R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
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February 24, 2021

Via: Email (cstredwick@southgate.ca)

Mr. Clint Stredwick
Municipal Planner
Township of Southgate
185667 Grey County Road 9
Dundalk ON N0C 1B0

Dear Clint:

Re: Township of Southgate
Wilders Lake Subdivision
File No.: CI-2020
Project No.: 300051718.0000

We have reviewed the third submission response for the Wilders Lake Subdivision located at 263512 Southgate Road 26. Our comments have been provided in tabular format on the enclosed Project Comment Form.

The following documents were included in the submission:

- 201216 Wilders Lake Comment Form – Sub 2 GMP Response Feb 7 2021, prepared by GM Blue Plan, dated February 2, 2021.

We recommend that Comment 32 is addressed prior to draft plan approval. The remaining comments in the enclosed Project Comment Form can be deferred to the detailed design submission.

We trust the attached comments will be of assistance. Should you have any questions, please call our office.

Yours truly,

R.J. Burnside & Associates Limited

Paul Hausler
Senior Project Manager
PH:sd

Enclosure(s) Project Comment Form

cc: Jim Ellis, Township of Southgate (enc.), Via: Email (jellis@southgate.ca)
Randy Scherzer, Grey County (enc.), Via: Email (randy.scherzer@grey.ca)
Dave Hopkins, R.J. Burnside & Associates Limited (enc.), Via: Email (Dave.Hopkins@rjburnisde.com)
Adrian Holvik, R.J. Burnside & Associates Limited (enc), Via: Email (Adrian.Holvik@rjburnisde.com)
Rachel Walton, R.J. Burnside & Associates Limited (enc), Via: Email (Rachel.Walton@rjburnside.com)

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Project Comment Form – Internal Review Comments

Project Name:	263512 Southgate Road 26, Southgate Proposed Wilders Lake Subdivision		
Project File Number (Municipal):	C1-2020	**Project File Number (Burnside):**	300051718.0000
Reviewer:	R.J. Burnside (P. Hausler, D. Hopkins, A. Holvik, R. Walton)	**Date of current comments:**	February 23, 2021

Most Current Document Reviewed		
Title	**Author**	**Report or Drawing Date (latest revision)**
Civil Drawings	GM BluePlan Engineering Ltd	Sealed November 10, 2020
Stormwater Management Report	GM BluePlan Engineering Ltd	November 2020
Hydrogeological Report and Site Servicing Study	GM BluePlan Engineering Ltd.	October 5, 2020

Comments:

	1st Submission (July 2020)	Developer's Response	2nd Submission (December 2020)	Developer's Response (February 2021)	3rd Submission	Developer's Response
	STORMWATER MANAGEMENT REPORT COMMENTS					
1.	The calculations used to determine the runoff coefficients and the initial abstractions values used in both the existing and proposed MIDUSS model found in Appendix A and B should be provided.	The justification for using the SCS value of 74 is noted in Section 4.2 of the SWM Report.	Satisfactory.			-
2.	The stage storage discharge table input into the MIDUSS model for Pond 31 does not match the stage storage discharge table provided in Appendix C. This inconsistency should be reviewed and resolved	The correct stage-storage-discharge table has been provided that matches the SWM Report models and Plans. An older version had been included.	Satisfactory.			-
3.	Consideration could be given to upgrading the side yard swales to enhanced grass swales on Lots 5, 6, 7, 8, 9, 10, 11 and 12 where the runoff is to discharge to Wilders Lake with no quality control. We recognize that this runoff is generally clean; however, there are significant public concerns regarding the water quality of Wilders Lake. This will help to provide additional quality control and address the local concerns regarding the water quality of Wilders Lake.	Given the permeability of the soils, the low imperviousness of the proposed lots and the fact that runoff draining to the side yard swales is considered clean runoff, no change has been made to the side yard swales.	Acknowledged.			-
4.	The floodplain extents of Camp Creek tributary and Wilders Lake should be delineated to show that the proposed development structures are not within the floodplain. Please show that the water surface elevations in Camp Creek are not increased in the proposed condition. Although the overall runoff during the 2 to 100-year storms is attenuated in the proposed condition, the Regional Storm runoff directed towards Camp Creek is increased in the proposed condition. The runoff from	A section specific to Safe Access and Camp Creek Floodline Elevations has been added to the SWM Report. Even during a Regional Storm event, the recently installed 900 mm culvert is expected to be sufficient to convey flows during major storm events and flow is not expected to breach over the roadway. The roadway is at elevation 423. 65 m. All proposed works are above this elevation.	We defer further comments in regard to safe access to the Conservation Authority. We also recognize that the proposed grading of the building envelopes is approximately at minimum 3.5 m above the existing water elevation of Wilders Lake. From the watershed creator in the Ontario Flow Assessment Tool, Wilders Lake has an approximate upstream drainage	Acknowledged. Our understanding is the SVCA has no issues with these issues raised.	Satisfactory.	-

Comments:						
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	Catchments 500, 201 and 600 is proposed to discharge to the existing pond in Block 32 which outlets into the existing pond across the road. In the existing condition the runoff from Catchments 500, 201 and 600 flows overland to the west and then to the Camp Creek tributary. It must be shown that discharging all this flow in one location will not increase the water levels in Camp Creek downstream of the existing pond adjacent to Lot 2. In addition, it should be shown that the increase in the road profile at the Camp Creek road crossing, with the two existing 900 mm diameter culverts will not increase the headwater elevations compared to the existing condition. This comment could be accomplished with a HEC RAS model of camp Creek comparing the existing and proposed conditions of Camp Creek.		area of 393 ha. In light of the height of the proposed building envelopes above the Lake and the Conservation Authority acceptance of the access road we defer comment regarding flood elevations relative to building elevations to Conservation Authority review.			
5.	The modelling of the enhanced grass swale should encompass the entire drainage area draining to the enhanced grass swale. For example, the total drainage area of catchment 500 is 1.69 ha, as shown on Figure 3. The modelling of the east and the west drainage areas only adds up to 1.52 ha.	The EGS design catchment areas are shown on Figure 4.	Satisfactory. Figure 4 provides more clarity regarding the drainage areas for each EGS.			
6.	In locations where the enhanced grass swale exceeds a longitudinal slope of 3%, rock check dams should be added to increase the runoff residence time and reduce potential erosion.	Rock check dams have been added to the design where slopes exceed 3%.	Satisfactory.			
7.	The modelling of the enhanced grass swale includes catchment 203. Please indicate where catchment 203 is located. For clarity a catchment area map showing the delineation of the catchment areas used in the enhanced grass swale modelling should be provided.	The EGS design catchment areas are shown on Figure 4.	Satisfactory. Figure 4 provides more clarity regarding the drainage areas for each EGS.			
8.	Provide the MIDUSS modelling referenced in Appendix F, used to size the driveway culverts.	A culvert sizing design sheet was completed and is provided in the revised SWM Report. The drainage areas are shown on Figure 4.	The culverts servicing lots 14-20 and 11-13 are over 96% full. As manning's calculation does not account for any entrance or exit losses in the culvert, consideration should be given to increase the diameters of these culverts to provide additional capacity and compensate for losses. We recommend a minimum factor of safety of 10% be used for the culvert sizing.	The culvert sizing calculations are very conservative as they do not include for infiltration in the ditches, which is expected to be significant. However, to satisfy this concern, the culverts will be increased in size with the bottom of the culvert buried so as to not lose elevation, as some of the culverts have minimal cover. This results in the ditch elevations remaining unchanged.	Acknowledged, this is to be shown on the detailed design plans.	

Comments:						
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9.	The 5-year storm sewer design sheet should be updated so that the storm sewer slope is consistent with the drawings and the 100-year design storm sheet.	The correct SSDS has been included.	Satisfactory.			
10.	Provide sizing calculations for all culverts inletting to the stormwater management ponds.	See the culvert sizing design sheet and Figure 4.	Satisfactory.			
11.	Cross sections of all overland flow channels should be provided.	Cross-sections of the SWM Ponds are provided in the revised drawings set.	Satisfactory.			
12.	Erosion protection should be provided at all cross culvert outlets and where the channels outlet into the SWM ponds.	Rip rap has been added at the road crossing culverts and at overflow spillways and pipe outlets from the SWM Ponds.	Satisfactory.			
13.	The use of Low Impact Development (LID) options are considered which is a good approach to stormwater management from both an environmental and cost perspective. The hydrogeology report notes coarse grained materials allowing for high infiltration rates generally supporting LID SWM practices. At the feasibility stage a hydrogeological review of the current SWM plan is recommended to specifically comment on the risk of adverse impacts to wells from road de-icing salt use.	Section 9.3 of the Site Servicing Study (Hydrogeological Report) addresses the potential for impacts from road de-icing. In summary, no impacts are expected due to the hydrogeological setting.	Satisfactory.			
14.	Additional information/comments regarding fisheries and ecology from approval agencies such as the Saugeen Valley Conservation Authority (SVCA) and Department of Fisheries and Oceans (DFO) as applicable should also be provided as the feasibility of the design will be contingent on their comments, as the SWM design relies on enhancements to existing water features. Approval Agency comments may place constraints on these water features. Treatment levels for water quality for discharging runoff to natural watercourses or lakes will need to be confirmed.	August 3, 2020 comments from staff of the SVCA identified no need for DFO staff to be circulated application materials at this time. SVCA staff did request to review any mitigation/monitoring requirements related to the on-site fisheries that may be required by the project biologist (SAAR). In this regard, please note the following recommended monitoring program which can form a condition of draft approval. Fish habitat monitoring: Annual thermal regime monitoring of the pond system at inflow and outflow locations. Annual temperature monitoring to occur twice a year at mid-summer and fall. TSS to be monitored at the same locations and prior to outfall to Wilder Lake during periods of construction. Annual monitoring of Phosphorus and Nitrogen of pond system (inflow and	Acknowledged.			

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		outflow locations) and at Wilder Lake at mid-summer and fall.				
	DRAWINGS					
15.	Provide cross sections of the proposed SWM ponds showing the inlets, outlets and the 5-year, 100-year and Regional Storm High Water Line (HWL). Indicate the inlet elevation of the orifice plates on the cross-section drawings.	Cross-sections have been provided on the revised drawings with the 5 and 100 year water levels as well as the Regional water level shown.	No further comment.			
16.	Drawing No. 5 - Will the culverts and ditches that outlet to the SWM ponds in blocks 30 and 31 combine into an overland flow channel that will inlet into the SWM pond? If so, please provide hydraulic calculations for the overland flow channel to show that it has capacity to convey the flows from the culvert and ditches to the pond.	The culverts and ditches combine at the inlet to the SWM Pond which has sufficient slope and width to inlet the flow.	Hydraulic calculations should be provided to support the capacity of the pond inlet swales.	Additional calculations will be provided as part of the resubmission for Detailed Design approval.	Acknowledged, to be provided during the detailed design.	
17.	All stormwater management ponds should be designed to have a minimum 0.3 m freeboard from the Regional Storm HWL to the top of the pond berm.	The SWM Ponds have been conservatively designed as no infiltration is considered within the pond. From the pond, all runoff will spill to an appropriate outlet. Regardless, top of bank elevations were raised along the sides adjacent to residential lands.	Satisfactory.			
18.	Erosion protection on all SWM pond overflow weirs should be provided. This could be shown on Drawing No. 5.	Rip rap has been provided for the outlet from the Block 30 and 31 SWM Ponds. The overflow from Block 32 is via an established wooded area, no changes are proposed.	Satisfactory.			
19.	Drawing No. 15 - Provide a typical cross section of the proposed enhanced grass swale with all dimensions labeled.	A detail has been provided on Drawing 16.	Satisfactory.			
20.	The inlet and outlet inverts, length, slope and material on all culverts should be labeled on Drawings 8-15.	As discussed, since the final driveway locations may change, the culvert detail is not necessary. The typical culvert size, type and minimum cover is provided on the typical cross-section on Drawing 16. The culverts size for each driveway culvert has been shown on the Plan and Profile drawings.	Satisfactory.			
21.	Driveway culverts should be shown in profile view on Drawings 8-15.	Same as response for Comment 20.	Satisfactory.			

Comments:						
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22.	A double catchbasin at all locations where the catchbasin is in a sag point should be specified.	A birdcage grate has been proposed for each CB in a low area and was confirmed with Jim Ellis as acceptable.	Satisfactory.			
23.	The proposed storm sewer system should be shown in profile view on Drawing 9.	The crossing storm sewer has been added.	Satisfactory.			
24.	If the existing walking trail to the dock is to be maintained in the proposed condition, we suggest it may be advantageous to include the walkway within the SWM pond block for future maintenance purposes.	As easement is proposed across the north portion of Lot 6. This will allow for drainage from the SWM Pond to spill to Wilder Lake and for Township access to the low side of the SWM Pond for maintenance purposes.	Satisfactory.			
25.	A detail of the proposed side yard swale indicating the minimum depth of the swale should be provided. Per the Township of Southgate standards, the minimum depth of a yard swale is to be 0.15 m.	The minimum depth of side yard swales has been added to each of the Typical Lot Grading Details on Drawing 16.	Satisfactory.			
26.	Elevations at all lot corners should be provided on Drawings 3 and 4. If the lot corner is to remain undisturbed, please label the elevation where the proposed grading is to match into the existing ground.	Elevations have been added to all lot corners.	Satisfactory.			
27.	The surface water drainage arrows on lots 1, 8, 9 and 10 should be shown on Drawings 3 and 4.	Additional drainage arrows have been added to Drawings 3 and 4.	Satisfactory.			
28.	The slope on all swales should be labeled on Drawings 3 and 4. It is recommended that any swales with a slope less than 1% have a 150 mm diameter pipe subdrain installed under the swale.	Slopes have been added for all swales. Given the perviousness of the site soils, subdrain is not considered necessary. We want to encourage infiltration and given the site soils, don't expect water to pond in the ditches.	Where swale slopes exceed 5%, consider adding erosion protection.	I think the only location where a swale exceeds 5% is the swale leading to SWM Pond Block 30. Rip rap erosion protection can be provided for this swale.	Acknowledged, to be shown on the detailed design plans.	
29.	The minimum underside of slab elevation and the (interpolated) seasonal high groundwater elevation for each lot should be labeled on Drawings 3 and 4. We acknowledge that interpolated groundwater elevations are of limited accuracy; however, they provide a useful visual when considering potential groundwater impacts to the lots. Actual borehole locations should be included on the same drawing as the interpolated values to give a sense of how far away the interpolated value is from the actual test result.	Since all ground water levels are more than 3 metres below the proposed finished grade, it is not necessary to provide a minimum underside of slab as the groundwater elevation is not a concern.	This comment was made as the underside of slab elevation and the seasonal high groundwater levels are required to demonstrate the feasibility of the proposed building envelopes. As pointed out, the groundwater levels are more than 3 metres below finished grade, which demonstrates feasibility. This comment is deferred to the individual building permit stage, where the underside of floor slab elevation and the seasonal high groundwater elevation will be required on the plans.	Acknowledged.		

Comments:						
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30.	It is our experience that the underside of the basement floor slab should be a minimum of 0.4 m above the seasonal high groundwater elevation. It would be beneficial to note this on the drawings as a requirement.	Agreed. As per comment 29, the groundwater elevation is not a concern, so no need to note it.	As per comment 29, this information is deferred to the individual building permit stage.	Acknowledged.		
31.	We recommend that all grading of the SWM ponds occur in the SWM pond block. If some of the SWM pond is located on private property, this creates future maintenance issues.	The SWM Ponds are fully located in the SWM Pond Blocks. Some minor grading may be required on adjacent properties, similar to what will occur between lots, but that is typical for a subdivision.	Acknowledged.			
32.	Maintenance access for all SWM ponds should be provided. The maintenance access should allow access for inspection of inlet/outlets and provide an area for future pond cleanout/maintenance. A full maintenance route around the entire pond perimeter may not be required as long as it can be shown and justified that the above activities can be carried out.	Maintenance access to each SWM Pond is provided. Block 30 has access via the Easement alongside it, Block 31 has access in from the road to the pond bottom which can be accessed to get to the outlet. The outlet from Block 32 can be accessed from the roadway.	The pond bottom is not a satisfactory maintenance route. What if maintenance is required when there is water in the pond? We acknowledge that space is limited between the adjacent lots; however, maintenance access is important in the event of blockage of the outlet. Please provide some form of maintenance access route that does not require driving through a potentially flooded pond to reach the outlet.	To provide access to the outlet from SWM Pond Block 31, either a 3.0 m wide easement will be provided for access across the north part of Lot 11, or Block 31 will be widened by 3.0 m.	We recommend that the pond access is determined and shown on the plans prior to draft plan approval.	
33.	Erosion protection should be provided on all pond outlets.	Rip rap has been provided at the outlet location of each SWM Pond outlet pipe. From that point, sheetflow is encouraged to the Lake, and disturbing additional vegetation is not recommended, as discussed on-site.	Satisfactory.			
34.	A removals plan to indicate which existing buildings and features are being removed should be provided.	Additional notes have been added to the General Plan indicating cabins to be removed/remain.	Please comment on the purpose of the two buildings that are to remain behind SWM Pond Block 30. Based on our site meeting, we understood that these are to be non-inhabitable spaces, please confirm. If they are to be habitable spaces it must be shown that the discharge from the SWM pond block will have a minimum clearance of 0.3 m from the Regional HWL to the minimum building opening elevation. As the Township will ultimately assume the SWM pond block, we do not want the Township liable for any damage to buildings or loss of life imposed on the buildings from the SWM Pond.	It is our understanding that the two (2) existing cottages to remain across the back of Block 30 are to be non-inhabitable. Any runoff spilling from Block 30 would drain to the north of the cottages, and we have no concern with the elevation or location of the cottages to remain. Please advise if there are still concerns regarding these cottages.	Satisfactory.	
35.	Per the Township of Southgate standards, trees	As per Township correspondence, tree	Acknowledged.			

Comments:						
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	shall be planted in front of every lot on the Municipal Right-Of-Way at a location 300 mm from the street property line. However, it is unclear if this standard applies to estate residential lots. We defer this comment to the Township for review.	planting will be included as a Draft Plan condition.				
36.	The typical ditch detail should be revised to state that 200 mm topsoil and hydroseed is to be provided as per the Township of Southgate standards.	The typical ditch detail was revised.	Satisfactory.			
37.	Is street lighting proposed? If so, show the streetlights on the "typical section thru new road" section on Drawing 15. As per the Township Standards, streetlights are to be offset 1 m from the property line.	Street lighting poles are shown on the revised plans. The streetlight design is provided on the Photometric Plan.	Please show the streetlight poles on the "typical section thru new road" section on Drawing 15. Will the proposed street lighting be in conflict with the proposed enhanced grass swale? The Photometric plan has been deferred to the Township for review.	The streetlights will be shown on a revised section as part of the Detailed Design submission.	Acknowledged, to be shown on the detailed design plans.	
38.	Silt fence should be provided along the rear of all lots backing onto Wilders Lake and shown on Drawing 7. There is significant concern regarding the health of Wilders Lake and added protection during construction will help reduce the amount of construction sediment directed towards Wilders Lake.	Silt fence has been added to Drawing 8 along the rear yards of lots along Wilder Lake.	Satisfactory.			
39.	The Township of Southgate standards require a surface inlet for at least every second unit along rear lot line swales. As these are larger estate lots, we recommend that a rear yard drainage system with inlets be considered for Lots 22, 27, 28, 29 and the Golf Club Lot. These lots drain at least half of the lot to the rear yard swale.	Given the imperviousness of the on-site soils as noted in Section 4.2 of the SWM Report additional inlets for runoff from grassed surfaces are not considered to be required.	Satisfactory.			
40.	A low flow channel from each of the SWM pond outlets to Wilders Lake should be provided to prevent water from ponding in the low-lying areas. Maintenance access to the low flow channel should be provided.	As it is proposed to maintain as much natural vegetation as possible and to encourage sheetflow, this is not recommended.	Satisfactory. We recommend that on Lot 6 the Township require an agreement to ensure that the Township is not held liable for any harm resulting from drainage (or failure of drainage) across the easement.			
41.	Hazard area setbacks should be shown on the drawings and referred to in the SWM Report for Wilder Lake and Camp Creek to delineate flooding setbacks as these setbacks impact lot layout and grading.	Hazard areas have been added on to the revised drawings. As noted earlier and discussed on-site, the floodline from Camp Creek does not impact the proposed lots or grading.	Outstanding. Hazard setbacks are not clearly identified on the plan. We note a proposed environmental protection zone is shown on the plan, but reference to Hazard setbacks are not apparent.	The Environmental Protection Zone is shown on the plan, which is expected to be the Hazard Limit and the Hazard setback. The Township should advise if any additional setbacks are to be shown.	No further comment.	

Comments:						
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42.	Drainage blocks or easements for legal outlets for stormwater should be provided. For example, SWM pond block 30 appears to drain to an existing wet area and then overland across private property. Also, a portion of a proposed culvert on Lot 2 is shown on private property.	An easement is provided for the SWM Block 30 outlet on the revised plans and for the Lot 2 culvert.	Satisfactory.			
43.	The existing and Regulatory Lake Levels for Wilder Lake were not prominently noted. The Lake Levels should be added to the drawing set.	The existing lake level is shown on all drawings.	The existing lake level has been provided, but the Regulatory Lake Level is outstanding. Refer to comment 4.	Acknowledged.		
44.	A "zoomed out" catchment map will need to be included to confirm if there are any external drainage areas to the site.	External drainage areas were considered when determining the drainage areas for the proposed development. External drainage areas do not drain into the proposed subdivision.	We acknowledge that the external areas drain primarily to Wilders Lake first before draining through the proposed development area via Camp Creek.	Acknowledged.		
45.	We recommend a construction mud mat be specified at all construction entrance and exit locations as part of the Erosion and Sediment Control Plan. The mud mat should be shown on Drawing 7. A detail of the construction mud mat should be provided. It is recommended that the mud mat is a minimum 20 m in length and 5 m in width. The pad shall be a minimum of 450 mm thick, constructed with 50 mm diameter clear stone in the first 10 m of the pad extended from the street. The remainder of the pad shall be constructed with 150 mm diameter stone	A construction mud mat is shown on the revised Sediment and Erosion Control Plan – Drawing 8.	Satisfactory.			
46.	The following notes should be added to Drawing 7: - Construction areas that exceed 30 days of inactivity shall be stabilized by seeding. This is to include stockpiles of fill and topsoil. - Contractor to maintain all roads affected by construction free of sediment by sweeping as necessary or as directed by the Contract Administrator or the Township. - Contractor to implement appropriate dust control measures to prevent excessive dust on site or migration of dust to adjacent properties.	The notes have been added to Drawing .	Satisfactory.			

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	EIS					
47.	The EIS recommended culverts for wildlife on the internal laneway in proximity to the pond chain. Please show the location of these culverts on the drawings.	A note has been indicated on the plan indicating the southerly 900 mm culvert is for the wildlife corridor.	Satisfactory.			
48.	It is recommended that once the existing cottages are removed the gaps should be planted out with species consistent with or complimentary to the existing shoreline species. Please show this planting on Drawing 6.	A note has been added to the plans for additional trees to be planted in the areas of the existing cottages.	Satisfactory.			
	HYDROGEOLOGY					
49.	Camp Creek is not shown on any of the figures or cross -sections that accompany the report. The Creek is reported to be a cold water fishery; however, there is no water level or water temperature data included in the Hydrogeological report to support this. Streambed piezometers should be installed to provide additional data on groundwater flow direction and so that the effects of the development can be assessed.	Updated groundwater contour plans have been prepared and provided in the revised report. Camp Creek is now labelled on the revised figures and cross- sections. Further, as part of the revised report, new surface water and piezometer locations were installed along Camp Creek to obtain both water quality and water level information. This new information is included in the figures Information regarding Camp Creek is provided in Section 5.2 and 5.3 of the revised Site Servicing Report.	Table 3A and Figure 8 present the water level data collected on August 8, 2020. Water levels in PZ-1S and PS-1D (found at the east end of Camp Creek) indicate a downwards gradient. However, water levels differ by more than 1m. This suggests that either there is a confining layer between the shallow and deep screens, or the piezometers need to be developed as they may be plugged with fine grained material introduced during installation. The August water levels indicate that there is no connection between the deeper groundwater and the creek at this location. Further downstream, water levels in PZ-2 are higher than at SW-2 suggesting there is an upwards gradient in the area. However, since surface water levels can fluctuate rapidly in response to precipitation events, this method is not as reliable as a nested piezometer for calculating gradients. As a result, there may be times when the groundwater gradient near PZ-2 is downwards. The rationale for which water level was used for contouring at the PZ-1 location should be provided since it will have a significant impact on where the 422.5 contour crosses the creek. Also, the current configuration of the contours (particularly the intersection with the creek and the "curve" back to the	As requested, the Hydrogeologic Report will be updated to provide soil profile and construction methods for the piezometers. In addition, further detail discussing the hydraulic contour mapping and support for conclusions will be provided. As a brief summary, we believe the contour maps provided more accurately portray the inferred groundwater flow conditions then the alternative possibility discussed in the response. Several lines of evidence support the contouring provided: 1. Piezometer location PZ-1 (with 1S and 1D) are situated in fine grained silty muck. It is common for creek beds to have areas of fine-grained deposition even within areas of coarser soils. PZ-1D is installed with a drive-point tip that is driven into the ground and PZ-1S is installed via manual excavation. We believe that PZ-1D is likely impacted by fine grained sediment, either through smearing, clogging of screen, or simply by nature of native soils adjacent to screen. We would agree that it is likely that PZ-1D has a falsely low water level reading. 2. Due to construction of the stainless-steel drive point tips, it is not likely possible to develop – or clear out the screen effectively. However, as discussed below, we don't believe this is a critical point in establishing groundwater contours or the fact that the creek is groundwater fed.	We are satisfied with the explanation that has been provided. The detailed design report is to be updated with some additional explanations.	

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			east on the north side of the creek) should be rationalized since it tends to exaggerate the influence of the creek on water levels. Burnside recommends that the details of the piezometer construction be provided and that the piezometers be developed and water levels be measured afterwards to confirm the interaction of groundwater with the creek as the groundwater flow direction in this area has implications for attenuation of phosphorous and nitrate from the septic systems on Lots 1 to 4 (see response to 60 below).	3. It is clear from on-site visual and flow (volume) based review, that the creek is influenced by groundwater. Most notably it is confirmed to be a cold-water fishery. At the location of PZ-1, cold water and upwelling conditions have been confirmed through the EIS and through site reconnaissance. Further along the creek, evidence of upwelling and "gaining" conditions are observed, with vegetation species that suggest year-round saturation and groundwater discharge locations. 4. Flow is noted in the Creek year-round, even when Lake levels are at their lowest with limited discharge to the Creek. Based on the foregoing, we will update the report to include the additional information and explanations.		
50.	The well names require some clarification. The well that provides water to the restaurant and clubhouse is referred to as 2593529 in Section 2.4 but is designated as 2513529 in later sections of the report. It appears that the well is labelled as DW-1 on the well location map. Similarly, well 7197381 is not cross referenced to the water well record in appendix B which is for Well tag A120515. There do not appear to be any well records for Well Tag A 227593 which is one of the wells tested. Also, the location of the well is not shown on any of the figures (is this DW-2 on Figure A?).	Well labels were added to the tables for clarification. Typographical error associated with Well 2513529 was corrected in Section 2.4.	Satisfactory.			
51.	Section 6.1.1 indicates that pumping tests were completed on 2513529, A227593 and 7197381. However, Section 6.2.4 mentions drawdown in well A227596. This well is not mentioned anywhere else in the report.	The typographical error associated with A227593 was fixed in Section 6.2.4.	Satisfactory.			
52.	Section 6.2.4 indicates that the domestic wells had between 0.7 and 2.8m of available drawdown. Additional detail is needed on how the available drawdown was calculated. Section 6.3 indicates that the drawdown from an individual well could be as much as 0.30 m at a 25 m distance from the well. The report indicates that this is insignificant; however, it is not clear how this impacts the available drawdown. Well tag A019451 is for deepening of an existing 6 inch well from 82 to 135 feet (25 to 41 m) below grade. This suggests that wells will have to be	The revised Site Servicing report clarifies the pumping test terminology in Section 6.2.4 and the supporting discussion and tables have been updated with additional information to provide improved clarity. The available drawdown is approximately 15 m in all three wells and significant potential yield is available at the site.	Satisfactory.			

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	installed in the deeper overburden.					
53.	Annual infiltration at the site is estimated to be 489 mm per year which is very high and the predominant soils at the site are coarse grained. Please confirm that the 9 m discharge distance from the wells was sufficient to eliminate recharge to the aquifer during the pumping tests.	The 9 m separation distance of the pump discharge is considered to be sufficient since the pumping tests were completed during winter with frozen ground which limits the chance of infiltration. Further, the discharge was placed down slope from the pumping wells, with overland flow away from the wells. Given the depth of the aquifer system and these conditions, artificial recharge is not expected (Section 6.1.1).	Satisfactory.			
54.	Flows used in the D-5-4 calculation are 1000L/day per lot, yet section 7.2 suggests that typical houses in the development will have between 4 and 7 bedrooms with design sewage flows as per table 8.7.4.1 of the OBC. For a 7 - bedroom house flows would be 3500L/day. How will this impact the D-5-4 calculations?	Section 7.1 and 7.2 provide additional detail regarding both procedures' and their respective assumptions and use. Essentially, for the evaluation of impacts, the "average" flow from a residential lot is considered. For the purposes of a sewage system design under the OBC, the "peak" flow expected is utilized.	Satisfactory.			
55.	Background nitrate concentrations are 0.53mg/L in the shallow groundwater in wells on the development site. Given that there are few anthropogenic sources of nitrate nearby what is the source of the nitrate and how does it relate to the groundwater flow directions? Nitrate in bedrock wells ranged from 0.38 to 1.50 mg/L. The proponent should indicate if this is an aquifer issue or related to poor well construction. It appears that low concentrations of nitrate are quite common in both the overburden and bedrock aquifers. The source of the nitrate should be identified as it appears that there are limited sources of nitrate in the immediate vicinity of the site other than the golf course and a few residences.	Discussion regarding the background conditions have been added to Section 9.1 (Groundwater Impact Assessment). The relatively low background levels of nitrogen and other constituents are considered to show only minor influence from anthropogenic sources (i.e., human activity). Generally, nitrogen inputs to the shallow overburden groundwater system may include fertilizers, sewage, animals and other agricultural use, and decaying plant debris. Low background levels of nitrogen in the bedrock system may relate to inputs from the larger surrounding agricultural area. The measured concentrations are considered to be relatively low and do not influence the assessment of the site ability to attenuate the proposed sewage system use.	Satisfactory.			
56.	What is the current nitrate/phosphorous concentration in Wilder lake and Camp Creek? Since groundwater is indicated to discharge to Camp Creek there is potential for nitrate and phosphorous loadings to increase.	New surface water and piezometer sampling was completed along Camp Creek, with water chemistry analytical results included in table format and discussed in section 5.2.4 Phosphorus concentrations in Wilder Lake since	The comments on surface water quality have been adequately addressed.			

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		2012 from were included and discussed in Section 5.2.4. Based on the analyses, it is expected that there will be no impacts from the proposed development to surface water resources (i.e., that the phosphorous will be attenuated in Camp Creek).				
57.	What are the predicted phosphorous concentrations that will be added to Wilder Lake/Camp Creek by the development? The report indicates there will be no impacts; however, this needs to be quantified.	A new section with calculations and discussion of phosphorus impact on surface water has been added in Section 9.2. Although it is reasonable to expect attenuation of phosphorous based on site conditions, a more quantitative approach is also provided. From these analyses, it is reasonable to expect that the phosphorous will be attenuated.	Burnside concurs with the Robertson approach; however, support needs to be provided for the initial phosphorous concentration of 1.0 mg/L. The MECP suggests influent concentrations of 6 to 12 mg/L. Robertson suggests effluent assimilation rates of between 10 and 15% and that immobilization rates can vary from 23 to 91%, depending on type of soils (Calcareous soils, 23%, non-calcareous 90%, median 55%). GM Blueplan indicates the soils at the site are calcareous which suggest that the P immobilization rate would be unlikely to be higher than 55%. A more rigorous approach should be provided to support the use of a 1 mg/L phosphorous concentration. The dilution calculation should be completed for each lot assuming the 30 m setback from Camp Creek as discussed in Section 9.2. Dilution should only consider the area between the bed and the creek. Since the groundwater flow contours may need to be revised, an alternate approach might be to use measured base flow in Camp Creek to calculate dilution.	The surface water dilution approach was not originally included since it was apparent from a practical perspective that the flow/dilution model would show that no impacts were present. In essence, the relatively low concentration in groundwater, and relatively low volume of groundwater contribution from the adjacent lots would not realistically cause impact. Anecdotally, the conversion of a golf-course (or similarly agricultural lands) to residential property use would not typically cause an increase in phosphorous (P) loading or decrease in water quality. As discussed, the report focused on the fate of phosphorous (P) in the groundwater only. Since we believe that the P in groundwater will be sufficiently attenuated to protect groundwater, supplemental attenuation calculations for surface water were not completed. To address the Burnside comments, we have also included for the dilution of the P due to dilution in the Creek itself. To complete these calculations, the approximate base flow in the Creek was estimated by using the measured elevation of water in the culvert on January 11, 2021 and culvert measurements with Manning's equation for flow in a partially full pipe flow. It is noted that at that time, there had been limited to no precipitation in the previous week and no recent significant melt events. The depth of flow in the 900 mm CSP culvert was 12.5 cm deep. The culvert has a fall of roughly 0.2 m over 18 m, for a slope of 1.1%. The resultant flow is calculated to be 0.043 m3/s. The P attenuation calculations have been updated to include the use of initial concentration of P in sewage of 15 mg/L. To calculate the P attenuation that would	We are satisfied with the revised approach to P attenuation. The comments reference a table of dilution calculations that was to be enclosed with the letter. We did not see this, but it can be included in the revised hydrogeology report during detailed design.	

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				be observed in the Creek under the "worst" case scenario, the dilution of P with precipitation is accounted for in the adjacent four lots (i.e., Lots 1 to 4). It is then assumed that all of this P will enter the Creek and be diluted by the baseflow. The background concentration of P in camp creek was also considered and was measured to be 0.007 mg/L as part of surface water monitoring in the creek. The mass of P in the creek volume was added to the dilution calculation. A table that shows a summary of the calculations is enclosed with this letter. Based on these analyses, the resultant "worst" case concentration in Camp Creek would be 0.0228 mg/L. This is below the PWQO for flowing water, which is 0.03 mg/L (30 ug/L). Most importantly, it should be noted that this is a very conservative, or "worst case" estimate since it doesn't account for any attenuation of P, beyond dilution and assumes a constant, relatively high concentration of P in the sewage effluent. More recent studies, as referenced in our Hydrogeologicaly Report, have shown that at least some level of attenuation can be expected and that source concentrations can be expected to be lower. Based on the use of dilution approach and an initial concentration of 15 mg/L of P in sewage, no impacts to Camp Creek will be realized.		
58.	It is estimated that the development will result in 30% impervious areas. How will this impact the dilution calculations for the septic effluent? Also please confirm that this will this have an impact on groundwater discharge to Camp Creek.	Discussion has been added to section 7.1 of the revised report. It is important to note that the dilution calculation assumes 40% runoff. Essentially, run-off is included in our calculations. This is conservative since the Stormwater Management is infiltration-based up to the 100 year storm. Consequently, most of the runoff from impervious areas will be infiltrated, meaning no impact to dilution calculations or groundwater discharge to Camp Creek. Using the infiltration components of stormwater, the nitrate concentrations would be even lower.	Satisfactory.			

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59.	Section 9.2 indicates that the 4 lots directly adjacent to Camp Creek will not impact water quality. The actual concentrations of nitrate and phosphorous should be calculated based on dilution between the septic bed and the Creek and confirmation should be provided as to the Water quality Guidelines that are applicable. The local conservation authority should be contacted to see if they have any specific requirements for nitrate and phosphorous loadings to surface water. The impact from Lot 2 is a concern as it appears that the creek bisects the lot which limits dilution potential.	A new section with calculations and discussion of phosphorus impact on surface water has been provided as Section 9.2. Based on the analyses, it is expected that there will be no impacts from the proposed development to surface water resources (i.e., that the phosphorous will be attenuated in Camp Creek).	As Indicated above, a more rigorous approach to calculating the P loading to Camp Creek from Lots 1 to 4 is needed.	See response to Comment 57.	See response to Comment 57.	
60.	Figure A provides groundwater levels and interpreted groundwater contours for the wells on site for data collected in November 2019. Three of the wells were dry. Given the lack of water level data it is not clear how the groundwater contours were developed. If only the three wells with water are used, the flow direction would be more southerly. The three ponds to the northwest do not appear to be strongly connected to the water table. Given the coarse- grained material described in the borehole logs it seems unlikely that Wilder Lake would be creating a localized groundwater mound unless it is underlain by fine grained material. Additional information on the depth of Wilder Lake and its influence on groundwater flow should be provided. This may require the addition of deeper monitors near MW5 and MW6 to confirm the deeper overburden conditions and construct wells (at MW6) that intersect the water table. Also, it appears that the shallow geology at the site is quite variable and that flow paths in the shallow overburden are not fully delineated. Additional interpretation is required to explain why the sand and gravel is saturated in some areas and not others.	Further to our discussion and follow-up from the initial review, additional certainty regarding groundwater flow has been provided through the installation of piezometers and surface water elevation stations. In combination with the site setting that confirms the occurrence of sand and gravel through the shallow overburden and more regular water levels, it is clear that the where the water levels have been measured below the bottom of the well, the overall water table is consistent and away from Wilder Lake. Discussion, figures and tables have been updated to provide additional information; in particular in Sections 5.2 and 5.3.	The water level in PZ-1D is about 1 m lower than the level in the shallow piezometer which suggests the presence of a confining layer or that the piezometer screen is plugged. The use of the water level data from the deeper piezometer could significantly change the groundwater contours. The level in PZ-1D is similar to that seen in MW-5 so it is conceivable that both the 422.5 and 422.0 contours remain parallel with the shore of Wilder Lake and the 421.5 contour is closer to PZ-1D. However, this creates problems with how to deal with water levels at PZ-2 (based on depth of installation is PZ-2 considered shallow or deep when compared to the PZ-1 nest?). If PZ-1D is found to be functioning correctly, how will the potential changes to the groundwater contours impact the assessment of nitrate and phosphorous impacts from Lots 1 to 4 on Camp Creek?	See response to Comment 49.	See response to Comment 49.	
	GENERAL					
61.	It is noted that Traffic Impact Study has not been included in the submission. This is noted to ensure there are no issues or concerns in this regard on the part of the Township or County	July 27, 2020 comments from Township planner, confirmed that the Township Public Works department has reviewed the proposal and does not believe that a Traffic Impact study is warranted for this scale of development and location.	Acknowledged.			

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62.	A Street lighting design is not provided with this submission. Please confirm if street lighting will be considered and how much lighting is expected such as throughout the entire subdivision or at intersections only and what level of lighting is proposed (i.e.,: Dark Sky Lighting).	July 27, 2020 comments from the Township planner note Kelvin Dark Sky compliant street lighting as a requirement of the subdivision which will form a draft plan condition and included in the subdivision agreement. September 2, 2020 comments from the Township Public Works department confirmed acceptance of the site photometrics submitted to the Township.	Acknowledged.			