



SECTION D – SUBWATERSHED MANAGEMENT STRATEGY

TABLE OF CONTENTS

D 1.0 SUBWATERSHED MANAGEMENT REQUIREMENTS..... 1

D 1.1 Greenspace Management Strategy..... 1

 D 1.1.1 Environmental Constraint Areas 2

 D 1.1.2 Existing Environmental Policy Areas..... 4

 D 1.1.3 Enhancement and Stewardship Areas 4

 D 1.1.4 Buffers..... 5

 D 1.1.5 Aquatic Remediation Strategy..... 7

D 1.2 Lands Outside the Greenspace System 7

 D 1.2.1 Groundwater Recharge..... 7

 D 1.2.2 Restrictions on Infiltration Losses 7

 D 1.2.3 Restrictions on Land Use 7

D 1.3 Water Management Strategy..... 8

 D 1.3.1 Stormwater Quality..... 9

 D 1.3.2 Stormwater Quantity 9

 D 1.3.3 Infiltration 9

D 2.0 IMPLEMENTATION FRAMEWORK..... 10

D 2.1 Interim Land Use Management Strategy 10

D 2.2 Greenspace Management Strategy 10

D 2.3 Aquatic Rehabilitation Strategy 12

D 2.4 Conceptual Trail Strategy 12

D 2.5 Environmental Impact Studies 13

D 2.6 Community Plans 14

D 2.7 Best Management Practices..... 15

D 2.8 Tree Protection 16

D 2.9 Adaptive Management Strategy (Monitoring) 16

D 3.0 SUMMARY RESOLUTION OF ISSUES AND PROBLEMS 18

D 4.0 KEY RECOMMENDATIONS 21

TABLES

Table D 2.5.1 Scoped and Full Site E.I.S. Requirements in the Hespeler West Subwatersheds follows 14

Table D.2.9.1a&b Monitoring Program – Part A: Creek Systems Part B: Creek Systems,
Part B: Natural Heritage System Monitoring follows 17

Table D 3.0.1 Subwatershed Objectives, Issues and Actions 19





D 1.0 SUBWATERSHED MANAGEMENT REQUIREMENTS

The initial phases of the Hespeler West Subwatersheds Study (Sections A to C) established background information, performed detailed studies and provide an environmental analysis for the area. Based on the information documented in these sections, the Management Plan (Section D) recommends requirements and criteria to be implemented across the subwatershed to preserve or enhance existing environmental features while allowing development to proceed in other areas.

The Hespeler West subwatersheds are characterized into their three specific subwatersheds when describing the management requirements. These are the same areas described in Section C that form the study area.

- East Creek subwatershed.
- Middle Creek subwatershed.
- West Creek subwatershed.

Management approaches will consider the following objectives:

- Any management strategy should embrace the fact that human activity will continue within the subwatershed and that urbanization within the Official Plan designated area is imminent.
- Subwatershed management strategies must meet Federal Fisheries and Oceans – “No Net Loss” policy objectives for fisheries habitat.
- In dealing with impact assessment and alternative strategy evaluation, it is necessary to concurrently address the requirements of the economic, social and natural (abiotic and biotic) environment.
- Stormwater management practices should, to the greatest extent possible, preserve the existing

hydrologic regime, including surface and groundwater flows by maintaining the volume and distribution of groundwater recharge / discharge in the subwatershed.

- Land use proposed for the urban area should complement the recharge / discharge characteristics of the subwatersheds, enhance and protect terrestrial resources (including corridors) and stream systems.
- Natural Heritage provisions of the Provincial Policy Statement and the Region’s and Cambridge’s Official Plan should be implemented in existing and new urban areas.
- A Greenspace Management Plan should form the basis for the planning and strategy management of the natural heritage system in the subwatershed. This plan should be designed to ensure that natural features and functions will be maintained and improved in a robust and adequate manner, minimizing the need for intervention and ongoing management on the part of the City and other agencies.
- Opportunities for restoration / rehabilitation of degraded resources should be identified.

D 1.1 Greenspace Management Strategy

The Greenspace Management Strategy (GMS) is intended to reflect the key features that will be protected in the subwatershed, and the key management measures to ensure protection. The GMS is comprised of the following components; management tools for implementation are described in subsequent sections and the Aquatic Rehabilitation and Community Trail Strategies are listed separately due to interconnective nature and criteria of the strategies related to the ecosystem components they are managing.



1. Natural Heritage System (Core areas, corridors and linkages, buffers and enhancement and stewardship areas).
2. Aquatic Rehabilitation Strategy.
3. Community Trail Strategy.
4. Environmental Impact Assessment (E.I.S.) Requirements.

- C. Buffers.
- D. Linkages.
- E. Enhancement and Stewardship Areas.

The Natural Heritage System is the foundation of the Greenspace Management Strategy. It is comprised of five important components:

Core Areas are upland and wetland habitats comprised of the following components:

- A. Core Areas.
- B. Aquatic Habitat.

- Environmental Policy Areas (PSW, ESPA, LSNA).
- Environmental Constraint Areas (High and Medium).
- Regulatory floodplain area.

To summarize, the following chart indicates the relationship of these features / terminology.

Greenspace Management Strategy					
Aquatic Remediation Strategy	(Refer to Section D 2.3)				
Community Trail Strategy	(Refer to Section D 2.4)				
EIS Requirements	(Refer to Section D 2.5)				
Natural Heritage System	Core Areas	Aquatic Habitat	Buffers	Linkages	Enhancement and Stewardship Areas
	<ul style="list-style-type: none"> - Environmental Policy Areas (PSW, ESPA, LSNA) - Environmental Constraint Areas (High) - Regulatory Floodplain Areas 				

These features have individual constraints as well as collective functions potentially affected by development that are addressed in detail below. Constraints associated with vegetation and wildlife components, and environmental policy areas are identified on [Figures B 8.3.3](#) and [C 3.3.1](#) respectively.

D 1.1.1 Environmental Constraint Areas

Buffers, Linkages and Enhancement Areas were discussed in detail in Section C, and their implementation under the preferred management option is outlined below. Implementation of the preferred Aquatic Habitat management option is discussed in Section D 2.3. Implementation aspects for Environmental Policy Areas and Constraint Areas are presented below.

Environmental Constraint Areas are composed of sensitive and/or significant biological and physical resources. They include High and Medium constraint features. Terrestrial (i.e., vegetation and wildlife) constraints have been identified as part of this study and are depicted on [Figure B 8.3.3](#). These constraints are an amalgamation of the environmental constraints related to steep slopes, vegetation communities and wildlife inventories completed as part of this study. Watercourse systems and related fish habitat constraints are contained within, or absorbed by the terrestrial constraint areas. Groundwater constraints do exist within these features and buffers however, for areas





outside these features, it is not considered a limiting factor to development provided that the Stormwater Management Strategy and Groundwater Protection Strategy recommendations are implemented.

Terrestrial constraints are assigned to vegetation features that, based on an assessment of vegetation and wildlife resources, are considered constraints to future development. The specific attributes used in the terrestrial constraint assessment can be viewed in **Appendix J5** and **Appendix J7**. **Appendix J6** lists the breakdown of scores.

High constraint terrestrial features are identified on [Figure B 8.3.3](#). They are predominantly associated with wetlands in the Maple Grove or Speed River Provincially Significant Wetland (PSW) Complexes. They are of high quality and sensitivity, containing significant species, high species diversity, and seasonally wet soils. Other high constraint features are those associated with steep slopes.

High Constraint areas are core areas of the Greenspace Strategy where development, encroachment and stormwater management facilities (i.e., ponds) are not permitted as per the Provincial Policy Statement, Regional and City Plan policies. These constraints are associated with:

- The watercourses and associated fish habitat;
- Regulatory floodplain associated with East, Middle and West creeks;
- Provincially Significant Wetlands;
- Environmentally Significant Policy Areas (if so designated by the Region); and
- Areas with steep slopes.

Protection can be achieved by designating the features Class 1 (Significant Natural Features) Open Space, as defined in the City of Cambridge Official Plan, and zoning them OSI.

In the case of wetlands, buffers are recommended (see following sections). Steep slopes adjacent to the creeks valleys and Speed River valley should be protected with an open space designation and with development setbacks applied as recommended in this study or refined through the completion of site-specific geotechnical investigations. Slope setback requirements will be detailed at the draft plan of subdivision stage of development.

Medium constraint features are identified on [Figure B 8.3.3](#), consisting of terrestrial features that are often located close to high constraint areas. They are associated with imperfectly drained areas, moderate slopes, successional areas, or areas containing lesser concentrations of significant species. While they are not as sensitive to development as high constraint lands, their features and functions frequently support those of the high constraint features. Wherever possible, they will be integrated as part of the Natural Heritage System, as natural features, or supporting Complementary Land Uses (including school playgrounds, stormwater management facilities and other open spaces), areas for trail development or as Enhancement Areas. A list of complementary land uses should be prepared as part of the Community Plan and updated as additional information on this alternative management technique becomes available. At the time of development applications in the subwatershed, the municipal Zoning By-law should be amended to recognize the land use restrictions on these lands as outlined in Section C.

In the case of hedgerows, integration may be difficult due to grading or other considerations unless particular features are taken into account in the layout of land uses. Compensation for hedgerow loss or fragmentation should take the form of replacement plantings in strategic areas in order to maintain and enhance existing functions.



Areas outside the High and Medium constraint (or Low Constraint) features are primarily agricultural fields and cultural landscape features, which are generally available for development, stormwater management, and roads. Standard policies and guidelines regarding the density of development, stormwater management, and servicing applies to these areas. Agricultural fields currently provide for extensive movement of small to large mammals, amphibians and reptilian species, which will not occur under urban conditions. Conversion of specific areas to naturalized buffer within the Enhancement Area is recommended under the Greenspace Management Strategy to offset the loss of ecological functions associated with urbanization of the agricultural lands.

D 1.1.2 Existing Environmental Policy Areas

Environmental Policy Areas are existing planning designations assigned to areas of the greenspace strategy. They represent natural heritage features that have been identified as significant either at the provincial, regional or local (City) levels. Existing Environmental Policy Areas within the study area may include the following:

- Fisheries Habitat – [Figure A 2.2.6](#) (City Plan Map 13).
- Provincially Significant and Locally Significant Wetlands – [Figure A 2.2.3](#) (City Plan Map 8).
- Locally Significant Natural Areas (LSNAs) – [Figure A 2.2.4](#) (City Plan Map 9).
- Class 1 (Significant Natural Features) Open Space District zoned lands – [Figure A 2.2.2](#) (City Plan Map 15).
- Regulatory floodplain associated with the Speed River but not shown for the Hespeler West subwatersheds – [Figure A 2.2.5](#) (City Plan Map 10).

Existing Environmental Policy Areas within the subwatershed do not yet include any Environmentally Sensitive Policy Areas (ESPAs).

These features have development constraints associated with them that are addressed by various management approaches as discussed in this chapter. The difference between Natural Heritage Constraints (such as steep slopes) and Environmental Policy Areas (such as ESPAs) is that Policy Areas are formally designated in land use policy related to constraint attributes. Overlap between these two criteria or description does exist.

[Figure A 2.2.4](#) identifies a Locally Significant Natural Area near Arriscraft / Idylwild Estates that has been deferred from the City of Cambridge Official Plan approval. This deferral, identified as Deferral #20 on the map is based on a disagreement as to the environmental significance of this wooded area. It should be noted that through the Hespeler West Subwatersheds Study this area has now been identified as part of the Maple Grove Provincially Significant Wetland Complex.

D 1.1.3 Enhancement and Stewardship Areas

Enhancement of the basic stream/wetland corridor is considered fundamental to ensuring that ecological functions will be retained in this landscape, and to minimize ongoing management requirements by the City.

Conceptual linkages and enhancement areas were noted on [Figure C.1.2.1](#) and more detailed opportunities have been identified on the Greenspace Management Strategy ([Figure C 3.3.1](#)). They are considered essential to substantially retain and enhance existing wildlife habitat functions under urbanized conditions. Lands within the Enhancement Area designation are not subject to any specific development restrictions, but are intended to be



carefully considered for complementary land uses (see Section C 3.3.3) or naturalization during Community Planning. Under existing agricultural and residential uses, the identified Enhancement Areas are areas where stewardship initiatives should ideally be focused.

The intention is to provide a natural corridor 200 to 300 metres in width along Middle Creek, which substantially maintains existing wildlife movements, reconnect fragmented sections and eventually reinforces core habitats to offset the encroachment effects of urban proximity. On East Creek, a narrower linkage (minimum 50 metres) would be provided to connect the PSW areas and the Speed River corridor. In the upper subwatershed, enhancement areas are intended as strategic additions of habitat where the extent of forest interior could be readily increased, or to create connections to the proposed Countryside Line area north of Middle Block Road.

On West Creek, a narrow linkage based on existing features is presented with enhancement proposed along Boxwood Drive and stewardship along Speedsville Road near the creek channel.

Enhancement approaches are recommended using available tools and mechanisms to improve the extent and diversity of naturalized vegetation cover, protect habitat characteristics, maintain wildlife corridor connections, and allow for pedestrian trail development. These approaches, discussed in Section C. 3.3 include naturalizing of adjoining agricultural lands in specified corridor and linkage areas and supplementing riparian vegetation along waterways where it is currently deficient.

[Figure C 3.3.1](#) noted Stewardship Areas in the vicinity of existing residential developments. These are areas close to core features and watercourses where focused landowner contact and stewardship programs would be beneficial. The intent would be to promote education on

sustainable practices in these areas including rehabilitation of degraded areas, naturalization close to sensitive features, planting of native species, and ecosystem monitoring. Stewardship Areas do not contain any restrictions on existing land uses.

D 1.1.4 Buffers

Vegetated buffers serve an important function as described in Sections C. Buffers are normally designated as open space (Class 1 (Significant Natural Features) Open Space using City of Cambridge terminology). Public ownership of the buffer areas preserves the integrity and function of the buffer, and their ongoing management. The ownership of buffers, their land use designation and the possible use of Conservation Easements will be negotiated at the Community Plan stage. On existing privately owned residential lands, buffers will only become applicable when a zoning change and/or a development plan is submitted and approved for the subject lands. Existing land uses are not affected but residents and landowners are encouraged to seek advice on how to minimize encroachment into these areas when requesting building permits for pools, decks and minor building additions. Significant developments may require the completion of an Environmental Impact Study in support of the proposal (see Section D 2.5).

Three options regarding Natural Heritage System management were presented and evaluated in Section C. The options included:

- Option 1 - No Buffers – considered unacceptable under Provincial, Regional, City and GRCA Policies;
- Option 2 – 30 metre buffers – considered adequate to protect local scale tree protection, wetland hydrogeology and water quality functions,



but inadequate to address corridor functions in the areas to be converted from agriculture to urban uses, and therefore unacceptable under Provincial, Regional, City and GRCA Policies. Subject to a Scoped EIS, buffers could potentially be reduced (minimum of 15 metres recommended) adjacent to upland habitat with successional cover; and

- Option 3 – Enhanced Corridor - 30 metre Buffers supplemented with Enhancement Areas, creating a corridor 200 to 300 metres wide along Middle Creek, which would substantially maintain existing wildlife movements, reconnect fragmented sections, and eventually reinforce core habitats to offset the encroachment effects of urban proximity. On East Creek, a narrower linkage (minimum 50 metres) would be provided to connect the PSW areas and the Speed River corridor. This is considered adequate to address corridor functions under future urban conditions and therefore acceptable under Provincial, Regional, City and GRCA Policies. Subject to a Scoped EIS, buffers could potentially be reduced (minimum of 15 metres recommended) adjacent to upland habitat with successional cover.

On West Creek, a similar enhanced corridor (approximately 50 m) would take advantage of existing natural heritage features in addition to enhancement and stewardship opportunities.

These approaches are described on **Table C 3.3.1 (NHS Alternative matrix)** with regard to their impact to vegetation, wildlife, functions, future land use, trails and recreation. Option 3 (Enhanced Corridor) is the recommended strategy as it is most effective in a) maintaining wetland habitats, wildlife, and corridor functions in an urbanized setting, b) minimizing future management

requirements by the City and other agencies to maintain habitat quality and functions. [Figure C 3.3.1](#) therefore reflects Option 3.

The existing landscape contains successional and cultural features (e.g., plantation) identified as medium constraint. Under existing conditions, these features contribute to ecological functions in the subwatershed by providing additional habitat structure, species diversity, and buffering from existing residential and agricultural uses. When more of the subwatersheds become urbanized, these functions will increase in importance. Wherever possible, these features should be incorporated into enhancement areas. They are not considered large enough to warrant dedicated buffers, but are to be protected from development through the establishment of a limit of development on (1) metre beyond the dripline of the outermost tree cover, where trees are the dominant cover, and at the limit of natural vegetation cover where successional cover (i.e., shrubs or herbaceous cover) is the dominant cover. The intention is to ensure that grading does not extend into these features. Based on consideration in the Community Planning process, most of these features should be further protected by the placement of enhancement areas as recommended under the Greenspace Management Strategy.

The implementation of the buffer and enhancement areas will require detailed negotiations at the Community Plan stage. Section C also discussed possible use of Complementary Land Uses to further support the corridor functions through the future urban area.

The recommended buffer standards meet or exceed those generally recommended by the Province, Region, City and GRCA, which are as follows:

- ESPA: 1.5 x the crown radius (trunk to dripline) measured outwards from the dripline, minimum 7



metres with no significant, vulnerable or rare species.

- Provincially Significant Wetland: Minimum 30 metres from boundary edge.
- Coldwater (perennial) Stream: Minimum 30 metres from top of bank, both sides.
- Warmwater (intermittent) Stream: Minimum 15 metres from top of bank, both sides.
- Hedgerows: Dripline buffer, minimum 7 metres. Temporary buffer during construction of 1.5 x the crown radius (trunk to dripline) or 7 metre minimum from trunk.

D 1.1.5 Aquatic Remediation Strategy

Rehabilitation scenarios for the creeks within the Hespeler West subwatersheds were identified in Section C and options were discussed for this highly altered fluvial system. The advantages and disadvantages of these suggested approaches were discussed and recommendations made regarding system-wide options:

1. Leave the systems as they are.
2. Establish naturally vegetated riparian buffers in all areas where none currently exist.
3. Protect and enhance existing buffers.
4. Remove the on-line ponds.
5. Remove or modify culverts that are barriers to upstream fish migration.
6. Conduct site-specific remediation strategies for immediate problem areas.

Section C describes the preferred alternative to rehabilitate the aquatic system as opportunities arise focused on the three creeks. These opportunities will be further identified during the Community Plan process. They are in order of priority: Option 3, 2 & 6, 5, and 4.

System-wide and site specific options will require final design consideration. The design process will require extensive public and agency consultation prior to their approval and implementation.

D 1.2 Lands Outside the Greenspace System

D 1.2.1 Groundwater Recharge

The groundwater aquifer provides base flow to both systems; the Chilligo and Hespeler West subwatershed creeks. Maintaining infiltration rates will need to be considered during the community plan and subdivision scale stages. Buffer requirements outlined in Section D 1.1.4 provides protection for high and medium constraint lands from groundwater disruption related to development.

D 1.2.2 Restrictions on Infiltration Losses

Surfacewater infiltration on lands surrounding the three creeks will be managed through subdivision approval and site plan control. Maintaining density requirements and lot sizes that maximize porous surface area and therefore infiltration is a prime consideration of this plan and the subsequent community planning process. This is due to the importance of base flow to both systems: Hespeler West subwatersheds and the adjacent Chilligo Creek system and the desire to reduce the intermittent nature of the present system.

D 1.2.3 Restrictions on Land Use

Land generally north of Middle Creek and Maple Grove Road (outside the current City Urban Area) is an area that is intended to remain rural in nature where agriculture remains the dominant land use. South of this line is an area where urban development will continue to occur and where density and degree of lot coverage may impact



surfacewater infiltration properties of the area. The area identified for development to the year 2016 is outlined in the City of Cambridge Official Plan.

Compatible land uses may be considered in the areas included in the Enhancement Areas (see Section C 1.2 and [Figure C 1.2.1](#)). These compatible land uses are primarily open space related recreational uses such as soccer fields, baseball diamonds, trails and viewing areas.

D 1.3 Water Management Strategy

The proposed Water Management Strategy has been based on the detailed studies outlined in the previous sections. This overall strategy has three main goals:

- To maximize infiltration across the subwatershed;
- To protect the quality of the surfacewater and the groundwater in the subwatershed; and,
- To minimize the impact of post-development conditions on downstream areas.

These goals will be achieved with a combination of facilities across the catchments (i.e., one end-of-pipe facility is not satisfactory). Section C 3.2 summarizes the development criteria (i.e., parameters, targets and the stormwater management components) for the various catchments generically across the study area. Implementation of this criteria will be addressed by a preliminary Stormwater Management Plan at the Plan of Subdivision stage.

Wetland cover is strongly reliant on discrete surface, and in the lower subwatersheds, groundwater conditions within individual subcatchments. The maintenance of these linkages between the physical and biologic systems is critical to the protection of habitats reliant on groundwater recharge and discharge. Infrastructure should avoid any

major change to hydrology and water quality as it is discharged into receiving watercourse.

Due to the altered nature of all three watercourses and parts of the subwatershed areas, the stormwater management parameters are important in enhancing and improving these areas. This report has provided general guidelines for a variety of parameters related to stormwater quantity and quality (see Section C 3.2.2) which must be considered. Monitoring of the facilities (see Section D 2.10) during and after construction will confirm that they are operating properly. It is therefore imperative that all targets be met where flows are discharged from the developing areas.

The Water Management Strategy includes primary facilities such as: lot-level infiltration, soakaway pits, or extended detention wetlands. Secondary facilities may also be implemented which will include: oil/grit separators, rooftop and parking lot controls, filter strips, buffer strips, grassed swales, and reduced lot grading outside the building envelope.

All facilities will be required to meet stormwater management targets and will generally be designed in accordance with the standard practices at the time of the development application submission (e.g., Stormwater Management Practices (SWMP) Planning and Design Manual, MOEE, 1994 or the most recent version), and the City of Cambridge Guidelines. The selection and siting of facilities must account for site specific hydrogeologic considerations such as soil infiltration potential and connectivity with the regional aquifer and potential for groundwater contamination. Performance criteria for the overall management strategy are detailed in Section D 2.10. These performance criteria will take precedence over any performance criteria presented in the SWMP Planning and Design manual.



Many facilities will also provide stormwater management for more than one landowner. These facilities are provided by the developer of the lands with the City cost-sharing for any oversizing required to accommodate external lands draining to the facilities.

D 1.3.1 Stormwater Quality

A portion of the developable area of the subwatershed recharges to the regional aquifer contributing to both systems: Hespeler West creeks and Chilligo Creek. Therefore, maintaining existing water quality is necessary to protect the function and quality of this aquifer and to protect downstream fisheries and fish habitat. Level 1 water quality control (MOEE 1994) is required based on habitat issues related to the Speed River and due to the existence of the Speed River PSW.

Stormwater management practices (SWMP) are described and evaluated in Section C 3.2. These include both primary and secondary control methods and are described under the three categories of lot level controls, conveyance controls and end of pipe controls. It is anticipated that a combination of several of the measures outlined in this section will be required to meet water quality targets.

D 1.3.2 Stormwater Quantity

As discussed above, stormwater management practices (SWMP) are described and evaluated in Section C 3.2. These include both primary and secondary control methods and are described under the three categories of lot level controls, conveyance controls and end of pipe controls. It is anticipated that a combination of several of the measures outlined in this section will be required to meet water quantity targets. Generally, post development conditions will need to match pre development conditions and they will need to meet instream erosion targets. In addition, any

discharge to the Speed River PSW will require volume control.

Stormwater management (SWM) pond locations for end of pipe controls have not been identified within the study area. Their locations and their impact on natural heritage values and buffer conditions such as proximity to floodplains and sensitive vegetation communities will need to be evaluated as part of the more specific community planning and site control stages.

It is recommended that the frequency of flooding on East Creek at the Beavertdale Road crossing be reduced by upgrading the culvert structure to pass the 25-year event discharge as a minimum. This should be investigated during any reconstruction of Beavertdale Road

D 1.3.3 Infiltration

Infiltration rates are generally high over most of the study area due to the sand and gravel deposits. These recharge rates must be maintained or enhanced for any new phase of development. A “no-net-loss” approach should be implemented until the relationship of groundwater infiltration with Chilligo Creek is fully understood as our investigations have shown that groundwater contributions to Ellis Creek are important. We understand that a subwatershed study for Chilligo Creek is being considered by the GRCA at the present time.



D 2.0 IMPLEMENTATION FRAMEWORK

D 2.1 Interim Land Use Management Strategy

The Hespeler West subwatersheds are comprised of natural heritage features and functions that are inter-related. These features are identified and defined with varying degrees of environmental sensitivity. The management premise is that you protect those areas and functions that are certain to be environmentally significant and provide opportunities to further assess those areas with marginal environmental significance or sensitivity in more specific planning exercises and development processes that are prerequisites to development. Implementation of these management options which reflect the goals and objectives of the subwatershed study are discussed under the following headings:

- D 2.1 Interim Land Use Management Strategy
- D 2.2 Greenspace Management Strategy
- D 2.3 Aquatic Rehabilitation Strategy
- D 2.4 Conceptual Trail Strategy
- D 2.5 Environmental Impact Studies (EISs)
- D 2.6 Community Plan
- D 2.7 Best Management Practices
- D 2.8 Tree Protection
- D 2.9 Adaptive Management Strategy

While the majority of the information outlined in the foregoing headings can be applied to the whole of the study area, specific components will generally be

applicable only to the area anticipated for development as outlined in the City of Cambridge Official Plan. This area is generally described as south of Maple Grove Road (see [Figure C 2.1.1](#)). The proposed Countryside Line may ultimately form the limit of development but no decision is expected to be taken until this matter is examined in greater detail during the next Official Plan review.

The City of Cambridge Official Plan (OP) and Region of Waterloo Official Policies Plan (ROPP) should be amended to incorporate recommendations from the Hespeler West Subwatersheds Study. Specifically, the amendments would include:

ROPP	PSW, candidate ESPAs.
City OP	PSW, LSNA, floodline, Community Plan recommendations (i.e., buffers).

These amendments should be completed as soon as possible upon the completion of the Subwatershed Study to ensure adequate protection. Public ownership of these areas by the City or Conservation Authority would increase the level of protection for these features.

D 2.2 Greenspace Management Strategy

The Greenspace Management Strategy is comprised of a Natural Heritage System, Aquatic Rehabilitation Strategy, Conceptual Trail Strategy and EIS requirements. The Greenspace Management Strategy will protect the key environmental features associated with the Hespeler West subwatersheds and preserve their functions. These features and functions are included due to their role and significance in achieving the goals and objectives of the Subwatershed Study. The Natural Heritage System can be described as being comprised of Core Areas (which include existing and proposed LSNAs, in addition to other High Constraint Areas, Regulatory Floodplains); Aquatic Habitat;





Buffers; Linkages; and Enhancement and Stewardship Areas. The organization chart first introduced in Section A is provided again to assist in explanation. The Aquatic Remediation Strategy, Community Trail Strategy, and EIS

Requirements are explained under separate sections (D 2.3 to D 2.5) due to their importance in the implementation of the study.

Greenspace Management Strategy					
Aquatic Remediation Strategy	(Refer to Section D 2.3)				
Community Trail Strategy	(Refer to Section D 2.4)				
EIS Requirements	(Refer to Section D 2.5)				
Natural Heritage System	Core Areas	Aquatic Habitat	Buffers	Linkages	Enhancement and Stewardship Areas
	<ul style="list-style-type: none"> - Environmental Policy Areas (PSW, ESPA, LSNA) - Environmental Constraint Areas (High) - Regulatory Floodplain Areas 				

It is recommended that the Natural Heritage System components appear on appropriate mapping and with appropriate text in the Community Plan to support the goals and objectives of the Hespeler West Subwatersheds Study. These mapping designations would include Natural Heritage Corridors, Open Space, Provincially Significant Wetlands, Locally Significant Natural Areas and Environmentally Sensitive Policy Area designations, buffers and perhaps Enhancement and Stewardship Areas to protect and enhance the environmental features contained within their boundaries (see [Figure C 3.3.1](#)).

These Natural Heritage System components and features can be complemented through the Community Plan process by the establishment of parks and open spaces and other complementary land uses consistent with the Greenspace Management Strategy (see Section C 3.3 – Management Alternatives). This may include portions of the Conceptual Trail Strategy (as per Section D 2.4) within those areas that are not sensitive to environmental disturbance.

Opportunities by both public and private interests to enhance habitat cover and linkage functions outside

existing Core Natural Heritage System areas (i.e., buffers and enhancement areas) include:

- consolidation of fragmented natural habitats or irregular natural feature boundaries in the lower and upper Subwatershed using naturalization, reforestation, and/or habitat restoration;
- protection of successional habitats on the same basis as more mature habitats; successional lands support diverse and some specialized species as well as provide valuable functions (e.g., water quality enhancement);
- enhancement of stream and wetland corridors to exceed existing vegetated buffer widths to achieve a total primary corridor width of 200 to 300 m along Middle Creek; on East Creek, a narrower linkage (min 50 m) would be provided to connect the PSW areas and the Speed River corridor;
- naturalization of portions of public open space and private recreational lands;
- integration of new or established features (hedgerows, small woodlots, successional features, utility easements) as linkages; and
- landscape-level management of species diversity, through the widespread promotion and use of





native plant materials and the control of invasive, non-native species including areas such as streetscapes, public parks, and stormwater facilities. This would be undertaken by the City and developers.

In order to successfully integrate identified natural features and expand opportunities in the context of creating a net gain of local corridor functions to offset the change in land use, consideration must be given at the Community Plan and Subdivision level to ensure that:

- core features reliant on local overland flows and groundwater conditions are adequately protected;
- features and their natural functions and attributes are protected, by means of buffering, fencing, development setbacks and other site specific management approaches;
- habitat augmentation, restoration and stewardship occurs to reinforce habitat cover in the three Hespeler West creek corridors, improve habitat connectivity, and enhance ecosystem functions after development (includes conservation easements on private lands, buffers on public lands, naturalization of disturbed or degraded lands to be dedicated as public parks, stormwater management wetlands, naturalized utility easements, culvert retrofitting for wildlife movement);
- locations and standards for trails, stormwater management facilities, and other infrastructure are compatible and protective of natural features and functions in the long term; and
- Landownership (private versus public versus Conservation Easements) of natural features.

Buffers provide a key component in the Natural Heritage System. A substantial increase in natural cover can be

most effectively achieved through the adequate buffering of existing natural cover (forests, wetlands), riparian corridors and stormwater facilities, and naturalization of utility corridors wherever available. Buffers (minimum of 30 metres adjacent to the core natural features) and enhancement areas to retain ecological functions under future conditions are consistent with the “adjacent land” definition in the Provincial Policy Statement. Normally, any adjustments to the recommended buffers and other protective measures for these features are determined on the basis of site specific Environmental Impact Studies (see Scoped EIS Requirements). The ROPP provide a definition for the expression “contiguous to” that may be more or less than the suggested buffer widths. This is dependant on the ESPA location and site conditions.

The plan will be implemented by the City of Cambridge in conjunction with the major stakeholders and relevant government agencies. The timing of implementation for the various sections of the Greenspace Management Strategy should be at the Community Plan, Draft Plan of Subdivision, and Scoped EIS reports for the specific areas of the subwatershed. It is the intent that the Community Plan for applicable areas of the subwatershed will implement the recommendations of the subwatershed Management Strategy through the formulation of specific policies. The Greenspace Management Strategy provides the framework for protection, enhancement, and use of ecological resources in the area.

The Greenspace Management Strategy for the subwatershed incorporates the following key features:

- Identify responsible agencies for each component of the open space;
- Identify ownership options of the ecological resources (private / public / easements);
- Incorporate natural regeneration and naturalization of buffers;





- Incorporate the Aquatic Rehabilitation Plan for the conservation and rehabilitation of the creek systems and associated wetlands;
- Develop community accessible trails within the Open Space that are ecologically sustainable;
- Conduct Environmental Impact Studies where proposals exceed protective thresholds, or where information to support detail design is considered inadequate;
- Outline and initiate a monitoring program that defines limits of acceptable change for sedimentation, bank stability, aquatic and riparian vegetation for the open space areas;
- Further define buffers for wetlands, enhancement areas, hedgerows and riparian communities; and
- Develop and implement public education and stewardship programs outlining terrestrial protection, conservation, rehabilitation/enhancement, principles of the Community Trails, approach to personal property use, community stewardship and monitoring.

Many of these items will be more fully investigated through a subsequent Community Plan and implementing Official Plan amendment policies that will designate land use.

D 2.3 Aquatic Rehabilitation Strategy

The preferred management option regarding the management of the related watercourses within the study area includes retaining components while rehabilitating other portions of the channel. These actions will assist in rehabilitating the entire watercourse systems to an improved state that better reflects a stable and functioning natural system. These actions will be directed by the recommendations outlined in Section B and C and should be implemented through an Aquatic Systems Rehabilitation Strategy for Hespeler West (see [Figure C 3.1.3](#)).

Portions of Middle Creek are subject to the Drainage Act (reference should be made to the Hunsperger Drain Report from the City of Cambridge) and as such, any future work in the area should consider this status. All recommendations of the Hespeler West Subwatersheds Study that pertain to the Hunsperger Drain are to be considered in any future Drainage Report. If future works do impact the Drain, the City will be required to modify the catchment area and update the assessment. We note that abandonment will require a Drainage Report, as prepared by a Professional Engineer, however, there is no priority placed on abandonment as a result of this study. We also note that the City may be the largest landowner within the catchment area and may petition for abandonment.

D 2.4 Conceptual Trail Strategy

It is necessary that a Community Trail system be supplied by this Conceptual Trail Strategy and through more comprehensive trail analysis at the Community Plan stage. The general goals of the trail system should be:

- to encourage passive recreational use of least environmentally sensitive or most resilient natural areas;
- to provide non-motorized options for people in a way that is efficient, convenient, enjoyable, and reasonably safe;
- to channel pedestrian traffic away from areas of special ecological sensitivity, steep slopes, areas of erosion, and to discourage the creation of new unauthorized trails;
- to provide a degree of pedestrian and wildlife safety in a natural setting;
- to provide opportunities for the appreciation of nature;
- to design trail treads with pervious material;



- to provide a healthier, better informed, appreciated, human/environment relationship;
 - to facilitate efficient maintenance by parks staff; and
 - to provide connection to existing and future communities and to serve as links in the trail network spanning Cambridge.
- Locally Significant Natural Areas (not designated Open Space);
 - Medium constraint woodlots / forested areas (not within ESPA or designated LSNA);
 - Groundwater infiltration and discharge zones;
 - Locally significant wetlands (not within ESPA or designated LSNA); and
 - Buffer areas.

The specific components, with conclusions, are described in Section C 3.4. In order to help guarantee the longer-term success of the trail system, participation by the public should be considered.

D 2.5 Environmental Impact Studies

Current policies including the Provincial Policy Statements, Regional OP Policies, and the City OP provide a hierarchy of significance and protection for environmental features. The existing policy framework suggests “No Development” within:

- Provincially Significant Wetland boundaries;
- Existing watercourses of the East, Middle and West Creeks;
- Regulatory floodplain (other than limited development of SWM facilities);
- Approved ESPAs; and
- LSNA designated Class 1 (Significant Natural Feature) Open Space.

The “no development” areas listed cover all high constraint and some medium constraint features identified in this study. Limited development may be considered in the existing policy framework however only after consideration to the environmental significance of features and functions through the completion of supplementary Environmental Impact Study (EIS) investigations relating to proposals for encroachment into:

As outlined in Section C 3.3.3, it is recommended that Option 3 be implemented incorporating a 30 metre buffer surrounding the core natural features as discussed in Section C 3.3.2 and shown on **Table C 3.3.1**. A minimum buffer of 30 metres must be implemented to provide protection to the features and their functions. Option 3 also recommends the supplemental provision of enhancement areas in key areas (see [Figure C 3.3.1](#)) to maintain existing landscape and corridor functions in accordance with provincial, Regional and City policies. Section C 3.3.3 summarized the key components of the system and their rationale.

This subwatershed study has been conducted to the level of a Comprehensive Environmental Impact Study, which defines limits of development and recommended management strategies under future conditions. Scoped or Full Site Environmental Impact Studies should be required where proposals exceed protective thresholds identified in the Subwatershed Plan, or where information to support detail design is considered inadequate. In general, the more extensive the encroachment/interference, the more detailed the required studies to examine alternatives, identify impacts, and recommend means to avoid or reduce impacts. Typically, such EIS investigations must address impacts to surface water, groundwater, vegetation and ecological functions where development of various types is proposed within buffers or protected natural features, or where adequate “functional buffering” is desired (e.g., for



stormwater facility placement and functional design). EIS studies will be completed by the development proponent, to the satisfaction of the City of Cambridge and those public agencies having jurisdiction.

Table D 2.5.1 summarizes EIS requirements in different areas of the subwatershed. Development beyond the 30 metre buffer can usually occur without the need for an EIS, subject to findings of the Community Planning process which will identify the recommended enhancement areas required to provide optimum corridor functions in key areas of the subwatershed. Full service trail development (i.e., asphalt surface) would not be allowed within buffer areas, or natural (limestone screening or wood-chip surface) closer than 15 metres to wetland features except under guidance of an EIS. A groundwater discharge zone has been identified generally located across the slope above the Speed River valley; this is connected to floodplain wetlands along the East and Middle Creeks downstream of Maple Grove Road, and along West Creek. These are sustained by a broadly based shallow water table condition on adjoining lands. Therefore scoped EIS should address groundwater effects within 120 metres of the Creeks in these areas, including consideration of the groundwater assessment factors listed in **Table D 2.5.1**.

Future EIS work may rely on data collected for the Subwatershed Study for up to five (5) years after the adoption of the study by the City. However, updated or more site-specific information may be requested by the City, Region or GRCA depending on the nature of specific proposals.

D 2.6 Community Plans

Community Plans are a requirement of the City of Cambridge. They are described in Section 3.2.1.2 of the Official Plan as a document to:

“...provide guidance and a framework within which approvals for amendment to the Official Plan or for plans of subdivision, zoning, site plans and other applications can be considered, building on other policies of the Official Plan and recommendations of watershed plans and other special studies, to provide a greater level of detail on how an area will develop. They implement such matters as the design and layout of trunk infrastructure, the protection of natural systems and built heritage resources over broad areas, the identification of hazard lands, and the planned function and coordination of individual developments for diverse and compatible land uses.”

Issues that will be more precisely defined in the Community Plans will relate to road and servicing crossings, density of development, identification of areas to be acquired or zones to accomplish the enhancement area functions under future development (in addition to the main buffers recommended in this study), and site specific criteria for the preparation of scoped Environmental Impact Studies. In addition, the Plan should address the issue of sand and gravel deposits currently being extracted, future extraction plans and rehabilitation options that are consistent with the goals of the Greenspace Management Strategy.

Community Plan recommendations must achieve the following management measures:

- identify steps to implement buffers and their policies explaining the criteria for establishing the width, use and location;
- identify the ownership options for the buffers;
- identify steps to implement the aquatic rehabilitation procedures that provide for the improvement of the watercourse systems from an environmental perspective;
- identify steps to implement the Community Trail Strategy goals and methods of creating them as



part of Community Planning and or subdivision plan process;

- provide direction on the implementation of the Water Management Strategy concerning stormwater and infiltration opportunities;
- recognition of approved licences made under the Aggregate Resources Act in conjunction with the final implementation of the Greenspace Management Strategy;
- implementation of an adaptive environmental monitoring strategy that provides for the continuous municipal assessment of the Hespeler West subwatershed ecosystems;
- recognition of the Hespeler West Subwatersheds Study as integral to planning and development within this portion of the City of Cambridge; and
- recognizing that tree protection is an important part of the protection of the natural heritage features identified, policies should be administered to follow the intent of preservation of these areas.

Issues related to phasing of development should also be implemented through the Community Planning process. The purpose of phasing is to identify inter-development timing dependencies for construction of stormwater and environmental management infrastructure which would serve to:

- minimize overall cost;
- minimize environmental impacts due to repeated construction disturbance;
- minimize requirements for temporary works; and
- avoid liability associated with impacts of out-of-phase works.

Typically, new development does not proceed in a sequence which is compatible with the timing and need for

major infrastructure projects. This is particularly true of drainage works. When this occurs, it is necessary to have a good understanding of the dynamics of the proposed system along with all its interdependencies. These include temporary works, SWM facility staging, centralization, stream corridor management and the maintenance of “out-of-phase” linkages. The Community Plan process will confirm servicing requirements that will trigger any necessary Environmental Assessment.

The Greenspace Management Strategy in particular needs to be implemented through the Community Planning process and prior to development occurring so to establish and protect the watercourse and take advantage of rehabilitation opportunities associated with development related infrastructure (e.g., the siting of storm water management facilities). Funding and implementation of the Greenspace Management Strategy may be possible through Development Charges process. Use of the Holding Zone land use designation may be considered for the Greenspace Management Strategy in the interim. There may also be a role in the development community initiating some of the preliminary investigations further in the interim. The City may wish to investigate these possibilities further.

D 2.7 Best Management Practices

Where lands are designated and used for agriculture, agricultural Best Management Practices (BMP's) are recommended to achieve subwatershed goals. These practices, outlined in Section B, are directly related to the protection and management of surfacewater quality and the reduction of non-point pollution sources. Such practices as conservation tillage, crop rotation and contour cropping will assist in the prevention of soil erosion and potential nutrient loading to the related watercourses.



Where lands are designated and used for residential use, residential BMP's are recommended to address issues such as pesticide use on lawns, domestic pet manure, and related issues. These will include issues such as fencing, the elimination of trimming and cutting of the grassed area surrounding the wetlands and creek systems.

Industrial BMPs take the form of compliance with the ISO 14000 Series of Environmental Management Practices, which ensure environmental safeguards are in-place to assist industries in approving contingency plans; and have in place emergency measures that will safeguard the environment and local ecosystems in addition to workplace safety. These programs are voluntary with respect to City and Regional land uses however have become common and required in some Sectors due to the requirements of financial institutions and insurance companies. Besides simply allowing industry to fulfill obligations to governments that may require them to attain ISO 14001 registration, implementation of the standards will help businesses to prevent violations of environmental law. Environmental auditing can improve efficiency by uncovering poor environmental practices in such areas as production and waste management. With an internationally recognized environmental risk management and auditing system in place, corporations will also lower the risk of environmental accidents and improve pollution and hazardous waste control. Companies who are registered to ISO14001 are also expected to compel their suppliers to become compliant with the Standard, thereby creating a trickle-down effect.

The size and magnitude of industrial properties within Hespeler West subwatersheds warrant consideration of this industry standard, in fact Toyota Motor Manufacturing Corporation is registered as to compliance with ISO14001.

D 2.8 Tree Protection

Opportunities to achieve the goal and objectives of the Subwatershed Plan may occur through other related land use processes and regulations. These may include the Region's Tree By-law (By-law No. 99-045) and the City's Tree Management Policies and Guidelines for Development. The Regional Tree By-law applies to all woodlots (rural and urban) 0.8 ha in size or greater. It does not apply to lands under draft plan of approval. The City's Tree Management Policies and Guidelines for New Developments may also provide a mechanism to protect, preserve, manage, replace forested areas within the City (Policy 6.4.1.4). Please note that the terminology used in the Regional Municipality of Waterloo 'Tree By-law' should not be confused with other similar terminology used to describe vegetation resources, such as in Section B 8.3.2.1.

D 2.9 Adaptive Management Strategy (Monitoring)

It is recommended that an Adaptive Management / Monitoring Strategy be adopted and implemented on the subwatersheds. This section recommends that public agencies and public stewardship programs undertake the Systems and Post-Development Monitoring and that the During Development Program be undertaken by the developer. The During Development Program includes three phases: 1) pre-development; 2) during construction; and 3) guarantee period. The proponent is responsible for monitoring surfacewater, groundwater, and terrestrial features which could potentially be impacted by construction.

A Monitoring Program is required to ensure the required management practices are performing as designed and to determine whether the High and Medium Constraint areas are affected by future development. A comprehensive



maintenance and monitoring program is required to ensure the proposed management measures for the development are adequate. The response program will also provide guidance for appropriate response actions if problems are identified.

The monitoring program is in three parts which includes:

- System Monitoring;
- During Development Monitoring; and
- Post-development Monitoring.

The proposed proponents for the During Development Monitoring would be the developer. The proposed System Monitoring will occur across the Hespeler West watershed and will be carried out by the municipality and other agencies or groups (e.g., the Grand River Conservation Authority, the Ministry of Natural Resources, the Region of Waterloo or community groups). A table showing terrestrial aspects of the Natural Heritage System is provided. The scope of the During Development and Post Development Monitoring are limited to the developing areas. The proposed proponents for the Post-Development Monitoring would be the municipality. **Table D 2.9.1a** outlines the base monitoring program components, requirements, and proponents.

Other parameters to be monitored as part of the Program are:

Groundwater: Groundwater levels should be measured during the spring, summer and fall at appropriate monitoring wells. Groundwater quality samples from the wells should also be analyzed regularly for general chemistry.

Water Temperature: Maximum/Minimum thermometer placed in the creeks, checked regularly and recorded when water is flowing. Alternately, a temperature datalogger

(such as HOBO's) could be used to provide more detailed information.

Erosion Assessment: Two permanent erosion stations should be established on each of the watercourses. Use of the existing sampling locations ([Figure B 4.3.2](#)) will provide continuity and a longer period of record). Channel renaturalization for creek portions will be carried out in conjunction with proposed development. Once this has been completed and the system stabilized, cross-sections of the watercourse should be surveyed at the indicated locations (see [Figure B 4.3.2](#)). As part of the erosion assessment, a photographic inventory and inspection of the entire watercourse should be carried out annually to monitor any change to the cross-sections.

Terrestrial Resources: During the preparation of the Subwatershed Plan, a significant amount of data on vegetation and wildlife species and habitats was collected and recorded. This information will be updated as development occurs over a period of years, largely through additional Environmental Impact Studies (see Section D 2.3.), and future Official Plan Reviews. **Table D 2.9.1b** summarizes:

- Features or Systems to be monitored;
- Parameters to be monitored (including timing);
- Locations to be monitored;
- Monitoring Evidence that warrants action;
- Adaptive Management Response; and
- Responsible agencies/groups.

Table D 2.9.1b summarizes key monitoring parameters, focusing on boundary integrity of features, ecological integrity indicators (species diversity, physical attributes), unauthorized activities, and problem species. Remote sensing using aerial photographs can document gross changes in shape, composition or density of vegetative



cover. Permanent vegetation plots (monitored for composition, and vegetation type under the Ecological Land Classification system) and photographic inventories at fixed locations in key habitats and buffer areas are effective to produce a consistent base of long term conditions.

The Hespeler West Subwatersheds Study has indicated that wildlife movement and habitat utilization is extensive in the study area. From a monitoring perspective, wildlife are useful indicators of changes to habitat quality. As individual species and as species associations, birds can be excellent indicators of habitat quality that are readily surveyed in the appropriate seasons. The monitoring of habitat specialist bird species (rather than habitat generalists that will likely increase in number after development) during the breeding season, will provide an efficient sample of subwatershed terrestrial health and changes. Observations of birds, mammals and amphibians provide evidence of habitat and buffer adequacy. A network of permanent monitoring points in the PSW and enhanced corridors (including bird survey stations in areas at least 100 metres from the forest edge) would effectively track changes over time.

Table D 2.9.1b contains detailed specifications for site-specific monitoring, based on an approach developed by the City of Waterloo, Regional Municipality of Waterloo, and City of Kitchener. The City and GRCA should develop resources and personnel equipped for this level of monitoring. Over time, stewardship programs and local naturalists can be trained to collect this information using established protocols (Ontario Breeding Bird Atlas, Marsh Monitoring Program).

Water Quality: Water quality samples should be taken during the spring, during the fall and during the summer after a rainfall event greater than or equal to 25 mm. The samples should be analyzed for concentrations of suspended sediments, bacteria and phosphorus, in situ

measurements of dissolved oxygen, temperature and flow should also be carried out at the time of sampling. Where infiltration of road runoff is approved, groundwater should be monitored for salt.

Benthic and Fishery Inventories: For the perennial portion of Hespeler West near the downstream end, sampling of benthic and fish communities is recommended. Fisheries data collected during the Subwatershed Study will assist in the development of an existing fisheries database.

D 3.0 SUMMARY RESOLUTION OF ISSUES AND PROBLEMS

The goal of the Hespeler West Subwatersheds Study is to protect, maintain and enhance the ecological processes and functions and significant natural features of the subwatershed in a way which is environmentally sound and socially and economically sustainable.

The following table outlines the issues and tools/requirements identified in the outset of the study and discussed in previous sections of the Subwatershed Plan.





Table D 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
1. AQUATIC			
1.1 To identify, protect, maintain and enhance aquatic resources.	A, B, C, E, F, G, I	Delineate and Protect green space system functions and features. Rehabilitate key creek reaches and associated ponds. Maintain/improve riparian conditions along selected stream reaches.	Adoption and implementation of the Aquatic Rehabilitation Strategy.
1.2 To prepare a strategy for the aquatic component of the Hespeler West creeks.			
1.3 To determine the impact of bridges, dams and ponds on fish habitat.			
1.4 To determine the status, potential, and management objectives for Hespeler West in accordance with the Grand River Fish Habitat Management Plan.			
2. TERRESTRIAL			
2.1 To identify, protect, maintain and enhance terrestrial resources.	A, E, F, H, I, J	Delineate and Protect green space system functions and features. Delineate and protect environmentally significant areas. Direct scoped EIS reports to guide adjacent development.	Adoption and implementation of the Green Space Management Strategy.
2.2 Identify, protect and manage Environmental Preservation Areas, Environmentally Sensitive Policy Areas and Regionally Significant Natural Corridors.	A, B, C, F, H, I		
2.3 To confirm the wetland boundaries and the status of the wetland complex.			
2.4 To prepare a strategy for the terrestrial component of each creek system.			
2.5 To assess and provide recommendations for future management of the agricultural lands within the subwatershed.			
2.6 To determine a preferred Natural Habitat Network and the elements of a Natural Habitat Network/ Greenspace Management Plan as per the Regional Official Plan Policies.			
2.7 To determine appropriate woodlot and vegetation management strategies.			



Table D 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
3. NATURAL HAZARDS			
3.1 To minimize the risk to life and property due to flooding and erosion.	A, B, E	Implement appropriate BMP's that maintain / reduce runoff peaks and volumes, Delineate regulatory flood lines, Require levels of development and runoff peak and volume control that maintain existing flood lines, Manage floodplain as integrated whole within greenspace system.	Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy.
4. SURFACEWATER RESOURCES			
4.1 To preserve natural hydrological systems.	A, B, E, F, G	Delineate and protect greenspace system functions and features,	Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy.
4.2 To protect and manage surfacewater quality and quantity in order to ensure the future ability of Regional water-taking requirements and maintain the assimilative capacity of downstream wastewater treatment plants.	D	Rehabilitate key creek reaches and associated ponds, Maintain /improve riparian conditions along selected stream reaches, Delineate and protect environmentally significant areas.	
5. GROUNDWATER RESOURCES			
5.1 To preserve natural hydrogeologic systems.	D, F, H, J	Implement appropriate water quality control BMP's and promote infiltration and/or sedimentation control and maintain / reduce runoff peaks and volumes, Limit impervious cover, Promote water conservation, Protect greenspace system functions and features.	Adoption and implementation of the Natural Heritage Strategy and the Water Management Strategy.
5.2 To protect and manage the quantity and quality of groundwater resources.			
5.3 To determine implications on water quality and quantity from infiltrated stormwater runoff from development.			
6.0 THE RURAL and URBAN ENVIRONMENT			
6.1 To develop an ecosystem-based approach to land use planning and resource management in the subwatershed.	ALL	Identify process related to implementing management options through land use planning and stewardship approaches.	Adoption and implementation of the Subwatershed Management Strategy composed of the following components:
6.2 To produce an implementation and monitoring plan to guide future development in the subwatershed.	ALL	*Identify monitoring requirements related to the management options.	The Greenspace Management Strategy; The Aquatic Rehabilitation Strategy;





Table D 3.0.1 Subwatershed Objectives, Issues and Actions

Objectives	Issues	Tools / Requirements	Key Recommendations
6.3 To determine and address the implications on development opportunities on the provision of infrastructure. 6.4 To determine the current state of repair of bridges, dams and ponds and to develop long-term remediation recommendations which would address public safety, maintenance and operation, public use and aesthetics. 6.5 To determine ownership and management strategies of the Greenspace Management Strategy. 6.6 To determine the appropriate buffers from development. 6.8 To determine the location and status of any existing agricultural or municipal drains. 6.9 To determine a potential trail system with potential linkages (within and beyond the subwatershed) and interconnection of natural areas.	D, E	Delineate and protect greenspace system functions and features, Delineate and protect environmentally significant areas.	The Water Management Strategy, Community Trail Strategy; and The Adaptive Management - Monitoring Strategy

Issues List for Table

- A. Hespeler West Green Space Management Strategy – status and future plans – ownership, management;
- B. Bridges, Culverts and Ponds – impact on fisheries, current state of repair, recommendations;-Fisheries – status, potential, management objectives (per Grand River Fisheries Management Plan);
- C. Wellhead protection area – implications for stormwater infiltration;
- D. Hespeler West Subwatershed Wetland Complex – confirmation of wetland boundaries, buffers from development;
- E. Location and status of municipal drains;
- F. ROPP Elements of the Natural Habitat Network);
- G. Woodlot protection and vegetation management;
- H. Potential trail linkages (within the subwatershed and beyond) and interconnection of natural areas; and
- I. Agricultural land classification and consideration.

D 4.0 KEY RECOMMENDATIONS

These recommendations are to be read and implemented in conjunction with the findings and recommendations addressed in previous sections. These will be implemented through the policies of the Community Plan, Zoning, Draft Plans of Subdivision, Severances, Site Plans, and all other development applications and building permit applications

subject to approval under the Planning Act and/or the Ontario Building Code Act.

Interim Land Use Management Strategy

It is recommended that land use amendments be completed to both Regional Official Policy Plan and City Official Plan Policies to recognize the PSW and floodline features and candidate ESPA areas determined through





the investigations of this study. These features are located in areas of the subwatershed that may not be included in future Community Plans and, therefore cannot rely on this mechanism for recognition. Some recommendations from the Community Plan (i.e., buffers) may also trigger amendments to City OP policies.

Greenspace Management Strategy

It is recommended that the Greenspace Management Strategy outlined in [Figure C.3.3.1](#) be adopted and implemented. The strategy will aid in the protection, enhancement, and use of ecological resources for the subwatershed. The strategy will be implemented at the Community Plan, Zoning, Draft Plan of Subdivision, Scoped EIS Studies and other such studies. As outlined in Section C 3.3, timing of the Greenspace Management Strategy should be at the Community Plan stage.

Environmental Constraints

It is recommended that the Environmental Constraints ([Figure B 8.3.2](#)) be adopted and implemented in the study area. These areas should be shown as Class 1 (Significant Natural Feature) Open Space in land use documents. This map amalgamates all constraint mapping relating to the vegetation and wildlife inventory completed as part of this plan. These include the related environmental features being the steep slopes, Regulatory Floodline, Provincially Significant Wetlands and LSNA, but does not include buffers of Constraint Level 1 lands. All future development application subject to approval under the Planning Act must conform to this Map and Plan.

Buffers and Enhancement Areas

Buffers are intended to protect habitats and key functions including: sensitive vegetative species and habitat, wildlife species and habitat for nesting or foraging, shallow

groundwater movement, surfacewater quality, and local topography. Enhancement areas supplement the buffers to maintain natural corridor functions, and will contain naturalized cover, or complementary land uses. Section C 3.3 and [Figures C.1.2.1](#) and [C.3.3.1](#) define the recommended approach for buffers and enhancement areas, which can be summarized as follows:

- 30 metre buffer surrounding natural heritage features
- a 200 to 300 metre wide enhanced corridor along Middle Creek and a minimum 50 metre wide enhanced corridor along East Creek. (Limited opportunities exist to enhance the corridor surrounding West Creek.)

It is recommended that these buffers, in conjunction with enhancement areas, be implemented to ensure that the key natural areas of the Hespeler West subwatersheds are maintained and protected. Development within natural features or their buffers will not be permitted without completion of additional Environmental Impact Studies. Grading within buffers may be necessary to create transitional grades between natural features and adjoining lots. Buffers should be designated as Class 1 (Significant Natural Features) Open Space and be publicly owned in order to preserve their integrity and function. However, the ownership of buffers and the dedication of buffers as parkland which serve a public function should be negotiated at the Community Plan level. Buffers around all natural heritage features should be confirmed in the Community Plan. Where multiple features and constraints coincide (i.e., a PSW within a flood plain) the greater buffer width will be applied.

Environmental Impact Studies (EIS)

Prior to any urban development, it is recommended that EIS investigations be carried out where encroachment is



anticipated into the recommended buffer. No EIS is required if development is located outside the buffer. These EIS studies will be completed at the expense of the developer and completed to the satisfaction of the City of Cambridge and other public agencies having jurisdiction based on the guidelines in Section D of this document.

Aquatic Rehabilitation Strategy

It is recommended that rehabilitation of riparian corridors associated with the three creeks in the Hespeler West subwatersheds be carried out prior to, and in accordance with the Community Plan. The remediation plan includes some channel rehabilitation on each creek and buffer plantings as outlined in Section D 1.1.5. Any future plans to upgrade culvert crossings by the City and/or culverts by the Region should consider the viability of enlarging the culvert size. This would improve the corridor function and improve the potential for the movement of wildlife through culverts.

Conceptual Trail Strategy

It is recommended that the Conceptual Trail Strategy be established by implementation at the Community Plan stage. Detailed trail treatment and placement will occur at that stage where adjacent land use is determined and trail requirements are better understood. The specific components are described in Section D 2.4 to be considered and implemented. In order to help guarantee the long-term success of the trail system, participation by the public should be considered.

Water Management Strategy

It is recommended that the Water Management Strategy outlined in Section D 1.3 in this report be adopted and implemented for the Hespeler West subwatersheds. The intent of the Water Management Plan is to maintain

existing peak flows, maintain or improve the existing infiltration rates, and to reduce the post-development volume of runoff in order to protect local and downstream features. Where a single stormwater management facility serves more than one landowner, an appropriate cost sharing agreement should be implemented through the appropriate means (i.e., Draft Plan conditions, Community Plan, agreement, etc.). General stormwater management criteria are outlined in Section C and include the following:

- maintain or enhance infiltration using at-source controls for rooftop runoff and pre-treatment facilities and infiltration trenches for road runoff;
- protect water quality by implementing a range of Stormwater Management Practices;
- provide stormwater quantity control;
- provide erosion control measures for slopes and stream channels; and
- improve East Creek culvert at Beaverdale Road.

Adaptive Management Strategy (Monitoring)

It is recommended that the Adaptive Management Strategy outlined in Section D 2.10 be adopted and implemented in the subwatershed. This section recommends that public agencies and public stewardship programs undertake the Systems and Post-Development Monitoring and that the During Construction Program be undertaken by the developer. The During Development Program includes three phases: 1) pre-development; 2) during construction; and 3) guarantee period. The proponent is responsible for monitoring surfacewater, groundwater, and terrestrial features that could potentially be impacted by construction.

Best Management Practices

Where lands are designated and used for agriculture, agricultural Best Management Practices (BMP's) are recommended to achieve subwatershed goals.





Where lands are designated and used for residential use, residential BMP's are recommended to address issues such as pesticide use on lawns, domestic pet manure, and related issues. These will include issues which may be considered prior to the Community Plan such as the treatment of existing fencing and the trimming and cutting of grassed areas adjacent to the creek systems. Where lands are designated and used for industrial use ISO 14000 EMS standards are recommended.

Public Education

It is recommended that public education (referenced in many sections of this Plan) be implemented by the City of Cambridge, Regional Municipality of Waterloo, other public agencies and the development proponents at the time of development. The Region and the City would develop a consistent and comprehensive public education program that should include (but not be limited to) the following information:

- potential environmental impacts of the public's activities (e.g., fertilizer application, disposal of hazardous materials, etc.);
- groundwater protection strategies;
- terrestrial preservation techniques; and
- industry BMP and ISO 14000 requirements.

This information could be used to provide information for local schools, neighbourhood associations and groups, real estate, and development industries and other relevant groups. The developer would use this information and distribute it to builders, real estate firms and potential home buyers (e.g., included in the offer to purchase and other correspondence). Educational signs would be provided as part of the construction work for the development. A Subwatershed Study List of Quick Facts is a potential tool to assist in the dissemination of data, information and

findings from this study. The following framework is provided:

**Quick Facts:
Hespeler West Subwatersheds**

- Total drainage area of subwatersheds including Speed River catchments = 990 ha
- Percent of subwatershed covered by 'wooded cover' = 17.75% (includes forests, woodlands, swamps and plantations)
- Percent of subwatershed covered by wetland = 18.15% (includes swamps and open aquatic features)
- Percent of subwatershed covered by development = 22.5%
- Percent of subwatershed covered by agricultural lands = 38.20%
- Percent of subwatershed covered by vegetation (natural, cultural and agricultural)= 74.6%
- Number of Provincially Significant Wetland (PSW) complexes = 2
- Number of Locally Significant Wetland (LSW) complexes = 1
- Number of Environmentally Sensitive Policy Areas (ESPA) polygon units found in the Hespeler West subwatersheds = 0 (However, certain areas of the subwatersheds meet ESPA criteria)
- Number of habitat blocks that contain forest interior wildlife species = 9
- Provincially or nationally 'vulnerable' (special concern), 'threatened' or 'endangered' species = none found
- Vascular plant species = 437
- Provincially Significant vascular plant species = 1
- Regionally Significant vascular plant species = 24
- Wildlife species = 144
- Provincially Significant wildlife species = none found
- Regionally Significant wildlife species = 35
- Birds = 91 (81 observed during the breeding season)
- Mammals = 17
- Amphibian and Reptiles (Herpetofauna) = 13
- Butterflies = 12
- Damselflies and Dragonflies = 11

These facts are only a few items extracted from the Hespeler West Subwatersheds Study. They are provided here to assist the reader in understanding the diversity and complexity of the Hespeler West Subwatersheds Study. Please consult the study report for additional and more complete information and analysis.

