161 Windermere Road, EIS

EIS Dated January 24, 2014

Reviewers: N. Bergman, D. Ellis, S. Levin, Dr. C. Smart
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EEPAC doesn't not support the development as proposed as the stormwater system's impact on the ESA will likely be negative. EEPAC believes that the EIS is incomplete and further information is required as to the hydrogeological conditions.

In no case should storm water outlet to the ESA, but rather to Windermere Road. This could be accomplished if the applicant were to delete units 4 and 5 from the proposed development.

PREAMBLE

There are a number of errors in the EIS.

- The bluff is on the left bank as the stream flow (see p. 12)
- Figure 1 does not show the section of the Medway Creek surveyed unless the entire area shown on the Figure was surveyed. This should be clarified.
- It is incorrect to say that the till is unconsolidated (see p. 13). The glacial till below is greatly compacted.
- The gully on site was not reviewed for activity. This is significant because no matter how the site is graded, water will also connect to the existing gully.
- The maps in the Appendices are generally too small to be read without aid. This is unacceptable.

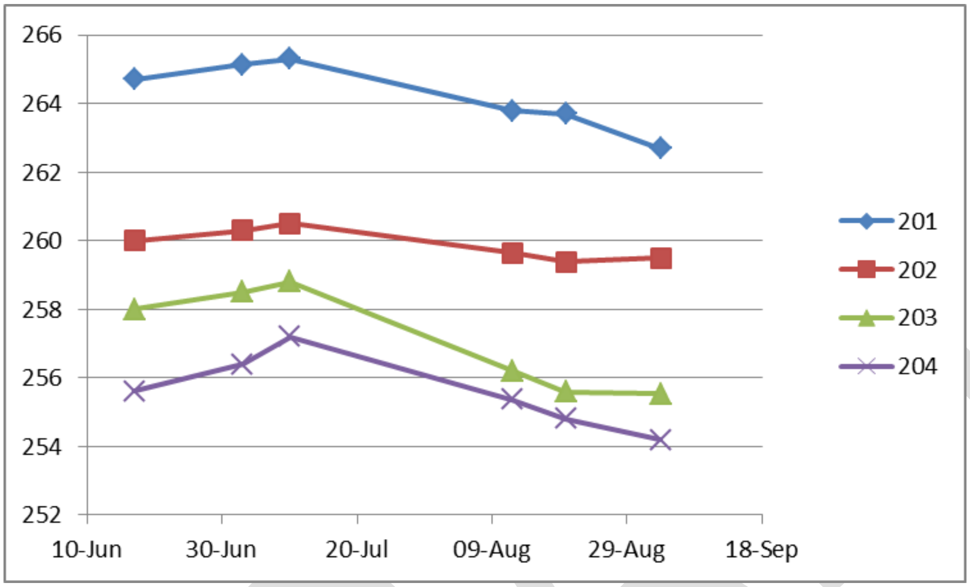
THEME #1 – Stormwater, Slope Stability and Storm Water Management

Hydrogeology

The hydrogeological report details a rather limited set of observations on a few shallow boreholes clustered in one part of the property. Deeper boreholes installed for geotechnical testing indicate the presence of a deeper aquifer than is not reported or analysed.

EXP finds numerous seepages on the subject site, and reports significant changes in water level in the monitoring wells, both indications of a permeable medium. Their finding from well tests and bulk samples is taken to show that the material has low permeability, contrary to the above observations. This is an overt contradiction. The site conceptualization is a problem: the silt is indeed low permeability. But it is riven through by permeable sand layers that allow a significant groundwater flow. Such hydrogeological conditions are not uncommon, but they prevent application of analyses that assume a homogeneous medium such as inferring groundwater flow paths (Figure 2) and permeabilities from Hvorslev analysis (p. 11, Appendix C). Bulk sampling and analysis also fails to capture the critical details in the site stratigraphy (Appendix B)

Water levels are reported on the observation wells (Table 2 p.6), but not analysed. Well elevations were only estimated from topographic maps, leaving some uncertainty in the data. Well coordinates were not provided.



The above plot was not provided, although a monthly rainfall plot was provided for some reason. No interpretation or explanation is provided for the trends observed. But the responsiveness confirms that groundwater flow is active at the site. Unfortunately, the finite depths to water are not consistent with the presence of seeps on the site (in which case dtw should ->0m). <u>This is problem also requiring explanation</u>.

The wells are limited to one sector of the slope. As such they do not provide the critical up slope conditions (north) that would indicate if there was a substantial aquifer. So we are left hanging as to whether the seeps are local rain water infiltrating and being quickly discharged OR if there an aquifer that will keep delivering water onto the site from upstream. This distinction is important given the proposed excavation, construction and runoff control proposed for the subject lands.

The absence of downslope wells means that the geotechnical condition of the slope foot is not described. Not only is this needed to comprehend the hydrogeology, but this is also the surface proposed to receive storm water runoff. The composition and moisture status of the lower slope should have been determine, reported and incorporated into the design. (Particularly as this is proposed as the receiving area for storm water discharge.)

It is not clear why the hydrogeological assessment did not incorporate the data from the deeper geotechnical boreholes drilled for slope stability assessment (and vice versa).

Slope stability analysis

The geomorphic assessment seems to draw on broad regional generalities rather than addressing the real risk of stream erosion of the slopes or erosion of the slope face by surface runoff. The proposed development occupies a perilous site atop an actively eroding river bluff. The current configuration can be expected to evolve in response to ongoing stream erosion, resulting in a less stable condition than that analysed in the report.

The stability assessment does not consider the presence or absence of fractures in the overconsolidated till or the silts. Fractures will eliminate the cohesive strength from the assessment.

The stability assessment does not consider water pressure that will considerably reduce the effective normal stress. The "perched aquifer" was described as ranging "between 6.1 and 15.2 m below the ground surface." Which depth refers to which borehole, and when were these observations obtained? What is the actual hydraulic head? What is the borehole datum? A rough analysis of the sketches provided suggests that the groundwater is not perched, but is consistent with regional discharge at Medway Creek. Groundwater discharge from the vulnerable bluffs below the proposed site raises many questions about the likely magnitude and seasonality of discharge, the vulnerability to stream erosion and the stability of the site. LIDAR analysis of the Medway Valley suggests that deep seated failures may have occurred in the recent, pre-settlement past.
The slope stability analysis seems much less rigorous and thorough than might be expected for a potentially dangerous location.

Recommendation #1 - A much more thorough geotechnical report is recommended, considering the hydrogeology and geomorphology of the property.

Storm Water Management

The storm water report proved difficult to read as the proposed installations were presented at an illegible scale. It is understood that some 100 m^3 of runoff storage is required for the site, assuming a maximal permitted discharge of 30L/s. The storage was to be gained from a two segment swale and an on-slope SWP. Discharge was mediated by a 150mm orifice under 0.4 m head.
It was not possible to assess the dimensions of the proposed structures given the information provided, however, it is a very large holding area. It is not properly illustrated on the last page of the EIS (is it between units 4 and 5 or at the property line?). We very much doubt this storage can be built (either above or below ground)

without encroaching into the ESA in some way. It is EEPAC member's opinion from experience that this much water will not discharge slowly and will result in new gullies and erosion. Erosion lines are not static. It is noted that both structures are close or beyond the maximal dimensions in their respective locations along the property boundary and on the slope below the development and immediately adjacent to the erosion limits and reserve boundary. Failure or sub-par performance of either structure is anticipated and would result in erosion and potentially catastrophic scour.

The natural slopes of the property indicate that the west side of the property (Including proposed driveways with high runoff coefficient) would feed into a gully unless they are actively captured. The critical runoff conditions are likely to occur in winter when the runoff coefficient of even permeable land surfaces would approach unity. The low permeability reported under the hydrogeology report suggests that the grass runoff coefficient is too low for such materials on such a steep slope. The high permeability (C=0.5) assumed in the rational equation is considered overly optimistic and incorrect. Thus maximal discharges would likely exceed those estimated in the design.

As proposed, stormwater from the site will most likely impact the ESA. The natural runoff determined for the site would naturally be distributed across the slope, rather than focused at the SWP outlet. The SWP discharge is more focused and much more likely to be erosive, and may require abundant rip-rap control through the ESA. Of greater concern is the lack of topographic constrain on the SWP discharge. The site mapping indicates that discharge is very likely to avulse to the west and descend down the steep slope to Medway Creek. Erosion would be a certain outcome of such an avulsion, sustaining this flow route and compromising the ESA and slope stability and ultimately threatening the SWP and buildings. Considerable effort should be placed on routing any storm water runoff from the lands to existing storm water facilities.

The proposed system has no quality control. It will be difficult to maintain as it is a heavily treed site, resulting in organic matter accumulating in the facility. This will reduce the effectiveness of the system, and overtime, malfunctioning. There is no discussion of how this private system will be properly maintained. Due to its isolated location, it is unlikely damage to the ESA will be noted until it is too late to correct.

The EIS and related appendices are not clear as to the location, depth and outlet point for the proposed pipe outlet of the stormwater system. Given the height of the property above the Creek, it will either take a lot of excavating to get a pipe down to the Creek, or the pipe will outlet in the ESA above the Creek, and then created a new channel down the slope. This is unacceptable. A system may work if the water is channeled to a less steep section, but this would require an outlet outside the subject site.

Recommendation 2: EEPAC recommends that units 4 and 5 be deleted from the proposed development so that the outlet for the storm water can be to Windermere Road.

THEME #2 - PRESENCE OF WETLAND

We, like the UTRCA, believe this EIS is incomplete until the question of the wetland on the subject site is resolved. When this site was study, the previous winter was abnormally dry with little snow on the site. Given the extreme conditions of this winter, many more seeps will be evident on the property this spring.

Recommendation 3: The EIS be considered incomplete until the wetland and other questions raised by the UTRCA are clarified through an on-site visit with the UTRCA, the proponent or designate, and a representative from EEAPC (N. Bergman or Dr. Smart).

THEME # 3 - Boundary Delineation and Buffering

It is unclear why the site plan with ESA limit shown in Appendix N of the EIS does not follow the top of slope.

Our interpretation is that Guideline 7 of the Boundary Delineation Guidelines applies in this case and the CUW1 on the site is to be included within the ESA boundary. While it can be debated if Guideline 4 applies to this site, Guideline 7 applies and has the same impact of including the adjacent FOM7 and the CUW1 on the subject site. The existence of the FOM7 community as part of the ESA seems to have been ignored by AECOM.

We also note that in the Dillon study of 2013, p. 66, the property has an area that contains habitat for a Species at Risk listed as Endangered. We are unclear if this is the Queensnake referenced in the AECOM report. If it is the Queensnake, it, and its habitat are protected under the Species At Risk Act. If it is this reptile, there are habitat protection requirements under the Act:

"The habitat regulation for Queensnake protects: the area within 50 metres of all natural or man-made Queensnake hibernacula; any part of a watercourse, waterbody or marsh up to the high water mark that is continuous and within 250 metres of the area being used by a Queensnake; the area up to 30 metres inland from the high water mark adjacent to the occupied watercourse, waterbody or marsh; where two known populations occur within one kilometre of each other, the intervening aquatic area and five metres inland from the high water mark is protected to allow for movement and to maintain connectivity between populations; these aquatic features and riparian areas are protected until five consecutive years of documented non-use. The regulation applies in the Regional Municipality of Waterloo, the Municipality of Chatham-Kent, the cities of Brantford, London and Windsor, the counties of Brant, Bruce, Essex, Huron, Lambton, Middlesex and Oxford, Haldimand County and Norfolk County." (MNR, January, 2014)

Recommendation 4: an independent study with a consultant agreed to by the city and the proponent should be done and completed to determine the presence of the Species at Risk or its habitat.
Recommendation 5: the ESA boundary be drawn as shown in the Dillon study conducted for the city and reported in December 2013.
Recommendation 6: As a minimum, the ESA limit should be the top of slope.

Even if the boundary is determined to follow AECOM's interpretation, we believe that additional buffering is required. We disagree with the EIS (p. 31) that there is no required buffer beyond the ESA boundary. Page 122 of the City's Environmental Management Guidelines note a minimum 10 m buffer beyond the drip line of trees for woodland features. Secondly, there is no buffer discussed or recommended for the FOM7 community on the adjacent property. There seems to be no disagreement that this community is part of the ESA. Therefore, a buffer between this community and the development on the subject site must be determined.

According to p. 93 and 94 of Beacon (referenced in the sources to the EIS on page 42), in most cases it is expected that the final buffer width will fall within the "medium risk" zone (as identified in **Table 7** of Beacon) and thereby represent a reasonable balance between achieving natural heritage protection and efficient land use planning objectives. Furthermore, using an additive approach which is based on the current science and is also responsive to site-specific conditions (i.e., BASE derived from the "high risk" end of a risk-based assessment of the science + ADDITIONAL buffer from site specific considerations with consideration for the related science) will help ensure that the final recommended buffer is defensible, appropriate for the given site, and supportive of good land use planning.

In the case of this site (Upland Woodlands and Forests), the medium risk zone (for screening human disturbance) starts at 5 m and goes to 20 m. As section 3.5.2 of Beacon points out p.61-62,(this is included as Appendix 1 to this submission), slope also influences the effectiveness of the buffer.
"As stated by Adamus (2007), vegetated buffers tend to be more effective (at least with respect to water quality) on relatively flat or mildly sloping terrain because this allows more time for surface water to move down through the roots and effectively be filtered. However, other factors, such as soil type and the structure of surface vegetation, are also recognized as important influences.
Although slope has long been recognized as a factor in determination of appropriate buffer widths, relatively few studies specifically examine the influence of slope in relation to buffer effectiveness. Slope has primarily been evaluated in terms of how it alters storm water, sediment and nutrient attenuation. However, results are unclear because it is difficult to separate the influence of slope from other related factors such as the buffer's vegetative structure and the soil type."

Recommendation 7: The buffer required for the CUW1 and FOM7 communities should be at least 10 m and more likely 20 m to deal with proposed stormwater impacts and human intrusions.

Recommendation 8: The proposed vegetative plantings require more vegetative structure than usually contemplated in such cases due to the nearby slope.

Recommendation 9: In addition to requiring as a condition of approval, plantings with native, non-invasive species to a density to keep out new invasives such as buckthorn and Norway Maple "volunteers," every effort be made to remove the invasive, non-native species (Siberian Elm, European Buckthorn, Tartarian honeysuckle) on the subject site.

Recommendation 10: as per p. 10 of the Slope Assessment by EXP, vegetation on the slope should be maintained. A program of planting including native deciduous trees and deep rooted vegetation be required. This program should be monitored by the city at the developer's expense, for two years from date of planting.

Recommendation 11: The ESA lands on the subject site be re-designated and rezoned to Open Space and OS5 respectively as part of the recommendation to Planning and Environment Committee.

Recommendation 12: The lands designated ESA or undevelopable be held in the ownership of the Condominium Corporation and be managed by the UTRCA under contract with the condominium corporation. As owners of the property, the Condominium Corporation is more likely to provide stewardship and be more interested in ensuring effective oversight of the ESA over time.

Recommendation 13: as per page 40 of the EIS, the Condominium Corporation be required to include in its by-laws prohibitions for lands within the ESA including the clearing of vegetation without approval, building of structures including fire pits, decks and patios, dogs and cats off leash, feeding of wildlife, and excluding access to the ESA.

THEME #4 – Construction Impacts and site alteration

There is nothing in the EIS to address the water flows from the servicing trench as noted in EXP's Hydrogeological report (page 12 and 13). Specifically, EXP recommends sediment control measures at the discharge point of the dewatering system. It also recommends excavated natural soils be reused as service trench backfill where suitable soil conditions are encountered.

Recommendation 14: sediment control measures at the discharge point of the dewatering system be required and the outlet be to Windermere Road

Recommendation 15: excavated natural soils be reused as service trench backfill where suitable soil conditions are encountered.

Given the location of the construction dust suppressants are advisable however, no chemical suppression should be permitted as it can have a deleterious impact on the ESA

Recommendation 16: Chemical dust suppressants not be used during construction to mitigate dust generation.

Damage to tree rooting zones noted on page 35 of the EIS can be avoided by putting a minimum 10 m buffer from the drip line of trees at the edge of the final location of the ESA if buffers are not included.

We disagree with the recommended approach in #16 on page 40 of the EIS. To have areas susceptible to erosion replanted with the wrong plant species will have a negative impact on the ESA.

Recommendation 17: A tree preservation report be a requirement for any development on the site

Recommendation 18: all surfaces susceptible to erosion must be re-vegetated with native, non-invasive woodland species immediately upon completion of construction activities.

Figure 4 and Appendix N differ in showing the proposed works.

Recommendation 19: This discrepancy be clarified prior to acceptance of the EIS.

THEME #5 - INDIRECT IMPACTS FROM DEVELOPMENT

It is unclear from the provided drawings where waste collection is to take place, whether at the door of each unit or in a central location. Given the location adjacent to the ESA, special conditions should be required to reduce the likelihood of harm to the ESA from human activities.

Recommendation 20: full cut off lighting be required for all outside lighting

Recommendation 21: a condition of draft approval be the inclusion of a central waste collection point including for yard waste, to reduce the likelihood of residents dumping yard waste in the ESA.

Recommendation 22: the boundary between the buffer/ESA be fenced and signed with the following: "Sensitive plants grow by the inch and die by the foot. Please do not enter this environmentally significant area here. Use the designated entrance at the Elsie Perrin Williams Estate."

THEME #6 – Other relevant points

A. It is unclear in various places as to the "study area." While the subject site is clearly marked, references to "the study area" are not shown on any of the maps. The "site limits" are marked on Figure 1 (which is titled "Study Area"). We assume the subject site is actually the study area. There may be other areas where data was collected, such as the aquatic survey somewhere in the Creek, but we doubt if permission was given for investigations on all of the other properties shown on Figure 1. For example, the FOM7 cited in the report, was "… viewed from the edge of the property line to the west." (EIS, page 15).

B. The consultants do not mention the beaver burrow at the base of the slope observed recently and regularly by N. Bergman during his thesis field work.

C. The EIS (p. 18) understates the number of bird species in the adjacent ESA. The EIS reports 14 (without indicating its definition of "adjacent") while the work by Dillon indicates 55 (p. 19):

"During the survey, 55 species were observed during the breeding season using a variety of habitats including meadow, wetland, forest and thickets. The majority of species observed exhibited evidence that confirms active breeding within the study area (e.g. food carrying, recently fledged young, entering/leaving nest). Ten of the species observed during the breeding season, including two Species at Risk, were observed as visitors to the MVHF South ESA (i.e. no evidence of active breeding within the ESA). Species at Risk observed include Barn Swallow and Chimney Swift (Chaetura pelagica), both are listed as Threatened under the ESA, 2007 and were observed foraging over the ESA. An additional 25 species were observed during the migration periods (early spring, fall), including three Species at Risk. These species did not exhibit breeding

behaviour and were observed passing through the ESA. As such, they were classified as migrants."

D. Dillon and AECOM differ as to the presence of Wood Thrush and Eastern Wood-Pewee. On p. 25 of the EIS, AECOM reports that Leonard and Associates (actually Martin and Wladarski on May 26 and June 5, see p. 16 of EIS) did not record either. Dillon recorded both including a breeding Pewee. While it is unclear where in the Medway south of Fanshawe these birds were noted by Dillon, both exist in the ESA. This raises the ongoing problem of EIS studies that fail to take into account the entire ESA and suggest that the smaller subject site is an "eco-site" independent of the larger area which can then be sliced and diced and removed from the larger area.

Appendix 1

Beacon page 61, 62
3.5.2 The Influence of Slope

As stated by Adamus (2007), vegetated buffers tend to be more effective (at least with respect to water quality) on relatively flat or mildly sloping terrain because this allows more time for surface water to move down through the roots and effectively be filtered. However, other factors, such as soil type and the structure of surface vegetation, are also recognized as important influences. Although slope has long been recognized as a factor in determination of appropriate buffer widths, relatively few studies specifically examine the influence of slope in relation to buffer effectiveness. Slope has primarily been evaluated in terms of how it alters storm water, sediment and nutrient attenuation. However, results are unclear because it is difficult to separate the influence of slope from other related factors such as the buffer's vegetative structure and the soil type. Some examples of findings and recommendations from the literature are cited below:

- Leavitt (1998) points out that steep slopes beside water features require much greater buffers because of the increased risk of landslide and cites Portland, Oregon's floodplain models that recommend 5 m buffers for streams with 20 – 40 ha drainage areas, but increase that to a 15 m buffer if the slope exceeds 25%, and 15 m buffers for streams with more than 40 ha drainage areas, increasing to a 60 m buffer if the slope exceeds 25%.
- Woodard and Rock (1995) found that buffers on slopes of up to 12% were still able to effectively attenuate sediments and phosphorus from residential storm water as long as they were vegetated with established ground covers and shrubs as well as a layer of forest litter, although in their earlier research (1991) they document these steeper slopes as needing wider buffers (i.e., closer to 23 m as opposed to 15 m) to achieve the same level of effectiveness.

- Schueler (1987) asserts that vegetative filter strips cannot function as intended with respect to sediment and nutrient attenuation if they are on slopes of more than 15% and function best on slopes of 5%.
- Wenger (1999) acknowledges slope is a key factor in the ability of a given buffer to attenuate nutrients and sediments, and suggests that 2 feet (0.61 m) be added for every 1% increase in slope to the "base" buffer width.
- Norman (1998) in his review concludes that filter strip performance is best at 5% or less, and hardly effective at attenuating runoff on slopes of more than 15%.
- Philips (1989) also emphasizes the importance of slope and points out that on slopes greater than 5% sheet flow starts to become channelized.
- In their review of riparian buffers, Castelle and Johnson (2000) cite research that recommends an additional 0.6 m for each 1% slope to a maximum of 50 m for 70% slopes (Haussman and Pruett 1978) and 6 m of each 5% slope increase (Clark 1977) beside watercourses. In an earlier review of wetland buffers, Castelle *et al.* (1992) conclude that buffers with dense vegetative cover on slopes less than 15% are most effective for water quality functions.
- Hook (2003) in his comparison of sediment attenuation for grassed buffer types between 1 and 6 m at 0 to 20% slope found that as long as buffers were at least 6 m wide there was no appreciable different in sediment attenuation irrespective of slope. Buffers of 1 or 2 m did have somewhat lower attenuation as slope increased (from 96% to 91%).
- Rules of thumb for adjusting buffer widths in relation to slope from a range of technical and policy sources in North America are synthesized by Adamus (2007), and summarized below, although none have been derived from empirical studies:
- Increases in 0.3 m to 0.9 m (1 to 3 ft) for every degree increase in slope;
- Increase in 3 m (10 ft) for every degree increase in slope;
- Increases in 0.6 to 1.5 m (2 to 5 ft) for every percent increase in slope; and
- 50% increase in the recommended buffer for slopes greater than 30%.

Generally, although buffer effectiveness in attenuating sediments, nutrients and other substances is considered reduced on steeper slopes, it is also recognized that this loss in effectiveness can be compensated for to some extent by increasing buffer width, and possibly by introducing more vegetative structure to the buffer (e.g., fallen logs) that slows the flows of water. For example, Broderson (1973, as cited in Sheldon *et al.* 2005), found that adequately sized buffers (in this case, 61 m) were able to effectively control sediment in entering Washington wetlands even on steep slopes.