

**Master Environmental
Servicing Plan (MESP)
4134 16th Avenue
Residential Development**

Prepared for:
Sixteenth Land Holdings Inc.

Prepared by:



October 2017

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Table of Contents

1.0	INTRODUCTION	1.1
1.1	PURPOSE.....	1.1
1.2	STUDY AREA	1.3
1.3	PREVIOUS STUDIES	1.3
1.4	STUDY TEAM AND REPORT STRUCTURE	1.4
1.5	LANDOWNERSHIP AND PARTICIPATION	1.4
1.6	PRE-CONSULTATION SUMMARY	1.4
1.7	PROPOSED PLAN	1.5

LIST OF FIGURES

Figure 1.1	Location Plan for Subject Property	1.6
Figure 1.2	Land Ownership Plan	1.7
Figure 1.3	Development Plan for Subject Property	1.8

LIST OF APPENDICES

APPENDIX 1 TERMS OF REFERENCE

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Executive Summary

A Master Environmental and Servicing Plan (MESP) has been prepared in support of an Official Plan Amendment application submitted to the City of Markham to permit the development of a residential community on the Subject Property.

The MESP has been completed to address the requirements of the Terms of Reference, dated July 2016, which have been prepared by the City of Markham in consultation with Toronto and Region Conservation Authority (TRCA), Ministry of Natural Resources and Forestry (MNRF) and the Regional Municipality of York.

The MESP was submitted to the City of Markham in September 2016. Comments were received from City of Markham on March 13, 2017 and May 10, 2017, Toronto and Regional Conservation Authority on May 10, 2017, Region of York on March 1, 2017 and a subsequent email from Region of York on May 10, 2017 and York Region District School Board on February 16, 2017. The report and drawings have been updated to reflect the revised draft plans and address the agencies comments.

The subject property has a total area of approximately 168 ha and is located on the north side of 16th Avenue, west of Kennedy Road and also has a small frontage on the east side of Warden Avenue. There is existing residential development surrounding the property on all sides. Berczy Creek crosses the western portion of the property and Bruce Creek traverses the property in a north/south direction bisecting the subject property into west and east tableland areas.

The purpose of the MESP is to characterize and analyze the natural heritage features and functions within the Berczy and Bruce Creek subcatchment areas, establish the limits of development, and address the potential impacts of development on the natural heritage features. The purpose of the SGR is to establish a stormwater management strategy as well as determine site grading and servicing requirements.

The following sections summarize the major findings and recommendations of the individual reports housed within each tab of the MESP.

Natural Environment Report / Environmental Impact Study

Existing Conditions

Field investigation to characterize the subject property were conducted between 2015 and 2017. These included:

- Breeding amphibian surveys
- Breeding bird surveys

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

- ELC classification and floral inventory
- Tree inventory
- Aquatic habitat assessment and headwater drainage feature assessment
- Natural feature/top of bank staking

A total of 29 different ELC community types were recorded on the subject property. These were comprised of 12 upland communities, 6 wetland communities and 11 cultural communities.

A total of 163 plant species were identified on the subject property. Approximately 71% of the plant species recorded on the subject property are native to the region. The relatively high proportion of native species for natural areas within an urbanized context is one indicator that, overall, the remaining natural areas on the subject property are of good quality. A total of 15 regionally and/or locally rare species were observed on the subject property. A total of 28 provincially Endangered Butternut trees are present. The Butternut Health Assessment, and subsequent audit by MNRF, confirmed that fourteen trees are Category 1, eight trees are potentially Category 2, and three trees are potentially Category 3. Hybridity testing will confirm the status of the potential Category 2 and 3 trees.

All trees ≥ 40 cm in diameter at breast height (DBH) were inventoried and assessed according to accepted arboricultural guidelines. Trees 20-39 cm DBH were inventoried in groups noting species present and the overall health of trees in the group. A separate Tree Inventory and Preservation Plan has been prepared.

A total of 47 bird species were observed on the site. This a moderate diversity that is reflective of the variety of habitats, albeit fragmented on the property. Two Species at Risk (SAR) were recorded. These were: Eastern Wood-Pewee (Special Concern) and Barn Swallow (*Hirundo rustica*) (Threatened).

Three amphibian species were identified through the surveys, all of which are widespread and common in Ontario. Green Frogs (*Rana clamitans*), American Toads (*Bufo americanus*) and American Bullfrog (*Lithobates catesbeianus*) were present. The presence of American Bullfrog can lead to consideration as Significant Wildlife Habitat but a single individual in a golf course pond does not meet the criteria, in the professional opinion of Beacon.

Bat surveys were undertaken, the results of which will be provided at a later date.

The Rouge River State of the Watershed Report (TRCA 2007) classifies Bruce Creek as a riverine warm water system. The stream morphology through the subject property is a mix of pools, runs and riffles, which signifies a stable system with good quality habitat for the various life stages of the fish community. The morphology of the downstream reaches is not as diverse. Undercut banks and tree cover are present in several locations. Eroding banks were identified at several locations throughout the property indicating some measure of instability.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

The Rouge River State of the Watershed Report, (TRCA 2007) classifies Berczy Creek as a riverine cool water system. This classification is based on the known groundwater discharge areas upstream of the property. The stream morphology consists of mixed pools, runs and riffles throughout the Subject Property. This diversity signifies a healthy condition that provides spawning, feeding and refuge habitat for the species present in the system.

Both Bruce and Berczy Creek as they flow through the subject property are identified by MNRF as occupied by the provincially Endangered Redside Dace with records as recent as 2009. Redside Dace habitat includes the active channel, as well as the meander belt + 30 m.

Nine ponds are located on the subject property. These are primarily irrigation ponds for the golf course. Several small surface drainage features were identified through aerial photo interpretation and were investigated as part of the field program. The configuration of ponds and surface drainage features is highly altered because of the golf course use. A complete Headwater Drainage Feature Assessment (HDFA) was completed for the property.

An analysis of the existing conditions within the subject property identifies the following key natural heritage features:

- Wetlands (Feature 1 woodland/wetland, wetlands associated with Bruce Creek)
- Significant Woodlands (Feature 1 woodland/wetland, Feature 2 woodland, woodlands associated with Berczy and Bruce Creek)
- Significant Valleyland (associated with Bruce and Berczy Creeks)
- Significant Habitat of Endangered or Threatened Species (Bruce and Berczy Creeks, Barn Swallow nests, Butternut)
- Fish Habitat (Bruce and Berczy Creeks)
- Permanent Watercourses (Bruce and Berczy Creeks, Tributary [SDF-C])

Outside of the watercourse corridors, natural / naturalized habitat is generally confined to two larger features on the subject property. Both are located in the east block plan area. These are identified as Feature 1 Woodlot/Wetland and Feature 2 Woodlot. Some woodlands and wetlands associated with Bruce and Berczy Creeks have been deemed significant using criteria from the OP.

Development constraint lines were driven by:

- Staked physical top of slope;
- Long-term stable top of slope;
- Proposed Regional floodline;
- Staked dripline;
- Staked wetland limit and,
- Limit of Redside Dace habitat (Meander belt + 30 m).

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

The Bruce Creek and Berczy Creek Valleylands are the primary constraints on the subject property. Features 1 and 2 are also constraints

The development limits were generally defined by the following:

- Proposed Regional Floodline + 10 m buffer,
- Meander belt + 30 m (Redside Dace habitat),
- Physical top of slope and/or dripline + 10 m buffer, whichever constraint governs;
- Wetlands + 30 m; and
- Long-term stable top of slope + 10 m setback.

Potential Impacts and Mitigation

The features and their prescribed buffers have determined the overall development limit. The application of buffers to the natural features creates the Natural Heritage System. The extensive protection provided by this system will contribute to the preservation of the valley and its features / functions.

An overall water balance was completed for the subject property as part of the Hydrogeology Assessment and Water Balance Report prepared by R.J. Burnside Associates (2017). The water balance calculations estimate that, following development, the potential infiltration, without mitigation could decrease by approximately 35% for the overall site and that runoff could increase by approximately 130%.

Mitigation methods to improve post development infiltration include: designing grades to direct roof runoff towards lawns, side and rear yard swales. Amended soils are also proposed for select areas in East and West draft plans. Additionally, certain natural features within the site require individual feature based water balance assessments to ensure ecological form and hydrologic function are maintained.

A feature based water balance assessment was completed for Feature 1. Mitigation measures in order to maintain this feature include, backyard drainage from lots adjacent to Feature 1 as sheet flow to the feature. Roof drainage from selected lots will also be directed to Feature 1. As well, two separate RLC pipes are proposed to collect clean water from 8 roofs and release to Feature 1. A flow dispersal mechanism will be installed at the RLC outfall prior to release of flow into the open space area.

With the presence of habitat occupied by Redside Dace, impacts to this endangered species may result if the SWM plan has not been designed for their protection. With this in mind, the ponds have been designed, where feasible, according to MNRF recommendations that SWM ponds discharging to Redside Dace streams provide a 3.0 m permanent pool with a bottom draw outlet to mitigate temperature impacts (Stantec, 2017). If this type of design is not feasible, cooling trenches and low flow augmentation systems will be implemented within the proposed development.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

The design must include best efforts to maintain the following conditions:

- Discharge temperature below 24°C;
- Dissolved oxygen concentration at discharge of at least seven milligrams per litre; and
- TSS of <25 mg/L above stream background (MNRF 2016).

A complete SWM plan has been developed by Stantec (2017). The analysis determined that four end-of-pipe wet pond facilities are required for quality control and quantity attenuation and one end-of-pipe infiltration facility providing quantity control.

SWM Facilities will maintain water quality and quantity for the proposed development conditions and minimize impacts to the watercourse related to sediment and temperature. The ponds will include a bottom draw outlet for thermal mitigation, and both ponds and outfall structures have been designed to provide 48-hour detention of the 25 mm storm, and peak flow reduction to pre-development levels. This design will be sufficient for minimizing erosive flows. All headwalls of SWM facilities are located outside RSD habitat. Also Ponds 1, 2 and 4 have been designed with a 3 m permanent pool but intersect the water table and will require liners. For Pond 3, a 1.5 m permanent pool is proposed to avoid interception with the water table along with a cooling trench and low flow augmentation to satisfy MNRF Redside Dace criteria. A 3 m pond can be accommodated but the water table would be intercepted and a liner and perimeter subdrains would be required. All ponds will require temporary dewatering during construction.

An infiltration facility is proposed that will treat roof, lot and road drainage. The drainage will be pretreated by landscaping, engineered sand, soil and organic filter medium prior to release into the underdrain and ultimately the storm sewer. Low Impact Development (LID) techniques will be implemented where appropriate throughout the development, to lessen the impacts associated with stormwater. The SWM plan will be discussed with MNRF as it relates to the *Endangered Species Act*.

A watermain crossing of Bruce Creek will be located along the road crossing. The watermain will either be suspended from the bridge structure, or a trenchless construction method to install the infrastructure below the creek invert will be undertaken in order to avoid impacts to RSD. A second crossing of the watermain between Street R East on the east draft plan to Street "V" West on the west draft plan has been proposed. This crossing will utilize trenchless construction methods. Environmental impacts associated with suspending the watermain from the bridge structure would be limited to works associated with the road crossing construction.

The proposed sanitary sewer will cross under Bruce Creek via trenchless method at a depth of 2.5 m below creek bed, which is consistent with Guidance for Development Activities in Redside Dace Habitat (MNRF 2016). This option will be feasible provided that sufficient cover is available over the pipe to meet the design criteria for TRCA. All efforts will be made to ensure construction activities remain outside Redside Dace habitat (i.e., entry and exit pits).

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

The grading design recognizes the existing boundary conditions including valley systems and natural heritage features. The site grading has been completed to retain these features while minimizing cut and fill operations and will replicate the existing subwatershed drainage boundary divide to the best extent possible. Minor grading encroachments into the Natural Heritage System are proposed in order to minimize disturbance and prevent the use of unnecessary retaining walls, while tying in proposed grades to existing grades. Further, the impact of these encroachments on the final NHS are reversible as all disturbed areas will be tilled or loosened and topped with sufficient topsoil in order to support the establishment and long-term growth of proposed plantings.

The existing golf course irrigation ponds within the Bruce Creek Valley will be dewatered and filled with topsoil to match the existing waterline levels. These areas will be stabilized with native vegetation.

One crossing of Bruce Creek is proposed for connectivity, neighborhood structure and traffic flow. The Crossings Guideline for Valley and Stream Corridors prepared by TRCA (2015) was reviewed in relation to the proposed crossing. The presence of Redside Dace has also been considered. The bridge is proposed to be a 40 m clear span bridge which avoids any obstructions to fish passage and will permit the movement of wildlife under the bridge. The wide meander belt width in this reach of the valley corridor precludes construction of a complete span of the meander belt.

A road connection to Warden Avenue was assessed at the location of the existing easement. It was determined that a crossing in this location would result in substantial environmental impacts that may not be mitigatable.

The proposed development requires pedestrian crossings of the Bruce Creek other than at the road locations. Several existing crossings for the golf course will be incorporated if possible wherever a trail crossing of the creek is proposed. This approach will minimize disturbance and impacts to the natural environment, in particular impacts to RSD habitat.

The subject property is within a "Secondary Bird Hazard Zone". The Canadian Aviation Regulations (CARs) state that 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. A Wildlife Hazard Assessment report has been completed Beacon to comply with the Airport Wildlife Planning and Management regulation under the CARs which came into force on December 30, 2006.

Most of the subject property is utilized as golf course and consists of landscaped areas. Almost of the trees situated within the areas to be developed will need to be removed with the exception of trees that have been integrated within park or buffer blocks, or in some cases rear lots of larger residences. The naturally vegetated areas on the block are mainly contained within the valley corridors and hence will be protected as part of the natural heritage system.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Three isolated wetland communities will be removed to accommodate the proposed development. This includes the following communities:

- Common Reed Mineral Meadow Marsh (MAM2, ELC unit 7);
- Forb Mineral Meadow Marsh (MAM2-10, ELC unit 30); and
- Reed Canary Grass Mineral Meadow Marsh (MAM2-2, ELC unit 18).

The total area of wetland that will be removed is 0.72 ha.

The majority of forest communities are located within the two major valley systems that traverse the block as well as the eastern woodlot/wetland feature in the East Block. These communities will be undisturbed through the development process provided the proposed Low Impact Development (LID) measures are implemented.

One woodland area (ELC unit 14) is located outside the proposed natural heritage system and is proposed for removal. It is a Fresh Mist White Cedar Hardwood Mixed Forest (FOM7-2) and is 0.28 ha. The treed areas associated with wetland unit 18 are also proposed for removal. These include two mixed hardwood forest units (16a and 16b) and a deciduous forest (unit 17), as well as a cultural plantation (unit 1). The total area of these two upland communities is approximately 0.38 ha. Several treed cultural communities, tree groupings and individual trees will be removed from the tableland portions of the site. These trees have also been assessed in the arborist report and will be subject to compensation accordingly.

Changes to the wildlife community will result from the proposed change in land use. The proposed redevelopment will likely result in a reduction in the overall number of birds that utilize the subject property for foraging. However, the diversity of species will probably be maintained post-development, as the majority of the existing naturally vegetated areas will be retained and enhanced. Also, areas within the subject property that are currently manicured lawn will be naturalized and much of the existing and higher quality habitat will have naturalized buffers established adjacent to them which will remain relatively undisturbed.

The golf course irrigation ponds (Ponds B through G, and I) and the SWM pond (Pond H) in the northeast will be removed. These ponds are likely to provide habitat for warmwater tolerant fish species, and breeding amphibian surveys have confirmed these ponds provide limited habitat for common amphibian species. The pond removals will improve water quality and temperature within Bruce Creek. Amphibian habitat will be replaced through the construction of the various SWM ponds within the development plans, which are also not natural habitat, but clearly support amphibians. Pond E will also be converted to a constructed wetland to provide additional habitat for wildlife within the protected watercourse corridor.

Headwater drainage features (HDFs) that have been assigned a Management Recommendation of 'Mitigation' will have their function replicated through LID or SWM measures. HDFs with a Management Recommendation of 'Conservation' will be replicated in the proposed compensation area.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Enhancement areas have been proposed for five locations within the subject property. These are as follows:

- Area A represents riparian and upland plantings along the Bruce Creek corridor;
- Area B represents riparian and upland plantings along the Berczy Creek corridor;
- Area C will be the creation of a wetland feature in Pond E;
- Area D consists of the infiltration gallery located in the Block 9 Park; and
- Area E is located in the Open Space area next to the Bruce Creek valley woodlot.

A Compensation and Enhancement Plan will be prepared as an addendum to this report which will provide details on the proposed enhancement areas, as well as the compensation required for tree removals identified in the Arborist Report.

Monitoring

Monitoring will focus on the performance of the stormwater management facilities, the effectiveness of the natural feature boundaries and the detection of any changes in the terrestrial and aquatic environments that might be attributable to the proposed development. The results of the monitoring plan will be analyzed and appropriate measures to resolve observed issues will be identified and implemented. Any monitoring that is required under additional legislation (i.e., Endangered Species Act) will be carried out as per the conditions of those agreements.

Policy Conformity

An evaluation of how the preferred land use option for the Subject Property complies with the applicable environmental policies and legislation is summarized. The major policies include:

- Federal Fisheries Act (1985)
- Provincial Endangered Species Act (2007)
- Provincial Policy Statement (2014)
 - Habitat for Threatened and Endangered Species
 - Significant Valleylands
 - Significant Wetlands
 - Significant Wildlife Habitat
 - Significant Areas of Natural and Scientific Interest
 - Fish Habitat
- City of Markham Official Plan (1987)
- York Region Official Plan (2010)
- TRCA Living City Policies and Regulations

Conformity with these policies has been demonstrated.

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

Hydrogeological Assessment and Water Balance

A Hydrogeological Assessment and Water Balance report was prepared in support of the proposed development of a residential community on the Subject Property municipally known as 4134 16th Avenue, in the City of Markham, Region of York. The purpose of the hydrogeological study is to characterize the geological and hydrogeological conditions on the property, identify potential development impacts on the local groundwater and surface water conditions, and to complete water balance calculations. The water balance calculations provide input to the stormwater management plans and provide recharge targets for the design of Low Impact Development (LID) measures to maintain, where possible, key hydrogeological functions.

Surficial geology mapping published by the Ontario Geological Survey shows that the majority of the Subject Property is covered by glaciolacustrine silt and clay deposits. The north and northeastern portions of the East Draft Plan area have been mapped as glaciolacustrine sand and gravel deposits and a small area in the northwest corner of the West Draft Plan area is mapped as silty to sandy till. Alluvial deposits comprised of sand, silt, clay and organics are mapped along the Bruce and Berczy Creek valleys. The geotechnical drilling records generally confirm that the Subject Property is covered by low permeable glaciolacustrine silt and clay deposits; however, they did not encounter glaciolacustrine sand and gravel at surface as widely shown on the published mapping. The borehole logs from 117 boreholes drilled across the Subject property show that sand and gravel deposits were found at surface or underlying fill material in isolated areas mapped as glaciolacustrine sand and gravel, as well as, at the surface in isolated boreholes mapped as glaciolacustrine silt and clay.

Groundwater levels have been monitored across the Subject Property since March 2016. The groundwater elevation data suggest that the water table in the upper till soils reflects the general surface topography and that the shallow groundwater flow patterns will mimic the surface water flow patterns, with flow moving from higher elevations towards lower elevations. A groundwater divide is interpreted to be roughly coincident with the surface water divide between the Bruce Creek and the Berczy Creek. Shallow groundwater levels have generally been found to range between approximately 0.2 m to 6.0 m below ground surface and have seasonal variations ranging from 0.5 m to 3.8 m. One exception is shallow groundwater observed to be above ground surface in a well located in a topographically low area in the north central portion of the property and is interpreted to be influenced by the local flow system from the topographically higher area to the northeast. Groundwater levels monitored in well nests generally indicate downward gradients (i.e., recharge conditions); however, well nests located in vicinity of the Bruce Creek valley typically show upward gradients (i.e., discharge conditions), suggesting groundwater is contributing to the baseflow of Bruce Creek. The Bruce Creek flow monitoring indicates the creek gains flow as it traverses across the Subject Property.

Two wetland features within the East Draft Plan area have also been the focus of our monitoring program to assess the features; the Unit 18 wetland which is proposed to be removed in post-development and the woodlot wetland (Feature 1) which will remain in place. It is interpreted

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

that when standing water occurs in the Unit 18 wetland feature during spring runoff or heavy rainfall periods that the feature has a recharge function and is supported by hydraulic gradients measured in piezometer nests within and around the feature. The hydraulic gradients measured within the higher elevated woodlot portion of Feature 1 suggest a downward gradient and recharge conditions. The groundwater levels within the reed canary grass mineral meadow marsh, located at the lower elevation portion of Feature 1 and downgradient of the woodlot, generally show an upward gradient (i.e., discharge conditions) suggesting groundwater contributes to the functionality of the wetland.

In order to assess potential land development impacts on the local groundwater conditions, a detailed water balance analysis has been completed for the East and West draft plans to determine the pre-development infiltration volumes (based on existing land use conditions) and the post-development infiltration volumes that would be expected based on the proposed land use plan. The calculations suggest that natural infiltration that occurs on pervious surfaces, along with the mitigative measures proposed in the FSR to address the groundwater infiltration deficit, do not meet the pre-development infiltration volume for the East Draft Plan area leaving a deficit of approximately 19,200 m³/a (~24% of pre-development infiltration volumes). It is noted that due to the high water table and the amount of cut proposed in the west-central portion of the East Draft Plan area, infiltration trenches or RLCs are not proposed as they could intersect the water table. The calculations also indicate that the typical increases in runoff that may occur with development can also be reduced (i.e., an increase in runoff of 1.4 times as compared to 1.5 times without LID measures). It should be noted that the development of the proposed East Draft Plan concept will reduce evapotranspiration by ~51% (216,500 m³/a).

Natural infiltration that occurs on pervious surfaces along with the proposed mitigative measures for the West Draft Plan area exceed the pre-development infiltration volume by approximately 34,600 m³/a (~34% increase in infiltration); 13,100 m³/a (~31% increase in infiltration) for the West Draft Plan - Berczy Creek Catchment area and approximately 21,600 m³/a (~36% increase in infiltration) for the West Draft Plan - Bruce Creek Catchment area. The typical increases in runoff that may occur with development can also be reduced; an increase in runoff of 2.2 times as compared to 2.7 times without LID measures in the West Draft Plan – Berczy Catchment area, and an increase in runoff of 1.4 times as compared to 1.7 times without LID measures in the West Draft Plan – Bruce Catchment area. In addition, the development of the proposed West Draft Plan concept will reduce evapotranspiration within the Berczy Catchment area by ~47% (104,900 m³/a) and within the Bruce Catchment area by ~24% (72,800 m³/a), with a total reduction of approximately 34% (~177,000 m³/a) to the West Draft Plan area.

The overall site-wide water balance for 4134 16th Avenue, incorporating low impact development techniques into the proposed development, will infiltrate 108% of the pre-development infiltration volume, amounting to an increase of ~12,100 m³/a. Comparing the pre-development infiltration of the Bruce Creek Catchment area (East Draft Plan Area and West Draft Plan Area – Bruce Creek Catchment) to the post-development infiltration, the calculations show that water balance will be maintained in post-development by implementing the proposed comprehensive LID strategy.

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

A feature based water balance was also completed for a woodlot/wetland (Feature 1) located within the East Draft Plan area that will remain in post-development. The development of the East Draft Plan area proposes to build houses and roads within the external drainage area to the feature, essentially eliminating infiltration and surface water contributions from the upland area, and creating infiltration and runoff deficits. The FSR proposes to create a buffer area around the woodlot/wetland to allow for groundwater to infiltrate and for runoff to be directed toward the woodlot/wetland feature. The buffer area will be left to naturalize and provide infiltration and runoff to the woodlot/wetland feature in post-development. The FSR also proposes downspout disconnection into the development plan for lots backing onto the woodlot/wetland feature to maintain the surface water runoff contribution. Natural infiltration that occurs within the woodlot/wetland and the proposed buffer area, along with the proposed mitigative measures, provide enough infiltration to maintain the pre-development infiltration volume for the woodlot/wetland and its existing catchment area. The runoff that occurs within the woodlot/wetland and the proposed buffer area along with the proposed mitigative measures exceed the pre-development runoff volume by approximately 500 m³/a (~6% increase in runoff). There is an overall reduction in evapotranspiration of about 20% (~8,000 m³/a).

Fluvial Geomorphology Report

A geomorphic assessment was also completed by Beacon for the subject property. The purpose of this assessment was to characterize existing fluvial geomorphic conditions (rapid assessments and detailed data collection), contribute to the determination of development constraints, and provide input to stormwater servicing plans for the subject property. A historic assessment was undertaken to determine changes in land use and channel planform over time. Results of this assessment identified extensive channelization of both Berczy and Bruce Creek within the subject property between 1961-present. Many of the ponds currently being used by the golf course for irrigation are located in former channel meander bends. This information was referenced in the delineation of meander belt limits for stream corridors (unconfined watercourses) to aid in the determination of erosion hazard limits, and the delineation of occupied Redside Dace regulated habitat (referencing meander belt plus 30 m) for stream and valley corridors to aid in the determination of development limits for the subject property.

In order to understand the potential impacts of the proposed development plan on channel morphology, an impact assessment was undertaken with respect to stormwater erosion control, as well as road and servicing stream corridor crossings. For the erosion control analysis, a comparison of pre- and post-development (controlled) flow conditions for the 25 mm, 30 mm and 35 mm storm events, as well as the 5-year, 25-year and 100-year storms (12 hour AES) under 24 hour, 48 hour and 72 hour detention scenarios was undertaken for nodes located at the downstream limit of the subject property to evaluate how closely post-development conditions can replicate existing condition hydrograph (peak, volume and form), focusing on those portions of the hydrograph above the critical discharge. Results of the analysis indicated, that for both Berczy Creek and Bruce Creek, the 48-hour detention scenario was able to most closely replicate modelled existing conditions (i.e., difference in pre to post cumulative time of

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

exceedance within 5%) without resulting in an over-control of flows. Overcontrol of stormwater within the system is undesirable as the transport of sand-sized material and washload within both Berczy and Bruce Creeks is critical to the maintenance of channel form and function. As such, the 48-hour detention scenario was identified as the preferred erosion control approach for Berczy Creek and Bruce Creek, through which exacerbation of existing rates of channel erosion are not anticipated under the post-development condition.

Only one road crossing of the NHS is proposed through the development plan. A 40 m clear span bridge is proposed to cross Bruce Creek. In accordance with the TRCA Crossings Guideline for Valley and Stream Corridors, an evaluation of channel planform (both current and historic) was undertaken at the proposed crossing location. Based on this evaluation, the proposed road alignment is considered to be optimal from a geomorphic perspective, as the road crosses the NHS on a relatively straight section of Bruce Creek along a riffle feature at an angle that is perpendicular to the central tendency of the watercourse. As data from the 42 year historic record indicates minimal lateral channel migration the proposed 40 m crossing span was deemed appropriate to accommodate long-term adjustments in channel form and meander geometry. Further, a review of the HEC-RAS model output for more frequent storm events in vicinity of the proposed crossing indicated a minimal impact on instream hydraulics.

A review of the four proposed trail crossings of the NHS using existing cart path crossings of Bruce Creek found all existing crossings to be performing well with respect to erosion and channel migration. In consideration of this existing condition, and that the proposed approach will avoid requirements for instream works, the proposed trail crossing design concept was considered appropriate from a geomorphic perspective. Due to the historically modified nature of Bruce Creek, 25-year migration rates were not quantified in support of the trails analysis. Instead, the 42-year post-channelization historic record was reviewed in relation to the proposed trail alignment and crossing locations. In this regard, all of the trail crossing locations are optimally placed to avoid governing meander bends and are aligned to cross the watercourse at an optimal angle of 90 degrees. Using this approach, a 15 m crossing span was deemed suitable to accommodate trends in channel migration over a 42-year record. It is, therefore, anticipated that this span dimension also addresses the 25-year erosion limit.

A sanitary sewer crossing of Bruce Creek is also proposed. The crossing will be installed using directional drilling and will achieve a depth of cover of 2.5 m under the existing channel bed. Based on the results of the rapid assessments, which indicated widening as the dominant process along Bruce Creek, the 2.5 m depth of cover was deemed sufficient to mitigate long-term risk to this infrastructure due to active erosion (i.e., channel incision).

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

Servicing and Grading Report

Stormwater Management Criteria

The proposed SWM criteria based on the following:

- Quality Control
 - Enhanced Level of Protection
- Erosion Control
 - Extended detention storage of runoff from a 25 mm storm over 48 hours
- Quantity Control
 - Bruce Creek control post-development peak flows to pre-development peak flows for 2 through 100 year storm events
 - Berczy Creek no flood control required (only extended detention)
- Water Balance
 - A "best effort made" approach for sites within a Low Groundwater Recharge Area. Natural features require feature based water balance assessment
- Regional Storm Control
 - Regional quantity storage is not required and further mitigation measures (downstream improvements) are not warranted or recommended.

Best Management Practices for Stormwater

A screening and assessment of best management practices for Stormwater was undertaken and the following are proposed to be implemented:

- Downspout disconnection with increased topsoil/amended soil
- Grassed swales
- Perforated pipe
- Wet ponds
- Bioretention facilities/rain gardens
- Infiltration galleries

Proposed Drainage Boundaries

SWM facilities (wet ponds) have been located to maintain existing drainage patterns, minimize number of SWM Ponds and minimize the amount of site grading required.

Major and minor system flows from the development area will be conveyed to four (4) proposed SWM facilities. Three (3) of the SWM facilities outlet to Bruce Creek and one (1) SWM facility outlets to Berczy Creek.

Proposed Stormwater Management Strategy

The LID strategies (lot level and conveyance controls) including clean roof runoff to perforated RLC pipes and infiltration galleries, as well as clean roof to increased topsoil and/or amended

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

topsoil are proposed as part of the site water balance strategy to improve infiltration and evapotranspiration and reduce runoff from the development.

Three (3) Bioretention enclaves are proposed to provide quality treatment through infiltration for the drainage from clean roofs, lots and road areas. These facilities are part of the site water balance strategy designed to improve infiltration and evapotranspiration and reduce runoff from the development.

One (1) Infiltration facility is proposed to provide quality treatment through infiltration for the drainage from clean roofs, lots and road areas. This facility is part of the site water balance strategy designed to improve infiltration and evapotranspiration and reduce runoff from the development.

Three (3) Stormwater management ponds (end-of-pipe wet pond facilities) outletting to Bruce Creek are proposed to provide water quality, quantity and erosion controls for the development of the subject property to ensure post-development peak flows are less than pre-development peak flows for the 2 year through 100 year storm events.

One (1) Stormwater management pond (end-of-pipe wet pond facility) outletting to Berczy Creek is proposed to provide water quality, and erosion controls for the development of the subject property.

Conceptual Design of Proposed SWM Facilities

The preliminary pond designs have been based on the criteria taken from the City of Markham Engineering Design Criteria (March 2015) and in accordance with applicable criteria outlined in the MOECC SWM Manual (March 2003) to ensure pond blocks are adequately sized.

Storm Sewer System

Storm sewers within the subject property will be designed as per City of Markham standards and sized to capture and convey runoff for storm events up to and including the 5 year storm event and direct flows to the SWM ponds. Flows in excess of the 5 year storm event will be routed overland within the ROW and other designated overland flow routes. In several locations a 100 year capture pipe is required to collect major system flows to minimize fill requirements, allow for tree preservation within proposed park blocks, and ensure the overland flow does not exceed the available ROW capacity.

A foundation drain collector (FDC) system will be employed in areas where the storm sewer is not deep enough to allow for basement storm connections.

Water Distribution System

The water distribution system will be designed in accordance with the City of Markham Design Criteria (2013). A Water Distribution Analysis Report was completed by WSP Canada Inc., dated

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

July 21, 2016 and revised November 3, 2017. This report provided preliminary watermain sizing, PRV requirements and connection points to existing watermain infrastructure.

Wastewater/Sanitary Servicing

Sanitary sewers will be designed in accordance with the City of Markham Design Criteria (2014) and the MOECC's criteria. The proposed sanitary drainage system will be designed based on gravity flow while minimizing infiltration. Also, consideration will be given to the existing sanitary sewers on the subject property with the intent to maintain and maximize the capacity of this infrastructure.

The subject property is broken down into three (3) sanitary drainage areas for the purpose of this report. Phase 1 located at the northeast corner of the site, the balance of the subject property east of Bruce Creek and the subject property west of Bruce Creek. The sanitary drainage from all three (3) areas of the subject property will flow into the existing 2100 mm diameter York Durham Sanitary Trunk Sewer located along the frontage of the subject property on the north side of 16th Avenue. The SGR contemplates a crossing by trenchless construction, of the Bruce Creek with the sanitary sewer to convey flows from the east Bruce development lands through the west Bruce development lands to a connection point to the YDSS. It is planned to have only one (1) proposed sanitary connection from the Subject Property to the existing YDSS.

Preliminary Grading Design

The proposed development of the subject property will be graded in accordance with the City of Markham Criteria and provisions will be made to minimize grading disturbances in the vicinity of existing vegetation and natural heritage features that are being retained. In two areas of the plan additional rear yard lot depth is provided with no proposed grading changes to allow existing trees to be retained. Additionally, proposed grading around the Park Blocks 5 east, 7 and 8 west will tie into the existing grades within the park blocks to minimize grading disturbance and allow existing trees to be retained within the Park Blocks.

The subject property is encompassed by several existing boundary conditions including existing roads, Bruce Creek and Berczy Creek valley features, existing natural features and existing adjacent developments.

The grading design has replicated the existing subwatershed drainage boundary divide to the extent possible between Bruce Creek and Berczy Creek. Due to the grade differential across the subject property, a significant earthworks operation is anticipated.

A preliminary road crossing design of Bruce Creek has been prepared and the design concept consists of a 40 metre wide open space span bridge section centered over the existing creek with a typical ROW configuration and embankment grading for the approach sections.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Right-of-Way Standards

It is proposed that the current City of Markham standard road cross-sections, with the exception of the proposed Enclave Cul-de-Sac, be implemented for the development of the subject property. The Enclave Cul-de-Sac has been designed and proposed specifically for this development to be used for infiltration purposes as part of the site water balance strategy.

The following City standard ROW's will be used within the proposed development of the subject property;

- 17.0m ROW – MR3 detail
- 18.5m ROW – MR4 detail
- 23.0m ROW - MR6 detail
- 24.5m ROW – MR7 detail
- 8.5m and 10.0m ROW – MR10 detail

Floodplain Hydraulics

TRCA's existing hydraulics models for Bruce Creek and Berczy Creek were updated with ground survey data for the Subject Property and the existing road crossings within the property and along 16th Avenue in order to map the existing 100 year and Regional Storm floodlines for the property. These floodlines and associated buffers were used as one of the site constraints in determining the overall limit of development.

A proposed conditions hydraulic model for Bruce Creek was prepared to incorporate the proposed grading and servicing strategy for the site including the proposed road crossing (bridge) over Bruce Creek and the partial encroachment of proposed SWM Pond grading (Ponds 1) within the fringe of the Regional storm floodline. Changes to Regional storm flood elevations occur within the Subject Property however, there are no increases to flood elevations within upstream lands. The proposed road and lots will be graded to ensure a minimum 0.3 m of freeboard is provided between the lots and the Regional flood elevation.

An incremental cut and fill assessment was completed to support the partial SWM Pond grading encroachment into the existing Regional Floodplain. The hydraulic modeling was updated with the cut and fill grading as well as the proposed road crossing over Bruce Creek.

Utilities

Enbridge Gas Distribution Inc. will be the natural gas provider for the proposed development. The existing gas infrastructure is shown in this report and formal application will be necessary to have Enbridge confirm requirements to provide future service.

Hydro will be provided to the Subject Property by Powerstream Inc., we are aware of the existing supply to the general area and further coordination will be necessary to establish hydro service alignment with the proposed development.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

Bell Canada will be the telephone service provider and Rogers Communications will be the cable service provider for the proposed development. Further coordination will be required with both service providers to determine exact requirements/infrastructure necessary to service the subject property.

Infrastructure and Development Phasing

The Phase 1 area of the development located generally at the northeast corner of the subject property will be the first area to be developed. Phase 1 is located outside of the current golf course playing area and has existing services available immediately.

Water supply can be provided from existing mains to the north and to the east of Phase 1.

Sanitary services are available by connecting into the existing sanitary trunk sewer that crosses Phase 1 lands in an east/west direction and eventually outlets to the existing YDSS located on 16th Avenue (through Yorkton Boulevard).

Phase 1 lands will drain directly into the existing trunk storm sewer which runs through this section of the subject property and outlets into an existing stormwater management facility, Pond 'H' and the Interim SWM pond, both of which have already been sized to provide the appropriate quality, erosion and quantity control for the area.

Beyond the Phase 1 area, construction phasing and staging will be dependent upon the end of golf course operations and completion of infrastructure. The major items of infrastructure that will require completion include the connection of the proposed sanitary trunk sewer under Bruce Creek and a connection to the YDSS at 16th Avenue, construction of SWM Ponds, watermain connection to existing services and the road crossing of Bruce Creek by way of bridge structure.

Preliminary Erosion and Sediment Control

Appropriate drawings will be prepared at the detailed design stage and submitted to the approval agencies along with supporting report and calculations.

A comprehensive Erosion and Sediment Control program will be initiated prior to construction within the subject property.

Monitoring

The subject property will be monitored during and after construction with respect to several aspects which include a summary of the Erosion and Sediment Control activities, Stormwater Management Facilities and LID features.

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

Transportation Assessment of Internal Roadway Network Options

The new Composite Plan has been enhanced to include a continuous north south collector road. This continuous north south collector road extends from 16th Avenue and incorporates the extension of Yorkton Boulevard to Prospectors Drive with a direct connection to Major Mackenzie Drive.

With this connection the subject property now secures multiple direct and convenient connections to each of the bounding arterial roads – Major Mackenzie Drive, Kennedy Road and 16th Avenue. The formation of the internal roadway network respects the Berczy Creek and related environmental features.

Poulos & Chung Limited prepared an updated Traffic Impact Assessment for the new Composite Plan and the East and West Draft Plans of Subdivision.

The findings and conclusions of this updated analysis are summarized below.

- The October 2016 Traffic Impact Analysis containing the detailed performance analysis of 12 boundary road intersections continues to be valid for the:
 - The new Composite Plan and the new West and East Draft Plan of Subdivisions;
 - The updated Phase 1 development;
- The October 26, 2016 traffic analysis is very conservative based upon the use of Synchro software default settings when analyzing intersection operations. This evidenced by the updated analysis presented in section 4.2 of updated report, where screenline capacity is compared to arterial road intersection capacity;
- Detailed engineering continues to refine the delivery and location of services for the entire phasing plan. As these details are worked out minor adjustments could occur to the dwelling unit numbers. As these adjustments occur and if the dwelling unit number rises accordingly; further traffic analysis can be conducted. Such an approach, as stages are finalized will provide updated traffic flow information with additional accurate horizon year calculations. As is evidenced by the screeline analysis; a more refined analysis can come forward as the phasing plan continues forward;
- The subject lands including a significant portion of the planned residential dwelling units have excellent accessibility to existing transit along 16th Avenue and Kennedy Road. Upon completion of Street “A” and with the introduction of internal transit all of the dwelling units will be within a 5 minute walk of transit;
- The active transportation system (sidewalks and exclusive bike lanes) along with the trail and path network provide:
 - Comfortable and convenient access to the internal public school, retail / commercial area and public school;

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

- Direct and controlled connections to nearby retail commercial plaza and high school;
- Direct and controlled connections to the existing trail and path system south of 16th Avenue;
- The TDM plan presented in the updated report contains the most recent enhancements and process steps identified by York Region and the City of Markham.

The updated transportation analysis continues to support the recommendations contained in the 2016 October Traffic Impact Assessment report.

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

INTRODUCTION

1.0 INTRODUCTION

Sixteenth Land Holdings Inc. has retained a consulting team to prepare this Master Environmental and Servicing Plan (MESP) in support of an Official Plan Amendment ("OPA") application to permit the development of a residential community on the Subject Property.

The Subject Property is municipally known as 4134 16th. Avenue, in the City of Markham, Region of York. The Subject Property is located in Part lots 16, 17 and 18, Concession 5. Except for an area adjacent to Kennedy Road, the balance of the Subject Property is currently used by its former owner York Downs Golf & Country Club for a golf course.

The Subject Property is a total of 168.64 hectares (416.72 acres), and is located on the north side of 16th. Avenue, on the west side of Kennedy Road, and has a small amount of frontage onto the east side of Warden Avenue as well. There is existing residential development surrounding the Subject Property on all sides.

The current golf course use has been in operation since York Downs Golf & Country Club opened on site in the early 1970s. The current Official Plan designation of 'Private Open Space' for the areas outside of the valleylands reflects this historic golf course use.

Sixteenth Land Holdings Inc. intends to develop the Subject Property for a residential community and is submitting an OPA to redesignate the developable portion of the Subject Property from 'Private Open Space' to appropriate urban residential designations to permit the development of residential uses.

This report has been prepared in conjunction with the OPA application in support of the redesignation as proposed in the draft OPA and in the Planning Report (Gatzios Planning, August 2016 and revised on September 15, 2017). Please refer to the draft OPA and to the Planning Report for a description of the proposed Official Plan land use designations proposed for the Subject Property.

This report was submitted to the approval agencies in 2016 as noted earlier and comments received. This report and drawings have been updated to reflect the revised draft plans and address agencies comments.

1.1 PURPOSE

This Master Environmental Servicing Plan (MESP) has been prepared in accordance with City of Markham, Region of York and Toronto and Region Conservation Authority (TRCA) requirements for the completion of a MESP for the Subject Property. It fulfills MESP requirements outlined in the York Downs MESP Terms of Reference approved by the City of Markham.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

INTRODUCTION

This MESP is one of several background studies to be undertaken as input to the Official Plan Amendment for the Subject Property. This MESP addresses a range of environmental and servicing issues including surface water, groundwater, fluvial geomorphology, terrestrial and aquatic resources and municipal servicing needs. It provides environmental and servicing data and designs required for the formulation of draft plans of subdivision within the Subject Property.

The purpose of the MESP is to provide input to the preparation of the Official Plan Amendment including:

- a. Characterizing and evaluating the existing physical conditions of the site including the natural landform, existing geology, hydrogeology, hydrology, and natural heritage features.
- b. Opportunities and Constraints mapping identifying a range of environmental features and functions, their approximate limits and preliminary management requirements (e.g. setback and buffers). This preliminary mapping provided land use input to the study team to assist in the preparation of a preliminary concept plan.
- c. Recommendations for a Natural Heritage System (NHS) to be incorporated in the concept plan, including delineating natural features boundaries of natural features in the field, providing recommendations for buffer and setback requirements, identifying permitted uses in the NHS (e.g. potential for trails, roads, services, stormwater management, watercourse relocation), and identifying other potential mitigative or restoration/enhancement opportunities within or adjacent to the NHS.
- d. A Proposed Stormwater Management Plan identifying design criteria and Stormwater Management Practices (location, type, sizing) to be incorporated into development plans including Low Impact Development opportunities.
- e. Input to the Servicing and Grading Report (SGR) and Transportation Study including assessing environmental implications of servicing and grading, transportation needs and recommendations, where appropriate, road crossing locations and designs, servicing crossing locations and construction practices as well as implications of servicing to groundwater levels and local use.
- f. Identifying geotechnical and hydrogeological recommendations for the development plan based on water balance and feature based water assessment.
- g. Identifying how the MESP recommendations meet requirements set out in the Provincial Policy Statement (PPS), Regional and Local Official Plans and any other applicable documents including identification and mapping of significant natural heritage features and areas (PPS significant and Regional).
- h. Recommending monitoring requirements for the development plan.

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

INTRODUCTION

1.2 STUDY AREA

The Subject Property is a total of 168.58 hectares (416.57 acres), and is located on the north side of 16th. Avenue, on the west side of Kennedy Road, and has a small amount of frontage onto the east side of Warden Avenue as well. There is existing residential development surrounding the Subject Property on all sides. The Subject Property is illustrated on **Figure 1.1**.

Berczy Creek traverses the western portion of the Subject Property, and the Bruce Creek traverses the Subject Property in a roughly north / south direction, bisecting the Subject Property into west and east tableland areas.

1.3 PREVIOUS STUDIES

The following approved studies/guidelines/documents were reviewed in preparation of this MESP. A complete listing of references is provided at the end of this report:

- City of Markham Official Plan (1987), and City of Markham Official Plan 2014 (as partially approved October 30, 2015);
- City of Markham Stormwater Management Guidelines, October 2016;
- Erosion and Sediment Control Guidelines for Urban Construction, Toronto and Region Conservation Authority et al, December 2006.
- MMM Rouge River Watershed Hydrology Update (2001);
- TRCA Rouge River Watershed Plan (2007);
- TRCA Rouge River State of the Watershed Report (2007);
- TRCA Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines (2009);
- TRCA Low Impact Development Stormwater Management Planning and Design Guide (2010);
- TRCA Stormwater Management Criteria (2012);
- TRCA Living City Policy (2014);
- TRCA Crossing Guideline for Valley and Stream Corridors (2015);
- MOEE Hydrogeological Technical Information Requirements for Land Development Applications (April 1995);
- MOECC Stormwater Management Planning and Design Manual (2003);
- Geotechnical Engineering Design and Submission Requirements (TRCA, November 2007);
- MNR Technical Guide for River & Stream Systems: Erosion Hazard Limit (2002);
- Aquafor/AECOM City-Wide Stream Erosion Master Study/Update (2014);
- Cosburn Patterson Mather Pond H Stormwater Management Report (1997);
- Stantec Stormwater Management Pond Certification & Assumption, York Downs Pond 'H' (2008);
- Cosburn Patterson Mather Angus Glen Village Stormwater Management Design Brief (1997) and detailed engineering servicing and grading plans (2000);
- Stantec Functional Servicing Report - Angus Glen East Village (Former School Block) (2012);
- Cosburn Patterson Mather Sanitary Trunk Servicing Drawings (May 1996);
- Stantec Functional Servicing Report (2006) and Stormwater Management Report for Deacon Lands (2007); and,

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

INTRODUCTION

- Stantec Functional Servicing Report (2015) and Stormwater Management Report for Yorkton Lands (2016).

1.4 STUDY TEAM AND REPORT STRUCTURE

A multidisciplinary team has studied the environment and servicing of the MESP Subject Property. The assembled MESP team and their responsibilities include:

- Stantec Consulting - addressing study integration and team management, municipal servicing and site grading, hydrology, hydraulics, and stormwater management;
- Beacon Environmental - addressing terrestrial ecology, fluvial geomorphology, limits of development, impact assessment, ecological restoration and sustainability, environmental protection, and management of aquatic resources;
- R. J. Burnside & Associates Limited – addressing geology and hydrogeology;
- Gatzios Planning + Development Consultants Inc.– addressing municipal planning matters and preparing the OPA and implementing draft plan of subdivision and ZBLA;
- MBTW – addressing urban design, landscape design, parks, and trail planning; and,
- Poulos & Chung - addressing transportation.

The MESP report has been separated into the following Tabs.

Tab 1 – MESP Introduction

Tab 2 – Natural Environment Report / Environmental Impact Study

Tab 3 – Hydrogeological Assessment and Water Balance

Tab 4 – Fluvial Geomorphology Report

Tab 5 – Servicing and Grading Report

Tab 6 – Transportation Assessment of Internal Roadway Network Options

1.5 LANDOWNERSHIP AND PARTICIPATION

The entire Subject Property is owned by Sixteenth Land Holdings Inc. The participating land ownership is illustrated on **Figure 1.2**.

1.6 PRE-CONSULTATION SUMMARY

Meetings were held with City of Markham (City) and Toronto and Region Conservation Authority (TRCA) on the following dates to discuss various items related to the MESP:

- January 14, 2016 – Application Pre-Submission Consultation meeting with City and TRCA
- March 2, 2016 - MESP Terms of Reference discussions
- June 6, 2016 – Pre-Consultation with TRCA on Erosion Threshold
- June 10, 2016 – Workshop with City Staff

The approved Terms of Reference for the overall MESP report are included in **Appendix 1**.

MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

INTRODUCTION

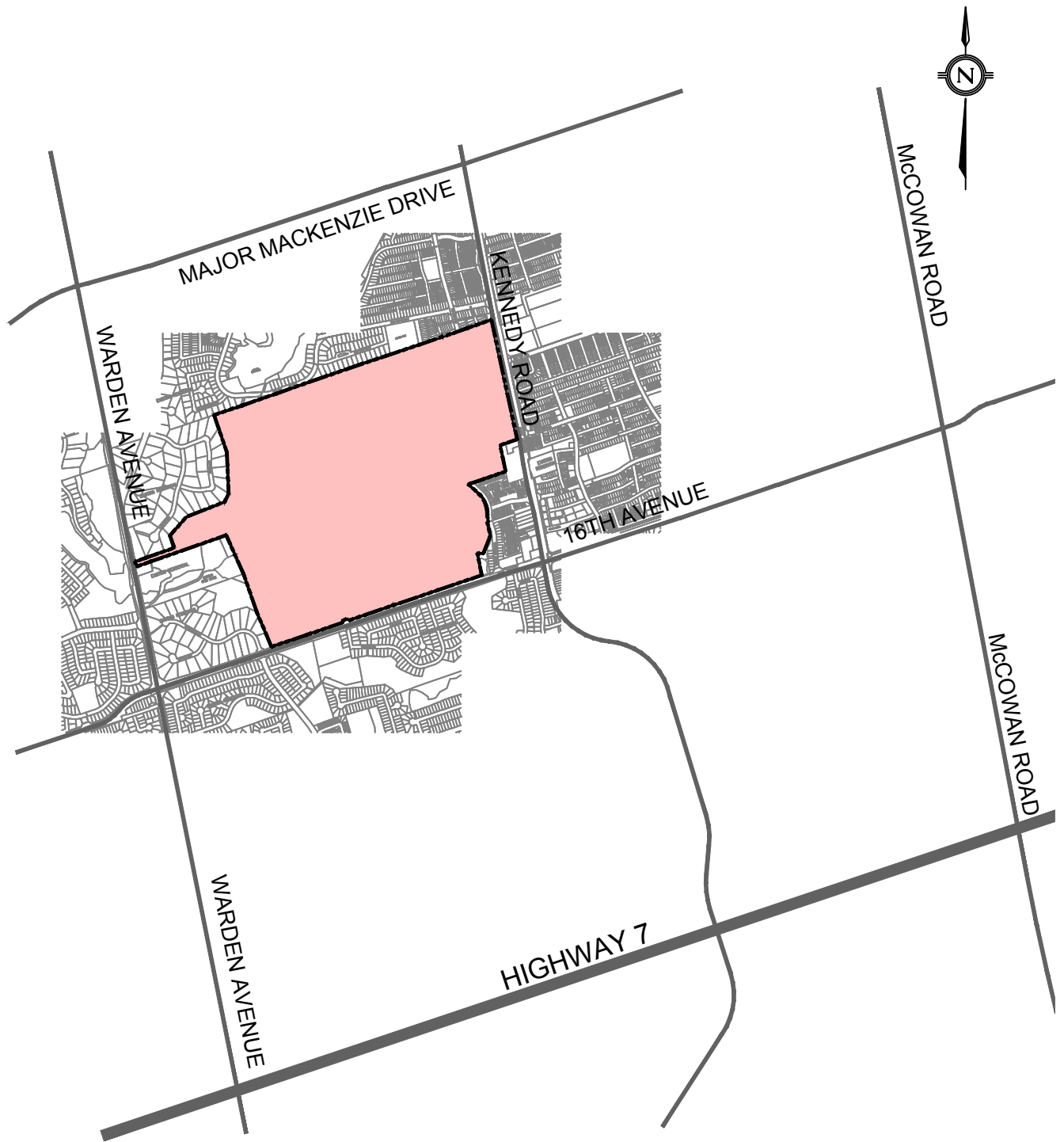
1.7 PROPOSED PLAN

The proposed residential development is detailed in the two draft plan of subdivision applications and associated Zoning By-Law Amendment applications that accompany the OPA application. There is one draft plan of subdivision for the east portion of the property and one for the west portion of the property, both draft plans are dated September 2017. The west draft plan of subdivision contains the valleylands associated with both Berczy Creek and Bruce Creek. References in this report to the two draft plans or to specific lots / blocks within each, will include 'East' or 'West' to denote the appropriate area. **Figure 1.3** illustrates the composite overall development plan for the Subject Property.

The East draft plan of subdivision contains a mix of residential, open space blocks, elementary school block, parks, and SWM ponds.

The West draft plan of subdivision contains a mix of residential, mixed use, open space blocks, parks, and SWM ponds.

The OPA application was submitted in September 2016. The comments were received from the City of Markham on March 13, 2017 and May 10, 2017, Toronto and Regional Conservation Authority on May 10, 2017, Region of York on March 1, 2017 and a subsequent email from Region of York on May 10, 2017 and York Region District School Board on February 16, 2017. The report and drawings have been updated to reflect the revised draft plans and address agencies comments.



NOT TO SCALE

Legend



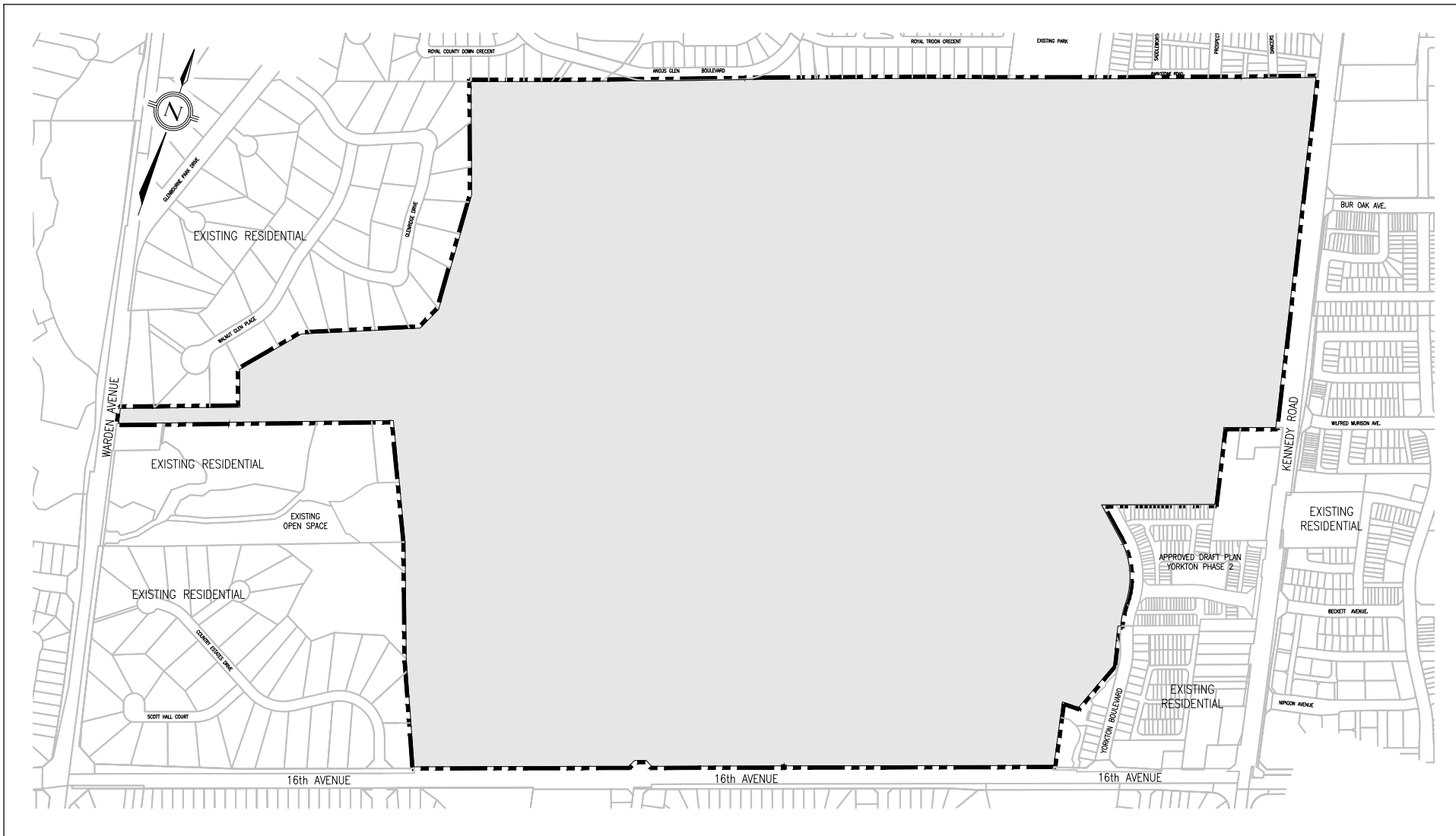
SUBJECT PROPERTY

MESP
SERVICING AND GRADING REPORT
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

FIGURE 1.1

**LOCATION PLAN
FOR SUBJECT PROPERTY**

October 2017



Legend

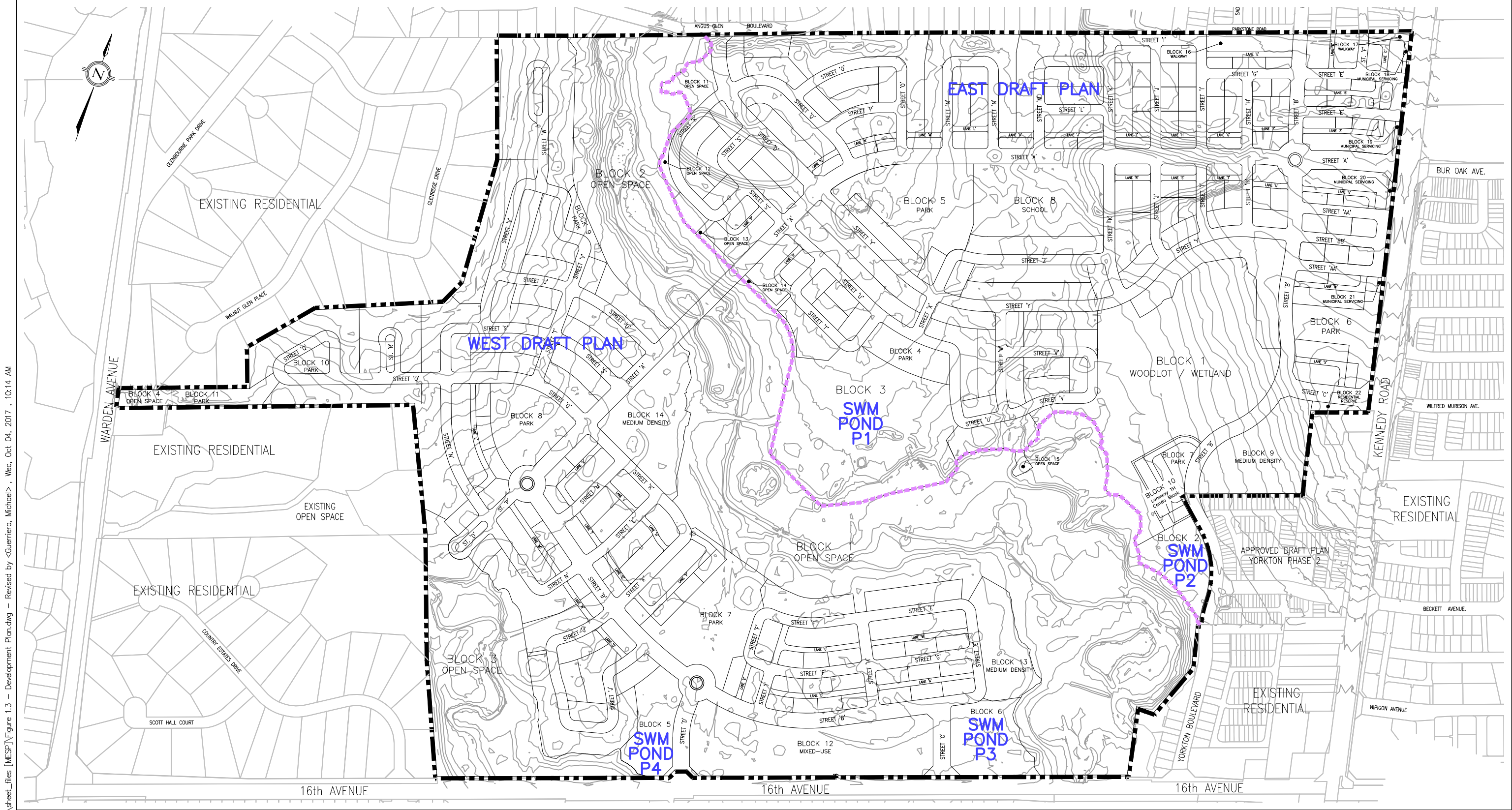


SIXTEENTH LAND HOLDINGS INC. (SUBJECT PROPERTY)

MESP
SERVICING AND GRADING REPORT
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

FIGURE 1.2 LANDOWNERSHIP PLAN

October 2017



File: V:\01606\Active\160622264\Drawing\sheet_files [MESP]\Figure 1.3 - Development Plan.dwg - Revised by <Quierio, Michael>, Wed, Oct 04, 2017, 10:14 AM



Legend

- SUBJECT PROPERTY
- DIVIDE BETWEEN WEST AND EAST DRAFT PLANS

MESP
SERVICING AND GRADING REPORT
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT

FIGURE 1.3
DEVELOPMENT PLAN
FOR SUBJECT PROPERTY

October 2017

**MASTER ENVIRONMENTAL SERVICING PLAN (MESP)
4134 16TH AVENUE
RESIDENTIAL DEVELOPMENT**

Appendix 1 Terms of Reference

Appendix 1 TERMS OF REFERENCE



Terms of Reference for a Master Environmental Servicing Plan (MESP) For York Downs July 2016

Preamble

The following provides an overview of the City of Markham's Submission Requirements for Master Environmental Servicing Plans (MESP's). The MESP is to be prepared in support of Secondary Plans for specific development areas, and is to be completed in conformance with the requirements outlined in the City's Official Plan. These submission requirements are intended to be generic and summarize the information requirements for an MESP completed anywhere within the City of Markham. Nevertheless, it is recognized that the submission requirements may be tailored to be specific to the available information and/or guidance from higher level studies (such as the Subwatershed Study for the City's Future Urban Area).

In circumstances where a Subwatershed Study (for instance) precedes a Secondary Plan and MESP process, some of the data/analyses listed herein may not require new work or it may be appropriate to build upon the technical analyses and assessments conducted in the primary or parent studies, subject to scope concurrence with the City and its partners. References in the table below to the need to refine SWS recommendations are intended to apply to circumstances where refinement may be needed if there are substantive differences in land use assumptions between the MESP and the SWS and/or legislative requirements, policies or engineering standards that have arisen since the completion of the SWS (e.g. Species At Risk [SAR], Climate Change, etc.).

These Terms of Reference summarize only the information and content which is required for an MESP. Further details of the scope of work required for MESP's (i.e. analytical tools and methodology, monitoring, field investigations, mapping and reporting formats and requirements, etc.) are to be defined in the Terms of Reference for each specific MESP. Development proponents are required to consult with the City of Markham and the City's Study Partners (e.g., Toronto and Region Conservation Authority (TRCA), Ministry of Natural Resources and Forestry (MNR), Regional Municipality of York (Region), adjacent municipalities, as appropriate) to establish and prepare the Terms of Reference for each MESP, prior to initiation.

Task	Required Components
1.	<p>Executive Summary</p> <p>The Executive Summary shall include the following:</p> <ul style="list-style-type: none"> • Integrated summary of the work completed and conclusions of the individual sections • Identification of inter-relationship between the various sections • Concise summary of the significance and implications of the findings of the MESP • Summary of conclusions and recommendations
2.	<p>Introduction</p> <p>The MESP shall include the following, subject to consultation with City and Study Partners:</p> <ul style="list-style-type: none"> • Purpose of the MESP including its relationship to higher level documents and/or other relevant Studies, and its relationship to neighbouring lands in terms of servicing, transportation etc.; Terms of Reference for the MESP should also include a section clearly outlining the study requirements • Study area location, attributes, descriptions, figures and boundaries, including rationale for determination of study extent • Setting (existing land use, natural features, etc.) • Study objectives; the MESP is to: <ul style="list-style-type: none"> ○ be completed in support of proposed land development within the corresponding Secondary Planning Area ○ be completed to advance detail and be consistent with the recommendations from higher level and/or relevant studies, as applicable ○ describe and evaluate opportunities and constraints and conceptual mitigation related to the hierarchy of protection, enhancement, or if required, compensation, for the natural heritage and hydrologic features potentially impacted within the study area; to evaluate these features and their functions in terms of opportunities and constraints for the management of Greenway System in the context of the development, specifically to determine the potential implications to the natural heritage and hydrologic features and valley lands in compliance with the approved policies in the OP (existing 1987 and the partially approved 2014) ○ outline site design or management techniques that may be required to mitigate, enhance or compensate for the potential adverse effects to the natural heritage and hydrologic features and functions ○ provide sufficient level of site investigation, servicing investigation and conceptual design, in recognition of potential access restrictions to some locations, to ensure that significant natural heritage and hydrologic features and their functions are protected and managed in the governing studies, where applicable, as part of the completion of the MESP ○ identify opportunities to reduce servicing and transportation crossings of the Greenway System <p>[Note: more detailed investigations will be required in support of individual</p>

	<p>development applications; however, those study requirements will be appropriately scoped as a result of this investigation.]</p> <ul style="list-style-type: none"> • Scope Outline • Study team that include an inter-disciplinary team with expertise including but not limited to environmental, hydrogeological/geotechnical, engineering, planning, landscape architects and public consultation and transportation. • Maps depicting land ownership and participation in the study • Report structure outline • Summary of pre-consultation activities with City, TRCA, MNRF, Region , and others as required • Background review of existing relevant studies (e.g. transportation studies, approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, etc.)
3.	<p>Planning and Environmental Policy Context</p> <ul style="list-style-type: none"> • Identify and define applicable Federal, Provincial, Regional, TRCA and Municipal planning and environmental policies including existing 1987 City of Markham Official Plan and the applicable sections of the partially approved City of Markham 2014 Official Plan which supersede it . This includes policy review of the applicable Official Plan policies • Reference existing relevant studies (e.g. approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, urban design studies, transportation studies, trail studies, etc.) which represent the parent studies and governing documents for the MESP. Identify, list and summarize applicable sections of each document as they relate to the MESP • Define requirements for compliance with any relevant Subwatershed and other applicable studies • Identify Greenway System including natural heritage and hydrologic features identified for protection in the applicable Official Plan policies.
4.	<p>Characterization of <u>Existing</u> Conditions: Constraints and Opportunities</p> <p>The MESP will include assessment/identification (as applicable) of constraints and opportunities to the Greenway System related to:</p> <ul style="list-style-type: none"> • Monitoring <ul style="list-style-type: none"> ○ Pre-development monitoring of adequate duration established consultatively with City and TRCA staff • Physical Setting <ul style="list-style-type: none"> ○ Physiography – characterization of physiographic setting and landform; ○ Topography – topographic survey of the study area and boundary, including all on-site structures, watercourses, drainage routes, culverts and general location of treed

	<p>areas, etc.; and</p> <ul style="list-style-type: none"> ○ Geology – surficial geology description and mapping, bedrock geology and stratigraphic interpretation of the subsurface sediments <ul style="list-style-type: none"> ● Surface Water Resources <ul style="list-style-type: none"> ○ Surface water hydrology and hydraulics including: <ul style="list-style-type: none"> ▪ Existing land use drainage conditions (boundaries and patterns) ▪ Existing land use hydrologic modeling ○ The Regional Storm assessment for existing and post development will be conducted using the watershed model prepared by TRCA. The consultant will conduct the modeling using the current VO2 model, but with the understanding that further assessment of the Regional impacts using the updated PCSWMM model will be required to confirm or adjust previous findings. Updates will be submitted to the City and the TRCA as amendments to the MESP ○ Water budget for existing conditions, based upon water balance for surface water with input from the groundwater component ○ In consultation with the city and TRCA, identify headwater drainage features and establish management scenarios as per the TRCA Evaluation Classification and Management of Headwater Drainage Features Guidelines (2014) ○ Update existing TRCA's floodline mapping based on current site topographic survey. ○ Surface water quality including: <ul style="list-style-type: none"> ▪ Documentation of water quality monitoring findings for area watercourses ▪ Outline of recommendations from Stormwater Management Retrofit Study/Plan including specifically any retrofit and restoration opportunities ● Water Budget/ Water Balance <ul style="list-style-type: none"> ○ Establish water budget for existing conditions, based upon water balance for groundwater with input from the surface water component. This would include (but not limited to): <ul style="list-style-type: none"> ▪ calculation of annual infiltration with input from field tests related to soil's hydraulic conductivity and infiltration rates ▪ establish targets for overall water balance including local groundwater recharge as necessary based on the extent of guidance provided by this MESP and any other relevant higher level studies (to ensure the sustainability of wetlands, woodlands, etc. and to manage runoff) ○ Feature based water balance - identify natural features within the study area and based on monitoring results provide information how each feature is sustained within their catchment areas (groundwater/surface water), hydroperiod, and expected timing to return to “normal” conditions ○ Prepare stage/storage/discharge information for storage based features using survey and monitoring data
--	--

	<ul style="list-style-type: none"> ○ Prepare and calibrate hydrologic/hydrogeologic modeling or calculations using monitoring data <p>• Groundwater Resources</p> <p>A hydrogeological assessment to assess the existing soil and groundwater conditions at York Downs will characterize the physiography, topography and drainage, surface water flow conditions and describe the surficial and bedrock geology, hydrostratigraphy, local aquifers, groundwater use and water quality, and the interpreted groundwater flow systems. Water balance calculations for pre-development, post-development and post-development with mitigation will also be provided.</p> <p>An extensive groundwater and surface water monitoring network has been established on the property including 28 monitoring wells, 16 drive point piezometers and 6 staff gauges. Monthly monitoring began in March 2016 and is on-going. In addition to this data, historical groundwater and surface water monitoring data previously subject to PTTW monitoring requirements are also considered.</p> <ul style="list-style-type: none"> ○ Hydrogeological investigations including: <ul style="list-style-type: none"> ▪ Existing groundwater levels, flow direction and gradients ▪ Aquifer locations and vulnerability ▪ Groundwater recharge and discharge zones ▪ Baseflow contribution to wetlands and watercourses ○ Major groundwater resources and groundwater users in the area from MOECC water well and water taking permits and other relevant information ○ Refine/define targets for overall water balance as necessary based upon scale of assessment and extent of guidance provided by higher level studies <p>• Source Water Protection Plan including:</p> <ul style="list-style-type: none"> ○ Wellhead Protection Area – Quantity ○ Wellhead Protection Areas – A, B, C, and D ○ Groundwater Vulnerability – 8 and 10 ○ Significant Groundwater Recharge Areas ○ Ecologically Significant Groundwater Recharge Areas ○ Surface Water Intake Protection Zones <p>• Fluvial Geomorphology</p> <ul style="list-style-type: none"> ○ Existing land use fluvial geomorphologic conditions including: <ul style="list-style-type: none"> ▪ Reach delineation ▪ Rapid assessments
--	--

	<ul style="list-style-type: none"> ▪ Detailed geomorphic field assessment ▪ Meander belt width assessments for major tributaries throughout the study area, using MNRF and TRCA approved assessment protocols in support of erosion hazard delineation ▪ ▪ Meander belt width delineation in support of Redside Dace habitat limits, where present in consultation with MNRF ○ Erosion threshold assessment including consideration of downstream areas • Aquatic Resources <ul style="list-style-type: none"> ○ Aquatic community description including: <ul style="list-style-type: none"> ▪ Physical conditions including channel form, in-stream cover, spawning habitat, refuge habitat, riparian cover, etc. ▪ Fisheries community composition and significant/sensitive species including aquatic species or communities that have designations under the Endangered Species Act or the Species At Risk Act ○ Hydrologically sensitive features and key hydrologic features <ul style="list-style-type: none"> ▪ Natural features' dependencies on surface water and/or groundwater based upon hydrogeological investigations. ▪ Identification and delineate (including staking) of all wetland features (provincially and locally significant wetlands and unevaluated wetlands) in consultation with the Ministry of Natural Resources and Forestry (as required), TRCA and the City. ▪ Identification and delineation of valleyland features and buffers • Terrestrial Resources <ul style="list-style-type: none"> ○ Vegetation community description and floral inventories including: <ul style="list-style-type: none"> ▪ Ecosystem context ▪ Community description using MNRF ELC standards ▪ Identification of Areas of Natural and Scientific Interest (ANSI) ▪ ▪ Identification of vegetative communities and significant/sensitive species including species or communities that have designations under the Endangered Species Act or the Species At Risk Act ▪ Identification and delineation (including staking) of woodlands. Any proposals for removal of woodlands will require completion of woodland assessment using the City's established Terms of Reference for Woodland Evaluation. This work can be completed separately (prior to impact assessment) or as part of this MESP. ▪ Habitat conditions and species. Acceptable methods should be clarified for birds, amphibians/reptiles and mammals and approved by City and TRCA staff.
--	---

	<ul style="list-style-type: none"> ▪ Significant wildlife species and habitat conditions ▪ Conduct breeding bird and amphibian surveys, as requested by TRCA and/or MNRF as required ▪ Significant species including local, Regional, Provincial significant species, communities of conservation concern as per TRCA rankings, and species or communities that have designations under the Endangered Species Act or the Species At Risk Act ▪ Identification of wildlife linkage passages and connectivity opportunities ○ Confirmation of the Greenway System <ul style="list-style-type: none"> - Integrated characterization (Task 4) of how the existing Greenway System is interconnected, including natural heritage and hydrologic features and their functions. This would include: <ul style="list-style-type: none"> - Identify natural linkages and ecological corridor functions - Identification of vegetation protection zones (i.e. buffers) - Identification of complementary land uses and potential enhancement lands ▪ Establish opportunities and constraints mapping and define developable areas, undevelopable areas and any areas requiring further study ▪ Clearly define the circumstances in which infrastructure is permitted within vegetation protection zones. LID, trails, etc
5.	<p>Proposed Development Plan and Municipal Servicing</p> <p>Note: The timing of this section of the MESP coincides with the timing of the Community Design Plan and Sustainability Framework development.</p> <p>The MESP will include:</p> <ul style="list-style-type: none"> • Summary description of development, including proposed development areas, types of development, and maps • Study area ownership • Stormwater Management (SWM) servicing including: <ul style="list-style-type: none"> ○ Functional stormwater and environmental management plan and associated hydrologic modelling (pre and post development) complete with boundaries as required ○ Updated hydrologic analysis and verification that stormwater management plan addresses criteria and requirements of Subwatershed Study and other parent documents as appropriate ○ Post development water budget to inform stormwater management plan for water quality, quantity, infiltration, groundwater and erosion control ○ Refine infiltration targets (for each landowner to meet) based on post development infiltration deficit (particularly in potentially significant recharge areas) based upon refined land uses and other technical information ○ Refine stormwater runoff control rates and/or design targets based upon refined

	<p>land uses and other technical information</p> <ul style="list-style-type: none"> ○ Hydraulic analysis – major infrastructure (floodplain, culverts, other crossings etc.) ○ If applicable, apply fluvial geomorphology recommendations for the design of open watercourses including: meander belt, erosion thresholds etc. ○ Outline best management practices/stormwater management recommendations/alternatives ○ Size and site general footprint of proposed stormwater management facilities and outfalls; where required, complete site visits with relevant agencies to review stormwater management facility/outfall locations ○ Delineate future land use catchment area boundaries ○ Delineate major and minor drainage systems ○ Preliminary grading plans/facility design elements, including preliminary storage-discharge relationships for stormwater management facilities ○ Screening and assessment of long list of low impact development (LID) techniques to be considered at detailed design stage including assessment of function and feasibility based upon proposed conditions. LID targets (infiltration, evapotranspiration, runoff) shall be established at the MESP stage based on the pre/post water balance assessment. The MESP should clearly state that LID measures will be implemented at the site specific stage consistent with the recommendations of the MESP, applicable City's OP policies and the City and TRCA LID guidelines and directions ○ Complete review of alternatives for Regulatory Event management and recommend preferred management strategy ○ Compare pre to post development stormwater conditions up to the Regional flows and water levels within downstream receiving watercourses including SPAs. ○ Integrate stormwater management plan requirements with future specific water budget analysis to identify appropriate mitigation measures to manage runoff volumes to specific features ○ Analysis and comparison of pre-development and post-development (controlled) flow conditions for modelled storm events relative to the erosion threshold (variation within +/- 5% will be allowed) ○ Consultation summary with MNRF to address implications on aquatic SAR (i.g. Redside Dace) <ul style="list-style-type: none"> ● Water supply servicing including: <ul style="list-style-type: none"> ○ Existing infrastructure ○ Availability of external services ○ Expected population and demands ○ Future Population (Ultimate Scenario) within the catchment area in accordance with the current Official Plan (OP) ○ Identification of proposed/permitted connection points to existing water supply systems
--	---

	<ul style="list-style-type: none"> ○ Pressure districts ○ Design criteria (average, daily, hourly, fire demand, pressure, and pipe roughness) ○ Proposed infrastructure and servicing plan ○ Water distribution modelling and pressures during maximum day, peak hour, minimum hour and maximum day plus fire conditions ○ Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development <p>Internal servicing constraints</p> <ul style="list-style-type: none"> ● Wastewater/sanitary servicing including: <ul style="list-style-type: none"> ○ Existing infrastructure ○ Identification of proposed/permitted connection points to existing wastewater servicing systems ○ Existing service areas and flows ○ Design criteria (generation rates and infiltration contribution) for growth ○ Proposed infrastructure and servicing plan ○ Expected population and wastewater generation ○ Future Population (Ultimate Scenario) within the catchment area in accordance with the current OP ○ Expected sanitary flow from the proposed and future developments within the area ○ Prepare and implement monitoring plan at key locations as required ○ Wastewater servicing model inclusive of existing and proposed service areas ○ Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development ● Preliminary site grading including: <ul style="list-style-type: none"> ○ Existing grading including existing topography and general grading/sloping direction(s) of site, location of high and low areas ○ Grading criteria including consideration of positive drainage of sewers and overland flow by gravity to receiving systems; ensure acceptable grading of site and roads ○ Proposed grading including proposed preliminary grading concept plan, location of future high and low areas, grading constraints in relation to existing and proposed servicing infrastructure and environmental/ecological features, potential requirements for cut/fill, consideration of existing and future grades of surrounding areas outside of TRCA buffers, interface with natural heritage and hydrological features ○ High level recommendations and principles to be applied for site management and phasing, related to minimizing erosion and sediment discharge to receiving watercourses during construction, consistent with City Engineering Standards
--	--

	<ul style="list-style-type: none"> ○ Considerations of reduction in cut/fill and integration of the natural topography in post development landscaping and road design ● Conceptual natural channel design (if required) for relocated watercourses including: <ul style="list-style-type: none"> ○ Base mapping ○ Design criteria (hydrology, hydraulics, channel dimensions, terrestrial and aquatic habitat) ○ Geomorphic field assessment ○ Design constraints ○ Corridor requirements (flood conveyance, erosion hazard limits, aquatic habitat, terrestrial habitat, existing City/Region trail systems) ○ Fish habitat impacts and mitigation, enhancement or if appropriate, compensation opportunities ○ Design concepts (plan view, profile, typical sections, etc.) ○ Barrier removal opportunities ○ Consultation summary with MNRF where Redside Dace (and/or other species at risk) habitats may be affected ● Road crossing, cycling and pedestrian bridge crossing, and trail system conceptual designs <p>Based on recommendations from relevant studies (where available), complete conceptual design of road crossings, cycling and pedestrian bridge crossing, and trail system including consideration of requirements related to hydraulics, fluvial geomorphology and wildlife passage</p>
	<p>Transportation</p> <p>The MESP at minimum will include:</p> <ul style="list-style-type: none"> ● Introduction <ul style="list-style-type: none"> ○ Study assumptions ○ Rationale and location of crossings as related to the Greenway System ○ Intersection operation methodology ○ Verification of crossing role and function ○ Transportation Association of Canada crossing vehicle capacity ● Existing Conditions <ul style="list-style-type: none"> ○ Site and area description ○ Study area road network (including transit, bike and pedestrian) ○ Transit service ○ Existing traffic volumes ○ Existing traffic intersection operations ● Future background traffic conditions <ul style="list-style-type: none"> ○ Planned network improvements ○ Traffic growth ○ Other area developments

	<ul style="list-style-type: none"> ○ Background traffic volumes ○ Background traffic intersection operations • Proposed development <ul style="list-style-type: none"> ○ Development statistics ○ Vehicular trip generation ○ Non-auto trip generation ○ Trip distribution and assignment • Total traffic conditions <ul style="list-style-type: none"> ○ Total traffic volumes ○ Assessment, comparison and evaluation of alternative road networks ○ Mobility connectivity – internal and external ○ Total traffic intersection operations ○ Transportation demand management ○ Recommended transportation network <ul style="list-style-type: none"> ▪ Road classification ▪ Non-auto facilities (Including transit, bike and pedestrian) ▪ Future transit service ▪ Right of way ▪ Cross sections
7	<p>Phasing</p> <p>The MESP will include:</p> <ul style="list-style-type: none"> • Development and construction phasing and staging (Phase 1 has been identified as per Figure 1. Remaining phases will be identified at a later stage and will be included in the MESP as updates or amendments) • Mobility connectivity - internal and external • Requirements for interim stormwater and environmental management and servicing, and associated recommendations
8	<p>Potential Development Impacts and Proposed Mitigation/Enhancements</p> <p>An impact assessment shall be conducted after the characterization of the Environment and once a Conceptual Plan has been developed.</p> <p>The impact assessment should include the application of the Mitigation Hierarchy. The Mitigation Hierarchy will be established in consultation with the City and TRCA staff and will prioritize the determination of avoidance, minimization and mitigation to alleviate environmental harm and the removal of natural heritage and hydrologic features. Requests for consideration of natural heritage compensation are always treated as a last resort outcome.</p> <p>The MESP will include:</p> <ul style="list-style-type: none"> • Assessment of impacts on surface and groundwater resources <ul style="list-style-type: none"> ○ Development footprint and site grading ○ Assessment of the impacts of the development on the surface water and groundwater systems and any mitigation measures required prior to construction

	<ul style="list-style-type: none"> ○ Define impacts of buried services and roads • List mitigation and enhancement techniques to achieve subwatershed study recommendations (as available) • Recommend list of acceptable LID techniques to maintain water budget, based upon long list of general mitigation techniques previously advanced (see Section 5); final LID and Best Management Practices (BMPs) to be established at the detailed design stage. Provide target information values for landowners. • Apply and advance the recommendations from the Subwatershed Study (as available) related to headwater drainage features completed as part of the subwatershed studies or related studies as available. The MESP shall recommend management scenarios for each feature based on established protocols and management scenarios in the subwatershed studies (as available) • Characterization of groundwater quality where potential exists for development to alter conditions (e.g., individual septic systems) • Assess impacts on aquatic and aquatic habitats and recommend suitable mitigation, enhancement, and compensation measures where applicable including consultation summary with MNRF to address implications on aquatic SAR (e.g. Redside Dace) • Assess impacts on vegetation and vegetative communities and recommend suitable mitigation measures, enhancements and compensation where applicable • Assess impacts on woodlands and recommend suitable mitigation measures, enhancements and compensation where applicable • Assess impacts on wildlife and wildlife habitat and recommend suitable mitigation, enhancement, and compensation measures where applicable • Update the PCSWMM model established by AMEC for the upstream Future Urban Area (FUA) with the post development hydrologic conditions for the site for the Regional Storm event. Modeling to be completed once PCSWMM is available. • Use the FUA PCSWMM model to complete a Regional Storm event impact assessment for the downstream receiving system including SPAs. Provide mitigation measures (if required) to address any increases in water levels in the SPAs that result from the proposed development of the York Downs lands. • Apply and advance the recommendations from the subwatershed study (as available) related to channel protection, buffers and/or setback delineation in accordance with criteria established in the applicable Official Plan and related Official Plan Amendments (OPAs) • Identify enhancement and compensation requirements based on recommendations from higher level studies • Effects on connectivity, and fragmentation and isolation of habitat • Complete a feature specific water budget analysis and identify mitigation, enhancement and potential compensation measures as applicable • Assess impacts to, and identify protection, enhancement and potential compensation approaches as applicable for the management of species at risk based on the federal Species At Risk Act (SARA) and/or the Provincial Endangered Species Act (ESA)
--	---

	<ul style="list-style-type: none"> • Description of how the recommended watercourse and stormwater management strategy and Greenway System address requirements of higher level studies • Integrated assessment of impacts to interconnection between the existing Greenway System with groundwater, surface water, wetlands, woodlands, and other natural heritage features • Summarize impacts on the natural environment and natural processes to protect, enhance or if appropriate, compensate, the natural environment and natural processes from the impacts of development
10	<p>General and Public Consultation</p> <p>The MESP will:</p> <ul style="list-style-type: none"> • Outline how all consultation requirements have been met for the Planning Act and the Municipal Class EA for the first two phases in the Planning and Design Process of the Class EA for all major road, water and wastewater projects at a minimum, where applicable • Include appropriate consultation within the context of the Planning Process
11	<p>Monitoring</p> <p>Monitoring requirements must be included in the MESP in accordance with findings of the MESP and any relevant environmental studies or other higher level documentations where applicable. The following requirements must be satisfied in this MESP for all phases (see Figure 1) in this study:</p> <ul style="list-style-type: none"> • Phase 1 – minimum two (2) years monitoring • Remaining Phases - minimum three (3) years monitoring • Terrestrial and aquatic system • Valleylands and Creek system • Surface and Groundwater systems • Water balance/ water budget for all feature based natural systems • During construction and post-construction monitoring activities • Other monitoring requirements (e.g. MNRF, Region)
12	<p>Future Study Requirements (Draft plan stage, detailed design stage, etc.)</p> <ul style="list-style-type: none"> • Native soil preservation
13	<p>Conclusions/Recommendations</p>