March 23, 2017 Project No. 1775960

Angela Porteous, BESc., Regulatory Compliance Officer
The Corporation of the City of Kawartha Lakes
12 Peel Street
Lindsay, Ontario
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RESPONSE TO MOECC COMMENTS
APPLICATION FOR APPROVAL OF INDUSTRIAL SEWAGE WORKS
AMENDMENT OF ECA # 8668-92MTK7 FOR COMPOST PAD STORMWATER POND
RELOCATION OF EXISTING LEAF AND YARD WASTE COMPOSTING OPERATIONS
LINDSAY/OPS LANDFILL SITE
LINDSAY, ONTARIO [MOECC REFERENCE NO. 1402-A5AM7C]

Dear Angela,

As requested, this letter provides responses to review comments received from the Ministry of Environment and Climate Change (letter from Stefanos Habtom, Senior Wastewater Engineer, dated January 31, 2017) on the above-noted Industrial Sewage Works application and supporting documentation prepared by Stantec Consulting Limited. The application is for the stormwater management pond (SWMP) that will service the proposed Compost Facility at the north end of the Lindsay / Ops Landfill Site. The proposed Compost Facility and associated SWMP will replace the existing Compost Facility and SWMP located at the south end of the landfill expansion area. Approval for the proposed Compost Facility was granted as an Amendment to ECA No. A321504 (Notice 1) dated October 5, 2015.

Review Comment No. 1

I have reviewed the report titled "Supporting 1. Documentation for ECA Amendment (A3211504) - Relocation of Existing Leaf and Yard Waste Composting Operations -Lindsay-Ops Landfill Site" dated January 2015. Section 3.2 - Stormwater Management Design which provides ***only a general description*** *of the stormwater management pond design is not adequate to assess the proposed stormwater management pond design basis and design specifications. Section 3.2 indicates that the SWM facility will be a wetland-type facility and the submitted Drawing No. C-100 shows an extended detention pond with a forebay. Please submit a detailed stormwater management pond design based on the Ministry's "Stormwater Management Planning and Design Manual" March 2003 providing details regarding the type of the proposed SWM pond, sizing specifications and how it meets MOECC design requirements i.e. pond depth, length, permanent storage capacity, extended storage capacity, stage storage capacity for design storm events, attenuation of all storm events to pre-development levels, outlet control specifications, and all other pertinent design information.*

Response

Please refer to the Technical Memorandum in Attachment A of this letter for the requested design information and supporting calculations pertaining to the proposed SWMP.

Review

The proposal is for a leaf and yard waste composting facility operation. Please submit details about the composting operation including what parts of the composting operation are conducted in the open, the management of leachate generated from the compost pad operation, management of potentially contaminated stormwater runoff from the composting operation, and segregation of non-contact stormwater runoff from the site.

Response

The operating practices for the proposed new Compost Facility will be the same as those for the existing facility and will be in accordance with Regulation 101/94, Part V – Leaf and Yard Waste Composting Sites, Sections 31 to 33 and ECA No. A321504. Only Leaf and Yard waste will be received for composting. The material will be weighed at the on-site scale as received. The designated drop-off area on the Compost Pad will be inspected on a daily basis to identify any unacceptable materials such as plastic bags, construction debris etc. All of the composting operations will be conducted in the open. The maximum amount of Leaf and Yard waste at the new Compost Facility at any time in not to exceed 8000 tonnes. Further requirements on the operation of the new Compost Facility are given in Condition 6.2 of the October 5 ECA No. A321504 Amendment (Notice 1) for the Lindsay-Ops landfill Site. Additional requirements are given in the City's Safe Operating Procedure (SOP) applicable to all of their composting facilities. A copy of the City's SOP is provided as Attachment B of this letter.

All leachate from the Compost Pad area will discharge to a perimeter swale which in turn discharges to the proposed SWMP as shown on the Detailed Design Drawings. The SWMP has been designed as a wetland-type facility to provide water quantity and water quality control for stormwater runoff from the Compost Pad as well as the existing transfer area, HHW building and associated asphalt areas. All of the run-off from this capture area will be managed as "potentially contaminated run-off" (i.e., will not be segregated into contact and non-contact run-off). The SWMP accommodates the volume of a 25 year storm (2,230 m^3) in a pond sized to hold 4,000 m^3. There is no outlet from the pond except for an overflow spillway to the north ditch when the 4,000 m^3 storage capacity is exceeded. With evaporation, infiltration and water uptake by plant materials, the potential for overflow is small and would occur only under exceptional circumstances.

Review Comment No 3

The stomwater monitoring program included under Table C-3: Surface Water Sampling of the Waste ECA No. A321504 issued March 8, 2013 will be used as monitoring requirements in the amended sewage works ECA. To ensure that potentially leachate contaminated stormwater is not discharged from the proposed composting stromwater management pond to the Scugog River, please submit a list parameters of concern and associated trigger levels to be used for the operation of the SWM pond i.e to allow discharge of non-contaminated stormwater to Scugog River and dispose off-site potentially contaminated stormwater for proper treatment. These trigger parameters should be representative of the quality of leachate being generated from the composting operation and based on the Provincial Water Quality Objectives (PWQO).

Response

Monitoring Program

In accordance with the October 5, 2015 Amendment to ECA No. A321504 (Notice 1), the surface water monitoring program for the new Compost Pad Facility involves the following two new stations (refer to Figure 1 for locations):

CP#1 - main retention area of the SWMP, and

CP#2 - north drainage ditch immediately downstream of the SWMP outflow spillway.

The monitoring frequency for stations CP#1 and CP#2 is twice per year (spring and late summer/early fall).

The analytical parameters for stations CP#1 and CP#2 are the same as those for the existing Compost Pad surface water monitoring program as listed in Table C-4 (Schedule E) of the March 8, 2013 Amended ECA, with the addition of tannins and lignins as required by the October 5, 2015 ECA Amendment (Notice 1). The list of parameters is provided below.

General Chemistry

Conductivity (field and lab), pH (field and lab), alkalinity, hardness, COD, DOC, temperature (field), Total Dissolved Solids, Total Kjeldhl Nitrogen, ammonia-N, total phosphorus

Major Ions

Chloride, fluoride, nitrite, nitrate, sulphate, calcium, iron, magnesium, manganese, potassium, sodium

Trace Metals

Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, molybdenum, mercury, nickel, selenium, silver, strontium, thallium, vanadium, zinc

Organics

Total Phenols, Tannins and Lignins, Total PCBs (spring and late summer/early fall every third year).

Although not part of the new Compost Pad surface water monitoring program, data from the existing monitoring stations SW4 and SW 14 located along the north drainage ditch upstream and downstream, respectively, of the Compost Pad will also be used to assess potential impacts associated with the Compost Facility operation. Figure 1 shows their location. As required by the October 5, 2015 ECA Amendment (Notice 1), these existing stations are monitored on a quarterly basis (winter, spring, summer and fall) for the same parameters noted above for the proposed CP#1 and CP#2 stations but with additional parameter groups such as volatile organic compounds that are appropriate for monitoring landfill impacts.

Trigger Parameters and Concentrations

The October 5, 2015 ECA amendment does not identify any trigger parameters / concentrations specific to the discharge from the proposed Compost Pad SWMP. Similarly, there are no trigger parameters / concentrations for surface water discharge from the existing Compost Pad SWMP. However, for the existing Compost Pad SWMP, the discharge is conveyed via ditches to the landfill SWMP west of the landfill expansion area which does have trigger parameters / concentrations for its inlet and outlet monitoring stations as specified in the March 8, 2013 ECA. For the inlet station SW15 (see Figure 1), additional sampling is required if the ammonia-N concentration exceeds 1.0 mg/L and/or if the pH falls outside the range of 6 to 8.5. For the outlet station SW18,

an ammonia-N concentration of 5 mg/L and/or a pH outside the range of 6.0 to 8.5 triggers closure of the outflow structure to prevent discharge to the north ditch. Of note though is that the selection of ammonia-N and pH as the trigger parameters for the landfill SWMP relates to their significance as key parameters in landfill leachate rather than in the Compost Pad drainage.

As an example of the expected "typical" water quality for the proposed Compost Pad SWMP, the attached Table 1 shows the 2015 water quality monitoring results for discharge from the existing Compost Pad SWMP. Also shown for comparison are the Provincial Water Quality Objectives (PWQO) and the water quality results obtained for the north ditch background station SW-4 on the same monitoring dates. Based on this information, the key parameters that are likely to be significantly elevated in the Compost Pad SWMP relative to PWQO and background surface water quality in the north ditch are phosphorus and iron. Both have concentrations between 10 and 100 times their respective PWQO values of 0.02 mg/L and 0.3 mg/L. However, both parameters are largely associated with particulate matter washed from the Compost Pad rather than being in a dissolved state. As such, their concentrations in the pond water column are expected to decrease as the suspended solids settle out. Other parameters that do not have a PWQO value but are at relatively high concentrations in the SWMP compared to concentrations at the background north ditch station SW-4 are Chemical Oxygen Demand, Dissolved Organic Carbon, potassium and Tanins and Lignins. They represent additional key indicator parameters for identifying potential impacts associated with discharge from the new Compost Facility.

For phosphorus, the concentrations in the Compost Pad SWMP shown in Table 1 are comparable to the maximum allowable monthly average concentration of 0.2 mg/L (i.e, 10 times PWQO) for the Lindsay-Ops Water Pollution Control Plant (WPCP) discharge. As a further comparison, the phosphorus loading from the proposed Compost Pad SWMP under the 25 year, 24 hour rainfall event assuming 0.6 mg/L phosphorus concentration is 2.4 kg/day which is less than the 4.3 kg/day monthly average loading allowed for the WPCP effluent discharge.

Considering the expected water quality for the proposed SWMP and that pond is designed as a wetland-type feature with limited potential for overflow, the application of trigger parameters / concentrations for the pond discharge is not warranted at this time. This approach is consistent with the March 8, 2013 ECA for the existing Compost Facility and the October 5, 2015 ECA amendment for the proposed Compost Facility which do not impose any trigger parameters/concentrations.

As surface water quality data becomes available from the semi-annual monitoring at the proposed Stations CP#1 and CP#2, the need for a trigger mechanism that would prohibit discharge to the north ditch and initiate pumping to the landfill SWMP for further treatment will be re-assessed taking into account any impacts at CP #2 and SW15 (i.e., the north ditch downstream stations) attributable to overflow from the SWMP. This re-assessment will be presented each year in the Annual Status Report for the Lindsay Ops Landfill which is submitted by April 30 as required by Condition 15.1 of the March 8, 2013 ECA.

We trust that the above responses adequately address the Ministry's review comments. Please contact us should you have any questions or require further clarification.

Yours truly,

GOLDER ASSOCIATES LTD.

Frank Barone, Ph.D., P.Eng.
Principal

FSB/sm/rb/jl

Table 1	Example Comparison of Existing Compost Pad SWMP Water Quality (2015) with PWQO and North Ditch Upstream Station SW4 Water Quality
Figure 1	Surface Water Monitoring Locations
Attachment A	Technical Memorandum – Stormwater Management Pond Design
Attachment B	City of Kawartha Lakes Safe Operating Procedure (SOP) for Composting Facilities

https://golderassociates.sharepoint.com/sites/11085g/shared documents/correspondence/letters/1775960 ltr 2017march23 response to moecc comments.docx

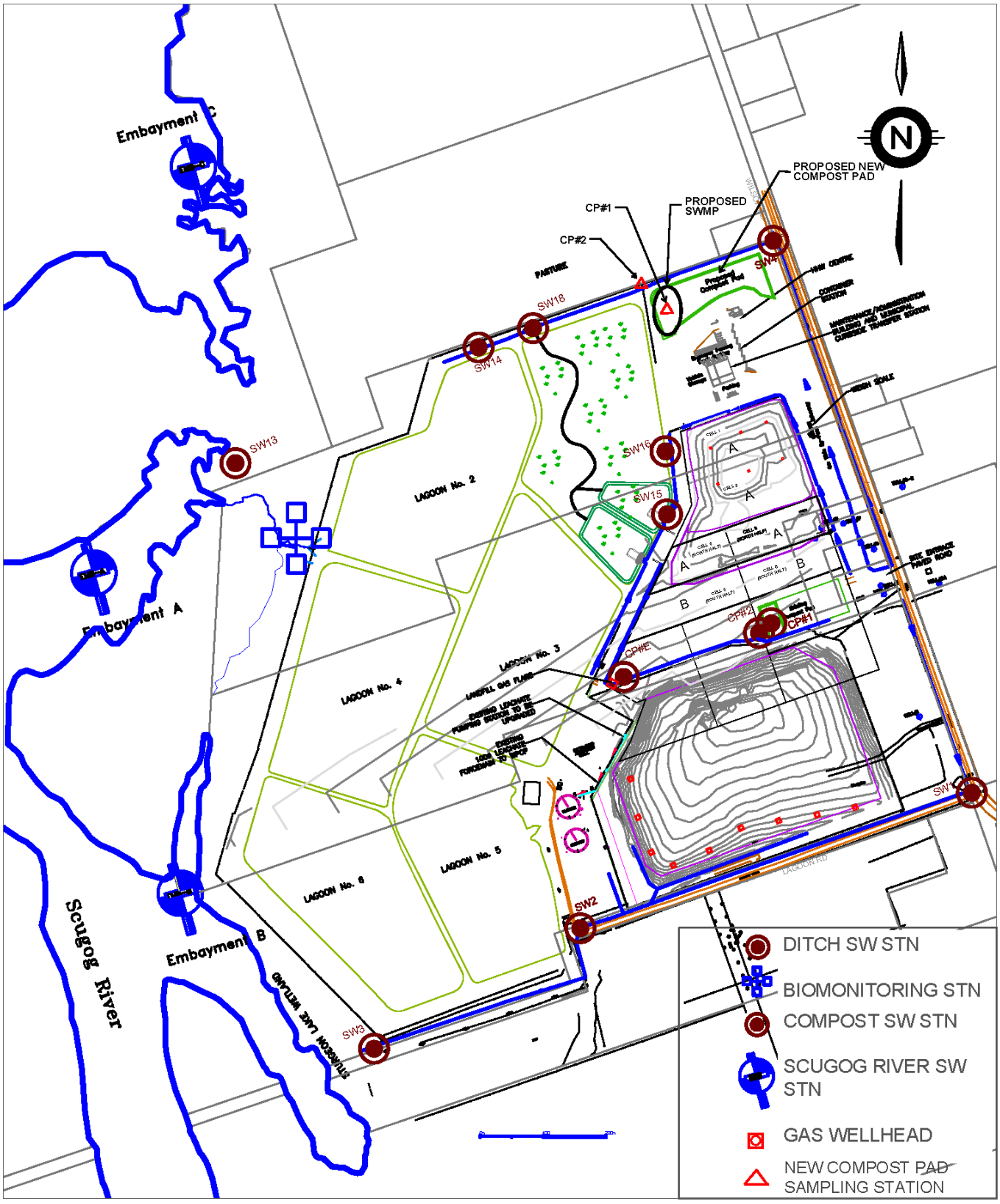
TABLES

Table 1: Example Comparison of Existing Compost Pad SWMP Water Quality (2015) with PWQO and North Ditch Upstream Station SW4 Water Quality

	PWQO (mg/L)	June / 2015 (mg/L)		November / 2015 (mg/L)	
		Existing Compost Pad CP#1	North Ditch Upstream SW4	Existing Compost Pad CP#1	North Ditch Upstream SW4
General Chemistry					
Conductivity (field)	-	599	756	843	800
pH (filed)	6.5 – 8.5	7.6	8.1	7.7	8.2
Alkalinity	-	215	312	287	256
Hardness	-	173	305	239	339
Chemical Oxygen Demand	-	97	13	180	<5
Dissolved Organic Carbon	-	18	8	53	4
Total Dissolved Solids	-	303	401	468	458
Total Suspended Solids	-	16	5	38	8
Total Kjeldhl Nitrogen	-	2	1	5	0.7
Ammonia – N	-	0.15	<0.01	0.06	0.01
Un-ionized Ammonia-N	0.02	<0.01	<0.01	<0.01	<0.01
Phosphorous	0.02	0.16	0.03	0.62	0.06
Major Irons					
Chloride	-	43	45	72	56
Fluoride		<0.1	0.1	0.1	0.1
Nitrite	-	<0.1	<0.1	<0.1	<0.1
Nitrate		<0.1	2	<0.1	7
Sulphate		2	13	4	49
Calcium		58	109	79	123
Iron	0.3	1.1	0.082	2.7	0.15
Magnesium		7	8	10	8
Manganese		0.51	0.037	0.46	0.048
Potassium		51	0.5	107	1.5
Sodium		13	29	20	37
Trace Metals					
Aluminum (filtered)	0.075	0.07	0.05	0.39	0.06
Antimony	0.02	<0.0001	0.0002	0.0003	0.0001
Arsenic	0.005	0.001	0.0003	0.0034	0.0002
Baruim	-	0.103	0.033	0.178	0.045
Beryllium	1.1	<0.002	<0.0002	<0.002	<0.0002
Boron	0.2	0.027	0.005	0.022	0.007
Cadmium	0.0005	<0.00002	0.00002	0.0001	<0.00002
Chromium	0.001	<0.0002	<0.0002	0.0007	0.0003
Cobolt	0.0009	<0.005	<0.005	<0.005	<0.005
Copper	0.005	<0.0001	0.0003	0.0056	0.0008
Lead	0.005	0.00006	<0.00002	0.0013	0.00011

	PWQO (mg/L)	June / 2015 (mg/L)		November / 2015 (mg/L)	
		Existing Compost Pad CP#1	North Ditch Upstream SW4	Existing Compost Pad CP#1	North Ditch Upstream SW4
Molybdenum	0.04	0.0001	0.0001	0.0005	0.0002
Mercury (filered)	0.0002	<0.00002	<0.00002	<0.00002	<0.00002
Nickel	0.025	<0.01	<0.01	<0.01	<0.01
Selenium	0.1	<0.001	<0.001	<0.001	<0.001
Silver	0.0001	<0.00002	<0.00002	0.00005	<0.00002
Strontium	-	0.22	0.31	0.30	0.33
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005
Vanadium	0.007	0.0002	0.0004	0.0012	0.0003
Zinc	0.02	<0.005	<0.005	0.047	<0.005
Organics					
Total Phenols	0.001	<0.001	<0.001	<0.001	<0.001
Tanins and Lignins		3.9	-	1.3	0.1

FIGURES



CLIENT
CITY OF KAWARTHA LAKES

PROJECT
COMPOST PAD RELOCATION
LINDSAY/OPS LANDFILL, LINDSAY, ONTARIO

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-03-21
PREPARED	RW
DESIGNED	-
REVIEWED	SR
APPROVED	FB

TITLE
SURFACE WATER MONITORING LOCATIONS

PROJECT NO.	CONTROL	REV.	FIGURE
1775960	0001	A	1

ATTACHMENT A

TECHNICAL MEMORANDUM

DATE March 24, 2017 **PROJECT No.** 1775960

TO Angela Porteous, BESc. Regulatory Compliance Officer
City of Kawartha Lakes

FROM Luis Vasquez and Frank Barone **EMAIL** Frank_Barone@golder.com

STORM WATER MANAGEMENT POND DESIGN SUMMARY
RELOCATION OF EXISTING LEAF AND YARD WASTE COMPOSTING OPERATIONS – LINDSAY – OPS LANDFILL SITE

1.0 INTRODUCTION

This technical memorandum provides supporting information for the storm water management design prepared by Stantec for the proposed relocation of the existing Leaf and Yard Waste Composting Operations at the Lindsay/Ops Landfill Site. A stamped detailed design drawing was provided by Stantec as part of the documentation for the October 5, 2015 ECA Amendment (A3211504) without an accompanying design report.

The Stantec detailed design and the supporting documentation provided in this technical memorandum are based on the Stormwater Management Planning and Design Manual (MOE, 2003). The Design Manual includes wetlands as one of the types of water management facilities that can be used for “end-of-pipe” control.

2.0 STORM WATER MANAGEMENT

The storm water management system is comprised of the following components:

- A storm water management pond to manage surface runoff from the Compost Pad as well as the existing transfer area, HHW building and associated asphalt areas; and
- A perimeter swale that collects surface runoff from the compost pad and conveys runoff to the storm water management pond.

The characteristics of the pond and the swale based on the Stantec design drawing are summarized in Table 1. The stage-storage capacity curve for the pond is tabulated in Table 2.

Table 1: Characteristics of the Storm Water Management System

Water Management Pond		Overflow Spillway and Collection Swale	
Pond total length	110 m	Overflow spillway section	Triangular
Pond bottom width	15 m	Overflow spillway depth	0.3 m
Pond side slopes	5H:1V	Overflow spillway total width	3.0 m
Pond bottom elevation (Forebay and Aftbay)	252.7 m	Overflow spillway side slopes	5H:1V
Pond top elevation	254.5 m	Overflow spillway lining	100 mm D_{50} riprap

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Water Management Pond		Overflow Spillway and Collection Swale	
Overflow spillway invert elevation	254.2 m	Collection swale section	Triangular
Pond maximum depth	1.5 m	Collection swale depth	0.6 m
Pond freeboard	0.3 m	Collection swale total width	6.0 m
Forebay length	58 m	Collection swale side slopes	5H:1V
Forebay bottom width	15 m	Collection swale lining	100 mm D_{50} riprap
Forebay berm height	0.3 m	Collection swale gradient	0.5%

Table 2: Storm Water Management Pond Stage-Storage Curve

Elevation (m)	Area (m^2)	Volume (m^3)
254.50[1]	4,140	3,532
254.25	3,306	3,161
254.20[2]	3,157	3,092
254.00	2,559	2,816
253.75	1,897	2,480
253.50	1,318	2,154
253.25	819	1,838
253.00	398	1,533
252.75	59	1,197

[1] Top of berm elevation

[2] Spillway invert

3.0 HYDROLOGY ANALYSIS

3.1 Storm Hyetographs

The closest meteorological stations to the site operated by Environment Canada are listed in Table 3.

Table 3: Environment Canada Meteorological Stations

Station Name	Station ID	Latitude/ Longitude	Altitude	Period of Record used to Derive IDF Data	Distance from Site
Lindsay Filtration Plant	6164432	44º 21' N 78º 44' W	251 m	1965 - 1989	5 km
Peterborough Airport	6166418	44º 14' N 78º 22' W	191 m	1971 - 2006	54 km
Orillia Brain	6115811	44º 36' N 79º 26' W	250 m	1965 - 2004	42 km

From the three stations shown in Table 3, the Lindsay Filtration Plant station is the closest to the site. The Peterborough Airport and Orillia Brain stations have more recent records. Upon comparison of Intensity-Duration-Frequency (IDF) data for the three stations, it was observed that rainfall values are higher at Lindsay Filtration Plant for short durations of less than 2 hours and return periods up to 25 years. The

Peterborough Airport IDF data presents higher rainfall values for durations higher than 2 hours and return periods higher than 25 years.

Considering that larger storms will maximize the required pond volume, the IDF data from the Peterborough Airport station was used to size the storm water management facilities (Table 4).

Table 4: Peterborough Airport (ID 6166418) Intensity-Duration-Frequency Data (1971-2006)

Duration (min)	Return Period (years)					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
	Rainfall Amount (mm)					
5	7.7	10.1	11.7	13.7	15.2	16.7
10	11.4	14.6	16.8	19.5	21.5	23.5
15	14.0	18.3	21.1	24.7	27.4	30.0
30	18.0	23.9	27.8	32.8	36.4	40.1
60	22.1	30.1	35.4	42.1	47.1	52.0
120	27.7	39.8	47.8	57.9	65.4	72.9
360	38.7	52.4	61.5	72.9	81.4	89.9
720	44.4	58.9	68.5	80.6	89.5	98.4
1440	49.0	65.0	75.6	88.9	98.9	108.7
	Rainfall Intensity (mm/hr)					
5	92.0	121.0	140.2	164.4	182.3	200.2
10	68.2	87.7	100.7	117.0	129.1	141.1
15	56.0	73.1	84.5	98.8	109.4	120.0
30	35.9	47.8	55.6	65.5	72.9	80.2
60	22.1	30.1	35.4	42.1	47.1	52.0
120	13.9	19.9	23.9	29.0	32.7	36.4
360	6.4	8.7	10.2	12.2	13.6	15.0
720	3.7	4.9	5.7	6.7	7.5	8.2
1440	2.0	2.7	3.1	3.7	4.1	4.5

3.2 Catchments

The Compost Pad has a total drainage area of 10,830 m^2 (1.08 ha) reporting to the on-site pond. Also reporting to the pond is the existing transfer area, HHW building and associated asphalt areas, which occupy approximately 18,253 m^2 (1.83 ha). The catchment area of the pond itself is 3,532 m^2 (0.35 ha). The swale total surface area is 2,595 m^2 (0.26 ha).

The time of concentration for the Compost Pad was calculated using the Bransby Williams Formula, which is recommended in MTO (1999) for surfaces with a runoff coefficient higher than 0.4. Based on the Compost Pad configuration, the longest path is approximately 75 m long with an average slope of 3.47%, resulting in a time of concentration of 5.5 minutes.

The same equation was used to calculate the time of concentration for the existing transfer area, HHW building and associated asphalt areas. Based on the longest path of approximately 140 m and an assumed average slope of 1%, the resulting time of concentration is 8.5 minutes.

The total time of concentration adding all the areas reporting to the collection swale is 14 minutes. For conservative purposes a time of concentration of 10 minutes was adopted.

A runoff coefficient of 0.80 was selected for the Compost Pad area, which corresponds to a compacted granular material (i.e., limestone screenings and Granular B) and slopes ranging from 5% to 10% (MTO 1999). A runoff coefficient of 1.0 was adopted (conservatively) for all other areas.

3.3 Peak Flows and Runoff Volumes

The Rational Method was used to calculate peak flows. It is the commonly used approach for peak flow estimation for small drainage areas and is based on runoff coefficients (Section 3.2) and rainfall intensity (Table 4). The calculations were carried out for return periods ranging from 2 to 100 years. The time of rain was matched to the time of concentration in order to select the event duration for calculation of peak flow rate, which is the underlying assumption with the Rational Method. The peak flows are presented in Table 5.

A similar approach was used to calculate runoff volumes considering the runoff coefficient and the rainfall amount for return periods ranging from 2 to 100 years. However, a duration of 24 hours was selected to calculate runoff volumes resulting from larger storm events to be managed in the storm water management pond. The runoff volumes are presented in Table 5.

Table 5: Estimated Peak Inflows and Runoff Volumes into the Storm Water Management Pond

Return Period (year)	Peak Inflow for 10-min Duration Events (m^3/s)	Total Volume for 24-hr Duration Events (m^3)
2	0.57	1,619
5	0.76	2,147
10	0.90	2,497
25	1.0	2,937
50	1.1	3,267
100	1.3	3,591

4.0 WATER MANAGEMENT FACILITIES DESIGN

4.1 Swale Design

The Manning's Formula was used to calculate the flow capacity of the swale that collects runoff from the Compost Pad and asphalt areas for conveyance to the storm water management pond. Considering that the swale will be lined with riprap for erosion protection, a roughness coefficient (Manning's n value) of 0.035 was selected to calculate the flow capacity.

The estimated water depth in the channel to convey a flow of 1.0 m^3/s (resulting from the 10-min, 25-year storm rainfall event) is 0.51 m. The associated peak flow velocity is 0.8 m/s. The flow capacity for the maximum water depth of 0.6 m (i.e., the total swale depth) is 1.6 m^3/s, with a corresponding flow velocity of 0.9 m/s. The flow capacity is greater than the peak flow for the 10-min, 100-year storm rainfall event (Table 5).

4.2 Pond Design

The proposed pond will act as a sedimentation/infiltration pond as the outlet invert is 1.5 m above the pond base. The forebay is shallow (0.3m deep) and will act as a sediment trap to reduce the amount of sediment reaching the main portion of the pond, thereby improving the long-term infiltration capacity of the pond base soils.

The storm water management pond was designed by Stantec to safely store 110% of the runoff volume resulting from the 24-hr, 25-year rainfall storm event (Stantec 2015). This event generates a total volume of 2,937 m^3 (Table 5) and results in a target volume of 3,230 m^3 when increased by 10%. The total pond storage capacity up to the invert of the overflow spillway is approximately 3,100 m^3 (Table 2), which is adequate to contain the total volume of the design storm and very close to the target volume (2% less than the target value).

It is worth noting that using IDF data from the Lindsay Filtration Plant station, the 24-hr, 25-year rainfall storm event generates 2,491 m^3 and results in a target volume of 2,740 m^3 when increased by 10%, with both values being within the total pond storage capacity.

The soils beneath the pond consist of sandy silt to silty sand with a hydraulic conductivity of $1x10^{-5}$ cm/s or higher. Typical percolation rates will range from 25 to 60 mm/hr although likely closer to the lower end of the range. The estimated daily percolation rates are presented in Table 6.

Table 6: Estimated Percolation Rates From the Storm Water Management Pond

Pond Base Area (m^2)	Percolation Rate[a] (mm/hr)	Percolation Rate (m^3/day)
1,197[b]	25	718
	60	1,724
2,158[c]	25	1,295
	60	3,108

[a] Source: MOE (2003)

[b] Pond bottom area

[c] Pond average area

When comparing the range of pond inflows up to the 25-year return event and the range of daily percolation rates, it can be inferred that the pond inflows will infiltrate within two to four days following the storm event. The storm water management pond is therefore large enough to store and infiltrate/evaporate the collected runoff for rainfall events ranging from 2 to 25-year return periods with minimal discharge through the overflow spillway. As a result, there is no permanent pool, only extended storage capacity that corresponds to approximately 3,100 m^3, which is the volume up to the overflow spillway.

An overflow spillway has been provided to attenuate flow rates and discharge the excess runoff resulting from storm events that exceed the maximum pond capacity. The active storage volume of the pond is approximately 3,530 m^3 (Table 2). Flood routing for rainfall storm events with 50-year and 100-year return period indicate that the pond can attenuate post-development flow rates below pre-development flow rates as shown in Table 7.

Table 7: Estimated Peak Discharge

Return Period (year)	Pre-development Peak Flow (m^3/s)	Post-development Peak Flow (Pond Discharge)[1] (m^3/s)
2	0.28	0
5	0.37	0
10	0.42	0
25	0.50	0
50	0.55	0.02
100	0.61	0.07

[1] Assuming the pond is empty at the beginning of the storm event

Although there is not expected to be a regular discharge to surface water from the pond, the water quality storage requirements based on receiving waters was calculated using Table 3.2 of MOE (2003). For an impervious level of 85% and a protection level to comply with 80% long-term suspended solids removal, the required storage volume is 116 m^3 for an infiltration pond considering the Compost Pad area plus adjacent asphalt areas (2.91 ha). The forebay section of the storm water management pond has a volume capacity of approximately 186 m^3, which exceeds the storage requirement for infiltration ponds.

To maintain efficient infiltration, it is recommended that the pond be inspected quarterly and cleared of loose sediment and debris as required.

5.0 CONCLUSIONS

The storm water management pond has adequate capacity to manage the runoff volumes resulting from storm events of 24-hour duration ranging from 2 to 25-year return period. Likewise, the collection swale has adequate capacity to convey the peak flow resulting from storm events of 10-min duration ranging from 2 to 25-year return period.

There is no permanent pool in the storm water management pond because the facility is large enough to store and infiltrate/evaporate the collected runoff for rainfall storm events up to the 24-hr, 25-yr return without discharge through an outlet pipe. The pond is equipped with an overflow spillway to discharge in a controlled manner the runoff resulting from storm events that exceed the maximum pond capacity. The overflow discharges into an existing ditch at the north end of the pond.

The runoff volume from rainfall storm events up to the design event (i.e., 24-hr, 25-year event) is fully contained by the pond without discharge given that there is no outlet pipe and the overflow spillway is not activated. If the design rainfall event is exceeded, the pond will attenuate post-development flow rates to existing or lower flow rates through storage and controlled discharge through the overflow spillway.

6.0 REFERENCES

MOE (Ministry of the Environment). 2003. *Stormwater Management Planning and Design Manual*, March 2003.

MTO (Ministry of Transportation of Ontario). 1999. *Drainage Management Manual*, 1997-1999.

Stantec. 2015. *Supporting Documentation for ECA Amendment (A321504) – Relocation of Existing Leaf and Yard Waste Composting Operations*. Report 165640083 prepared for the City of Kawartha Lakes dated January 2015.

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ATTACHMENT B

Leaf and Yard Waste Handling

PPE REQUIRED:	PROTECTIVE CLOTHING	SAFETY BOOTS	EYE PROTECTION	SAFETY GLOVES
				

ACTIONS	DETAILS
Weigh Incoming Leaf and Yard Waste	• All loads of leaf and yard waste will be weighed on landfill scales by onsite Landfill Attendants • Landfill Attendants will notify the Operations Supervisor as soon as the daily volume of leaf and yard material accepted will exceed maximum daily quantity (including curbside material): ○ **Lindsay Ops**: 240 tonnes (2,242 yards) per day ○ **Fenelon**: 250 tonnes (2,335 yards) per day ○ **Eldon and Laxton:** 150 tonnes (1,400 yards) per day ○ **Somerville:** 150 tonnes (1,400 yards) per day
Segregate Materials	• Landfill Attendants will direct customers to correct locations and separate into fine and coarse • ***Fine Material*** is leaf and yard waste that is less than seven (7) centimetres in diameter • ***Coarse Material*** consists of tree stumps, limbs or other woody materials greater than seven (7) centimetres in diameter
Maintain Windrow Pile	• Fine material must be windrowed by Equipment Operators ○ **Lindsay Ops and Fenelon**: every 4 days ○ **Eldon, Somerville and Laxton**: every week • ***New Windrow Piles*** require ○ Weekly temperature readings will be taken until the pile reaches 55°C from one (1) metre within the pile. This will be measured and documented by Equipment Operators with thermometer stored in the equipment garage. ○ Piles that reach 55°C will be turned once per week

	(Wednesday's) for five (5) weeks by Equipment Operators ○ After the fifth week the temperature must reach 55°C to begin curing without new leaf and yard material added to the pile • ***Curing Windrow Piles*** require • Equipment Operators to turn curing piles at least once per month while curing (Wednesday) • Temperature of curing piles will be recorded weekly by Equipment Operators • Piles must cure for a minimum of six (6) months
Compost Log Sheet	**<u>Lindsay Ops and Fenelon</u>** • The ***Compost Log Sheet*** shall be completed once per week by Equipment Operator (Wednesday) • The Compost Log Sheets are stored in a binder, kept in the administration building for access by all staff
Operational Problems	• Any noted operational problems associated with windrow piles will be reported immediately to the Crew Leader or Operations Supervisor • ***Operational problems*** include odor, incorrect material sorting or waste deposited incorrectly • The Crew Leader or Operations Supervisor will provide direction to staff to remedy the operational problem • All operational problems and remedial action taken must be documented in the Compost Log Sheet
Grind Coarse Material	• Waste Technician will coordinate grinding of coarse material to produce wood chips: ○ **Fenelon**: biannually ○ **Lindsay Ops**: quarterly ○ **Eldon, Somerville and Laxton**: annually • Waste Technician will document date and quantity of ground material in the Compost Log Sheet and the master excel file
Distribution/Use of Wood Chips	• Crew Leader and Operations Supervisor will coordinate use and distribution of wood chips • Quantity and date of all wood chips leaving the stockpile must be recorded in the Compost Log Sheet

Distribution/Use of Compost	• Each windrow of compost must be sampled by the Waste Technician once curing is complete, prior to distribution • Quantities of compost removed from the compost pad for use as alternative daily cover must be recorded in the Compost Log Sheet • If compost meets chemical parameters it can be used onsite for alternative daily cover and interim cover at Lindsay Ops, Fenelon, Eldon and Laxton

Compile and Review Data	• Daily quantities will be recorded at the scale house and entered into master excel file by Regulatory Compliance Officer
	• On a monthly basis Regulatory Compliance Officer will review tonnes of material onsite (considering material that has been used or taken offsite) and summarize in the master excel file
	• Quantities of stockpiled course material cannot exceed:
	  ○ **Fenelon**: 1,500 tonnes (14,000 yards)
	  ○ **Lindsay Ops**: 750 tonnes (7,000 yards)
	  ○ **Eldon, Somerville and Laxton**: 500 tonnes (4,670 yards)
	• Daily wind speed, wind direction and air temperature will be measured at the Lindsay Ops weather station and data downloaded by the Waste Technician and entered into a master excel file by the Regulatory Compliance Officer

MOECC Reporting Requirements	• Annual reporting for each site will include a summary of
	  ○ Compost Daily Log Sheets
	  ○ Master Excel File data
	  ○ Scalehouse leaf and yard waste quantities
	  ○ Chipping and Grinding
	  ○ Chemical analysis completed for compost