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October 31, 2018 File No. 115157

Ministry of Natural Resources and Forestry, Guelph District
1 Stone Road West
Guelph ON
N1G 4Y2

Attn: **Ms. Tara KcKenna**
District Planner

Ref: **Town of Erin, Urban Centre Wastewater Servicing Class EA**
ESR Review Comments

Thank you for your June 12, 2018 comments on the Environmental Study Report (ESR) for Urban Centre Wastewater Servicing Class EA in the Town of Erin. In response to your comments we attach our sub-consultant's comprehensive responses.

If you have any questions or additional comments, please do not hesitate to contact us.

Yours truly,

AINLEY & ASSOCIATES LIMITED

J. A. Mullan, P.Eng.
President & CEO

S:\115157 Erin\4 Environmental Assessment (EA)\17 Part II Orders and Statutory Responses\Outstanding Agency Comments on ESR\115157 Erin Class EA - Response to MNRF (Oct 31 2018).docx

cc. B. Slattery, EA/Planning Coordinator, MECP (via e-mail)
J. Dougherty & L. Marray, CVC (via e-mail)
R. Neubrand, MECP (via e-mail)
S. Khan, MECP (via e-mail)
P. Ziegler, Triton Engineering (via e-mail)

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October 31, 2018 HESL Job #: J160005

Tara McKenna
Ministry of Natural Resources and Forestry, Guelph District
1 Stone Road West
Guelph, ON N1G 4Y2

Dear Ms. McKenna:

Re: Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment – Environmental Study Report – Town of Erin, County of Wellington – Response to MNRF Comments dated June 12, 2018.

The Ministry of Natural Resources and Forestry (MNRF) provided comments on *Town of Erin EA Natural Environment Report* (Hutchinson Environmental Sciences Limited (HESL) 2017[1]), *Technical Memorandum Wastewater Treatment Plant Site Selection* (Ainley Group 2017[2]), *Technical Memorandum Effluent Outfall Site Selection* (Ainley Group 2017[3]), *and Pumping Stations and Forcemains Technical Memorandum* (Ainley Group 2017[4]) on March 16, 2018. Responses to the comments were provided on April 10, 2018 and issues were discussed at a meeting on May 3, 2018. Additional comments on the Environmental Study Report (ESR) were provided by MNRF on June 12, 2018 (appended). Our project team responses to these comments can be found on the following pages in *italics*.

If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,
Per. Hutchinson Environmental Sciences Ltd.

Brent Parsons, M.Sc.
brent.parsons@environmentalsciences.ca

Deborah Sinclair, M.A.Sc.
deborah.sinclair@environmentalsciences.ca

[1] *Hutchinson Environmental Sciences Ltd. 2017. Town of Erin EA Natural Environment Report. Prepared for the Ainley Group.*

[2] *Ainley Group. 2017. Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment Technical Memorandum Wastewater Treatment Plant Site Selection Draft. Prepared for the Town of Erin.*

[3] *Ainley Group. 2017. Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment Technical Memorandum Treated Effluent Outfall Site Selection Draft. Prepared for the Town of Erin.*

[4] *Ainley Group. 2017. Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment Technical Memorandum Treated Effluent Outfall Site Selection Draft. Prepared for the Town of Erin.*

Location of WWTP Alternatives

Comment #1:

- The treatment plant alternatives are limited to three sites located at the same intersection – 10th Line and Regional Road 52. MNRF maintains the recommendation that alternatives at different intersections across the subwatershed, with different aquatic sensitivities, be explored within the Town of Erin.

Response: The Servicing and Settlement Master Plan (SSMP) established the preferred general alternative solution for the site of the outfall to the West Credit River and for the WWTP site. The Phase 3 and Phase 4 Class EA process refines this general alternative into a recommended design alternative.

Throughout the SSMP, considerable efforts were expended to identify the preferred location for an outfall to the West Credit River. After the preferred general location was identified, considerable efforts were expended over a number of years to establish water quality and flow information for the river within this area in consultation with CVC. As a result of these efforts, the SSMP established the area between 10th Line and Winston Churchill Boulevard along the West Credit River as the recommended general alternative solution for the outfall to the West Credit River. The SSMP included comprehensive consultations with the public and agencies including MNRF and was approved by the MOECC and CVC. The Terms of Reference for Phase 3 and Phase 4 of the Class EA process were therefore, rightfully based on this recommended general alternative.

The selection of the preferred outfall site considered the entire area identified within the SSMP general alternative solution. The evaluation work is detailed in Appendix P of the ESR. Potential areas/sites along the river were considered and 3 potential sites identified for more detailed evaluation. In establishing these 3 sites, specific areas along river were eliminated primarily due to property, access and environmental impact considerations. The project team is confident that the most appropriate sites for the outfall were identified within the study area and the recommended site was identified after a comprehensive evaluation completed during the SSMP and the ESR processes. The project team believes that the selected outfall site minimises the potential for environmental impact within the study area.

It is also noted that subsequent to the SSMP, during Phase 3 and Phase 4 of the Class EA, additional consideration was given to a two plant solution with one plant discharging to the West Credit River in Hillsburgh and one plant discharging to the West Credit River South of Erin Village. In addition, further consideration was given to subsurface disposal alternatives throughout the study area. Both of these studies confirmed the validity of the general alternative solution established during the SSMP.

The SSMP established the area between Main Street in Erin Village and Winston Churchill Boulevard along County Road 52 as the recommended general alternative solution for the WWTP site. The SSMP was approved by the MOECC and CVC and the Terms of Reference for Phase 3 and Phase 4 of the Class EA process were based on this recommended general alternative. The selection of the preferred treatment plant site considered this entire area. The evaluation work is detailed in Appendix Q of the ESR. Potential areas/sites were considered and 4 potential sites identified for more detailed evaluation. In establishing these 4 sites, specific areas along County Road 52 were eliminated, primarily due to potential impact on existing subdivisions and residences. The project team is confident that the most appropriate sites for the WWTP were identified within the study area and the recommended site(s) were identified after a

comprehensive evaluation completed during the SSMP and the ESR processes. The project team has provided evidence in the ESR demonstrating that the selected WWTP site(s) minimise the potential for environmental impact within the study area.

Aggregate Resources

Comment #2:

- As discussed at the meeting, MNRF notes that two of the proposed WWTP locations (2A and 2B, both south of Wellington Road 52) appear to be within a proposed *Aggregate Resources Act* (ARA) licence area. In addition, the proponent for the ARA licence has already registered their proposal activities related to Barn Swallow, Bobolink and Eastern Meadowlark under the *Endangered Species Act* (ESA). It is unclear to MNRF staff how these two locations proposed for the WWTP are compatible with the proposed ARA licence, and how the commitments made under the ESA registrations for Barn Swallow, Bobolink and Eastern Meadowlark would be impacted.

Response: Barn Swallow, Bobolink and Eastern Meadowlark were observed on the Site during field investigations. To address Eastern Meadowlark and Bobolink habitat, a proposed Bobolink and Eastern Meadowlark Habitat Management Plan was prepared and accepted by MNRF in October 2016. Grassland habitat will be created and managed within the rehabilitated portion of the existing pit for Bobolink and Eastern Meadowlark. To address Barn Swallow habitat, kiosks were constructed as replacement habitat on the rehabilitated lands of the existing pit on Concession 10.

The proposed WWTP would only be constructed on sites 2A or 2B once aggregate extraction is complete. If either site is ultimately selected, impacts associated with the development on SAR habitat, including any rehabilitated lands, will have to be assessed during detailed design according to what exists on site at that time and what was committed through the ARA Licence. The assessment will require consultation with MNRF and adherence to relevant ESA policies, including habitat provisions in place at that time as well as ARA Licence conditions.

Species at Risk

Comment #3:

- It is MNRF's understanding that little or no tree removal will occur for this project. If significant tree removal is required for this project, MNRF recommends conducting acoustic surveys to determine SAR Bat Habitat Suitability. For additional SAR survey information, please contact ESAGUELPH@ontario.ca for more information. Please note: the timing window for tree removal is from April 1st to September 30th.

Response: MNRF's recommendation has been noted and will be implemented as the project moves forward into detailed design.

Licence to Collect Fish

Comment #4:

- This project may require a licence to collect fish if any work conducted will require dewatering of the watercourse and fish removal. Please contact MNRF for details.

Response: MNRF's recommendation has been noted and will be implemented as the project moves forward into detailed design.

Crown Land Easement

Comment #5:

- MNRF staff note that this project may require a crown land easement for the effluent outfall. Please contact Jennifer Harvard, Lands and Waters Technical Specialist at 519-826-4933 for more information

Response: MNRF's recommendation has been noted and will be considered as the project moves forward into detailed design.

Assimilative Capacity Study

Comment #6:

- The 7Q20 low flow statistic has been applied; it is understood that this is a standard (conservative) approach for receiving water assessments. In this circumstance, data for 10th Line has been used (data from July 2013 to December 2015). It is noted by the consultant that 10 years of flow management data is ideal. It may be appropriate for the proponent to compare local weather data during the time period when flow data was obtained (for the purpose of determining if any anomalies are present in the data).

Response: Credit Valley Conservation (CVC) calculated a 7Q20 value for 10th Line by developing a transposition factor between the 8th Line and 10th Line flow measurements and applying that factor to the 7Q20 value calculated for 8th Line (see Appendix B of ACS). The 7Q20 value of 0.123 m^3/s for 8th Line was determined using the lowest 7-day mean flows from 1984 – 2015 (20 years of data). The mean daily flows at 8th Line were paired with corresponding flows for 10th Line for the period of July 2013 to November 2015. The series were sorted by the ratio of 10th Line flows to 8th Line flows in ascending order; removing outliers (values that were outside the mean ± 2 standard deviations). A regression analysis was used to explore the relationship between the two stations, and the quality of the regression equations were examined using standard deviation of the criterion variable and standard error of estimate, coefficient of determination, and F-test. The regression was deemed to be significant, at a level of p< 0.05.

Given that 20 years of data was used to calculate a 7Q20 flow for 8th Line, the data was sorted and outliers removed, and statistical analysis of the relationship between the 8th Line and 10th Line was determined to be statistically significant; comparison of local weather data during the 20 year time period when flow data was obtained, is not necessary to determine if any anomalies are present in the data.

Comment #7:

- Primary concern with the QUAL2K and CORMIX modelling is that uncertainty in estimated outputs is not made explicit. Variability in receiving water and effluent water quality parameters does not appear to have been accounted for. Models should be run for the full range of expected variability (i.e., diurnal and seasonal) in these estimates (in particular those that influence ammonia speciation—e.g., pH and temperature), in order to provide an indication of the range/uncertainty in outputs. At present, model outcomes are presented as deterministic rather than probabilistic, which is problematic given the inherent uncertainty associated with these types of models, and the

numerous assumptions that were made within the models themselves. It is recommended that the project team simulate responses for a range of input variables (i.e., not just 75th percentile value) and showing variability in water quality response parameters under different scenarios.

Response: Ontario's Ministry of Environment, Conservation and Parks (MECP) are the governing authority with respect to discharge requirements for waste water treatment plants (WWTPs) in the province of Ontario. The two documents that direct the discharge requirements for effluent to surface water are:

1. *Policies, Guidelines and Provincial Water Quality Objectives of the Ministry of Environment and Energy[5], which provides direction on the management of surface water and groundwater quality and quantity for the Province of Ontario, and*
2. *Deriving Receiving Water Based, Point-Source Effluent Requirements for Ontario Waters[6], which provides requirements for point-source discharges and the procedures for determining effluent requirements for an Environmental Compliance Approval (ECA).*

The West Credit River Assimilative Capacity Study (HESL 2018) was completed following MECP's published policies and guidelines, and in consultation with MECP and CVC, who reviewed and approved the work plan and final report.

For continuous discharges to streams and rivers, the 7Q20 low-flow statistic is used as a basic design flow to determine the assimilative capacity. The 7Q20 flow represents the minimum 7-day average flow with a recurrence period of 20 years. The 75th percentile concentration is used to determine background water quality when developing receiver-based effluent limits and is also used to determine the Policy status for each of the contaminants. The modeling was completed using 7Q20 flows and 75th percentile water quality data, which is the accepted approach to a conservative assessment. Results were compared with PWQO/CWQGs which are, in themselves, conservative estimates derived for the long-term continuous exposure and protection of the most sensitive life stages of the most sensitive species of aquatic life in accordance with MECP policy.

An approved and accepted approach; coupled with a conservative evaluation process provides certainty that the predictions made in the ACS are protective of aquatic life in the West Credit River.

Comment #8:

- Modelling input value for stream pH was 8.21 which was noted as being the "75th percentile of CVC hydrolab data (June and Aug 2008)". From the Appendices presented in the Erin Servicing and Settlement Master Plan, 2011, it is understood that this data was collected during two sets of diurnal monitoring at a site within the West Credit d/s of 10th Line, wherein pH was recorded every 30 minutes for a period of 5 days in June 2008, and a period of 4 days in late August 2008.

  From the raw data, it is clear that there was significant diurnal variation in stream pH during both sampling periods—which is to be expected for this particular parameter (e.g., ranged from 8.02 to

[5] *Ontario Ministry of Environment and Energy. 1994. Water management policies guidelines and water quality objectives of the Ministry of Environment and Energy, July 1994. ISBN 0-7778-8473-9 rev.*

[6] *Ontario Ministry of the Environment (MOE). 1994b. Deriving receiving water based point source effluent requirements for Ontario waters. PIBS#3302 Procedure B-1-5*

8.36 in the June 2008 sampling, and from 7.93 to 8.32 in Aug 2008). Given this variation, it would be preferable to have a longer continuous sampling period (i.e., more than just 5 days within a month) and more recent diurnal pH data monitoring results to ensure that model inputs are indeed representative of current stream water chemistry.

Furthermore, for mass balance, assimilation, and mixing zone modelling, it would be more appropriate to model un-ionized ammonia concentrations under the full range of stream pH values, in particular the higher values that are reached for several hours in the mid-late afternoon periods (i.e., not just the 75th percentile value), as derived from longer, more continuous, and more recent stream water quality monitoring at the sites of interest within the West Credit River. In particular, diurnal monitoring of pH and temperature should be conducted in July—and these higher values be included as model input parameters--as per the recommendation by B.M. Ross (2014):

> *"Note: It is recognized that lower 7Q20 flow amounts have been calculated for the months of August and September, however the river temperature and pH values during those months result in an un-ionized fraction of the total ammonia that is much less than what would occur during the month of July.* ***For this reason and based on modelling results, July has been assumed to be the worst case scenario for reviewing the end of pipe mixing zone and un-ionized ammonia impacts in the river****."*

Given the above, MNRF would appreciate clarification on why the worst-case was modelled for August (i.e., using August 2016 HESL temp logger data for temperature, and June and August pH values). MNRF staff would also recommend mixing zone modelling for chloride.

Response: A diurnal range in pH from 8.02 to 8.36, and 7.93 to 8.32 is not "significant" nor was it unexpected. pH naturally varies throughout the day due to photosynthesis and respiration. During photosynthesis, carbon dioxide is removed from the water raising the pH. During respiration, carbon dioxide is added to the water, lowering pH. pH of water is therefore highest in the afternoon when plants are photosynthesizing, and lowest before sunrise at the height of respiration.

The 75th percentile pH of 8.21 was used for the modelling. This was the 75th percentile of the CVC logger data from 2008. The 75th percentile data from combined HESL 2016 field data and CVC 2008 logger data was 8.11. The more conservative pH value was therefore used for the modelling as higher pH values result in higher unionized ammonia concentrations. Using the 75th percentile data, as opposed to extreme values that are only reached for several hours in the mid-afternoon follows MECP published policies and guidelines with respect to deriving receiving water based effluent objectives. As previously noted, all model predictions (including un-ionized ammonia) were compared to PWQO/CWQGs for the long-term exposure and protection of aquatic life (conservative values). Therefore, short term excursions beyond PWQOs, as might be expected given diurnal pH fluctuations, would not be of ecological consequence as the PWQOs are intended for protection during continuous exposure.

The modelling used 75th percentile August temperature (20.26°C) and the 75th percentile CVC 2016 pH as these were higher than the 75th percentile values calculated (the 75th percentile July 2016 temperature was 19.53°C). These provided more conservative predictions than using July values while still following the

MECP guidance. We also note that, although B.M. Ross (2014) states that July represents the worst case for pH and temperature; that the 7Q20 flows used in our modelling, are lowest in August and September, when temperatures are cooler and lower levels of photosynthetic activity reduce the diurnal changes in pH. The additional analyses requested by MNRF are outside of the procedure defined by MECP to assess effluent assimilation in Ontario and would not add value to the analysis or additional assurance of protection.

With respect to chloride, please see response to Comment #14 below.

Comment #9:

- CORMIX2 modelling for multi-port discharges simulated a "5m long multi-port diffuser running parallel to the south bank of the West Credit River..." This is not the typical diffuser port design orientation which is generally located perpendicular to the net current to maximize dilution. It is stated that this configuration "was set based on model runs to minimize the size of the mixing zone, while allowing for fish passage along the bank opposite to the diffuser". These model output results are not presented, so this is difficult to validate.

  Has this diffuser orientation been used elsewhere? MNRF would appreciate clarification on whether there is precedent for using this particular design orientation, and if there is evidence to demonstrate that it is preferable for fish passage. Would fish otherwise avoid the area of mixing and therefore not be able to move/migrate upstream of the diffuser? Is there evidence that fish will selectively use the proposed "passage" area outside of the mixing zone? Please clarify and provide rationale.

  MNRF notes the concern that siting the effluent discharge location at the Winston Churchill site may create a barrier to further upstream movement of fish and impact access to spawning sites upstream. The assimilative capacity study indicates that for 10th Line discharge site, 40% of the width of the river will be available for fish passage with the inclusion of the modelled diffuser design.

Response: The orientation of the diffuser was chosen to minimize the width of the river in which effluent would mix, thereby maintaining a larger area outside of the zone of initial mixing. The purpose of the work during the Class EA stage, is to show that the proposal is feasible, which has been proven. The diffuser design can be modified during the detailed design phase, as recommended on page 63 of the ACS and the final design will need to be reviewed and approved by MECP as part of the ECA application. The current orientation meets the requirements of the Class EA.

Modelling was completed for a 10th Line discharge as flows were 15% lower at this location than at Winston Churchill Boulevard, therefore the assessment was more conservative. The fluvial geomorphological assessment found that the West Credit River at Winston Churchill site was geomorphologically similar to 10th Line location (PECG 2017). No barrier to fish movement is predicted for a Winston Churchill Boulevard discharge, as the available width for passage of 40% would also apply to the river at this location or be higher due to higher flows and wider channel at this location.

A wide range of design solutions have been adopted for effluent outfalls into rivers depending on the geomorphological and flow conditions in the river as well as the requirement for mixing. Side discharges present a considerable structural advantage in dealing with storm and ice flow conditions while minimising bed erosion. In addition, in this particular case, there is added advantage in potentially improving the conditions for fish migration.

In recognition of MNRF concern, the project team will modify the ESR to include more specific requirements for a microscale assessment of habitat conditions, geomorphological and flow conditions upstream and downstream of the proposed outfall location, including any potential impacts to the large culvert immediately downstream of the proposed outfall location to be conducted in support of the outfall design.

Comment #10:

- Most of the impacted area or "mixing zone" identified through modelling is predicted to occur along the south shore (likely reflecting simulated discharge from a diffuser running parallel to the south bank of the W.C. River). Have field observations confirmed whether sensitive species use habitat along the south shore in the projected mixing zone either for spawning, upstream migration, or for other life processes? Was the choice of a south shore discharge based on field reconnaissance which measured the relative amount and quality of habitat available on the south vs. north banks of the river? Would this be expected to be the same if the discharge site was located at Winston Churchill Blvd? MNRF would appreciate the opportunity to review the results of mixing zone modelling described within the context of actual in-stream habitat characteristics of impacted reaches.

Response: Field observations within the mixing zone were gathered during habitat assessment and benthic invertebrate collection (August 15, 2017) and the Brook Trout spawning assessment (November 1, 2016), and presented within the Town of Erin Class EA Natural Environment Report (HESL 2018). Three spawning redds were observed within the nearfield mixing zone at 10th Line while zero were observed within the nearfield mixing zone at Winston Churchill Blvd. (Figure 5 of Natural Environment Report). Habitat within the potential nearfield mixing zones is described on pages 20 and 21 of the Natural Environment Report as part of the benthic invertebrate assessment and pages 24-27 as part of the habitat assessment. The choice of a south shore (versus north shore) discharge was based on engineering considerations and was not selected based on natural environment findings. The purpose of the Natural Environment Report and ACS was to compare three sites at Winston Churchill Blvd. and 10th Line. As noted in the response to comment #9 above, a more detailed, microscale assessment of habitat conditions will be completed to support design of the diffuser . Alternative detailed design solutions will include the south bank and the north bank immediately upstream of the culvert under Winston Churchill Boulevard. The Class EA, however, has demonstrated that the project is feasible with no significant adverse effects, and this conclusion is substantiated in the Natural Environment Report.

Comment #11:

- All modelling was conducted for 10th line potential outfall location, which is not the "preferred" alternative (i.e., indicated that Winston Churchill site is preferred). Will the mixing zone extent still be 153m downstream of that site? Will the southern shore still be the most impacted area downstream? What about differences in fluvial geomorphology between the reaches downstream of 10th line vs. downstream of W.C. Blvd? Will these not influence flow dynamics and therefore mixing zone extent for different water quality parameters of environmental significance (i.e., ammonia, chloride)? If the effluent diffuser is located at Winston Churchill Blvd. will there still be 40% of the river width available for fish passage at Full Build Out? This would seem highly dependent on site-specific stream morphology. Need to conduct dye tracer study at the Winston Churchill station to validate modelling for this site.

Response: The modeling was conducted for 10th Line, because flows and water quality are lower at this location than those measured at Winston Churchill Boulevard (see ACS sections 4.1 and 4.2); and therefore, this represented a more conservative assessment of river response than at Winston Churchill Boulevard where there was greater dilution and better water quality. This approach was approved by MECP and CVC.

The dye study was conducted between 10th Line and Shaw's Creek Road, which extends 1.3 km downstream of Winston Churchill Boulevard (Figure 3 ACS). Results from the dye study were used as inputs to the Qual2K model. Detailed fluvial geomorphological assessments were completed for three sites – one downstream of 10th Line and two near Winston Churchill (one upstream and one downstream of the road crossing) and found that all three sites had similar bankfull channel dimensions, bankfull channel hydraulic geomorphology, and similar grain size distributions. The assessment found that discharging the effluent at either location is appropriate from a fluvial geomorphological perspective (PECG 2017).

Given the geomorphic similarity between the two stations, the lower flows at 10th Line, the higher water quality at Winston Churchill Boulevard, the predictions made in the ACS regarding water quality and the size and shape of the effluent plume, the ACS demonstrates that there are no adverse effects (per the requirements of the EA) at either discharge location.

While the project team is confident that the preferred location for the effluent outfall has been identified, as noted in the response to comment #9 above, a microscale assessment will be conducted during the design stage of the project aimed at maximising the objectives identified during the Class EA.

Comment #12:

- MNRF staff would appreciate clarification on how, for both the Phase 1 diffuser scenario and the Full Build Out diffuser scenario at 72m downstream, the PWQO was met at exactly the same distance (6.5 m) from the closest bank—leaving 40% of the width of the river for safe fish passage in both cases.

Response: CORMIX modelling results are presented in the report in Section 4.8 and in Appendix G of the Assimilative Capacity Study. The mixing behaviour of any wastewater discharge is governed by the interplay of ambient conditions (i.e. shape, cross-sections, bathymetry, water velocity) and discharge characteristics (i.e. arrangement of ports, orientation of the diffuser, flow rate). The fact that the PWQO is met at the same lateral location for both scenarios indicates that the ambient conditions play a large role in the mixing processes. Comment #12, however, presents an incomplete interpretation of the CORMIX results. For Phase 1, the PWQO is met at a distance of 6.5m from the bank, as stated, and at 100m downstream (p.59). For Full Build Out, the PWQO is also met at 6.5m from the bank, as stated, but at a distance of 152m downstream (p.60), in recognition of the higher effluent volumes.

Comment #13:

- How will beaver-dams impact mixing zone extent? Given that this was shown to influence flow measurements within the proposed discharge study area, are there plans to mitigate such impacts?

Response: The mixing zone could be affected by the presence of beaver dams, by obstructing flow. The extent it will be affected cannot be defined as the location, size, timing, and duration cannot be predicted. As the outfall will be located near a road crossing, we anticipate, that any beaver dams within or downstream of the culvert could be removed as a matter of routine maintenance.

Comment #14:

- Chloride assessment (Page 56)

> "*The predicted downstream fully mixed chloride concentrations in the West Credit River are 121 mg/L and 180 mg/L for Phase 1 and Full Build Out respectively using the maximum effluent chloride concentration of 534 mg/L and 7Q20 conditions. The Phase 1 concentration is just above the chronic (longterm) CWQG of 120 mg/L, and the Full Build Out concentration of 180 mg/L is 60 mg/L above the chronic CWQG. Using average effluent chloride concentrations, the predicted chloride concentrations in the West Credit River are below the CWQG of 120 mg/L for Phase 1 (100 mg/L, Table 20), and 22 mg/L above the CWQG for Full Build Out (142 mg/L, Table 20). Under both conditions, the predicted receiver concentrations are well below the acute toxicity threshold of 640 mg/L*."

Chloride assessment (Page 71)

> "*From the mass balance modelling, the resulting downstream fully mixed chloride concentrations in the West Credit River were 121 mg/L and 180 mg/L at Phase 1 and Full Build Out Effluent at 7Q20 flows, respectively. Both fully mixed concentrations were above the chronic CWQG of 120 mg/L, but below the acute CWQG of 640 mg/L and not likely to impair aquatic life*."

Note: MNRF staff did not see hardness included in the suite of parameters used for samples collected from the WCR. Literature (article attached in email) indicates that in areas where water hardness is higher, the toxicity of chloride may be reduced. EA documents indicate that the Municipal communal water supply (groundwater) has elevated hardness. It is understood a groundwater source influences temperature in the WCR in between 10th line and WC Boulevard. Since there is no indication of a hydraulic connection between that Municipal groundwater supply and the WCR, MNRF staff cannot assume water in the WCR has elevated hardness. The proponent may wish to examine this further.

Response: These chloride concentrations were predicted using 7Q20 flows and so do not represent expected concentrations for the long-term indefinite exposures that are relevant to CWQG of 120 mg/L. Exposure to the predicted concentrations (1 mg/L above CWQG) would be for brief periods (7 days every 20 years) and aquatic life would be exposed at concentrations well below the short-term exposure CCME guideline of 640 mg/L.

We acknowledge that hardness influences chloride toxicity. At the time of the CWQG derivation (CCME 2011), insufficient data were available to develop hardness-based guidelines, and therefore the guidelines are conservative, in that they do not consider the ameliorating effects of hardness. Therefore, we do not consider that this needs to be examined any further.

The effluent Cl concentrations used for the modeling were estimated using data from other WWTPs with similar water supplies (see p. 49 of the ACS). We have, therefore, recommended that chloride concentrations in the WWTP influent and effluent be monitored by the Town (p. 50 of the ACS) and, if these concentrations approach those used for the mass balance calculations, that the Town consider implementing a public education program focusing on the use of water softeners to mitigate chloride discharge to the sewage system as water softeners are the primary source of chloride levels in wastewater in these areas. In addition, we have recommended that the Town may also consider a road salt and de-icing management and education program. While the latter would not address chloride source control, it may have a beneficial impact on background chloride concentrations in the West Credit River.

Comment #15:

- Total Ammonia Nitrogen (TAN) assessment (Page 71)

  "Mass balance modelling of total ammonia nitrogen (TAN) and nitrate were also completed as a "starting point" in determining effluent limits for these parameters using the Phase 1 and Full Build Out effluent flows which were derived from the TP mass balance modelling. The mass balance modelling found that at summer temperatures, a TAN concentration of 1.2 mg/L (Phase 1) and 0.6 mg/L (Full Build Out) resulted in fully mixed downstream TAN concentrations that equated to un-ionized ammonia concentrations that were below the PWQO for un-ionized ammonia."

  "Winter effluent TAN concentrations (of 2 mg/L at both Phase 1 and Full Build Out flows) were also checked to determine the corresponding concentration of un-ionized ammonia. Since speciation of ammonia to its un-ionized state is driven by increasing temperature and pH, un-ionized ammonia at winter temperatures is rarely of concern. In this case, the Phase 1 and Full Build Out flows corresponded with winter un-ionized ammonia concentrations of 0.003 mg/L and 0.006 mg/L, respectively, assuming a water temperature of 4°C. Therefore, the winter effluent TAN concentrations are acceptable."

- MNRF recommends that final effluent and the receiving waters be sampled and tested for un-ionized ammonia concentrations as a condition of the ECA. Similar to the following condition:

  The temperature and pH of the effluent from the Works as well as samples collected from the receiving waters shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (unionized).

- MNRF staff recommends that final effluent be sampled and tested for Acute Lethality (Rainbow Trout and Daphnia Magna) on a minimum quarterly basis. Testing should be in accordance with (example condition):

the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", July 1990 and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna ", July 1990.

To confirm that the final effluent is non-acutely lethal, toxicity testing should be undertaken on a quarterly basis, as indicated in Table _ in accordance with the most current procedures published by Environment Canada. The Water Supervisor may reduce the testing frequency to annual following twenty four (24) months of consistent passes.

Response: These are routine requirements for an ECA and, if necessary, will be imposed by MECP as a condition of the ECA.

Comment #16:

- MNRF staff recommends that final effluent be sampled and tested for Chronic toxicity in light of concerns related to chloride discharges (modelling predicts exceedance of chronic toxicity criteria for chloride).

Response: MECP and federal guidelines do not require that effluent not be chronically toxic; in Water Management: Policies, Guidelines, Provincial Water Quality Objectives (MOE 1994), MECP allow for mixing zones in receivers, in which water quality is above PWQOs, provided the mixing zones are as small as possible and do not result in toxic conditions. This is demonstrated in the ACS. We have recommended that chloride concentrations of the effluent be monitored and note that the ECA for the discharge will likely require biological monitoring within the river itself and that this represents a direct assessment of any chronic toxicity. We therefore do not see the merit in conducting chronic toxicity testing of the effluent.

Comment #17:

- It is not clear how the effluent targets for water quality parameters will be achieved and ensured. No models have been presented for the proposed treatment alternatives to indicate: the estimated diurnal/monthly/seasonal raw wastewater concentrations of water quality parameters of interest; treatment effectiveness/efficiencies of proposed alternatives for these parameters; calculated post-treatment concentrations/measures given the former.

Response: Appropriate unit processes have been identified that are capable of meeting the required effluent limits and objectives. Design of all unit processes must be in accordance with MECP design guidelines and must demonstrate that the WWTP will meet effluent objectives under all diurnal/monthly/seasonal flow conditions.

Effluent limits and objectives for parameters of interest have been delineated in the Assimilative Capacity Study.

Assumed raw wastewater concentrations for parameters of interest are outlined in the Treatment Technology Alternatives Technical Memorandum (Appendix R to ESR).

MECP Design Guidelines for all selected unit processes delineate design characteristics to be used to achieve the desired removal rates for parameters of interest.

MECP will review the design of all unit processes for compliance with their guidelines and will issue an ECA for the proposed WWTP.

Comment #18:

- What is the proposed response to exceedances in effluent parameters? Will these critical water quality parameters be monitored and quantified in the effluent continuously? If not, how frequently? Will exceedance result in re-routing of effluent for further treatment? What measures will be taken to ensure compliance with proposed effluent limits?

Response: These questions are regulated by MECP and will be addressed during the design of the system and in the ECA.

<u>Temperature Assessment</u>

Comment #19:

- Climate change: It is noted that a "correction" was applied to 7Q20 to account for climate change, but what about for stream temperatures? Given the importance of temperature to Brook Trout life history, as well as the influence of temperature on ammonia speciation, MNRF recommends that this should also be considered and simulated.

Response: HESL is not aware of any provincial or federal guidance with respect to responses of water temperatures in groundwater fed rivers to climate change. If MNRF is aware of any work or research in this area, we will review this documentation, and determine if our temperature assessment for ammonia in the ACS requires updating.

Comment #20:

- Assumptions about effluent temperature: based on Elora WWTP—does this facility service the same number of residents? Employ the same treatment technology as what is being proposed for Erin WWTP?

Response: Page 5 of HESL's Thermal Assessment of Erin WWTP on West Credit River (App. J in April 2018 ACS) outlines why use of the Elora effluent temperatures is appropriate in the absence of an existing plant data:

> *The Elora WWTP effluent temperatures were used as it is close to Erin, and similar water sources and climate would result in similar effluent temperatures. It should be noted however that the Elora WWTP uses an extended air process which has higher retention time and longer exposure to ambient air temperatures compared to the treatment process that is proposed at Erin, which means that the use of Elora WWTP effluent temperatures represents a conservative approach of higher effluent temperatures than will likely be recorded at the Erin WWTP.*

Comment #21:

- MNRF staff recommend modelling for full range of effluent temperature scenarios—include diurnal/seasonal variation in effluent temperature—not just 75th percentile.

Response: Using the 75th percentile data, as opposed to extreme values follows MECP published policies and guidelines with respect to deriving receiving water based effluent objectives. This represents a conservative estimate of the long-term exposure conditions for which PWQOs are derived. Seasonal variance in effluent temperature was considered as monthly temperatures were modelled.

Comment #22:

- No mitigation for potential thermal impacts appears to have been identified. Is there an option to cool the effluent before discharging into the river?

Response: The thermal assessment concludes that the temperature changes resulting from the WWTP discharge will not "significantly change the distribution and abundance of plant and animal life" per the Provincial Water Quality Objective, therefore temperature mitigation has not been proposed. Should the need arise in future, there are options available to use heat exchangers to extract heat from the effluent for use plant heating systems.

Comment #23:

- Predicted distance to upper threshold temperatures during Full Build Out are 715m in October – this would be during Brook Trout spawning season and raises concerns.

Response: Temperature changes are analysed in the memo "HESL J160005 – Thermal Assessment of Erin WWTP on West Credit River" that is included as App. J in the April 2018 ACS and which MNRF has received. The large increase in October is an artifact that relates to the transition from a growth tolerance temperature of 19^{o}C to a spawning tolerance of 16^{o}C, which was assumed to occur on October 1 but which will depend on when fish actually spawn. The actual affected distance in the river will be much less than the 715 m predicted. At 35 m downstream of the diffuser, water temperatures are predicted to be 19.2^{o}C and 16.2^{o}C for August and October respectively. This is only 0.2^{o}C greater than the upper tolerance thresholds for spawning and egg development and at Winston Churchill Blvd, the downstream border of the affected habitat is located within the 45 m long culvert.

There are several qualifications mentioned throughout the thermal assessment that made it conservative. Qualifications include:

1. *These predictions were made for 7Q20 low flow conditions as a conservative estimate of change. The 7Q20 flow statistic corresponds to a flow duration range of 99.5-99.7 "which is indeed a very low flow" (Pryce (2004). Flows will be higher and temperature changes smaller at least 99.5% of the time.*
2. *Appendix B in the ACS provides the detailed 7Q20 calculations completed by CVC and shows that the 7Q20 flows occur in September, ahead of the brook trout spawning season. This confirms that our use of the 7Q20 flow for the thermal modelling and assessment is a conservative approach and that actual changes in temperature will be less than those*

which informed the thermal assessment presented in the ACS, Temperature cycles from summer highs to winter lows provide an acclimatization period to temperature extremes for Brook Trout (Raleigh 1982),

3. *Brook Trout commonly seek out thermal refugia within streams (Ebersole et al. 2001),*
4. *Different Brook Trout strains have acclimatized to the water temperatures of their environment (Stitt et al. 2014), so it is challenging applying reported thermal tolerances of assemblages in the West Credit River when the studies were not completed on these populations, and*
5. *Most importantly, Brook Trout commonly spawn overtop of rocky substrates and groundwater upwellings, and eggs develop within the interstitial spaces of the substrates. Groundwater inputs to these habitat features will not be impacted by the WWTP effluent and therefore water temperatures near these spawning areas and within the interstitial spaces between rocky substrates are not likely to change. Water temperature modelling is focused on the assimilation of effluent throughout the water column and not on water temperatures within or adjacent to sediments, so the prediction of impacts on spawning habitat represents a very conservative assessment of the effect of change to water temperatures.*

The Provincial Water Quality Objective for water temperature is, "The natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed." (MOE 1994). Based on the results of the thermal assessment on Brook Trout, including the various conservative qualifications, we predict that the temperature changes resulting from the WWTP discharge will not "significantly change the distribution and abundance of plant and animal life" per the Provincial Water Quality Objective and will not impair brook trout habitat.

<u>Natural Environment Report</u>

Comment #24:

- The effluent outfall assessment appears to be limited to downstream of Erin Village. The consultant (Ainley, April 2018) reports the following:

"A proposed outfall at Winston Churchill Blvd is preferred over the 10th Line for a number of sound environmental reasons as discussed in the Natural Environment Report and ACS, including:

1. It provides greater dilution (9-32%) higher flows than 10th Line;
2. Has greater ability to assimilate treated effluent and avoid thermal impacts to aquatic biota due to lower nutrient concentrations and cooler water temperatures;
3. Supports less Brook Trout spawning habitat and a lower quality benthic assemblage; and
4. The 45 long culvert directly downstream of the proposed outfall at Winston Churchill Blvd. represents degraded habitat compared to a location at the 10th Line. The culvert is permanently shaded and limits the form of the stream bed and width of the channel, and 30% of the near-field mixing zone will be contained in the culvert.

"We completed a thorough assessment of thermal impacts and have reviewed comments from MOECC, CVC, MNRF and the County of Wellington on the Natural Environment Report, and

continue to recommend that Winston Churchill Blvd is the more appropriate effluent outfall location."

Rationale for "preferred" outfall location at Winston Churchill Boulevard it "Supports less Brook Trout spawning habitat and lower quality benthic assemblage" seems to be unsupported.

Differences in mean %EPT and Diversity between the 2 potential outfall sites, as presented in Table 5 of the Natural Environment Report, were not statistically significant. Therefore, it is MNRF's opinion that statements cannot be made about differences in sensitive biota between the two sites. OBB data appears to have been collected during a single monitoring event and therefore may not be representative of natural variability in community structure – either seasonally, or annually.

Response: Benthic invertebrate data was collected following OBBN protocol to align with current CVC sampling methodology to help inform the selection of the wastewater effluent outfall location. It will also serve as a baseline to allow for future temporal comparison and determination of any effects. Winston Churchill Blvd would have been the preferred location in the absence of benthic invertebrate data because of greater dilution and ability to assimilate effluent, less Brook Trout downstream spawning habitat, and the presence of the 45 long culvert so any additional deliberation over benthic invertebrate results is academic and does not change the overarching conclusions.

Comment #25:

- It is also MNRF's opinion that assumptions about differences in Brook Trout spawning habitat between the two sites also cannot be validated based on a single sampling event. Brook Trout spawning may last several weeks, and surveys should be conducted repeatedly prior to spawning and at regular intervals throughout the spawning period until no new redds are observed. Baseline quantification of spawning habitat should be acquired over multiple years to account for interannual variation.

Response: The spawning assessment was completed according to CVC protocol with CVC staff during peak spawning based on local observations of CVC staff. CVC also recommended that additional field investigations to quantify spawning habitat should not be completed to limit associated impacts on the spawning Brook Trout population. The findings of the background fisheries review, spawning assessment, and habitat assessment in relation to Brook Trout spawning requirements, goes above and beyond fisheries assessments that are typically completed as part of Assimilative Capacity Studies as effluent limits are inherently protective of fish and other aquatic species.

Comment #26:

- Do not recommend placing effluent outfall sites at an area of known upwelling – areas of upwelling are preferred Brook Trout spawning sites. Concern that 5 m long diffuser that is to be placed on the river bed could in fact destroy sensitive Brook Trout spawning sites.

Response: Redds were not observed at the proposed effluent outfall location at Winston Churchill Blvd. and habitat in the area, as described at benthic invertebrate sampling stations WCB-A and WCB-B in the Natural Environment Report, did not constitute high quality Brook Trout spawning habitat like the majority

of the study reach. Recommended mitigation measures also included development of an Erosion and Sediment Control Plan, and a construction timing window to protect sensitive Brook Trout life stages of spawning and rearing.

Comment #27:

- See comment above – placing the outfall site at Winston Churchill Blvd. could prevent safe fish passage to known spawning sites immediately upstream.

Response: Effluent will be treated so that it is protective of all fish at all life stages, including migration and spawning. Furthermore, a diffuser has been proposed that limits the mixing zone to 40% of the width of the West Credit River to encourage the safe passage of fish around the effluent plume, in accordance with MECP policy.

Overflow Risk Management

Comment #27:

- The memorandum (titled "Urban Centre Wastewater Servicing Class Environmental Assessment Technical Memorandum Overflow Risk Management", produced by Ainley, dated April 2018) fails to include consideration for the probability of increased frequency and intensity of storm events as a result of climate change, which would increase the risk of spills or overflow events. How will this be accounted for in estimating the facility storage capacity necessary to accommodate these events?

Ainley Response: The proposed wastewater collection system is a "separate" system. It will be a new system and will not be connected to any surface water systems and the clear intention will be to isolate the wastewater system from any impacts of storm events. It is recognised that climate change will increase the intensity, nature and duration of storm events with the potential to impact water and wastewater infrastructure. It is also recognised that any deterioration of the wastewater collection system may increase the potential for impacts from storm events in the longer term. In finalising the ESR, the project team will strengthen the recommendations around potential impacts on the collection system from climate change to ensure that the impact from climate change is minimised.

It should also be recognised that MECP guidelines for the design of any future expansion to the wastewater system must take into consideration the actual wastewater flows being experienced at that time (previous three years).

Comment #28:

- While the capacity during Phase 1 may not be an issue, there is likely a much greater risk of overflows or spills at Full Build Out. Also, the infrastructure at this phase will be older (possibly more susceptible to leaks/breaks, etc.).
- Many recommendations are presented, e.g.:
    - Overflow pipes/chambers not recommended in collection system; MNRF supports provided that sufficient capacity is provided within collection system (e.g. wet wells) and/or treatment system to address high flow periods even at full build-out.

- It is recommended that the proponent consider the feasibility of establishing infrastructure at the WWTP (e.g. inflow & infiltration tanks) to accommodate peak flows and therefore prevent bypasses.

Ainley Response: As proposed in the recommended design alternative, the entire collection system will pump wastewater to the WWTP from the last Sewage Pumping Station in Erin Village. This will be the most critical location from a spills perspective and should be the main focus for provision of additional storage capacity within the collection system. The WWTP capacity will be required to match the capacity of the last main SPS to ensure treatment that meets the required effluent limits at all times. Any additional storage at the WWTP site would likely result from a risk analysis of any potential failures at the WWTP site. In finalising the ESR, the project team will strengthen the recommendations around potential impacts on the treatment plant from climate change to ensure that the impact from climate change is minimised.

Comment #29:

- *A commitment to redundancies for a power supply and pumping equipment identified in the Ainley report (often standard in wastewater collection systems) should be included as part of the wastewater collection system design to prevent spills*

Ainley Response: These recommendations are outlined within the MECP Wastewater System Design guidelines. As such, they will be enforced by MECP during the permitting and approvals process.

Comment #30:

- *Other inflow and infiltration minimizing measures, such as leak-free manhole lids in low-lying areas, should also be adopted"...*

- *"As the system ages, the potential or risk of high flows exceeding the peak capacity of the wastewater treatment plant or pumping stations will increase. This can be managed by increasing storage throughout the system either by constructing addition wet wells at pumping station sites or storage tanks at critical locations such as the last pumping station before the wastewater treatment plant."*

Ainley Response: In finalising the ESR, the project team will strengthen the recommendations for collection system design considerations.

Comment #31:

- However, MNRF staff note that it is not explicit if or how the stated recommendations for the wastewater collection system will be implemented. In order to prevent spills which would likely impact sensitive brook trout habitat and downstream SAR habitat, MNRF staff requests that strong consideration be given to the above recommendations in the form of action items and next steps.

Ainley Response: As noted above, MECP design guidelines will require future system expansions to take into consideration actual wastewater flows being experienced in the previous three years before the application.

Comment #32:

Additional concerns about WWTP effluent outfall in habitat with sensitive fisheries

- There is a growing body of scientific evidence indicating that there is an association between municipal wastewater treatment plant outfalls and the feminization of male fish, resulting from exposure to endocrine-disrupting compounds (EDCs) that are routinely measurable in municipal WWTP effluents.

  While these compounds are not regulated by MOECC, from a fish health perspective, exposure to EDCs poses a risk of reduced reproductive success, and therefore raises serious concerns where WWTP effluent may discharge into fish-bearing waters. For these reasons, in order to protect aquatic species from potential negative impacts of EDCs, it is necessary to reduce exposure by ensuring that municipal WWTP operational processes remove these compounds.

  A municipal WWTP in Kitchener, ON recently underwent significant upgrades that included the conversion from a carbonaceous activated sludge to a nitrifying activated sludge treatment process, as well as more efficient aeration and higher solids retention time of >5 days. In a recently published, peer-reviewed scientific study, Hicks et al. (2016)* reported that these upgrades not only significantly improved the removal of ammonia, but also significantly reduced total effluent estrogenicity. Furthermore, these upgrades resulted in a reduction from 70-100% intersex incidence in male Rainbow Darter in proximity to the WWTP outfall, down to <10%.

  It is strongly recommended that the Erin WWTP include these operational processes and treatment technologies in order to ensure the removal of compounds with estrogenic properties, as well as ammonia, in order to protect aquatic species in receiving waters.

* Keegan A. Hicks, Meghan L. M. Fuzzen, Emily K. McCann, Maricor J. Arlos, Leslie M. Bragg, Sonya Kleywegt, Gerald R. Tetreault, Mark E. McMaster, and Mark R. Servos (2017) Reduction of Intersex in a Wild Fish Population in Response to Major Municipal Wastewater Treatment Plant Upgrades. Environmental Science & Technology 51 (3), 1811-1819.

Response: The referenced Hicks et al. study involves the upgrade of an existing WWTP in Kitchener, ON to improve poor effluent quality, specifically to enhance the removal of ammonia and achieve full nitrification. The upgrades at the Kitchener WWTP reduced the median effluent ammonia concentration from 25 mg/L to 2-6 mg/L. The proposed ammonia effluent limit for Erin WWTP is 0.6 mg/L at full build out – an order of magnitude less than the improvement at Kitchener. The Erin WWTP will also be incorporating membrane filtration for tertiary treatment; currently a best available treatment technology. There is therefore no need to consider the operational processes and treatment technologies employed at the Kitchener WWTP, as the proposed Erin WWTP will achieve lower effluent limits and is therefore highly protective of the aquatic species in the West Credit River.

In closing, we thank you for the opportunity to respond to the comments and concerns of the MNRF. We conclude that the results presented in the April 2018 ACS and Natural Environment Report for the proposed Erin WWTP support our conclusion that the plant can be built and operated with no significant adverse effects to aquatic life, in line with the conclusions presented in the Environmental Study Report.

Ministry of Natural Resources and Forestry

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June 12, 2018

Preya Balgobin, P. Eng.
Senior Project Manager
Ainley Group

Re: Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment – Environmental Study Report – Town of Erin, County of Wellington – MNRF Comments

Dear Ms. Balgobin,

The Ministry of Natural Resources and Forestry (MNRF) Guelph District Office can confirm receipt of the documents provided in support of Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment (Class EA) Notice of Study Completion. It is understood that this Class EA has been undertaken for a municipal wastewater treatment plant (WWTP) and collection system for Hillsburgh and the Village of Erin. MNRF staff previously reviewed the Natural Environment Report (NER), in addition to the Wastewater Treatment Plant Site Selection Technical Memorandum, Effluent Outfall Site Selection Technical Memorandum, and Pumping Stations and Forcemains Technical Memorandum to better understand the potential impacts and footprints of the proposed project.

MNRF previously provided comments on March 16, 2018. Since then, we have received a response to our comments, along with the Assimilative Capacity Study, from Ainley Group on April 10, 2018, and met with the project team on May 3, 3018. MNRF staff has since received and reviewed the Environmental Study Report (ESR) and Notice of Study Completion. MNRF staff can offer the following comments, including comments from MNRF Aurora District staff and MNRF Southern Region staff.

In general, MNRF staff continues to express concerns with the proposed outfall locations and proposed facility location in proximity to a high quality brook trout fishery in the West Credit River. It is understood the location for the WWTP (Winston Churchill Blvd.) was chosen through the previous Servicing and Settlement Master Plan (SSMP) process.

Based on the information in the ESR and previous documentation provided, MNRF staff is of the opinion that uncertainty remains in terms of the baseline water quality collection, subsequent modelling and assessment (detailed comments below) and fish habitat impact assessment. In addition, the technical memorandum for overflow risk management (April 2018) does not appear to fully describe the types of infrastructure failure risks and recommends that a risk assessment be undertaken in the future. MNRF staff also notes that the risk of exceeding key water quality parameters, such as chloride, ammonia and nitrate does not appear to have been assessed in the context of proposed urban growth.

MNRF Comments

Location of WWTP Alternatives

- The treatment plant alternatives are limited to three sites located at the same intersection – 10th Line and Regional Road 52. MNRF maintains the recommendation that alternatives at different intersections across the subwatershed, with different aquatic sensitivities, be explored within the Town of Erin.

Aggregate Resources

- As discussed at the meeting, MNRF notes that two of the proposed WWTP locations (2A and 2B, both south of Wellington Road 52) appear to be within a proposed *Aggregate Resources Act* (ARA) licence area. In addition, the proponent for the ARA licence has already registered their proposed activities related to Barn Swallow, Bobolink and Eastern Meadowlark under the *Endangered Species Act* (ESA). It is unclear to MNRF staff how these two locations proposed for the WWTP are compatible with the proposed ARA licence, and how the commitments made under the ESA registrations for Barn Swallow, Bobolink and Eastern Meadowlark would be impacted.

Species at Risk

- It is MNRF's understanding that little or no tree removal will occur for this project. If significant tree removal is required for this project, MNRF recommends conducting acoustic surveys to determine SAR Bat Habitat Suitability. For additional SAR survey information, please contact ESAGUELPH@ontario.ca for more information. Please note: the timing window for no tree removal is from April 1st to September 30th.

Licence to Collect Fish

- This project may require a licence to collect fish if any work conducted will require dewatering of the watercourse and fish removal. Please contact MNRF for details.

Crown Land Easement

- MNRF staff note that this project may require a crown land easement for the effluent outfall. Please contact Jennifer Harvard, Lands and Waters Technical Specialist at 519-826-4933 for more information.

Assimilative Capacity Study

As part of this review process, MNRF District staff requested the support of MNRF Southern Region expertise for the purposes of reviewing the Assimilative Capacity Study, and related reports. Previously, MNRF recommended that *"alternatives at different intersections across the subwatershed, with different aquatic sensitivities, be explored."* Although MNRF staff has received additional rationale for the preferred final effluent discharge point (Winston Churchill Blvd.), MNRF staff continue to note potential fish impact/habitat concerns. In light of this review, MNRF staff can offer the following technical comments on the Assimilative Capacity Study.

- The 7Q20 low flow statistic has been applied; it is understood that this is a standard (conservative) approach for receiving water assessments. In this circumstance, data for 10th Line has been used

(data from July 2013 to December 2015). It is noted by the consultant that 10 years of flow management data is ideal. It may be appropriate for the proponent to compare local weather data during the time period when flow data was obtained (for the purpose of determining if any anomalies are present in the data).

- Primary concern with the QUAL2K and CORMIX modelling is that uncertainty in estimated outputs is not made explicit. Variability in receiving water and effluent water quality parameters does not appear to have been accounted for. Models should be run for the full range of expected variability (i.e., diurnal and seasonal) in these estimates (in particular those that influence ammonia speciation—e.g., pH and temperature), in order to provide an indication of the range/uncertainty in outputs. At present, model outcomes are presented as deterministic rather than probabilistic, which is problematic given the inherent uncertainty associated with these types of models, and the numerous assumptions that were made within the models themselves. It is recommended that the project team simulate responses for a range of input variables (i.e., not just 75th percentile value) and showing variability in water quality response parameters under different scenarios.

- Modelling input value for stream pH was 8.21 which was noted as being the "75th percentile of CVC hydrolab data (June and Aug 2008)". From the Appendices presented in the Erin Servicing and Settlement Master Plan, 2011, it is understood that this data was collected during two sets of diurnal monitoring at a site within the West Credit d/s of 10th Line, wherein pH was recorded every 30 minutes for a period of 5 days in June 2008, and a period of 4 days in late August 2008.

  From the raw data, it is clear that there was significant diurnal variation in stream pH during both sampling periods—which is to be expected for this particular parameter (e.g., ranged from 8.02 to 8.36 in the June 2008 sampling, and from 7.93 to 8.32 in Aug 2008). Given this variation, it would be preferable to have a longer continuous sampling period (i.e., more than just 5 days within a month) and more recent diurnal pH data monitoring results to ensure that model inputs are indeed representative of current stream water chemistry.

  Furthermore, for mass balance, assimilation, and mixing zone modelling, it would be more appropriate to model un-ionized ammonia concentrations under the full range of stream pH values, in particular the higher values that are reached for several hours in the mid-late afternoon periods (i.e., not just the 75th percentile value), as derived from longer, more continuous, and more recent stream water quality monitoring at the sites of interest within the West Credit River. In particular, diurnal monitoring of pH and temperature should be conducted in July—and these higher values be included as model input parameters--as per the recommendation by B.M. Ross (2014):

  > *"Note: It is recognized that lower 7Q20 flow amounts have been calculated for the months of August and September, however the river temperature and pH values during those months result in an un-ionized fraction of the total ammonia that is much less than what would occur during the month of July.* ***For this reason and based on modelling results, July has been assumed to be the worst case scenario for reviewing the end of pipe mixing zone and un-ionized ammonia impacts in the river****."*

Given the above, MNRF would appreciate clarification on why the worst-case was modelled for August (i.e., using August 2016 HESL temp logger data for temperature, and June and August pH values). MNRF staff would also recommend mixing zone modelling for chloride.

- CORMIX2 modelling for multi-port discharges simulated a "5m long multi-port diffuser running parallel to the south bank of the West Credit River…" This is not the typical diffuser port design orientation which is generally located perpendicular to the net current to maximize dilution. It is stated that this configuration "was set based on model runs to minimize the size of the mixing zone, while allowing for fish passage along the bank opposite to the diffuser". These model output results are not presented, so this is difficult to validate.

  Has this diffuser orientation been used elsewhere? MNRF would appreciate clarification on whether there is precedent for using this particular design orientation, and if there is evidence to demonstrate that it is preferable for fish passage. Would fish otherwise avoid the area of mixing and therefore not be able to move/migrate upstream of the diffuser? Is there evidence that fish will selectively use the proposed "passage" area outside of the mixing zone? Please clarify and provide rationale.

  MNRF notes the concern that siting the effluent discharge location at the Winston Churchill site may create a barrier to further upstream movement of fish and impact access to spawning sites upstream. The assimilative capacity study indicates that for 10th Line discharge site, 40% of the width of the river will be available for fish passage with the inclusion of the modelled diffuser design.

- Most of the impacted area or "mixing zone" identified through modelling is predicted to occur along the south shore (likely reflecting simulated discharge from a diffuser running parallel to the south bank of the W.C. River). Have field observations confirmed whether sensitive species use habitat along the south shore in the projected mixing zone either for spawning, upstream migration, or for other life processes? Was the choice of a south shore discharge based on field reconnaissance which measured the relative amount and quality of habitat available on the south vs. north banks of the river? Would this be expected to be the same if the discharge site was located at Winston Churchill Blvd? MNRF would appreciate the opportunity to review the results of mixing zone modelling described within the context of actual in-stream habitat characteristic of impacted reaches.

- All modelling was conducted for 10th line potential outfall location, which is not the "preferred" alternative (i.e., indicated that Winston Churchill site is preferred). Will the mixing zone extent still be 153m downstream of that site? Will the southern shore still be the most impacted area downstream? What about differences in fluvial geomorphology between the reaches downstream of 10th line vs. downstream of W.C. Blvd? Will these not influence flow dynamics and therefore mixing zone extent for different water quality parameters of environmental significance (i.e., ammonia, chloride)? If the effluent diffuser is located at Winston Churchill Blvd. will there still be 40% of the river width available for fish passage at Full Build Out? This would seem highly

dependent on site-specific stream morphology. Need to conduct dye tracer study at the Winston Churchill station to validate modelling for this site.

- MNRF staff would appreciate clarification on how, for both the Phase 1 diffuser scenario and the Full Build Out diffuser scenario at 72m downstream, the PWQO was met at exactly the same distance (6.5 m) from the closest bank—leaving 40% of the width of the river for safe fish passage in both cases.

- How will beaver-dams impact mixing zone extent? Given that this was shown to influence flow measurements within the proposed discharge study area, are there plans to mitigate such impacts?

- Chloride assessment (Page 56)

  "*The predicted downstream fully mixed chloride concentrations in the West Credit River are 121 mg/L and 180 mg/L for Phase 1 and Full Build Out respectively using the maximum effluent chloride concentration of 534 mg/L and 7Q20 conditions. The Phase 1 concentration is just above the chronic (long-term) CWQG of 120 mg/L, and the Full Build Out concentration of 180 mg/L is 60 mg/L above the chronic CWQG. Using average effluent chloride concentrations, the predicted chloride concentrations in the West Credit River are below the CWQG of 120 mg/L for Phase 1 (100 mg/L, Table 20), and 22 mg/L above the CWQG for Full Build Out (142 mg/L, Table 20). Under both conditions, the predicted receiver concentrations are well* ***below*** *the acute toxicity threshold of 640 mg/L*."

  Chloride assessment (Page 71)

  "*From the mass balance modelling, the resulting downstream fully mixed chloride concentrations in the West Credit River were 121 mg/L and 180 mg/L at Phase 1 and Full Build Out Effluent 7Q20 flows, respectively. Both fully mixed concentrations were* ***above*** *the chronic CWQG of 120 mg/L, but below the acute CWQG of 640 mg/L and not likely to impair aquatic life*."

  Note: MNRF staff did not see hardness included in the suite of parameters used for samples collected from the WCR. Literature (article attached in email) indicates that in areas where water hardness is higher, the toxicity of chloride may be reduced. EA documents indicate that the Municipal communal water supply (groundwater) has elevated hardness. It is understood a groundwater source influences temperature in the WCR in between 10th line and WC Boulevard. Since there is no indication of a hydraulic connection between that Municipal groundwater supply and the WCR, MNRF staff cannot assume water in the WCR has elevated hardness. The proponent may wish to examine this further.

- Per comments from MOECC (March 2018), a recommendation has been made to include a condition for the monitoring for Chloride in the WWTP influent, effluent and receiving waters. MNRF supports this condition.

- Total Ammonia Nitrogen (TAN) assessment (Page 71)

  "Mass balance modelling of total ammonia nitrogen (TAN) and nitrate were also completed as a "starting point" in determining effluent limits for these parameters using the Phase 1 and Full Build Out effluent flows which were derived from the TP mass balance modelling. The mass balance modelling found that at summer temperatures, a TAN concentration of 1.2 mg/L (Phase 1) and 0.6 mg/L (Full Build Out) resulted in fully mixed downstream TAN concentrations that equated to un-ionized ammonia concentrations that were below the PWQO for un-ionized ammonia."

  "Winter effluent TAN concentrations (of 2 mg/L at both Phase 1 and Full Build Out flows) were also checked to determine the corresponding concentration of un-ionized ammonia. Since speciation of ammonia to its un-ionized state is driven by increasing temperature and pH, un-ionized ammonia at winter temperatures is rarely of concern. In this case, the Phase 1 and Full Build Out flows corresponded with winter un-ionized ammonia concentrations of 0.003 mg/L and 0.006 mg/L, respectively, assuming a water temperature of 4°C. Therefore, the winter effluent TAN concentrations are acceptable."

  MNRF recommends that final effluent and the receiving waters be sampled and tested for un-ionized ammonia concentrations as a condition of the ECA. Similar to the following condition:

  The temperature and pH of the effluent from the Works as well as samples collected from the receiving waters shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (unionized).

- MNRF staff recommends that final effluent be sampled and tested for Acute Lethality (Rainbow Trout and Daphnia Magna) on a **minimum** quarterly basis. Testing should be in accordance with (example condition):

  the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", July 1990 and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna ", July 1990.

  To confirm that the final effluent is non-acutely lethal, toxicity testing should be undertaken on a quarterly basis, as indicated in Table _ in accordance with the most current procedures published by Environment Canada. The Water Supervisor may reduce the testing frequency to annual following twenty four (24) months of consistent passes.

- MNRF staff recommends that final effluent be sampled and tested for Chronic toxicity in light of concerns related to chloride discharges (modelling predicts exceedance of chronic toxicity criteria for chloride).

- It is not clear how the effluent targets for water quality parameters will be achieved and ensured. No models have been presented for the proposed treatment alternatives to indicate: the estimated diurnal/monthly/seasonal raw wastewater concentrations of water quality parameters of interest; treatment effectiveness/efficiencies of proposed alternatives for these parameters; calculated post-treatment concentrations/measures given the former.

  What is the proposed response to exceedences in effluent parameters? Will these critical water quality parameters be monitored and quantified in the effluent continuously? If not, how frequently? Will exceedence result in re-routing of effluent for further treatment? What measures will be taken to ensure compliance with proposed effluent limits?

<u>Temperature Assessment</u>:

- Climate change: It is noted that a "correction" was applied to 7Q20 to account for climate change, but what about for stream temperatures? Given the importance of temperature to Brook Trout life history, as well as the influence of temperature on ammonia speciation, MNRF recommends that this should also be considered and simulated.

- Assumptions about effluent temperature: based on Elora WWTP—does this facility service the same number of residents? Employ the same treatment technology as what is being proposed for Erin WWTP?

- MNRF staff recommend modelling for full range of effluent temperature scenarios—include diurnal/seasonal variation in effluent temperature—not just 75th percentile.

- No mitigation for potential thermal impacts appears to have been identified. Is there an option to cool the effluent before discharging into the river?

- Predicted distance to upper threshold temperatures during Full Build Out are 715m in October—this would be during Brook Trout spawning season, and raises concerns.

<u>Natural Environment Report</u>

- The effluent outfall assessment appears to be limited to downstream of Erin Village. The consultant (Ainley, April 2018) reports the following:

  > "*A proposed outfall at Winston Churchill Blvd is preferred over the 10th Line for a number of sound environmental reasons as discussed in the Natural Environment Report and ACS, including:*
  >
  > 1. *It provides greater dilution (9-32% higher flows) than 10th Line;*

2. *Has greater ability to assimilate treated effluent and avoid thermal impacts to aquatic biota due to lower nutrient concentrations and cooler water temperatures;*
3. *Supports less Brook Trout spawning habitat and a lower quality benthic assemblage; and*
4. *The 45m long culvert directly downstream of the proposed outfall at Winston Churchill Blvd. represents degraded habitat compared to a location at the 10th Line. The culvert is permanently shaded and limits the form of the stream bed and width of the channel, and 30% of the near-field mixing zone will be contained within culvert.*

We completed a thorough assessment of thermal impacts and have reviewed comments from MOECC, CVC, MNRF and the County of Wellington on the Natural Environment Report, and continue to recommend that Winston Churchill Blvd is the more appropriate effluent outfall location."

Rationale for "preferred" outfall location at Winston Churchill Boulevard it "*Supports less Brook Trout spawning habitat and a lower quality benthic assemblage*" seems to be unsupported.

Differences in mean %EPT and Diversity between the 2 potential outfall sites, as presented in Table 5 of the Natural Environment Report, were not statistically significant (student's t-test p-values were 0.187 and 0.280, respectively). Therefore, it is MNRF's opinion that statements cannot be made about differences in sensitive biota between the two sites. OBB data appears to have been collected during a single monitoring event and therefore may not be representative of natural variability in community structure — either seasonally, or annually.

- It is also MNRF's opinion that assumptions about differences in Brook Trout spawning habitat between the two sites also cannot be validated based on a single sampling event. Brook Trout spawning may last several weeks, and surveys should be conducted repeatedly prior to spawning and at regular intervals throughout the spawning period until no new redds are observed. Baseline quantification of spawning habitat should be acquired over multiple years to account for inter-annual variation.

- Do not recommend placing effluent outfall site at an area of known upwelling—areas of upwelling are preferred Brook Trout spawning sites. Concern that 5 m long diffuser that is to be placed on the river bed could in fact destroy sensitive Brook Trout spawning sites.

- See comment above—placing the outfall site at Winston Churchill Blvd. could prevent safe fish passage to known spawning sites immediately upstream.

<u>Overflow Risk Management</u>

- The memorandum (titled "Urban Centre Wastewater Servicing Class Environmental Assessment Technical Memorandum Overflow Risk Management", produced by Ainley, dated April 2018) fails to include consideration for the probability of increased frequency and intensity of storm events as a

result of climate change, which would increase the risk of spills or overflow events. How will this be accounted for in estimating the facility storage capacity necessary to accommodate these events?

- While the capacity during Phase 1 may not be an issue, there is likely a much greater risk of overflows or spills at Full Build Out. Also, the infrastructure at this phase will be older (possibly more susceptible to leaks/breaks, etc.).

- Many recommendations are presented, e.g.:
    - Overflow pipes/chambers not recommended in collection system; MNRF supports provided that sufficient capacity is provided within collection system (e.g. wet wells) and/or treatment system to address high flow periods even at full build-out.
    - It is recommended that the proponent consider the feasibility of establishing infrastructure at the WWTP (e.g. inflow & infiltration tanks) to accommodate peak flows and therefore prevent bypasses.
    - A commitment to redundancies for a power supply and pumping equipment identified in the Ainley report (often standard in wastewater collection systems) should be included as part of the wastewater collection system design to prevent spills
    - "Other inflow and infiltration minimizing measures, such as leak-free manhole lids in low-lying areas, *should also be adopted*" …
    - "As the system ages, the potential or risk of high flows exceeding the peak capacity of the wastewater treatment plant or pumping stations will increase. This *can be managed by increasing storage throughout the system either by constructing addition wet wells at pumping station sites or storage tanks at critical locations* such as the last pumping station before the wastewater treatment plant."

  However, MNRF staff note that it is not explicit if or how the stated recommendations for the wastewater collection system will be implemented. In order to prevent spills which would likely impact sensitive brook trout habitat and downstream SAR habitat, MNRF staff requests that strong consideration be given to the above recommendations in the form of action items and next steps.

<u>Additional concerns about WWTP effluent outfall in habitat with sensitive fisheries</u>

- There is a growing body of scientific evidence indicating that there is an association between municipal wastewater treatment plant outfalls and the feminization of male fish, resulting from exposure to endocrine-disrupting compounds (EDCs) that are routinely measurable in municipal WWTP effluents.

  While these compounds are not regulated by MOECC, from a fish health perspective, exposure to EDCs poses a risk of reduced reproductive success, and therefore raises serious concerns where WWTP effluent may discharge into fish-bearing waters. For these reasons, in order to protect aquatic species from potential negative impacts of EDCs, it is necessary to reduce exposure by ensuring that municipal WWTP operational processes remove these compounds.

  A municipal WWTP in Kitchener, ON recently underwent significant upgrades that included the conversion from a carbonaceous activated sludge to a nitrifying activated sludge treatment process,

as well as more efficient aeration and higher solids retention time of >5 days. In a recently published, peer-reviewed scientific study, Hicks et al. (2016)* reported that these upgrades *not only significantly improved the removal of ammonia*, but also *significantly reduced total effluent estrogenicity*. Furthermore, these upgrades resulted in a reduction from 70-100% intersex incidence in male Rainbow Darter in proximity to the WWTP outfall, down to <10%.

It is strongly recommended that the Erin WWTP include these operational processes and treatment technologies in order to ensure the removal of compounds with estrogenic properties, as well as ammonia, in order to protect aquatic species in receiving waters.

* Keegan A. Hicks, Meghan L. M. Fuzzen, Emily K. McCann, Maricor J. Arlos, Leslie M. Bragg, Sonya Kleywegt, Gerald R. Tetreault, Mark E. McMaster, and Mark R. Servos (2017) Reduction of Intersex in a Wild Fish Population in Response to Major Municipal Wastewater Treatment Plant Upgrades. *Environmental Science & Technology 51* (3), 1811-1819.

Closing

The Ministry appreciates the opportunity to review and provide comments on Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment Environmental Study Report. In general, MNRF staff recommends that the surveys and data gaps above be addressed.

If further comment or clarification is required please contact the undersigned. MNRF staff is also available for a meeting to discuss the above comments.

Regards,

TMcKenna

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