

Wildlife Hazard and Risk Assessment Proposed Stormwater Management Ponds

**4134 16th Avenue (York Downs Golf and Country Club)
City of Markham**

Prepared For:

Sixteenth Land Holdings Inc.

Prepared By:

Beacon Environmental

Date: *Project:*

October 2017 215200

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1. Introduction

Beacon Environmental has been retained by Sixteenth Land Holdings Inc. to conduct a Wildlife Hazard and Risk Assessment for proposed stormwater management (SWM) ponds for a plan of subdivision located at 4134 16th Avenue (formerly York Downs Golf and Country Club) within the City of Markham, York Region (Subject Property). The Subject Property is a total of 168.64 hectares and it is located on the north side of 16th Avenue, on the west side of Kennedy Road (**Figure 1**). Existing residential development surrounds the property on all sides.

The Pickering Airport Lands were expropriated in 1972 by the Federal Government for a potential international airport. The Pickering Airport Lands were officially announced as an “airport site” on August 1 2001 (LGL 2002). The Pickering Airport Lands consist of 7,530 hectares in the municipalities of Pickering, Markham and Uxbridge. Pursuant to subsection 5.5(1) of the *Aeronautics Act*, Transport Canada published the Pickering Airport Site Zoning Regulations (AZR) on October 20, 2004. The AZR can restrict the height of buildings and trees and seeks to protect aircrafts from hazards such as bird strikes. The AZR applies to lands outside of the airport boundary and is enacted for both active airports and land designated as future airport sites, as is the case for the Pickering Airport.

The Pickering Airport Site AZR identifies the Subject Property to be located in the Wildlife Hazard Zone. With respect to the proposed SWM facilities associated with the proposed development, Section 6 of the Pickering Airport Site AZR, Bird Hazard would apply:

(6) No owner or lessee of land within the limits of the bird hazard zone shall permit any part of that land to be used for activities or uses attracting birds that create a hazard to aviation safety and are therefore incompatible with the safe operation of the airport or aircraft.

Analysis of the Bird Hazard Zones associated with the Pickering Airport Lands was completed by LGL in 2002. The study looked at bird use, bird hazards and risks, and appropriate bird hazard zoning criteria for lands surrounding the Pickering Airport Site. The study recommended two bird hazard zones for the Pickering Airport Lands, a Primary Bird Hazard Zone and Secondary Bird Hazard Zone. The Subject Property lies within the Secondary Bird Hazard Zone (**Figure 2**). This zone is described as “a buffer zone beyond the Primary Bird Hazard Zone that accounts for variation in such factors as pilot technique, environmental conditions, Air Traffic Control and bird behaviour” (TC 2007).

Because of the subject property location within the Secondary Bird Hazard Zone, the City of Markham has requested that Sixteenth Land Holdings Inc. confirm that the proposed SWM ponds within the Subject Property will not represent an additional bird hazard and risk to future operation of the Pickering Airport.

1.1 Report Author Qualifications

This study was completed by Mr. Ron Huizer. Mr. Huizer has over 20 years of experience in the assessment of wildlife hazards and risks at airports and in the vicinity of airports. As a recognized wildlife control specialist within the North American aviation industry, he was a contributing author to Transport

Canada's Airport Wildlife Control Handbook, Sharing the Skies. He has received wildlife control training certificates from both Transport Canada and the USDA - Animal Damage Control.

In the 1990s he developed and presented Transport Canada's two-day wildlife control training course for airport managers and staff at Canada's international airports. In 1996 he completed a wildlife management plan for Victoria International Airport which is identified by Transport Canada as a reference publication for compliance with the Canadian Aviation Regulations (CARs) for wildlife planning and management at airports in Canada. Under contract to Transport Canada, he conducted an assessment of bird hazard land use zoning requirements for future development and operation of Pickering International Airport (Toronto). Mr. Huizer has completed many wildlife hazard and risk studies of varying scope for local, regional and international airports across Canada. Has presented to Bird Strike Committee Canada and is a frequent attendee of Bird Strike USA/Canada conferences.

Selected Projects Completed by Mr. Huizer:

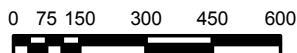
- Bird Hazard and Risk Assessment for a Proposed Stormwater Management Facility within Ottawa International Airport Bird Hazard Zone, 2017.
- Windfields Neighborhoods Development Stormwater Pond Wildlife Hazard Assessment, Oshawa Airport/City of Oshawa, 2012.
- Thunder Bay Airport Bird & Wildlife Risk Assessment, Thunder Bay International Airport Authority, 2012.
- Identification of Bird hazard zones following ABRAP and completion of a Wildlife Management Plan for Ottawa International Airport, 2007.
- Halifax International Airport Airside Stormwater Pond Wildlife Hazard and Risk Assessment, 2000.
- Bird and Wildlife Hazard Assessment for the Stormwater Control Design for the Expansion of the Simcoe Regional Airport 2010.
- Development of an Airport Wildlife Management Plan for Brampton Airport 2011.
- Integrated Wildlife Management Plan for the expansion of the Hanover Walkerton Landfill, Municipality of Brockton 2012.
- Bird Hazard and Risk Assessment for the expansion of the City of Yellowknife Solid Waste Facility, 2009.
- Bird and Wildlife Risk Assessment and Development of Wildlife Management Plans for 23 Northern Manitoba Airports for MIT, 2008.

2. Methodology

Beacon Environmental conducted field investigations in 2017 from late March through the end of September. To gain an understanding of the number and movements of gulls and Canada Geese, field surveys were conducted for the surrounding lands within a 10 km radius of the Subject Property. In late March and April, during spring migration period for Canada Geese and gulls, surveys of farm fields and ponds were conducted and flight lines were noted. These surveys were undertaken again in September. A specific night roost survey of Swan Lake, a waterbody located north of 16th Avenue, east of Markham Road that is similar in size to the largest proposed SWM pond on the Subject Property, was undertaken between 19:00 and 20:15 on March 29, 2017.



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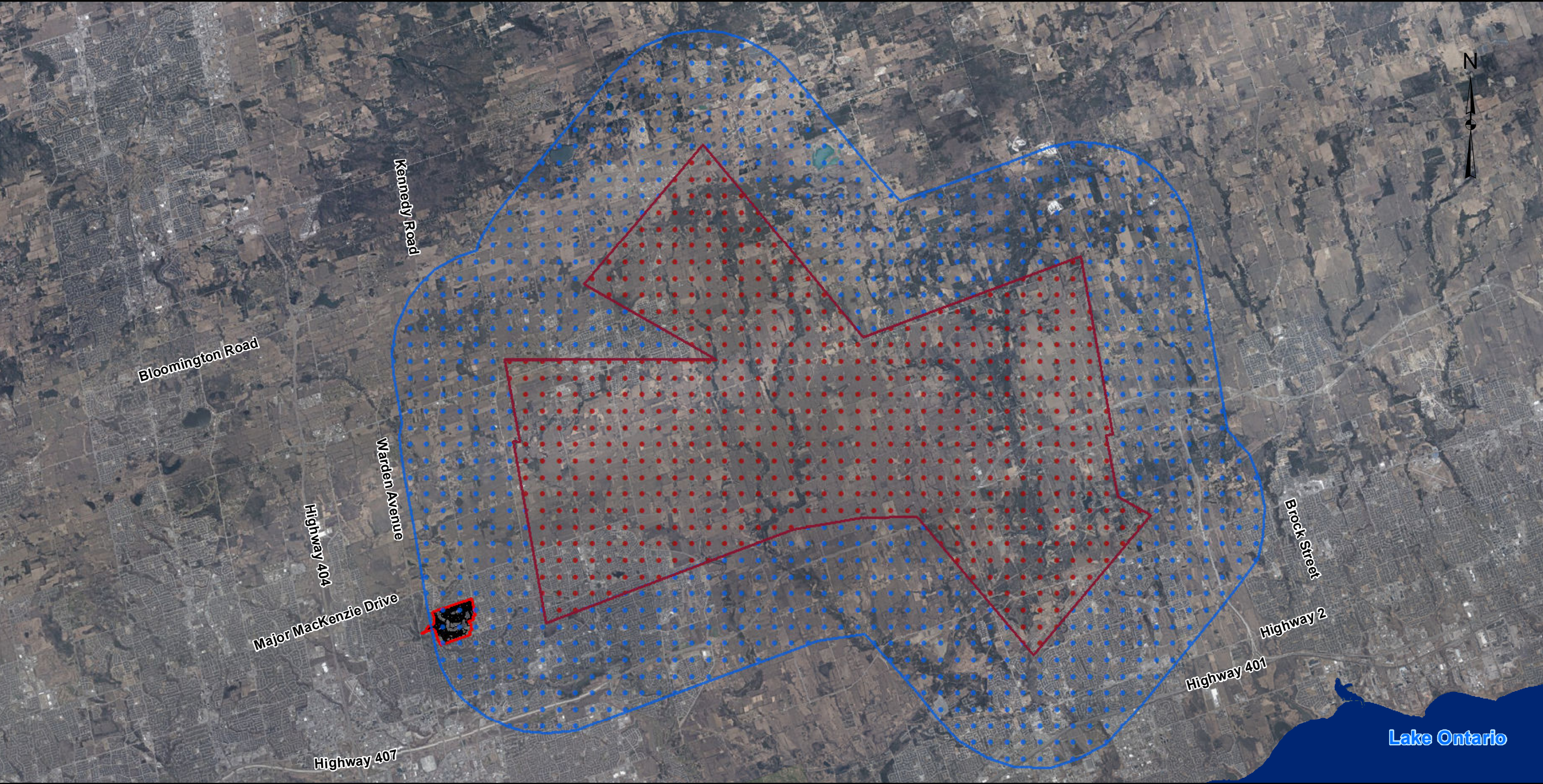
- Subject Property
- Draft Plan Boundary




MASTER ENVIRONMENTAL
SERVICING PLAN FOR
4134 16TH AVE

FIGURE 1 Site Location

First Base Solutions Web Mapping Service 2015
UTM Zone 17 N, NAD 83

Date: September 2017





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Subject Property

Development Plan (September, 2017)

Primary Bird Hazard Zone

Secondary Bird Hazard Zone

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SERVICING PLAN FOR
4134 16TH AVE

Figure 2 - Airport Bird Hazard Zone -
Primary & Secondary

First Base Solutions Ortho Photo 2016
UTM Zone 17 N, NAD 83

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3. Assessment of Bird Numbers and Movements

3.1 Numbers of Gulls and Geese

During the spring (March-April) and fall (September-October) migration periods, the number of gulls and Canada Geese that occur in the landscape of the Greater Toronto Area (GTA) from the shore of Lake Ontario to Lake Simcoe, 70 km to the north, number in the tens of thousands, with most birds occurring on lands that are in close proximity (10-20 km) to the shoreline of Lake Ontario. During this time, bird movements, from Lake Ontario and Lake Simcoe night roosts to feeding areas in the farm fields and urban areas, occur daily. In March and April 2017, road surveys of the farm fields up to 10 km north of Major Mackenzie Drive noted flocks of geese of varying numbers, from 5 to 500, with an estimated daily number of over 3000 birds in the local area of the Subject Property. Gull numbers in farm fields were lower, with flocks of 20 to 100 birds. Similar numbers of gulls and geese were found to occur in September. During the summer nesting period the numbers of gulls and geese in the local landscape are significantly reduced, with small numbers of non-nesting gulls occurring in the urban environment south of Major Mackenzie Drive. Pairs of nesting geese associated with small farm and golf course ponds were noted in the local area.

Swan Lake, located 5.5 km directly to the west of the Subject Property, was specifically surveyed as this small (400 X 250 m) 10 ha constructed lake is similar in size to the proposed 5 ha SWM pond (**Photographs 1 and 2**). During the spring, daytime numbers of geese were between 100 and 150, with other waterfowl numbering as high as 50. Gull numbers were lower (i.e., less than 50 birds). A night roost survey conducted on March 29, 2017, documented small flocks of geese continually arriving throughout the evening from the north, east and west, with over 500 birds on the lake by nightfall.



Photograph 1. Swan Lake 5.5 km to the East of the Subject Property.



Photograph 2. Canada Geese and Ducks on Swan Lake Spring of 2017

On September 29, 2017, a survey was conducted at a 6 ha (200 X 300 m) SWM pond located 9 km to the southeast of the Subject Property at the Highway 407 and Donald Cousens Parkway Interchange. The pond was found to support over 900 Canada Geese (**Photograph 3 and 4**) with continual movements of small flocks arriving and leaving the pond.



Photograph 3. Canada Geese on 6 ha SWM Pond during the Fall Migration of 2017, 9 km to the Southeast of the Subject Property



Photograph 4. Canada Geese on 6 ha SWM Pond during the Fall Migration of 2017, 9 km to the Southeast of the Subject Property

3.2 Movements

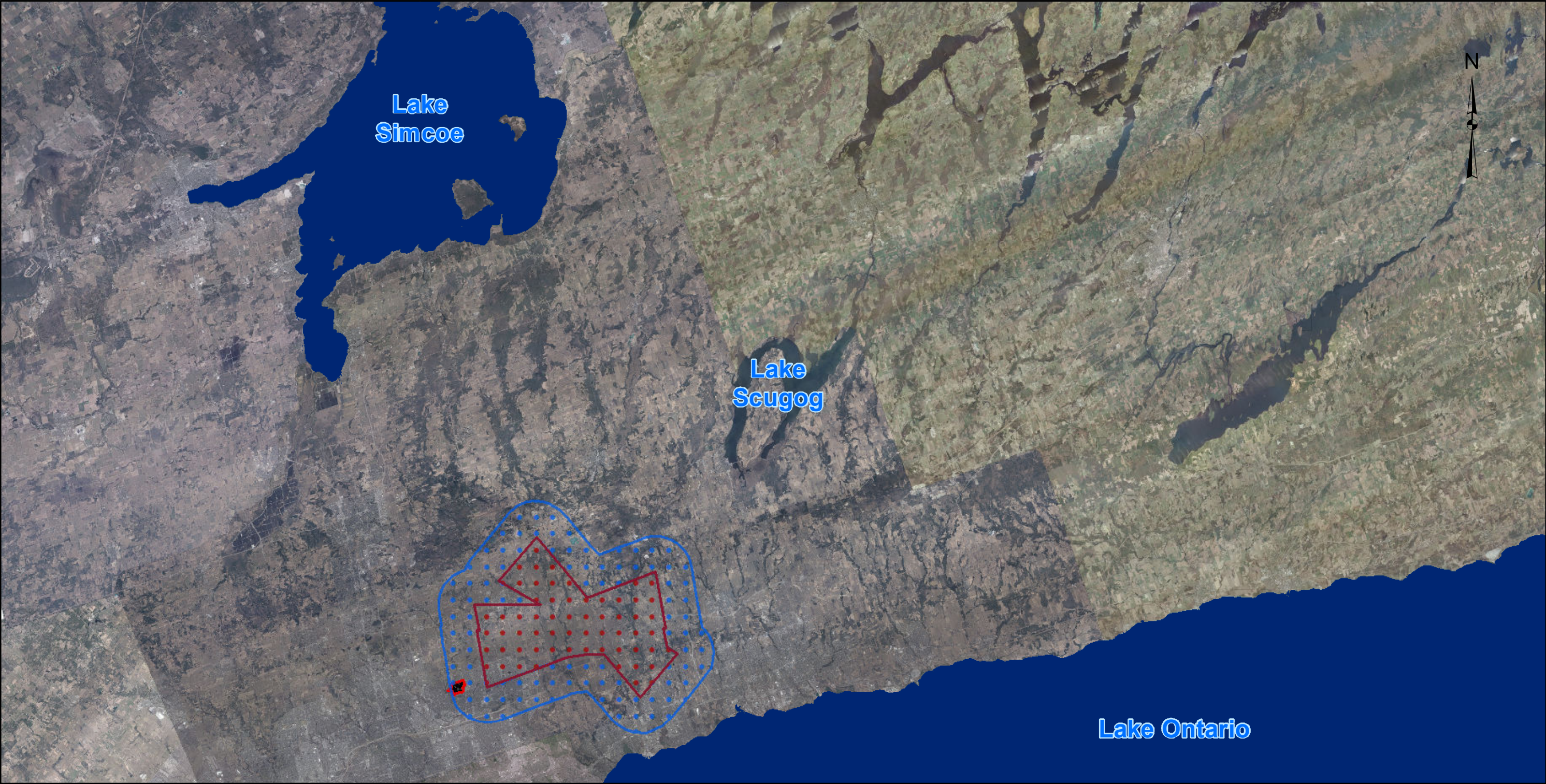
Flight lines of geese in the local area vary with the seasons and the age of geese. Generally in the GTA, in the early spring (March), fall and winter, large flocks of geese move daily from the roosts along the Lake Ontario shore in the morning, northward (i.e., inland) for up to 20-30 km, to feed during the day in farm fields, returning at nightfall to the lakeshore again. These flight paths are unpredictable and change continually as the location of feeding areas change. The flights are of low altitude, <1000 feet above ground level (agl), and when they occur in the vicinity of an airport, they can represent a hazard to aircraft operations. Generally the locations of SWM ponds in the local landscape do not influence these flight lines, as the ponds do not represent feeding areas at these times of the seasons. However, ponds that support a large surface area of standing water (i.e., >2ha), can be used at these times by geese as temporary staging/loafing areas that lie between morning and night flights. During the summer months, a subcomponent of the goose population, represented by non-breeding immature birds and molt migrants, will continue this flight pattern to and from the Lake Ontario shore.




Through the mid-spring and summer, the majority of the local population of adult geese will remain on breeding sites. Local summer breeding sites, such as golf courses with numerous ponds and larger SWM ponds can support over 100 breeding pairs. Prior to the onset of nesting, most flight movements occur in the area, local to the breeding site. These flights are to local feeding sites, are generally less than a 5 km distance from the breeding site, and occur at less than 500 feet agl. During the post hatch/gosling stage in early and mid-summer, adult geese are flightless, as all flight feathers are lost at once during the summer molt. This flightless stage typically occurs from mid-June through July. Following fledging (when goslings obtain the ability to fly), initial flights of adults and young birds again occur only in the local area. It is at this time that flights by individual groups of birds that breed in the local area can be expected to occur to and from SWM ponds, farm fields and golf courses.

Figure 3 shows the location of the Subject Property in the general landscape and the Pickering Airport Site Bird Hazard Zones. The shoreline of Lake Ontario lies 21 km to the south of the Subject Property and Lake Simcoe is located 45 km to the north. Lake Scugog, a large inland lake, is located 40 km to the northeast. These three lakes represent areas where both gulls and geese movements from night roosts to feeding sites will occur during the spring and fall migration, and summer post breeding season. During the field surveys it was noted that regular flights of gulls and geese in the vicinity of the Subject Property are back and forth from Lake Ontario to the farm fields north of Major Mackenzie to Regional Road 40. During these movements, daytime loafing on ponds located between the roost sites on Lake Ontario and feeding fields to the north occurs regularly. The surveys also documented that larger ponds, like Swan Lake, would also be used as overnight roost sites. No regular flights from the Subject Property northward to Lake Simcoe, or northeast to Lake Scugog, were noted.

4. Bird Hazard and Risk Assessment

In aviation, a hazard is a condition or circumstance that can lead to damage to an aircraft from a collision with wildlife. For a wildlife risk assessment, a hazard can be of two general categories. One, a “wildlife hazard” refers to the one or more birds or mammals that might be struck by an aircraft; and two, a “habitat hazard” refers to the land-use that attracts birds or mammals to areas through which aircraft operate. It is an antecedent condition of a wildlife hazard. Habitat hazards have a direct effect on the exposure of aircraft to birds or mammals.





0 2,400 4,800 9,600 14,400 19,200

1:438,997

Legend

- Subject Property
- Development Plan (September 2017)
- Primary Bird Hazard Zone
- Secondary Bird Hazard Zone

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4134 16TH AVE

Figure A1- Airport Bird Hazard Zone -
Primary & Secondary

First Base Solutions Ortho Photo 2016
UTM Zone 17 N, NAD 83

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Risk is the consequence of a wildlife hazard, measured in terms of likelihood and severity. Likelihood qualitatively factors in the frequency of which a risk can be expected to occur. The likelihood of a collision with wildlife increases when wildlife occur in the same airspace where an aircraft is operating, either in the air or on the ground. The likelihood also increases when greater numbers of individuals, such as a flock of birds, occur in the airspace where an aircraft is operating. The severity of a risk is determined by examining two circumstances. The first is the damage experienced during the wildlife strike - damage to the airframe, engine or one or more aircraft systems. The damage can range from none to catastrophic, depending on the location of the impact(s) on the aircraft, the wildlife species, the aircraft type, and aircraft speed. The second includes any additional damage incurred after the strike. This damage can range from negligible to catastrophic, depending on the location and speed of the aircraft at the time of the strike, and the aircraft's flight worthiness after the strike. As examples, post-bird strike damage will usually be negligible when the crew rejects the take-off of a slow-moving aircraft; or the damage could be catastrophic, if the strike occurs just as the aircraft gets airborne, and the strike causes sufficient damage resulting in the loss of control of the aircraft, causing it to impact the ground.

The two bird species that pose the greatest hazard and risk to aircraft operating at the proposed Pickering Airport are gulls, primarily Ring-billed Gull, and Canada Geese. These two species are also known to be attracted to SWM ponds as feeding and loafing sites, as well as breeding sites for geese. Gulls and geese pose the greatest hazard due to their large size, tendency to occur in flocks, and high altitude movements through the landscape. These species currently have high and growing population numbers in the urban and rural environs within the GTA.

The risk for bird-aircraft interactions (i.e., a bird strike) with these species increases when the birds occur in airspace that is frequently used by aircraft operating to and from the airport. The greatest risk occurs when birds occur on airside lands at the airport, particularly within the area of the runways. Canada Geese represent a high risk during the spring and fall migration period when movements of flocks occur through the airspace of aircraft on approach and departure from airports. Movements of local breeding geese tend to be short transit flights below 500 feet agl, are infrequent, and represent a much lower risk for a bird strike.

The proposed development plan on the Subject Property will create four SWM ponds (**Figure 4**), three just over 1 ha in size, and one large 5.7 ha pond. These ponds will be located outside the primary bird hazard zone of the proposed Pickering Airport. The SWM ponds are located at the western limit of the Secondary Bird Hazard Zone, 7 km to the south of the direct west approach path to the airport runways. With a typical 3% glide approach to a runway, a commercial jet aircraft will be operating well above 500 feet agl at the location of the SWM ponds. As a result of the steeper incline of the takeoff, aircraft will operate at an even higher altitude above the ponds on departure from the runways.

Field surveys have confirmed that both gulls and geese can be expected to utilize the ponds as feeding and loafing sites, and as breeding sites by geese. In addition, the large 5 ha pond will also be used as a night roost site by geese, as is already the case with Swan Lake to the east.

Daily movements of hundreds of local gulls and geese currently occur in the Secondary Bird Hazard Zone during the spring and fall migration period. Typically these daily movements occur below 500 feet agl and given that the proposed SWM ponds are located at the western limit of the Secondary Bird Hazard Zone, local bird movements at the location of the ponds would not put birds in the airspace used by aircraft operating at the proposed Pickering Airport. For the local area in which the proposed SWM ponds will be located, the majority of the higher altitude flights to and from roost sites occur north-south (i.e., to and from Lake Ontario), and not northward to Lake Simcoe or northeast to Lake Scugog.

Therefore, birds utilizing the proposed SWM ponds as a roosting site would not use flight lines that would cross the airspace of the approaches to the proposed Pickering Airport runways.

With respect to the number of birds, the creation of the four SWM ponds will not significantly increase the local population size or numbers of migrating gull and geese that currently occur in the local landscape in which the proposed Pickering Airport Site is located. As occurs at Swan Lake, hundreds of geese will use the large pond as a loafing and roosting site, given the distance from the proposed airport, the ponds will not directly increase bird numbers on the proposed airport lands. For the large SWM pond, the number of breeding pairs of geese could be as high as 30 pairs of birds. However, as noted, breeding birds are relatively sedentary and local flights occur below 500 feet agl, and will not pose an increased risk to aircraft operating at the airport.

In summary,


- Gulls and Canada Geese that will be associated the proposed SWM ponds represent the primary bird hazard to aircraft operating to and from the proposed Pickering Airport.
- The proposed SWM ponds will be located at the westernmost limit of the Secondary Bird Hazard, with direct aircraft flight line approaches occurring through the Primary Bird Hazard Zone, located 7 km to the north. At the location of the proposed SWM ponds, aircraft will be operating at 1500 feet agl, well above the local flights of gulls and geese which typically occur below 500 feet agl.
- Based on current known movements of gulls and geese, both direction and altitude, in the local area where the proposed SWM ponds will be located, the birds' use of the proposed ponds as either nesting, loafing or roosting sites will not increase the likelihood of bird-aircraft interaction for aircraft operation to and from the proposed Pickering Airport. As a result, no direct increased risk for a bird strike has been identified.


5. Recommended Mitigation Measures


For wildlife-aircraft strike risk assessment, mitigation includes the measures taken to eradicate a hazard (either a wildlife or habitat hazard); reduce the exposure of a wildlife hazard; or to reduce the severity or likelihood of one or more risks of a wildlife strike.

The mitigation of habitat hazards aims to reduce exposure. Managing the habitat so that wildlife are not attracted to areas through which aircraft operate reduces the likelihood of a strike. This assessment has determined that, based on: (1) the location of the proposed SWM ponds which will be at the western limit of the Secondary Bird Hazard Zone; and (2) known movements of gulls and Canada Geese in the local landscape, use of the proposed SWM ponds by these birds will not increase the exposure to a bird hazard or increase in the likelihood or risk of a bird strike to aircraft operating at the proposed Pickering Airport. Nevertheless, the following mitigation measures have been recommended, and will be incorporated into the design of the SWM ponds.



 **Stantec**





 **BEACON**
ENVIRONMENTAL

 **BURNSIDE**

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Legend

-  Subject Property
-  Development Plan
-  Watercourse
-  Development Constraint

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015, Development Plan, 2017.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL
SERVICING PLAN FOR
4134 16TH AVE

FIGURE 4: Development Plan

UTM Zone 17 N, NAD 83

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5.1 Design Elements Implemented to Reduce SWM Use by Geese and Gulls

Both gulls, geese and other waterfowl are attracted to storm ponds directly due to the presence of permanent standing water conditions. They are used as feeding sites, breeding sites, safe day time loafing sites, and overnight roost sites. Therefore design elements of a SWM Pond that reduce or eliminate access to large areas of open water can significantly reduce the presence of birds at the SWM pond.

Permanent Pond

Maintaining a permanent standing water pond is a required design feature for achieving the water quality goals of the facility. Therefore a dry pond design is not possible in this situation.

In order to reduce feeding habitat deep standing water is better than shallow water, and steep, deep shorelines are better than shallow littoral zones. Slopes will be moderately steep, ranging from 3:1 to 5:1. Geotechnical constraints and public safety requirements preclude further steepening of slopes.

Where possible water depth should be as deep as possible, 2 m or greater deep, with a shoreline depth of 1 m or greater to reduce the growth of submergent and emergent aquatic vegetation. The permanent pools have all been designed to be 3 m deep.

While water fluctuation is inherent to the function of a stormwater management pond, landscape plantings chosen for the shoreline will be species highly tolerant to frequent inundation such that exposed soil will be avoided.

In-water Berms

Islands and in-pond berms and dykes are highly attractive as nesting sites for Canada Geese and are used as loafing sites by both geese and gulls. For this pond design a berm is required in the pond to address the requirements of the City of Markham. The berm will be treated with rip-rap and will have side slopes of 3:1. The physical makeup of the berm has been made as less attractive as possible while maintaining the required function of the peninsula.

Upslope Nearshore Environment

Making the upslope near shore of a SWM as unattractive to geese and gulls as possible is a critical design feature for reducing use of the site by birds. The more sterile and uncomfortable the shoreline is within 20 m of the pond edge the less attractive it is to birds.

A continuous minimum 5 m-wide band of dense riparian shrub planting will be provided around the pond perimeter to discourage geese from easily accessing the water and nesting along the shoreline. The pond edge will also have a dense planting of shrubs to prevent birds from walking into the pond (ex. Red-osier Dogwood (*Cornus stolonifera*) and Meadow Rose (*Rosa blanda*)).

Public Facilities

A pathway is proposed around the ponds and the design concept of the pond and open space is to promote public use. High numbers of gulls can be attracted to areas such parks where there is an opportunity to feed on food waste.

Garbage receptacles should be covered or closed contains to reduce accessibility to waste. The trails adjacent to the pond will be monitored and litter removed when necessary.

5.2 Contingency Measures

In the event that, in the future, the hazard level and associated risk to aircraft associated with the SWM ponds reaches an unsatisfactory level (i.e., there is hazardous bird activity reported by a pilot in the vicinity of the ponds or a bird strike occurs that is directly linked to bird activity on the ponds, the following is recommended.

Design

- Additional landscape hardening of pond shore and open space environment.
- Specific alternate landscape planting to reduce use of specific areas.
- Over wiring of the permanent pond.

Wildlife Control

- Egg oiling
- Capture-Release
- Harassment (effigies/dogs etc.)

As noted, the distant location of the SWM Pond from the future Airport runways significantly reduces the risk associated with bird strikes for aircraft operating at the Airport. The mitigation measures employed will discourage feeding, breeding, loafing or roosting by birds on the site.

6. Closure

For the proposed SWM ponds associated with the Subject Property, Beacon Environmental has undertaken an assessment of the risk of bird strike, of gulls and Canada Geese, to aircraft operating at the proposed Pickering Airport. The assessment concludes that although significant numbers of gulls and geese can be expected to utilize the ponds, the location of the SWM ponds in the airport's Secondary Bird Hazard Zone and current movements of gulls and Canada Geese, no increase in risk for a bird for aircraft operating at the proposed Pickering Airport is identified. Design elements have been incorporated to reduce access to the SWM pond facilities. Contingency measure have been recommended which may be required should the airport be constructed in the future.

Beacon Environmental has prepared this report following the standard practices of the industry, adapted for site-specific conditions. Beacon Environmental, including its staff and Directors, assume no liability

whatsoever for bird strikes or accidents that may occur in the future at the proposed Pickering Airport, or in the local vicinity of the Airport.

Report Prepared By:
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