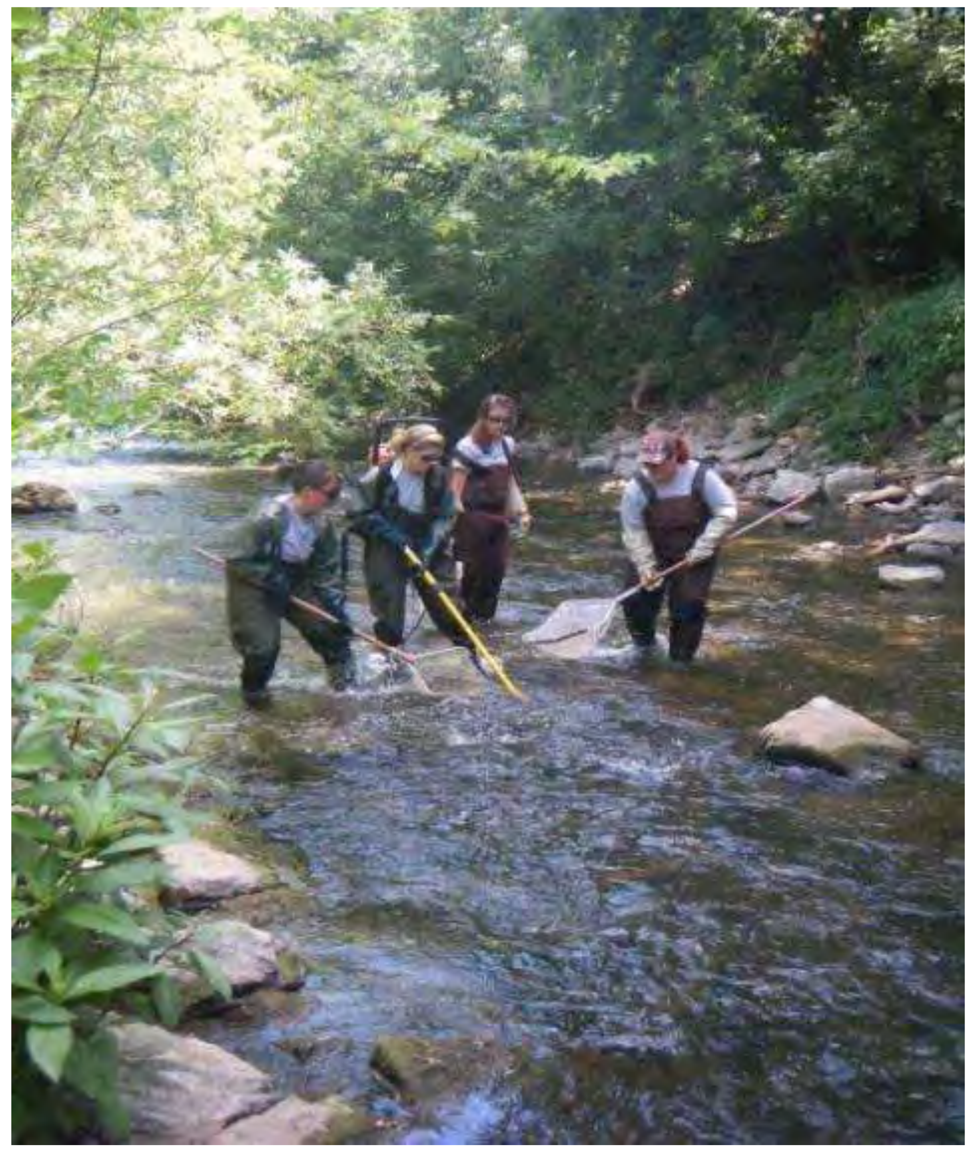
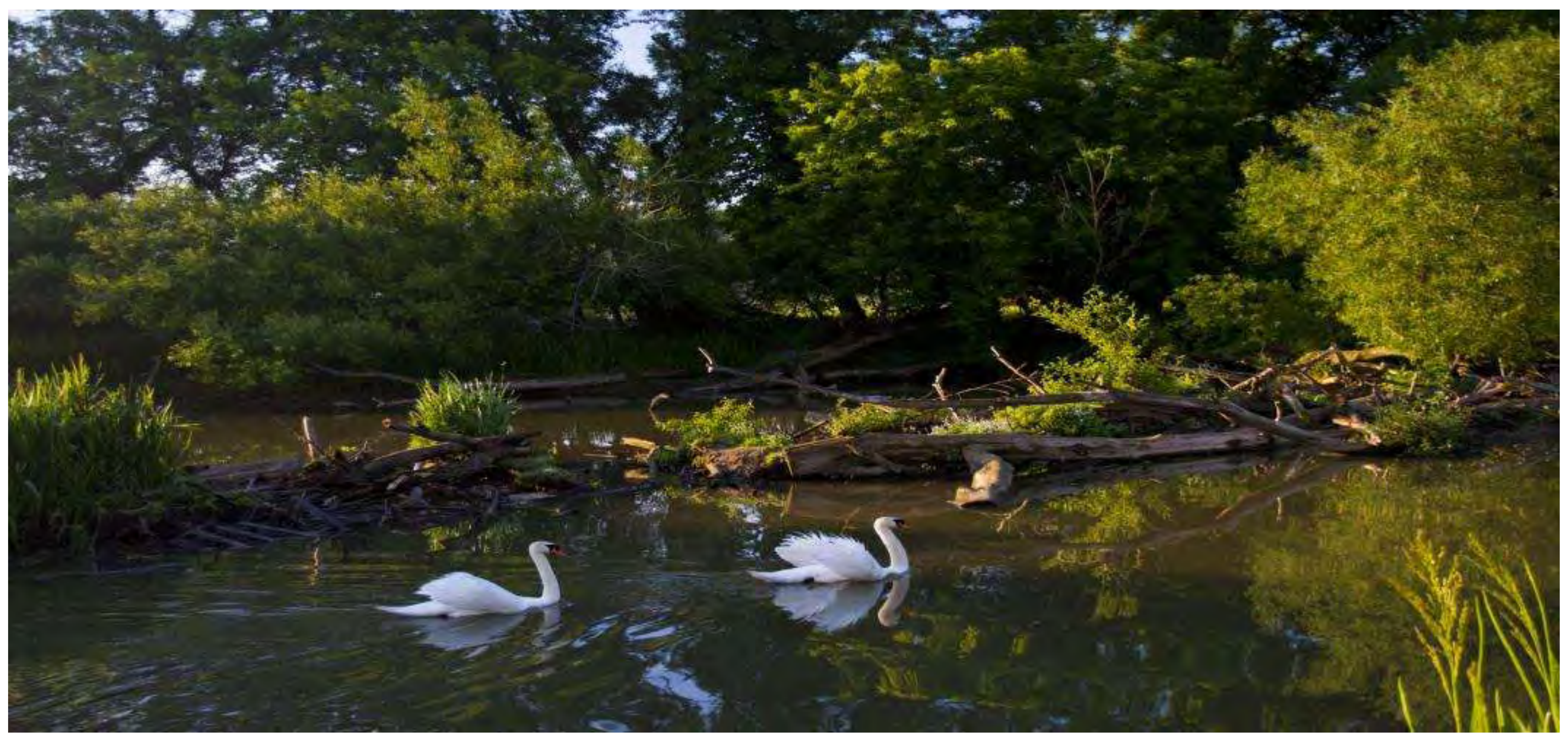
Public Information Centre





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Lower Spencer Integrated Subwatershed EA - Purpose

Purpose:

This project is being undertaken in order to assess the overall health of the creek system and will incorporate considerations for flooding, erosion, surface and groundwater flow patterns, fish habitat and migration, the terrestrial environment, and water quality as well as how these aspects interact with each other. It will also examine future stresses and opportunities to the Lower Spencer Creek system and develop an adaptive management approach to improve the health of the watershed and the residents that live within.

Goals:

•Control flooding within the subwatershed through remedial works and land use controls;

•Minimize soil loss through land management practices and remedial control measures.

•Protect, maintain and enhance aquatic communities, with special regard for fish and fish habitat;

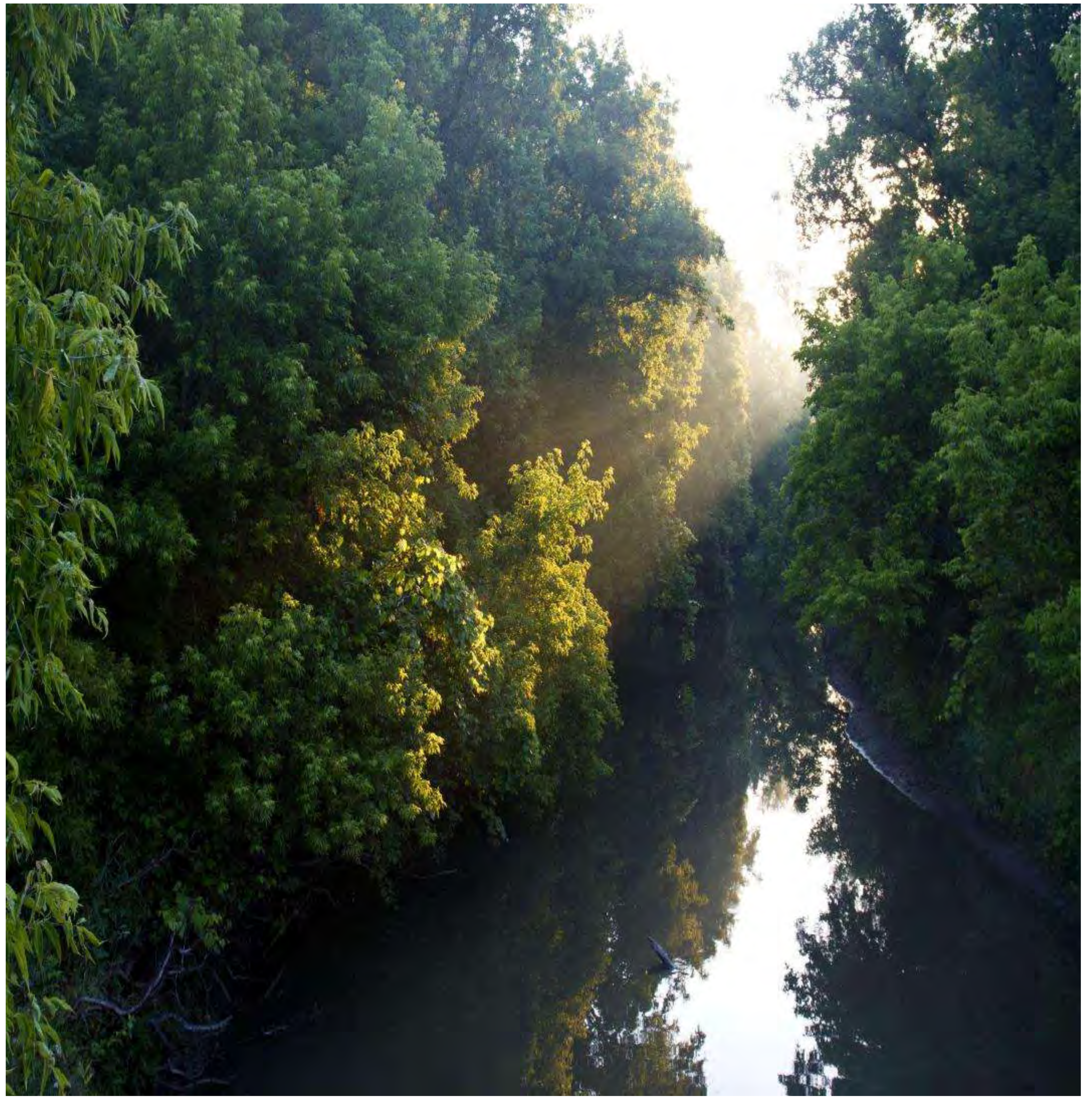
•Maintain or restore water quality to a level which maintains ecological integrity and permits desired uses including recreational activities;

•Protect and maintain groundwater recharge/discharge areas and baseflow to a level which ensures adequate supply for desired uses;

•Protect and maintain self-sustaining natural ecosystems and significant natural features;

•Protect diverse recreational opportunities that are in harmony with the environment;

•Protect and enhance the environment in a manner which is in harmony with the natural features of the subwatershed;



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Municipal Engineers Association (MEA) Municipal Class Environment Assessment

The Study is being conducted to satisfy Phases 1 and 2 of the Municipal Engineers Association (MEA) Class Environmental Assessment (October 2000, as amended in 2007 & 2011)process.

Public Information Centre # 2
We are here

Phase 1: Identify the Problem (s)

Phase 2: Alternative Solutions

- Identify reasonable alternative solutions to the problem(s).
- Inventory natural, social and economic environment
- Identify impacts of the alternative solutions on the environment and mitigating measures
- Evaluate the alternative solutions and identify the recommended solutions
- Consult review agencies and the public
- Select the preferred solution

Phase 3: Alternative Design Concepts for the Preferred Solution

- Identify alternative design concepts for the preferred solution
- Inventory natural, social and economic environments
- Identify the impact of the alternative designs after mitigation
- Evaluate alternative designs and identify recommended design
- Consult review agencies and the public
- Select the preferred design

Phase 4: Environmental Study Report (ESR)

- Document Phases 1 to 3 in the ESR
- Notice of Completion. Notify the public and review agencies of completion of the ESR and the Part II Order provision in the EA Act.
- Place ESR on public record for 30 days for public review

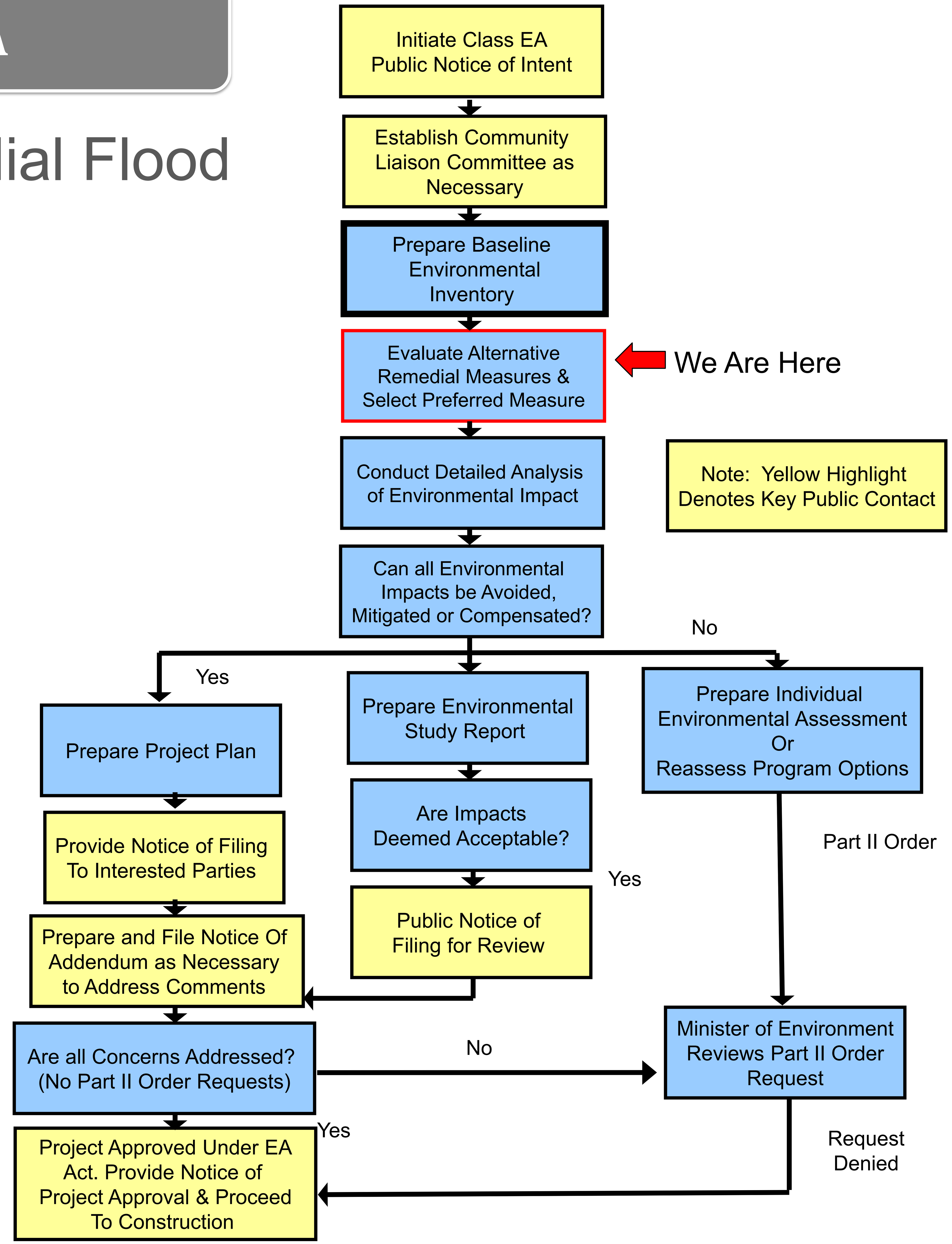
Phase 5: Implementation

- Complete contract drawings
- Proceed to design/construction of the project.
- Monitor for environmental provisions and commitments.

Lower Spencer Integrated Subwatershed EA

Class Environmental Assessment for Remedial Flood and Erosion Control Projects (2002)

- The Class EA for Remedial Flood and Erosion Control Projects establishes a planning and approval process for a variety of projects that may be carried out by Conservation Authorities in Ontario.
- The Class EA process categorizes proposed municipal projects according to their anticipated environmental impact, and calls for increasingly stringent review requirements as the magnitude of the anticipated environmental impact increases.
- Remedial Flood and Erosion Control Projects refer to those projects undertaken by Conservation Authorities, which are required to protect human life and property, in previously developed areas, from an impending flood or erosion problem. Such projects do not include works which facilitate or anticipate development.



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Lower Spencer Integrated Subwatershed EA – Hydrology

Spencer Creek Watershed Hydrologic Impact Assessment

The calibrated hydrologic model was used to determine the impact of changing land uses in the watershed on the flow regime in the Lower Spencer Creek using three scenarios.

Scenarios were selected and evaluated based on the following criteria:

- **Scale** – Hydrology impacts were assessed at a watershed scale
- **Possible Future** – Scenarios were selected that addressed plausible future issues in the watershed
- **Phase One Objectives** – Impacts were assessed in light of the goal "to protect, enhance and maintain the ecological processes, functions and significant natural features of the Lower Spencer Creek subwatershed."

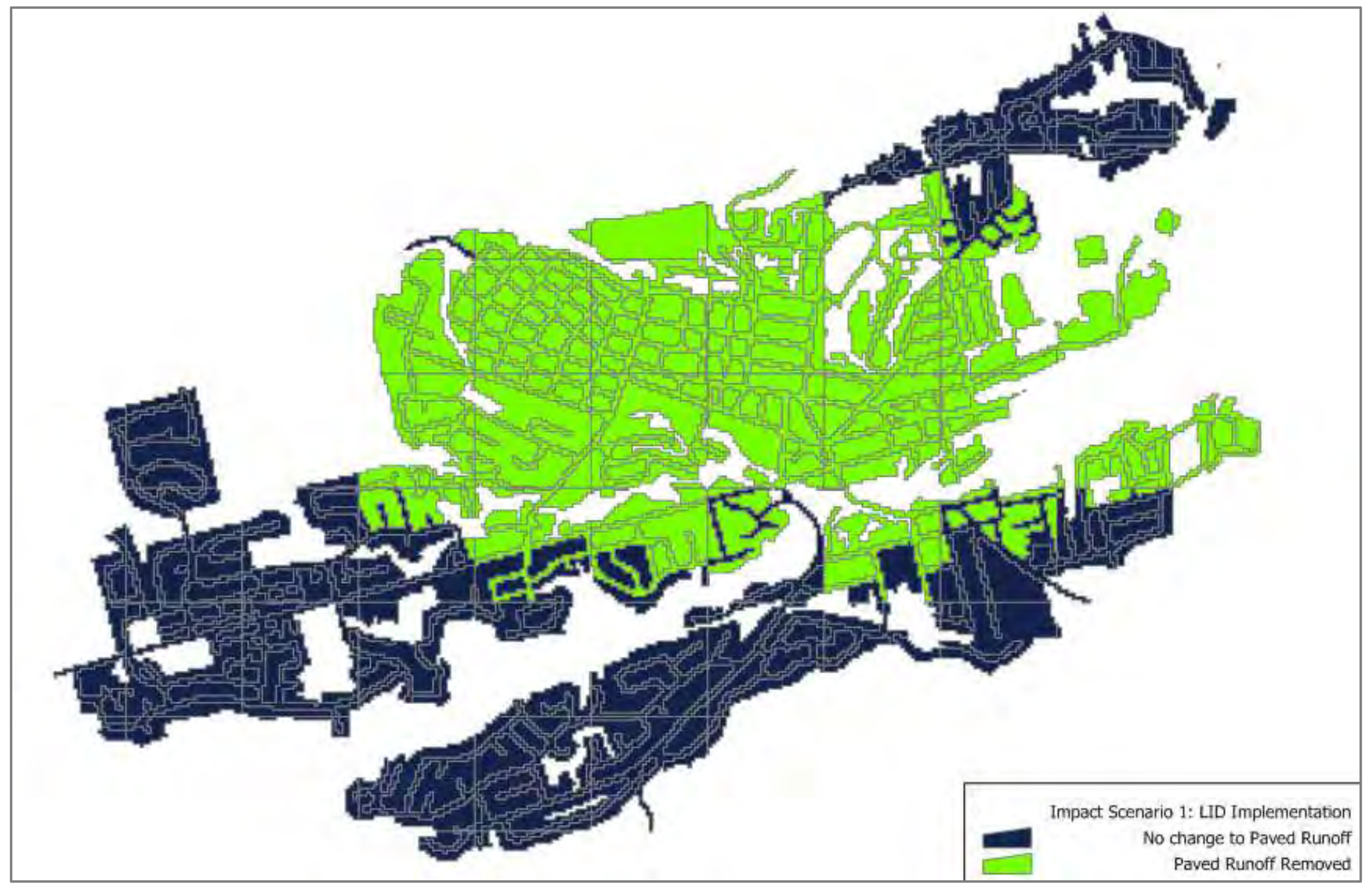

Fig 1. Dundas Built-Up Area Showing Modelled Area of Paved Runoff Removal

Impact Scenario #1 – Low Impact Development Implementation in Dundas

- The model was used to simulate Low Impact Development techniques implemented in 50% of the built-up area in Dundas to evaluate possible changes to streamflow in the Lower Spencer Creek during localized summer storms.
- Paved runoff for 50% of the areal coverage of urban Dundas was removed, preventing rainfall in those areas from draining directly to storm sewers.

Impact Scenario #2 – Increase Irrigation Demand

- This scenario evaluated the impacts to streamflow under a "maximum possible irrigated land" assumption.
- "Maximum irrigated land" was determined based on slope less than 3%, presence of existing agricultural lands, and pervious soils underlying agricultural land use.
- Water supply for irrigation was determined as either takings directly from Spencer Creek or from a shallow groundwater source in the centroid of the field.

Impact Scenario #3 – Drought Condition Testing for Resilience

- An drought scenario was designed to test the resiliency of the watershed to an extended period of low precipitation volumes.
- A notable historic drought was selected and was repeated three times to create the climate datasets. Due to its recent occurrence and greatly reduced precipitation, the 1998-1999 drought was used for this scenario. The climate data during 2000-2001 and 2002-2003 was replaced with 1998-1999 climate data, resulting in a six year drought.

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Lower Spencer Integrated Subwatershed EA – Hydrology

Impact Scenario #1 Preliminary Results – Low Impact Development Implementation in Dundas

A representative hydrograph downstream of Dundas was selected in August 1995 to show the local impacts of LID implementation (Figure 1). The results on the local storm hydrograph are threefold:

- *Reduction in Peak Flow:* The hydrograph shows 12% reduction of the highest peak flow, 30% of the lower peak
- *Reduction in Hydrograph Volume:* The overall hydrograph has 10% reduction in runoff volume
- *Increase in Time to Peak:* Slight delay in the time to peak of the initial peak – increases from 8 hours to 9 hours; there is no delay in the time to peak of the higher peak flow

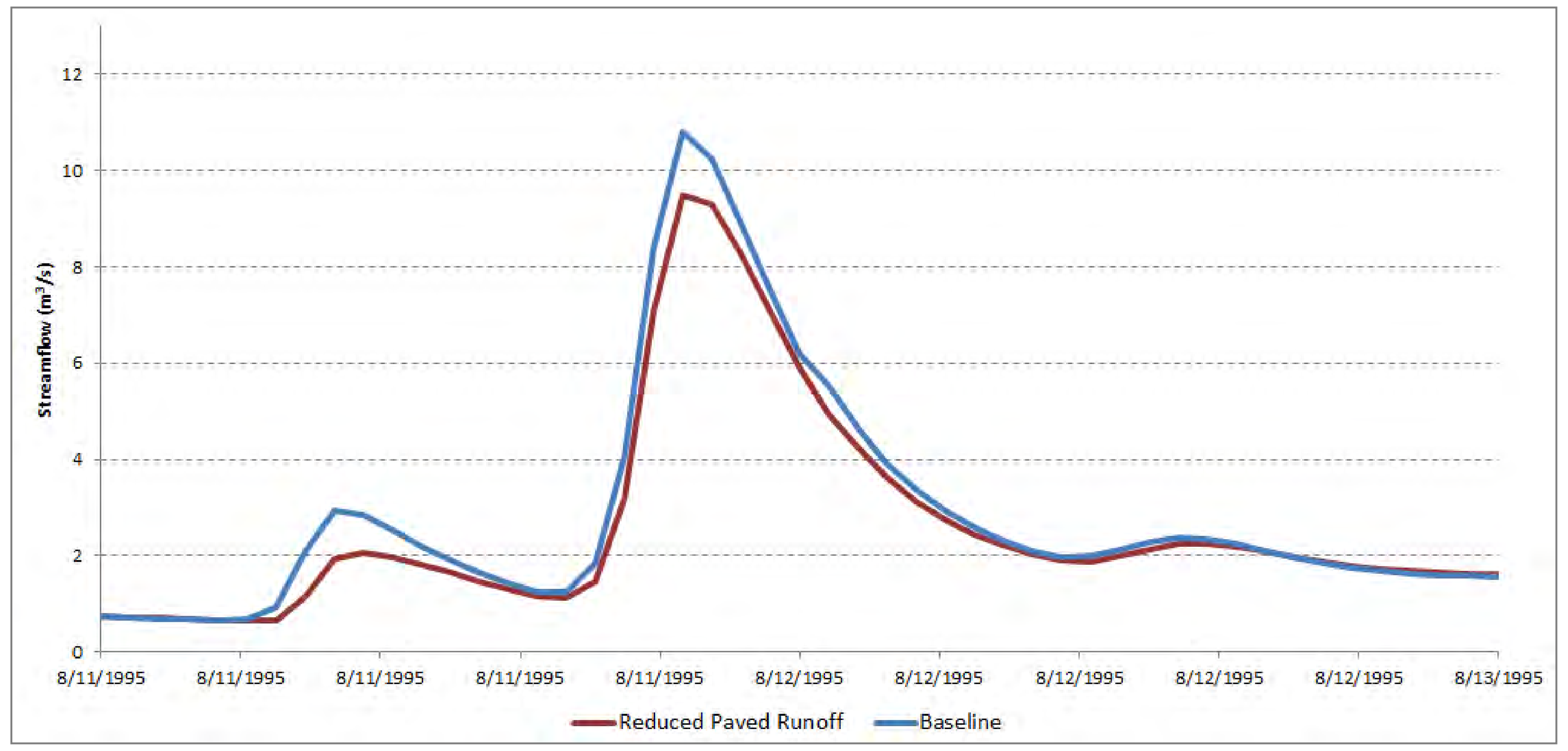

Fig 1. Storm Hydrograph in Lower Spencer Creek showing Runoff Volume Reduction due to Dundas LID Scenario

Impact Scenario #2 Preliminary Results – Increased Irrigation Demand

- An increase in irrigation to the "maximum irrigated lands" scenario results in slight decreases to the average Summer Low Flows in the Lower Spencer Creek.

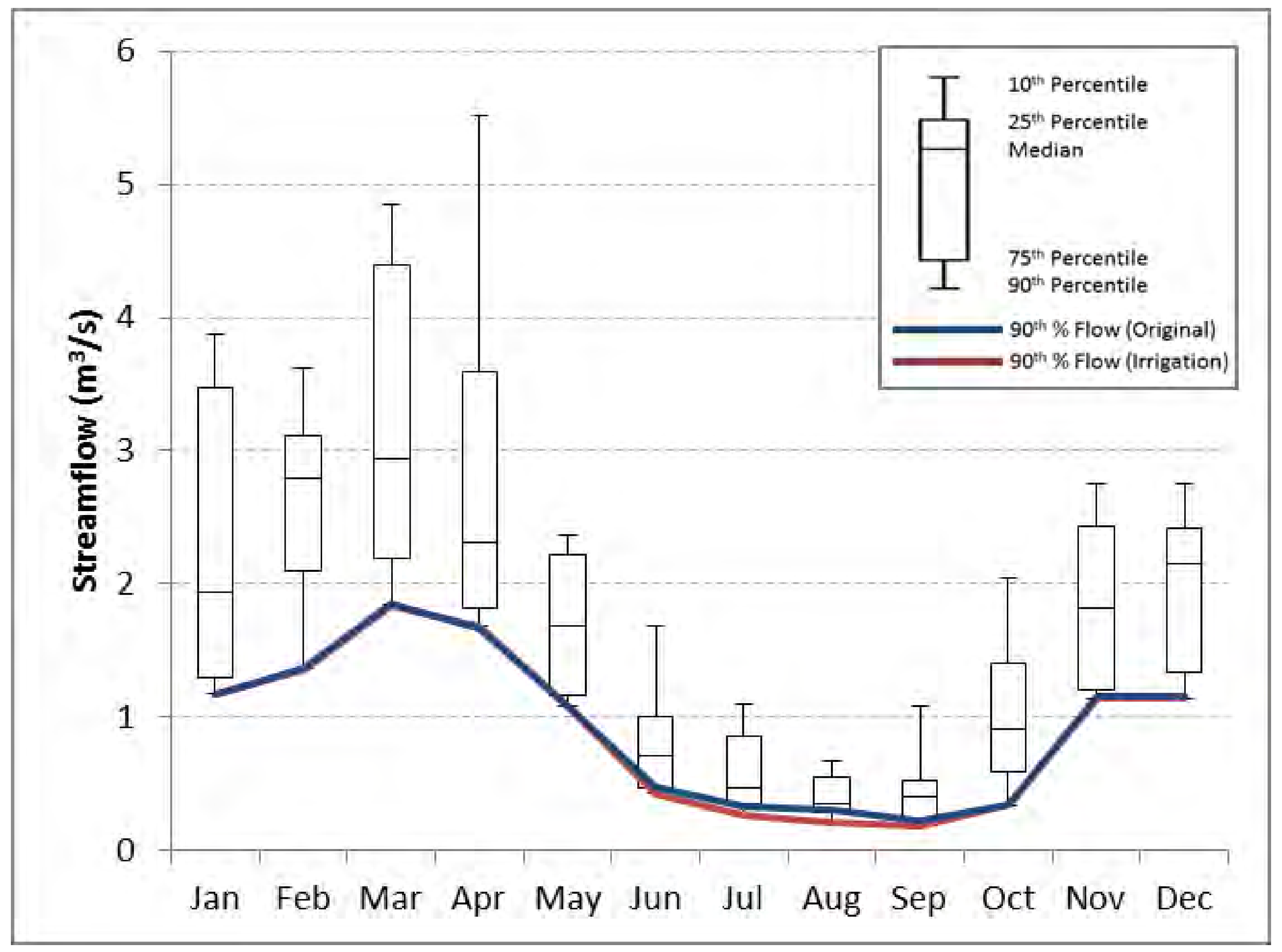

Fig 2. Lower Spencer Creek Flow Regime and 90th Percentile Flows, Scenario 2

Table 1. Lower Spencer Creek Summer Low Flows, Scenario 2 (Irrigation)

Scenario	June (L/s)	July (L/s)	Aug (L/s)
Original Scenario 90th % Flows	480	330	300
Irrigation Scenario 90th % Flows	**430**	**270**	**210**

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Impact Scenario #3 Preliminary Results – Drought Condition Testing for Resilience

- Recovery of groundwater levels in Beverly Swamp area and Westover Creek subwatershed was better than those around Greensville and near Fletcher Creek.

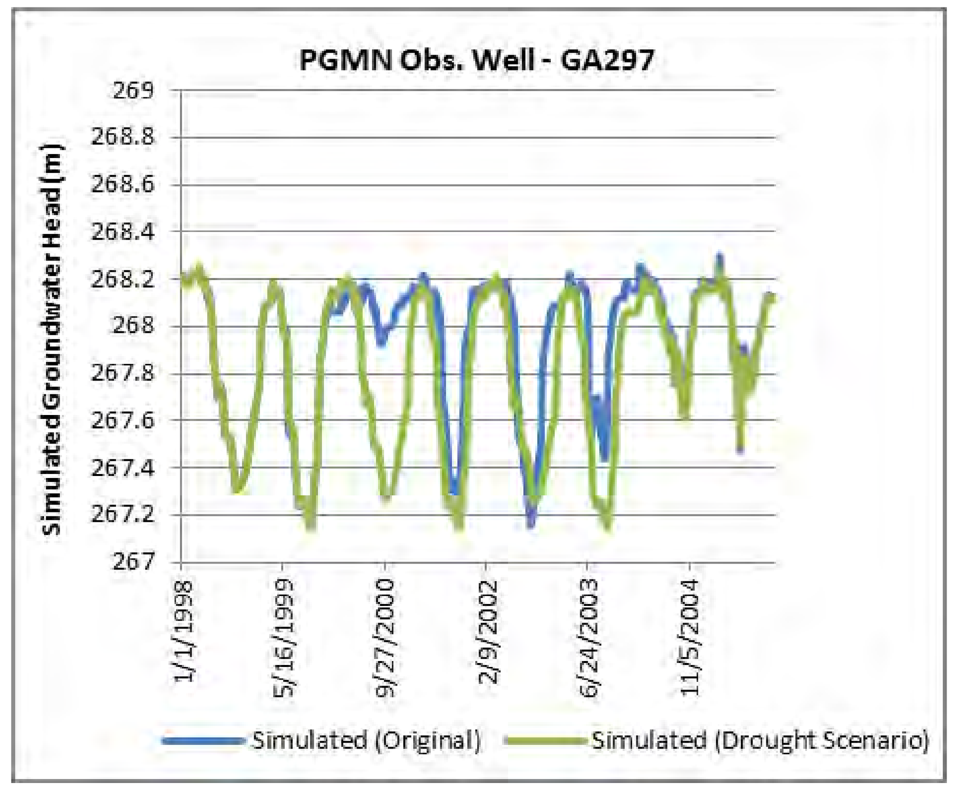


Fig 3. Simulated Groundwater Heads in the Beverly Swamp area

- In the drought scenario, there was no major reduction in low flows due to an extended drought period. There was a slight decrease in summer low flows from 1998 to 2003, but low flows are relatively stable at the 7Q10. This suggests that the storage available in Spencer Creek is sufficient to maintain the 7Q10 streamflow in spite of drought.

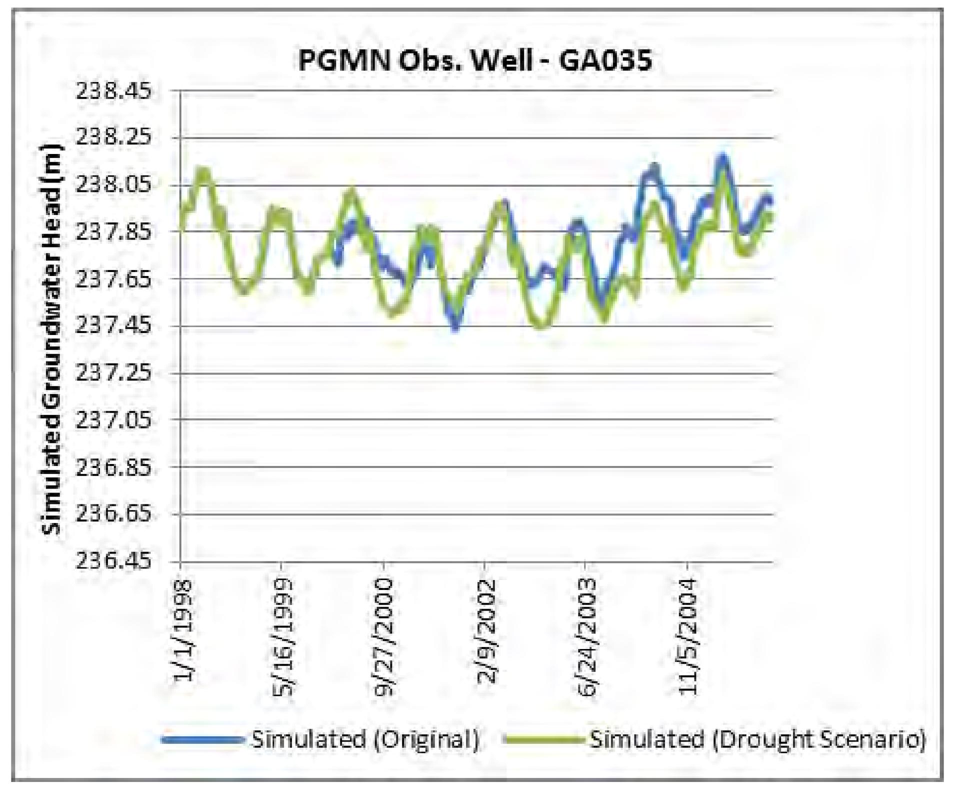


Fig 4. Simulated Groundwater Heads in Greensville area

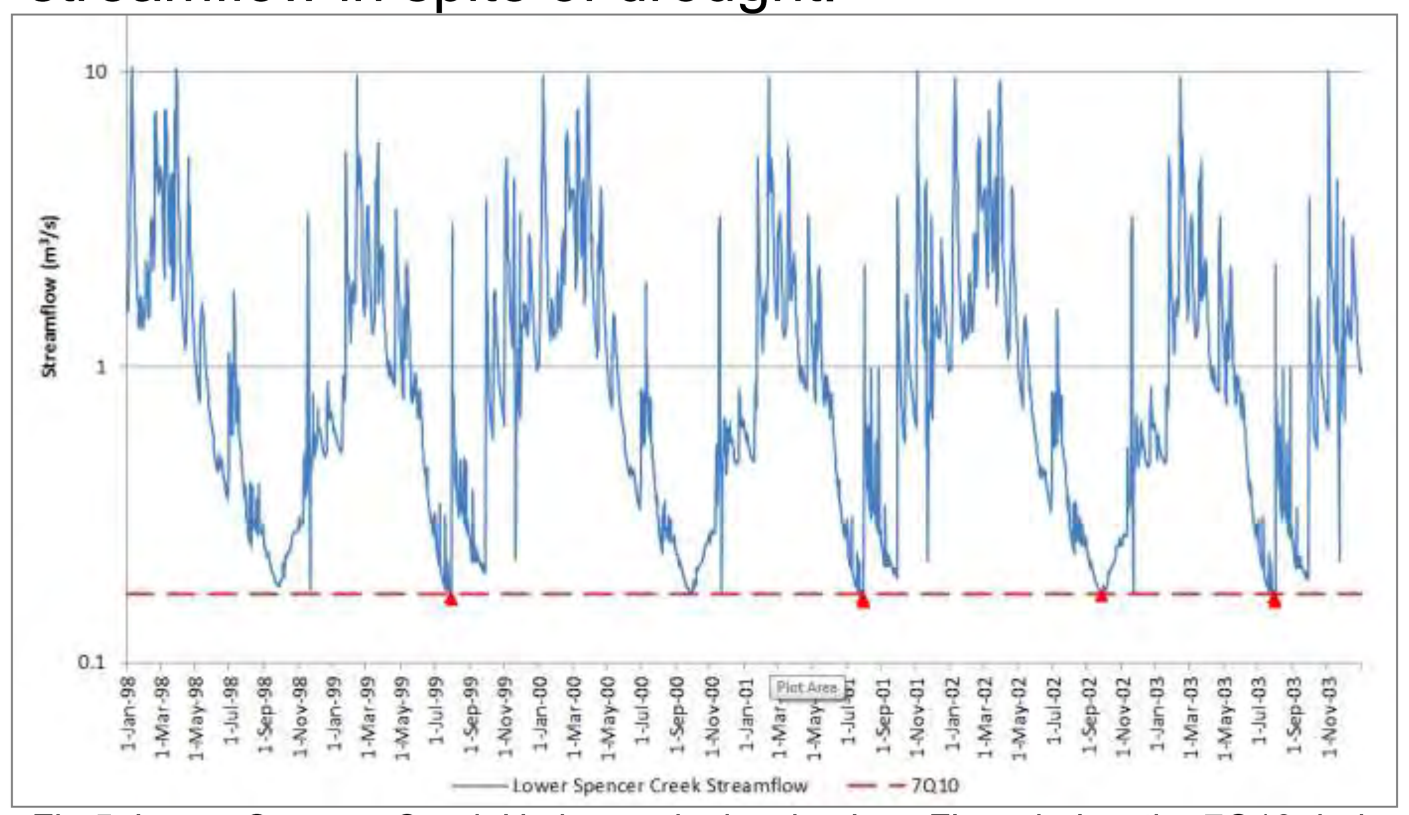


Fig 5. Lower Spencer Creek Hydrograph showing Low Flows below the 7Q10 during the Drought Scenario

Lower Spencer Integrated Subwatershed EA – Watercourse Hydraulics

Phase II – Alternatives

Three alternatives have been developed to address flooding along Lower Spencer Creek. Included are the following:

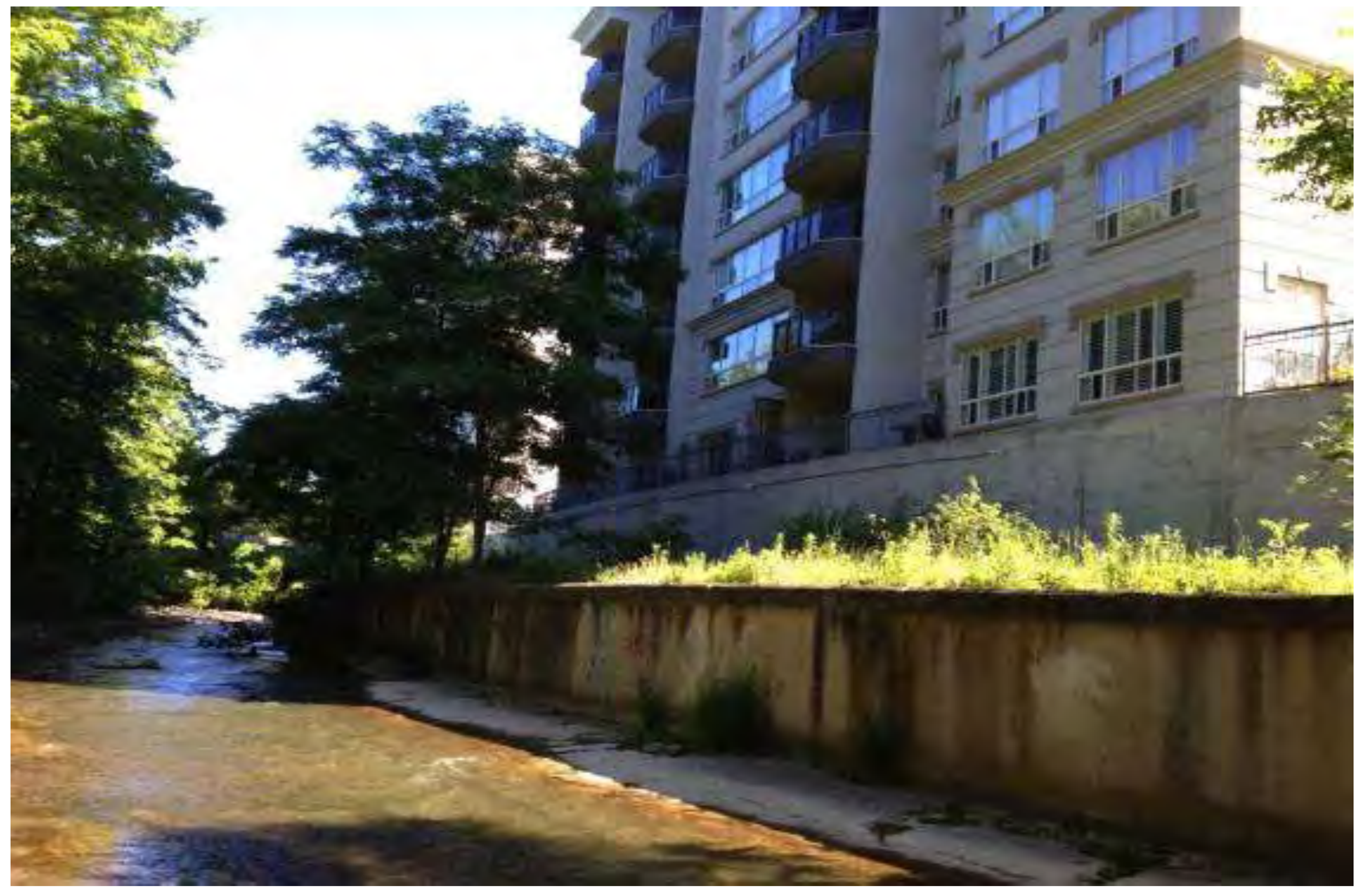
•Do Nothing

•Non Structural

•Structural

Alternative 1 – Do Nothing

The Do Nothing Alternative assumes current practices of flood plain management are maintained. The updated Regulatory Flood Plain is shown on the adjacent boards. Alternatives are compared to the Do Nothing alternative to determine residual impacts and benefits.



Alternative 2 – Non Structural

Alternative 2 enhances current management practices along Lower Spencer Creek. Alternative 2 includes the following:

•Continue to provide flood warnings to the City of Hamilton;

•Continue to Regulate flood plain lands in Dundas;

•Review and update the Special Policy Area through Dundas; and

•Develop an Emergency Preparedness Plan to deal with potential flooding.

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Lower Spencer Integrated Subwatershed EA – Watercourse Hydraulics

Alternative 3 – Structural

Increase the level of flood protection to the Regional Storm by:

•Providing a spillway from the CN Railway to downstream of King Street to convey the Regional Storm;

•Providing a sufficient channel and crossings to convey the Regional Storm from King Street to Thorpe Street; and

•Providing additional capacity at the Cootes Paradise outlet to alleviate potential flooding in Dundas.

Given the built up nature of the flood plain in Dundas it is expected that several decades will be required to implement Alternative 3. In the near term the following recommendations should be implemented:

•New crossings or Crossing Replacements – should be constructed to convey the Regional Storm without overtopping; and

•New Development Adjacent to Lower Spencer Creek – should allow for the conveyance of the Regional Storm without inundating existing or proposed buildings.

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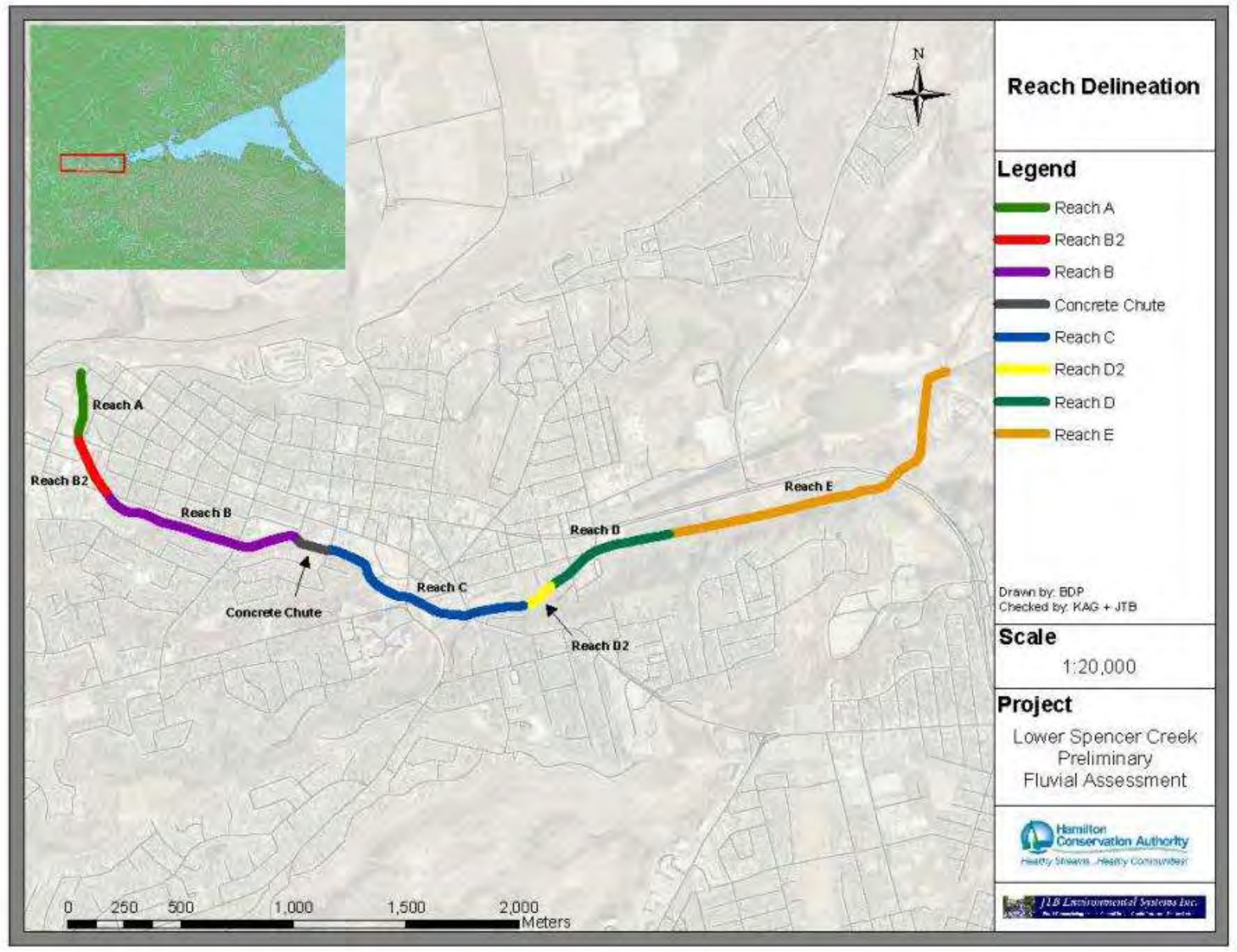
Lower Spencer Integrated Subwatershed EA – Fluvial Geomorphology

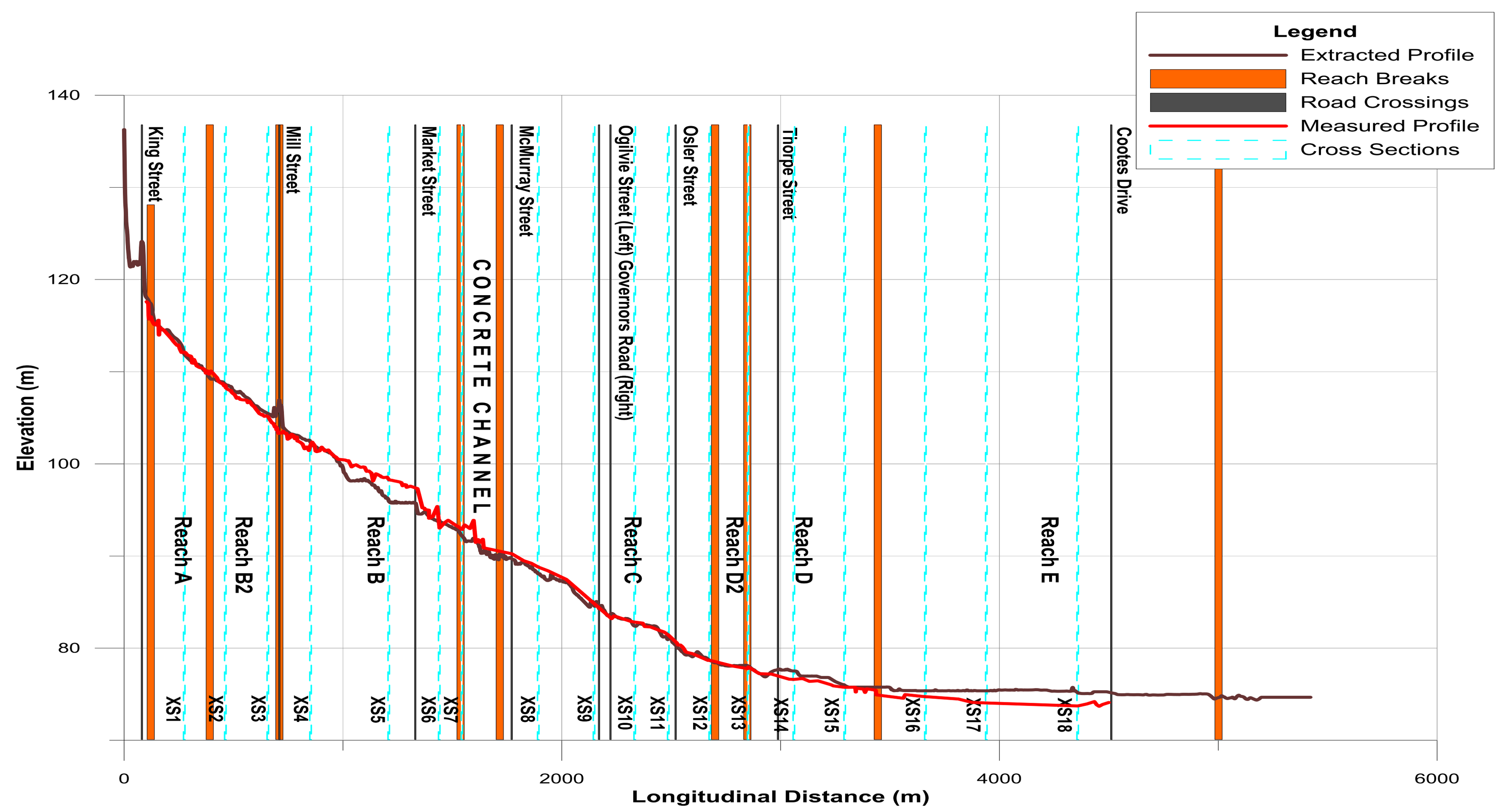
Problems Needing to be Addressed

- Lower Spencer Creek has been straightened and channelized throughout the development of the Town of Dundas. This has resulted in:
    - Confined channel planform
    - Elimination of floodplain access
    - Steepened channel slope

Alternatives

- Do nothing
- Local Erosion Mitigation
- Reduce channel slope
    - Add grade control structures
- Create meandering channel planform with appropriately sized floodplains





Study Area Characterization

- From King Street to Cootes Drive
- Study area was divided into River Reaches base predominantly on channel slope
- Entire study are was surveyed
- 18 long term cross sections established
- Bed substrate characterization
- Flow analysis

Reach	Length (m)	Slope (DEM)	Slope (Survey)	# Bridges	Sinuosity
A	270	0.032	0.032	0	1.01
B2	290	0.015	0.018	0	1.04
B	910	0.015	0.007	2	1.08
C	985	0.012	0.012	4	1.12
D2	150	3.88E-03	3.88E-03	0	1.07
D	595	3.88E-03	3.88E-03	1	1.00
E	1550	4.81E-04	1.00E-03	1	1.00

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Lower Spencer Integrated Subwatershed EA – Fluvial Geomorphology

Local Erosion Control

Erosion mitigation measures which are employed to address specific to localized erosion and bank failures.

Local Erosion Control Options

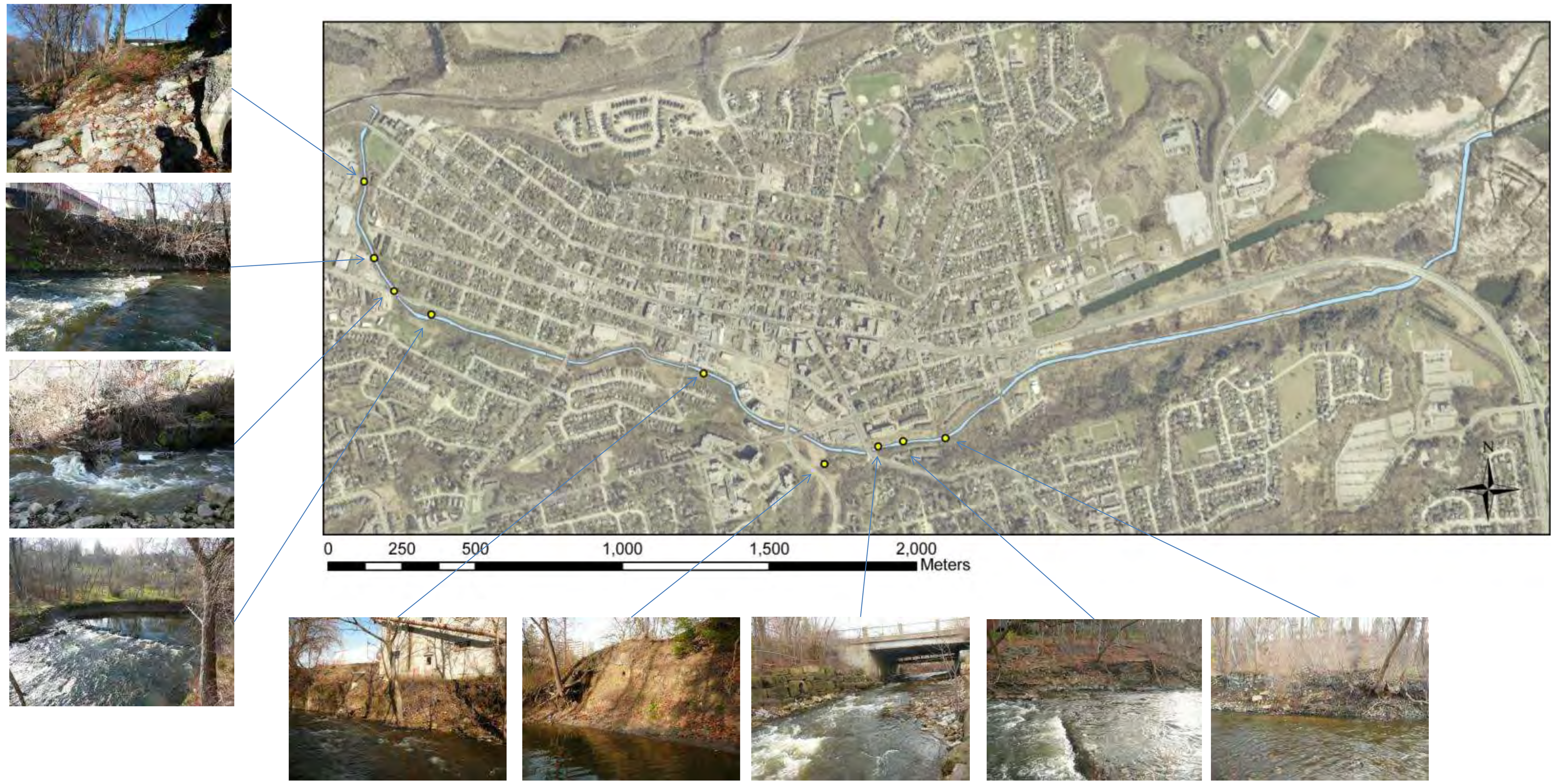
Physical Protection

- Boulder Placement
- Crib Walls

Flow Deflection

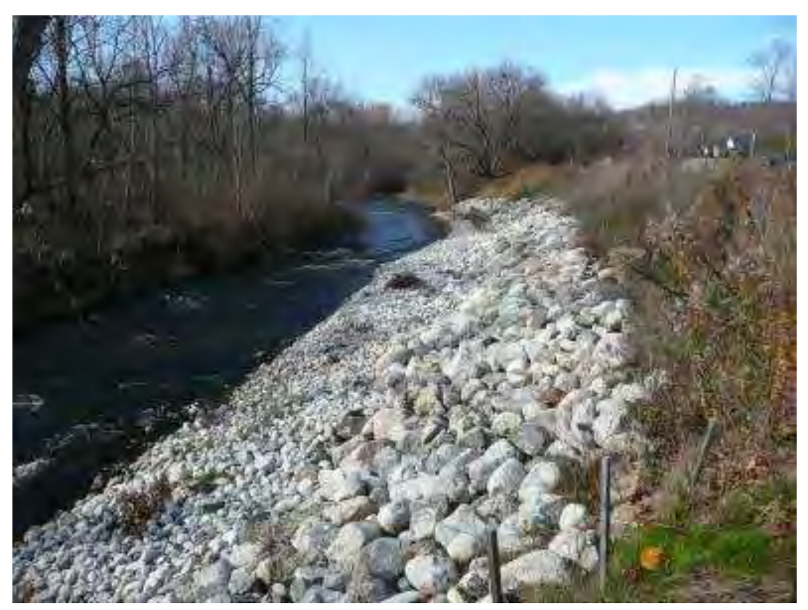
- Dyke Vane
- Cross Vanes

Christie Reservoir flow regulation was also considered, however analysis determined that altering discharge rates would not help to mitigate channel erosion.



Short Term Solution

Local erosion mitigation measures are generally considered to be short term solutions as they usually do not address the underlying issues causing the erosion. The implementation of local erosion control measures must be carefully considered to ensure do not cause problems else where within the river system.


Boulder Placement


Crib Walls


Cross Vanes


Dyke Vanes

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Lower Spencer Integrated Subwatershed EA – Fluvial Geomorphology

Channel Grade Control

Maintaining the channel in its current location requires the installation of in-stream grade control structures to reduce channel slope resulting in lower flood flow velocities.

Methods

Flow conditions which cause the bed of the stream to move were determined:

- Critical Shear Stress of the bed based on the size of bed substrates
- Critical velocity, the flow velocity required to move the bed

Channel slope was adjust to the point when the bed would be stable under a 100year flood event.

Bed stability based on critical flow velocity is the most sensitive parameter and provides the most conservative design approach

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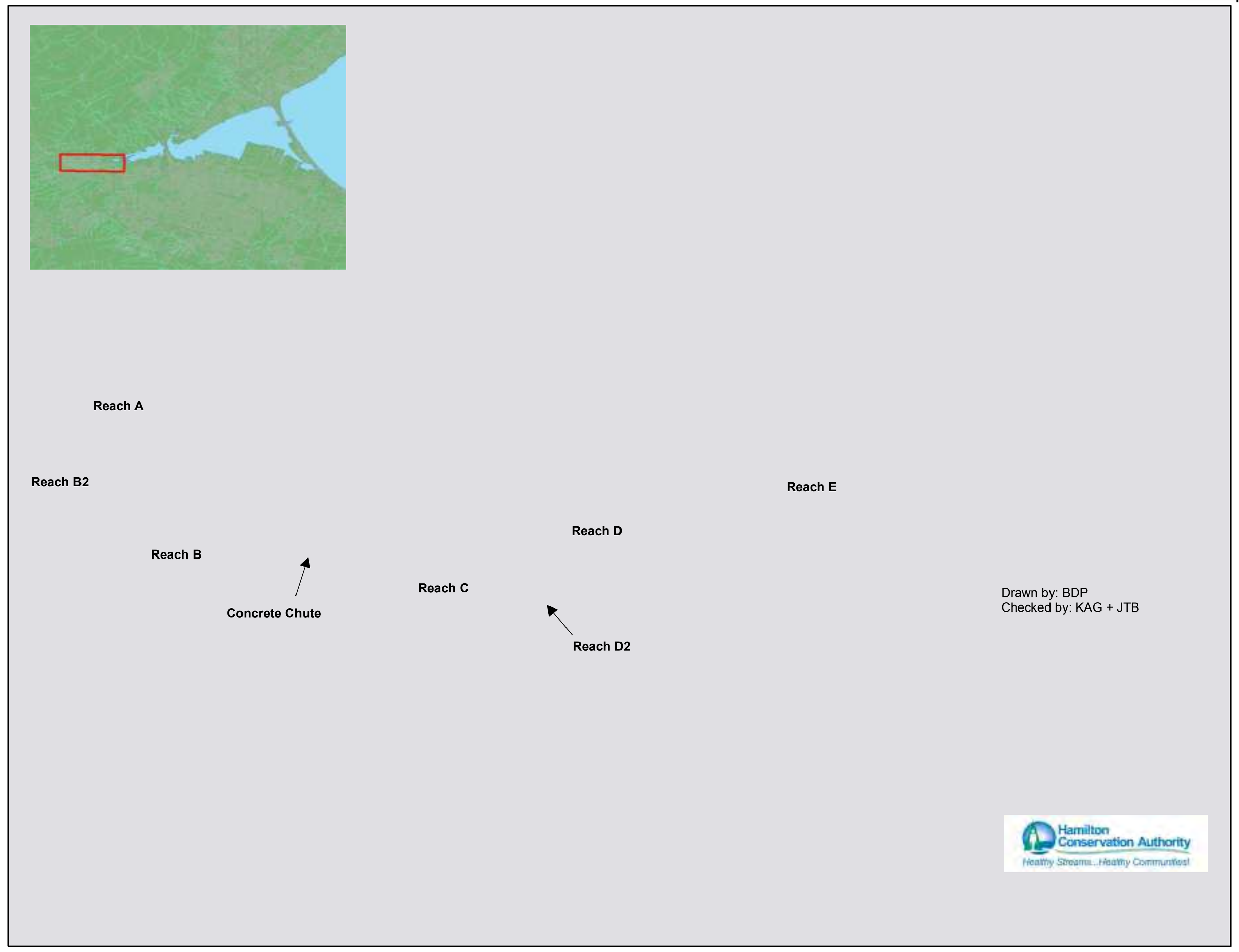
Reach	Length	Number of Drop Structures			
		100 yr Flow		10 yr Flow	
		Shear Stress	Critical Velocity	Shear Stress	Critical Velocity
A	270	8	8	8	8
B2	290	4	5	4	5
B	910	2	4	1	3
C	985	7	10	6	9
D2	150	0	0	0	0
D	595	1	2	1	2
E	1550	0	0	0	0
Total	4750	22	29	20	27

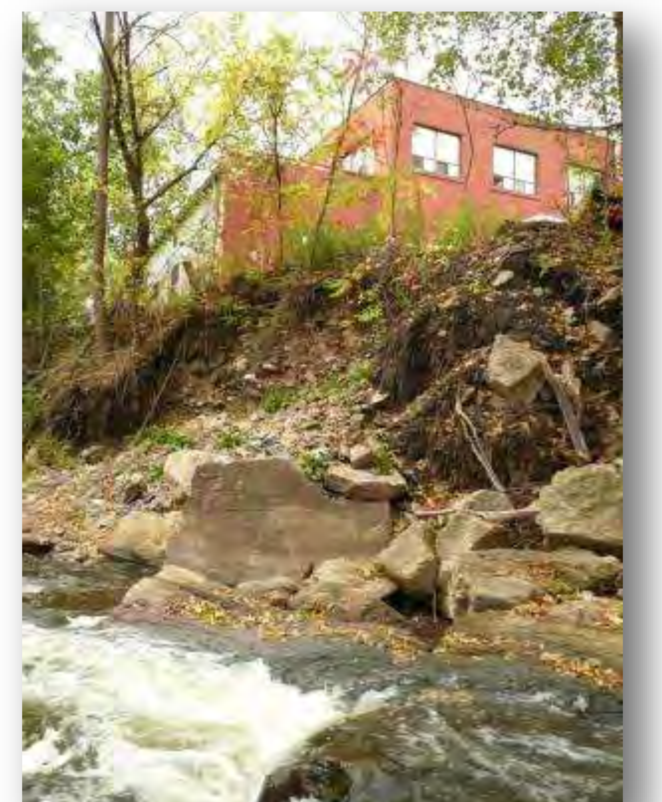


Lower Spencer Creek Subwatershed Assessment

Drawn by: BDP
Checked by: KAG + JTB

Drop Structures

- Constructed of large boulders or limestone rock
- 1m elevation change per structures
- Design has to consider fish passage
- Design has to consider bank stability



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Lower Spencer Integrated Subwatershed EA – Fluvial Geomorphology

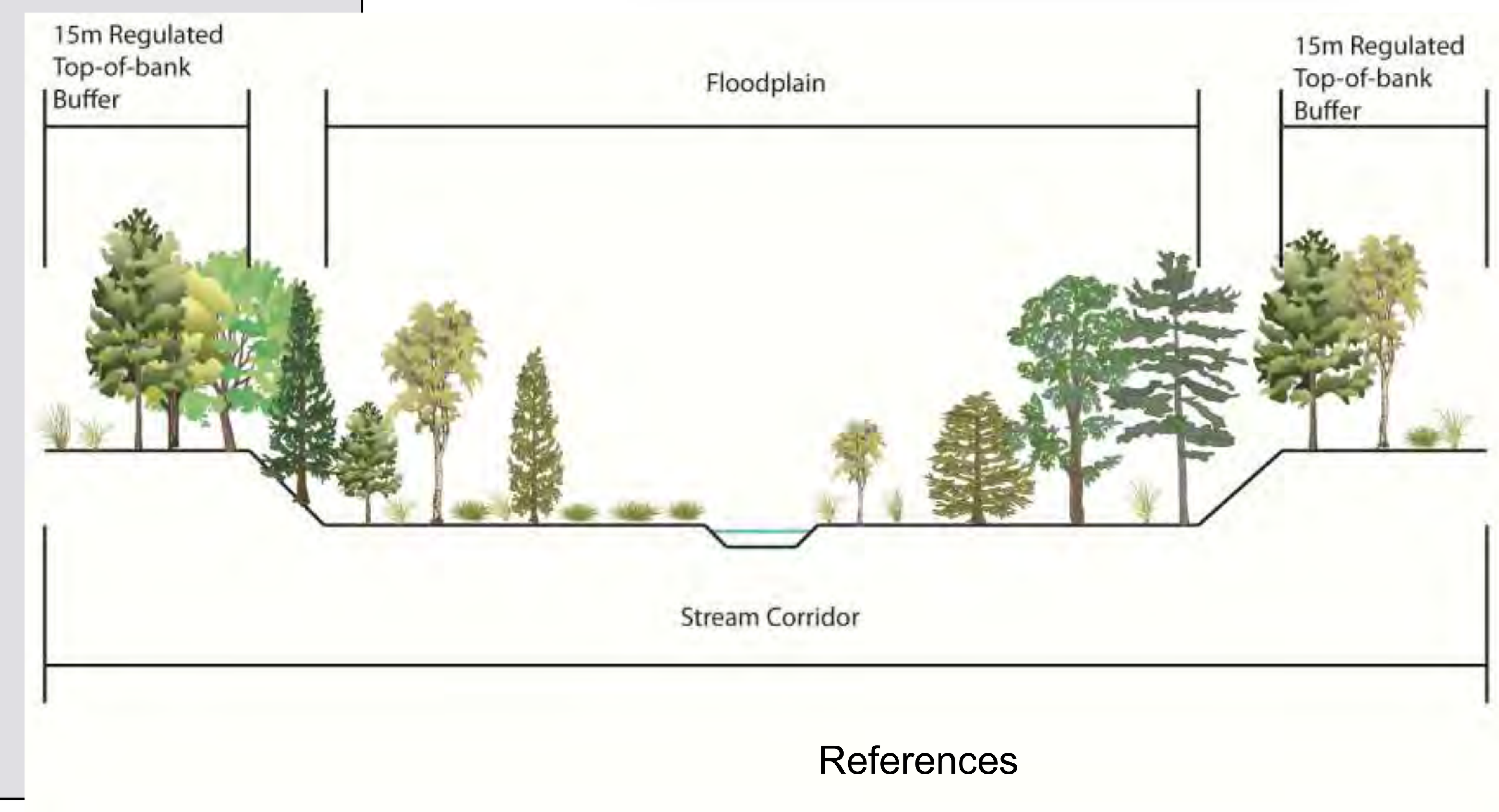
Plan Form Adjustment

The goal is to reduce channel slope and provide floodplain access. Both measures will lower flow velocity under flood conditions and increase channel stability.

Methods

Establishing an appropriately sized floodplain was based on:

- Previously calibrated channel forming discharges (Annable et al., 2011)
- Regime equations relating planform geometry to bankfull parameters (Annable, 1996),
- Channel form metrics relating to quasi-equilibrium channels following Rosgen channel classification (Rosgen, 1996)
- Hydraulic and sediment transport analyses based on conveyance and channel stability



Reach	Belt Width (m)		Safety Factor 10%		3:1 Side Slope (m)	HCA Regulated Top of Bank Setback (m)	Total Stream Corridor (m)	
	Min	Max	Min	Max			Min	Max
A	36.8	55.2	40.48	60.72	15	30	85	106
B/B2	120.2	172.9	132.22	190.19	15	30	177	235
C	121.2	179.9	133.32	197.89	15	30	178	243
D, D2, E	130.5	172.9	143.55	190.19	15	30	189	235

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References

Annable, W. K. (1996), 'Morphological relationships of rural water courses in southwestern Ontario and selected field methods in fluvial geomorphology', Technical report, Ontario Ministry of Natural Resources, ISBN:0-7778-5113-X.

Annable, W. K.; Lounder, V. G. & Watson, C. C. (2011), 'Estimating channel-forming discharge in urban watercourses', *River Research and Applications* **27**(6), 738-753.

Annable, W. K.; Watson, C. C. & Thompson, P. J. (2012), 'Quasi-equilibrium conditions of urban gravel-bed stream channels in southern Ontario, Canada', *River Research and Applications* **28**(3), 302-325.

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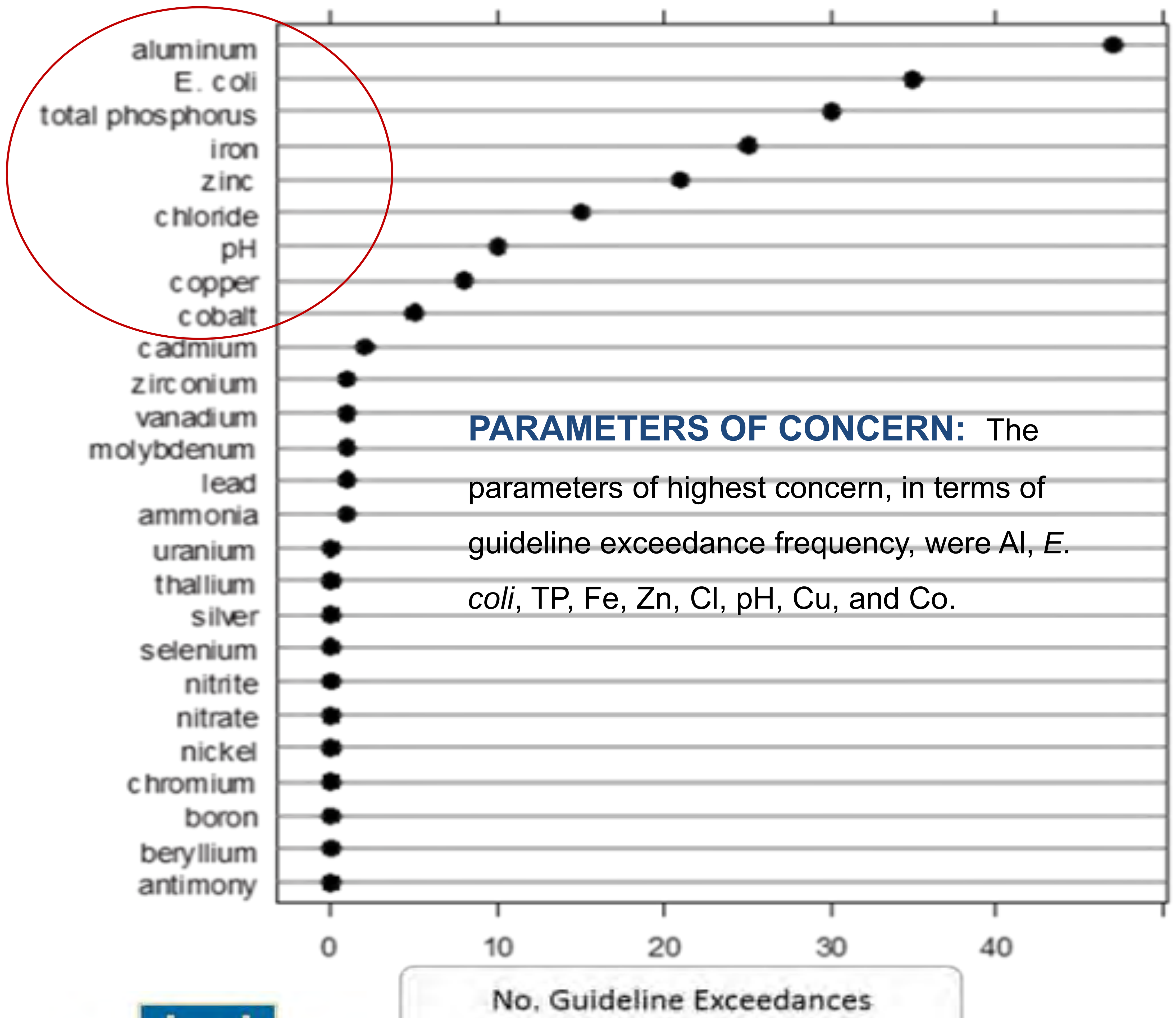
Lower Spencer Integrated Subwatershed EA – Water Quality

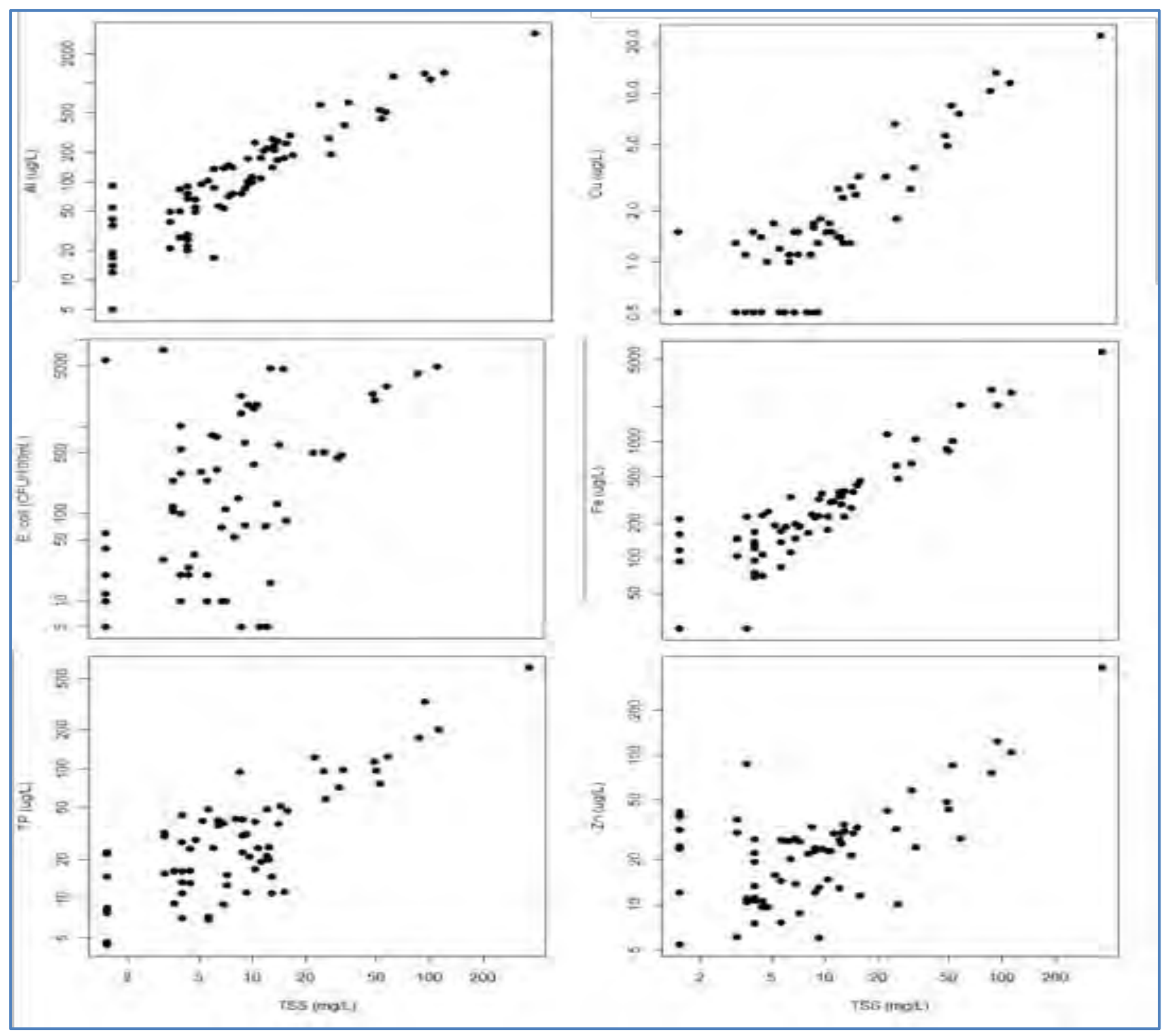
SUMMARY

Water quality in Spencer Creek is generally acceptable, and reflects its transition from wetland and agriculture dominance in the upper watershed to urban influences, most notably stormwater inputs, in the lower watershed.



PARAMETERS OF CONCERN: The parameters of highest concern, in terms of guideline exceedance frequency, were Al, *E. coli*, TP, Fe, Zn, Cl, pH, Cu, and Co.

Figure 2: The Lower Spencer Creek Integrated Subwatershed Study Area



TOTAL SUSPENDED SOLIDS (TSS)

Most parameters that frequently exceeded Provincial Water Quality Objectives were correlated with TSS, indicating the influence of erosion in the stream bed from high storm flows and surface runoff from agricultural (upper watershed) and urban (lower watershed) areas.

STORMWATER

High concentrations of some metals (Al, Fe, Zn), TSS, Total Phosphorus, and bacteria (*E. coli*) were found in Dundas stormwater.

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Impact Assessment Approach

1. Use measurements of flow and water quality to calibrate an **export coefficient model** of pollutant export from various land uses.
   - for base flow periods
   - storm events

Export Coefficient Approach

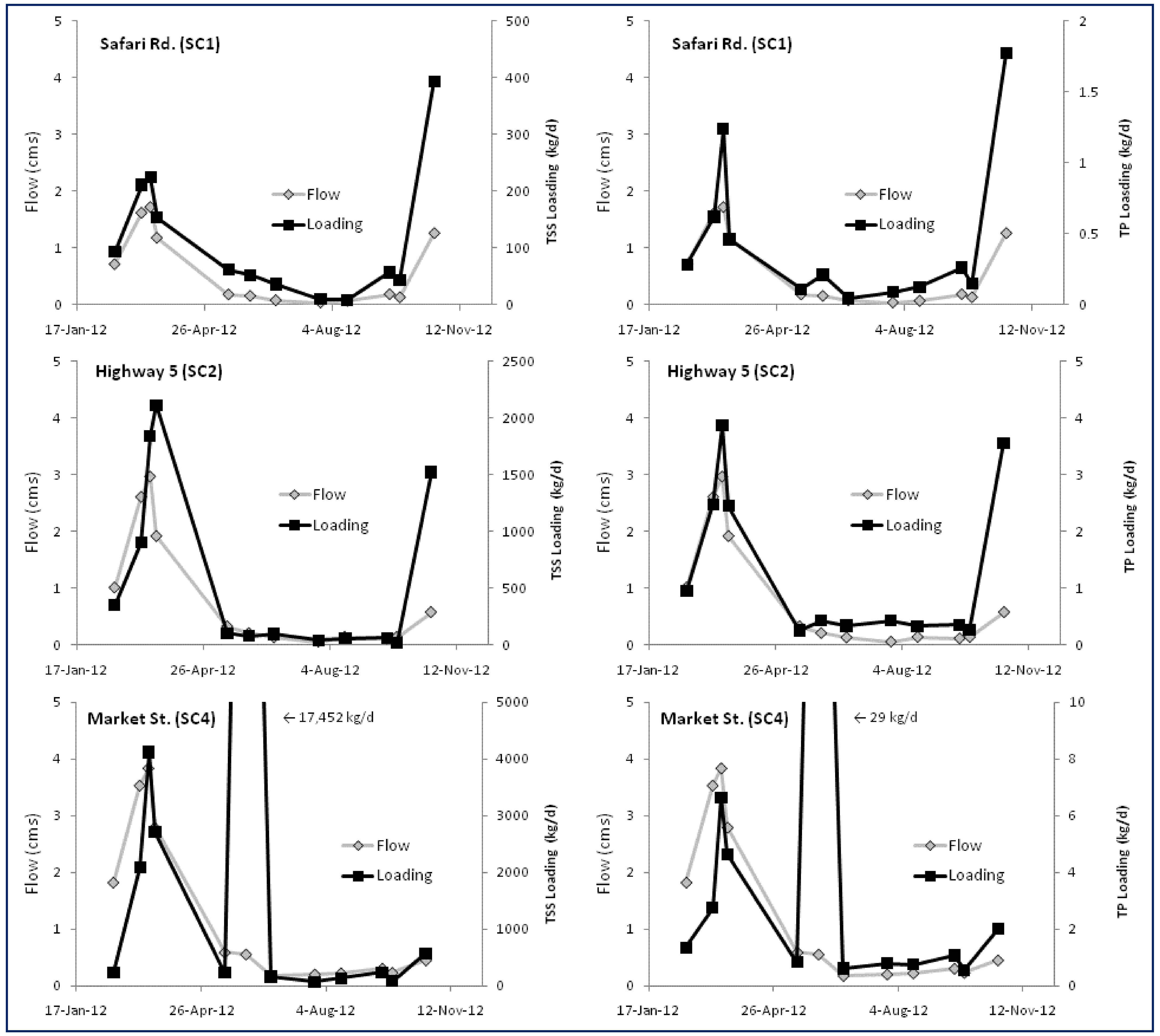
L = ∑ (Ei * Ai) - (Load = Sum (Land use areas * Land Use Coefficients)

Sample Export Coefficients for Southern Ontario (HESL/MOE 2012)	Phosphorus Export (kg/ha/yr)										
	Cropland	Hay-Pasture	Turf-Sod	High Intensity Development: Commercial /Industrial	High Intensity Development: Residential	Low Intensity Development	Quarry	Unpaved Road	Forest	Transition	Wetland
	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10

Spencer Creek Watershed Land Uses

At WQ Sampling Site	Land Use (ha)					Total Catchment Area (ha)
	Residential	Industrial/Commercial /Institutional	Transportation	Agricultural	Open Space	
SC1	190	13	122	2,651	1,899	**4,874**
SC2	282	183	160	4,896	1,684	**7,205**
SC3	297	79	131	1,460	1,126	**3,093**
SC4	42	18	23	0	49	**132**
SC5	432	46	204	772	845	**2,300**
SC6	856	178	410	519	1,960	**3,923**

Export Coefficient Calibration via Measured Loads



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Impact Assessment Approach

2. Model various Best Management Practices and Low Impact Development Techniques that reduce storm flows and pollutant loads.

- use documented BMP/LID efficiencies and apply to export coefficients

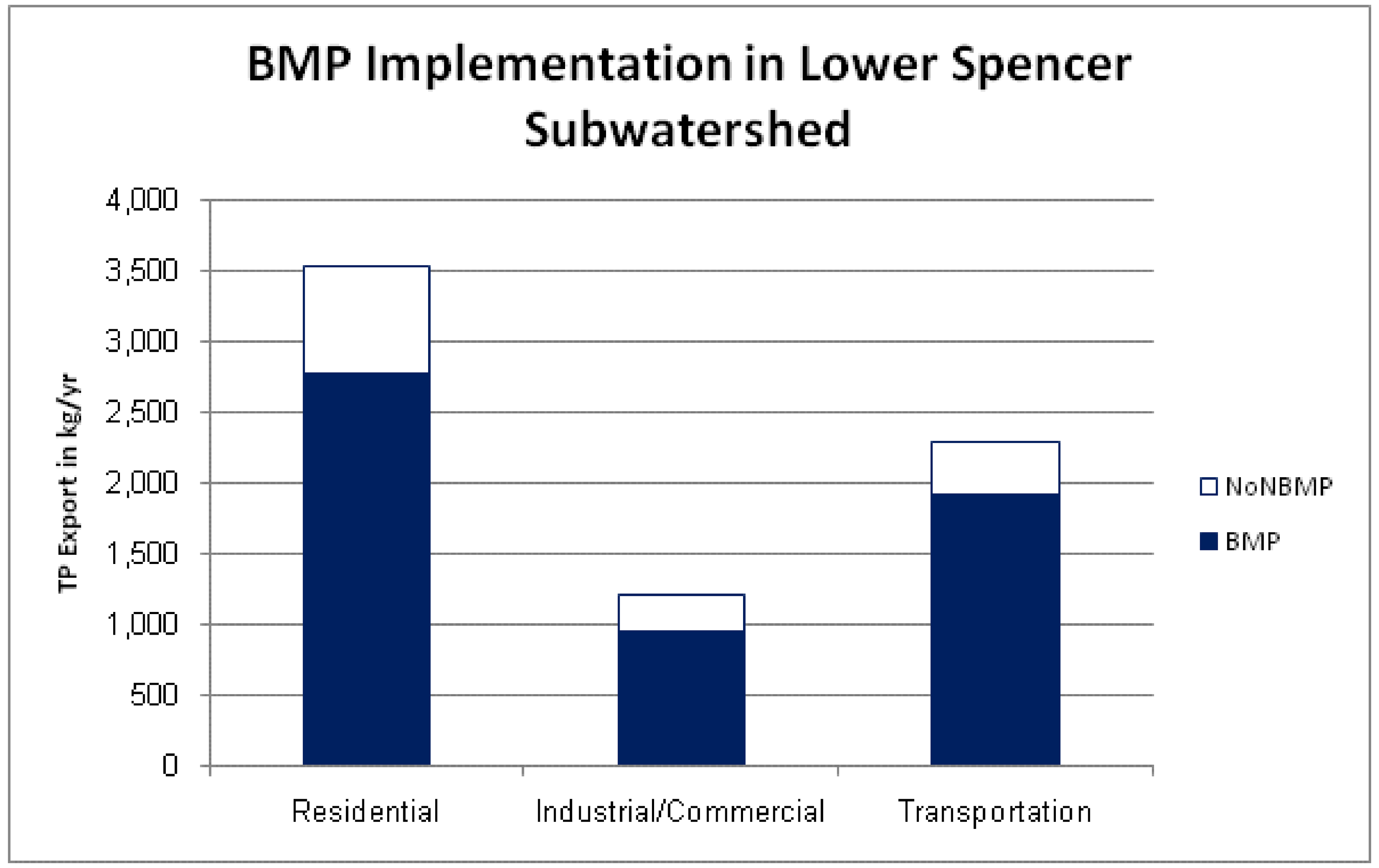
Export Coefficient Approach

$L = \sum (Rj * Ei * Ai)$

Load = Sum (Percentage Reduction * Export Coefficient * Land Use Area)

BMP Class	Reference IDs[1]	Reported Phosphorus Removal Efficiency (%) Min	Reported Phosphorus Removal Efficiency (%) Max	Relevant to Ontario?	Range <40%?	Are Non-Ontario values acceptable?	Possible design criteria?	Median % Removal Efficiency
Post-development BMPs								
Bioretention Systems	8-10, 12,13, 34-38, 40	-1552	80	no	no	no	No	none
Constructed Wetlands	104, 106, 109	72	87	yes	yes			77
Dry Detention Ponds	104, 109	0	20	no	yes	yes		10
Dry Swales	24, 26-32	-216	94	no	no	no	possible	none
Enhanced Grass/Water Quality Swales	21, 104	34	55	no	yes	no	No	none
Flow Balancing Systems	106	77		no	?	yes	Min data	77
Green Roofs	2	-248		no	no	no	No	none
Hydrodynamic Devices	109	-8		no	?	yes		none
Perforated Pipe Infiltration/Exfiltration Systems	7, 4	81	93	yes	yes			87
Sand or Media Filters	104, 109	30	59	no	yes	yes		45
Soakaways - Infiltration Trenches	6, 104	50	70	no	yes	yes		60
Sorbtive Media Interceptors	111	78	80	no	yes	yes		79
Underground Storage	106	25		no	?	yes	Min data	25
Vegetated Filter Strips/Stream Buffers	6, 42, 104	60	70	no	yes	yes	Yes	65
Wet Detention Ponds	104-106, 109	42	85	yes	yes			63

	WQ Sampling Site	Residential (ha)	TP Export @ 1.32 kg/ha/yr	BMP Perforated Pipe (87%) Infiltration on 50% of Dundas	Industrial Commercial Institutional (ha)	TP Export @ 1.82 kg/ha/yr	BMP Perforated Pipe (87%) Infiltration on 50% of Dundas	Transportation (ha)	TP Export @ 1.82 kg/ha/yr	BMP Vegetated Filter Strips (65%) on 50% of Dundas
Upper Watershed	SC1	190	251	251	13	23	23	122	221	221
	SC2	282	372	372	183	334	334	160	291	291
	SC3	297	392	392	79	144	144	131	238	238
Lower Watershed	SC4	42	55	31	18	32	13	23	42	29
	SC5	432	570	322	46	84	35	204	371	251
	SC6	856	1,129	638	178	324	133	410	746	504
	Totals	2,098	2,770	2,007	518	942	681	1,050	1,910	1,534
	Total BMP	kg		763			261			377
	Reduction	%		28%			28%			20%



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Impact Assessment Scenarios

Scenario #1

Where	**Lower Watershed – Town of Dundas**
What	**Implement Best Management Practices (BMPs) and Low Impact Development (LID) Techniques in 50% of urban area to reduce runoff and pollutant export**
How	**Calibrated export coefficient modelling**
Results	**Reduced pollutant export and estimated improvements in water quality in Lower Spencer Creek**

Scenario #2

Where	**Upper watershed**
What	**Increased irrigation on agricultural lands will result in more intensive agriculture (exposed soils and increased runoff sensitivity with no BMPs) + increased runoff with 50 % increase in quarry size and dewatering.**
How	**Export coefficient modelling**
Results	**Degraded water quality**

Scenario #3

Where	**Entire watershed**
What	**Increased drought conditions on a warmer climate. Longer periods of baseflow/ low flow and same summer precipitation volume delivered in fewer more intense storms .**
How	**Partition measured pollutant loading (2011-2012) into low flow and storm flow events. Model longer periods of low flow and fewer more intense storms based on measured loadings**
Results	**Degraded water quality**

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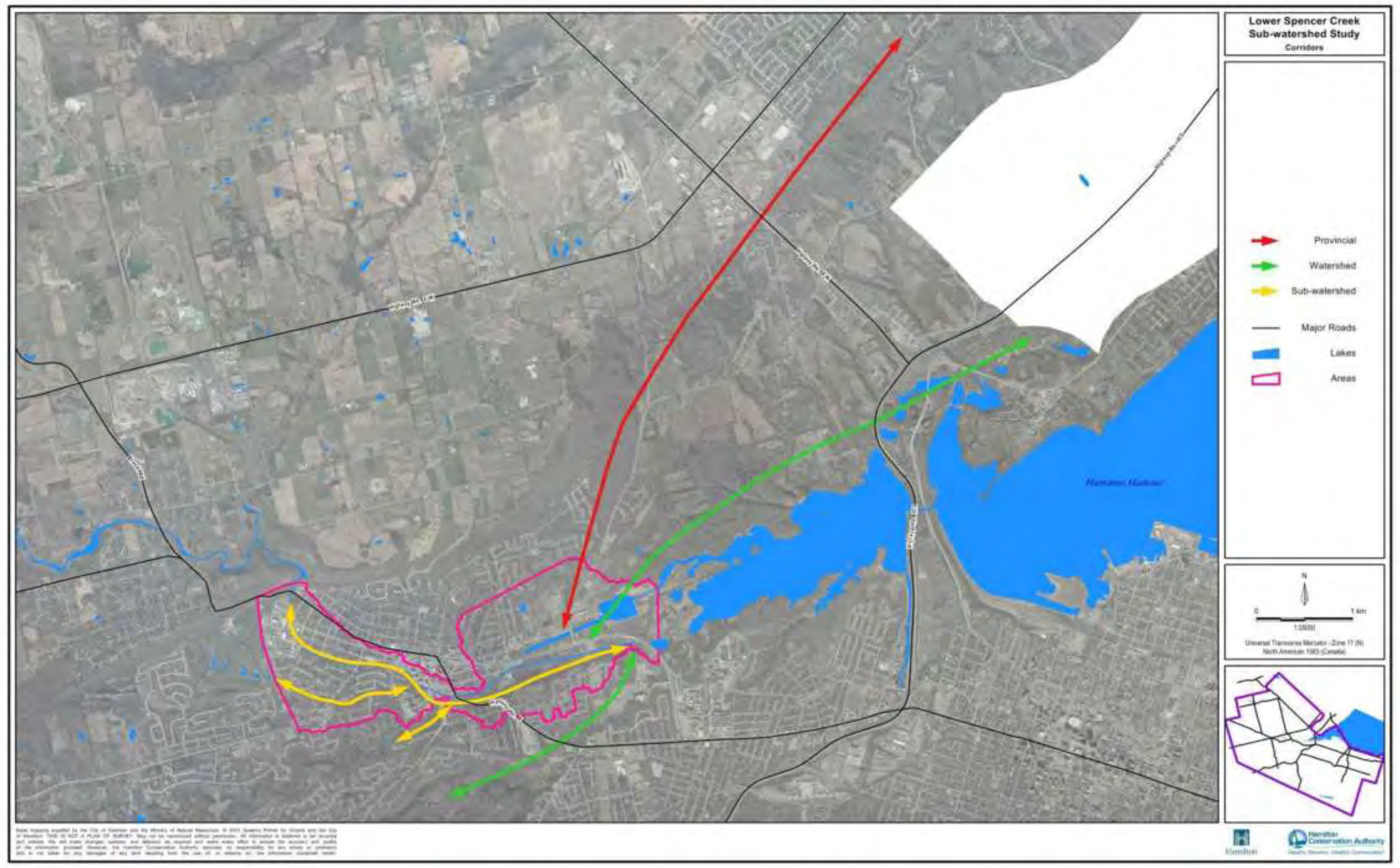
Hutchinson
Environmental Sciences Ltd.

Lower Spencer Integrated Subwatershed EA – Terrestrial

Objective

Following the characterization, an assessment of potential impacts from land use changes can be initiated. The sensitivity to change will be determined for each area identified in Phase 1. Impacts from land use change scenarios will then be assessed based on the individual and cumulative interactions of other study components (hydrology, hydrogeology, fluvial geomorphology) on the terrestrial system as well as direct impacts resulting from physical changes to the landscape.



Phase 2 – Impact Assessment

Was reviewed at three scales; watershed, subwatershed and site and under three themes; do nothing, structural and non-structural.

Results:

•Do nothing

System will continue to degrade as non-native invasive species expand, human impacts continue and connectivity remains limited.

•Structural - Corridors and connectivity (subwatershed and site level)

Improve connectivity through the subwatershed and site level

Recommendations include bridge replacements to improve wildlife passage and increasing the width of corridors.

• Structural - Trail design and (site level)

Move current pedestrian trail to the edge habitat of the current corridor.

•Non-Structural - Habitat quality (site level)

Removal of aggressive non-native invasive species (dog-strangling vine, Japanese knotweed, tree of heaven and black locust).

Landscape remediation with native species, tree and understory plantings.

Education of landowners in regards to feral and household pets.

•Non-structural - Human impacts (site level)

Work with local interest groups to lower human impacts through garbage clean ups and other events.

Education of trail users on sensitive areas in the lower spencer.

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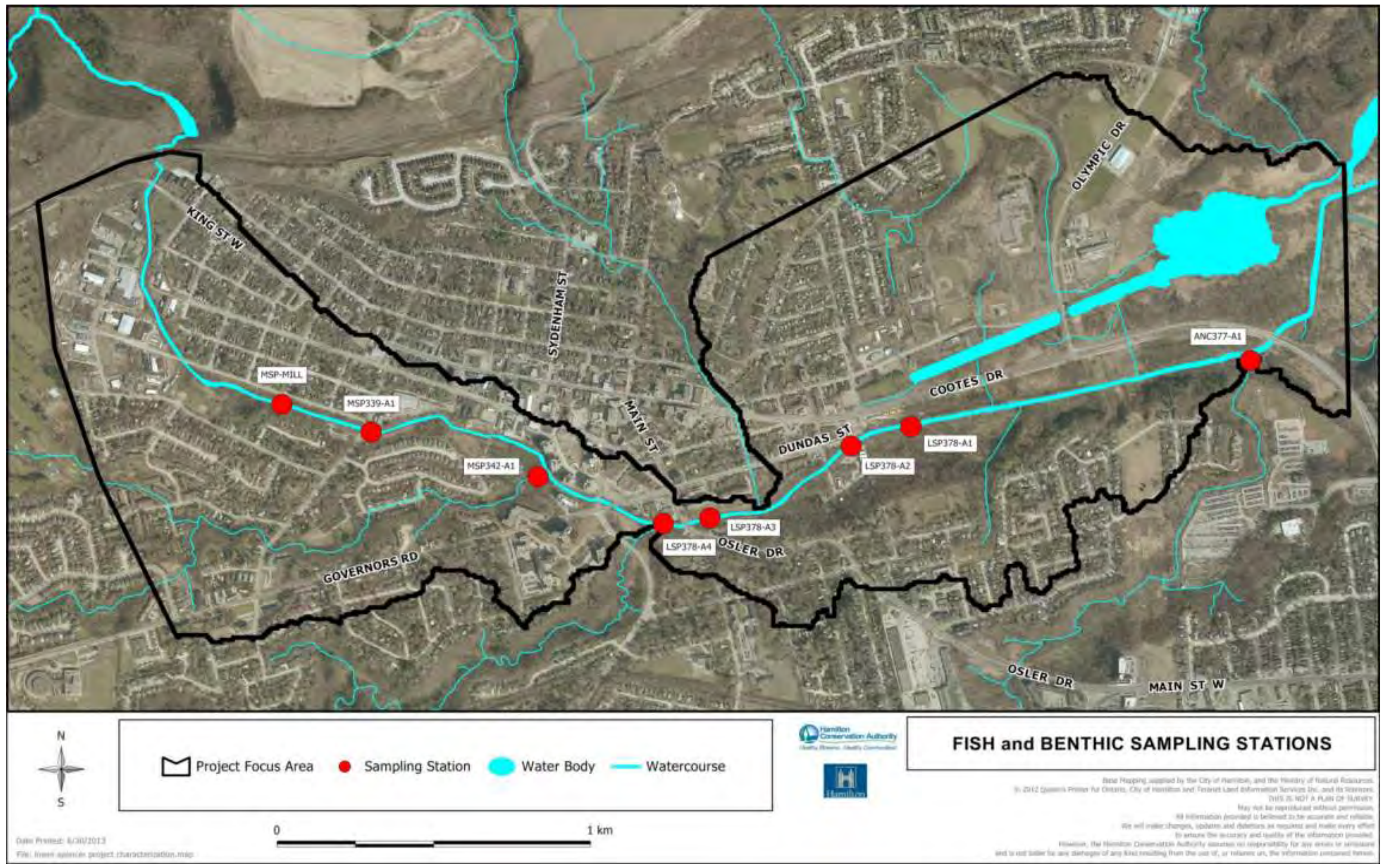
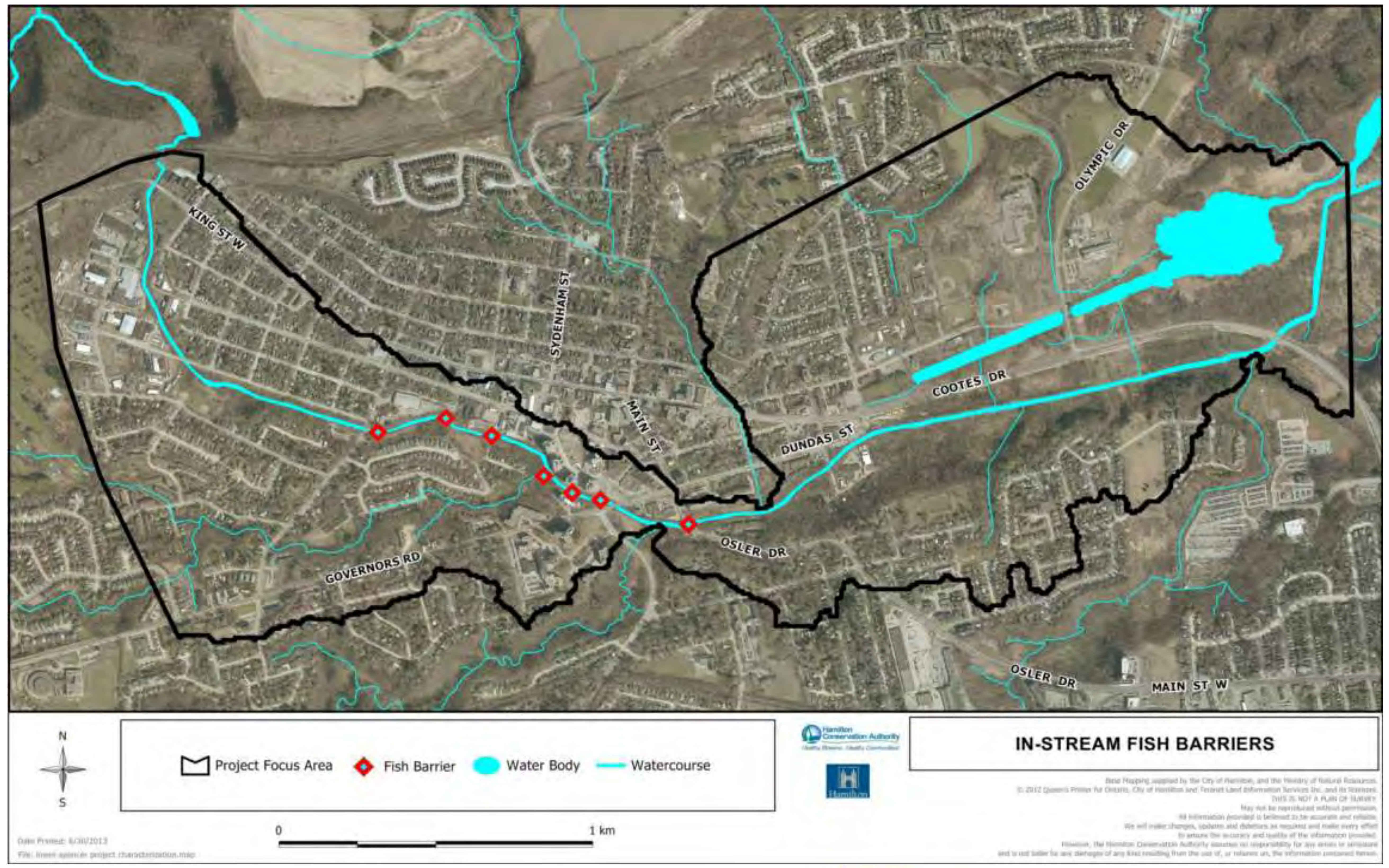
Lower Spencer Integrated Subwatershed EA – Aquatics

Impact Assessment Process

Following an accepted model of impact prediction based on proposed changes, fish communities will be assessed based on their sensitivity and stream classification. Impacts usually relate to key parameter changes identified from hydrology, hydrogeology, geomorphology, terrestrial or riparian ecology, and water quality components. It is assumed that indicators such as changes in peak flows related to urbanization will be considered. Thermal impacts from stormwater management is also a concern requiring analysis. Sewage treatment and water taking may also be considered for assessment.

Targets for fish life processes will be established for the various fish species in Lower Spencer Creek and integrated with the stream morphology component to establish barrier remediation objectives. An analysis of the proposed creek improvements will be completed and benefits to fish habitat quantified.





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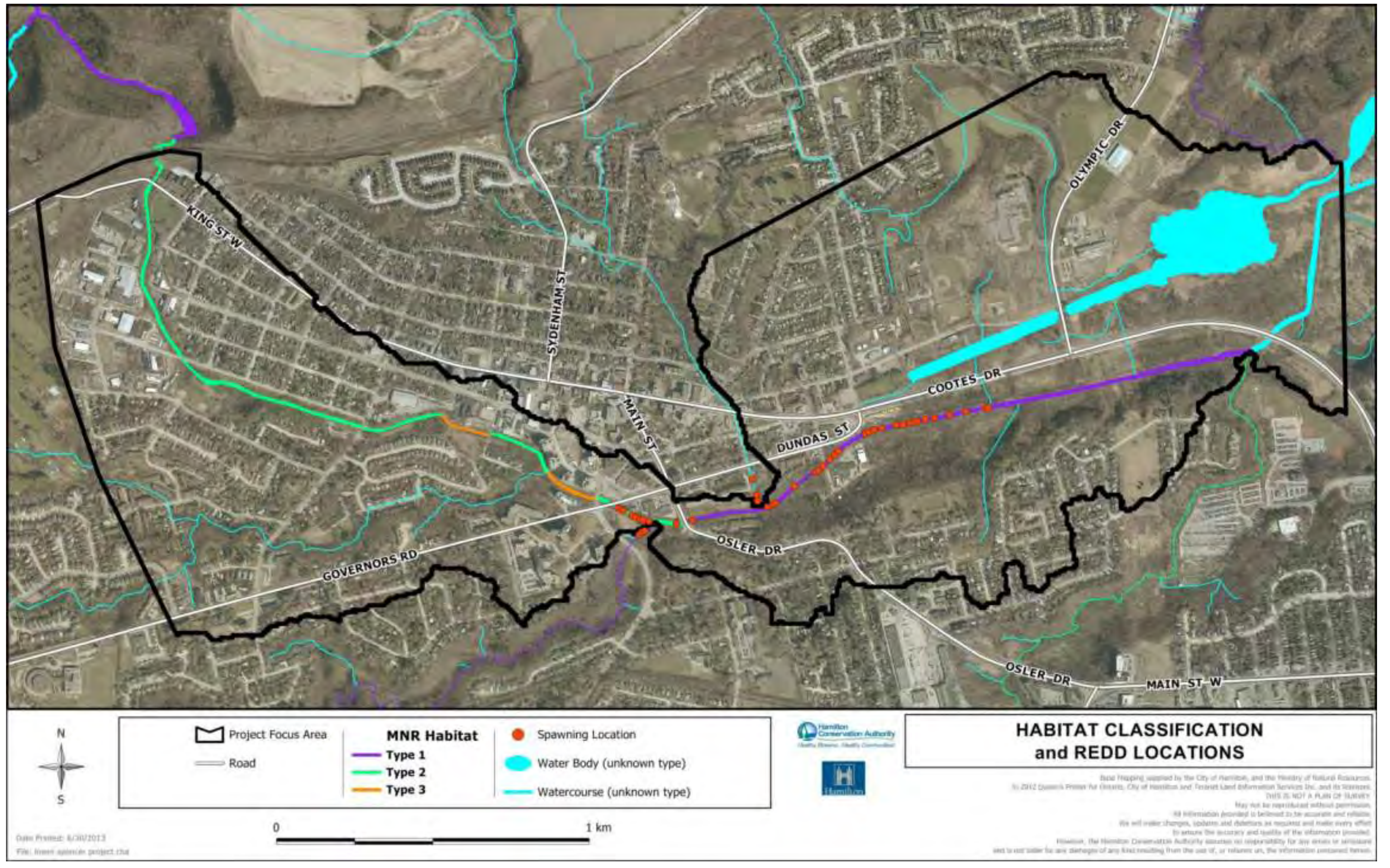
Lower Spencer Integrated Subwatershed EA – Aquatics

Phase 2 – Impact Analysis

Coordination and integration with other disciplines when considering aquatic habitat impact assessment is key. Small changes in the other disciplines can have a large and noticeable impact on the fish and benthic populations in the Lower Spencer. The impact assessments provided by the other team members was reviewed along with the existing conditions information gathered through the phase 1 characterization. This impact assessment will be evaluated under three themes, do nothing, structural and non-structural at the stream reach level.

- **Do nothing**
  - System would remain as is, with barriers, impaired water quality and few sources of food supply. Will degrade if brownfield or remaining natural areas are developed.
- **Structural**
  - As noted in the fluvial geomorphology component, reducing channel slope and reconnecting the floodplain in the upper reaches would allow fish to move further up the system. It would also allow for the development of refugia where fish could rest as they move through the creek corridor.
  - Removal/mitigation of fish barriers would also allow movement of fish further up stream.
- **Non-Structural**
  - Low impact development (LID) measures should improve water quality therefore improving habitat for fish and macroinvertebrates.
  - The reduction in stream flow volume s provided through the use of LID's will also benefit fish by moderating stream flows.
  - Increase in vegetation along the banks of the Lower Spencer through the use of crib walls will increase food supply , shade and shelter.



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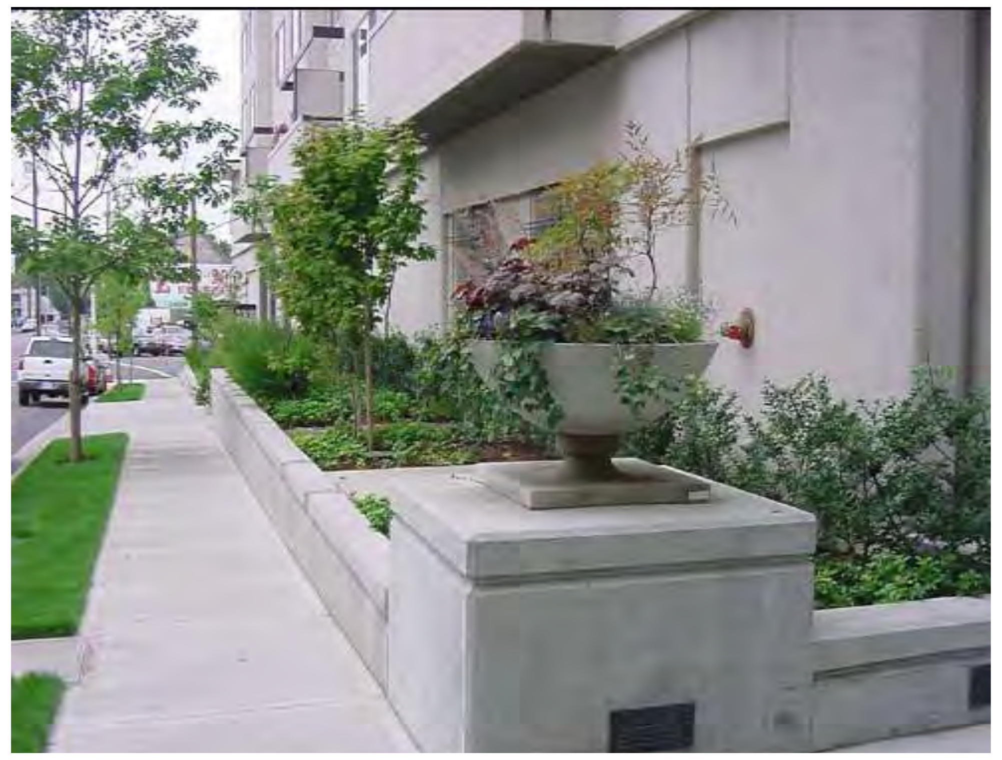
Approach to Impact Assessment

Discipline	Scale of Analysis	Tools Used	Indicators for Measuring Change
Hydrology	Watershed, subwatershed	Stormwater Modeling	Peak flows, base flows
Hydraulics	Reach	Hydraulic Modeling	Flood elevation, velocities, structures in floodplain
Fluvial Geomorphology	Reach	Stream metrics e.g. slope, substrate	Flow regime, velocities
Water Quality	Watershed, Subwatershed	Export Coefficient Modeling, Flow Based Loading	Phosphorus and TSS concentrations
Terrestrial	Landscape , Watershed, Subwatershed	Corridor Analysis ELC Faunal Surveys	Floristic Quality Index Shannon Diversity Index Bird Communities by Type Connectivity
Aquatics	Reach	All of the above	Species Diversity, Richness, Abundance, Fish Life Stages

Evaluation of Alternatives

Alternative	Meets S/W Goals	Environmental	Social	Economic
Flooding				
Do Nothing				
Structural				
Floodplain/ Channel Improvements				
Stormwater Management – At source (Low impact development), conveyance, end-of-pipe				
Non Structural				
Flood Forecasting and Warning				
Creek Maintenance Plan				
Erosion				

Lower Spencer Integrated Subwatershed EA
Low Impact Development



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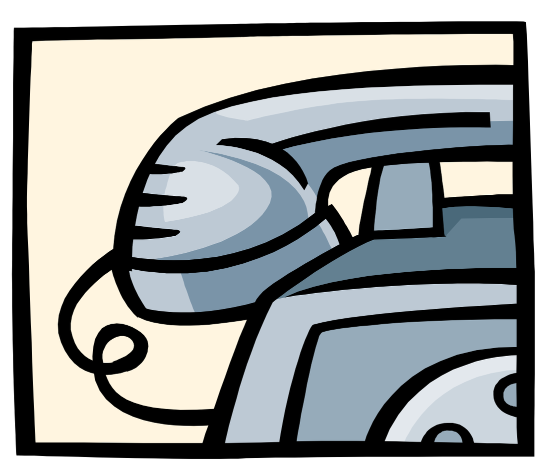
Opportunities for treating stormwater

Source: CVC

Next Steps

- Receive public comments by Tuesday November 12, 2013.
- Complete Impact Assessment Report
- Prepare Implementation Report
- Host Public Information Centre No. 3
- File final Integrated Subwatershed Study Report for 30 day public review period.

How to Provide Your Comments



- Complete a comment sheet
- By Mail
- By Phone
- By Fax
- By e-mail

Please submit comments
no later than
Tuesday November 12, 2013
(two weeks).

Hazel Breton P.Eng.
Hamilton Conservation Authority
838 Mineral Springs Road, P.O. Box 7099
Ancaster, ON L9G 3L3
P: 905-525-2181 ext. 137
F: 905-648-4622
Email:
Hazel.Breton@conservationhamilton.ca

Nahed Ghbn
Senior Project Manager
Hamilton Water Division
Public Works
City of Hamilton
77 James Street North
Suite 320
Hamilton, Ontario L8R 2K3
P: 905-546-2424 ext 6413
F: 905-546-4435
Email: Nahed.Ghbn@hamilton.ca

Thank you for your Participation!

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