EXECUTIVE SUMMARY

The Village of Richmond is surrounded by high quality natural features including the Richmond Fen (a Provincially Significant Wetland) to the west, and the Marlborough Forest (NESS Area 422) to the southwest. The Village core contains patches of natural vegetation including meadow, old field and woodlands. The Jock River is a high-quality riverine feature into which drains the Van Gaal Drain (with headwaters in the Richmond Fen) and Marlborough Creek (with headwaters in Marlborough Forest). There are no NESS areas within the Village Boundaries, and no Areas of Natural or Scientific Interest (ANSI's). Spawning habitats for pike, musky and other game fish species occur along the Jock River, Van Gaal Drain and within Marlborough Creek. There have been no rare, threatened or otherwise endangered species identified within the boundaries of the Village of Richmond.

Terrestrial features are protected under municipal guidelines, as well as provincial and federal legislation. The City of Ottawa’s Official Plan provides for protection of vegetative cover, with a target of 30% tree cover at the watershed level. Applications for subdivision or site plan approval must be supported by tree-preservation plans and landscape planting plans that retain as much natural vegetation as possible, especially along watercourses, on steep slopes, in valued woodlots and in areas linking green spaces, with a particular emphasis on high quality or rare vegetative communities. Provincial and Federal legislation related to species at risk may protect some natural features within or around the Village if those areas are shown to contain species at risk or the habitats of species at risk.

Aquatic features are protected under municipal, provincial and federal policy. Alterations to watercourses (e.g., realignment, culvert crossing installation) may require permits from the Ontario Ministry of Natural Resources, Rideau Valley Conservation Authority, the Ministry of the Environment, and the Department of Fisheries and Oceans (DFO). The 100-year flood line, the meander belt width, aquatic buffer, and erosion setbacks are important constraints when land surrounding watercourses is to be developed. The Jock River Reach 2 Existing Conditions report indicated that the meander belt widths delineated as part of that study were conservative. Consequently, meander belt widths and associated erosion setbacks would need to be refined to accurately determine the constraints to development. The Jock River itself is also adjacent to the Mattamy Homes’ land holding.

Various site-specific field investigations are necessary on the Mattamy lands in order to understand the potential interactions and effects of infrastructure and other urban development projects on the natural environment. Inventories of terrestrial features on Mattamy lands are necessary because they have to date not been done. The fishery of the Jock River in the vicinity of the Village of Richmond is generally well described, as is the fishery for Marlborough Creek. Studies of the Van Gaal drain, and in particular tributaries to the Van Gaal drain on Mattamy’s land holding are required. Meander belt width delineation has not been completed for the Jock River and therefore this needs to be determined for the reach in addition to an analysis of appropriate erosion setbacks.
TABLE OF CONTENTS

1.0 INTRODUCTION ................................................................................................................... 1
  1.1 Background ......................................................................................................................... 1
  1.2 Study Area .............................................................................................................................1
  1.3 Policy Review.........................................................................................................................1
    1.3.1 Provincial Legislation and Policy .............................................................................1
    1.3.2 Municipal Legislation and Policy .............................................................................3
    1.3.3 Federal Legislation and Policy ................................................................................4

2.0 SUMMARY OF EXISTING CONDITIONS .............................................................................5
  2.1 Aquatic Environment ............................................................................................................5
    2.1.1 Water Quality ...........................................................................................................5
    2.1.2 Water Temperature .................................................................................................6
    2.1.3 Physical / Fluvial .....................................................................................................9
    2.1.4 Fisheries .................................................................................................................10
  2.2 Terrestrial Environment ........................................................................................................ 14
    2.2.1 Wetlands ................................................................................................................15
    2.2.2 ANSIs .....................................................................................................................15
    2.2.3 Significant Woodlands ..........................................................................................15
    2.2.4 Significant Wildlife Habitat ....................................................................................16
    2.2.5 Species at Risk ......................................................................................................17
  2.3 Opportunities and Constraints .............................................................................................22
    2.3.1 Opportunities .........................................................................................................22
    2.3.2 Constraints ............................................................................................................22
  2.4 Next Steps and Required Analysis ......................................................................................23
    2.4.1 Aquatic ..................................................................................................................23
    2.4.2 Fluvial Geomorphological .....................................................................................23
    2.4.3 Terrestrial ..............................................................................................................24

3.0 LITERATURE CITED ..........................................................................................................24

List of Tables

Table 1.  Averages for conventional water quality parameters for several locations on the Jock River system within the vicinity of the Village of Richmond.............................................6
Table 2.  Fish species captured in the Jock River Watershed ....................................................12

List of Figures

Figure 1.  Village of Richmond showing the Mattamy Land Holding........................................2
Figure 2.  Relationship between air and water temperature in the mainstem Jock River in the vicinity of the Village of Richmond.................................................................7
Figure 3.  Map of the Study Area Showing Areas of Coldwater Fisheries Habitat and Nursery Habitat......................................................................................................................8
Figure 4. Photographs of the Van Gaal Drain (October 22, 2007) upstream of Perth Street showing representative areas of marginally flowing water (A) and dry creek bed (B).

Figure 5. Map of the Village of Richmond showing the Mattamy Land Holding and woodlots 1 to 7 (W1 through W7).

Figure 6. Map of the Village of Richmond (and surrounding area) showing the proximity of the Richmond Wetland.

Figure 7. Map of the Village of Richmond (and surrounding area) showing forest cover.

Figure 8. Map of the Village of Richmond (and surrounding area) showing areas of Interior Forest and Ness Areas.
1.0 INTRODUCTION

1.1 Background

This Existing Information report for the Village of Richmond has been prepared at the request of Mattamy Homes. This report documents the existing natural-environment information, as well as municipal, provincial and federal legislation and policy pertaining to the natural environment that will influence the future development of Mattamy’s land holding, as well as supporting infrastructure. This report identifies information gaps that will be addressed during follow-up on site investigations of the aquatic environment (fisheries, water quality, fluvial geomorphology) and terrestrial environment.

1.2 Study Area

The Village of Richmond is approximately 25 km southwest of the downtown core of the City of Ottawa. Mattamy’s land holding consists of ~350 acres of land along the west side of the Village of Richmond (Figure 1). The Mattamy land holding is adjacent to the Jock River which flows in a north-easterly direction south east of the property. The Mattamy land holding is drained primarily by agricultural drains which feed into the Van Gaal Drain. The Van Gaal Drain has been modified in many segments both on the Mattamy lands and in the Village of Richmond. The Jock River bisects the Village of Richmond. The village east of the Jock River is drained primarily by the Hamilton Drain which has also been modified and straightened through some of the reaches. Flowing Creek drains into the Jock at the northern edge of the Village of Richmond. Likewise, Flowing Creek appears to have been modified and straightened in several locations.

There are small natural terrestrial features both on the Mattamy land holding, as well as elsewhere within the Village of Richmond. The Richmond Fen, a provincially significant wetland lies to the west of the Village, while the Marlborough Forest lies further to the southwest of the Village.

1.3 Policy Review

Several pieces of municipal, provincial and federal environmental policies and legislation exist to protect against natural hazards to property, and to protect wildlife in the terrestrial and aquatic environments. The major pieces of legislation and policy are reviewed in the sections below.

1.3.1 Provincial Legislation and Policy

The Provincial Policy Statement for Understanding Natural Hazards describes several constraints related to watercourses and developments. Flooding hazards include the 100-year flood limit. This is the elevation to which the 100-year flood would reach. This is to say the flood level that has the probability of occurring once every 100 years. Construction must occur outside of this flood limit to ensure the integrity of structures.
Figure 1. Village of Richmond showing the Mattamy Land Holding
An erosion hazard refers to the loss of land that could threaten life or property. This is usually defined using the 100-year erosion rate, or the extent of bank erosion that can occur over a 100-year period. Historic aerial photographs are usually used for this purpose. There are several components considered when establishing erosion setbacks for rivers, depending on the geographic setting of the river. A toe erosion allowance is often established where the eroding bank is less than 15 m from a valley wall. The extent of the erosion setback allowance is determined based on the native soil structure as well as the severity of the bank erosion observed in the river at this location. The stable slope allowance in confined systems is defined as the setback at the top of the slope to ensure that infrastructure and developments are not affected by any slope failures. A stable slope allowance three times the height of the slope is considered the minimum setback. These setbacks are usually set through a geotechnical study. In unconfined systems, the meander belt width is of particular importance when considering appropriate setbacks for development. The meander belt width is defined as the corridor the river could potentially occupy through meander growth and migration and is usually established using the largest amplitude meander in a given reach. The meander belt width therefore defines a hazard zone of the area that could be susceptible to erosion as the river naturally meanders through the floodplain.

The Provincial Policy Statement (2005), issued under Section 3 of the Planning Act, promotes the long-term maintenance and enhancement of ecological functions. It prohibits development with Provincially Significant Wetlands (PSWs) and the significant habitat of Endangered and Threatened species. Development within areas such as significant woodlands, significant valleylands, significant wildlife habitat and Areas of Natural and Scientific Interest (ANSIs) is not permitted unless it has been demonstrated that no negative impact will occur on these features.

The provincial Endangered Species Act (1971) prohibits destruction of individuals or habitats of regulated Endangered species in Ontario. However, a new Ontario Endangered Species Act was passed in 2007, which broadens protection provisions to Endangered and Threatened species as well as their habitats. Many policies surrounding this new Act are still in development and under consultation.

1.3.2 Municipal Legislation and Policy

Ottawa’s Official Plan (2003) provides further specific policy related to the Natural Environment (Section 3.2). Policies regarding Significant Wetlands and Natural Environment Areas (NEAs, or areas that have been found to have a high environmental value through federal, provincial or municipal studies) are outlined. These areas are mapped in Schedules A and B of the Official Plan. The City of Ottawa has also developed a Greenspace Master Plan (2007), which expresses the City’s vision for maintaining greenspace within the urban areas and works toward developing policies to achieve them.

City Council also establishes minimum setbacks from rivers, lakes and streams through watershed, subwatershed and environmental management plans. Additional studies may be required to refine setback limits through the Development-Review process. The Jock River...
Reach 2 subwatershed study recommended the following protection for watercourses, on the basis of the City of Ottawa's Official Plan (Sections 4.7.3, Policy 1):

1. Setbacks from rivers, lakes and other watercourses will be the greater of the following considerations:
   
   a. Development limits as established by the regulatory floodline;
   
   b. Development limits as established by stable slope lines;
   
   c. Development limits required to accommodate natural meander belts as defined through subwatershed plans or environmental management plans;
   
   d. Application of the minimum setback standards as described in Policies 2 through 5 of the subsection (4.7);
   
   e. No development or site alteration is permitted within a minimum setback of 30 m from the normal high water mark of rivers, lakes and streams, as determined in consultation with the appropriate Conservation Authority, or, where there is a defined bank, 15 m from the top of the bank, whichever is greater.

Policy 2 dictates that where a council-approved plan does not exist, the minimum setback will be the greater of the following:

   a. Regulatory floodline;
   
   b. Geotechnical limit of the hazard lands;
   
   c. 30 m from the normal high water mark of rivers, lakes and streams
   
   d. 15 m from the existing top of bank, where there is a defined bank.

Policies 3, 4 and 5 provide exceptions to the above setback limits.

1.3.3 Federal Legislation and Policy

Ontario’s signatory status to the federal Accord for the Protection of Species at Risk provides policy support to the federal Species at Risk Act (2003), which describes prohibitions that apply mainly to federally governed species (e.g. migratory birds, fish), and all species found on federal lands. Most migratory birds in Canada, including many waterfowl and songbirds, are also protected under the federal Migratory Birds Convention Act (1917), which provides the ability to regulate activities that may affect migratory birds while in Canada.

The Federal Fisheries Act provides three significant constraints that need to be respected by the Richmond development. First, Section 35 of the FA prohibits the destruction, disruption or alteration of direct or indirect fish habitat (i.e., a HADD). Direct fish habitats include
watercourses directly supporting fish, while indirect fish habitats included watercourses that do not contain fish, but that contribute water and nutrients (food) to downstream watercourses. Alterations to drains on the Mattamy land holding may be considered to be HADDs of fish habitat requiring Authorization.

Other Sections of the *Fisheries Act* may provide additional constraints to the development of the Mattamy land holdings. Section 32 of the FA prohibits the killing of fish, though a permit to kill fish can be obtained. Section 36 of the *Fisheries Act* prohibits the deposit of a deleterious substance. Construction activities must be mitigated to prevent eroded soils from entering waterways.

### 2.0 SUMMARY OF EXISTING CONDITIONS

#### 2.1 Aquatic Environment

##### 2.1.1 Water Quality

City of Ottawa water quality monitoring data were summarized in the subwatershed study by MMM and WESA (2007). The Jock River in the vicinity of the Village of Richmond, as well as Flowing Creek were both considered to have “Marginal” water quality. Water quality data have been obtained from the City of Ottawa for the Van Gaal Drain and Jock River in the vicinity of the Village of Richmond. Data include conventional pollutants such as metals and nutrients, as well as more general indicators of water quality (e.g., pH, suspended solids) and water temperature (Jock River only). The Jock River is a hard-water system, with relatively high concentrations of base cations (i.e., Ca, Mg, Na, K), basic pH, and relatively high alkalinity. Those factors buffer the potential effects of metals. Aluminum concentrations have been high at all locations monitored by the City of Ottawa (Table 1) with the exception of the Jock River at Ottawa Street. In addition to aluminum, concentrations of iron have also been high, exceeding its CCME (2002) water quality guideline. Further, copper concentrations have been high in an unnamed tributary (at King Street in the Village of Richmond) to the Jock River. Total phosphorus concentrations at all locations monitored within the vicinity of the Village of Richmond have exceeded the Provincial Water Quality Guideline of 0.03 mg/L to prevent nuisance growths of algae in riverine systems. Concentrations were very high (> 0.1 mg/L) in the unnamed tributary inside the Village of Richmond, as well as in Upper Van Gaal Drain (>0.3 mg/L). Total suspended solids loads have generally been low (i.e., < 25 mg/L), with the exception of the Upper Van Gaal Drain (almost 80 mg/L). Canada’s Code of Practice for Road Salts recommends chloride concentrations below 35 mg/L for long-term exposures and below 140 mg/L for short-term exposures in fresh surface waters to protect aquatic organisms. Concentrations of chlorides in the unnamed tributary have been upwards of 180 mg/L, indicating some potential risk of effects due to chlorides.
Table 1. Averages for conventional water quality parameters for several locations on the Jock River system within the vicinity of the Village of Richmond.

<table>
<thead>
<tr>
<th>Sample Point</th>
<th>Parameter</th>
<th>Al</th>
<th>Cu</th>
<th>Fe</th>
<th>pH</th>
<th>Alk</th>
<th>Hard</th>
<th>TP</th>
<th>TSS</th>
<th>Cl</th>
<th>Cond</th>
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<tbody>
<tr>
<td>JR-09</td>
<td>Jock River @ Eagleson Road</td>
<td>0.275</td>
<td>0.005</td>
<td>0.413</td>
<td>8.11</td>
<td>182</td>
<td>189</td>
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<td>JR-11</td>
<td>Jock River @ McBean Street</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.054</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JR-12</td>
<td>Jock River @ Ottawa Street</td>
<td>0.074</td>
<td>0.002</td>
<td>0.172</td>
<td>8.26</td>
<td>173</td>
<td>191</td>
<td>0.034</td>
<td>4</td>
<td>18</td>
<td>394</td>
</tr>
<tr>
<td>JR-42</td>
<td>Unnamed Tributary @ King Street</td>
<td>0.550</td>
<td>0.008</td>
<td>0.841</td>
<td>7.93</td>
<td>277</td>
<td>354</td>
<td>0.108</td>
<td>23</td>
<td>181</td>
<td>1144</td>
</tr>
<tr>
<td>JR-43</td>
<td>Lower Van Gaal Drain @ Fowler Street</td>
<td>0.194</td>
<td>0.003</td>
<td>0.403</td>
<td>8.01</td>
<td>219</td>
<td>279</td>
<td>0.052</td>
<td>8</td>
<td>49</td>
<td>614</td>
</tr>
<tr>
<td>JR-44</td>
<td>Upper Van Gaal Drain @ Joy's Road</td>
<td>0.372</td>
<td>0.004</td>
<td>5.436</td>
<td>7.78</td>
<td>183</td>
<td>212</td>
<td>0.332</td>
<td>78</td>
<td>6</td>
<td>362</td>
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<tr>
<td>CCME Guideline</td>
<td></td>
<td>0.100</td>
<td>0.004</td>
<td>0.300</td>
<td>6.5-9.5</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Code of Practice</td>
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</tr>
</tbody>
</table>

Table Notes: Data covering 1991 to 2007, and provided by the City of Ottawa (Adam Bishow). Codes: Al = aluminum, Cu = copper, Fe = iron, Alk = alkalinity, Hard = hardness, TP = total phosphorus, TSS = total suspended solids, Cl = chloride, Cond = conductivity.

2.1.2 Water Temperature

Stream water temperature data are available for six monitoring stations in the Jock River main channel for the period from May to September 2004, including locations at Moodie Drive, Steeplehill Road, Cambrian Road, Eagleson Road, Ottawa Street and in Leamy Creek at Cambrian Road. Data for two locations, one upstream of the Village of Richmond (Jock River at Eagleson Road, and one downstream (Jock River at Ottawa Street) are illustrated in Figure 2. The relationship between air and water temperatures can be used to classify the thermal regime of a surface-water system (Stoneman and Jones, 1996). The data from both locations suggest that the mainstem of the Jock River is warmwater. Further, temperature of the river decreased significantly (2 to 4°C) from upstream to downstream through the summer of 2004, reflecting apparent inputs of cool surface water and/or groundwater. The presence of sculpin and pearl dace in the vicinity of the Village of Richmond (MMM and WESA, 2007; Figure 3) confirm inputs of “cold” water. Inputs of groundwater would be consistent with the shallow depth to bedrock within the Village of Richmond in the vicinity of the Jock River.
Figure 2. Relationship between air and water temperature in the mainstem Jock River in the vicinity of the Village of Richmond.

Figure Note: Data for the summer of 2004, and provided by the City of Ottawa (Brian Bezaire).
Figure 3. Map of the Study Area Showing Areas of Coldwater Fisheries Habitat and Nursery Habitat.

Figure Note: data from MMM and WESA (2007)
2.1.3 Physical / Fluvial

The subwatershed study (MMM and WESA, 2007) delineated reaches for all the streams and drains flowing into the Jock River in the subwatershed. Reach delineation was initially completed using stream order and was then further refined into subreaches based on geology, land use, and gradient. Rapid Geomorphic Assessments were completed in June and September 2004 during low-flow conditions. A rapid assessment is a synoptic survey meant to quickly and qualitatively assess stream reaches in order to identify any specific problems, assess overall channel stability and sensitivity, and validate mapping and aerial photography (i.e., the desktop analysis). Flowing Creek was found to have a dominant geomorphic process of aggradation. The lower-order streams were found to be relatively stable, however, the mainstem was found to be in poor condition. The Van Gaal Drain was found to be in similar condition to Flowing Creek although the Van Gaal Drain is a smaller system with many of the tributaries being dry for most of the year. The dominant process observed through much of the subwatershed was aggradation with channel widening also important in the lower portion of the Van Gaal Drain. Meander belt widths were also delineated for the subwatershed following the Toronto and Region Conservation Authority’s guidelines. Due to the altered nature of many portions of the channels in Flowing Creek and Van Gaal Drain, surrogate belt widths had to be used in some areas. The meander belt width for Flowing Creek was determined to be 40 m for the main channel. The main branch of Van Gaal Drain was determined to have a meander belt width of 30 m with meander belt widths of the tributaries ranging in widths from 15 to 20 m (see Figure 3.5.5.6 in MMM and WESA, 2007).

Robinson Consultants (2003) produced its Engineer’s Report for Van Gaal Municipal Drain. This report outlined the procedure for relocating the East Main Drain to accommodate a new development north of Perth Street. The downstream portion of the East Main Drain between Garvin Road and Perth Road was to be redirected along the northern boundary of the new development to join with the West Main Drain. From the new confluence down to Perth Road, the prior confluence of the two drains, the West Main Drain was to be deepened to accommodate the increase in flows as a result of the relocation of the East Main Drain. OTTHYMO modeling of both drains indicated that current road crossing structures were sufficient to accommodate any change in flow regime as a result of the new configuration. Proposed erosion control included seeding, buffer strips, and rip rap protection at key areas (i.e., culvert outlets, channel bends). The work outlined in the 2003 report was completed in 2006 by Capital Engineering (personal communication Andy Neon, Capital Engineering). No report or design brief was produced at this time as the 2003 design was implemented as is.

2.1.3.1 Historical Analysis

Changes in land use are a contributing factor to changes to stream stability over time. In examining the changes in land use through historic aerial photographs, changes can be detected and related to changes in channel stability. Aerial photographs from 1946 (1:15,000), 1975 (1:15,000) and 2007 (digital) were reviewed to determine if any changes had occurred in
land use or stream orientation on the property owned by Mattamy Homes and within the Village of Richmond.

The 1946 aerial photographs show that the study area was primarily agricultural with a small woodlot in the south east corner. The Village of Richmond at this time was mainly confined to McBean Street with most of the surrounding roads consisting of farms. The Van Gaal Drain appears to have been straightened northwest of Fortune Street prior to 1946. The planform of the Van Gaal Drain could not clearly be identified in these photographs.

The 1975 aerial photographs show that there was substantial residential growth after 1946 with residences extending from Fortune Street to King Street which had previously been occupied by agricultural lands. By 1975 there was also significant residential development south of the Jock River where there had previously only been agricultural lands. Due to the quality of the 1946 photographs, changes to planform could not be identified.

The 2005 digital images show increased development north of Perth Street. There did not appear to be any significant increase in residential development south of the Jock River. The number of trees in the Village of Richmond appears to have increased since 1975, particularly in the corridor surrounding the Van Gaal Drain downstream of Fortune Street. No changes in planform could be detected since the 1975 photographs although the channel downstream of Fortune Street was been partially obscured by vegetation in the current Google Earth imagery.

### 2.1.4 Fisheries

#### 2.1.4.1 Fish Assemblages

The RVCA and the City of Ottawa carried out fish community investigations in 1995, 2002, 2003 and 2004. These investigations resulted in the capture of 35 fish species in the Jock River subwatershed. The fish communities present included warmwater, coolwater and coldwater fish species, including one sensitive species, the greater redhorse sucker (*Moxostoma valenciennesi*), captured in the Jock River (Table 2.4.1).

Pearl dace and mottled sculpin are the primary cool/coldwater species found in the Jock River (MMM and WESA, 2007). Mottled sculpin have been captured at four locations in the mainstem of the Jock River, including three locations in the Village of Richmond. The fourth was located at the confluence of the Jock River and Monahan Drain. The preferred habitat for mottled sculpin consists of well shaded cobble and gravel riffles, and to a lesser extent sand (Scott and Crossman, 1973). The mottled sculpin captured in the Village of Richmond were collected from an area of limited shade with a substrate consisting of a combination of coarse materials (i.e. gravel, cobble) and fine material (i.e. silt, sand) (MMM and WESA, 2007). The presence of this species in areas of open canopy suggested that groundwater upwelling was occurring in these reaches allowing this species to inhabit these less than preferred habitat conditions.

Pearl dace have been captured at two locations within and near the Village of Richmond. In one site, Pearl dace dominated while in the second, it was outnumbered by pumpkinseed and rock bass. Pearl dace is considered a coldwater species due to its preference for a water
temperature of ~16°C, although it has a high upper temperature tolerance limit of ~31°C that enables it to inhabit warmwater habitats.

The presence of pearl dace and mottled sculpin reflects apparent inputs of cold water, potentially groundwater. The fish community of the main channel, however, is generally dominated by warmwater and coolwater species such as blacknose shiner, blacknose dace, brook stickleback, common shiner and golden shiner. The warmwater fish species captured in the main channel in the greatest abundance have included bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), common carp (*Cyprinus carpio*), emerald shiner (*Notropis atherinoides*) and pumpkinseed.

The fish community of the Van Gaal Drain has not been well characterized, and was not described by MMM and WESA (2007). The Rideau Valley Conservation Authority (Jennifer Lamoureux) has a record of young-of-the-year (YOY) northern pike having been collected in the Van Gaal Drain at Perth Street (Figure 3) in 1999. RVCA also has a record of white sucker having been caught in the drain upstream of Perth Street in 2000. Bernie Muncaster conducted a site visit on October 22, 2007 and found that the creek to contained areas of marginal flow interspersed with areas of dry creek bed. Cyprinids (unidentified minnows) were observed in various locations of the drain during the site visit. The creek has had certain bank areas reinforced with rip-rap, while a 2-m diameter corrugated steel pipe culvert is also present 350 m north of Perth Street. The culvert does not present an obvious barrier to upstream fish migrations (i.e., was not perched), though there was a slight pool (18 cm) on the downstream side of the culvert.
Table 2. Fish species captured in the Jock River Watershed

<table>
<thead>
<tr>
<th>Warmwater Fish Species</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluegill</td>
<td>Lepomis macrochirus</td>
</tr>
<tr>
<td>Bluntnose minnow</td>
<td>Pimephales notatus</td>
</tr>
<tr>
<td>Brown bullhead</td>
<td>Ameiurus Nebulosus</td>
</tr>
<tr>
<td>Common carp</td>
<td>Cyprinus carpio</td>
</tr>
<tr>
<td>Emerald shiner</td>
<td>Notropis atherinoides</td>
</tr>
<tr>
<td>Fathead minnow</td>
<td>Pimephales promelas</td>
</tr>
<tr>
<td>Greater redhorse</td>
<td>Moxostoma valenciennesi</td>
</tr>
<tr>
<td>Largemouth bass</td>
<td>Micropterus salmoides</td>
</tr>
<tr>
<td>Logperch</td>
<td>Percina caprodes</td>
</tr>
<tr>
<td>Muskellunge</td>
<td>Esox masquinongy</td>
</tr>
<tr>
<td>Northern redbelly dace</td>
<td>Phoxinus eos</td>
</tr>
<tr>
<td>Pumpkinseed</td>
<td>Lepomis gibbosus</td>
</tr>
<tr>
<td>Smallmouth bass</td>
<td>Micropterus dolomieu</td>
</tr>
<tr>
<td>Yellow bullhead</td>
<td>Ameiurus natalis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coolwater Fish Species</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banded killifish</td>
<td>Fundulus diaphanus</td>
</tr>
<tr>
<td>Black crappie</td>
<td>Pomoxis nigromaculatus</td>
</tr>
<tr>
<td>Blacknose dace</td>
<td>Rhinichthys obtusus</td>
</tr>
<tr>
<td>Blacknose shiner</td>
<td>Notropis heterolepis</td>
</tr>
<tr>
<td>Brassy minnow</td>
<td>Hybognathus hankinsoni</td>
</tr>
<tr>
<td>Brook stickleback</td>
<td>Culea inconstans</td>
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<tr>
<td>Central mudminnow</td>
<td>Umbra limi</td>
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<tr>
<td>Common shiner</td>
<td>Luxilus comutus</td>
</tr>
<tr>
<td>Creek chub</td>
<td>Semotilus atromaculatus</td>
</tr>
<tr>
<td>Fallfish</td>
<td>Semotilus corporalis</td>
</tr>
<tr>
<td>Golden shiner</td>
<td>Notemigonus crysoleucas</td>
</tr>
<tr>
<td>Johnny darter</td>
<td>Etheostoma nigrum</td>
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<tr>
<td>Longnose dace</td>
<td>Rhinichthys cataractae</td>
</tr>
<tr>
<td>Northern pike</td>
<td>Esox lucius</td>
</tr>
<tr>
<td>Rock bass</td>
<td>Ambloplites rupestris</td>
</tr>
<tr>
<td>Silver redhorse</td>
<td>Moxostoma anisurum</td>
</tr>
<tr>
<td>Spottail shiner</td>
<td>Notropis hudsonius</td>
</tr>
<tr>
<td>Walleye</td>
<td>Sander vitreus</td>
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<tr>
<td>White sucker</td>
<td>Catostomus commersonii</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Coldwater Fish Species</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
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<td>Mottled sculpin</td>
<td>Cottus bairdii</td>
</tr>
<tr>
<td>Pearl dace</td>
<td>Margariscus margarita</td>
</tr>
</tbody>
</table>

Table Note: classification provided in MMM and WESA (2007).
Figure 4. Photographs of the Van Gaal Drain (October 22, 2007) upstream of Perth Street showing representative areas of marginally flowing water (A) and dry creek bed (B).

Figure Note: Photographs taken by Bernie Muncaster on behalf of Mattamy Homes.
2.1.4.2 Spawning and Nursery Habitat for Key Species (Pike and Muskellunge)

The Rideau Valley Conservation Authority and the City of Ottawa established nineteen fish-community sampling locations in the Jock River at known nursery habitat locations. Fourteen of these nursery habitat locations are located within the boundaries of the Town of Richmond between Fowler Street and Eagleson Road while the remaining stations were located at the confluence of the Jock River and Leamy Creek and immediately upstream and downstream of Moodie Drive (Figure 3). The determination of whether a species was using nursery habitat was based on the presence of YOY. Species observed to be using these known nursery habitat areas included bluegill, brown bullhead, muskellunge, pumpkinseed, smallmouth bass, northern pike and rock.

The fish species found to be using the Jock River main channel as nursery habitat at the greatest frequency included rock bass and pumpkinseed with YOY captured at 15 and 16 of the 19 stations, respectively. The YOY of both these species were found to occur with each other at 13 sites. The association of these two species is likely a result of the similarity between their preferred nursery habitats consisting of shallow water areas in or adjacent to aquatic vegetation. YOY muskellunge was captured at 6 of the 19 stations in association with rock bass and pumpkinseed and is again likely attributed to the preference for similar nursery. The remaining species were captured at two or fewer stations. As above, the RVCA found northern pike YOY have been observed in the Van Gaal Drain (in 1999) suggesting that habitats in the drain upstream of Perth Street have in the past been suitable spawning and nursery habitat for pike.

2.1.4.3 Species at Risk

A review of Royal Ontario Museum (ROM) and the OMNR listings of fish species at risk in Ontario indicates only three fish species have ranges potentially intersecting the Jock River watershed: Lake Sturgeon (Acipenser fulvescens), American Eel (Anguilla rostrata) and River Redhorse (Moxostoma carinatum). However, there are no records of these three species occurring within the entire Rideau River watershed.

2.2 Terrestrial Environment

The study area is mainly agricultural, with seven main wooded areas and several hedgerows dividing the agricultural fields (corn in 2007). Six of these wooded areas are on Mattamy’s land holding. The properties have the designation of “Village” on Schedule A of Ottawa’s Official Plan.

The surficial geology of the site shows predominantly fine, offshore sediments of the Champlain Sea: clay, silty clay and silt. A small area of till plain is documented on either side of Ottawa St. at approximately the western property boundary, and an area of muck and peat lies just to its north. Near the Jock River, the older bedrock is more exposed in outcrops of limestone, dolomite, and/or sandstone (Richard, 1982).
Soil mapping shows the entire property to be poorly drained clay loam (North Gower Clay Loam) and loam (Osgoode Loam), generally level topography with slightly alkaline to neutral soils (Hills et al., 1944). Bottomland soils are found along the Jock River floodplain.

One small wooded area (W1, approximately 1.3 ha) is found at the northern edge of the Mattamy land holdings and another lies just to the east of the property (W2, 1.1 ha; Figure 5). A third small woodland (W3, approx. 1 ha) is behind homes along the west side of Queen Charlotte Street. Another four larger woodland parcels are found at the south end of the Mattamy land holdings. Two of these are to the north of the Jock River (W4 and W5) and two are to the south of the Jock River and adjacent the railway line (W6 and W7). Hedgerows of trees and shrubs line fields within the site, and there is some riparian vegetation along the drains through the property.

Some natural features in the study area have been described in the Lower Jock River Subwatershed Reach 2 Study (MMM and WESA, 2007). This study shows the property contains some old field/meadow habitat, hedgerows or thickets, and in the southern floodplain of the Jock River, an area of coniferous and deciduous forest (within woodlands W4, W5, W6 and W7; Figure 5). The City of Ottawa’s NESS (Natural Environment System Strategy) study completed by the City of Ottawa in 1997 also contains some information that may apply to the woodlands at the south end of the property (i.e. W4-W7), but it is not known whether these areas were visited specifically as part of the NESS study.

2.2.1 Wetlands

No Provincially Significant Wetlands (PSWs) occur within the study area. The Rideau Valley Conservation Authority’s online Wetland Information System (which uses NRVIS data) and the Jock River Reach 2 study both confirm this.

To the south and west of the study area is the Richmond Fen Provincially Significant Wetland (Figure 6). At its closest point, it is about 0.5 km upstream from the study area along the Jock River. This is a diverse wetland of fen, mixed swamp, and emergent marsh with areas of mixed and deciduous forest.

2.2.2 ANSIs

No Areas of Natural and Scientific Interest are found within the study area. ANSI reports for MNR Site Districts 6-11 and 6-12, the Jock River Reach 2 Study (MMM and WESA, 2007), and the NHIC website were consulted. Approximately 3 km to the northeast of the village of Richmond lies the Richmond Forest ANSI – a regionally significant upland deciduous forest.

2.2.3 Significant Woodlands

Significant woodlands as described under the Provincial Policy Statement have not yet been formally identified or mapped by the City of Ottawa to date. However, the southernmost wooded areas (i.e., W4-W7; Figure 6, Figure 7) have been identified as having ecological significance in two studies. These wooded areas (NESS Area 422, Marlborough Forest) are...
identified as High Value in the NESS study of 1997 (Brownell et al., 1997). The Marlborough Forest area (NESS 422) is described by author David White as one of the most significant natural areas in the former RMOC for maintaining biodiversity and ecological function, with a high representation of diverse vegetation communities, rare species, wildlife concentrations, and hydrological features. Very little is known about the very small portion of NESS Area 422 that lies within the study area, as no site-specific information could be located. Although the remainder of NESS 422 is identified as a Rural Natural Feature on Schedule A of Ottawa’s Official Plan, this area is identified as “Village” on Schedule A.

The Jock River Reach 2 Subwatershed Study (MMM and WESA, 2007) identifies an area of interior forest habitat for area-sensitive breeding birds in the woodlands south of the railway line (W5; Figure 8). An area just to the south of the Jock River (W5) is also shown to be coniferous forest older than 50 years. Finally, both wooded areas north and south of Jock River (W4 and W5) provide a riparian buffer of at least 100m from the Jock River (MMM and WESA 2007). This area is also large enough to provide linkages for wildlife movement along the Jock River corridor into the much larger Marlborough Forest and Richmond Fen natural area complex.

The three small woodlots (W1, W2, W3) were not identified during the NESS or other studies as significant. At the landscape level, they do not possess features typically used to identify areas of ecological significance (e.g. large area, presence of interior forest for area sensitive breeding birds, close proximity to other wooded areas, proximity to riparian areas).

However, these wooded areas will be inventoried during field studies to determine whether they possess other features considered significant, e.g. rare or significant vegetation communities, species at risk, or old growth forest. Vegetation communities will be mapped according to the Ecological Land Classification methods (ELC) (Lee et al. 1998) during the spring and summer of 2008.

One additional factor related to forest cover is worth noting. Section 4.7.2 of the Official Plan provides for protection of vegetative cover within the City of Ottawa. The City has a target of 30% tree cover throughout the City. At present, the Jock River Reach 2 Subwatershed Study calculated that forests, treed swamps, and plantations occupy 17.3% of the land cover of the intensively agricultural Jock River Subwatershed (MMM and WESA, 2007). Applications for subdivision or site plan approval must be supported by tree-preservation plans and landscape planting plans that retain as much natural vegetation as possible, especially along watercourses, on steep slopes, in valued woodlots and in areas linking green spaces, with a particular emphasis on high quality or rare vegetative communities. Where there is substantial alteration of the natural vegetation cover on the site, the ecological impact during and after construction will be considered and mitigation measures must be proposed.

2.2.4 Significant Wildlife Habitat

Significant wildlife habitat as described under the Provincial Policy Statement has not been identified or mapped by the City of Ottawa to date, and therefore none of the study area has been specifically identified as Significant Wildlife Habitat.
During site visits in spring and summer 2008, features that are typically considered to contribute to significant wildlife habitat will be assessed (e.g. presence of features including tree cavities, stick nests, interior forest bird species, rare vegetation communities, snake hibernacula, vernal ponds, and deer yards).

### 2.2.5 Species at Risk

No existing site-specific field investigations outlining species at risk or regionally significant species were located. The NESS study of 1997 documented 5 fauna and 80 flora species considered rare in the former Regional Municipality of Ottawa-Carleton (RMOC), within the 15,787 ha natural area of Marlborough Forest (NESS 422). It is not known whether any of these species occur in the portion of NESS 422 that is on the site along the Jock River (W4 and W5), but this will be confirmed in field studies.

A broad search for previously documented records of species at risk and rare species was completed for the general area surrounding the study site (approximately 5km x 5km), using the database of the Natural Heritage Information Centre (NHIC) of the Ministry of Natural Resources. Within this broad area, there were records for the following species at risk: Least Bittern (*Ixobrychus exilis*, THR), Yellow Rail (*Coturnicops noveboracensis*, SC), Loggerhead Shrike (*Lanius ludovicianus*, END), Halloween Pennant (*Celithemis eponina*, a dragonfly, S3), and three sensitive species (THR, SC and END). Information requests to the Kemptville MNR office will identify the sensitive species. None of these appear occur on the study site based on MNR’s web mapping.

The Least Bittern, and Yellow Rail require extensive areas of wetland, with very specific habitat requirements. There is no wetland habitat on this site. Loggerhead Shrike could occur in the general Richmond area; this record is from an area more than 5 km southwest of Richmond Village. There have not been any active Loggerhead Shrike nests reported in the Ottawa area in more than five years. Their habitat is open, short grass pasture (i.e. not cropped fields) with scattered shrubs and small trees (e.g. red cedar or hawthorn), and this type of habitat is not present on the site, which is currently cropped with corn through the growing season.

The Halloween Pennant is a striking, orange and black dragonfly that was recorded about 2km northeast of the site. It can be found in meadows and ponds. Field studies in the summer of 2008 will provide further information on whether any of these species can be found, or the suitability of habitat for them.

Although no previously documented records were found, it is possible that field studies will locate Butternut (*Juglans cinerea*) trees on the property. Once a widespread tree across eastern North America, Butternut is now nationally and provincially endangered because its population has been greatly reduced by disease. Butternut trees are still found in woodland and hedgerows

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1 The designations given to Species at Risk are listed here in order of severity: END: Endangered; THR: Threatened; SC: Special Concern.
in the Ottawa area and if found, trees will be assessed for their health in order to provide direction on whether trees should be retained (if healthy) or removed (if diseased).

**Figure 5.** Map of the Village of Richmond showing the Mattamy Land Holding and woodlots 1 to 7 (W1 through W7).
Figure 6. Map of the Village of Richmond (and surrounding area) showing the proximity of the Richmond Wetland.

Figure Note: map information obtained from MMM and WESA (2007).
Figure 7. Map of the Village of Richmond (and surrounding area) showing forest cover.

Figure Note: map information obtained from MMM and WESA (2007).
Figure 8. Map of the Village of Richmond (and surrounding area) showing areas of Interior Forest and Ness Areas.

Figure Note: map information obtained from MMM and WESA (2007).
2.3 Opportunities and Constraints

2.3.1 Opportunities

Although small in size, there is an opportunity to incorporate some or all of the small woodlots (W1 and W2) at the north end of the Mattamy land holdings into the open space plans for the community. This would help to retain as much natural vegetation as possible on the site, in keeping with the City’s Official Plan policies.

Several sections of the Van Gaal Drain have been straightened and realigned over the years. As residential development is planned for some of the land surrounding these sections, there would be opportunities to re-naturalize the channel through a natural-channel design. This would restore proper function to the straightened channels and would reduce the need for channel maintenance in addition to improving the esthetics of the channel and improving fish habitat.

An undersized culvert was installed in the Van Gaal drain upstream of Perth Street. The drain presents a potential velocity barrier to upstream-migrating fish during periods of high flow (i.e., spring). Re-sizing of the culvert would eliminate that barrier and facilitate upstream fish movements. This is particularly relevant to pike that may potentially use spawning habitats upstream.

2.3.2 Constraints

2.3.2.1 Aquatic Environment Including Fluvial Geomorphological Considerations

- The main branch of the Van Gaal Drain flows through the north east section of the Mattamy land holdings. The Van Gaal Drain contains fish, including pike. A setback requirement needs to be established based on Official Plan policy and site specific study. As noted in the Policy Review, the 100-year flood line, the meander belt width, and erosion setbacks are important constraints when land surrounding watercourses is to be developed. The subwatershed report indicated that the meander belt widths delineated as part of that study were conservative. Consequently, meander belt widths and associated erosion setbacks would need to be refined to accurately determine the constraints to development. The Jock River itself is also adjacent to the Mattamy Homes’ land holding. Meander belt width delineation did not appear to have been completed for the Jock River and therefore this would need to be determined for the reach in addition to appropriate erosion setbacks.

- Drains bisecting the Mattamy land holding provide direct fish habitat. They may be ephemeral but do contain fish during the spring. These drains will be a constraint to the development of the property, with setbacks (or other options) being established on the basis of site-specific study.
2.3.2.2 Terrestrial Environment

- Woodlands in the southernmost part of the land holding (W4, W5, W6, W7) are part of NESS 422 and considered of high ecological value; portions of this area are also identified as having interior forest habitat, riparian vegetation along the Jock River, and forests over 50 years old.

- Woodlands in the southernmost part of the land holding (W4 and W5) of are part of NESS 422 and considered of high ecological value; portions of this area are also identified as having interior forest habitat, riparian vegetation along the Jock River, and forests over 50 years old.

- Low tree cover within Jock River Reach 2 Subwatershed may require tree-preservation plans and landscape planting plans that retain as much natural vegetation as possible.

2.4 Next Steps and Required Analysis

2.4.1 Aquatic

Field studies will be conducted to characterize natural areas and surface water features within and surrounding Mattamy Homes land holding. Field studies will include:

- Inventories of fish to determine the use of the tributary drains by fish;

- Water temperatures of the Van Gaal Drain and its associated temperatures will be monitored during the hottest period of the summer of 2008;

- Physical habitats of the tributary drains including the Van Gaal Drain (width, bankfull depth, flow velocities) will be determined.

2.4.2 Fluvial Geomorphological

The next steps in the process would include a continuation of the desktop work to include the 100 year erosion rate, and to determine a planning level meander belt width for corridor delineation (which would include the 100 year erosion set back). Following the completion of the desktop work, field work would be completed to update the RGA assessments completed in 2004 and to complete Rapid Geomorphic Assessment Technique walks. These walks would identify any channel instabilities and would evaluate the overall stream health. These walks would also serve to confirm meander belt widths and would identify any areas of excessive erosion. Based on the results of the RGA and RSAT walks, detailed field work will be completed on select reaches to provide erosion thresholds and/or determine the feasibility of any channel relocation. Monitoring sites would also be installed at this time to provide a baseline prior to any residential development.
2.4.3 Terrestrial

Field studies are necessary to describe any other natural features and functions, especially as they may relate to opportunities and constraints;

Studies proposed for the Spring and Summer of 2008 include:

- Surveys for vertebrate fauna (birds, amphibians, reptiles) during the breeding season and summer;
- Flora surveys and Ecological Land Classification mapping of vegetation communities;
- Identification of any Species at Risk or suitable habitat for those documented from the area;
- Candidate trees or potential areas for tree preservation plans.

Analysis of these features and functions will be contained in a detailed Existing Conditions study in fall 2008.

3.0 LITERATURE CITED


