

Bradford West Gwillimbury Water Pollution Control Plant

Environmental Study Report Phases 3 and 4

Final - March 2012

Submitted by

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Abbreviations and Acronyms

°C	degrees Celsius
ADF	Average Day Flow
B&V	Black & Veatch Canada
BAF	Biologically Aerated Filter
bioP	biological phosphorus removal
BNR	Biological Nutrient Removal

BOD5	Biological Oxygen Demand (in five days)
CAS	Conventional Activated Sludge
CBOD5	Carbonaceous Biological Oxygen Demand (in five days)
Class EA	Municipal Class Environmental Assessment
cm	centimetre
cm/s	centimetre per second
CofA	Certificate of Approval
DAF	Dissolved Air Flotation
dB	decibel
DO	Dissolved Oxygen
Dwg.	Drawing
EA	Municipal Class Environmental Assessment
EBR	Ontario Environmental Bill of Rights Registry
E. coli	Escherichia coli
EPA	United States Environmental Protection Agency
ESR	Environmental Study Report
F/M ratio	food to microorganism ratio
GE	General Electric
HESL	Hutchinson Environmental Sciences Ltd.
HRT	Hydraulic Retention Time
Hwy	Highway
I/I	Inflow and Infiltration
ICI	Industrial, Commercial and Institutional
IFAS	Integrated fixed-film activated sludge
kg	kilogram
kg/day	kilogram per day
kg/year	kilogram per year
L	litre
L x W x H	Length times width times height
L/c/d	Litres per capita per day
lmh	Litres per square metre per hour
LOT	Limit of Technology
LSEMS	Lake Simcoe Environmental Management Strategy
LSPP	Lake Simcoe Protection Plan
m	metre
m/s	metres per second
m2	square metre
m3	cubic metre
m3/day	cubic metre per day
Max.	Maximum
MEA	Municipal Engineer's Association
mg/L	milligram per litre
mL	millilitre
ML/d	Megalitres per day
MLD	Megalitres per day / Million litres per day
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed liquor volatile suspended solids
MOE	Ontario Ministry of the Environment

n/a	not applicable
NH3	un-ionized Ammonia
NH3 + NH4	Ammonia
NHIC	Natural Heritage Information Centre
NMS	Nutrient Management Strategy
No.	Number
NPV	Net Present Value
O&M	Operations and Maintenance
OMB	Ontario Municipal Board
OP	Official Plan
OPA#1	Official Plan Amendment Number 1
O.Reg.	Ontario Regulation
o/s	out of service
P	phosphorus
PAO	Phosphorus Accumulating Organisms
PF	Peak Flow
PIC	Public Information Centre
ppu	persons per unit
PRS	Phosphorus Reduction Strategy
PWQO	Ontario Provincial Water Quality Objectives
Q	Flow
RAS	Return Activated Sludge
SBR	Sequencing Batch Reactor
SLR	Solids Loading Rate
SOR	Surface Overflow Rate
SPR	Shoreline Protection Regulation
SRT	Solids Retention Time
TAL	Technology Achievable Limit
TKN	Total Kjeldahl Nitrogen
Town	Town of Bradford West Gwillimbury
TP	Total Phosphorus
TSS	Total Suspended Solids
UV	Ultraviolet
VFA	Volatile fatty acid
VSS	Volatile Suspended Solids
WAS	Waste Activated Sludge
WCES	Water Conservation and Efficiency Strategy
WEFTEC	Water Environment Federation Technical Exhibition and Conference
WERF	Water Environment Research Foundation
WPCP	Water Pollution Control Plant
WQT	Water Quality Trading feasibility study

EXECUTIVE SUMMARY

Background

To accommodate planned growth, the Town of Bradford West Gwillimbury completed a Master Servicing Plan Update to satisfy the requirements of Phases 1 and 2 of the Class Environmental Assessment planning process. The Master Plan Update was documented in a Report entitled "Water Supply and Wastewater Servicing Master Plan Update, Town of Bradford West Gwillimbury, Class Environmental Assessment, Final Study Report" (C. C. Tatham & Associates Ltd, March 31, 2011). The Study identified the need for additional wastewater treatment capacity and recommended that the existing WPCP be expanded. The Town retained the team of Ainley & Associates Limited and Black & Veatch Canada (Ainley/B&V) in January 2011, to undertake Phases 3 and 4 of the Class EA planning process and to document the planning in an Environmental Study Report.

Class EA - Phase 1

The Town issued a Notice of Study Commencement on May 21, 2008, which advised the public that the Town was investigating "…alternative solutions for water supply and wastewater treatment to accommodate the short-term and 25-year projected population growth….".

Phase 1 included determination of the socio-economic and natural environments of the Study Area. The Town's existing sewage collection system and water pollution control plant were described in general detail. The servicing requirements were outlined and were presented in Table 5 of the Servicing Master Plan Update. The future average day and peak flows were determined to be 23,300 m3/d and 53,400 m3/d respectively (Table 12 of the Servicing Master Plan Update).

The Problem Statement was defined as part of the Phase 1 Class EA as follows:

"A Master Servicing Study for water supply and wastewater treatment capacity was completed in January 2003, and an Addendum to the Water Servicing Study was completed in September 2003. The resulting master servicing plans need to be updated to accommodate the planned growth as set out in the Town's Official Plan and amendments. The preferred water supply and wastewater treatment solutions will need to comply with all regulations, meet environmental protection and sustainability objectives, and be cost-effective."

Class EA – Phase 2

Phase 2 consisted of identifying possible alternatives to address the problem statement and the selection of the Preferred Alternative. The evaluation determined an expansion of the Bradford WPCP with effluent discharge to the Holland River to be the best alternative.

Class EA - Phase 3

At the commencement of Phase 3, the Town published a Notice to advise the public and the review agencies of its intent to complete the Class EA planning process (continuing on from the Servicing Master Plan Update). The Notice was published on March 31, 2011 and again on April 7, 2011 in the Bradford Times.

The MOE's Phosphorus Reduction Strategy (PRS), June 2010, identified a new baseline phosphorus compliance load of 698 kg/year for the Bradford WPCP to be achieved by 2015 or by the next plant expansion. The requirement for further incremental reductions will be re-evaluated by the Province in 2015 during the first review of the PRS.

It should be noted that the June 2010 PRS (discussed in Section 6.0) qualified the requirement for future incremental TP loading reductions by stating that a re-evaluation will be completed in 2015. As such, the requirement for staged decreases in TP loading from the Bradford WPCP has not been addressed in this ESR. In addition, the need to include and assess the option of water quality trading was considered to be unnecessary at this time and therefore, the option of water quality trading has not been considered in this ESR.

Hutchinson Environmental Sciences Ltd. Completed an Assimilation Study of the West Holland River and determined that the aquatic habitat and surface water quality of the River at Bradford are degraded. Total phosphorus concentrations in the river exceed the PWQO most of the time and ammonia concentrations are elevated though do meet the PWQO for unionized ammonia. Some metal concentrations consistently exceed PWQOs and turbidity (suspended solids) in the river is high, indicating large algal productivity, and benthic invertebrate communities upstream and downstream of the outfall are indicative of degraded water quality. During low flow, the current (17 MLD) and proposed (23.3 MLD) effluent flow is higher than the river discharge. Therefore, the West Holland River generally does not have a large assimilative capacity. It is proposed to treat the effluent to stringent water quality levels in order to reduce the impact on the River.

The major conclusions of the Assimilation Study are as follows:

1. For all scenarios, the extent of the mixing zone that exceeds the PWQO of unionized ammonia is limited to one side of the river and does not exceed a length of 110 m. Therefore the effluent plume does not represent a barrier to movement of aquatic life.

2. The effluent is diluting total phosphorus concentrations in the river.

3. The effluent meets the requirement of non-lethal toxicity.

These results demonstrate that the proposed effluent from an expanded Bradford West Gwillimbury WPCP will meet the requirements for a mixing zone and for non-lethality and that the effluent can be discharged to the River.

Black & Veatch completed an assessment of the potential to optimize the existing plant. In summary, the existing WPCP can be expanded to a meet the proposed future flow rate of 23.3 MLD through optimization of specific existing treatment processes coupled with the addition of a tertiary phosphorus removal facility. In general the summarized recommendations are as follows:

- Replace or upgrade influent pumps for peak flows
- Re-rate existing screens and install an additional screen and new by-pass channel
- Re-rate activated sludge systems in plants B, C and D and provide required blower capacity
- Provide ballasted flocculation tertiary treatment facility including larger equalization basin
- Install a thickened waste activated sludge facility

A Phase 3 Public Information Centre was held on June 22, 2011 for the purpose of identifying Alternatives to increase the WPCP capacity and to present the Town's Recommended Alternative. Only one major comment was received as a result of the PIC. A letter dated July 8, 2011 was received from Cassels Brock (Lawyer) on behalf of their client, Tsam lands. A concern was expressed that the Tsam lands may not be included in the capacity increase. The Town responded, stating that the Tsam lands were indeed included in the population projection outlined in the Servicing Master Plan Update.

The Steering Committee determined that the following recommendations regarding the proposed capacity increase for the Bradford WPCP would be proposed for public and review agency comment:

1. The Town intends to optimize the existing plant performance, with no additional capital works as an interim phase in order to obtain an immediate capacity increase.
2. Identified upgrades will be undertaken by the Town to increase the capacity of the secondary treatment process to handle a flow rate of 23.3 MLD.
3. The Town will install a facility to thicken waste activated sludge to 4%.
4. The Town will install a larger equalization basin and a ballasted flocculation system to improve phosphorus removal.
5. The budget capital cost estimate for the proposed works is $20 million, which is to be funded through Development Charges. In addition to the above-mentioned recommendations, the Town will undertake to improve its existing water conservation and reuse program.

The Town further requested that the Consulting Team determine the current optimized capacity of the WPCP assuming no capital works were undertaken. A Re-rating Study was completed which concluded that the overall plant capacity could be increased from the currently approved rating of 17.4 MLD to 19.4 MLD by simply upgrading the alum pumping capacity. It is the Town's intention to apply for a re-rated Certificate of Approval prior to proceeding with any major capital works.

Principal Environmental Impacts of the Project and Proposed Mitigating Measures

Due to the fact that the proposed capital works are not major and will not require any land acquisition (all works can be completed within the confines of the existing site), the environmental impacts are related to construction and can be mitigated as outlined in Section 13.

Public's Principal Concerns

Based on comments received as a result of the initial Notice and the PIC, the public does not have any concerns with the proposed works. A summary of all comments received during the Class EA planning process was prepared and is included in Section 16.0.

The Public was given the opportunity to provide comment throughout the Class EA planning process.

As a result of the publication of the initial Notice and the PIC, the Town received some responses from review agencies, mainly asking to be kept informed. The Lake Simcoe Conservation Authority requested pre-consultation and the Ministry of the Environment outlined its "general comments" on the Class EA process.

Project Implementation

It is the Town's intention to apply to the MOE for a re-rating of the plant capacity from the current 17.4 MLD to 19.4 MLD as outlined in this ESR. Assuming the re-rating is approved by the MOE, the Town will, in the future, expand the plant capacity from 19.4 MLD to 23.3 MLD as one stage. The decision to undertake the expansion in one stage (one construction contract) was based on the following considerations:

- If sub-components of the expansion were to be completed on their own (such as the upgrade to the tertiary treatment facility), no additional capacity above 19.4 MLD would be gained; and
- If the Project is broken into three or four sub-components and completed over a number of years the combined total cost of these smaller contracts would most likely be greater than if the works were completed as one contract.

Phase 4

The Notice of Completion, initiating the 30-day public review of the Draft ESR, was published in the January 19 and 26, 2012 issues of the Bradford West Gwillimbury Times.

A copy of the Draft ESR was sent to the Ministry of the Environment, Central Region, Technical Support Section on January 18, 2012 under cover of letter which responded to previous MOE comments.

As a result of the publication of the Notice of completion, the Town received comments from Chippewas of Rama First Nation, (letter dated January 20, 2012), Don Boswell, Senior Claims Analyst, Ontario Research Team, Specific Claims Branch (email dated January 26, 2012) and the MOE (letter dated February 23, 2012).

The Chippewas of Rama First Nation wanted to make sure that Ms. Karry Sandy-McKenzie was included in the Contact list. It is noted that Ms. Sandy-McKenzie was included in the Contact List throughout the Class EA planning process.

Mr. Boswell suggested that additional web sites might need to be researched in order to advise First Nations groups of the Town's intention. The following First Nations groups were identified as a result of the additional research:

- Saugeen First Nation (located west of Owen Sound)
- Chippewas of Nawash First Nation (located on the Bruce Peninsula)
- Wasauksing First Nation (located near Parry Sound)

These three first Nation groups were deemed to be remote from Bradford West Gwillimbury and therefore, they were not added to the Contact List.

The MOE expressed addition comment on the proposed effluent concentration for CBOD as it relates to the DO level in the receiving West Holland River. The MOE also provided additional comment on the Air Quality Impacts Assessment Report. A response letter was provided to the MOE (dated March 23, 2012). In summary, the Town committed to:

- Prepare a work plan (for MOE review and comment) to assess current DO levels in the West Holland River and to model the proposed increase in effluent flow (23.3 MLD) as part of the final design for the future plant expansion,
- Revise the effluent CBOD limit depending on the results of the DO assessment,
- Undertake additional dispersion modeling and an assessment of compliance with O. Reg. 419/05 as part of the final design of the proposed expansion to 23.3 MLD, and
- Identify specific air quality mitigation measures as part of the additional dispersion modeling.

The ESR was finalized on March 23, 2012.

1.0 Introduction

The Town of Bradford West Gwillimbury (BWG) completed Phases 1 and 2 of a Class Environmental Assessment planning process culminating in the documentation of a Servicing Master Plan Update (Final Study Report) dated March 31, 2011 (C. C. Tatham & Associates Ltd.). That "Study Report" identified water and wastewater servicing requirements to address future growth associated with three Official Plan Amendments (OPA 9, 15 and 16). With respect to wastewater treatment, the Servicing Master Plan Update recommended an expansion of the Bradford WPCP to a capacity of 23,300 m3/d taking into account the maximum phosphorus load of 698 kg/year. A copy of the Servicing Master Plan Update is included in Appendix A.

In order to complete the Class EA planning process for the expansion/upgrade of the Town's wastewater treatment capacity, the Town undertook an Expression of Interest/Request for Proposal process to retain a Consulting Engineering Team. The Team of Ainley Group (Ainley) and Black & Veatch Canada (B & V) was awarded the assignment in January 2011.

2.0 Steering Committee

A Steering Committee was formed from members of Town staff and the Consulting Engineering Team (see list below) for the purpose of directing the progress of the Phase 3 and 4 Class EA planning process and to facilitate the decision making process. Steering Committee meetings were held on a regular basis and copies of all meeting minutes are included in Appendix B. In addition, a Workshop meeting was held with Town Operating Staff and a copy of the minutes is also included in Appendix B. A copy of notes prepared from an April 26, 2011 meeting with the MOE is also included in Appendix B.

On June 7, 2011, a presentation was made to Town Council by members of the Steering Committee. A copy of the presentation is included in Appendix B.

The list of Steering Committee Members is as follows:

Debbie Korolnek	- Director of Engineering, Bradford West Gwillimbury
Jon Morton	- Project Manager, Bradford West Gwillimbury
Brad Sullivan	- Chief Plant Operator, Bradford West Gwillimbury
Rick Way	- Senior Plant Operator, Bradford West Gwillimbury
David Latarius	- Engineering Assistant, Bradford West Gwillimbury
Richard Waite	- Project Director, Black& Veatch Canada
Joe Mullan	- Project Manager, Ainley Group
Brian Edwards	- Assistant Project Manager, Black & Veatch Canada
Reid Mitchell	- Ainley Group

3.0 Initial Notification

An initial Notice was prepared and published in the local newspaper on March 31, 2011 and April 7, 2011. The purpose of the Notice was to advise the public and the Review Agencies of the Town's intent to continue with the Class EA planning process and to provide notification of an upcoming Public Information Centre. A copy of the Notice, the Communication List and all related correspondence is included in Appendix C. A summary of the correspondence received as a result of the Initial Notice is as follows:

- Alderville Fist Nation letter dated April 1, 2011 – minimal potential impact, wants to be kept informed
- MOE letter dated April 4, 2011 – General Comments
- Chippewas of RAMA First Nation letter dated April 4, 2011 – direct all future correspondence to Karry Sandy-McKenzie
- Email dated April 4, 2011 from Rob Baldwin of the Lake Simcoe Conservation Authority – requesting information and wanting to attend working group sessions
- Email dated April 20, 2011 from Enbridge – wants to be advised when design is underway in order to protect buried plant
- Email dated April 28, 2011 from R. Baldwin of LSRCA – wants pre-consultation
- Ministry of Aboriginal Affairs letter dated May 20, 2011 – provides suggested First Nations contacts.

4.0 Class Environmental Assessment Planning Process

Ontario Municipalities are subject to the requirements of the Environmental Assessment Act (EAA) for public works projects. The Municipal Engineer's Association's (MEA) "Municipal Class Environmental Assessment" document (October 2000, as amended in 2007) provides municipalities with a phased procedure, approved under the EAA, to plan most municipal works projects. These are usually limited in scale with a predictable set of environmental impacts and mitigation measures. As noted in the MEA Document, the "Key Principles of successful environmental assessment planning" are:

- Consultation
- Reasonable range of alternatives
- Consideration of effects on all aspects of environment
- Systematic evaluation
- Clear documentation
- Traceable decision-making.

The MEA procedure for the BWG WPCP Class EA is a Schedule C planning process, involving five Phases.

- Phase 1 – Problem or Opportunity
- Phase 2 – Alternative Solutions
- Phase 3 – Alternative Design Concepts for Preferred Solution
- Phase 4 – Environmental Study Report
- Phase 5 – Implementation

The Town completed phases 1 and 2 and the planning was documented in the Town's "Water Supply and Wastewater Servicing Master Plan Update (Final Study Report) dated March 31, 2011.

The team of Ainley/Black & Veatch was retained to complete and document Phases 3 and 4 of the Class EA planning process and this ESR provides that documentation. The implementation Phase will be undertaken as necessary by the Town.

5.0 Background Information and Reports

5.1 Water Supply and Wastewater Servicing Master Plan Update, Final Study Report, March 31, 2011

The Water Supply and Wastewater Servicing Master Plan Update (Master Plan Update), provides documentation of the Problem Statement, the Study Area and the identification, assessment and selection of the Preferred Phase 2 Solution regarding wastewater treatment.

The Problem Statement is outlined in Clause 2.1 of the Master Plan Update and is reprinted as follows:

"A Master Servicing Study for water supply and wastewater treatment capacity was completed in January 2003, and an Addendum to the Water Servicing Study was completed in September 2003. The resulting master servicing plans need to be updated to accommodate the planned growth as set out in the Town's Official Plan and amendments. The preferred water supply and wastewater treatment solutions will need to comply with all regulations, meet environmental protection and sustainability objectives, and be cost-effective."

The "Study Area" is defined in Clause 2.2 and on Figure 1 of the Master Plan Update. In general, there are three designated areas within the Town that require municipal wastewater servicing. They are: the Bradford Urban Area, the Highway 400/County Road 88 Area and the Bond Head Settlement Area.

Following publication of a Notice dated October 20, 2008, a Public Information Centre (PIC) was held on November 5, 2008 to present the Recommended Alternatives for water supply and storage and for wastewater treatment. Public comments were summarized in Table 20 of the Servicing Master Plan Update. With respect to wastewater treatment, the following comments are noted:

- WPCP should provide anaerobic treatment to denitrify to reduce nitrate loadings to the Holland River and the Lake
- Include expansion of water conservation programs and encourage incentives for water reduction etc.
- Concerned about internal phosphorus loadings from the West and East Holland Rivers from late fall to early spring, and the impact of the WPCP effluent.
- Interested in effluent dilution and assimilative capacity in the West Holland River when water is pumped out for irrigation in the Holland Marsh.
- Early consultation with MOE.

A Notice of Study Completion was issued on July 15, 2010.

The Preferred Wastewater Solution (related to the existing WPCP) is summarized in the Executive Summary of the Master Plan Update as follows:

"Expansion of the Bradford WPCP to a capacity of 23,300 m3/day.

The required capacity of the expansion assumes that BWG continues to inspect, maintain and upgrade its sanitary sewage collection system such that the current low inflow and infiltration rates are maintained or improved.

The design of the WPCP expansion will consider:

- ***The actual capacity of the WPCP's secondary treatment units, established from stress test results.***
- ***Modifications to the secondary biological treatment process and the sludge treatment and management approach to minimize space utilization, energy usage and costs, and to optimize overall process performance.***
- ***Significant improvements to the tertiary treatment process to comply with an effluent phosphorus concentration of 0.08 mg/L, which would result in a maximum phosphorus load of 698 kg/year at design flows. The design effluent criterion for phosphorus will be confirmed during Phase 3 of the Class EA.***

If required, BWG will consider achieving further reductions in phosphorus loadings by offsetting with other sources of phosphorus and by participating in a water quality trading program, if available."

5.2 Assimilative Capacity Study and Benthic Invertebrate Studies

5.2.1 Desktop Assimilative Capacity Study – 2005

A desktop study was conducted by R.J. Burnside & Associates Limited in February 2005 to assess the capacity of the Holland River at Bradford to assimilate the discharge from the proposed expanded Bradford WPCP and establish effluent discharge criteria.

The study reviewed historical flow and water quality data to determine background concentrations for the parameters of interest and established the maximum acceptable WPCP discharge concentrations for key wastewater contaminants on a monthly basis.

The desktop study concluded the following:

- The West Holland River is MOE Policy 2 with respect to Total Phosphorus and therefore has no remaining assimilative capacity for this parameter all year round. Regardless of the concentration of phosphorus in the WPCP effluent, the PWQO criterion cannot be met downstream. A monthly average TP concentration of 0.11 mg/L or less would be required in the WPCP effluent to meet these MOE requirements. Relative to the C of A compliance limit of 0.14 mg/l, this represents a small but significant reduction.
- The West Holland River is usually MOE Policy 1 with respect to un-ionized ammonia for the whole year except for July. The downstream average in-stream un-ionized ammonia must be maintained at or below 0.02 mg/l for every month except for July where it should be below the historical 75th percentile concentration of 0.045 mg/l. The total ammonia limit of 0.3 mg/l is therefore suggested to meet the PWQO in the summer. A limit of 2.1 mg/l is suggested in the winter.
- The West Holland River is usually MOE Policy 1 with respect to E. coli except for the months of July and November. A year round compliance limit of 123 organisms/100ml (or less) is recommended to ensure consistent compliance with the PWQOs and MOE policies.
- A monthly maximum average TP concentration of 0.11 mg/l would result in a maximum daily loading to Lake Simcoe of 1.914 kg/day (based on a design flow of 17,400 m3/day) which is higher than the current loading allotment specified by the Certificate of Approval but lower than the total daily allotment (cap) of 2.046 kg/day currently allocated to Bradford WPCP.
- For the purposes of phosphorus impact on surface water and compliance with the MOE policies, there is no limitation on phosphorus flow rate as long as the concentration limit of

0.11 mg/l is met. However, the loading limit to Lake Simcoe effectively places a flow rate limit on the WPCP discharge and at higher flow rates than currently proposed, other water quality parameters become limiting to flow.

- A low flow analysis of the West Holland River shows that flows are lowest in June, July and September, with 7Q20 flows ranging from 0.15 m3/s in September to 1.02 m3/s in April.
- From an assimilative capacity perspective, the critical water quality parameters are TP and un-ionized ammonia. Significant reductions in the effluent limits would be required to comply with MOE Policies and Objectives (0.11 mg/l for TP and 0.3 mg/l for total ammonia)
- Basic pH sensitivity analysis shows that the maximum allowable total ammonia in the effluent can be increased substantially if the after-mixing pH in the River is lowered relative to historical levels. For example, if the after-mixing pH were reduced consistently below 7.5, the WPCP ammonia limit for compliance with the MOE policies increases from 0.3 mg/l to 1.4 mg/l. It is recommended that a more detailed assessment of expected after-mixing river pH be performed to confirm appropriate ammonia criteria prior to detailed design. This would need to consider the future pH of the effluent, which may be impacted by future changes in the supply of potable water. Currently all potable water distributed within the Town is derived from groundwater. A new water transmission main from the Town of Innisfil will be constructed to provide the Town with potable (lake-based) water, which will be "softer" and less alkaline than the groundwater currently used in the Town.
- The resulting effluent criteria, as proposed by R. J. Burnside & Associates Limited in 2005, is summarized in the Table below.

Table 5-1 Effluent Criteria as prescribed by the 2005 Desktop Assimilative Capacity Study

Parameter	Existing Non-Compliance Criteria on C of A (ADF = 8,870 m3/day)	Effluent Criteria to meet MOE Policies (ADF = 8,870 m3/day)	Effluent Criteria to meet MOE Policies (ADF = 17,400 m3/day)
Total Phosphorus	0.14 mg/L (1.24 kg/d)	0.11 mg/L (0.96 kg/d)	0.11 mg/L (1.94 kg/d)
Total (Ammonia + Ammonium) Nitrogen	2.0 mg/L (April – Oct) 4.5 mg/L (Nov – March)	0.3 mg/L (April – Oct) 3.4 mg/L (Nov – March)	0.3 mg/L (April – Oct) 2.1 mg/L (Nov – March)
E.coli.	200 organisms/100ml	145 organisms/100ml	123 organisms/100ml
In addition, un-ionized ammonia levels shall not exceed 0.1 mg/L in the effluent			

5.2.2 Benthic-invertebrate Study – 2004

In 2004, a benthic-invertebrate study, to monitor potential environmental impacts of the WPCP outfall on the receiving West Holland River, was initiated by Tarandus Associates Limited. A total of six sites were sampled and studied (three upstream and three downstream of the WPCP). The BioMAP WQI for the data suggests that the water quality is impaired at all six sampling locations including the "control" station located 1.75 km upstream of the WPCP discharge. The results of the other benthic metrics including richness, EPT index (total number of mayflies, stoneflies and caddisflies found at a given location), taxon dominance and Hilsenhoff Biotic Index also indicate degraded water quality throughout the study area. These do not, however, show any spatial trends in water quality and therefore show no correlation between the water quality and the operation of the WPCP. It is suggested that the main sources of water quality impairment is organic in nature, not surprisingly since the river flows through one of Ontario's largest intensive agricultural operations.

5.2.3 Benthic-invertebrate Study - 2010

A benthic invertebrate study was conducted by Azimuth Environmental Consulting Inc. on the West Holland River wastewater effluent discharge area at the WPCP in 2010. The same six sites as in the 2004 report were sampled and studied. The study concluded that the results indicated no apparent trend between the benthic invertebrate communities upstream and downstream of the River WPCP outfall, which would indicate that in general the treated effluent discharge does not appear to be adversely impacting on the water quality. However, the results also indicate that the River contains generally poor water quality and substantial organic pollution within the study area as well as a low range of biodiversity and community complexity. These conditions are likely to be attributed to a combination of the surrounding urban and agricultural land-use practices as well as the natural characteristics of the River.

5.3 Outfall Studies

With respect to the hydraulic capacity of the existing outfall pipe and channel, no background information was available. The outfall is considered to be comprised of a 600 mm dia. High Density Polyethylene pipe (about 54 m long) from the plant's final effluent channel followed by an existing channel that drains to the West Holland River. Based on a review of various internal diameters for a 600 mm pipe, the maximum water level in the final plant channel will vary from 220.68 m up to 221.127 m. This is based on the design peak flow rate of 53.4 MLD and a maximum flood elevation in the channel of 219.91 m. The existing top wall of the plant's final effluent channel is approximately 221.5 m. Therefore, the existing outfall pipe appears to be suitably sized to handle the design peak flow rate.

It is noted that Certificate of Approval # 6664-7ZGKXG describes the "Final Effluent Chamber and Outfall" as "a final effluent chamber to combine disinfected effluent from the existing and proposed UV channels, with pipe and outfall for discharge to West Holland River". This indicates that the mixing zone, for assimilation assessment, is the point where the outfall meets the river.

5.4 Geotechnical Report, October 1995

A geotechnical investigation was undertaken, by Terraprobe Limited in October 1995 at the site of the proposed Plant C expansion. A total of six boreholes were drilled to determine the soil and groundwater conditions in the area. The soil conditions at the boreholes were found to be SANDY SILT to SILTY SAND FILL over NATIVE SILT followed by SANDY SILT TILL. Groundwater was found at depths ranging from 1.8 to 4.5 m. This soil was considered suitable for the support of various structures on conventional spread footings and/or concrete tank pads. However, it was recommended that all deleterious material be removed from the footings area prior to pouring concrete. Also, the native silt soils at the site were deemed to be suitable for support of sewers and other related piping but it was recommended that the thrust blocks be cast against undisturbed native ground. It was recommended that the building foundations and tanks be extended to a depth of 1.5 to 6 m below existing grade and therefore, the recommended safe side slope configuration for temporary unbraced excavations was 1 ½ to 1 (horizontal to vertical). Additional consideration was given to deep excavations in close proximity to existing foundations and structures so that there was minimal loss of ground support. Excavated soils at the site were deemed to be difficult to place and recompact as backfill and therefore it was recommended to import OPSS Granular 'B' type material for backfilling structures. It was recommended that any soft, loose or disturbed soils encountered as a result of groundwater seepage or construction traffic be excavated and replaced with suitably compacted sand fill.

A further geotechnical investigation was undertaken, by Terraprobe in December 2003, in support of the February 2005 ESR (Burnside). A total of six boreholes were drilled to determine the soil and groundwater conditions in the area. The investigation found varying depths of fill throughout the site ranging from 1.8 to 4.7 m below the existing grade. Buildings constructed as slab on grade would require greater than the conventional 1.2 m depth for footings and the removal of all fill material below the slab. At the location of the aerobic digesters and biosolids storage tanks, the depth of fill was approximately 4m below grade. This condition required relatively deep foundations and/or the use of engineered fill as the full depth of the fill had to be excavated and filled below the tank slabs. The bearing capacities ranged from 100 to 250 kPa with the lower value located in the northern edge of the site. However, it was recommended that most of the tanks be founded at an elevation with a minimum bearing capacity of 150 kPa. Therefore the existing capacities were deemed to be suitable. The water table was measured at 2 to 3 m below grade but varied seasonally. The structures were therefore designed for hydrostatic pressure and uplift assuming the water table was at grade. For deeper/larger span structures, this may have resulted in heavier (thicker) bases/walls or alternatively, pressure relief valves may have been installed where appropriate.

Based on previous geotechnical assessments, the soil conditions at the plant site are considered to be acceptable for either a plant expansion or optimization of the existing facilities.

5.5 Stormwater Management Assessment, Feb 2005

As part of the February 2005 ESR (Environmental Study Report, Bradford Water Pollution Control Plant WPCP Expansion), impacts on the Regional Floodplain and Provincially Significant Wetlands were identified (Clause 10.2 of the 2005 ESR). In summary, the following points were noted:

- The WPCP, including the suggested 2005 expansion, is located just within the limit of the Regional storm floodplain.
- Given the large expanse of the Holland River floodplain at the location of the WPCP, it is not expected that the minimal loss of floodplain storage would have a noticeable effect on the Regional Flood levels.

In addition, storm drainage was assessed as part of the 2005 ESR (Clause 10.7 of the 2005 ESR). A summary of the points made is as follows:

- Erosion and sediment control measures, meeting Town and LSRCA standards are to be installed, inspected and maintained during construction.
- De-watering operations are to include sediment traps or filter bags as required to reduce sediment load to the surrounding areas.
- Stabilization of exposed soils is to take place as soon as possible following completion of the construction.
- Any disturbance of the existing ditch outfall area is to be stabilized with suitable native shrub species, as outlined in the LSRCA requirements.

- Existing storm drainage characteristics of the adjacent properties (upstream and downstream) are to be maintained.
- Final design details are to address measures to control possible oil, gas or fuel spills during construction.

All of these observations and recommendations are applicable to either an expansion of the existing plant or to optimization of the existing treatment facilities.

5.6 Stress Testing Report for Plants B and C, Jan 2008

TSH (now AECOM) was retained by the Town in 2006 to complete stress testing of Plants B and C for the purpose of re-rating the capacities of those two facilities. The Report titled "Stress Testing of Plants B and C" was provided to the Town under cover of a letter dated January 10, 2008. The Report notes that during the preparation of the February 2005 Environmental Study Report for Plant D, the capacity of Plant B was reduced by the MOE from 4544 m3/d to 3075 m3/d to account for future nitrification requirements and clarifier capacity. The Report also notes the rated capacity of Plant C as 4325 m3/d.

The Report assumed that the effluent loading requirements, as outlined in the Certificate of Approval, would be retained in the future.

TSH developed an industry standard BioWin process computer model for both Plants B and C. Higher than normal flows were directed to each of the two plants during various periods between July 2006 and June 2007. According to the Report, the model "correlated very well with the actual plant operation and therefore is a useful tool in predicting future plant performance."

The stress testing indicated that, with various modifications, Plant B could be re-rated to 4544 m3/d and Plant C could be re-rated to 6015 m3/d. Coupled with the rated capacity of Plant D, the overall plant capacity would be 20559 m3/d. Allowing for the robustness of future Plant D (under construction in 2008), the TSH Report concluded that the entire facility could be re-rated to 22560 m3/d or higher.

The Report also concluded the following:

- Plant B experienced issues with respect to establishing nitrification during certain periods of stress testing as a result of blower breakdown
- Removal of sludge from the secondary clarifier in Plant B resulted in denitrification occurring within the clarifier during the summer period, resulting in impairment of effluent quality
- With mechanical improvements, the proposed effluent limits can be met by not relying on blending for either Plant B or C.

A summary of the facility modifications as recommended by TSH is as follows:

- Upgrade the influent flow measuring and monitoring for both Plants B and C
- Install an automatic flow splitting device for Plants B and C influent
- Provide new blowers for Plant B
- Upgrade the return sludge pumps for Plant B
- Expand the equalization tank in Plant C
- Upgrade the equalization tank pumps for Plant C.

The conclusions and recommendations of the Report were considered during the 2011 Optimization Assessment, which was undertaken as part of this Class EA planning process. The results of the most recent assessment are identified in Clause 5.14 of this ESR.

5.7 Record Drawings

Record Drawings were available for Plant C (Ainley Group File 197022 dated June 1998) and for Plant B (Proctor & Redfern File 77119 dated October 1983). In addition, Record Drawings related to the Main Sewage Pump Station Extension (Proctor & Redfern File 77119 dated March 1984) were also reviewed. These Record Drawings were used to confirm facility sizes for optimization assessment.

The Town provided "As Tendered" Drawings for Plant D, printed July 2006 for Class EA purposes.

5.8 Historical Flow Data

The Town provided the historical flow and population data for the years 2007 to 2010. It is assumed that wastewater flow rates for future growth of industrial, commercial, institutional and residential will remain proportionate to current flow levels. It is noted that although the historical flow data provides both influent and effluent flow information, the Town advised that the influent flow data is not accurate. Therefore, for the purposes of this Class EA, all historical flows are effluent flows.

The Town provided the serviced populations.

Table 5-2 below lists estimated annual historical average daily effluent flows per capita.

Table 5-2 Annual Average Daily Flows per Capita

Year	Serviced Population	Average Daily Flow (ADF) m3/d	Peak Day Flow (PDF) m3/d	Peak Factor	Actual per Capita flows (L/c/d)
2007	19,060	5827	9646	1.66	306
2008	21,218	6768	16014	2.37	319
2009	22,000	7227	17185	2.38	329
2010	23,293	7107	12384	1.74	305

5.9 Proposed Design Flows

The design criterion for the capacity increase was determined by the Town as part of the Master Servicing Study. The design criteria are summarized in Table 5.3 (overleaf).

Based on the design criteria, average day flows and peak flows were determined for the proposed growth. Tables 5.4 and 5.5 (overleaf) outline the design flows.

In summary, the design flow rates to service a residential population of 47,400 persons and an employment equivalent population of 30,000 are as follows:

- Average Day Flow = 23,250 m^3/d
- Peak Flow = 53,400 m^3/d

Town of Bradford West Gwillimbury
Bradford WPCP EA

Table 5.3 - Design Criteria

Water Consumption	**Average Day**		**Peaking Factor**
Residential	250	L/c/day	Harmon
Extraneous	90	L/c/day	2.5
Existing Industrial, Com and Inst in Bradford Urban Area	5	m^3/net ha/day	2
Future Industrial and Com in Hwy 400 Area	8	m^3/net ha/day	2

Table 5.4 - Average Day Flows

	Residential		**Employment**			**Extraneous**	**Total**
	Population	**Avg Day Flows (m^3/d)**	**Population**	**Area (ha)**	**Avg Day Flows (m^3/d)**	**m^3/d**	**m^3/d**
Bradford Urban Area	38,800	9,700	15,000	378	1,890	4,227	15,817
Interphase Industrial				21	168	55	223
Bond Head Area	4,400	1,100				396	1,496
Highway 400 Employment			15,000	405	3,240	1,041	4,281
Total	**43,200**	**10,800**	**30,000**	**804**	**5,298**	**5,719**	**21,817**
Allowance for Intensification and Infilling	4,200	1,050				378	1,428
Total	**47,400**	**11,850**	**30,000**	**804**	**5,298**	**6,097**	**23,245**
						SAY	**23,250**

Table 5.5 - Peak Flows (m^3/d)

	Harmon	**Residential**	**Employment**	**Extraneous**	**Total**
Bradford Urban Area	2.37	22,976	3,780	10,568	37,324
Interphase Industrial			336	138	474
Bond Head Area	3.30	3,626		990	4,616
Highway 400 Employment			6,480	2,603	9,083
Total	2.32	**25,101**	**10,596**	**14,298**	**49,995**
Allowance for Intensification and Infilling		2,436		945	3,381
Total		**27,537**	**10,596**	**15,243**	**53,376**
				SAY	**53,400**

Note: The total peak flow from all areas is not the sum of the individual peak flows. It was recalculated with a residential peaking factor of 2.32 to account for the total population. S:\110060\Working File\Bradford WPCP Data\Tables 5.3, 5.4 and 5.5.xls

5.10 Historical Raw Wastewater Concentrations

The historical raw wastewater concentrations, shown in Table 5-6 below, for 5-day Carbonaceous Biochemical Oxygen Demand (CBOD5), Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Kjeldahl Nitrogen (TKN) are based on the Town's SCADA Reports.

Table 5-6 Historical Raw Wastewater Data

Year/Parameter	CBOD5 mg/L	TSS mg/L	TP mg/L	TKN mg/L
2007	171	181	4.2	32
2008	173	171	3.6	29
2009	155	179	4.2	30
2010	183	135	4.2	34

Historical influent data from January 2007 through December 2010 was evaluated to develop the raw influent wastewater characteristics. An influent composite sample is taken once per week and does not include any side-streams (except return from the grit classifier). The influent flow meter readings are inaccurate at current flows, therefore the effluent flow is used for Ministry of Environment reporting purposes.

The annual average flows, concentrations, loads and peaking factors for 2007 through 2010 are presented in Table 5-7. Outlier sample values were eliminated from the data set. Furthermore, the raw influent Total Suspended Solids (TSS) data in 2010 shows periods of very low TSS, which are inconsistent with the influent carbonaceous biochemical oxygen demand (CBOD5), total Kjeldahl nitrogen (TKN) and total phosphorus (TP). Therefore, 2010 data are presented but have not been considered in developing the influent wastewater characteristics.

Table 5-7 Historical Average Flows, Loads and Peaking Factors (2007 through 2010)

	2007	2008	2009	2010
Effluent Flow				
Average (AA)	5827	6772	7227	7107
Max Month (MM)	6491	8807	8778	7832
Peak Day (PD)	9646	16014	17185	12384
PD/AA	1.7	2.4	2.4	1.7
MM/AA	1.11	1.30	1.21	1.10
$CBOD_5$				
Average concentration	171	173	155	183
Average Load	994	1174	1118	1303
Max Month Load	1198	1587	1536	1794
Peak Day Load	1340	1833	1914	2411
MM/AA	1.20	1.35	1.37	1.38
PD/MM	1.12	1.16	1.25	1.34
TSS				
Average concentration	181	171	179	135
Average Load	1056	1159	1293	959
Max Month Load	1444	1586	1681	2090
Peak Day Load	1840	1955	1917	2879
MM/AA	1.37	1.37	1.30	2.18
PD/MM	1.27	1.23	1.14	1.38
TKN				
Average concentration	32	29	30	34
Average Load	186	195	214	244
Max Month Load	208	247	280	300
Peak Day Load	251	318	365	348
MM/AA	1.11	1.27	1.31	1.23
PD/MM	1.21	1.29	1.30	1.16
TP				
Average concentration	4.2	3.6	4.2	4.2
Average Load	24	24	31	30
Max Month Load	29	30	43	35
Peak Day Load	37	42	60	44
MM/AA	1.17	1.22	1.39	1.16
PD/MM	1.31	1.42	1.41	1.25

Design raw influent wastewater characteristics were then developed based on the historical plant data from 2007 through 2009.

Table 5-7 presents the design annual average (AA), maximum month (MM), and peak day (PD) flows and loads for the raw influent wastewater. Based on the historical trend of the influent wastewater, it appears that the maximum month flow and the maximum month load could occur simultaneously (see Figure 5-1). Therefore, the maximum month concentrations are calculated based on the maximum month flow and the capacity of the plant has been evaluated based on the maximum month flow and loads.

The plant measures influent CBOD5, however the MOE recommends that BOD5 is used "for the assessment of raw sewage and primary effluents in estimating design parameters such as organic loadings and process air requirements of the secondary treatment process[1]". Therefore influent BOD was estimated based on a typical CBOD/BOD ratio of 0.92. A VSS/TSS ratio of 0.85 was assumed for the raw influent solids.

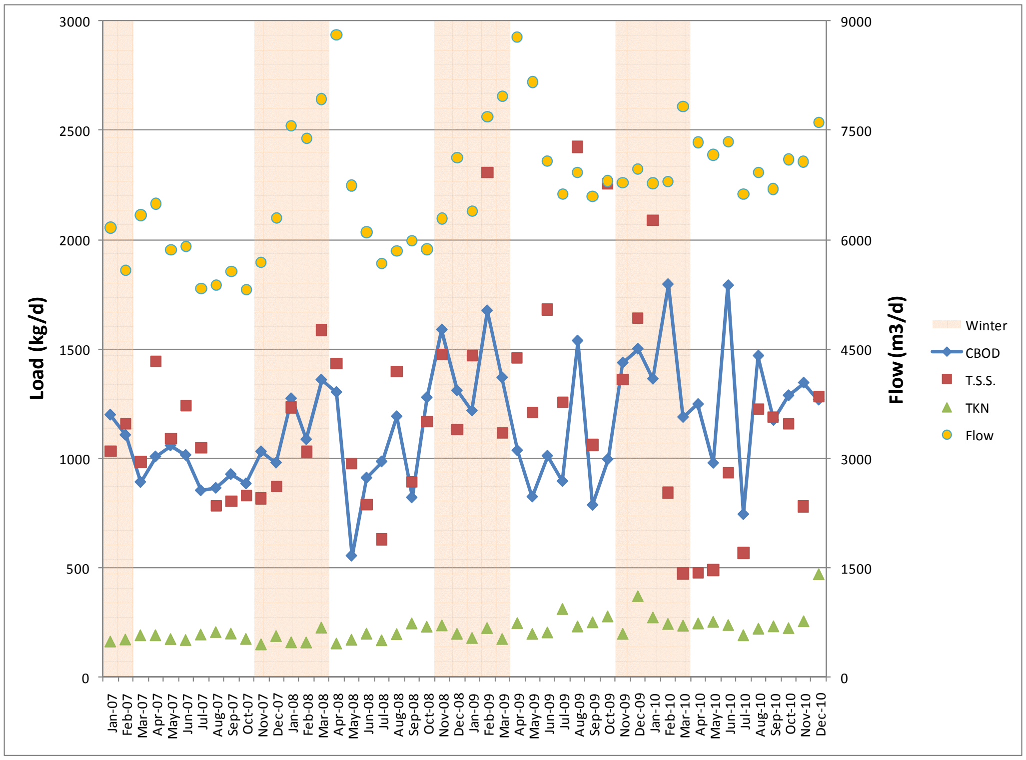


Figure 5-1 Historical Flows and Influent Loads illustrating coincident load and flow peaks during freezing period

The addition of alum for phosphorous removal generates a significant amount of chemical sludge that has to be accounted for in the design. The chemical sludge generated was estimated on a stoichiometric basis. The influent TSS in the table that follows was adjusted to account for the chemical sludge from alum addition.

[1] MOE Design Guidelines for Sewage Works, 2008, Page 8-10

Table 5-8 Design Raw Influent Characteristics

Parameter	Peaking Factor	MLD	mg/L	kg/day
Annual Average				
Flow	----	23.3	----	----
BOD_5 (1)	----	----	200	4,660
TSS – raw (2)	----	----	180	4,194
TSS – (chemical sludge)			218	5,079
TKN (3)	----	----	32.0	746
TP	----	----	4.2	98
Maximum Month (4)				
Flow	1.20	28.0	----	----
BOD_5 (1)	1.33	----	212	5,928
TSS – raw (2)	1.38	----	207	5,788
TSS – (chemical sludge)			250	6,990
TKN (3)	1.23	----	34.7	970
TP	1.23	----	4.9	137
Peak Day (5)				
Flow	2.29	53.4	----	----
Peak Hourly (6)				
Flow	2.78	64.77	----	----

Note:
(1) CBOD/BOD ratio of 0.92.
(2) TSS data from 2010 was ignored.
(3) Total Kjeldahl Nitrogen (TKN)
(4) Maximum month peaking factors represent MM/AA.
(5) Peak day flow factor represents PD/AA.
(6) Peak hourly flow factor represent the PH/AA. Peak hour is based on all 4 influent operating simultaneously at maximum capacity)

5.11 Historical Effluent Quality Data

Historically, the existing Bradford WPCP has performed well with respect to meeting effluent concentration criteria. A tabulation of effluent parameters for CBOD5, TSS, TP, TKN, Total Ammonia Nitrogen and E. coli is shown below.

Table 5-9 Historical Effluent Data

	CBOD5 (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)	NH3 + NH4 (mg/L)	E. coli
Effluent Objective	5	5	0.08		0.6 (apr–oct) 2.0 (nov-mar)	< 50
Effluent Limit	10	10	0.082		0.8 (apr–oct) 2.5 (nov-mar)	<100
2007 – Annual Average	3	3	0.09	2.72	1.44	4
2008 – Annual Average	3	2	0.08	1.75	0.64	36
2009 – Annual Average	2	3	0.08	0.97	0.34	7
2010 – Annual Average	2	2	0.06	1.29	0.39	8

The pH is consistently between 6.0 and 9.5.

With respect to actual loadings, Table 5-10 shows a comparison of effluent criteria against recorded loadings.

Table 5-10 Historical Effluent Loadings

Parameter – Limit	2007 Average	2008 Average	2009 Average	2010 Average
ADF m^3/d – 17,400	5,827	6,768	7,227	7,107
TP – 0.11 mg/L, 2.046 kg/d	0.53 kg/d	0.49kg/d	0.47 kg/d	0.33 kg/d
Total Ammonia Nitrogen – 0.8 or 2.5 mg/L	1.44 mg/l	0.64 mg/l	0.34 mg/l	0.39 mg/l
CBOD – 10 mg/L, 174 kg/d	18.38 kg/d	17.26 kg/d	14.12 kg/d	14.45 kg/d
TSS – 10 mg/L, 174 kg/d	19.38 kg/d	12.55 kg/d	14.57 kg/d	14.15 kg/d

Based on average daily flows and TP loadings, the historical annual total phosphorus loadings for 2007 to 2010 are as follows:

2007 = 0.53 x 365 = 193 kg

2008 = 0.49 x 366 = 179 kg

2009 = 0.47 x 365 = 172 kg

2010 = 0.33 x 365 = 120 kg

5.12 Current Certificate of Approval

The current Certificate of Approval was also referenced with respect to existing effluent requirements. A copy of Amended Certificate of Approval No. 6664-7ZGKXG is included in Appendix D. In addition, Certificate of Approval No. 9408-7SFP7B was issued for Air. A copy is also included in Appendix D.

5.13 Recently Completed Studies

In order to evaluate all of the options to increase the capacity of the BWG WPCP, it was necessary to complete two additional studies. An Optimization Study was completed in order to determine if optimization is a feasible solution. The findings are summarized in Section 5.14.

In addition, an Assimilation Study was undertaken to assess the impact of the proposed effluent loadings on the West Holland River. The findings are summarized in Section 8

5.14 Optimization of Existing Plant Processes

5.14.1 Report Summary

As part of the Class EA Assignment, an assessment of the feasibility of optimizing operation of the existing plant was undertaken. An Optimization Report was prepared and copy is included in Appendix E. In summary, it has been concluded that through the completion of relatively minor modifications, the capacity of the Bradford WPCP can be re-rated from 17.4 MLD to 23.3 MLD. This option will be evaluated with other options described hereinafter. The recommendations for plant optimization are outlined in the Report and are reiterated as follows:

Table 5-11 Recommendations for Plant Optimization

Unit Process	Existing Capacity	Upgrades
Influent Pumps	4 x 181 L/s, each pump rated for 16.2 MLD for an installed capacity of 64.8 MLD and a firm capacity of 48.6 MLD	• Replace two influent pumps to 23,000 m^3/d units to provide firm capacity of 55,000 m^3/d • Bypass residual peak instantaneous flows to equalization lagoon
Headworks Screening	2 x 24,400 m^3/d mechanically cleaned screens	• Rerate existing screens to 34,000 m^3/d. • Install 46,000 m^3/d screen in bypass channel • Construct new external bypass pipe or channel • Install standby grit classifer
Grit Removal	2 x 24,400 m^3/d vortex units	• No improvement – bypass at higher flows
Activated Sludge Systems	Plants B, C & D = 17,400 m^3/d	• Rerate existing tankage at 23,300 m^3/d • Install additional blowers as needed

Unit Process	Existing Capacity	Upgrades
		• Chlorine dosing system for filamentous control
Digester Supernatant	Filter reject pump capacity is insufficient to handle digester supernatant	• Redirect (pump) digester supernatant to the headworks instead of to the filter reject system
Tertiary Phosphorus Removal	None	• Install larger equalization basin upstream of existing sand filter • Install ballasted flocculation system
Filtration and UV Disinfection	Existing Capacity = 63,600 m^3/d	• No improvements – sufficient capacity
Sludge Stabilization		• Install thickening technology to thicken WAS to 4% by adding new TWAS facility building with duty and standby RDT and polymer system

5.14.2 Recommendations for Reliability

In order to ensure that Optimization is viable, the Optimization Report identifies recommendations for reliability:

Plant B

The recommendations for Plant B reliability are:

- Base Load Plant B to prevent peak day flow event overloading clarifiers. This will require operation of the automatic gate and flow meter at the existing influent flow splitter
- Divert more flow to Plant D at peak flow when all Plant D clarifiers are in operation
- If Plant D is operating reliably for nitrification then consider sending Plant D WAS to Plant B as a nitrifying seed to ensure nitrification year-round
- Convert Plant B digester capacity to aeration capacity for additional treatment at lower MLSS in Plant B
- Install additional blower for Plant B, replace coarse bubble diffusers with fine bubble diffusers in converted aerobic digester
- Modify influent and effluent channels to suit.

Plant C

The recommendations for Plant C reliability are:

- Upgrade or expand aeration blower capacity for Plant C
- Supply provision for chlorination Plant C recycle (control Sludge Volume Index)
- Increase SBR decant equalization working volume from existing capacity (597 m^3) to approximately 1,890 m^3.

Plant D

The recommendations for Plant D reliability are:

- Install motorized valves on some aeration diffuser drop legs to provide DO control of aeration
- Install aeration in the combined mixed liquor channel at the end of the aeration basins to ensure MLSS stays in suspension
- Fix the octagon MLSS Flow splitter to clarifiers
- Supply provision for chlorinating Plant D RAS recycle (control Sludge Volume Index)

On Site Pump Station and Headworks

The recommendations for pump station and headworks reliability are:

- Replace two existing influent pumps with larger units, each capable of pumping 23,000 m^3/d to ensure adequate firm capacity for the peak day flow
- Headworks screen equipment is undersized for the peak day flow of 53.4 MLD and undersized for the instantaneous nameplate peak capacity of the influent pumps
- Install additional screen in the bypass channel and rerate the existing two screens and/or install a replacement bypass channel
- Grit classifier wash water and decant drains to a single influent wet well limiting plant redundancy – flow must be diverted to both raw influent wet wells
- Provide additional standby grit classifier for flexibility and security.

Other Recommendations

The following additional recommendations were noted during the assessment of the existing plant:

- Demolish Plant A to free up space for the new equalization tank and the new prefiltration facility
- Repair leaks in the existing air supply piping
- Repair the existing biofilter in the headworks (currently susceptible to freezing)

5.14.3 Recommendations for Biosolids Processing

The Optimization Study provides the following recommendations with respect to treatment of biosolids:

- Convert Plant B aerobic digester to aeration basin
- Provide capability to transfer sludge from Plant B to other locations for treatment or storage
- Reuse the existing SBR equalization tank for dilute WAS storage prior to thickening
- Install a biosolids thickening centrifuge or gravity belt thickener or rotating drum thickener
- Construct a new TWAS facility near the existing aerobic digesters and biosolids storage tanks.

5.14.4 Recommendations for Tertiary Treatment Upgrade

The Optimization Study considered several options to improve tertiary treatment and short-listed two alternatives – Ballasted Flocculation and Tertiary Clarifiers. Ballasted Flocculation is the recommended solution.

6.0 Provincial Requirements

6.1 General

The Lake Simcoe Protection Act became law in December 2008. The act required the Province to establish a protection plan for Lake Simcoe and surrounding area. The Lake Simcoe Protection Plan (LSPP) took effect on June 2, 2009. The purpose of the plan is to provide direction that will help protect and restore the ecological health of the Lake Simcoe watershed as important decisions are made, including decisions about new development. The LSPP also outlines a number of proposed actions to be undertaken by both the public and private sectors. In the near-term, the plan focuses on the issues most critical to the health of the lake, including improving water quality through reducing the amount of nutrients, primarily phosphorus, entering the lake. Recommendations included in the LSPP were to develop a phosphorus reduction strategy, study the feasibility of water quality trading to help reduce phosphorus loading to the Lake, and to develop a regulation to protect the shorelines of Lake Simcoe.

In 2009 the Province filed interim Regulation 60/08 (amended to O. Reg. 130/09), titled, "Lake Simcoe Protection" under the Ontario Water Resources Act. The Regulation contained measures to protect Lake Simcoe and to reduce phosphorus loadings to the lake in the short term until the Province could implement long term measures under the Lake Simcoe Protection Act and the associated Lake Simcoe Protection Plan. As a result of the legislation, the BWG WPCP will have to meet more stringent permit limits, in particular for total phosphorus (TP).

Section 2(1) of Regulation 60/08 assigned individual limits to the total amount of phosphorus that can be discharged from each of 15 wastewater treatment plants located in the Lake Simcoe Basin. With respect to the BWG WPCP, the interim annual TP loading for the period from April 1, 2008 to March 31, 2010 was 361 kg/year.

6.2 Phosphorus Reduction Strategy

As a result of the issuance of the Phosphorus Reduction Strategy, the annual TP loading limit was revised. The "Lake Simcoe Protection Plan" (LSPP) contains measures to protect Lake Simcoe and to reduce phosphorus loadings to the lake, including the Phosphorus Reduction Strategy (PRS), Water Quality Trading Feasibility Study (WQT) and the Shoreline Protection Regulation.

Basically, the PRS has decreased the annual loading of TP from the BWG WPCP from the 747kg/year (Current Certificate of Approval) to 698 kg/year. The Province's intent is to reduce loadings of phosphorus to Lake Simcoe. Lake Simcoe is a sensitive water body that is currently suffering from nutrient enrichment. It was the subject of an intensive remedial program (the Lake Simcoe Environmental Management Strategy, "LSEMS"), which has now been superseded by the Lake Simcoe Protection Plan. A copy of the June 2010 Phosphorus Reduction Strategy is included in Appendix F.

6.3 Water Quality Trading Feasibility Study

The WQT feasibility study looked at different means to implement a WQT program to determine if it is feasible for the Lake Simcoe Watershed. Water Quality Trading is a market based way to control pollutants by trading them as commodities, with a net overall reduction as the goal. In the Lake Simcoe Watershed, the main pollutant that was investigated for trading is phosphorus. As part of the feasibility study, a number of items were considered including; if a there is a market for trading (demand is greater than supply); other successful programs and past studies of the watershed to determine if the phosphorus could be quantified.

The WQT feasibility study concludes that WQT is feasible for the Lake Simcoe Watershed. However, based on the comments received during the February 17, 2010 to April 3, 2010 public review period, the MOE will determine whether to proceed with implementing a WQT Program. If they decide to implement a program, the specifics of how it will operate will be determined at that time. The feasibility study did make recommendations for the MOE to consider. One of these recommendations includes establishing a central "clearinghouse" where all credits are sold and all credits are purchased. This would make the process more transparent and accountable and would prevent private deals between two parties. However, the specifics as to how the clearinghouse would be created and managed as well as any specifics on how credits will be sold and subsequently purchased will be determined as part of the program implementation. The MOE has indicated that, if water quality trading is a future option, the details of such a program will be provided prior to 2015.

The ESR is based on the assumption that water quality trading will not be in place for the next plant expansion.

6.4 Shoreline Protection Regulation

The Shoreline Protection Regulation (SPR) generally prohibits the removal of natural vegetation in existing naturally vegetated areas within shoreline buffer areas and shoreline natural areas, which may be areas within 15m of the lake or 30m of a stream. The intent is to leave these areas undisturbed, i.e. no removal, pruning, cutting or grubbing. Some exceptions are proposed but, in these cases, compensation will be required elsewhere to achieve "no net loss" of natural vegetation.

The regulation requires establishment of a vegetated riparian area at the time other works or activities are undertaken along the shore of a lake or a stream and applies within 15m to works such as erosion control, boathouse or dock construction or new landscaping. It would require that works within 15m revegetate to a distance of 5m from shoreline (15m is the "trigger", 5m is the "requirement") to mitigate past activities, and it would appear to be triggered by a building permit application.

The regulation prohibits significant shoreline alteration such new or expanded dredging into shoreline, new or expanded lagoons, and new or expanded channels between pond/lagoon and lake (i.e. this would prevent future Big Bay Point developments). The regulation says that developments transitioned by O. Reg. 219/09 "may be exempt"; however, we believe the proper wording should be "are exempt".

The regulation prohibits fertilizer use but appears to focus on "residential/aesthetic" uses as it exempts agriculture and allows municipal sports applications if need is demonstrated via soil testing. There is a total prohibition of fertilizer use within 5m of shoreline, and fertilizer must be phosphorus free within 30m. The prohibition could include compost, manure etc.

The regulation would prohibit new septic system or subsurface sewage works within 100m of shoreline or any permanent stream. Some exemptions would apply (agriculture, replacement of old system) but there does not appear to be an exemption for new cases even where advanced sewage treatment precedes disposal to a tile field that is used for disposal only, not treatment. This part of the regulation would be regulated under the Ontario Building Code.

The regulation would prohibit wetland interference, including:

- Activities that would change wetland boundary or wetland hydrology
- Removal of vegetation from wetland, or natural vegetation within 30m of wetland (vegetation removal would not change wetland classification)

There are some exceptions and exemptions; however the regulation even defines wetland drainage as a form of site alteration.

Implementation by and large would be through adding regulations to existing permits (Building Permits, Dock Permits) or the Public Lands Act. Voluntary compliance is encouraged; alternatively municipalities may be required to put in place bylaws consistent with regulation.

It was concluded that the Shoreline Protection Regulation does not have any significance with respect to the capacity increase of the Bradford West Gwillimbury WPCP.

6.5 Water Conservation and Efficiency Strategy

Prior to June 2014, the Town is required to address the requirements of the Province's Water Conservation and Efficiency Strategy. This includes commitment to the completion of a Water Conservation and Efficiency Strategy (WCES), to assess historical water/wastewater conditions and implement a strategy for water efficiency. The Water Conservation and Efficiency Strategy should be completed in conjunction with detailed design, prior to the proposed plant expansion. It is noted that the Lake Simcoe Protection Plan (LSPP) requires that a WCES be completed with implementation beginning by June 2, 2014. The WCES should span the full planning horizon. The WCES should :

- Provide targets for conservation, efficiency, inflow and infiltration reduction to the WPCP
- Provide timelines for achieving the targets, as well as strategies, tactics, programs and initiatives to be used, including the cost to implement these
- Assess methods of achieving conservation measures such as improved management practices, the use of flow restricting devices and other hardware
- Encourage water conservation incentives, education and demand monitoring in an attempt to reduce water consumption
- Aggressively reduce wet weather peak inflow and infiltration rates into the collection system through enhanced system monitoring (flow measurement), system inspections and regular maintenance
- Develop a strict Sewer Use Bylaw along with regular monitoring program
- Assess the feasibility of non-potable effluent reuse/recycling complete with practices and technologies associated with water reuse/recycling
- Consider the potential impacts of climate change.

In addition, the WCES is to include a program for the reduction of inflow and infiltration from the WPCP collection system. This program shall include reduction priorities, targets, timelines, tactics and initiatives, and the associated costs to implement these.

The WCES is also to include an implementation plan for the proposed initiatives. It shall also include a monitoring and reporting plan to assess the effectiveness of the initiatives as well as the achievement of water conservation and/or efficiency targets.

The Town must commit to consult with the public, relevant government agencies and the Ministry of the Environment's Central Regional Office on its proposed WCES.

The WCES shall include a review of best in class water conservation and efficiency programs, initiatives, strategies and tactics adopted by other jurisdictions. The review shall include an analysis of best in class tactics/strategies used by other jurisdictions throughout the world. This review shall be made public and shall form part of the consultation process for the WCES, as required above.

In conclusion, the Town of Bradford West Gwillimbury is required to address the requirements of the Water Conservation and Efficiency Strategy prior to June 2, 2014.

PHASE 3 REPORT

7.0 Existing Wastewater Treatment Plant

The Bradford WPCP is located east of Dissette Street (# 225 Dissette), south of Jay Street. Based on a review of the Master Plan Update - Final Study Report, the WPCP is comprised of four plant "trains" which are described as follows:

- Plant A – no longer in use (abandoned)
- Plant B - extended aeration activated sludge facility - rated capacity of 3,075 m^3/d.
- Plant C - added in 1998 - sequencing batch reactor activated sludge facility - rated capacity of 4,325 m^3/d
- Plant D - added in the fall of 2009 - comprised of Plants D1 and D2, each rated at 5,000 m^3/d.
- Total Rated Capacity = 17,400 m^3/d.
- Peak Flow Capacity = 40,800 m^3/d.

It is noted that Plant D was designed for an ADF of 12,000 m^3/d and a peak flow rate of 30,840 m3/d to ensure process robustness.

A complete description of the existing WPCP is included in Clause 6.2.2 of the Master Plan Update (Appendix A).

8.0 Effluent Discharge Criteria to West Holland River

8.1 West Holland River Aquatic Baseline Review

8.1.1 General

In order to determine the impact of an increase in treated effluent flow being added to the West Holland River, Hutchinson Environmental Sciences Limited (HESL) was retained to undertake an assimilation assessment. A copy of the HESL Report "Receiving Water Assimilation Study, June 2011" is included in Appendix G. In order to complete the assimilation assessment, HESL determined that an aquatic baseline review was needed.

The objectives of the West Holland River Aquatic Baseline Review were to:

- Summarize the existing aquatic conditions in the West Holland River to provide baseline conditions that future water quality in the river – potentially affected by the Bradford WPCP - will be compared to; and,
- Discuss the current water quality in the West Holland River as it relates to aquatic habitat, water quality standards and the Lake Simcoe Phosphorus Reduction Strategy.

In addition to the studies summarized in Section 5.2 the following sources were consulted: West Holland River Subwatershed Plan (Lake Simcoe Region Conservation Authority 2010), Estimate of Phosphorus Loadings to Lake Simcoe (The Louis Berger Group 2010) and Environmental Study Report, Bradford WPCP Expansion (Burnside & Associates 2005) as well as data recently collected by the Provincial Water Quality Monitoring Network. This section presents a summary of the detailed baseline review, which is included in the HESL Assimilation Study as Appendix C "Site Visit Technical Memorandum".

8.1.2 Physical Setting

The West Holland River flows northerly and joins with the East Holland River north of Bradford, before discharging into Lake Simcoe at Cooks Bay, further to the north. The West Holland River subwatershed is approximately 350 km^2 in area. Topography in the West Holland River subwatershed is relatively flat, with the West Holland River flowing through low lying and flat polders for approximately 15 km. The BWG-WPCP, discharges through a 650 m long channel into the lower portion of the West Holland River.

The West Holland River subwatershed is largely a low-lying, agricultural watershed, including intensive agriculture conducted in polders (wetlands that were drained and converted to agricultural use). The West Holland River subwatershed also includes appreciable urbanized land areas. Run-off from agricultural land and urban areas, as well as storm sewer discharge from urban areas, carries sediment, nutrients and contaminants into the West Holland River.

Tributaries in the southern and central portions of the subwatershed (i.e., at and downstream of the Bradford WPCP) run through silt and clay glacial till. When eroded during spring runoff or rainfall events, silt and clay easily stay suspended in moving surface water and can travel long distances in the West Holland River. Tributaries, canals and overland flow contribute appreciable eroded agricultural soils to the West Holland River. Most eroded soils have nutrients adsorbed to them (e.g., phosphorus and nitrogen) that contribute to nutrient loading in the West Holland River; agricultural soil is especially nutrient rich due to its organic nature and fertilizer input.

The combination of natural physical settings and land use in the West Holland River watershed has led to degraded water quality and aquatic habitat of the West Holland River, as described in the sections below.

8.1.3 Hydrology

While there is currently no ongoing flow monitoring on the West Holland River, data are available from the Lake Simcoe Region Conservation Authority station at Highway 11 until 1991, as summarized in Burnside and Associates (2005). West Holland River Flow follows patterns typical for south Ontario streams, with maximum flows during spring freshet, minimum flows during summer and low flow during winter. Due to irrigation and drainage requirements of the upstream agricultural operations in the Holland Marsh, however, the flows are heavily modified. Burnside (2005) provided a 7Q20 estimate of 0.15 m^3/s.

8.1.4 Water Quality

Data collected at the Provincial Water Quality Monitoring Network Station ca. 1.3 km upstream of the BWG-WPCP indicate that the West Holland River water quality is degraded. Forty-seven of 49 water samples contained phosphorus concentrations greater than the PWQO of 0.03 mg/L and several metals concentrations (aluminum, cadmium, zinc, iron, cobalt, lead) exceeded PWQOs frequently. Concentrations of nitrogen species were elevated but the samples did not exceed the PWQO of 0.02 mg/L for un-ionized ammonia. Dissolved oxygen concentrations were below the PWQO for cold water biota during the summer months. High turbidity values suggest that many of the metals, as well as phosphorus, are present in particulate form on soil particles from urban and agricultural runoff in the watershed. High turbidity in the river also indicates that there may be appreciable algal productivity in the river in the later summer and early fall.

8.1.5 Aquatic Habitat

Vegetation in some riparian areas of the subwatershed's watercourses has been removed to accommodate development, agricultural and other activities, leaving the watercourse banks vulnerable to erosion once the stabilizing influence of the roots of vegetation is removed. Other habitat stressors identified in the West Holland River watershed are barriers to fish movement, such as dams, culverts and stormwater retention structures, bank hardening and stabilization and invasive species.

Slow flow and enriched nutrient status of the West Holland River produces thick riverbed sediments and a robust community of emergent aquatic plants. On the other hand, turbidity and algal growth in the water column tend to limit light penetration into the water column and the growth of submerged aquatic plants.

Monitoring of fish communities by the LSRCA from 2005 to 2007 showed that warm water species are present in the West Holland River at and downstream of Bradford. Cold water fish species are present in some of the tributaries feeding into the West Holland River at and downstream of Bradford.

Benthic invertebrate communities have been assessed on several occasions in the areas up and downstream of the Bradford WPCP. The results of the studies consistently indicated that there is degraded water quality and habitat in the West Holland River near Bradford, and that there is no significant difference above and below the point of discharge of the effluent.

8.1.6 Summary

Overall, the aquatic habitat and surface water quality of the West Holland River at Bradford and downstream are degraded. The water is nutrient rich, turbid, oxygen poor in summer and regularly exceeds PWQOs for several metals. This is the result of naturally nutrient-rich soils in the area and highly modified watershed, river channel and hydrology from urban development and agricultural operations. There are emergent aquatic vegetation communities as well as warm- and coldwater fish communities, but the benthic invertebrate communities consistently indicate degraded habitat quality up- and downstream of the WPCP. Therefore, the West Holland River generally does not have a large assimilative capacity.

8.2 Proposed Effluent Criteria

Proposed effluent criteria have been determined based on the current C. of A. and on the TP limits established by the PRS. Furthermore, the effect of plant effluent on the West Holland River receiving waters after expansion was investigated by conservative mixing modelling and using the proposed effluent compliance criteria. The results of the modelling showed that the Bradford WPCP discharge after expansion to 23.3 ML/d would meet all MOE requirements for a mixing zone in the West Holland River. The WPCP effluent is non-lethal but will continue to produce a small volume mixing zone in the West Holland River in which un-ionized ammonia concentrations exceed the PWQO. In terms of Total Phosphorus concentrations, it will have a diluting effect on the nutrient-rich West Holland River. The details of the assimilation assessment are outlined in the HESL Report (Appendix G).

The proposed effluent criteria for a plant expansion to 23.3 MLD are shown in Table 8-1 below.

Table 8-1 Effluent Criteria for 23.3 MLD Plant Expansion

Parameter	Objective Limit	Compliance Limit
Total Phosphorus (TP) mass loading	680kg/year	698kg/year
Total Phosphorus (TP)	0.08mg/L	0.082mg/L
CBOD5	5mg/L	10mg/L
Total Suspended Solids (TSS)	5mg/L	10mg/L
Total Ammonia Nitrogen	0.6 (April 1 to Oct 31) 2.0 (Nov 1 to Mar 31)	0.8 mg/L (Apr 1 to Oct 31) 2.5 mg/L (Nov 1 to Mar 31)
E. coli	50 organisms per 100 millilitres	100 organisms per 100 millilitres
PH	Maintain between 6.0 and 9.5 inclusive at all times	Maintain between 6.0 and 9.5 inclusive at all times

8.3 Regulatory Context: Effluent Toxicity and Mixing Zones

A common concern for WWTP discharges to surface water is potential for effluent toxicity from the un-ionized fraction of ammonia (NH_3). This un-ionized fraction of ammonia increases with temperature and pH of the water and can have negative effects on aquatic life, such as fish and invertebrates. For the purpose of regulating surface water quality, chronic (long-term) effects and acute (immediate) effects are distinguished.

The Ontario Ministry of the Environment (MOE) requires that all effluent discharging to surface waters be non-acutely lethal at the end of the pipe. This generally requires an effluent concentration of 0.2 mg/L or less of un-ionized ammonia (NH_3), as a conservative estimate of the lethal threshold[2]. The proposed total ammonia compliance limits for the BWG WPCP effluent in summer (0.8 mg/L) and winter (2.5 mg/L) meet the requirement of non-lethality (Table 8.1, and Table 8.2)) at the "end-of-pipe". This is true if pH and temperature of the effluent or the river itself are used for calculating the proportion of un-ionized ammonia. In reality, the pH and temperature will lie in between effluent and river levels at the point of initial mixing; and accordingly, the un-ionized ammonia values will lie in between the river and effluent values as indicated in Table 8.2.

Table 8.2. Un-ionized Ammonia Concentrations in BWG WPCP Effluent Compared to Provincial Requirements. .

Season	Total Ammonia Compliance Limit	Effluent/ River pH (75th percentile)	Effluent/River Temperature (75th percentile)	Un-ionized Ammonia in Effluent/River	Meets lethal threshold (0.2 mg/L)?	Meets PWQO (0.02 mg/L)?
Summer (Apr-Oct)	0.8 mg/L	7.6 / 8	21.4°C / 21.2°C	0.014 mg/L / 0.03 mg/L	Yes / Yes	Yes / No
Winter (Nov-Mar)	2.5 mg/L	7.6 / 7.9	16.2°C / 6.4°C	0.03 mg/L / 0.03 mg/L	Yes / Yes	No / No

Beyond the requirement for non-lethal effluent, the MOE manages surface water quality through the Ontario Provincial Water Quality Objectives (PWQO, MOE 1994). These are a set of narrative and numeric criteria which the MOE use to ensure that surface waters are of a quality suitable for aquatic life and recreation. Waters which are below the PWQO are considered safe for the long-term survival of the most sensitive life stage of the most sensitive aquatic species expected in Ontario waters. The PWQO for un-ionized ammonia is 0.02 mg/L. In winter, the PWQO is exceeded at the end of pipe under both effluent and river conditions (Table 8.2). Under the high-pH and high temperature conditions often encountered in summer in West Holland River, the PWQO of 0.02 mg/L will be exceeded where the Bradford WPCP effluent meets the river. High river temperatures and higher river pH will drive the un-ionized proportion of ammonia over the PWQO despite the dilution effect at the point of initial mixing.

[2] *The MOE does not provide formal documented guidance on what levels of un-ionized ammonia are considered acutely toxic. We therefore consulted EPA (2009) which recommends 5 mg/L ammonia nitrogen as a criterion for acute toxicity at pH 8 and 25°C or, that the average not exceed 4.5 mg/L over any 4 day period. Total ammonia concentrations of 5 and 4.5 mg/L correspond to un-ionized concentrations of 0.27 and 0.24 mg/L respectively at pH 8 and 25°C. USEPA. 2009. DRAFT 2009 UPDATE AQUATIC LIFE AMBIENT WATER QUALITY CRITERIA FOR AMMONIA – FRESHWATER EPA 822-D-09-001. December 2009.*
Environment Canada (2009) provide a median LC50 of 0.481 mg/L unionized ammonia (NH_3) for rainbow trout and 1.16 mg/L for the most sensitive daphnid species tested. An effluent concentration of 0.2 mg/L or less would therefore assure no acute toxicity to test organisms. Environment Canada/Health Canada (2001) Canadian Environmental Protection Act. Ammonia in the Aquatic Environment – Priority Substances List Assessment Report. February 2001. TD195.A44P74 2000

Although the PWQO represents a desirable water quality standard, the MOE also recognize the concept of mixing zones for assimilation of waste water discharges. A mixing zone is "an area of water contiguous to a point source … where the water quality does not comply with one or more of the Provincial Water Quality Objectives" (MOE 1994).The mixing zone recognizes that the cost of treating all effluent streams to PWQO level may not be feasible and that residual waste may be diluted and assimilated in the aquatic environment with no adverse effect. Mixing zones are allowed, however, subject to several conditions:

- Mixing zones are not an allowable substitute for reasonable or practical effluent treatment. For the BWG WPCP this requirement will be met through the use of technology that permits treatment to high quality effluent.
- Water quality must not be acutely lethal at any point in a mixing zone. This is assured by the proposed effluent that meets the lethal threshold of 0.2 mg/L for un-ionized ammonia prior to discharge.
- Mixing zones should be as small as possible. This condition is met at the BWG WPCP through a highly treated effluent and relatively quick dilution at the outlet as shown by the modeling exercise below.
- The mixing zone must not form a barrier to the passage of aquatic life. In practice, this means that it should not permanently occupy the entire width or depth of the receiving water. This condition is met for the BWG WPCP, as shown by the modeling below.
- The mixing zone should not prevent any beneficial uses of the water. In practice this is generally interpreted as a requirement that the mixing zone not interact with a swimming area. There is no swimming area close to the outfall.

8.4 Dispersion Analysis

Existing information on the West Holland River near Bradford was summarized and the dispersion of effluent from the upgraded plant in the West Holland River was modeled. In this section, the approach and results of the hydrodynamic modelling of the effluent plume behaviour are summarized and implications for West Holland River water quality within the current regulatory context are discussed. A thorough background review on the West Holland River including flow characteristics, water and habitat quality and aquatic biota as well as the detailed methodology and results of effluent mixing modeling are provided in the HESL Report (Appendix G).

The main objective of the modelling exercise was to estimate the size and location of the effluent plume where the PWQO for un-ionized ammonia (NH3) will be exceeded and thus assess if the above listed requirements for mixing zones will be met by the effluent of the proposed expanded WPCP. Total phosphorus (TP) was also modelled in order to display by how much West Holland River will be diluted for this parameter. The modelled effluent quality corresponds to the proposed compliance limits, e.g., 0.8 mg/L total ammonia for summer, 2.5 mg/L total ammonia for winter and 0.082 mg/L total phosphorus.

Three scenarios were developed that represent a range of seasonal conditions. The worst-case scenario for an ammonia-enriched effluent is represented by warm summer conditions (75th percentile temperature) and low flow (September 7Q20; 0.15 m^3/s) in the West Holland River. High temperatures promote a high ratio of un-ionized ammonia and low flow limits the amount of water available for effluent dilution. Winter low flow conditions (January 7Q20; 0.52 m^3/s) were modeled because during winter, biological assimilation of ammonia is inhibited by low temperature and low flow limits mixing. An average summer scenario was constructed in order to describe the mixing zone under average summer flows (summer average flow; 0.91 m^3/s).

Dispersion modeling was based on available water quality and quantity information as summarized in the baseline review and channel morphometry data collected during a field visit. A conservative approach was taken to modeling, e.g., input parameters for the model were chosen to represent conditions favouring the occurrence of un-ionized ammonia. Modeling was carried out using a standard professional near-field mixing modeling tool (CORMIX(R)).

For both summer flow scenarios, the discharge is described as a shoreline-attached jet and plume that are strongly deflected by the river flow and attached to the bottom due to shallow discharge depth. The plume remains attached to the shore and flows parallel to the main flow, while spreading laterally. The PWQO for unionized ammonia is met at ca. 110 m downstream from the outlet for the summer average flow and at ca 80 m distance from the outlet for the summer low flow scenario. These points are shown as dotted yellow lines on the figures. The plume exceeding PWQO is larger for the average scenario, because higher river velocities carry the plume faster downstream than under the low flow scenario.

The winter scenario resulted in the same flow classification as the summer scenarios: a shoreline-attached deflected plume. The winter plume, however, spreads laterally much more quickly and reaches the right bank ca. 20 m downstream of the outlet (Figure 7.2). This is caused by a much larger temperature difference between effluent and river water in winter as opposed to similar temperatures in summer. In winter, the warm effluent floats on top of the cold river water and spreads laterally until it reaches the other bank. Ammonia PWQO is met ca. 8 m downstream of the discharge location under the winter low flow scenario.

Total phosphorus concentrations in the effluent after the expansion will be lower than the West Holland River most of the time. The effluent will therefore have a diluting effect on West Holland River. The total phosphorus concentrations will be diluted by ca. 30 % under the summer low flow scenario, by ca. 20 % under the summer average flow scenario (Figure 7.1) and by ca. 25% under the winter scenario.

The major conclusions of the dispersion analysis are as follows:

1. For all scenarios, the extent of the mixing zone that exceeds the PWQO of un-ionized ammonia is limited to one side of the river and does not exceed a length of 110 m. Therefore the effluent plume does not represent a barrier to movement of aquatic life. In the winter scenario, although the plume extends across the width of the river, it only occupies the upper 0.5 m of the water column and so does not represent a barrier to the movement of aquatic life.
2. Total phosphorus concentrations in the river are being diluted by the effluent.

These results demonstrate that the effluent of the expanded Bradford West Gwillimbury WPCP will meet the requirements for a mixing zone. The assimilative capacity of the West Holland River, however, is limited due to impaired water quality, low flow velocities and relatively small flow compared to effluent flow. This means that the West Holland River may not have the capacity to assimilate increased effluent volumes of the same quality from any future expansions beyond the currently proposed one, in particular in terms of ammonia. Any future expansion would require explicit modelling of the proposed flows and effluent qualities.

9.0 Summary of Design Basis for Capacity Increase

9.1 General

The influent wastewater characteristics were reviewed in detail and, in combination with the flow projections developed in Section 5.9, this information was used to develop loading projections. These influent characteristics, flow and loading projections were used to assess the feasibility and extent of optimization of the existing plant and to consider other methods of providing additional treatment capacity.

9.2 Wastewater Treatment Plant Loading Rates

The primary constituents of concern for the BWPCP are: BOD5, TSS, TP and total Kjeldahl nitrogen (TKN). Table 9-1 lists the influent concentrations and loadings of these parameters at the BWPCP, averaged over the years 2007-2010.

Table 9-1 Influent Characteristics (2007-2010 Average)

Constituent	Concentration (mg/L)	Flow (m^3/d)		Average Loading (kg/d)
		Average	Peak Daily	
CBOD5	170.5	6,733*	17,185 (recorded in 2009)	1148
TSS	166.5			1121
TP	4.0			26.9
TKN	31.3			210

* Average effluent flow rate.

Projected loading rates were developed for the proposed expansion to 23.3 MLD average daily flow. The influent criteria for this future expansion are summarized in Table 9-2. It is noted that the plant designs for secondary treatment are based on maximum month loading conditions. Other processes in the plant are generally sized based on peak hydraulic conditions.

It is recognized that at the present time, the serviced area of the Town is mixed residential with some light commercial and industry. Depending on future industrial growth, the historical raw wastewater concentrations for both TKN and TP may change. It is proposed, therefore, to increase the concentrations slightly for preliminary design purposes to allow for some future flexibility with respect to industrial and commercial wastewater servicing. It is proposed to use slightly higher concentrations for design purposes as follows:

Table 9-2 Influent Flow and Loading Criteria for Expansion to 23.3 MLD

Parameter	Peaking Factor	MLD	mg/L	Kg/day
Annual Average				
Flow	----	23.3	----	----
BOD_5	----	----	200	4,660
TSS (raw)	----	----	180	4,194
TSS with Chem. Sludge	----	----	218	5,079
TKN	----	----	32.0	746
TP	----	----	4.2	98
Maximum Month(1)				
Flow	1.2	28.0	----	----
BOD_5	1.33	----	212	5,928
TSS (raw)	1.38	----	207	5,788
TSS with Chem. Sludge			250	6,990
TKN	1.23	----	34.7	970
TP	1.23	----	4.9	137

Notes:

1. Evaluation of historical data shows that the maximum month load and flow could occur simultaneously.
2. Peak day flow factor represents PD/AA. Peak day load factor represents PD/MM and applies to the full max month load used under winter design conditions.

10.0 Wastewater Secondary Treatment Alternatives

10.1 General

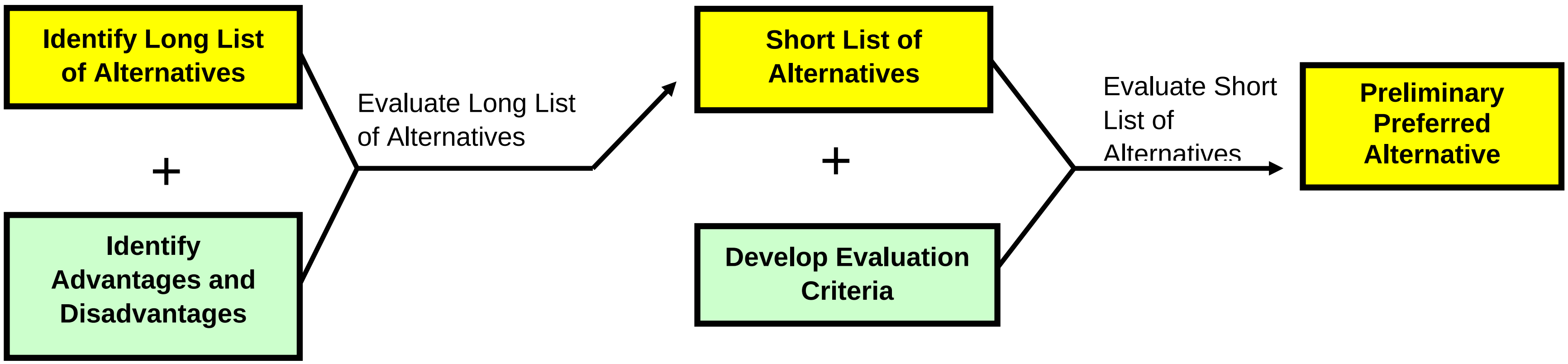
This section includes a description and evaluation of the wastewater secondary treatment alternatives.

10.2 Evaluation Approach for Wastewater Treatment Processes

A wide range of wastewater treatment processes was considered for expanding the BWG WPCP. These alternatives are differentiated in terms of the predominant treatment characteristics. The process undertaken to select the preferred wastewater treatment alternatives was based on the following approach as outlined in Figure 10-1:

- Identify feasible treatment alternatives (long list) that could possibly be constructed at the existing site
- Summarize the advantages and disadvantages of each alternative
- Develop a short list of alternatives based on analysis of the long list
- Develop evaluation criteria to evaluate the short list of alternatives
- Apply the evaluation criteria to each short-listed alternative
- Select the preferred alternative.

Figure 10-1 Planning Process to Select Preferred Biological Treatment Alternative



10.3 Long List Evaluation

10.3.1 General

The current BWG WPCP capacity includes three treatment trains (Plants B, C, and D) with different capacities and capabilities. Some possible alternatives for the incremental expansion and upgrade of the treatment facilities include:

1. Re-rating of the Existing Extended Aeration Process with upgrades to plant B
2. Expand Plant D and retain Plants B and C to provide additional volume and capacity;
3. Expand the Existing Extended Aeration Process (Plant D)
4. Enhance the existing capacity by converting Plant D to Integrated Fixed-film Activated Sludge (IFAS) Process
5. Enhance the existing capacity by converting either Plant D or C to Membrane Bioreactor
6. Improve water conservation, reuse in accordance with the MOE's Water Conservation and Efficiency Strategy.

10.3.2 Alternative 1 - Re-rating of the Existing Extended Aeration Process

The capacities listed in the Certificate of Approval for Plants B, C and D are 3,075 m^3/d, 4,325 m3/d and 10,000 m^3/d, respectively. Several studies have been conducted to assess optimization of the WPCP. As discussed in Section 5.14, it was found that by base loading Plant B to 3,075 m3/day, a re-rated capacity for Plant C and D of 6,333 and 14,437 m^3/d, respectively can be achieved. This results in a total optimized plant capacity of 23,845 m^3/d.

This alternative would allow for the best use of infrastructure and is the most cost effective alternative having a minimal capital cost. It is consistent with current operating practices and would have the least environmental impact and the shortest schedule due to the minimal construction required. In addition, this alternative will allow for immediate additional capacity for allocation.

10.3.3 Alternative 2 - Add Primary Clarifiers to Plant D

It would be possible to significantly increase the capacity of the existing treatment trains by adding primary clarifiers upstream of the aeration basins. The primary clarifiers would remove approximately 60% of the influent total suspended solids and about 30% of the BOD, which would reduce the load to the aeration basins and allow more flow to be treated in the existing volume. If primary clarifiers are added, the 23,300 m^3/d capacity could easily be met, although it will be necessary to assess the capability of the existing aeration blowers for meeting the overall oxygen demand for the additional flow. Future expansions beyond 23,300 m^3/d may require additional secondary clarifiers to be constructed.

In addition to lower aeration basin loadings and a corresponding reduction in aeration energy requirements, incorporating primary clarifiers also provides an opportunity for significant reduction in total chemical usage for phosphorus removal through two mechanisms. First, adding chemicals to multiple locations through the process has been shown to result in significant reductions in overall chemical consumption. Second, a portion of the spent chemicals from a new tertiary chemical phosphorus removal process can be returned to the primary clarifiers via the backwash water, and has been shown at some facilities to improve solids removal and phosphorus removal in the primary clarifiers, even without direct addition of chemicals at the clarifiers themselves.

A disadvantage of adding primary clarifiers at this time is that some changes to the solids handling system may be needed to accommodate primary sludge. It also would be necessary to cover and provide odour control for the primary clarifiers.

The existing aerobic digesters were designed to facilitate future conversion to anaerobic digestion. Although it is possible to operate aerobic digesters with a combination of primary sludge and waste activated sludge, the plant would be expending considerable aeration energy to stabilize the raw primary sludge. Conversion to anaerobic digestion would eliminate the need for this air and would allow the plant to generate biogas, which could be used as fuel for heating and other uses around the plant. This, however, would result in a significant change to the existing operation, and the 23,300 m^3/d capacity is not out of range for cost-effective operation of an extended aeration process with aerobic digestion. Therefore, maintaining the existing extended aeration system and aerobic digestion process until the next expansion beyond 23,300 m^3/d may be more attractive to the Town.

10.3.4 Alternative 3 - Expansion of Existing Extended Aeration Process (Plant D)

A further alternative is to provide additional aeration basin volume to achieve the proposed 23,300 m^3/d capacity. This could add an additional treatment train to Plant D, similar in size to the existing Plant D basins. Considering the relatively small overall increase in total capacity, adding some additional volume is likely the simplest approach if the full 23,300 m^3/d capacity is not able to be achieved through re-rating alone because it would be consistent with the current operation. This alternative would have a significant capital cost and would have more environmental impact due to the additional construction required.

10.3.5 Alternative 4 - Enhancement of Existing Capacity by Converting to an IFAS Process

An additional alternative for achieving the capacity increase without adding more basin volume would be to convert the existing activated sludge process to operation as an integrated fixed-film activated sludge process (IFAS). Free-floating plastic media would be added to the aeration basins to provide area for bacteria to grow, thus increasing the effective solids inventory in the basins but without increasing the overall mixed liquor suspending solids (MLSS) concentrations. The media are retained in the aeration basins by media retention sieves. By avoiding an increase in MLSS, the capacity of the secondary clarifiers is enhanced. By converting Plant D for operation as an IFAS process, it was determined that there should provide enough capacity should be provided to meet the total requirement without modifying Plants B and C.

This alternative would be the best use of existing infrastructure and would save space by not requiring additional construction. This is also a resilient and reliable process. The disadvantages include the use of smaller screens and a significant change in process, which would require significant operator training.

10.3.6 Alternative 5 - Enhancement of Existing Capacity by Converting to a Membrane Bioreactor (MBR) Process

An MBR process could be implemented with or without primary clarifiers. Instead of using secondary clarifiers and filters, the membranes would provide solids separation. Fine screens would be incorporated downstream from the existing headworks to keep debris from accumulating in the MBR process. MBRs are commonly designed at an MLSS concentration of 8,000 to 10,000 mg/L, which allows for smaller aeration basins or re-rating of existing basins. Apart from the use of membranes for solids separation, the MBR would function the same way as an activated sludge system. Very good phosphorus removal to very low concentrations is possible by simply adding chemicals to the MLSS just before the membranes, and experience thus far shows that effluent TP concentrations of less than 0.05 mg/L can be achieved. If the Town were to pursue an MBR method of treatment, the most cost-effective option is likely to upgrade either Plant B or C to an MBR, thus effectively doubling its capacity. The MBR effluent flow could bypass the filters and go straight to disinfection, eliminating the potential need to expand the filters at this time. By operating the remaining treatment trains as extended aeration activated sludge basins with secondary clarifiers, the total cost of membranes and total energy costs for the plant operation would be minimized.

Although MBRs produce a high quality effluent in a reduced aeration basin volume, one disadvantage is that they consume more energy than traditional activated sludge processes because of the need for scour air to keep the membranes clean. The MBR manufacturers have been working to optimize air scour requirements and methodologies, and the energy requirement is being improved. Another disadvantage would be the use of a completely new process which would require significant operator training.

In addition to increasing the capacity rating of the activated sludge process, some improvements are needed to the headworks and disinfection facilities as well as tertiary phosphorus removal.

10.3.7 Alternative 6 – Improve Water Conservation and Reuse

The requirements of the Provincial Water Conservation and Efficiency Strategy (WCES) are described in Section 6.0. The Town is required to meet the Province’s requirements by June 2014. On its own, this Alternative will not provide the capacity increase that the Town is looking for. However, it must be considered as a complimentary solution to the selected treatment process Alternative.

10.4 Screening of Alternatives

Table 10-1 provides a summary of the advantages and disadvantages of the secondary wastewater treatment alternatives.

Table 10-1: Advantages and Disadvantages of Wastewater Treatment Processes

Alternatives	Advantages	Disadvantage
Alternative 1 - Rerate Plants B, C and D with modification to B.	• Best use of the existing infrastructure • Consistence with current operation • The most cost effective alternative • Minimum environmental impact due to minimized construction • Minimal capital cost • Reduced schedule	• Need additional basin volume for next expansion
Alternative 2 - New Primaries to D	• Increase the capacity of the existing basins • Reduction in aeration energy requirements significant reduction in total chemical usage for phosphorous removal • Conversion of aerobic digestion to anaerobic digestion which would save energy and produce biogas	• Significant change to solids handling system • Require covers for primary clarifiers for odor control
Alternative 3 - New Aeration to D	• Simple approach, constant with current operation • Ease of next plat's expansion	• Significant capital cost • More environmental impact
Alternative 4 - Convert Plant D to IFAS	• Saves space • Best use of existing infrastructure • Resilient process	• Requires smaller screens • New process • Requires operator training
Alternative 5 - Convert either Plant B or C to MBR	• Best use of existing infrastructure • Similar to activated sludge process except for the solids separation • No need for tertiary filter with membranes	• High energy consumption • Requires installation of fine screens • New process • Requires operator training
Alternative 6 – Improve Water Conservation and Reuse	• Meets Provincial requirements of WCES • May reduce water demand and raw wastewater flow	• Not a complete solution to provide required capacity increase

10.5 Short List Evaluation

10.5.1 Description

Based on an evaluation of the advantages and disadvantages of each secondary treatment alternative the following alternatives were short-listed for more in depth evaluation:

- **Alternative 1** – Optimize Plants C and D and upgrade Plant B to obtain a total rated capacity of 23,300 m^3/d
- **Alternative 2** – Expand Plant D and retain Plants B and C to obtain a total capacity of 23,300 m^3/d
- **Alternative 6** – Improve water conservation, reuse in accordance with the MOE's "Water Conservation and Efficiency Strategy"

10.5.2 Evaluation Criteria

The evaluation used is not based on a numerical ranking system. To ensure statistical validity, such an approach would have to strictly adhere to statistical methods that are often difficult to apply in a multi-faceted issue such as a Municipal Class EA. Instead, a descriptive or qualitative evaluation is used to consider the suitability of alternative solutions and design concepts. In this respect, the trade-offs that have been made between alternatives are described in the text of the report and these trade-offs form the rationale for:

1. the identification of the preferred alternative,
2. an advantage or
3. accepting a disadvantage to address a higher priority consideration.

Evaluation criteria were developed to evaluate the short listed alternatives. The purpose of the evaluation was to select the alternative that offers the greatest potential to solve the identified wastewater servicing problem.

The evaluation criteria address a wide range of technical, environmental, social, and financial concerns. An increasing level of detail was used to evaluate the short listed alternatives, and a qualitative rating scale was established for each criterion (i.e., high, medium and low). A "High" rating is most preferred and a "Low" rating is the least preferred as shown in Table 10-2. Table 10-3 lists the evaluation criteria used in the Short List Evaluation and the descriptions along with the definition for each rating.

Table 10-2 Criterion Table

○	Minimal impact
◉	Moderate impact
●	High impact

Table 10-3 Evaluation Criteria for Short List of Alternatives

Criterion	Criterion Description	Criterion Measure Guidelines	
Natural Environment			
Water Quality	Potential to impact the receiving water quality	○ **○** ●	Minimal impact Moderate impact High impact
Aquatic Systems	Potential to impact aquatic systems	○ **○** ●	Minimal impact Moderate impact High impact
Land Requirement	Land area requirement for biological process	○ **○** ●	Minimal land required Moderate land required Large land required
Groundwater Resources	Potential to impact groundwater resources	○ **○** ●	Minimal or no impact Moderate impact High impact
Floodplain	Potential to impact floodplains	○ **○** ●	Minimal or no impact High impact Minimal or no impact
Technical			
Reliability	Reliable operation with minimal maintenance requirements and ability to meet effluent quality objectives	○ **○** ●	Very reliable Moderately reliable Not reliable
Ease of Implementation/Integration	Can be easily implemented on a technical, regulatory and practical basis	○ **○** ●	Very easy Moderately easy Not easy
Ease of Operation	Process is easily operated	○ **○**	Very easy Moderately easy

Criterion	Criterion Description	Criterion Measure Guidelines	
		●	Not easy
Ease of Expansion	Process is easily expanded	○ **○** ●	Very easy Moderately easy Not easy
Future TP Limit	Ability to meet current and future MOE requirements	○ **○** ●	High Moderate Low
Social Environment			
Noise	Potential to produce noise during construction and/or operation	○ **○** ●	Minimal potential Moderate potential High potential
Air Quality	Potential to produce air quality impacts during construction and/or operation	○ **○** ●	Minimal potential Moderate potential High potential
Immediate Benefit	Potential for increasing allocated capacity	○ **○** ●	Minimal or no impact Moderate impact High impact
Visual/Aesthetic	Potential for visual impact to the area	○ **○** ●	Minimal or no impact Moderate impact High impact
Community Health and Safety	Potential impacts to community health and safety	○ **○** ●	Little or no risk Moderate risk High risk
Economic			
Capital Cost	Opinion of probable capital cost	○ **○**	Low cost Moderate cost

Criterion	Criterion Description	Criterion Measure Guidelines	
		●	High cost
Operating/ Maintenance Cost	Opinion of probable operating and maintenance cost	○ ◎ ●	Low cost Moderate cost High cost

10.5.3 Short List Evaluation

The short-listed secondary treatment Alternatives 1 and 2 were evaluated based on the criteria in Table 10-3. Summaries of the evaluations are provided in Table 10-4. Alternative 6 was not evaluated as a stand alone solution. Alternative 6 will be complimentary to the selected solution.

Table 10-4 Evaluation of Short List of Biological Process Alternatives

Criterion	Optimization	Expand Plant D
Natural Environment		
Water Quality	○	○
Aquatic Systems	○	○
Land Requirement	○	◎
Groundwater Resources	○	○
Floodplain	○	◎
Technical		
Reliability	○	○
Ease of Implementation	○	◎
Ease of Expansion	○	◎
Ease of operation	○	○
Future TP Limit	○	○
Social and Environmental Impacts		
Noise	○	○
Air Quality	○	○
Visual/Aesthetic	○	◎
Community Health and Safety	○	○
Immediate Benefit	○	●
Economic		
Capital Cost	○	●
Operating/Maintenance Cost	○	○

10.6 Selection of the Recommended Alternative

Based on the evaluation, Alternative 1 was selected as the Recommended Alternative for expansion of the secondary treatment process. Alternative 6 will also be included in the overall solution. The primary factors for the selection of Alternative 1 are:

- Less land required
- Provides immediate benefit
- Less capital cost.

10.7 Selection of the Preferred Alternative

Based on the fact that no major public or review agency comments were received as a result of the June 22, 2011 PIC, the Steering Committee selected the Preferred Alternative (Combination of Alternative 1 and 6) in accordance with the Recommended Solution as outlined in Section 10.6.

11.0 Biosolids Treatment Alternatives

11.1 General

Currently biosolids treatment process for all three plants is provided by aerobic digestion for stabilization and destruction of VSS. Plants B, C and D stabilize WAS in new aerobic digester tanks that were constructed with the recent expansion. Pre-thickening of WAS is not performed, WAS is fed to the digesters at relatively dilute concentration (less than 1% total solids). During digestion, biosolids are thickened decanting a supernatant or clarified liquor to the head of the plant and the digested sludge is then stored during the winter months in new biosolids storage tanks that were also constructed with the last plant expansion. Final disposal of stabilized biosolids is through agricultural land application.

MOE guidelines recommend 45 days of sludge retention time (SRT) including both the digester process and the SRT of the activated sludge process. Plant B digester tankage is presently not used. However if re-instated the total digester volume for Plant B is 1,549 m^3, which, on an annual average basis would provide 31 days of sludge retention time for WAS produced at 3,075 m^3/d based loaded capacity. The available 6,500 m^3 total digester volume for plant C and D will only provide 23-24 days retention time for WAS produced. Therefore, digester capacity is limited at 23,300 m^3/d future design flow.

This section includes a description and evaluation of the treatment alternatives of WAS to produce biosolids.

11.2 Identification and Evaluation of Alternatives

11.2.1 Identification of Alternatives

Two possible alternatives for the treatment of WAS for the expansion of the biosolids treatment processes are available to produce biosolids for land application. They are:

1. Construct a new Thicken Waste Activated Sludge (TWAS) Facility and thicken WAS to approximately 3% thus increasing existing aerobic digester capacity and biosolids storage
2. Convert to anaerobic digestion process

11.2.2 Alternative 1 – Thicken Waste Activated Sludge

This alternative will see the decommissioning of Plant B's aerobic digester and with the demolishing of Plant A, will eliminate biosolids storage for Plant B. Construction of a new TWAS facility near the existing aerobic digester for Plant C and D will increase the WAS concentration to 3% providing the minimum number of days of SRT and adequate biosolids storage capacity to achieve a minimum 240 days of winter storage. This facility will include two rotating drum filters (duty and standby), utilization of an obsolete EQ tank for pre-thickening storage, polymer dosing system, and new building. All WAS from plant B, C, and D will be diverted to this new unit process.

Advantages:

- Consistent with the current biosolids treatment process of aerobic digestion
- Utilizes existing infrastructure minimize capital cost thus the most economical process from a capital investment perspective given the size of the wastewater treatment plant
- Least amount of constructability issues or complexity as the facility can be constructed while minimizing the impact to existing operations
- Lowest operating and maintenance cost compared to anaerobic digestion at this size of a wastewater treatment plant.

Disadvantages:

- Does not provide for future sustainable energy recovery of biogases
- Does not provide for the recovery of TP

11.2.3 Alternative 2 – Convert to Anaerobic Digestion

Anaerobic mesophilic (35ºC temperature) digestion is a very common process for digesting primary sludge and a mixture of primary and secondary sludge, but is not as common for digestion of waste activated sludge only. Anaerobic digestion is more common in larger wastewater treatment plants and active digestion results in volatile solids reduction and gas production. Conversion of the existing aerobic digestion process would require decommissioning of Plant B's aerobic digester and with the demolishing of Plant A, will eliminate biosolids storage for Plant B. Major retrofits to the primary and secondary digesters are required and major supporting infrastructure would also need to be constructed for gas collection/storage, energy recovery, etc. In addition, a WAS thickening facility is also required in order to ensure that the MOE guidelines of 15 days of nominal hydraulic retention time (HRT) is achieved in the primary digesters.

Advantages:

- Eliminates the need for aeration blowers compared with aerobic digestion.
- Provides for a sustainable energy resource while saving money by allowing gas generated to be an energy source (e.g. heating, power production, supplemental gas for dryer systems)
- Substantial savings on energy costs and lower costs for large wastewater treatment plants
- Greater VSS destruction (although not substantially greater for WAS digestion)
- Potential for phosphorus recovery from centrate (as an add-on technology)

Disadvantages:

- Initial capital cost are very high in comparison
- Sensitive to adverse effects from lower temperatures in winter (heating is required)
- Increased potential for odours and corrosive gases
- New process that will require additional training for operations and maintenance staff
- Higher potential for foaming issues
- Potential for struvite formation
- Still requires prethickening of sludge.

11.3 Recommendation of Alternative

Based on a comparative evaluation of the advantages and disadvantages of the two alternatives the recommended alternative is to thicken the waste activated sludge in order to make use of the existing digester capacity and biosolids storage volume. This selection was made for following reasons:

- Lowest capital cost
- Best use of existing infrastructure
- Least impact to existing plant operation
- Least complexity of operation
- Lowest construction complexity and installation.

11.4 Selection of Recommended Alternative

Based on the evaluation of the advantages and disadvantages of the two alternatives the Recommended Alternative is to thicken the waste activated sludge in order to make use of the existing digester capacity. This selection was made for the following reasons:

- Lowest capital cost
- Least impact to existing plant operation
- Least complexity of operation.

11.5 Selection of the Preferred Alternative

Based on the fact that no major public or review agency comments were received as a result if the June 22, 2011 PIC, the Steering Committee selected Alternative 1 as the Preferred Solution in accordance with the Recommended Solution as outlined in Section 11.4.

12.0 Wastewater Tertiary Treatment Alternatives

12.1 General

This section includes a description and evaluation of the tertiary treatment alternatives.

12.2 Long List Evaluation

12.2.1 General

Possible alternatives for the tertiary treatment options include:

1. Ballasted Flocculation using Actiflo or Densadeg ahead of existing sand filters
2. Adsorption using CoMag or BluePRO in series with ferric chloride
3. Enhanced Filtration using membranes
4. Enhanced Pre-filtration using Flocculation and DAF or Flocculation and Lamella Clarifiers

12.2.2 Ballasted Flocculation using Actiflo or Densadeg Ahead of Existing Sand Filters

Chemical Flocculation and clarification, such as Actiflo® or DensaDeg® followed by sand filtration has been used to meet low phosphorus limits and has been successfully implemented at a number of plants across the US and Canada. Polishing with filters would be needed to ensure that low phosphorus limits are met.

The Actiflo® process is comprised of coagulation, sand and polymer injection, floc maturation, lamella clarification and sand recovery. The microsand acts as a seed for floc formation. The microsand ballasted flocs display unique settling characteristics, which allow clarifier designs with very high overflow rates and short retention times.

The DensaDeg® Process is similar to Actiflo in many ways but relies on the use of recycled, previously settled sludge to assist with floc formation and to increase the mass of the settling flocs.

Both processes were successfully pilot tested in 2000 at the Regional plant in New Tecumseth with the goal of achieving a total phosphorus limit (design objective) of 0.07 mg/L.

Both these technologies have small footprints, are reliable options and are easy to operate. They also both allow for rapid response to chemical changes. The disadvantages of this option include the clogging of the effluent filters due to the binding of the sand from polymer overuse, the additional preventative maintenance required to the pumps and the need to monitor sand levels closely. This option will also produce dilute sludge and will require screening of secondary effluent.

12.2.3 Adsoption using CoMag or BluePRO in series with ferric chloride

The Blue Water TechnologiesBluePro® process consists of treating secondary effluent in a reactor where FeCl3 is added before the liquid is passed to a continuously backwashing filter similar. The FeCl3 coats the media granules and a precipitation/adsorption process removes the phosphorus from the liquid to very low levels. During on-going filter backwash the iron phosphate coating is partially removed and recycled back to the activated sludge plant where a considerable reduction in phosphorus takes place.

The CoMagTM process is a "magneto-chemical" process that incorporates the use of finely divided magnetic ballast to bind the precipitated phosphorus and other fine particles. Magnetite provided a magnetic ballast seed that when mixed with alum and polymer increases both flocculation and settling rates which reduce the tanks sizes significantly. The floc particles are attracted to a magnet and magnetic separation is used for polishing the effluent rather than sand filtration or membrane systems. The magnetite is separated and recycled. The footprint is smaller than that of filters and phosphorus removal to 0.05 mg/L has been achieved.

12.2.4 Enhanced Filtration using membranes

Tertiary Membranes – Several municipal WWTPs in North America (e.g., Ashland WWTP) have had successful experience using tertiary membranes to achieve very low effluent TP concentrations. The membrane system consists of hollow strands of porous plastic fibres. Clean water is collected inside the hollow fiber. Chemical addition facilities would be provided upstream from the membranes.

Membrane Bioreactors (MBR) – The MBR process uses membranes to provide solids separation. MBRs are commonly designed at an MLSS concentration of 8,000 to 10,000 mg/L, which allows for smaller aeration basins. Apart from the use of membranes for solids separation, the MBR would function the same way as an activated sludge system. Experience this far shows that effluent TP concentrations of less than 0.05 mg/L is possible by simply adding chemicals to the MLSS just before the membranes. It is also possible to operate for biological phosphorus removal with chemical trim.

12.2.5 Enhanced Pre-filtration using Flocculation and DAF or Flocculation and Lamella Clarifiers

The Parkson DynaSand D2 process consists of chemical addition and two continuously backwashing filters in series, similar to the BluePro process. With D2 alternative coagulants can be used and there may or may not be adsorption (in addition to precipitation), depending on the coagulant used. A lamella settler is provided for solids separation from the backwash water.

12.3 Screening of Alternatives

Table 12-1 provides a summary of the advantages and disadvantages of the tertiary treatment alternatives.

Table 12-1 Advantages and Disadvantages of the Tertiary Treatment Alternatives.

Process	Advantages	Disadvantages
Alternative # 1 **Ballasted Flocculation** • Actiflo + Dynasand • Densadeg + Dynasand	• Small foot print • Reliable option • Ease of operation • Rapid response to chemical changes • Proprietary technology • Actiflo was piloted at Innisfil	• Overuse of polymer may bind the sand and clog the effluent filters • Dilute sludge • Sand pumps require preventative maintenance • Sand levels most be monitored • Require screening of secondary effluent
Alternative # 2 **Adsorption** • CoMag + Dynasand • Add coagulant + BluePro	• Blue Pro is a proven technology and was piloted at Innisfil • Relatively smaller footprint than other Alternatives	• Require ferric chloride as coagulant • Comag is a new technology with little experience
Alternative # 3 **Enhanced Filtration** • Double Dynasand • Membrane filtration • Tube settlers + Upflow adsorption clarifier + Downflow dual media filtration	• Proven technologies • Membranes are flexible to flow and loads • Membranes and Dynasand were piloted at Innisfil • Membranes are recognized by MOE as the limit of technology for 0.05 mg/L TP on Lake Simcoe	• Require ferric chloride as coagulant • Expensive option
Alternative # 4 **Enhanced Pre-Filtration** • Flocculation + Dissolved Air Floatation • Flocculation + Tertiary Clarifiers or Lamella Clarifiers	• Popular technology • Flexible to flow and load fluctuation	• Expensive option

12.4 Short List Evaluation

12.4.1 Description

Based on an evaluation of the advantages and disadvantages of each tertiary treatment alternative the following alternative treatment processes were short-listed for more in depth evaluation:

- **Alternative # 1** – Ballasted flocculation using Actiflo ahead of existing sand filters
- **Alternative # 4** – Enhanced filtration using Lamella Clarifiers

12.4.2 Short List Evaluation

The short-listed tertiary treatment alternatives were evaluated based on the criteria in Table 10-3. Summaries of the evaluations are provided in Table 12-2.

Table 12-2 Evaluation of Tertiary Wastewater Treatment Processes Shortlist

Criterion	Ballasted Flocculation	Lamella Clarifiers
Natural Environment		
Water Quality	○	○
Aquatic Systems	○	○
Land Requirement	○	○
Groundwater Resources	○	○
Floodplain	○	○
Technical		
Reliability	○	○
Ease of Implementation	○	◉
Ease of Expansion	○	◉
Ease of Operation	◉	○
Social and Environmental Impacts		
Noise	○	○
Air Quality	○	○
Visual/Aesthetic	○	○
Community Health and Safety	○	○
Economic		
Capital Cost	◉	◉
Operating/Maintenance Cost	○	○

12.5 Selection of the Recommended Alternative

Based on the evaluation of the two alternatives, Ballasted Flocculation was selected as the Recommended Alternative. Although it may be slightly more difficult to operate than Enhanced Pre-Filtration, it is easier to integrate into the existing plant and is easier to expand. Ballasted Flocculation is also considered a better choice to meet future, reduced TP limits.

12.6 Selection of the Preferred Alternative

Based on the fact that no major public or review agency comments were received as a result of the June 22, 2011 PIC, the Steering Committee selected the Preferred Alternative in accordance with the Recommended Alternative as outlined in Section 12.5.

13.0 Impact of Recommended Alternative on the Environment and Mitigating Measures

The preferred solution does not significantly impact environmental features within and surrounding the study area. Any potential impact will be identified, addressed, monitored, and mitigated as required.

13.1 Truck Traffic

During construction, vehicular traffic to and from the project area will increase as construction equipment is delivered and removed, and construction materials are delivered. To mitigate these impacts, construction times will be limited in accordance with local by-laws. The need for a traffic impact study will be assessed during final design but it is considered that the long-term impacts will be minimal.

In order to mitigate the impacts to the local community, an established truck route should be selected by the Town.

13.2 Noise, Dust and Mud

Potential sources of noise, dust, and vibration include truck traffic and regular construction activities. These impacts can be mitigated as follows:

- Ensuring all vehicles and construction equipment are equipped with effective muffling devices and are operated in a fashion so as to minimize noise in the project area
- Enforcing the local noise by-law for all construction activities
- Restricting all truck traffic, excavation equipment, and other activity that potentially generates significant noise levels to normal working hours
- Excavated soil and rock material should be used on-site as much as possible in order to minimize truck haulage to off-site disposal areas
- Dust control agent can be applied as necessary.

13.3 Fuel Spills

During the refuelling of construction equipment, spills could occur with the potential of contaminating surface water and groundwater. Mitigation measures include:

- Preparing a contingency plan for cleaning up fuel spills
- Only allowing designated areas that are no closer than 15 m to any watercourse for refuelling construction equipment
- Providing spill containment for on-site storage tanks

13.4 Continuity of Operation

As the continuing operation of the BWPCP is of utmost importance, careful consideration will be given during the design and construction scheduling to avoid impacts on the plant operation. Since there are three separate "trains" it may be possible to work on one plant (B, C or D) while the other two are in operation. The construction of the equalization tank will not be an operational issue but the addition of the ballasted flocculation tertiary treatment units may require some flow diversion.

13.5 Vegetation and Loss of Tree Cover

The construction will encounter some shrubbery, bushes, and trees, which will need to be removed. Protective fencing will be placed around all trees that are designated to remain, in order to clearly define the construction work area.

Vegetated lands disturbed during construction will either be replanted with natural wild grasses and saplings of trees indigenous to the area (save for areas that require clearing for the BWPCP expansion) or trees will be planted in other areas of the site such as along the property boundaries.

13.6 Noise Assessment

It is considered that the proposed new equipment (pumps, blowers, tertiary treatment and sludge thickening) will not add any appreciable noise to the existing environment. However, it is recognized that in order to determine the need for and extent of any mitigation measures, a noise assessment may be required as part of final design. At that time, a more detailed knowledge of equipment requirements will be available, which will result in a more reliable and useful noise assessment. At this time (Class EA stage), the impact of additional noise is considered to be minimal and easily mitigated.

13.7 Odour Assessment

A preliminary odour screening assessment was recently completed and the results are provided in Appendix H. In summary, there are no odour impacts that cannot be mitigated, as a result of the proposed capital works to expand the plant to a capacity of 23.3 MLD.

At the present time and based on the preliminary proposed works, the only suggested mitigation measure is the addition of a carbon filter unit at the future thickened waste activated sludge (TWAS) facility. Additional mitigation measures may be identified as part of the future additional dispersion modeling that will be required as part of the final design of the plant expansion to 23.3 MLD.

14.0 Stormwater Management Assessment

The proposed upgrades will not impact the existing site drainage in any way. There is sufficient grade around the site to accommodate the new building/tanks. The previously completed stormwater assessment is considered to be adequate for the proposed works.

15.0 Opinion of Cost

A budget cost estimate was prepared as part of the Class EA planning process for the recommended works. The estimate is in $2011 and includes an allowance for engineering & contingencies.

The capital cost is to be funded 100% by Development Charges. The capital cost estimate is a planning level estimate, based on conceptual design prepared for Class EA planning purposes. The estimate is accurate to within +50% and –30%.

Table 15-1 – Estimated Capital Cost

Description	Estimated Capital Cost
General site works	$600,000
Upgrades to onsite pump station	$300,000
Upgrades to headworks	$900,000
Demolition of Plant A	$300,000
Upgrades to Plant B	$1,000,000
Upgrades to Plant C	$700,000
Upgrades to Plant D Aeration	$200,00
New equalization tank and ballasted flocculation facility	$13,000,000
New water activated sludge thickening facility	$3,000,000
Total Estimated Capital Cost	**$20,000,000**

16.0 Phase 3 Public Information Centre – Public's Principal Concerns

A Phase 3 Public Information Centre was held on June 22, 2011 to present the overall Recommended Solution and to obtain public and Review Agency input. A copy of the PIC Material and related correspondence is included in Appendix I. A summary of the verbal and written comments received is as follows:

- Letter dated July 8, 2011 from Cassels Brock Lawyers representing the Tsam Lands and requesting clarification of the service area. A response letter was provided by the Town dated July 12, 2011.
- Verbal inquiry regarding nitrification

Copies of the PIC Notice, Communication Plan, PIC Displays, sign-in sheet, letters and a memo outlining the comments received are included in Appendix I.

A summary of all comments received as a result of the Class EA is provided in Table 16-1.

TABLE 16-1 Summary of Comments

FROM/DATE	NATURE OF COMMENT	ADDRESSED THROUGH CLASS EA
Alderville First Nation April 1, 2011	- Minimal impact to First Nations rights - Keep us informed	- Notices were sent
MOE – April 4, 2010	- Address noted issues	- See Section 18.0
Chippewas of Rama First Nation – April 4, 2010	- Direct all future correspondence to Karry Sandy-McKenzie	- Future Notices were sent to Ms. Sandy-McKenzie
Enbridge Gas – April 20, 2010	- Send copies of plans during final design to determine conflict with gas plant	- No action required at this time
LSRCA – April 4, 2010	- Wants representation on "Working Group"	- Invited to PIC and was offered opportunity to meet to discuss the Project
LSRCA – April 28, 2010	- Suggests some pre-consultation	- Was invited to June 13, 2011 Steering Committee meeting

FROM/DATE	NATURE OF COMMENT	ADDRESSED THROUGH CLASS EA
		(did not attend) - Was invited to June 22, 2011 PIC (did not attend) - Was informed that PIC Information is on the Town's Web Site
Ministry of Aboriginal Affairs – May 20, 2011	- Suggests appropriate First Nations Contacts	- Contacts were added to Communication Plan
Unidentified PIC attendee – June 22, 2011	- Does nitrification occur? - What is retention time in the Plant?	- Plant is design for nitrification to meet ammonia limit - Retention time is not relevant to Class EA
Cassels Brock – July 8, 2011	- Do the "Tsam Lands" have capacity in the current plant?	- Town letter dated July 12, 2011 responded that wastewater treatment capacity is currently available for the Tsam Lands.
Hiawatha First Nation – June 7, 2011	- Minimal impact to First Nations rights - Keep us informed	- Notices were sent
Cassles Brock – July 18, 2011	- Wanted clarification on Tsam Lands	- Town email dated July 18, 2011 confirms that there is sufficient capacity in the existing plant to accommodate the Tsam Lands
Curve Lake First Nation – July 6, 2011	- Not currently aware of any issues - Contact Karry Sandy-McKenzie	- Ms. Sandy-McKenzie was added to Contact List - Town letter dated July 27, 2011 to Karry Sandy-McKenzie noted Web Site location for PIC information

17.0 First Nations Consultation

Based on a review of the responses received, no issues or concerns were raised by the Aboriginal Communities. The list of First Nation Groups that were consulted is included in the Communication Plan in Appendix I.

18.0 Design Considerations Resulting from Public and Agency Consultation

There are no design issues that need to be considered as a result of public consultation.

With respect to the MOE letter dated April 4, 2011, the following points are noted in response to the Ministry's concerns.

18.1 Ecosystem Protection and Restoration

All of the proposed works will be constructed within the limits of the developed area of the WPCP property. The existing wet land within and adjacent to the WPCP property will not be developed in any way. As such, the form and function of the wet land ecosystem will be maintained with no impact. Mitigation measures have been identified and described in Section 13 of this ESR.

No natural heritage features have been identified since all proposed works are within the currently developed area of the WPCP property. The effluent outfall will not be changed in any way and it has been proven that the additional effluent flow will meet Provincial requirements for discharge to the West Holland River. The MNR and the DFO were contacted as part of the Class EA process and neither of those agencies had any comment on the proposed undertaking.

The level of growth is consistent with the Town's OP and all policies related to ecosystem protection are considered to have been addressed due to the fact that the proposed works are within a currently developed area of the existing WPCP property.

18.2 Surface Water and Groundwater

It is recognized that approval under Section 53 of the OWRA will be required. An assimilative capacity assessment of the West Holland River was completed as part of the Class EA planning process, based on assumed effluent criteria. That Report will be used when the Town applies for a Certificate of Approval. The proposed effluent criteria was presented to the MOE Central Region during the Class EA process. The Town recognizes the TP loading requirement of 698 kg/year and the selection of the proposed works was based on that requirement. Biosolids ("residue") treatment needs were assessed and addressed as part of the Class EA process.

There are no water supply wells in the immediate area of the WPCP. The locations of the municipal wells are far removed from the WPCP site. There will not be any water takings required for the construction and operation of the expanded plant. No existing wells will be impacted or abandoned. The groundwater conditions are described in the Geotechnical Reports that have been reviewed as part of the Class EA process.

A Contingency Plan for dealing with potential adverse effects on surface water (e.g. fuel spills) will be prepared prior to construction.

The impacts to groundwater-dependant natural features will be minimal considering the fact that the groundwater table is 2 m below grade. Water taking for construction purposes will be minimal (excavation dewatering) and the discharge impact can be mitigated. There will be no significant impacts to the groundwater. The need for a Permit to Take Water will be assessed during final design but at this time, the need for such a Permit is considered to be low.

18.3 Air Quality, Dust and Noise

A screening of potential sources of air pollution from the proposed works has been completed and the results are provided in Appendix H of this ESR. In summary, there are no odour impacts that cannot be mitigated, as a result of the proposed capital works to expand the plant to a capacity of 23.3 MLD.

The effects of dust, generated as a result of construction, will be mitigated as outlined in Section 13 of this ESR.

As noted in Section 13.6, the proposed works include pump and blower replacements, to be installed in existing buildings. As such, the effect on the noise level in the area of the WPCP will be minimal. The Town acknowledges that a noise assessment will be required as part of the final design process.

18.4 Servicing and Facilities

The need for a revised Certificate of Approval for both wastewater and air is recognized.

The Ministry's references are noted.

18.5 Waste Materials and Spills

The requirement for disposal of waste that is generated during construction is noted.

The requirements for removal of soil from the site will be reviewed during final design but at this time, it is suggested that all excavated material will be reused within the WPCP site.

All underground pipes within the WPCP are owned by the Town. There are no underground storage tanks proposed.

18.6 Mitigation and Monitoring

The requirements mitigation and monitoring are noted.

18.7 Planning and Policy

The requirements of Planning and Policy are noted.

18.8 Class EA Process

The ESR provides:

- Clear and complete documentation of the planning process
- Documentation of the consultation process including public consultation efforts
- Identification of concerns and how they were addressed
- Copies of comments submitted and responses
- Identification of potential environmental impacts and proposed mitigation measures
- A list of permits/approvals that will be needed prior to construction.

18.9 Aboriginal Peoples Consultation

The Ministry of Aboriginal Affairs and the Department of Indian and Northern Affairs were contacted throughout the Class EA planning process in addition to numerous other First Nations contacts. All comments received as a result of the consultation process have been identified in this ESR.

19.0 Summary of Preferred Alternative

A summary of the Preferred Alternative is as follows:

- Apply to the to the Ministry of the Environment for a revised Certificate of Approval with a total WPCP capacity of 19.4 MLD in conjunction with increasing the capacity of the alum pumps;
- Optimize Plants C and D and modify Plant B to obtain a total rated capacity of 23.3 MLD;
- Increase existing aerobic digester capacity by adding thickening of Waste Activated Sludge (WAS);
- Construct ballasted flocculation process upstream of the existing sand filters;
- Complete a Water Conservation and Efficiency Strategy (WCES) for the water and waste water flows within the respective Service Areas. The WCES is also to be completed in accordance with the requirements of the Lake Simcoe Protection Plan (LSPP).

20.0 Re-rating Study

An assessment of the plant's interim capacity was recently completed to determine what level of capacity increase would be reasonable, assuming no major capital works were undertaken at the WPCP. A copy of the Re-rating Study is included in Appendix J. The Study concludes that the overall capacity of the WPCP can be increased from the currently approved rating of 17.4 MLD to 19.4 MLD by simply upgrading the capacity of the alum pumps. This 2 MLD capacity increase is currently available in the Plant D train.

It is the Town's intent to apply to the Ministry of the Environment for a revised Certificate of Approval based on the Re-rating Study. This will allow the Town to allocate additional wastewater treatment capacity to new development within future growth areas, prior to undertaking any major capital works.

21.0 Monitoring Requirements

After expansion of the BWG WPCP and following acceptance testing, the Town will assume full-time operation of the system. The Town intends to continue monitoring users discharging into the sewer system to ensure that they do not impact plant operation. The Town will also ensure that it complies with applicable environmental regulations. For compliance with the MOE CofAs, the Town will put in place a monitoring program that satisfies both the provincial requirements and the plant's operational needs. The BWG WPCP has a wastewater laboratory that will continue to provide the necessary information to plant operations for process control, plant effluent quality, and solids quality monitoring to ensure that the plant complies with provincial and municipal requirements. Samplers will be provided to monitor raw and treated wastewater. An annual report will be prepared to document the plant's performance. The Town will monitor effluent quality, as required by the MOE's CofA.

The Town will continue to monitor flows in the collection system in an attempt to locate areas of excessively high inflow/infiltration (high wet weather flows). The Town will continue to rehabilitate the collection system as necessary.

In addition, the Town should review and upgrade its Sewer Use By-Law to limit wastewater flows and parameters from commercial and industrial sources. Such sources should be monitored.

22.0 Permits and Approvals

The following submissions are to be made during detailed design once sufficient information has been prepared for agency review purposes.

The MOE Certificates of Approval that will be required include:

- C of A (wastewater) – required for all works, to be submitted near completion of design.
- C of A (air) – required for emergency power system and for various parts of the Bradford WPCP expansion and requires an air assessment/noise attenuation study in support of the C of A, to be submitted near completion of design.

Other approvals and permits include:

- Site Plan Approval – required for all works, to be submitted to the Town and County near completion of design.
- Building Permit – to be submitted to the Town (by Contractor) during start of construction.

23.0 Implementation Schedule

Key milestones of the preliminary schedule are as follows:

- Posting of ESR for 30-day review – January 19 to February 17, 2012
- Apply to the MOE for a rerating of the WPCP to 19.4 MLD
- Completion and implementation of Water Conservation and Efficiency Strategy
- Completion of preliminary design to expand the WPCP rating from 19.4 MLD to 23.3 MLD
- Apply to the MOE for a rerating of the WPCP to 23.3 MLD
- Completion of detailed design and approvals for 23.3 MLD Plant
- Award of contract for construction
- Completion of Construction

Based on the finding of the Re-rating Study, it is the Town's intention to apply to the MOE for a re-rating of the plant capacity from the current 17.4 MLD to 19.4 MLD. Assuming the re-rating is approved by the MOE, the Town will, in the future, expand the plant capacity from 19.4 MLD to 23.3 MLD as one stage. The decision to undertake the expansion in one stage (one construction contract) was based on the following considerations:

- If sub-components of the expansion were to be completed on their own (such as the upgrade to the tertiary treatment facility), no additional capacity above 19.4 MLD would be gained; and
- If the Project is broken into three or four sub-components and completed over a number of years the combined total cost of these smaller contracts would most likely be greater than if the works were completed as one contract.

PHASE 4 REPORT

24.0 Notice of Completion

The Notice of Completion was published in the local newspapers on Thursday January 19 and Thursday January 26, 2012. The Notice was sent to residents within a 1km radius of the BWG WPCP. A copy of the Notice and mailing lists are included in Appendix K. The Notice was added to the Town's web site.

Prior to the publication of the Notice of Completion, a Draft version of the ESR was reviewed by the MOE. The Draft ESR was sent to the Ministry on October 25, 2011. The Ministry's comments on the Draft ESR were provided in a letter dated November 29, 2011. A copy of the MOE's letter is included in Appendix K. All applicable Ministry comments have been addressed in the ESR.

In addition, the proposed effluent criteria for a re-rating of the plant to a capacity of 19.4 MLD, was provided to the MOE Environmental Approvals and Assessment Branch for comment. A copy of the email is provided in Appendix K.

As a result of the publication of the Notice of completion, the Town received comments from Chippewas of Rama First Nation, (letter dated January 20, 2012), Don Boswell, Senior Claims Analyst, Ontario Research Team, Specific Claims Branch (email dated January 26, 2012) and the MOE (letter dated February 23, 2012). Copies of these three items of correspondence are included in Appendix K.

The Chippewas of Rama First Nation wanted to make sure that Ms. Karry Sandy-McKenzie was included in the Contact list. It is noted that Ms. Sandy-McKenzie was included in the Contact List.

Mr. Boswell suggested that additional web sites might need to be researched in order to advise First Nations groups of the Town's intention. The following First Nations groups were identified as a result of the additional research:

- Saugeen First Nation (located west of Owen Sound)
- Chippewas of Nawash First Nation (located on the Bruce Peninsula)
- Wasauksing First Nation (located near Parry Sound)

These three first Nation groups were deemed to be remote from Bradford West Gwillimbury and therefore, they were not added to the Contact List.

The MOE expressed addition comment on the proposed effluent concentration for CBOD as it relates to the DO level in the receiving West Holland River. The MOE also provided additional comment on the Air Quality Impacts Assessment Report. A response letter was provided to the MOE (dated March 23, 2012) and a copy is included in Appendix K. In summary, the Town committed to:

- Prepare a work plan (for MOE review and comment) to assess current DO levels in the West Holland River and to model the proposed increase in effluent flow (23.3 MLD) as part of the final design for the future plant expansion,
- Revise the effluent CBOD limit depending on the results of the DO assessment,
- Undertake additional dispersion modeling and an assessment of compliance with O. Reg. 419/05 as part of the final design of the proposed expansion to 23.3 MLD, and
- Identify specific air quality mitigation measures as part of the additional dispersion modeling.

25.0 Recommendations and Conclusions

Considering all of the information provided in this ESR, it is recommended that the Town:

- Proceed with the planning and implementation of a Water Conservation and Efficiency Strategy in conformance with the Lake Simcoe Protection Plan;
- Consider continuing with its existing program of investigating the sanitary sewer system in order to monitor and possibly reduce wet weather flows to the plant;
- Make application to the MOE for an Environmental Compliance Approval (ECA) to allow an interim capacity increase (re-rating to 19.4 MLD) based on optimization of the existing WPCP facilities with no additional capital works;
- Consider the timing for the design of the necessary works as outlined in this ESR, to increase the capacity of the WPCP to 23,300 m^3/d including obtaining all applicable approvals;
- Prepare a work plan to assess current DO levels in the West Holland River and discuss the work plan with the MOE prior to initiation of the Assessment;
- Undertake the work plan to assess the impact on DO levels in the West Holland River based on the proposed flow increase to 23.3 MLD including computer modelling and reassess effluent CBOD limits based on the results of the DO modelling;
- Undertake additional air quality impact assessment dispersion modelling based on the proposed plant expansion to 23.3 MLD complete with an assessment of compliance with O. Reg. 419/05;
- Make application to the MOE for an ECA to increase the capacity of the WPCP to 23.3 MLD based on the final design;
- Complete the construction of the works that are identified in this ESR when deemed necessary for future growth; and
- Implement any mitigation measures associated with both the construction and the operation of the expanded plant.

In conclusion, this ESR provides sufficient documentation of the Class EA planning process that was followed by the Town of the Bradford West Gwillimbury to support an interim capacity increase from 17.4 MLD to 19.4 MLD without any capital works. The ESR also provides documentation of the planning process to support a future capacity increase from 19.4 MLD to 23.3 MLD based on future assessments (DO in the West Holland River and additional Air Quality) and on the completion of a future final design of the proposed expansion facilities.

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