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# Windfall

## **SWMF OPERATIONS & MAINTENANCE MANUAL**

Windfall GP Inc.

# Document Control

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Issue	Date	Description
1	January 2012	First Engineering Submission (Phase 1 - 6)
2/3	June/November 2012	Response - TOBM/NVCA Comments
4	September 2018	Redline Revision (Phase 4 - 6) Lot Layout
5	June 12, 2019	Response to TOBM First Submission Comments (Windfall Phase 4, 5 & 6)
6	June 12, 2020	Redline Revision (Phase 5 - 6) Lot Layout



# Document Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Stormwater Management Plan.....	1
1.2	Importance of SWMF Maintenance .....	1
1.3	Objective .....	2
<b>2</b>	<b>Inspection and Maintenance .....</b>	<b>3</b>
2.1	Before Assumption .....	3
2.2	After Assumption.....	3
2.2.1	Sediment Removal .....	3
2.2.2	Vegetation .....	4
2.2.3	Conditions of Inlets/Outlets/Storm Sewer.....	5
2.2.4	Conditions of Spillways .....	5
2.2.5	Trash and Debris.....	5
2.2.6	Water Contamination .....	5
2.2.7	Embankments .....	5
2.2.8	Pond Maintenance Access Routes .....	5
2.2.9	Aesthetics .....	6
<b>3</b>	<b>Precautions During Construction &amp; Maintenance Operations.....</b>	<b>7</b>

## Appendices

Appendix A: SWMF Operation Summary

Appendix B: SWMF Water Quality Sizing Requirements

Appendix C: Operation and Maintenance Inspection Checklist



# 1 Introduction

## 1.1 STORMWATER MANAGEMENT PLAN

The stormwater management plan for the Windfall development incorporates an extended detention wet pond stormwater management facility (SWMF), which includes both a sediment forebay and a wet pond cell. The facility is designed to provide enhanced level water quality control and a minimum of post to pre-development water quantity control meeting the design criteria established by the Ministry of the Environment, Conservation and Parks (MECP), the Town of The Blue Mountains and the Nottawasaga Valley Conservation Authority (NVCA). The technical design of the SWMF is documented in the Master Stormwater Management Report Revision No. 4 (January 2012 – Revised June 2020), prepared by Tatham Engineering Limited (Tatham). The SWMF configuration and design (ultimate conditions) are illustrated on the Master SWM Pond Plan and Details Sheets (Drawings PND-3 and PND-4) enclosed.

## 1.2 IMPORTANCE OF SWMF MAINTENANCE

A stormwater management facility generally provides two important functions.

The first is to provide water quantity control, whereby the facility is used to retain stormwater allowing it to be released at a controlled rate. The post development release rate is generally limited to pre-development levels up to the 100 year design storm. The Windfall SWMF has been designed to over control the release rates of post development flows under major storm events below pre-development levels by providing sufficient storage volume in the facility and an engineered outlet to control release rates. The storage volume allocated for water quantity control is the volume above the permanent water level of the pond. The SWMF water levels, discharge rates, and storage volumes for the development are identified in Appendix A for reference.

The second function of the SWMF is to provide water quality control. The volume of water below the permanent pool is used to collect many of the common pollutants that bind or attach to sediments transported through the storm sewer or by overland flow into the pond. The water quality control storage requirements are enclosed in Appendix B for reference along with the forebay sizing and cleanout frequency calculations.

Without quantity and quality controls, urban development could potentially result in significant erosion, downstream flooding, increased pollutants and negative impacts to the ecosystem within local creeks, rivers and lakes.



### **1.3 OBJECTIVE**

For the SWMF to operate effectively, regular inspection and maintenance is required. This document outlines an inspection and maintenance plan for the Windfall SWMF. A copy of the Master Stormwater Management Report for Windfall should be kept on file by the operating authority for background information and future reference.



## 2 Inspection and Maintenance

There are several components of the SWMF that require routine inspections and periodic maintenance. Some components will require maintenance at regular intervals, while others may require maintenance only when deemed necessary through inspection. Additional inspections and/or maintenance may be necessary following spill occurrences and significant runoff events.

It is recommended that the developer (before assumption) and municipality (after assumption) prepare an annual maintenance report for this SWMF. This manual includes a suggested inspection and maintenance checklist (Table 1 in Appendix C).

### 2.1 BEFORE ASSUMPTION

During construction, the SWMF will be inspected by the engineer and maintained by the contractor. The contractor and engineer will inspect the facility on a bi-weekly basis and after every significant storm event. It is important during this period to confirm that the pond is operating properly. Inspection and maintenance during construction will follow the recommended approach described in Section 2.2.

During the warranty period, the engineer and developer will conduct regular inspections in accordance with Table 1 in Appendix C and the contractor will perform maintenance before the facility is ultimately assumed and taken over by the Operating Authority, which, in this case is the Town of The Blue Mountains.

Immediately prior to assumption by the Operating Authority, the SWMF should be inspected to ensure that grades and vegetation are in accordance with design and all structures and spillways are in good condition. Debris which has accumulated around headwalls, culverts and maintenance hole sumps should be removed from the SWMF, as described in the sections that follow, and disposed of at an approved off-site location.

### 2.2 AFTER ASSUMPTION

Following assumption, it is recommended that the Operating Authority implement a regular inspection and maintenance program to ensure the SWMF operates effectively and continuously. In addition to routine inspections, the SWMF should be checked after each major storm event to observe if the pond is functioning properly. The following items are recommended to be included during inspections and should form part of the maintenance program.

#### 2.2.1 Sediment Removal

One of the most important maintenance tasks is the removal of accumulated sediment from the sediment forebay (cell 1), wet pond cell (cell 2) and all structures. Under proper operating



conditions, sediment accumulates and deposits on the bottom of the SWMF over time. It may be several years before removal is required depending on the characteristics of the catchment area. These deposits can be reduced by cleaning out the sumps in the catch basins and maintenance holes within the development on an annual basis, thus ensuring the sediment does not end up in the SWMF.

Sediment levels should be inspected on an annual basis. The actual sediment depth within the sediment forebay (cell 1) should be measured. A common method used to measure sediment is to use a graduated pole with a flat plate attached to the bottom. A marker should be placed in the pond as a control benchmark.

Sediment should be removed from the sediment forebay (cell 1) when the sediment depth exceeds 0.6 m. Depending on the sediment accumulation, it is expected that the wet pond will need to be cleaned out every 10 to 15 years. The water from the SWMF will need to be lowered through pumping operations and a backhoe or mini excavator used to remove the sediment and load it on a truck for disposal. Any sediment removed shall be properly disposed of at an approved off-site location. During removal, the vegetation and grades around the pond should remain undisturbed or be reinstated as necessary.

It is recommended that a detailed SWMF clean-out plan is developed at the time of sediment removal. The detailed plan should include sediment testing for off-site disposal, siltation and erosion control measures, a dewatering plan, construction sequencing and contingencies for inclement weather. In general, it is recommended that pond dewatering takes place during periods of dry weather and that the dewatering discharge is routed through silt bags or equivalent sediment control measures before discharging into the Tributary Watercourse at Outlet D. The water level in the pond will have to be drawn down by pump. Pumping to the downstream watercourse should only take place when flows are less than bank full conditions to ensure negative impacts do not occur.

Borehole logs indicate the groundwater table above the pond bottom. As such, it is expected that water taking will include groundwater. As part of the detailed cleanout plan for the SWMF, the water taking should be reviewed to determine if the taking needs to be registered on the Sector Registry or if a PTTW is required.

### **2.2.2 Vegetation**

Vegetation surrounding the SWMF and within the boundaries of the pond should be inspected on an annual basis, in consideration of the following:

- remove and replace dying or unhealthy vegetation;
- weeds, poisonous or invasive vegetation should be removed without the use of pesticides;



- tree growth interfering with pond operation or maintenance access should be trimmed or if necessary, removed;
- allowing grass around the pond to grow will enhance water quality (grass cutting should be limited as much as possible while recognizing the aesthetic concerns of nearby residents; grass clippings must be removed to reduce potential for organic loading);
- herbicides and insecticides should not be used to control weeds; and
- fertilizer should be limited to minimize nutrient loadings.

### **2.2.3 Conditions of Inlets/Outlets/Storm Sewer**

The inlets, outlets and connecting storm sewer should be inspected monthly and after major storms for obstructions or damage. Each inlet and outlet should be inspected for erosion in the immediate area and corrective action should be carried out as necessary.

### **2.2.4 Conditions of Spillways**

The condition of the overflow spillway should be inspected monthly for erosion, missing or moved rip-rap, displaced or damaged turf reinforcement mat and dying or unhealthy vegetation. Corrective action should be carried out as required.

### **2.2.5 Trash and Debris**

During inspections, the area should be checked for any trash and/or debris in and around the pond. All trash and debris should be collected and disposed of.

### **2.2.6 Water Contamination**

During annual inspections, the water surface should be checked for any oil, discolour or sheen. This may indicate contaminants or pollutants in the water such as gas, oil, grease, etc. which may cause damage to plant or animal life and be flushed downstream during large storm events. Removal and disposal of contaminants should be completed after consulting the local health department.

### **2.2.7 Embankments**

Embankments should be inspected for erosion, rodent holes, etc. on an annual basis and repaired to their original state as required.

### **2.2.8 Pond Maintenance Access Routes**

Maintenance access routes to the sediment forebay (cell 1), wet pond cell (cell 2) and structures should be inspected for surface defects including erosion, debris, weeds and obstructions. The maintenance access routes should be maintained and repaired as required.





### 2.2.9 Aesthetics

An annual inspection for graffiti on any structures, garbage and colour of water and the growth of the vegetation should be conducted. Actions to improve and maintain the aesthetics of the pond should be carried out as necessary.



### 3 Precautions During Construction & Maintenance Operations

The following notes pertaining to construction/maintenance of the SWMF identify the precautions to be taken and are to be strictly followed before and after assumption.

1. All geotextiles used in rip-rap lined spillways and working pads shall be suitably keyed into the underlying soils.
2. Temporary excavation side slopes should not be steeper than 3H:1V and excavated materials shall not be stockpiled near the excavation area. The contractor shall satisfy himself with respect to soil conditions on the site prior to construction.
3. During construction operations, the contractor shall provide a working access within the 4.0 m wide granular access footprint capable of supporting equipment required to complete the works. This temporary access shall be removed and replaced with final ground cover as specified on the approved landscape plans.
4. The contractor will be responsible for control of groundwater during the construction and maintenance SWMF works.
5. Only light construction equipment (such as a small track mounted excavator, low ground pressure dozer, etc.) should be used in the base of the SWMF during sediment removal activities.
6. Heavy trucks should be limited to the maintenance access road.

This manual should be referenced along with the Geotechnical Investigation prepared by Terraprobe Limited (November 14, 2011), the Master Stormwater Management Report Revision No. 4 prepared by Tatham (January 2012 – Revised June 2020) and Drawings PND-3 and PND-4, prior to, during and after construction of the SWMF.




## **Appendix A: SWMF Operation Summary**

**WINDFALL****TATHAM PROJECT No.: 111179****HYDROLOGIC MODEL RESULTS SUMMARY****SWMF SUMMARY (MASTER - PHASE 6 DEVELOPMENT)**

Storm	Discharge				Storage (cu.m)	Water Level (m)
	Q <sub>Total</sub>	Q <sub>B</sub>	Q <sub>C</sub>	Q <sub>D</sub>		
25mm	0.087	0.014	0.008	0.065	4,629	213.06
2 YR CHI	0.112	0.018	0.010	0.084	7,281	213.29
5 YR CHI	0.434	0.079	0.039	0.316	9,499	213.47
10 YR CHI	0.697	0.159	0.042	0.496	10,796	213.58
25 YR CHI	0.968	0.320	0.045	0.603	12,697	213.72
50 YR CHI	1.253	0.476	0.048	0.729	14,220	213.83
100 YR CHI	1.562	0.599	0.049	0.914	15,406	213.92
Regional	3.742	1.021	0.054	2.668	19,761	214.23
2 YR SCS	0.210	0.032	0.029	0.149	8,205	213.37
5 YR SCS	0.548	0.110	0.041	0.397	10,067	213.52
10 YR SCS	0.793	0.202	0.043	0.548	11,364	213.62
25 YR SCS	1.054	0.374	0.046	0.634	13,233	213.76
50 YR SCS	1.322	0.506	0.048	0.768	14,502	213.86
100 YR SCS	1.661	0.629	0.050	0.982	15,735	213.95

## **Appendix B: SWMF Water Quality Sizing Requirements**

	<b>Project:</b>	WINDFALL DEVELOPMENT
	<b>File No.:</b>	111179
	<b>Date:</b>	July, 2018
	<b>Designed By:</b>	DRT
	<b>Checked By:</b>	DJH
	<b>Subject:</b>	SWMF FOREBAY SIZING CALCS

**SWM Facility Design Calculations**  
**Using MOE SWMPD Manual / March 2003**  
**SWM Facility Sediment Forebay Sizing**

**WINDFALL DEVELOPMENT (MASTER)**

1) Settling

Dist	=	$\text{SQRT}(r \cdot Q_p / V_s)$	Dist = Forebay length (m)		
			r = Length to width ratio	r	= 2.0000
			Qp = 2yr SWM outflow - water quality (cms)	Qp	= 0.2100 cms
			Vs = settling velocity for 0.15 mm particles (m/s)	Vs	= 0.0003 m/s
Dist	=	37.4 m	Actual forebay length =	65m	


2) Dispersion Length

Dist	=	$8 \cdot Q / d \cdot V_f$	Dist = Length of dispersion (m)		
			Q = 5 Yr max inlet flow (cms)	Q	= 3.4790 cms
			d = depth of permanent pool in forebay (m)	d	= 0.9000 m
			Vf = desired velocity in forebay (m/s)	Vf	= 0.5 m/s
Dist	=	61.8 m	Actual forebay length =	65m	

3) Cleanout Frequency

Table 6.3 MOE SWMPD Manual

Cleanout	=	$\text{Vol} / (\text{load} \cdot \text{Asew} \cdot \text{eff})$	Asew = contributing sewer area (ha)	Asew	= 44.10 ha
			Actual Forebay Length	Alength	= 65 m
			Imp = avg. percent Impervious (%)	Imp	= 48 %
			load = sediment loading (cu.m/ha)	load	= 1.25 cu.m/ha
			eff, = removal efficiency (%)	eff.	= 0.8
			Targ = cleanout Frequency Target (Years)	Targ	= 10 years
			Vol = bottom 0.6 m volume (cu.m)	Vol	= 455 cu.m
Cleanout	=	10 years	- therefore cleanout target is satisfied		

	Project: Windfall		Date: July, 2018	
	File No.: 111179		Designed By: DRT	
	Subject: Water Quality Requirements		Checked By: DJH	

**Stormwater Management Facility Water Quality Storage Requirements (Master SWMF - Development Phase 6)**

Contributing Areas

Catchment	200	Area	20.9	ha	%Impervious	60
Catchment	201	Area	15.8	ha	%Impervious	45
Catchment	209	Area	4.8	ha	%Impervious	0
Catchment	202	Area	2.6	ha	%Impervious	60
Catchment		Area		ha	%Impervious	
Catchment		Area		ha	%Impervious	
Catchment		Area		ha	%Impervious	
Catchment		Area		ha	%Impervious	
<b>TOTAL AREA</b>			<b>44.1</b>	<b>ha</b>	<b>%Impervious</b>	<b>48</b>

Required Level of Treatment	80	%	Enhanced Level
SWM Facility Type	4		(1-Infiltration, 2-Wetlands, 3-Hybrid Wet Pond/Wetland, 4-Wet Pond, 5-Dry Pond)

	Enhanced	Normal	Basic	
<b>Water Quality Storage Requirement</b>	<b>172.5</b>	-	-	cu.m/ha
<b>Permanent Pool Volume Required</b>	<b>132.5</b>	-	-	cu.m/ha
	<b>5843</b>	-	-	cu.m
<b>Extended Detention Volume (40 cu.m)</b>	<b>40.0</b>	-	-	cu.m/ha
	<b>1764</b>	-	-	cu.m
<b>25mm Storm Runoff Volume</b>	<b>12.4</b>	mm		
	<b>5464</b>	cu.m		

**Erosion Control Storage Requirement (Simplified Approach)**

FRIMP (%)	27
Soils Group	C/D
Source Control	0
Active Storage Volume Requirement	106 cu.m/ha
<b>Erosion Control Volume Required</b>	<b>4675</b> cu.m

<b>Required Extended Detention Volume</b>	<b>6439</b>	cu.m		
<b>Permanent Pool Volume Provided</b>	<b>6990</b>	cu.m	<b>Provided</b>	<b>&gt; Required</b>
<b>Extended Detention Volume Provided</b>	<b>7400</b>	cu.m	<b>Provided</b>	<b>&gt; Required</b>

## **Appendix C: Operation and Maintenance Inspection Checklist**



**TABLE 1 - OPERATION AND MAINTENANCE INSPECTION REPORT  
WINDFALL - SWM FACILITY**

Inspector's Name \_\_\_\_\_ Inspection Date \_\_\_\_\_

	Checked		Maintenance Needed		Inspection Frequency	Comments/Action Taken
	Yes	No	Yes	No		
<b>Pond Components</b>						
<b>1. General</b>						
a. Condition of maintenance accesses					A	
b. Trash or debris removal required					M	
c. Leaks/seepage from pond					A	
d. Embankment erosion					A	
e. Visual settlement or horizontal misalignment of pond top of bank					A	
f. Animal burrows					A	
g. Unauthorized plantings					A	
h. Dead or dying vegetation					A	
i. Weeds, poisonous or invasive species					A	
j. Overall aesthetics of pond					A	
k. Condition of granular trail					A	
l. Other (specify)						
<b>2. Sediment Forebay (Cell 1)</b>						
a. Sediment accumulation					A	
b. Condition of storm sewer inlet (storm sewer/headwall/pedestrian barricade/etc.)					M,S	
c. Condition of storm sewer inlet erosion protection					M,S	
d. Visible blockages of inlet structures					M,S	
e. Condition of forebay berm erosion protection					M,S	
f. Visual pollution within permanent pool					A	
g. Floating or floatable debris accumulation					A	
h. Condition of overflow spillway (erosion protection/concrete spillway/etc.)					M,S	
i. Condition of outlet overland flow route					M,S	
j. Visual settlement or horizontal misalignment of forebay top of bank					A	
k. Other (specify)						
<b>3. Wet Pond Cell (Cell 2)</b>						
a. Sediment accumulation					A	
b. Condition of overland inlet spillways (Unilock Duramat/erosion protection/etc.)					M,S	
c. Condition of storm sewer outlet (storm sewer/headwalls/maintenance holes/etc.)					M,S	
d. Condition of storm sewer outlet erosion protection and bank stabilization					M,S	
e. Condition of primary outlet structure (CSP riser/storm sewer/rip rap/etc.)					M,S	
f. Condition of secondary outlet structures (storm sewer/headwalls/maintenance holes/etc.)					M,S	
g. Visible blockages of outlet structures					M,S	
h. Condition of low flow berm					A	
i. Visual pollution within permanent pool					A	
j. Floating or floatable debris accumulation					A	
k. Visual settlement or horizontal misalignment of wet pond top of bank					A	
l. Other (specify)						
<b>4. Other</b>						
a. Complaints from residents (specify)					A	
b. Identifiable public hazards					M	
c. Other (specify)						

**Inspection Frequency Key A = Annual, M = Monthly, S = After Major Storm**

**TABLE 1 - OPERATION AND MAINTENANCE INSPECTION REPORT  
WINDFALL - SWM FACILITY**

**Summary**

1. **Inspectors Remarks:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
2. **Overall Condition of Facility (Check One)**  
  
\_\_\_\_\_ Acceptable  
\_\_\_\_\_ Unacceptable
  
3. **Dates of any maintenance that must be completed by:**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
4. **Comments**  
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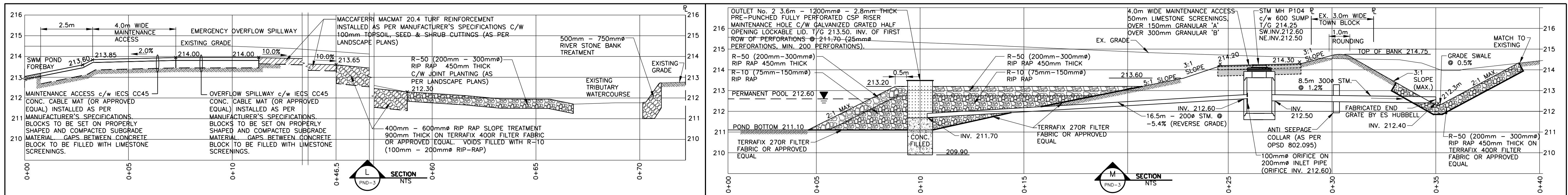
\_\_\_\_\_  
**Inspectors Signature**

\_\_\_\_\_  
**Date**









## PND-4