
1.0 INTRODUCTION

Aquafor Beech Limited and North-South Environmental Incorporated were retained by 1281216 Ontario Inc. (Intracorp) to prepare an Environmental Impact Study to assess the impacts of the proposed Residential Subdivision on the existing natural features within part of the residentially designated tablelands of the Castlemore Golf and Country Club, generally located between Airport Road and Goreway Drive, south of Countryside Drive (Figure 1). The proposed development comprises 201 single family Residential Lots, two (2) Park Blocks, two (2) Stormwater Management Ponds and open space. The proposed Subdivision utilizes a portion of the existing golf course located north and south of the existing Estate Residential Subdivision on Tortoise Court as well as vacant land between the existing golf course (south of Tortoise Court) and the Ridgecore Subdivision which is currently being developed. The northerly part of the proposed Subdivision also abuts a group of estate residences that front on Countryside Drive.

There are two drainage features that traverse the Subdivision in a southeasterly direction from Countryside Drive to Goreway Drive (see photos). North of Countryside Drive, both features have been incorporated into the existing urban infrastructure. The “Westerly Feature” drains an existing stormwater pond (Vales of Castlemore North SWM Pond No. 2) located north of Countryside Drive and east of Landscape Drive as well as localized road drainage from Countryside Drive, while the “Easterly Feature” conveys storm drainage from the Countryside Drive right of way to the north of the existing residences as well as from an existing stormwater management pond outlet (Vales of Castlemore North SWM Pond No. 3).

The Westerly Feature, where it crosses the southerly portion of the Intracorp Subdivision, was the subject of a previous EIS report (LGL 2006) which was completed for the adjacent Ridgecore Residential Subdivision (File No. 21T-05019B). A copy is included in Appendix “C” for reference. The aforementioned EIS assessed the environmental impacts of realigning the subject watercourse (Westerly Feature), from the south limit of the existing Tortoise Court Residential Area southerly to Goreway Drive, using natural channel design principles, and concluded that the realigned watercourse would provide an overall net gain in terms of aquatic habitat function. This portion of the Westerly feature was therefore not assessed as part of this Study, however, the relevant aspects of the mitigation and compensation measures are presented again as part of this report, since they are relevant to the overall plan for the subdivision.

A tree inventory for the property has also recently been prepared (MBTW 2007). The majority of trees on the subject property are either individual specimens or small groups of trees most of which were planted as part of the golfcourse design, although there are some small groups of trees that may predate the golfcourse. Many of the specimens are non-native species. In general specimens or small groups of trees were identified for preservation if they satisfied the following criteria:

- They provide a visual buffer from adjacent lands
- They were located in a park block

- They were good quality native specimens that may be incorporated into the subdivision layout, subject to grading constraints
- They occur in association with other features to be protected (for example the Easterly Feature in Segment 6 – Figure 2)

The report provides recommendations for tree protection including preconstruction flagging/fencing of specimens to be protected and construction monitoring to ensure protected trees are not at risk.

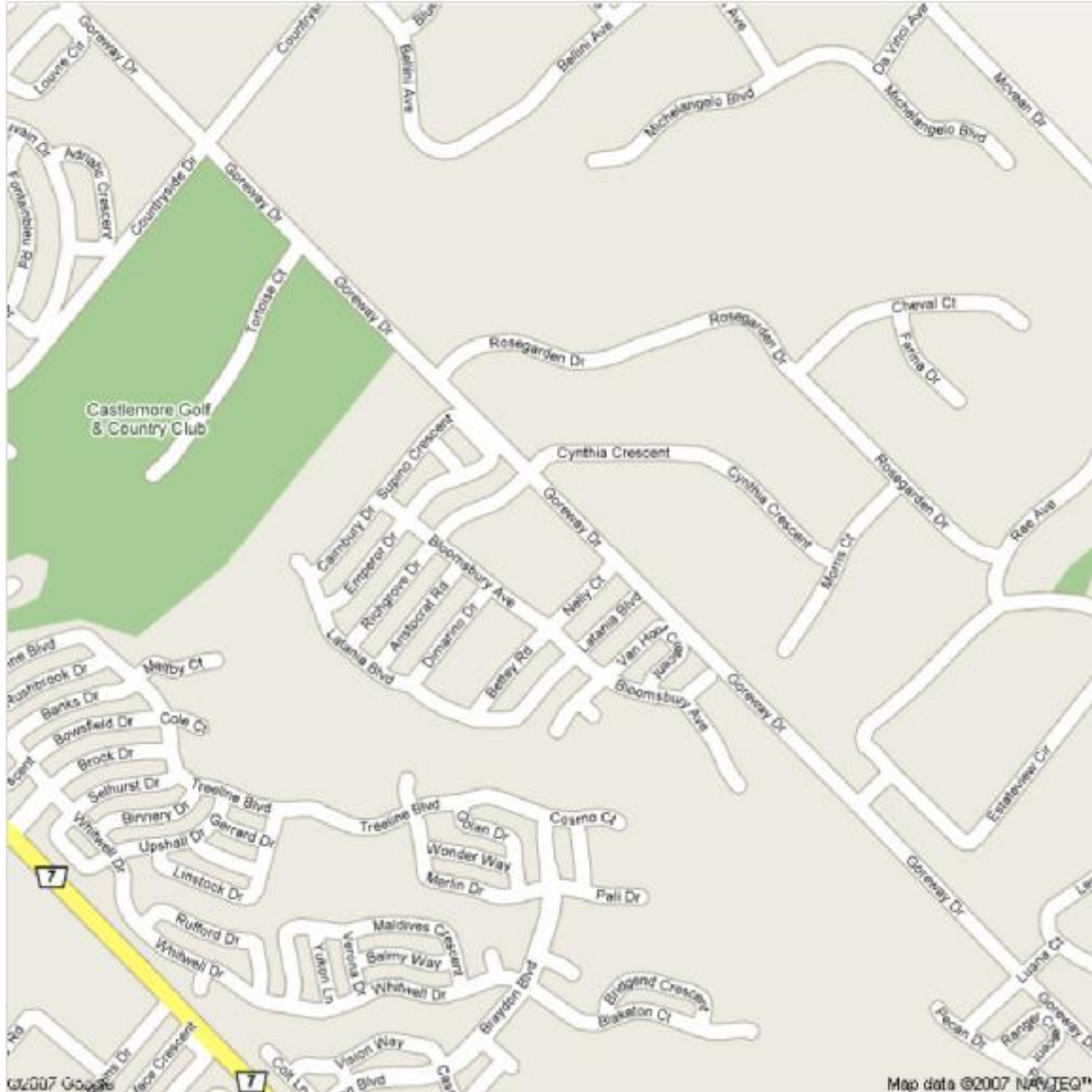


Figure 1. General Study area

2.0 STUDY METHODOLOGY

Vegetation and wildlife, including breeding birds, in the wet areas of the Subdivision Lands were surveyed in late May and early June 2007. The visits were conducted early

in the morning, in warm conditions with no wind, which are considered to be appropriate conditions for breeding bird surveys as determined by Canadian Wildlife Service Breeding bird survey protocols. Vegetation communities were delineated using southern Ontario Ecological Land Classification (ELC) protocols (Lee et al. 1998). Species lists mainly focused on dominant species and on species that could indicate significant habitats. Species were screened for significance in Ontario as determined by the Natural Heritage Information Centre (NHIC 2007) and for regional significance in the Toronto and Region Conservation Authority jurisdiction (TRCA 2003).

An aquatic habitat assessment was completed in late May 2007, which included electrofishing in the shallow portions of the existing golf course ponds.

3.0 VEGETATION

Six vegetation communities were noted within the existing golf course ponds and along the Drainage Features. Vegetation communities along the Drainage Features consisted primarily of patches of mineral meadow marsh, an indicator of conditions transitional between upland and wetland, interspersed with shallow aquatic vegetation within the golf course ponds. The Easterly Feature consists of rudimentary fragments of marsh along open portions of the drainage ditch through the golf course, with mowed grass over portions that have been piped underground. However, there are wider stands of cattail at the northern and southern ends of the Drainage Feature where it crosses the golf course. The Westerly Feature includes a band of wetland vegetation along an ill-defined, open ditch, interspersed with larger ponds and the occasional culvert. All soils in the Drainage Feature are mineral, consisting mainly of silty loam.

None of the plant communities identified within the Study Area is considered to be provincially rare. One of the aquatic plant communities noted (SAS 1-1) is potentially considered to be regionally rare (i.e. rare in the Toronto and Region Conservation jurisdiction).

The following section details the existing vegetation communities.

3.1 Vegetation Communities

Creeping Bent-Grass Mineral Meadow Marsh (MAM 2-3)

This community is slightly dissimilar to the one noted in the Ecological Land Classification manual (it is dominated by creeping bent-grass (*Agrostis stolonifera*) instead of red-top (*Agrostis gigantea*), a closely related, and non-native species. Narrow portions of the Drainage Features are dominated by creeping bent-grass. These small patches serve a limited habitat function as they are less than 1 m wide, with little diversity.

Broad-leaved Sedge Mineral Meadow Marsh (MAM 2-6)

A small portion of meadow marsh adjacent to the larger pond on the Westerly Feature is dominated by a dense cover of small-fruited bulrush (*Scirpus microcarpus*). Several other sedges are occasional to abundant, including lakebank sedge (*Carex lacustris*) and

fox sedge (*C. vulpinoidea*). This wetland community, though very limited in size, is more diverse than other features within the Study Area.

Cattail Mineral Shallow Marsh (MAS 2-1)

This vegetation type is common along wetter portions of the drainage features, and along the pond edges. It is dominated by a near-monoculture of narrow-leaved cattail (*Typha angustifolia*). Willow shrubs, mainly sandbar willow (*Salix eriocephala*) and slender willow (*S. petiolaris*) are scattered throughout the cattail. Small silver maple seedlings (*Acer saccharinum*) are also occasional.

Pondweed Submerged Shallow Aquatic Marsh (SAS 1-1)

The shallow water area of the Pond A on the Westerly Feature is dominated mainly by sago pondweed (*Potamogeton pectinatus*). Other species within this shallow water area include Nuttall's waterweed (*Elodea nuttallii*), which is considered regionally significant in the TRCA jurisdiction, and coontail (*Ceratophyllum demersum*). Due to the presence of the Nuttall's waterweed this community could be considered regionally rare in the TRCA jurisdiction, however, since this species was sparsely distributed in the pond which is dominated by the non-native sago pondweed, the community is not considered regionally rare. The deeper portion of the pond contained no aquatic vegetation and is not considered part of this community type.

Manitoba Maple Mineral Deciduous Swamp (SWD 3-4)

Manitoba maple (*Acer negundo*) and hybrid willow (*Salix x rubens*) dominate a small area of the Easterly Feature just west of Goreway Drive. The understory consists of narrow-leaved cattail and jewelweed (*Impatiens capensis*).

Manicured Willow

This vegetation consists of planted white willow (*Salix alba*) surrounding a man-made pond within an existing Tortoise Court Estate residential lot. The understory consists of mowed grass.

3.2 Flora

Twenty-five plant species were noted within the Drainage Features and ponds on the site. Almost all of the plant species found on the site are common, adaptable species characteristic of a variety of urban wetland habitats. Most species are considered common in the TRCA jurisdiction. One species rare in the TRCA jurisdiction was found: Nuttall's waterweed (*Elodea nuttallii*). It was sparsely distributed in the larger pond on the Westerly Feature which was dominated by sago pond weed (a non-native species).

Summary

The following is a summary of the existing areas of the vegetation features within the Subject Subdivision and the existing residential lots (existing vegetation within the Westerly feature downstream of Tortoise Court is not included) :

ELC Community	Total area (ha)	Area within Subdivision Plan only (ha)
MAM2-3	0.14	0.14
MAS2-1	0.33	0.24
MAM2-6	0.05	0.05
SAS1-1*	0.20	0.20
SAS1	0.07	0.00
SWD2-4	0.14	0.04
Manicured Willow	0/21	0.00
Total Area	1.14	0.67

* the deeper part of the pond is not included in this ELC community type

The total area of Wetland Vegetation within the Subject Subdivision is approximately 0.63 ha and the area of Woody Vegetation is approximately 0.04 ha.

4.0 FAUNA

Seventeen species of fauna were noted within the Subdivision Property (Appendix 2). One reptile, a snapping turtle, was noted within the larger pond on the Westerly Feature. Nest scrapes were noted in a cleared area south of Tortoise Court, approximately 20 m from the edge of the Westerly Feature. One resident of the area noted that a painted turtle had been seen within the golf course property.

Birds

The group with the greatest diversity on the site was birds. Fifteen species were noted. All species are those characteristic of small patches of natural habitat within a highly developed landscape. The only species that was specifically associated with the wetland habitat on the site were Canada geese and red-winged blackbirds. Warbling vireo, a species usually found in treed riparian habitat, was noted once on the site. Other species were noted in trees and shrubs around the wetlands, but were also noted in trees and shrubs in other parts of the site, such as American robin, song sparrow and eastern kingbird. None of the species noted on the site is considered significant in Ontario, or in the TRCA jurisdiction.

One species noted in fields adjacent to the drainage features, eastern meadowlark, is considered to be an area-sensitive grassland species. These can be significant because they require larger tracts of habitat. They are becoming more scarce in southern Ontario as development encroaches on agricultural habitat. However, eastern meadowlark is not considered rare in Ontario or in the TRCA jurisdiction.

Amphibians and Reptiles

Two species of amphibian were noted on the property: green frog and American toad. Both these are highly adaptable species that are frequently found in disturbed landscapes and can breed in a variety of habitats with standing water. Green frogs are mainly aquatic, while American toads require uplands in which to forage during the summer, as well as soils in which they can burrow below the frost line in winter. Evidence of a snapping turtle was observed adjacent to Pond B within the Tortoise Court subdivision, and residents also report painted turtles using this pond.

Mammals

No mammals were observed during the field investigations, however, evidence of the following species (tracks, scat, etc.) were noted:

- Raccoon
- White Tail Deer
- Skunk
- Grey squirrel

These are species typical of urban environments and most will persist following development. White tail deer generally require more extensive habitats and agricultural lands, and their habitat is becoming more limited as the area urbanizes. Remaining habitat is likely within the river valleys to the south and west.

5.0 AQUATIC RESOURCES

The Drainage Features within the Subdivision convey surface storm water into the westerly branch of Salt Creek, a tributary of the West Humber River. The West Humber Subwatershed Study (Aquafor 2002) defines these features as Fish Community Zone 1 intermittent drainage features in the Subwatershed Study, which provide a support function in terms of water quantity and quality to the downstream fish communities in the westerly branch of Salt Creek. During periods of extended flow, such as the spring freshet, the lower reaches of the Westerly Feature, downstream of the existing Tortoise Court Subdivision may also provide limited, seasonal fish habitat for fish populations within the westerly branch of Salt Creek. The recommended treatment of these features in the Subwatershed Plan is to ensure that the water quantity and quality conditions are maintained to support downstream fish communities and habitats.

The Draft Humber River Fisheries Management Plan (TRCA and MNR 2005) defines the Westerly Feature, downstream of the Tortoise Court Subdivision as a Small Riverine Warmwater Habitat. This habitat type is comprised of watercourses draining less than 10 square km. For the most part, these are first and second order tributaries draining the Peel plain. Due to the dominance of clay soils, infiltration rates and corresponding groundwater discharge rates are low. Many of these tributaries are either reduced to standing pools or completely dry up during summer months. The low baseflow to average annual flow ratio suggests that these tributaries have unstable flow regimes with stream levels fluctuating wildly after rainfall. Water temperatures are also unstable and typically exceed 25 C in summer. These watercourses generally lack fish species with specialized feeding habits and piscivores. The fisheries rehabilitation target for this portion of the tributary is darter species. **The Easterly Feature is not classified in the Fisheries Management Plan and therefore is recognized as providing only a supporting habitat function for downstream fish communities in the westerly branch of Salt Creek. One of the key recommendations in the Fisheries Management Plan is to incorporate measures to reduce thermal effects, augment base flows and reduce wildly fluctuating flow conditions that negatively affect downstream habitats that would support darter species.**

The Draft Humber River Fisheries Management Plan also recognizes ponds and reservoirs as features that provide fish habitat and identifies habitat protection and enhancement targets for the larger ponds and reservoirs that exist on public lands. For the more than 600 online and offline ponds on private property within the watershed, the Plan recommends working with landowners to address the following:

- Mitigate the effects of online ponds on fish migration and thermal warming
- Encourage the protection of fish habitat in ponds where they exist
- Promote the use of native species for stocking purposes
- Avoid the transfer of non-indigenous fish species from ponds into watercourses

A summary of the habitat conditions of the two Drainage features and the four (4) ponds within the Subdivision property is provided below and illustrated in Figure 2.

There are two small, intermittent Drainage Features, the “Westerly Feature” and the “Easterly Feature”, which are tributary to the westerly branch of Salt Creek, that cross the Study Area. Both drainage features originate north of Countryside Drive where they were incorporated into the stormwater management infrastructure as part of the Subdivision development of the Vales of Castlemore North Secondary Plan and discharge through culverts and a storm sewer system to the south side of Countryside Drive. The subject Intracorp Subdivision includes portions of these drainage features on the northerly and southerly sides of the existing Tortoise Court residential Subdivision. The Tortoise Court residential subdivision comprises large lots (approximately 0.8 ha or larger) that originally were serviced on private septic systems, but have recently been serviced by a sanitary sewer.

The features, where they cross the existing Tortoise Court Subdivision, generally remain in a pre-development condition, as no specific measures were implemented to enhance the existing conditions. It was noted that there is some ongoing grading activity along a portion of the Westerly Feature and there have been some minor impacts on both features associated with the culverts under Tortoise Court and the recent sanitary sewer construction.

It was also noted that the Easterly Feature is piped for a portion of its length north of the Tortoise Court development.

As previously noted in Section 1 of this Report, the part of the Westerly Feature that crosses the southerly portion of the Intracorp Subdivision south of Tortoise Court was previously addressed in an EIS Report completed for the adjacent Ridgecore Subdivision. The existing on-line pond and drainage feature are proposed to be replaced by a new channel designed with natural channel design principles. The existing on-line pond will be eliminated, consistent with the recommendations of the draft Humber River Fisheries Management Plan to eliminate online ponds and reduce thermal impacts to fish habitats in the westerly branch of Salt Creek. These features are illustrated in Figure 3.

The Westerly Feature flows from a storm sewer outlet on Countryside Drive for a distance of about 200 m and discharges into an on-line pond (Pond A) with a surface area of about 0.25 ha (Segment 1). There is also a small pool feature (which was dry in July) immediately downstream of the pond culvert outlet. Downstream of the outlet of Pond A, the Westerly Feature flows for a distance of about 20 m to the lot line of the existing Tortoise Court Subdivision lots (Segment 1). Within the existing Tortoise Court Subdivision, the Westerly Feature discharges into a small on-line pond (Pond B) with an area of about 0.06 ha. The feature drains across the Tortoise Court Subdivision Lots for a distance of about 200 m (Segment 2) and then continues onto the southerly portion of the Intracorp Subdivision. A natural channel design for the feature south of the Tortoise Court Subdivision south to Goreway Drive (approximately 300 m of new channel has been approved by TRCA and the City of Brampton).

The Easterly Feature flows through an existing residential property fronting onto Countryside Drive for a distance of about 100 m downstream of Countryside Drive, before entering the Intracorp Subdivision (Segment 3). The Feature continues

intermittently for a distance of about 150 m before entering the Tortoise Court Subdivision (Segment 4). The feature flows through the Tortoise Court Subdivision for a distance of about 220 m (Segment 5), then through the northeasterly corner of the southerly portion of the Intracorp Subdivision for a short distance of about 35 m (Segment 6) before crossing Goreway Drive. As noted above, The Easterly Feature is discontinuous through the existing golf course north of the Tortoise Court Subdivision where it is enclosed and piped through a small diameter pipe for a distance of approximately 55m. It is also enclosed and piped through field tile for a similar distance through the existing Estate Residential lot located on the north side of Tortoise Court.

In addition to the two Drainage Features and associated ponds as described above, there are three other manmade ponds (Ponds C, D and E) located at the westerly edge of the Subdivision near the Castlemore Golf Course Clubhouse and parking lot. All three of these ponds are irrigation ponds associated with the golf course and have areas of about 0.5 ha (Pond C), 0.06 ha (Pond D) and 0.25 ha (Pond E) respectively.

During the May 2007 field visit, there was no flow in either of the Features draining the site and no fish were found in the drainage features. A further survey completed on August 2007 also indicated that there was no flow in either Drainage Feature (see photo section). While no fish were captured by electrofishing in the four ponds, schools of brown bullhead were observed in Pond A.

Both Drainage Features lack a defined channel, and, in both cases, flow for a portion of their length across the manicured fairways of the golf course or through enclosed pipes. In both cases, they support limited emergent wetland vegetation consisting of cattails and creeping bentgrass. With the exception of Segment 6, a 25 m section of the Easterly Feature, where it crosses the southerly portion of the Intracorp Subdivision, riparian habitat is lacking on the Drainage Features. This short section (Segment 6) has a narrow wooded riparian zone, dominated by Manitoba Maple. Similarly, riparian habitat is lacking in both Drainage Features where they traverse the existing Tortoise Court Subdivision, except around Pond B and on the Easterly Feature south of Tortoise Court, where a narrow wooded riparian zone, dominated by Manitoba Maple exists.

Flows for each feature for various return frequencies are shown in the following table (m^3/s):

	East	West
DRC	0.056	0.041
2 Year	0.375	0.280
5 Year	0.588	0.485
10 Year	0.705	0.571
25 Year	0.852	0.661
50 Year	0.969	0.735

100 Year	1.168	0.870
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The 100 year flow can easily be accommodated within the allotted corridor widths for each feature. In addition, the field observations combined with the low flow volumes and shallow gradient support our assessment that the channel is currently vegetatively controlled and that a linear wetland feature is an appropriate design form for the new channel.

The two features were assessed using the TRCA/CVC headwater drainage feature protocol (2007). This classification determines the appropriate management treatment for each feature based on its function as fish habitat. The possible management treatments are defined as follows:

Protection: “Preserve the existing drainage feature to protect permanent flow and fish habitat, including the maintenance of external drainage and the incorporation of shallow groundwater and base flow protection techniques – extended detention outfalls are to be located to avoid and/or minimize impacts to fish habitat.”

Conservation 1: “Conserve the function in a drainage feature that provides fish habitat and flow conveyance, e.g., A realigned natural feature/corridor, including the maintenance (or replacement) of surface flows, seasonal groundwater flows or contributing wetland flows – this can be achieved by maintaining external flows, extended detention facility outlet, third pipe / FDC system, and/or infiltration treatments, that outlet to the realigned corridor”.

Conservation 2: “Conserve the function in a form that provides flow conveyance and contributes directly to fish habitat, i.e., direct connection to watercourse and/or wetland, etc., – this can be achieved by enhanced lot level conveyance measures, including well-vegetated swales which incorporate herbaceous, shrub and tree material to mimic online wet vegetation pockets.”

Mitigation: “Maintain flow conveyance through lot level conveyance measures, e.g., rear yard swales connected to the stormwater management system”.

No Management Required: “The pre-screened drainage features has been field verified to confirm that no feature and/or functions associated with headwater drainage features are present – generally characterized by evidence of cultivation, furrowing, presence of seasonal crop, lack of vegetation, etc.”

Feature	Flow Assessment	Fish Habitat Assessment	Vegetation Assessment/ Linkage	Channel Form	Habitat Classification	Drainage Feature Management Recommendation
Westerly Feature	Ephemeral – flow in response to precipitation only Online pond provides storage function	No seasonal habitat in drainage feature Online pond supports brown bullhead population	Majority of riparian habitat is golfcourse, limited riparian wetland habitat Pond supports wetland vegetation	Majority of channel is vegetatively controlled. Primarily swale across golfcourse. Intermittent channel development and associated riparian wetland	Contributing (type ii) – provides indirect habitat to downstream reaches – simple contributing habitat: influences flow conveyance, attenuation, storage and infiltration	Mitigation 2: replicate functions by lot level conveyance measures (ie swales) connected to natural heritage system, as feasible and/or the stormwater management system
	No Groundwater function	No critical habitat, barriers, limited riparian habitat, limited food supply function	Linkage function is truncated at Countryside Drive. Wildlife corridor function is negligible. Pond provides some waterfowl habitat	No pool:riffle morphology, limited bank definition, stream gradient very low		
Easterly Feature	Ephemeral – flow in response to precipitation only	No seasonal habitat in drainage feature	Majority of riparian habitat is golfcourse, limited riparian wetland habitat	Majority of channel is vegetatively controlled. Primarily swale across golfcourse. Intermittent channel development and associated riparian wetland	Contributing (type ii) – provides indirect habitat to downstream reaches – simple contributing habitat: influences flow conveyance, attenuation, storage and infiltration	Mitigation 2: replicate functions by lot level conveyance measures (ie swales) connected to natural heritage system, as feasible and/or the stormwater management system
	No Groundwater function	No critical habitat, barriers, limited riparian habitat, limited food supply function	Linkage function is truncated at Countryside Drive. Wildlife corridor function is negligible.	No pool:riffle morphology, limited bank definition, stream gradient very low		

The Drainage Features in their current form do not support fish habitat within the proposed Intracorp Subdivision, however they have potential to support downstream fish communities in the westerly branch of Salt Creek. As noted previously it is proposed, pursuant to the LGL Environmental Impact Study Report (2006), that the Westerly Feature be enhanced south of the existing Tortoise Court Subdivision using a natural channel design to provide seasonal fish habitat (Figure 3).

The small section of the Easterly Feature, Segment 6, also offers some potential as seasonal fish habitat although flows are extremely intermittent due to the small size of the Feature.

Pond A provides fish habitat that currently supports a population of brown bullheads. This pond is relatively deep with a fringe of emergent (primarily cattail) and submergent (primarily sago pondweed) aquatic vegetation around the perimeter of the pond. The pond has historically received agricultural drainage from lands north of Castlemore Road and current receives discharge from the stormwater ponds serving the developed lands north of Countryside Drive as well as runoff from a section of Countryside Drive.

Ponds C, D and E, which are artificially created irrigation ponds, are steep-sided and relatively deep, when filled. Their use for irrigation, by drawing them down substantially, and their steeply sloping sides has limited the development of shallow vegetated areas that would provide fish habitat. Aquatic habitat in these features may be described as poor because of the lack of aquatic vegetation and their use as irrigation ponds.

A summary of the habitat conditions within the limits of the Easterly and Westerly Drainage Features is provided in Table 1

Table 1. Summary of Aquatic Habitat Conditions (see Figure 2)

Feature	Length/Area	Aquatic Habitat	Riparian Habitat
Westerly Feature – Segment 1	200 m	<ul style="list-style-type: none"> C 120 m - Intermittent, channel varies from defined to ill-defined, grasses and soil/sediment in channel C 80 m - Intermittent, no defined channel, channel consists of grasses C Some emergent aquatic vegetation – bentgrass and cattail 	<ul style="list-style-type: none"> C No native riparian habitat C Riparian areas limited to golfcourse roughs and fairways
Westerly Feature – Tortoise Court Segment 2	120 m	<ul style="list-style-type: none"> C Intermittent, channel varies from defined to ill-defined, grasses and soil/sediment in channel 	<ul style="list-style-type: none"> C No native riparian habitat C Riparian areas limited to unmanicured residential lands C Evidence of disturbance - grading
Pond A	0.25 ha	<ul style="list-style-type: none"> C Deep (when full) (> 2 m deep) – edge (steep side slopes) with limited emergent vegetation (cattails) <i>extending</i> less than 1 m from perimeter of pond 	<ul style="list-style-type: none"> C No native riparian habitat

Pond B	0.06 ha	C Shallow (< 2 m deep) – edge (shallow side slopes) dominated by cattails 2 m from perimeter of pond	C Woody riparian habitat around pond - willows
Easterly Feature – Segment 3 – Private land	100 m	C Intermittent, no defined channel, channel consists of grasses	C No native riparian habitat C riparian areas limited to unmanicured residential lands
Easterly Feature – Segment 4	150 m	C 70 m - Intermittent, no defined channel, channel consists of grasses C 80 m – Culvert under fairway	C No native riparian habitat C Riparian areas limited to golfcourse roughs and fairways
Easterly Feature – Tortoise Court Segment 5	220 m	C 50 m – Intermittent, tile drained C 170 m – Intermittent, channel varies from defined to ill-defined, grasses and soil/sediment in channel	C Narrow woody riparian area dominated by Manitoba Maple C No native riparian vegetation
Easterly Feature – Segment 6	35 m	C Intermittent, channel varies from defined to ill-defined, grasses and soil/sediment in channel	C Narrow woody riparian area dominated by Manitoba Maple
Pond C	0.5 ha	C Irrigation pond C Relatively deep, steep-sided, poorly developed shallow zone – limited aquatic vegetation	C No native riparian habitat
Pond D	0.06 ha	C Irrigation pond C Relatively deep, steep-sided, poorly developed shallow zone – limited aquatic vegetation	C No native riparian habitat
Pond E	0.25 ha	C Irrigation pond C Relatively deep, steep-sided, poorly developed shallow zone – limited aquatic vegetation	C No native riparian habitat

5.0 SUMMARY OF ECOLOGICAL FUNCTIONS

On the Westerly Feature, the on-line Pond A provides marginal habitat for a limited diversity of native wetland-dependent fauna and flora, including one flora species significant in the TRCA jurisdiction. The other ponds within the Study Area have more limited ecological functions.

Although there was documentation of an Eastern Meadowlark, which is considered area sensitive, this species is gradually disappearing in urban areas as the agricultural landscape on which it depends is developed. There is insufficient habitat within the Tableland Areas of the Subdivision to sustain this species in the future. The existing wetland/pond habitat within the Subdivision lands provides very limited and localized habitat for a number of common species of fauna and flora that are well adapted to an urban setting. The nearby vegetated valleys of the West Humber River and its major tributaries (including Salt Creek) provide the primary habitat for these common species.

From an aquatic habitat perspective, the two Drainage Features where they cross the proposed Subdivision, and excluding the portion already approved as a natural channel

design in connection with the Ridgecore Subdivision, provide a support function to downstream fish habitat. This current function is limited by the lack of riparian habitat, the warming effect of Ponds A and B, and water quality related impacts from historic and current land uses.

Pond A provides fish habitat and currently supports a brown bullhead population. This is a warmwater fish species that is tolerant of warm temperatures, periodic conditions of high turbidity and moderate nutrient enriched conditions.

5.1 Designated Features

Important natural features are designated for protection through the Provincial Planning Act and Policy Statements and through the City of Brampton's Official Plan.

The Planning Act and Policy Statements, protect natural features as follows:

“**2.1.3** *Development and site alteration* shall not be permitted in:

- a. *significant habitat of endangered species and threatened species;*
- b. *significant wetlands in Ecoregions 5E, 6E and 7E1;* and
- c. *significant coastal wetlands.*

2.1.4 *Development and site alteration* shall not be permitted in:

- a. *significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E1;*
- b. *significant woodlands south and east of the Canadian Shield2;*
- c. *significant valleylands south and east of the Canadian Shield2;*
- d. *significant wildlife habitat;* and
- e. *significant areas of natural and scientific interest*

unless it has been demonstrated that there will be no *negative impacts* on the natural features or their *ecological functions*.

2.1.5 *Development and site alteration* shall not be permitted in *fish habitat* except in accordance with *provincial and federal requirements*.”

None of the features on the subject property fall under the definitions of Sections 2.1.3 and 2.1.4 of the provincial policy statements. The drainage features on the site have been identified as providing supporting habitat to fish communities located downstream offsite. Their treatment under section 7.0 is consistent with this policy statement.

The City of Brampton's Official Plan provides for the protection of Environmentally Significant Features, Provincially Significant Wetlands, Areas of Natural and Scientific Interest and Woodlots. A review of Schedule D of the Official Plan “Environmental Features” indicates that none of these features are located on the subject property. In

addition, the inventory and assessment of natural features conducted as part of this study did not indicate that any of the features identified should be given special status under either the City of Brampton's Official Plan or the Provincial Policy Statements.

6.0 WATER BUDGET CONSIDERATIONS

The average water budget was based on the monthly average precipitation and temperature records (Canadian climate normals 1971 – 2000) for Toronto Lester B. Pearson International Airport. The average annual precipitation is 792.7 mm/year

The pre- and post-development evapotranspiration components were calculated using the method of Thornthwaite and Mather (1957) using the latitude of 43°47' and a soil moisture retention value of 100 mm. The soil moisture retention is applicable for a clay loam under shallow-rooted crops.

The proposed residential subdivision is on a portion of the Castlemore Golf and Country Club. Soil mapping (Hoffman and Richards 1955) shows the presence of the Peel Clay over the area and geotechnical studies confirm that the predominant soil is a silty clay till that has been re-worked by wave action and is relatively highly weathered where exposed within 1 metre of ground surface (Soil-Eng, 2000a,b). Topsoil and fill over the landscaped portions of the country club is generally less than 30 cm, although topsoil has been mixed with remobilized silty clay and used as fill for landscaping purposes.

The resulting actual evapotranspiration (ET) value is 537.3 mm/year, which leaves a water surplus of 255.4 mm/year, which is partitioned between infiltration and runoff.

Annual infiltration values for areas covered by glacial lake Peel clays are of the order of 50 mm/year (Gerber and Howard, 2002), which leaves a runoff value of 205 mm/year.

Component of Water Budget	Mm/year
Total Precipitation	792.7
Evapotranspiration	537.3
Water Surplus	255.4
Infiltration	50
Runoff	205

A monthly water budget estimate for pre-development conditions is provided in Appendix 3.

7.0 IMPACTS AND MITIGATION

The proposed Intracorp Subdivision will relocate and enhance the Easterly and Westerly Drainage Features within the limits of the Subdivision comprising Segments 1 and 4, preserving a total combined stream corridor length of about 400 m (excluding sections that pass under the proposed residential road), bi-passing the proposed stormwater

management facility and connecting to the existing features, where they enter the Tortoise Court development. In addition, it is proposed that Pond A will be re-designed and re-shaped to create a stormwater management facility (Figure 3). Irrigation Pond D will be eliminated and irrigation ponds C and E will be replaced elsewhere within the golf course. Segment 6 of the Easterly Feature will be maintained, which includes all of the woody riparian vegetation in the Study Area (about 0.05ha).

The support function of the two Drainage Features to downstream fish habitats, both in the Westerly Branch of Salt Creek, and in the portion of the Westerly Feature located within the southerly part of the Intracorp Subdivision which will be realigned as a natural channel, will be maintained as follows:

- Relocation and enhancement of the Easterly and Westerly Drainage Features as linear riparian wetlands that will connect to the existing features where they cross the Tortoise Court development;
- Re-design of Pond A as a stormwater management facility providing enhanced water quality, erosion and flood control;
The stormwater management pond will be designed to provide some thermal regulation (submerged outlet or bottom draw), baseflow augmentation and moderation of event flows to enhance conditions downstream to support the target darter species;
- Maintenance of Segment 6 of the Easterly Feature

The new proposed plan maintains the Westerly Feature in a 25 m wide corridor for a distance of about 330 m where it is then piped beneath the proposed road and stormwater management block, and outlets into the existing open channel within the Tortoise Court development. The Easterly Feature is maintained in a 15 m wide corridor for a distance of about 130 m, excluding the portion of the feature that will be piped under the proposed road, that will outlet into the existing open channel within the Tortoise Court development.

The linear riparian wetlands constructed in the re-aligned corridors of the Westerly and Easterly Drainage features will maintain the existing feature length of 350 m, and also result in the creation of about 0.85 ha of wetland habitat to offset the small loss of wetland habitat as a result of the development. The riparian wetlands will be planted with native species, including the rare Nuttall's Waterweed transplanted from Pond A. The following photos illustrate a typical riparian wetland feature (the illustration shows a feature that is more entrenched than the proposed feature here):



There are two “right angle” bends in the proposed corridor for the new alignment of the Westerly feature. Since the proposed design for this feature is a riparian wetland, rather than a meandering channel, these bends can be accommodated by creating larger wetland features at the “bends” as we have designed in other similar features in Brampton. These wetland features will accommodate the design flows without experiencing erosion.

As can be seen in the photos of the Westerly and Easterly Features, they currently do not provide seasonal fish habitat, nor do they have a functional riparian zone over much of their length through the subject lands.

In summary, the proposed Subdivision development will result in a net increase of about 1.2 ha in natural features (from 0.67 ha to 1.85 ha), predominantly wetlands.

The conversion of Pond A from its current state to a designed stormwater management pond will have a short-term impact on the existing brown bullhead population, however the stormwater pond, once constructed will provide similar aquatic habitat conditions, suitable for this species. Prior to constructing the pond, a fish rescue and temporary holding strategy will be developed to keep a portion of the population for re-introduction to the stormwater pond, once it is stabilized.

Although no fish were captured by electrofishing in Ponds C, D and E, it is recommended that a fish rescue plan be implemented as required prior to the elimination of Pond D and the relocation of Ponds C and E. Any recovered fish will be introduced into other golfcourse ponds as a mitigation measure. It is also recommended that the design of the relocated irrigation ponds C and E be enhanced to provide improved aquatic conditions supportive of fish habitat.

In addition to the above, there are also a number of other mitigation measures that will be incorporated into the subdivision design to address potential impacts to the natural heritage system, as follows:

- Rear lot fencing to protect stream and riparian corridors

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- Routing of rear lot drainage and clean stormwater (ie from rooftops) to the drainage features where feasible and into bioswales to maintain water balance
 - Extensive use of native materials to revegetate riparian areas and riparian wetland features

There are a number of construction mitigation measures that will be implemented as part of the construction process, including:

- Preparation of an erosion and sediment control plan for the subdivision, including identifying fish timing windows, proper phasing and timing of constructions and installation and removal requirements for appropriate erosion and sediment control measures
- A commitment to construction site supervision, including providing specialist supervision of riparian wetland feature construction
- Fish rescue as part of the removal and re-alignment of existing irrigation facilities

As part of the detailed design process, an environmental monitoring program will be established to address construction and post-construction monitoring requirements.

In conclusion, the proposed mitigation measures will not only offset the habitat losses associated with the Subdivision Development but will result in a net increase of about 1.2 ha in natural features, predominantly linear wetlands. In addition, the creation of two (2) stormwater management ponds will enhance downstream fish habitat to support target species of darters. A new natural channel will create about 305 m of seasonal fish habitat, and the linear wetland features will create about 400 m of seasonal fish habitat, an increase of about 250 m over the existing 450 m of supporting habitat. The new channels will include a naturalized riparian zone of about 1.85 ha providing better quality riparian habitat than currently exists along the ill-defined channels to be eliminated.

PHOTOS



Photo 1: Westerly Feature upstream of Pond A in Segment 1 at Countryside Drive



Photo 2: Westerly Feature upstream of Pond A looking downstream



Photo 3: Pond A showing shoreline emergent and floating vegetation near pond margin (SAS 1-1).



Photo 4: Easterly Feature downstream of Countryside Drive properties on Intracorp lands – Segment 4



Photo 5: Easterly Feature on northerly part of Intracorp lands – Segment 4



Photo 6: Pond C: Existing irrigation pond



Photo 7: existing irrigation pond near Clubhouse

Appendix 3. Predevelopment Monthly Water Budget Calculations

Pre-development:

	January	February	March	April	May	June	July	August	September	October	November	December	ANNUAL	NOTES
Temp (°C)	-6.3	-5.4	-0.4	6.3	12.9	17.8	20.8	19.9	15.3	8.9	3.2	-2.9		
Rain (mm)	34.9	22.3	36.7	62.4	72.4	74.2	74.4	79.6	77.5	63.4	62.0	34.7	694.5	
Snow (cm)	31.1	22.1	19.2	5.7	0.1	0.0	0.0	0.0	0.0	0.5	7.6	29.2	115.5	
Precip (PPT mm)	52.2	42.6	57.1	68.4	72.5	74.2	74.4	79.6	77.5	64.1	69.3	60.9	792.8	
Act ET (Thornthwaite & Mather 1957)	0	0	0	30.24	79.5	104.2	102.4	91.6	77.5	39.9	12	0	537.3	1
Surplus (mm)	52.2	42.6	57.1	38.2	-7.0	-30.0	-28.0	-12.0	0.0	24.2	57.3	60.9	255.5	
assumed snow storage (mm)	31.1	22.1	19.2	5.7	0.1	0.0	0.0	0.0	0.0	0.5	7.6	29.2	115.5	2
assumed snow melt (mm)	0.0	0.0	57.8	57.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	115.5	3
adjusted surplus after snow storage/melt (mm)	21.1	20.5	95.7	90.2	-7.1	-30.0	-28.0	-12.0	0.0	23.7	49.7	31.7	255.5	
Infiltration (mm) (assume factor =0.35)	7.4	7.2	33.5	31.6	-2.5	-10.5	-9.8	-4.2	0.0	8.3	17.4	11.1	89.4	4
Runoff (mm) (by difference)	13.7	13.3	62.2	58.6	-4.6	-19.5	-18.2	-7.8	0.0	15.4	32.3	20.6	166.0	
Infiltration (mm) (assume Peel Clay value)	2.5	1.6	2.6	4.5	5.2	5.3	5.4	5.7	5.6	4.6	4.5	2.5	50.0	5
Runoff (mm) (by difference)	18.6	18.9	93.0	85.7	-12.3	-35.3	-33.4	-17.7	-5.6	19.1	45.2	29.2	205.5	

1. ET calculated from USGS Thornthwaite & Mather model using 1971-2000 climate normals for Pearson Airport for shallow-rooted crops on clay loam (100 mm water retention).
2. Assume all precip falling as snow remains as snow on the ground
3. Assume half of snow storage melts in March, half in April
4. Assume infiltration factor of 0.35 as per MOE BMP Manual, Table 3.1: 0.15 (rolling/hilly topography) + 0.1 (clay soil) + 0.1 (cultivated cover)
5. Total annual infiltration through Lake Peel clay/silt sediment is 50 mm from Gerber and Howard (2002), Can. Jour. Earth Sci., V.39, 1333-1348

