Appendix K

Wastewater Report

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engineers · scientists · planners

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March 11, 2011

Mr. John S. Munsey, PG
Managing Scientist & Principal
C.T. Male Associates
50 Century Hall Drive
Latham, NY 12100

Subject: Lost Lake FEIS
Wastewater Analysis Comments
Project No. 30107.01

Dear Mr. Munsey:

Please find below our responses to your comments dated March 3, 2011, regarding the Wastewater Analysis for the FEIS. As part of our responses, please find attached the Waste Assimilative Capacity (WAC) analysis for the discharges from the proposed Lost Lake wastewater treatment plant to the Bush Kill. Responses to your respective numbered comments are as follows:

1. General Comment. Additional information has been provided within the WAC analysis.
2. Accuracy of Flow Estimation. The "proportional MA7CD/10 flow" has been better defined and explained in the "Hydrologic Setting" section of the enclosed analysis.
3. WAC Analysis. The presentation of the analyses has been expanded, and includes spreadsheets for the two scenarios (Phase 1 and Full Buildout) with multiple "f" values.
4. f-factor. The calculations performed for the analysis has been updated to include f=2 and f=4, in addition to the previous f=3.
5. Assumptions. In the "Effluent Characteristics" section of the enclosed study, an explanation of the derivation of the different effluent parameters for Phase 1 and Full Buildout scenarios is given. An explanation of how ammonia is removed in the treatment process is also supplied.

Thank you for your time and consideration in this matter. If you have any questions or comments regarding the above, please feel free to contact our office.

Very truly yours,

William T. Orlowsky, P.E.
Project Engineer

M. Christopher McCoach, P.E.
Project Manager

cc: Randy Gracy, Double Diamond
John Grohol, Eagle Rock Resort
Steve Read, Advantage Engineering
Fred Wells, Tim Miller Associates

WASTE ASSIMILATIVE CAPACITY ANALYSIS

for

WASTEWATER TREATMENT FACILITY DISCHARGE

PROPOSED LOST LAKE RESORT PROPERTY

Town of Forestburgh, Sullivan County, New York

PREPARED BY:

Advantage Engineers, LLC
910 Century Drive
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MARCH 2011

Respectfully Submitted:

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1.0 INTRODUCTION

1.1 Project Summary and Work Scope

This document describes analysis of the proposed wastewater effluent discharge to the Bush Kill at the Lost Lake Resort (LLR) property in the Town of Forestburgh, Sullivan County, New York. This work was performed on behalf of Double Diamond Companies, owners of the site, and in support of the State Pollution Discharge Elimination System (SPDES) permit application for the proposed discharge. The LLR property includes 2,080 acres (3.25 square miles) which is proposed to include approximately 2,700 residential lots composed of house units, condominiums, and cabins, plus a golf course with restaurant and clubhouse. The project is proposed to be developed in seven (7) phases.

This analysis followed the procedures contained in New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) document 1.3.1.D. This series of procedures evaluates an isolated discharge to a freshwater stream to estimate waste assimilation capacity (WAC) and allowable waste loading. For this WAC the estimated effluent volume for the initial phase (0.132 MGD) and final phase (0.884 MGD) was evaluated. In addition, several different effluent characteristics were considered.

1.2 Hydrologic Setting

Based on NYSDEC Title 6 regulations the Bush Kill waters index is D-1-22, which consists of the Bush Kill and two tributaries. The current Classification is B(T), i.e., the best usage is for recreation, but not for drinking water, and it may support a trout population (T). The Bush Kill discharges to the Neversink River at Oakland Valley, approximately 5.7 stream miles to the south of the proposed discharge. The upstream drainage area from the proposed discharge is 8.9 square miles (mi^2), as determined from USGS StreamStats basin analysis. Figure 1 shows the site topographic setting and Bush Kill segment D-1-22 as well as the Oakland Valley gage station, proposed WWTF discharge point and their respective basins.

The minimum average 7-consecutive day 10-year recurrence low flow (MA7CD10) for the Bush Kill was determined from USGS/NYDEC Bulletin 74 (1979) using Bush Kill data from a partial record gage (1958 to 1977, continuous record) at Oakland Valley (see Figure 1). This location is considered a valid reference gage for the effluent discharge point because:

- It is less than 6 miles distant, and thus subject to essentially the same climatic conditions (see Figure 1 for basin sizes)
- The Bush Kill stream segment between the site and Oakland Valley, and upstream from the site, are underlain by the same bedrock units (Walton Formation sandstone and shale)
- The stream segments drain lands with similar soil types
- The stream segments have similar gradients, except for the lower approximately two (2) miles, which has a substantially higher gradient where the Bush Kill approaches the Neversink gorge.
- The drainage basin for the WWTF discharge point comprises the northern portion of the Gage station drainage basin.
- The statistical analysis based on peak flow for the basin and stream flow for both drainage basins use the same data with the same regression equation valid ranges. (see attached stream stats site reports).

The upstream drainage area is 19.5 mi^2 for the Oakland valley gage, and the MA7CD10 is reported at 2.0 cubic feet/second (cfs). The upstream drainage area from the proposed effluent discharge point to the Bush Kill is 8.7 mi^2. The use of reference gages that lie within a 1/3 to 3 times ratio is appropriate (USGS, 2002)[1]. T**he proportional MA7CD10 flow at the proposed discharge is 0.9 cfs (8.7/19.5 x 2.0 cfs), which converts to 0.582 million gallons per day (MGD)**.

1.3 Receiving Water Quality Design Parameters

This analysis assumed the default parameters, as follows:

1. In Stream Dissolved Oxygen (DO) – 8.0 milligrams per liter (mg/L), 90% saturation is 7.2 mg/L based on discharge elevation at 1,350 feet amsl)
2. Up Stream Total Oxygen Demand (TOD) – 3.0 milligrams per liter (mg/L)
3. Stream purification factor (f value) – 3.0 (Swift stream, Table II from TOGS 1.3.1D), consistent with trout stream designation and site observations
4. Ammonia (NH_3) – 0 mg/L
5. Temperature – 24°C (trout stream)

1.4 Stream Renovation Factor

A critical parameter to the analysis is the flow characteristic of the stream (f-value), which are provided below in Table II, excerpted from TOGS 1.3.1.D. The Bush Kill in the vicinity of the effluent discharge and downstream was considered a swift stream, based on the

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[1] U.S. Geological Survey, Water Resources Division, New Cumberland, Pa. [2002].
no authors

presence of riffles, boulders, and ledges, and the trout stream designation. The f-value ranges from 3.0 to 5.0 for a swift stream, and the lower value was used.

TOGS 1.3.1D, Table II Stream Renovation Factor	
Nature of Receiving Water	"f" Value
Small ponds and backwaters	0.5 - 1.0
Sluggish Streams, Large Lakes	1.0 - 1.5
Large Streams Slow Velocity	1.5 - 2.0
Large Streams Moderate Velocity	2.0 - 3.0
Swift Stream	3.0 - 5.0
Rapids, Waterfalls, ect.	5.0 and up

1.5 Effluent Characteristics

Different effluent limit concentrations for the Phase 1 and the full-buildout scenarios of the development are based on the anticipated mass loadings of each effluent parameter. Concentration is determined by the mass of a contaminant within a volume of water.

Concentration = Mass/Volume

Regulatory agencies typically determine effluent limits by first calculating the allowable additional mass of a contaminant that can enter a waterway. Once the allowable mass is established, the concentration is found by dividing the mass by the flowrate or capacity of the treatment plant. Since the mass is fixed, the concentration and volume have an inverse relationship, as can be seen in the formula above. If the flowrate is less than the full capacity of the treatment plant as in Phase 1, then a higher concentration of contaminant can be released in the effluent without exceeding the established allowable mass. Therefore, two (2) scenarios were evaluated, as follows:

- Scenario 1: Effluent treatment level for the projected Phase I full build out volume of 0.132 MGD.
- Scenario 2: Effluent treatment level to meet projected full build out volume of 0.884 MGD.

The effluent treatment levels were selected to preclude exceedance of the assimilative capacity of the Bush Kill. A critical parameter is the nitrogenous component of the waste. Thus, the higher effluent volume required lower nitrogen content for the full build out condition. All other treatment levels were the same. With respect to the nitrogen, biological removal of nitrogen can be accomplished within a properly designed and operated wastewater treatment plant. The two main mechanisms of nitrogen removal are known as assimilation and nitrification-denitrification. Because nitrogen is a nutrient, a portion of the nitrogen in the wastewater will be consumed or assimilated by the microbes in the wastewater. In the nitrification-denitrification process, nitrogen removal occurs in two steps. During nitrification, the nitrifying bacteria convert ammonia to nitrate and nitrite. Nitrification occurs under aerobic conditions. The conversion of nitrate and nitrite to nitrogen gas is known as denitrification. Denitrification can be accomplished biologically by bacteria under anoxic conditions. The overall process results in the conversion of ammonia to nitrogen gas, which enters the atmosphere.

The following table summarizes the modeled wastewater characteristics:

Table A Effluent Characteristics			
Effluent:	**Units**	**Scenario 1**	**Scenario 2**
Average daily Flow (**ADF**)	MGD	0.132	0.884
(1)Biological Oxygen Demand (**BOD, 5-day**)	mg/L	5.0	5.0
Dissolved Oxygen (**DO**)	mg/L	8.0	8.0
Total Nitrogen (**N**)	mg/L	6.0	3.0
Ammonia (**NH3**)	mg/L	0.15	0.15

(1) Includes both carbonaceous (COD) and nitrogenous oxygen demand (NOD)

These scenarios do not account for possible lower effluent volumes if the per connection wastewater design volume of 330 gpd that was used for the ADF projections is actually lower.

1.6 Waste Assimilative Capacity

For each scenario the procedure to quantify the Bush Kill WAC was determined using the TOGS 1.3.1.D methodology. The following pages include spreadsheets with input and calculated parameters, and Table B summarizes the findings and ultimate TOD of the effluent and stream assimilation capacity as TOD for Scenarios 1 (Spreadsheet A) and 2 (Spreadsheet B). For each scenario, the Bush Kill assimilative capacity exceeded the waste loading total oxygen demand.

1.7 Sensitivity Analysis

The stream renovation factor (f-value) is a critical parameter to the equations used to derive the stream WAC. For this reason the analysis was performed for each scenario with f-values one unit lower (f-value of 2.0) and higher (f-value of 4.0), and keeping the same values for other input. These results are also included in Table B, and detailed on Spreadsheets C through F. This analysis indicated that the Bush Kill assimilative capacity exceeded the waste loading total oxygen demand, except for the lower f-value simulation for the full build out projected volume of 0.884 MGD. For the f-value 2.0 simulation, the stream capacity was 3% lower than the waste loading total oxygen demand. However, the stream capacity will exceed the waste loading for this scenario if either the projected effluent volume is decreased by 10% to 0.800 MGD, or lowering the effluent total nitrogen from 3.0 mg/L to 2.8 mg/L which can be accomplished through the treatment process.

Spreadsheet A	**Scenario 1: Phase 1 Effluent Volume of 0.132 MGD, Stream F-Value of 3.0**			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.132	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	f	**3.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.66	mg/L	Calculated
Maximum Allowable Oxygen Demand	L_a	**13.75**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	40.7	lbs/day	
Nitrogen Oxygen Demand (lb/day)	NOD	28.82	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	10.68	lbs/day	**YES**
Waste Assimilation Capacity TOD (WAC) (lb/day)	WAC	67.3	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	10	mg/L	Process Engineer
Total Nitrogen	N_T	6	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

Spreadsheet B	**Scenario 2: Full Build Out Effluent Volume of 0.884 MGD, Stream F-Value of 3.0**			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.884	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	f	**3.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.32	mg/L	Calculated
Maximum allowable Oxygen Demand	L_a	**15.25**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	136.4	lbs/day	
Nitrogen Oxygen Demand (lb/day)	NOD	99.53	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	36.86	lbs/day	**YES**
Waste Assimilation Capacity TOD (WAC) (lb/day)	WAC	171.9	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	5	mg/L	Process Engineer
Total Nitrogen	N_T	3	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

Spreadsheet C	**Scenario 1: Phase 1 Effluent Volume of 0.132 MGD, Stream F-Value of 2.0**			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.132	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	f	**2.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.66	mg/L	Calculated
Maximum allowable Oxygen Demand	L_a	**10.50**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	40.7	lbs/day	
Nitrogen Oxgen Demand (lb/day)	NOD	28.82	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	10.68	lbs/day	**YES**
Waste Assimiliation Capacity TOD (WAC) (lb/day)	WAC	48.0	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	10	mg/L	Process Engineer
Total Nitrogen	N_T	6	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

Spreadsheet D	**Scenario 1: Phase 1 Effluent Volume of 0.132 MGD, Stream F-Value of 4.0**			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.132	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	*f*	**4.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.66	mg/L	Calculated
Maximum allowable Oxygen Demand	L_a	**17.00**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	40.7	lbs/day	
Nitrogen Oxgen Demand (lb/day)	NOD	28.82	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	10.68	lbs/day	**YES**
Waste Assimiliation Capacity TOD (WAC) (lb/day)	WAC	86.7	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	10	mg/L	Process Engineer
Total Nitrogen	N_T	6	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

Spreadsheet E	**Scenario 2: Full Build Out Effluent Volume of 0.884 MGD, Stream F-Value of 2.0**			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.884	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	f	**2.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.32	mg/L	Calculated
Maximum allowable Oxygen Demand	L_a	**12.00**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	136.4	lbs/day	
Nitrogen Oxgen Demand (lb/day)	NOD	99.53	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	32.44	lbs/day	**NO – see note**
Waste Assimiliation Capacity TOD (WAC) (lb/day)	WAC	132.2	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	5.0	mg/L	Process Engineer
Total Nitrogen	N_T	3	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

NOTE: The stream capacity <u>will exceed</u> the waste loading for this scenario if: 1) the projected effluent volume is decreased by 10% to 0.800 MGD, which results in the stream capacity changing to 123.7 lbs./day and waste load to 123.4 lbs./day; or 2) lowering the effluent total nitrogen from 3.0 mg/L to 2.8 mg/L which results in the stream capacity changing to 132.2 lbs./day and waste load to 129.8 lbs./day.

Spreadsheet F	Scenario 2: Full Build Out Effluent Volume of 0.884 MGD, Stream F-Value of 4.0			
Explanation	Parameter	Value	Unit	Source
Effluent Flow from WWTF	Q_w	0.884	MGD	Input
Stream DO Saturation	C_s	8.00	mg/L	TOGS Table 1
Effluent DO	DO_w	8.00	mg/L	Input
Effluent DO Deficit	D_w	0.00	mg/L	Calculated
Stream Flow u/s of the WWTF	Q_s	0.58	MGD	Input
DO u/s of WWTF, Dos	DO_s	7.20	mg/L	TOGS Table 1 90%
Stream DO Deficit u/s of WWTF	D_s	0.80	mg/L	Calculated
Stream Standard	DO_{ss}	5.00	mg/L	TOGS Table
f Value (renovation factor)	f	**4.00**	unitless	TOGS Table II
Initial DO Deficit after Mixing	D_a	0.32	mg/L	Calculated
Maximum allowable Oxygen Demand	L_a	**18.75**	mg/L	TOGS Figures 1-7 (Da,f,Dc)
Critical DO Deficit	D_c	3.00	mg/L	Calculated
mg/L to lbs/day conversion factor	-	8.34	lbs/gallons	Conversion Factor
NOD to TOD Conversion	-	4.50	mg/L	Conversion Factor
TOD Stream	TOD_S	3.00	mg/L	Generic Value
WWTF TOD after Secondary Treatment (lb/day)	TOD	136.4	lbs/day	
Nitrogen Oxgen Demand (lb/day)	NOD	99.53	lbs/day	**Is WAC greater than Effluent TOD?**
CBOD (lb/day)	CBOD	36.86	lbs/day	**YES**
Waste Assimiliation Capacity TOD (WAC) (lb/day)	WAC	214.7	lbs/day	
WWTP Parameter	Variable	Value	Unit	Source
BOD5	BOD_5	5	mg/L	Process Engineer
Total Nitrogen	N_T	3	mg/L	Process Engineer
Dissolved Oxygen	DO	8	mg/L	Process Engineer
TSS	TSS	5	mg/L	Process Engineer
Total Phosphate	TP	0.3	mg/L	Process Engineer
Stream Parameters				
Total Oxygen Demand	TOD_S	3	mg/L	Generic Value

Table B Summary of WAC Analysis

	f-value	Initial DO Deficit After Mixing (Da)	Maximum Allowable Oxygen Demand (La)	TOGS Da Graph Used to Select La	Stream Assimilative Capacity (pounds/day)	Waste Loading (pounds/day)	Stream Capacity Exceeds Waste Load
Scenario 1 (0.132 MGD)	2.0	0.66 mg/L	10.5 mg/L	Da = 1.0	48.0	40.7	Yes
	3.0		13.75 mg/L		67.3	40.7	Yes
	4.0		17.0 mg/L		86.7	40.7	Yes
Scenario 2 (0.884 MGD)	2.0	0.32 mg/L	12.0 mg/L	Da = 0.0	132.2	136.4	No (1)
	3.0		15.25 mg/L		171.9	136.4	Yes
	4.0		18.75 mg/L		214.7	136.4	Yes

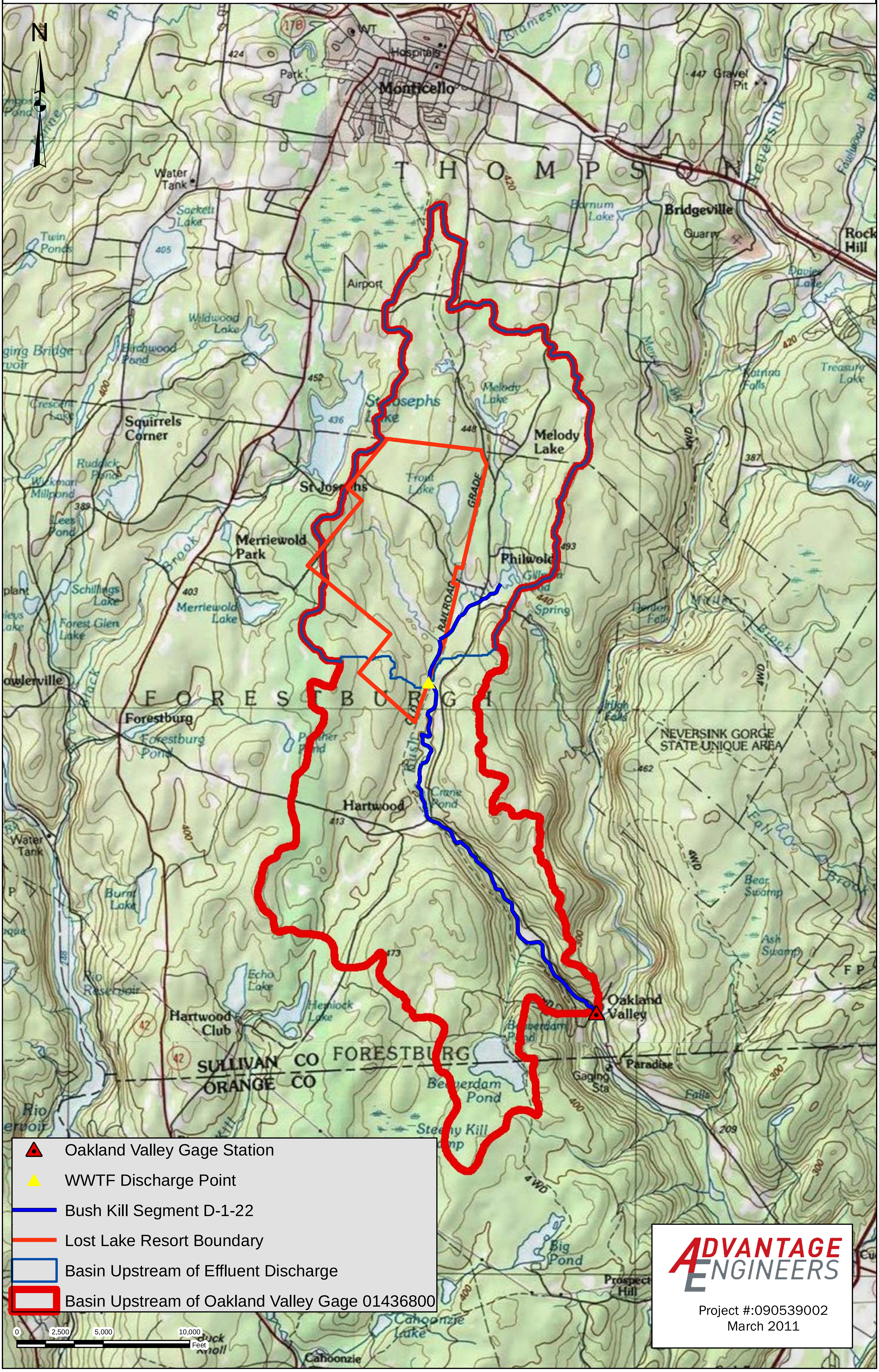
(1) The stream capacity will exceed the waste loading for this scenario if either the projected effluent volume is decreased by 10% to 0.800 MGD, or lowering the effluent total nitrogen from 3.0 mg/L to 2.8 mg/L.

1.8 Conclusions

The analysis of the proposed wastewater treatment levels and effluent discharges at the projected average day volumes for the Lost Lake Resort project demonstrates that the average daily flows for the two scenarios do not exceed the assimilative capacity of the receiving water, the Bush Kill, for the MA7CD10 low flow stream conditions. This analysis serves to support the conclusion that there will not be an adverse surface water impact, provided that the WWTP is properly designed, constructed and operated in accordance with a SPDES discharge permit issued by NYSDEC.

Figure 1 - Location Plan

Lost Lake Resort



USGS
New York StreamStats

Streamstats Ungaged Site Report

Date: Thu Mar 10 2011 09:14:21 Mountain Standard Time
Site Location: New_York
NAD27 Latitude: 41.5046 (41 30 17)
NAD27 Longitude: -74.6488 (-74 38 56)
NAD83 Latitude: 41.5047 (41 30 17)
NAD83 Longitude: -74.6484 (-74 38 54)
ReachCode: 02040104000417
Measure: 1.49
Drainage Area: 19.4 mi2
Percent Urban: 0.21 %

Peak Flows Region Grid Basin Characteristics

100% 2006 Full Region 3 (19.4 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	19.4	0.41	3480
Lag Factor (dimensionless)	0.22	0.002	20.582
Mean Annual Runoff in inches (inches)	23.8	16.86	40.73
Median Seasonal Maximum Snow Depth (inches)	13.9	13.02	20.42

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK1_25	486	26	5.1		
PK1_5	603	24	8.4		
PK2	749	24	5.4		
PK5	1190	20	11		
PK10	1550	19	19		
PK25	2020	17	36		
PK50	2410	15	54		
PK100	2810	15	77		
PK200	3220	14	100		
PK500	3760	14	130		

USGS
New York StreamStats

Streamstats Ungaged Site Report

Date: Thu Mar 10 2011 08:40:32 Mountain Standard Time
Site Location: New_York
NAD27 Latitude: 41.5571 (41 33 26)
NAD27 Longitude: -74.6843 (-74 41 04)
NAD83 Latitude: 41.5572 (41 33 26)
NAD83 Longitude: -74.6840 (-74 41 02)
ReachCode: 02040104000420
Measure: 66.61
Drainage Area: 8.9 mi2
Percent Urban: 0.36 %

Peak Flows Region Grid Basin Characteristics

100% 2006 Full Region 3 (8.9 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	8.9	0.41	3480
Lag Factor (dimensionless)	0.29	0.002	20.582
Mean Annual Runoff in inches (inches)	23.7	16.86	40.73
Median Seasonal Maximum Snow Depth (inches)	14.2	13.02	20.42

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK1_25	232	26	5.1		
PK1_5	288	24	8.4		
PK2	359	24	5.4		
PK5	574	20	11		
PK10	748	19	19		
PK25	986	17	36		
PK50	1190	15	54		
PK100	1390	15	77		
PK200	1600	14	100		
PK500	1880	14	130		

WAC Equations and Tables from TOGS 1.3.1.D

Table I
Dissolved Oxygen Saturation Values (mg/L)

		100% Saturation		90% Saturation	
Elevation (Feet)	Barometric Pressure (mm)	25° C	24° C	25° C	24° C
0	760	8.3	8.4	7.5	7.6
500	746	8.1	8.3	7.3	7.5
1000	732	8.0	8.1	7.2	7.3
1500	718	7.8	8.0	7.0	7.2
2000	704	7.7	7.8	6.9	7.0
2500	690	7.5	7.7	6.7	6.9
3000	677	7.4	7.5	6.7	6.7

Table 2
Required D.O. Concentrations (mg/L)

Classification		A,B,C	D	SA,SB,SC	SD
Trout Waters	Spawning minimum	7.0	n/a	n/a	n/a
	Minimum daily average	6.0	n/a	n/a	n/a
	Minimum anytime	5.0	n/a	n/a	n/a
Non-Trout Waters	Minimum daily average	5.0	-	-	-
	Minimum anytime	4.0	3.0	5.0	3.0

Table 3
Stream Renovation Factor

Nature of Receiving Water	"f" Value
Small ponds and backwaters	0.5 - 1.0
Sluggish Streams, Large Lakes	1.0 - 1.5
Large Streams Slow Velocity	1.5 - 2.0
Large Streams Moderate Velocity	2.0 - 3.0
Swift Stream	3.0 - 5.0
Rapids, Waterfalls, ect.	5.0 and up

a) Non-Trout Stream = 25C
b) Trout Stream = 24C

$$Da(mg/L) = \frac{(Qw(MGD)*Dw(mg/L) + (Qs(MGD)*Ds(mg/L))}{(Qw(MGD)+Qs(MGD))}$$

$$Dc(mg/L) = Cs(mg/l) - DOss(mg/L)$$

$$NOD(lbs/day) = N_T(mg/L)*4.5*8.34*Q_W(MGD)$$

$$CBOD(lbs/day) = BOD_5(mg/L)*8.34*Q_W(MGD)$$

$$TOD(lbs/day) = NOD(lbs/day) + CBOD(lbs/day)$$

$$WAC(lbs/day) = [(Q_W(MGD) + Q_S(MGD))*La(mg/L)*8.34] - [Q_S(MGD)*3.0(mg/L)*8.34]$$

$$D_W = C_S - DO_W$$

$$D_S = C_S - DO_S$$