Town of Erin

Urban Centre Wastewater Servicing Class Environmental Assessment

Technical Memorandum
System Capacity and Sewage Flows
Draft For Comments

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Technical Memorandum
System Capacity and Sewage Flows

Project No. 115157

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The Town of Erin

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1.0 Introduction

This Technical Memorandum has been prepared in support of the Town of Erin Urban Centre Wastewater Servicing Environmental Assessment (UCWWS EA). The majority of properties within the Village of Erin and Hillsburgh are currently serviced by individual private septic systems. The Servicing and Settlement Master Plan (SSMP), completed by B.M. Ross in 2014, selected a communal wastewater collection system for both communities as the preferred alternative solution to deal with issues related to the private systems. The SSMP undertook part of Phase 1 and part of Phase 2 of the Class Environmental Assessment process and the Town is now engaged in completing these two phases and moving on to complete Phase 3 and Phase 4 of the Class EA process.

This Technical Memorandum outlines the flow volumes anticipated from each area that has been recommended for connection to the future communal sanitary collection system for the Town. The areas recommended for inclusion or exclusion for the wastewater system are shown in ***Appendix A***. Further, this report will outline the potential discharge volume to the West Credit River on the basis of the revised assimilative capacity report and outlines the amount of growth that the overall system could potentially accommodate.

2.0 Objectives

The objectives of this Technical Memorandum are as follows:

- Identify sanitary sewer flow volumes for each area within the existing urban area of Erin and Hillsburgh.
- Confirm the discharge potential to the West Credit River.
- Establish growth potential for the Town based on the proposed servicing limits for the communal wastewater system.

3.0 SSMP Overview of Flows and Discharge

In 2013, B. M. Ross conducted an Assimilative Capacity Study (ACS) of the West Credit River. The study investigated the impact on the river, as an effluent receiver, under three discharge scenarios: existing population of Erin (3,087 people), existing population of Erin and Hillsburgh (4,481 people), and a Future Population Scenario of 6,000 people. For the purpose of this summary, the impact on the receiver under the “Future Population Scenario” will be discussed.

The report assumed an average water usage rate of 345 litres/capita/day (L/c/d) combined with an inflow and infiltration rate of 90 L/c/d for a total of 435 L/c/d. On the basis of a future population of 6,000 residents the estimated Average Daily Flow (ADF) at 435 L/c/d was therefore 2,610 m^3/d. The ACS reviewed the impact of the discharge on the river at treatment parameter objective concentrations and non-compliance concentrations (summarized in Table 1 below).

Table 1 – SSMP Effluent Parameters

Parameter	Objective	Non-Compliance
TSS (mg/L)	3.0	10
Total Phosphorus (mg/L)	0.1	0.15
Total Ammonia (mg/L)	0.4	2.0
Nitrate-Nitrogen	5	6
TKN (mg/L)	-	3
BOD_5	3.6	7.5

The impact of each parameter on the river was evaluated on a month-by-month basis using monthly 7Q20 flow values developed for the report. Of the parameters considered at the assumed discharge of 2,610 m^3/d, the only concern was a slight exceedance for total nitrate nitrogen compliance limit during the month of February. This assessment was completed on the basis of increasing the phosphorus concentration in the West Credit River up to a limit of 0.03 mg/L corresponding to the Provincial Water Quality Objective (PWQO).

The result of the SSMP was an identified servicing capability of 6,000 persons including the existing population and new growth. While the SSMP identified an existing population of 4,481 persons within the proposed service area, no detailed flow contributions were presented and there was no discussion on "equivalent population" representing flows from institutional, commercial and industrial areas.

3.1 ACS Update Results

As part of this phase of the Class EA process, the Ministry of Environment and Climate Change (MOECC) and the Credit Valley Conservation (CVC) Authority requested updates to the work completed in the SSMP including revisiting the 7Q20 flow values and reevaluating the assimilative capacity of the West Credit River based on updated 7Q20 flows and recommended effluent objective and compliance concentrations of the key effluent parameters. The updated ACS also provides an analysis of all other parameters including dissolved oxygen. The updated ACS is provided as a separate report and the results incorporated into this Technical Memorandum which calculates flow and capacity based on the updated 7Q20 flow.

While the effluent discharge to the West Credit River will be required to meet a full range of compliance limits for various discharge parameters in order to secure MOECC approval, for the purpose of this Technical Memorandum, phosphorus concentration is assumed to be the parameter that limits the amount of treated wastewater effluent that can be discharged to the river. The West Credit River is defined as a Policy 1 stream for management of surface water quality as it has a Total Phosphorus (TP) concentration of between 0.011 – 0.015 mg/L, well below the PWQO of 0.03 mg/L and will have to be managed to remain below the PWQO. While the SSMP assumed a downstream phosphorus concentration of 0.03 mg/L after mixing with the wastewater effluent, discussions with MOECC and CVC throughout the ACS update established that it would be inappropriate to model the wastewater discharge to this limit. Based on this, Hutchinson Environmental Sciences Ltd (HESL) was requested to identify an appropriate downstream phosphorus concentration to ensure that the river remained a Policy 1 receiver while maintaining the appropriate level of water quality. ***Appendix B*** contains HESL's

memorandum titled "Recommended Downstream TP Target for West Credit River at Winston Churchill Blvd" which recommends a "Site Specific Target" for Phosphorus downstream of the proposed effluent discharge.

Based on this analysis, it is recommended that a downstream Site Specific Water Quality Objective (SSWQO) of 0.024 mg/L TP be adopted to protect the cold water habitat and water quality in the West Credit River, consistent with Environment Canada and Canada Council of Ministers of the Environment (CCME) guidance. This target aims to maintain the current trophic status of the river. A higher water quality objective is not recommended as the effect of changing the trophic status of the river on brook trout and other aquatic life in the West Credit River is not well understood at this time.

Targeting a fully mixed West Credit River phosphorus concentration of 0.024 mg/L, a range of wastewater effluent scenarios were modeled as outlined in Table 2.

Table 2 – Updated ACS Effluent Discharge Potential (River Concentration 0.024 mg/L)

Effluent Phosphorus Concentration (mg/L)	Discharge Potential (m^3/d)
0.15 mg/L	1,234
0.1 mg/L	2,050
0.07 mg/L	3,380
0.05 mg/L	5,982
0.046 mg/L	7,172

It is noted that the 2,610 m^3/d discharge potential identified in the SSMP associated with a downstream phosphorus concentration of 0.03 mg/L can no longer be achieved at a wastewater effluent concentration of 0.15 mg/L.

4.0 Wastewater Flow Design Basis

4.1 Flows from Existing Developed Communities

In recent years it has been recognized, through changes to the plumbing code and additional efforts to reduce water use; that the wastewater flow rates historically used in Ontario for design of wastewater systems, are high and could result in unnecessary infrastructure spending. More typically, wastewater system capacities are being designed based on lower actual flows. While Erin does not have wastewater flow data available, data for municipal water usage exists and provides a guide for estimating wastewater flow. The current MOECC guidelines for sewage works design suggest a design value of 450 L/c/d for the sizing of wastewater systems. In light of existing water use data, our approach is geared towards optimizing system design by determining a flow estimation value which reflects the actual water use in the existing communities.

The majority of Erin and Hillsburgh planned wastewater service area is presently serviced by municipal water. The water taking records from 2013-2015 were obtained from the Town and the monthly total

water demand for this period is summarized in Figure 1. The 3-year average shows the trend of increased water usage during the summer months typically associated with warm weather activities such as lawn/garden watering, car washing, driveway washing, etc. Normally, the increased water usage in the summer is not reflected in increased wastewater flows to municipal systems during that period. Typically a baseline water usage rate exists throughout the year for in-home use including laundry, showers, flushing, dishwashing, etc. and this is reflected in a relatively constant wastewater flow throughout the year.

For Erin, based on the average monthly water usage rates, the baseline overall water usage rate was determined to be 29,500 m^3/month (average of 9 months less June, July, August) which equates to approximately 215 L/c/d considering an existing water service population of approximately 4450 residents. Further, the water taking records reflect the volume of water pumped into the distribution system, not necessarily the volume of water use by residents/businesses/industry in the serviced communities. Typically, water distribution systems have a portion of distributed water unaccounted for through system leaks and operational uses. An efficient system may still have unaccounted for water of up to 10% of distributed water in this manner. Based on this analysis, we can realistically conclude that the Erin per capita wastewater generation rate may be approximately 195 L/c/d. For the purposes of this study it is suggested that a 50% safety factor be used for design over and above this baseflow. It is therefore proposed to use a residential wastewater generation rate of 290 L/c/d. This generation rate is exclusive of flow generated through inflow and infiltration (I&I) sources.

The proposed residential wastewater generation rate is around the mid-range of design standards used by various locations within southern Ontario. Several example locations and their respective rates are outlined in Table 3. Although this will be a completely new wastewater system, the existing residential water use pattern is well established and wastewater flow rates towards the lower end of the range may not be realized. It is therefore prudent to allow for a higher rate of 290 L/c/d.

Table 3 – Sewage Generation Assumptions, Southern Ontario

Design Standard	Residential Flow Rate
City of Barrie	225 L/c/d
Region of Halton	275 L/c/d
Region of Peel	303 L/c/d
Region of Waterloo	350 L/c/d
MOECC (design guidelines)	450 L/c/d

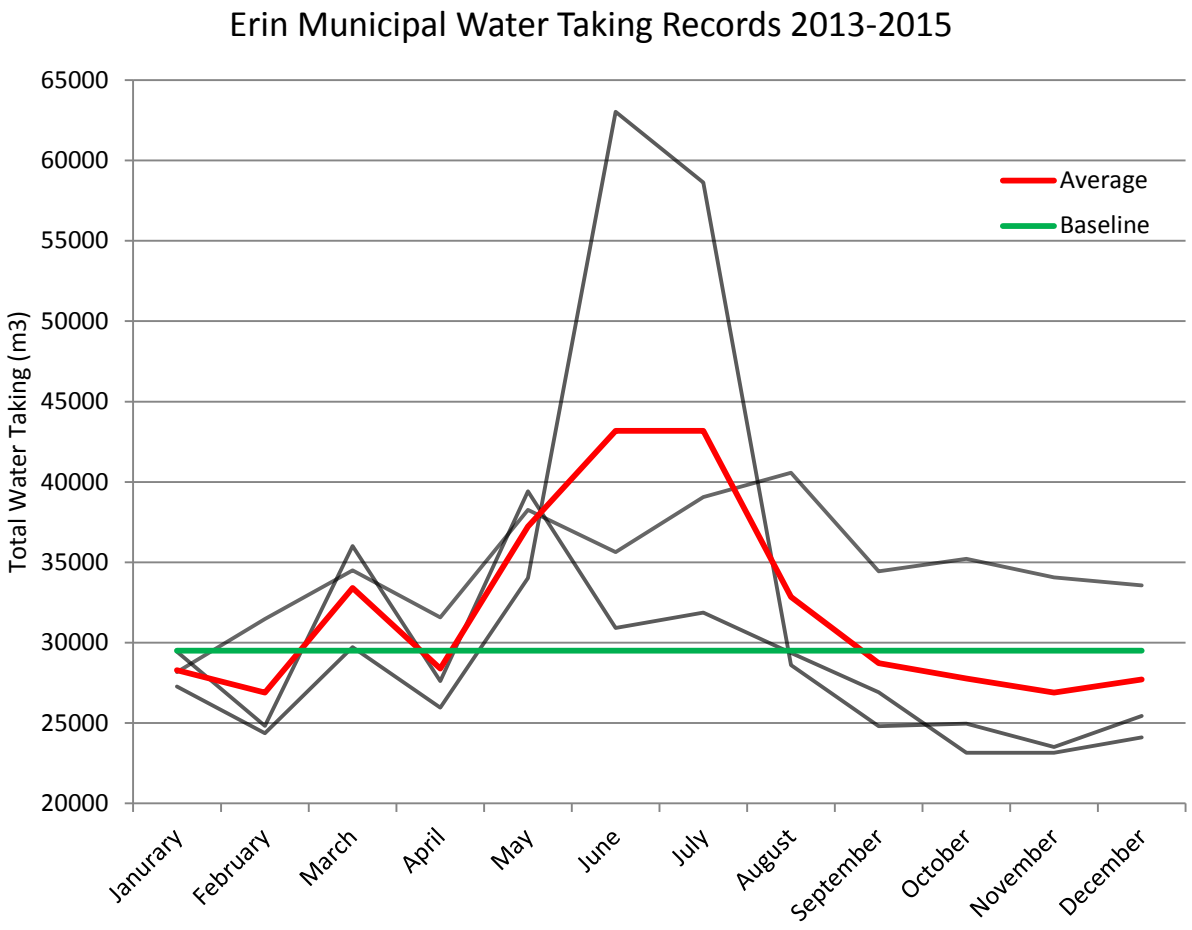

Figure 1 – Erin Municipal Water Taking Records

Table 4 outlines the assumptions used to generate the estimated average daily flow for residential, institutional, commercial and industrial flows as well as inflow and infiltration from the existing properties in Erin.

Table 4 – Flow assumptions for preliminary design

Residential Flow	290 L/c/d
Inflow and Infiltration	90 L/day/capita
School Flow	95 L/student/day
Industrial Flow	9 m^3/ha/d
Commercial Flow	28 m^3/ha/d

The industrial flow assumption has been revised down to 9 m^3/ha/day (from the MOECC standard 28 m^3/ha/day), in light of existing water use data from 2013-2016. This flow allocation is representative of "dry" industries. Future proposals for industrial developments in Erin would likely need to look at the

total allocation to industrial/commercial and will also need to look at the nature of the discharge in terms of its effect on treatment and discharge to the West Credit River.

The inflow and infiltration assumption is based on the MOECC design guidelines.

The volume of wastewater generation from the existing developed communities of Erin and Hillsburgh was calculated on an area by area basis using the property database developed for the Septic System Report for those areas recommended to be connected to the communal wastewater system and using the per capita flows established herein. The database includes existing properties serviced by private sewage systems within the communities.

In addition to flows from existing serviced properties, the recommended areas for communal wastewater servicing may also be expected to generate wastewater flows from vacant lots (infill) and from intensification of development on existing serviced lots.

Average daily flows and peak flows were calculated by area. Peak flows were also determined for each community and for both communities combined. Peak flows were calculated using the Harmon Peaking Factor calculation.

4.2 Wastewater Flows from Future Planned Growth Areas

Growth areas are designated in the Town's Official Plan (OP). These areas were confirmed with the County of Wellington and are illustrated in ***Appendix C.*** Also based on discussions with the County of Wellington, the assumed density of residential development is 16 units/ hectare and 2.8 persons per unit. Residential populations are therefore based on this density. Flow contributions from institutional/commercial/industrial growth areas expressed as an equivalent population are determined by calculating the flows based on the flow assumptions in Table 4 and then dividing by the per capita flow contribution of 380 L/C/D. The growth areas considered within the analysis are listed in Table 5 below:

Table 5 – New Growth Areas and Equivalent Population

Identification	Designation	Area (Ha)	Equivalent Population
ER-11	Erin - Residential	14	627
ER-13	Erin - Residential	38	1,702
ER-14	Erin - Residential	18	806
ER-15	Erin - Residential	42	1,882
ER-16	Erin - Residential	3	135
Ind.	Erin - Residential	4.2	188
Ind.	Erin – Industrial	15.3	362
Ind.	Erin – Industrial	15.3	362
Ind.	Erin – Commercial	7.8	575
Erin - Total		157.6	6,639
ER-02	Hillsburgh - Residential	9	403
ER-03	Hillsburgh - Residential	25	1120
ER-04	Hillsburgh - Residential	13	583

ER-05	Hillsburgh - Residential	6	269
ER-06	Hillsburgh - Residential	14	627
ER-07	Hillsburgh - Residential	20	896
ER-45	Hillsburgh - Residential	15	672
Ind.	Hillsburgh – Industrial	7.7	182
Hillsburgh Total		109.7	4,752
Total		267.3	11,391

5.0 Wastewater Flows from Proposed Communal System

5.1 Servicing Existing Developed Communities

The extent of the proposed communal wastewater service area for the existing communities has been identified in the Septic System Survey Technical Memorandum and that technical memorandum includes the rationale for inclusion or exclusion of various sections of the communities on an area by area basis. The results of the study indicate that the entire urban areas of both Erin Village and Hillsburgh should be included in the communal service area except for North East Erin, South Erin, and Upper Canada Drive. The boundaries of the proposed wastewater communal system servicing existing developed communities, are shown in ***Appendix A.*** This Technical Memorandum addresses the flow estimate from only those areas recommended to be in the communal wastewater system.

This section addresses the total wastewater flows from all of the existing developed areas recommended to be serviced by the communal wastewater system. The detailed flow determinations on an area by area basis are shown in ***Appendix D*** for Erin and ***Appendix E*** for Hillsburgh.

In determining wastewater flows from existing developed urban areas it is necessary to determine the flow from existing serviced lots and also to determine the flows from infill development of undeveloped lots. It is also prudent to consider the possibility of intensification as the change from private wastewater systems to communal sewage systems provides the opportunity for properties, especially in downtown core areas, to construct larger commercial properties. For this reason, this Technical Memorandum addresses flows for the proposed existing area in terms of these three components (Existing Lots, Infill Lots and Intensification).

In addition, it is prudent to consider the full build out of existing areas (Existing Lots, Infill Lots and Intensification) when allocating system capacity to the existing communities.

On the basis of the flow assumptions presented in Section 4.0 Wastewater Design Flow Basis, and the detailed area by area flow calculations shown in ***Appendix D*** and ***Appendix E***, the anticipated flow from existing serviced lots in the proposed collection area is presented in Table 6. The ADF flow estimate represents the average daily flow while Peak Day Flow Estimate represents the peak daily flow expected for a gravity system experiencing Inflow and Infiltration. While other collection system alternatives will be considered to eliminate or reduce Inflow and Infiltration, this memorandum considers the worst case in order to establish a minimum potential system capacity.

Table 6 – Sanitary Collection System Flow Estimation – Existing Developed Lots

Location	Equivalent Population[2]	Residential Population	ADF Flow Estimate (m^3/d)	Peak Day Flow Estimate (m^3/d)
Erin	4,852	2,943	1,844	6,006
Hillsburgh	1,513	1,327	575	2,113
Total	6,365	4,270	2,419	7,610[1]

[1] Peak Day Estimates are calculated using the Harmon Peaking Factor and therefore the peak day estimates for each location do not sum to the total.

[2] Equivalent Population (EP) represents Residential Population plus institutional/commercial/industrial wastewater flow sources expressed as the equivalent number of residents, while Residential Population represents the "actual" population exclusive of institutional/commercial/industrial wastewater flows.

It is noted that while the SSMP used an existing population of 4,481, it is not clear whether this represented an equivalent population or simply the existing residential population. None-the-less the estimated equivalent population from the proposed existing communal serviced area is 6,365 which is significantly more than the existing residential population.

It is also noted that the latest available estimated existing residential population of the two urban areas is 4,415 (C N Watson and County Planning). The residential population shown in Table 6 represents the estimated population for the proposed service area while the C N Watson and County Planning estimate is based on the whole urban areas population.

As noted, vacant lots throughout both Erin and Hillsburgh were tallied under the assumption that these lots would be allocated capacity for connection to the proposed sanitary system. The lot tally was conducted using Google Earth images. Vacant lots within industrial areas were assumed to be reserved for industrial development, likewise for residential and commercial areas. The equivalent population and estimated flow rates for the infill lots is presented in Table 7.

Table 7 – Sanitary Collection System Flow Estimation - Infill

Location	Equivalent Population	Residential Population	ADF Flow Estimate (m^3/d)	Peak Day Flow Estimate[1] (m^3/d)
Erin	720	125	273.5	903
Hillsburgh	26	26	10	33
Total	746	151	283.5	935

[1] Peaking Factor assumed to be 3.3 based on the existing population

As the existing communities are on private septic systems it has been difficult for property owners to add to the existing development on their existing lots. There is typically insufficient space to increase the wastewater disposal bed size on most lots. When the communities are serviced with a communal wastewater system, some amount of intensification will likely occur in the core areas where there will be increased opportunity for more commercial activity. For this reason, it is prudent to assume rates of

intensification for various areas of Erin and Hillsburgh under the assumption that the communities will further develop on the communal wastewater system. This assumption will help ensure that the design of the proposed system will allow for a moderate amount of intensification to occur without impacting the performance of the system. The equivalent population and estimated flow rates for intensification is presented in Table 8.

Table 8 – Sanitary Collection System Flow Estimation - Intensification

Location	Equivalent Population	Residential Population	ADF Flow Estimate (m^3/d)	Peak Day Flow Estimate (m^3/d)
Erin	333	157	126.6	417.8
Hillsburgh	38	38	14.4	47.5
Total	371	195	141	465.3

[1] Peaking Factor assumed to be 3.3 based on the existing population

Considering the total flow estimate from the existing lots, infill lots and intensification, Table 9 summarizes the total equivalent population and Table 10 summarizes the total estimated wastewater flow needed to service the existing developed areas. It is also noted that the expected residential population for build out of these the existing areas proposed for servicing is 4,616.

Table 9 – Equivalent Population Summary, Servicing Existing Areas

	Existing Equivalent Population	Infill Population	Intensification Population	Total Equivalent Population
Erin	4,852	720	333	5,905
Hillsburgh	1,513	26	38	1,577
Total	6,365	746	371	7,482

Table 10 – ADF Flow Summary, Servicing Existing Areas

	Existing Flow m^3/d	Infill Flow m^3/d	Intensification Flow m^3/d	Total ADF Flow m^3/d
Erin	1,844	273.5	126.6	2,244.1
Hillsburgh	575	10	14.4	599.4
Total	2,419	283.5	141	2,843.5

5.2 Servicing Future Planned Growth Areas

The total potential growth for the communities based on available land designated in the OP as shown in Table 5 is summarized in Table 11. The per capita wastewater flow assumptions outlined in Table 4 were applied to planned growth areas and equivalent populations to establish projected wastewater flows from these areas.

Table 11 – New Growth Areas, Equivalent Population and ADF Estimate

Identification	Designation	Equivalent Population	ADF Estimate (m^3/d)
ER-11	Erin - Residential	627	238.3
ER-13	Erin - Residential	1,702	646.9
ER-14	Erin - Residential	806	306.4
ER-15	Erin - Residential	1,882	715.0
ER-16	Erin - Residential	135	51.1
Ind.	Erin - Residential	188	71.5
Ind.	Erin – Industrial	362	137.7
Ind.	Erin – Industrial	362	137.7
Ind.	Erin - Commercial	575	218.4
Erin - Total		6,639	2,523
ER-02	Hillsburgh - Residential	403	153.2
ER-03	Hillsburgh - Residential	1120	425.6
ER-04	Hillsburgh - Residential	583	221.3
ER-05	Hillsburgh - Residential	269	102.1
ER-06	Hillsburgh - Residential	627	238.3
ER-07	Hillsburgh - Residential	896	340.5
ER-45	Hillsburgh - Residential	672	255.4
Ind.	Hillsburgh – Industrial	182	69.3
Hillsburgh Total		4,752	1805.7
Total		11,391	4,328.7

Table 12 – Sanitary Collection System Flow Estimation – New Growth Areas

Location	Equivalent Population	Residential Population	ADF Flow Estimate (m^3/d)	Peak Day Flow Estimate[1] (m^3/d)
Erin	6,639	5,340	2,523.0	7,316
Hillsburgh	4,752	4,603	1,805.7	5,237
Total	11,391	9,943	4,328.7	12,553

[1] Peaking Factor assumed to be 2.9 based on the total growth population

5.3 Full Build Out Wastewater Flow

Full Build out wastewater flow represents the total estimated wastewater flow that would be generated from the existing developed areas of Erin and Hillsburgh and the total wastewater flow from all planned growth areas identified in the Official Plan. Table 13 shows the full build out flows and Table 14 shows the estimated equivalent population and estimated residential population that would need to be serviced to achieve full build out of the Official Plan. While Equivalent Population includes an allowance for institutional, commercial and industrial flows, the Residential Population represents the actual estimated serviced population. The "Existing Community" in both Table 13 and Table 14 includes infill and intensification.

Table 13 – Full Build Out ADF Flow Summary (m^3/d)

	All Development			Residential Development		
	Erin	Hillsburgh	Total	Erin	Hillsburgh	Total
Existing Community	2,244.1	599.4	2,843.5	1,225.5	528.6	1,754.1
Growth Areas	2,523.0	1,805.7	4,328.7	2,029.2	1,749.1	3,778.3
Total	4,767.1	2,405.1	7,172.2	3,254.7	2,277.7	5,532.4

Table 14 – Full Build Out Population Summary

	Equivalent Population			Residential Population		
	Erin	Hillsburgh	Total	Erin	Hillsburgh	Total
Existing Community	5,905	1,577	7,482	3,225	1,391	4,616
Growth Areas	6,639	4,752	11,391	5,340	4,603	9,943
Total	12,544	6,329	18,873	8,565	5,994	14,559

6.0 Balancing Estimated Wastewater Flows and Effluent Discharge Potential

6.1 Effluent Discharge Scenarios

Using the Updated ACS Effluent Discharge Potential shown in Table 2, the total equivalent population under each phosphorus effluent concentration scenario is outlined in Table 15. The TP effluent discharge concentrations of 0.15 mg/l (used in the SSMP) and 0.10 mg/l have no longer been included because they do not allow the existing community to be serviced.

Equivalent populations are derived from the ADF flows and the per capita flow contribution of 380 L/c/d which is associated with a gravity sewer system and includes an allowance for inflow and infiltration. The residential populations are derived from the previously calculated residential population from the existing areas plus the residential populations from the growth areas at 45 persons per hectare.

Table 15 – Equivalent Population for Discharge Scenario (River Concentration 0.024 mg/L)

Servicing Limits For Flow and TP Discharge Concentration Limits	TP Effluent Discharge Concentration (mg/L)	Equivalent Population Potential	Residential Population	ADF (m^3/d)
Fully Service Existing Community	0.079	7,482	4,616	2,844
Potential Stage 1 Servicing	0.07	8,895	6,029	3,380
Potential Stage 2 Servicing	0.05	15,742	12,876	5,982
Potential Stage 3 Servicing (Full Build Out)	0.046	18,873	14,559	7,172

To service the existing community including infill and intensification would require a wastewater treatment plant to achieve a TP effluent discharge concentration of 0.079 mg/l.

To achieve full build out of the Official Plan (O.P.) including all of the designated growth areas, would require a wastewater treatment plant to achieve a TP effluent discharge concentration of 0.046 mg/l.

The Stage 1, Stage 2 and Stage 3 servicing options are discussed below.

6.2 Treatment Technology Limits for Phosphorus Removal

For the purposes of this Technical Memorandum, it is assumed that meeting the discharge limits for phosphorus into the West Credit River will be the most critical treatment parameter limiting system capacity. As outlined in Section 3 of this Technical Memorandum, it is recommended to adopt a downstream phosphorus concentration of 0.024 mg/l to protect water quality in the river. Phosphorus effluent concentrations from the proposed treatment plant that maintains this downstream level of phosphorus, will therefore dictate the flow that can be discharged and dictate the capacity of the system. Based on this, treatment technologies adopted for phosphorus removal in the treatment plant, will likewise dictate the capacity of the system.

Treatment technologies and overall project phasing will be considered in more detail during Phase 3 and 4 of the Class EA as an implementation plan is developed. Having established the wastewater flows and discharge limits needed to meet full build out of the Official Plan, it is necessary to identify whether it is practical to achieve these limits using available treatment technologies.

Treatment of municipal wastewaters using primary, secondary and tertiary treatment, can reliably achieve an effluent phosphorus concentration below 0.1 mg/l. A range of treatment alternatives including biological phosphorus removal, chemical addition and sand filtration has been used for many decades to achieve this level of removal. In addition to these traditional methods used to remove phosphorus, there are several technologies available that can achieve an effluent concentration below 0.03 mg/l. While at present, 0.03 mg/l may be considered the limit that can reliably be achieved by best available technologies, MOECC appears to have adopted a cautious approach to approval of treatment systems at this limit. While it is considered that the effluent concentration of 0.046 mg/l needed to meet full build out conditions, can be achieved through application of best available technology, it is likely necessary to adopt a staged approach to achieving this limit in order to satisfy MOECC that it can be reliably achieved.

It is therefore suggested that a staged approach could be adopted to achieve full build out condition. This approach would use best available technology combined with a process of treatment plant rerating based on operational results. It should also be noted that, while MOECC issue an approval based on compliance limits, they also set operational objectives to ensure that treatment plants reliably meet their compliance limits. For example, a compliance limit of 0.1 mg/l may also have an objective of 0.08 mg/l that the plant needs to meet.

While phasing will be considered in more detail during Phase 3 and 4 of the Class EA, the following is staging plan is suggested to illustrate the potential for servicing at various Effluent Limits.

6.3 Stage 1 – Effluent Phosphorus Limit 0.07 mg/L

A phosphorus effluent compliance limit of 0.07 mg/L with an operational objective of 0.05 mg/l would provide for the following:

- Equivalent service population limit of 8,895
- Existing lots, infill and intensification can be serviced with 1,413 equivalent population still available for new growth
- Actual residential population could increase to 6,029
- The treatment plant could be operated to demonstrate reliable performance under 0.05 mg/l sufficient to apply for rating to meet Stage 2 limits

6.4 Stage 2 – Effluent Phosphorus Limit 0.05 mg/L

A phosphorus effluent compliance limit of 0.05 mg/L with an operational objective of 0.04 mg/l would provide for the following:

- Equivalent service population limit is 15,742
- Existing lots, infill and intensification can be serviced with 8,260 equivalent population still available for new growth
- Actual residential population could increase to 12,876
- The treatment plant could be operated to demonstrate reliable performance under 0.04 mg/l sufficient to apply for rating to meet full build out limits

6.5 Stage 3 – Effluent Phosphorus Limit 0.046 mg/L

A phosphorus effluent compliance limit of 0.046 mg/L with an operational objective of 0.04 mg/l representative of full build out of the Official Plan, would provide for the following:

- Equivalent service population limit is 18,873
- Existing lots, infill and intensification can be serviced and still allow for 11,391 equivalent population meeting full development of all new growth areas
- Actual residential population could increase to 14,559

7.0 Conclusions and Recommendations

The Servicing and Settlement Master Plan (SSMP) identified an existing communal wastewater serviced population of Erin and Hillsburgh at 4,481 people and a potential future total population of 6,000 based on an estimated wastewater Average Daily Flow (ADF) of 435 L/c/d resulting in a wastewater flow of 2,610 m^3/d discharging to the West Credit River at an effluent phosphorus concentration of 0.15 mg/l to achieve a downstream phosphorus concentration in the West Credit River of 0.03 mg/l corresponding to the Provincial Water Quality Objective for Phosphorus.

The objective of this Technical Memorandum is to:

- More accurately identify predicted wastewater flows from the existing urban areas of Erin and Hillsburgh and from planned growth areas in both of these communities;
- Confirm the discharge potential to the West Credit River based on an updated Assimilative Capacity Study and to confirm the potential to service the urban areas of Erin and Hillsburgh with a communal wastewater system based on the ability to meet discharge limits to the river.

This Technical Memorandum concludes the following:

- The SSMP does not represent a realistic wastewater system capacity scenario based on either downstream phosphorus limits in the West Credit River or based on available wastewater treatment technologies for effluent discharge;
- Whereas the SSMP recommended a downstream TP of 0.03 mg/l; a Site Specific Water Quality Objective (SSWQO) of 0.024 mg/l is a more appropriate downstream TP concentration for the West Credit River, in order to protect the cold water habitat and water quality in this Policy 1 receiver;
- To further protect water quality it is recommended that a target of "net zero" increase in phosphorus loading be adopted, such that the cumulative phosphorus loading from municipal wastewater effluent and stormwater runoff must not increase between the pre-development and post-development condition;
- Whereas the SSMP recommended use of an average daily flow of 435 L/c/d; given the level of municipal water consumption in Erin and Hillsburgh, 380 L/c/d is a more appropriate per capita flow contribution for wastewater;
- Whereas the SSMP identified a wastewater flow of 2,610 m3/d to service a population of 6,000; this Technical Memorandum establishes the wastewater flows necessary to service both existing communities and to service all growth areas defined in the Town Official Plan (OP);
- Based on a detailed assessment of the wastewater servicing requirements, the following wastewater flows would result:
    - To fully service Existing Communities with infill growth 2,844 m^3/d
    - To service New Growth Areas Defined in Town Official Plan 4,328 m^3/d
    - Resulting in a total estimated wastewater flow 7,172 m^3/d
- Servicing the existing communities and new growth areas would result in the following residential populations:
    - To fully service Existing Communities with infill growth 4,616 persons
    - To service New Growth Areas Defined in Town Official Plan 9,943 persons
    - Resulting in a total residential population 14,559 persons
- This Technical Memorandum assumes that TP is the limiting parameter for discharge of treated effluent to the West Credit River;
- This Technical Memorandum assumes that the collection system will be a gravity system and makes allowance for inflow and infiltration into the sewers;

- Based on the results of the Assimilative Capacity Study, the following TP effluent Limits would need to be met from a Wastewater Treatment Plant to service the existing communities and new growth:
    - To fully service Existing Communities with infill growth 0.079 mg/l
    - To service Full Build Out of the Town Official Plan 0.046 mg/l
- Treatment technologies will be reviewed and recommended during Phase 3 of this Class EA, however, it is considered that Best Available Technology for phosphorus removal can meet an effluent limit required to achieve full build out of the Town Official Plan;
- It is suggested that the Town of Erin should target a future TP effluent limit of 0.046 mg/l to meet the requirements of full build out of the Town OP;
- It is recognized that additional operating experience with available technologies may need to be demonstrated in order to secure approval from MOECC for an effluent limit of 0.046 mg/l and a staged approach may be necessary in order to achieve this approval in future;
- While it is recommended that a SSWQO of 0.024 mg/l be established to protect water quality in the river, it is recommended that water quality be monitored through phased implementation of wastewater servicing. A relaxation of the SSWQO from 0.024 mg/l to 0.025 mg/l would mean that a treated effluent limit of 0.05 mg/l could achieve full build out of the Town Official Plan;
- While this Technical Memorandum addresses wastewater servicing requirements to meet full build out of the Town OP, it does not address the municipal water requirements to meet full build out of the OP.

Based on the results of this study and the ACS, it is concluded that the Town of Erin can implement a communal wastewater system for the Village of Erin and for Hillsburgh that meets the wastewater servicing requirements of the existing communities including infill and intensification of these areas and can also service all new growth areas identified in the Town Official Plan while protecting water quality in the West Credit River and utilizing “Best Available Technology” for phosphorus removal.