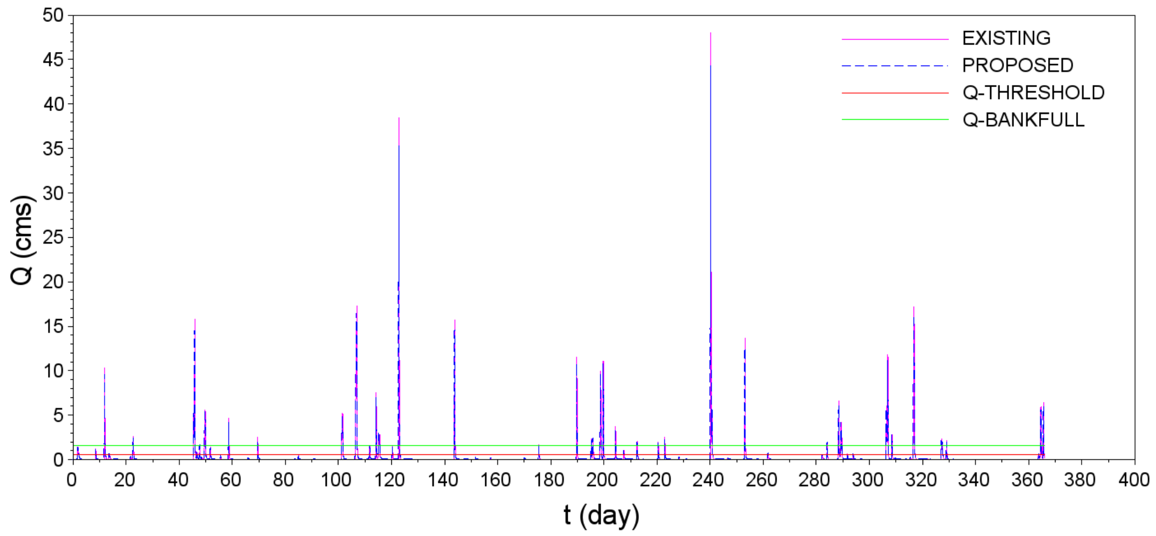
MEC-R05
High Runoff Scenario



Average year (1980)

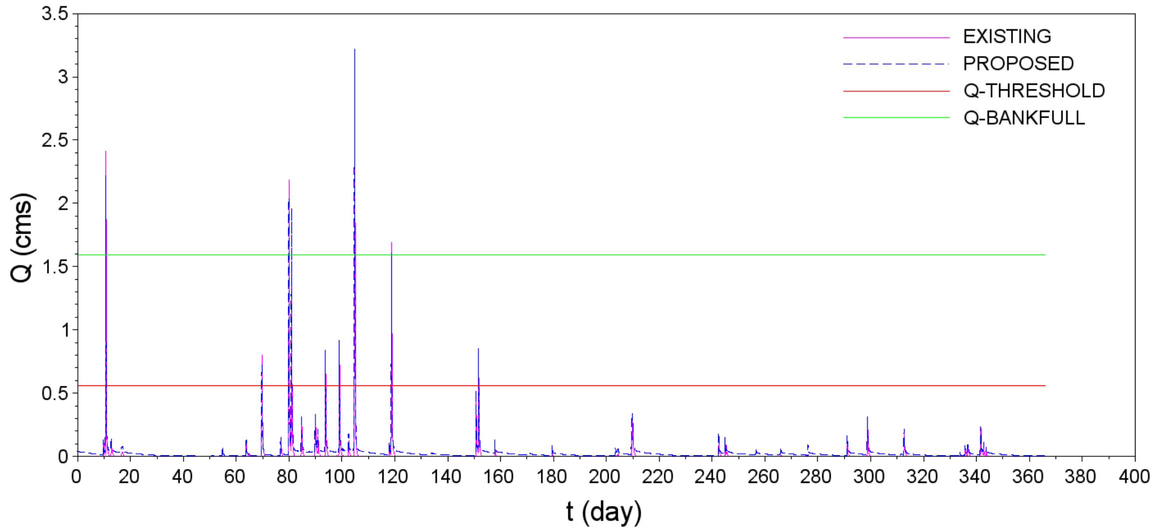


Low flow year (1971)

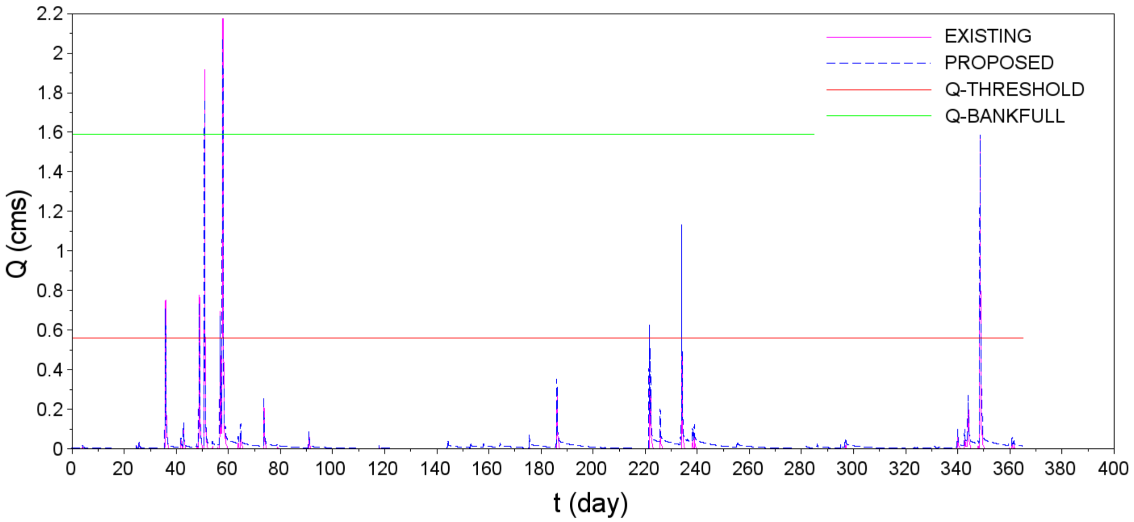


High flow year (1992)

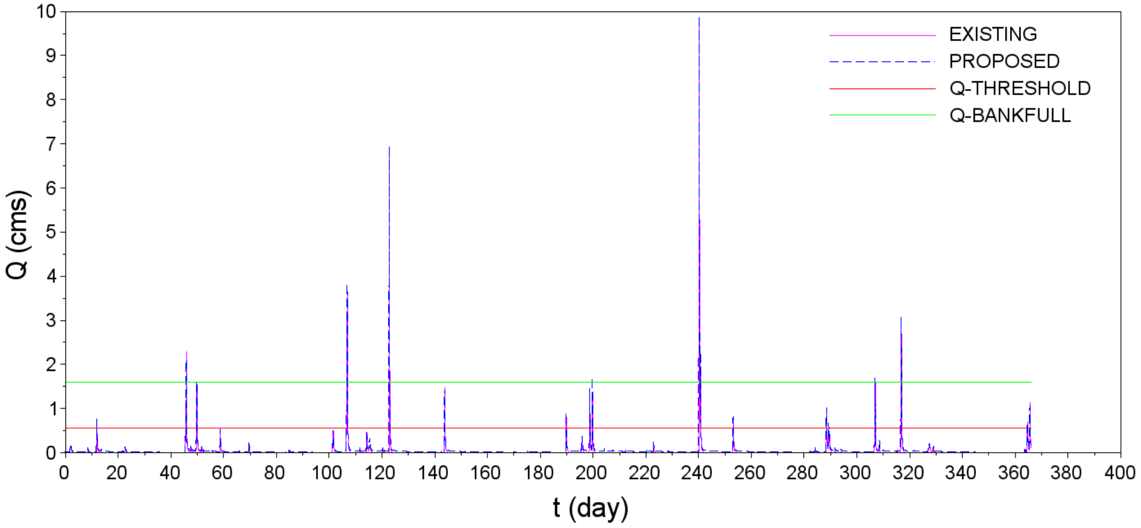
MEC-R05
Low Runoff Scenario



Average year (1980)



Low flow year (1971)



High flow year (1992)