

17 December 2012

Hill and Dale Property Owners, Inc.  
c/o Ms. Maureen Fleming  
P.O. Box 411  
Carmel, New York 10512

Re: Kent Manor Condominiums  
Application 3-3722-0041/00003

Dear Ms. Fleming:

Hill & Dale Property Owners, Inc. has requested Princeton Hydro, LLC to conduct a desktop analysis to quantify the annual total phosphorus (TP) load originating from some septic systems within the Palmer Lake watershed (existing conditions) and compare this to the proposed increase in the wastewater discharge for the Kent Manor WWTP. Palmer Lake is located within the Croton Falls watershed, within the Town of Kent, Putnam County, New York.

Specifically, a set of 13 parcels within the Palmer Lake watershed would be included in an expansion of the Kent Manor WWTP. While this would result in an increase in the amount of total phosphorus (TP) entering the main tributary of Palmer Lake, there would be an associated decrease in TP by sewerage the 13 parcels and decommissioning their existing on-site wastewater treatment system (septic systems). Thus, this desktop analysis will compare the wastewater TP loads under existing conditions to the proposed conditions as explained below.

In 2009, the New York State Department of Environmental Conservation (DEC) issued a SPDES permit modification to the Kent Manor Sewer Corporation, allowing the Kent Manor WWTP to discharge 70,000 gpd to an unnamed tributary that enters Palmer Lake. This Permit (SPDES Number NY0207322) included the most restrict permit limit for TP in New York, which is 0.05 mg/L.

**Princeton Hydro, LLC**

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In 2012 a Draft SPDES Permit was submitted to request an increase in the wastewater discharge of the Kent Manor WWTP to a total of 103,200 gpd but to keep the TP discharge limit at 0.05 mg/L. As part of this expansion a total of 13 parcels within the Palmer Lake watershed will be sewerred, with their septic systems decommissioned. To quantify the existing and proposed wastewater conditions, a modified version of Reckhow's on-site wastewater treatment system (OWTS) model was used (Reckhow, et. al., 1980). This modified model was recently used to update the OWTS phosphorus load for the New Jersey end of the Greenwood Lake watershed (Passaic County, New Jersey / Orange County, New York), as well as develop a OWTS Management Plan for the New Jersey end of the watershed. This Management Plan was recently reviewed and approved by the New Jersey Department of Environmental Protection (NJDEP) and will now move into the implementation phase.

As mentioned above, Reckhow's OWTS model was used to quantify the existing TP load generated from those septic systems of the 13 parcels targeted for sewerred. It should be noted that this model is frequently used in pollutant loading and TMDL analyses for lakes and has been widely accepted by both US EPA as well as a number State Environmental Agencies.

One of the factors required for this analysis is the phosphorus export coefficient which is described as the amount of phosphorus generated by a septic tank / capita / year. In the original US EPA Phase I Diagnostic Feasibility Study of Greenwood Lake, New Jersey and New York (Princeton Aqua Science, 1983) a TP export coefficient of 0.115 kg of TP/capita/yr was utilized in the modeling. This coefficient was derived from a national eutrophication study conducted by US EPA (US EPA, 1975). However, as part of the recent OWTS management plan project for Greenwood Lake, some on-site sampling of the sub-surface leachate leaving the leachfield of an existing septic system was conducted; the sampling septic system services the Township of West Milford's municipal building.

Sampling protocol for the municipal septic system was outlined and summarized in a Quality Assurance Protection Plan (QAPP), which was submitted to NJDEP for review and approval. The sampling methodology was based on previous sub-soil leachate studies conducted in New York and Canada (Meehan, unpublished; Ptacek, 1998).

Based on data collected during four sampling events (n=8), the sub-surface leachate immediately downgradient of municipal septic leachfield varied between 0.10 and 1.70 with a median value of 0.62 mg/L. Using this median value, a TP export coefficient of 0.165 kg of TP/capita/yr was calculated. This was the coefficient used in the Palmer Lake analysis.

The 13 parcels within the Palmer Lake watershed represent a mix of residential / commercial and light industrial land use. In order to run the septic model, the number of people using the existing septic systems needed to be quantified so per capita rates could be established. The information you provided on the number of people residing or

working at each lot with the parcels was used, in conjunction with some relatively conservative assumptions. These assumptions included:

1. Any lot where the business was no longer in operation was assumed to have no one currently utilizing that septic system.
2. One bedroom apartments were assumed to house one person, two bedroom apartments were assumed to house two people, etc.
3. Anything that was a residence or house was given the Town's mean household estimate of 2.84.
4. For businesses or other commercial property, only employees were considered in determining the number of people who use that particular septic system. This includes restaurants. Thus, the number of people actually using the septic system at a restaurant more than likely under-represents the predicted per capita loads.
5. Residential dwellings were assumed to be year-round (365 days), while for commercial property the "work year" was defined as 236 days per employee.

Another assumptions for the model included that all septic system leachfields were within 100 meters (330 ft) of a local waterway (stream, ditch, wetland, and pond), within the Palmer Lake watershed. Additionally, local soil and watershed conditions are known to be severely restrictive for both conventional on-site wastewater treatment systems (septic systems) as well as community-based on-site treatment systems. Such restrictive conditions include, but are not necessarily limited to, shallow depth to groundwater, shallow depth to bedrock and steep slopes. It was also assumed that these existing septic systems are older than at least 20 years, if not 50 years.

Finally, it should be noted that there should be some clarification associated with the term "failing" septic system. Typically, the term "failing" for a septic system refers to it not operating to properly remove pathogenic organisms (e.g. bacteria and viruses) from a human health perspective. Typically a failing system is often accompanied by surface ponding and foul odors; however, phosphorus leaching may also occur without signs that are obvious to the homeowner. An existing septic can easily be operating from a public health perspective (pathogenic organisms), but still be a net source of phosphorus due to local watershed / soil conditions, age of system and/or lack of routine maintenance and upkeep (Green, 2001). Thus, it cannot be assumed that only those septic systems identified as "failing" are net sources of phosphorus. In fact, a failing system may actually generate substantially more phosphorus than an operating, non-failing system (Green, 2001). However, for the sake of this desktop analysis, the TP export coefficient of 0.165 kg of TP/capita/yr was applied to all septic systems within the 13 parcels, with the assumptions described above, to calculate the existing, septic-associated TP load.

The calculated septic-based TP load was compared to the annual TP load originating from the Kent Manor WWTP under existing and proposed SPDES permit conditions. First, under the existing permitted conditions of discharging a total of 70,000 gpd at a TP limit of 0.05 mg/L, the WWTP would generate 10.7 lbs of TP per year within the Palmer Lake watershed. If the 2012 draft SPDES permit is established and sets the total

wastewater discharge for the WWTP at 103,200 gpd, with the same TP limit of 0.05 mg/L, the resulting annual TP load is 15.7 lbs. Thus, expanding the capacity of the Kent Manor WWTP to 103,200 gpd would result in a net addition of 5 lbs of TP per year.

Under existing conditions, the septic systems associated with the 13 parcels are estimated to product 18.8 lbs of TP per year. Thus, under existing conditions the combined Kent Manor WWTP and septic systems are estimated to produce a total of 29.5 lbs per year.

Under the proposed 2012 draft SPDES permit conditions, the WWTP annual TP load is 15.7 lbs. However, under this proposed scenario the septic systems associated with the 13 parcels would be decommissioned since these lots would be sewerred. Thus, the septic load from these 13 parcels would be 0.0 lbs per year.

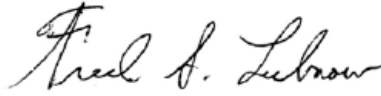
Based on this analysis, while the WWTP TP load would increase by 5 lbs per year with the proposed expansion of the WWTP, the total wastewater (WWTP + septic) would be 15.7 lbs per year since the existing septic systems would be decommissioned. This results in a 13.8 lbs decrease in the total wastewater TP load (29.5 lbs per year vs. 15.7 lbs per year).

A more conservative analysis was also run with the model, where only those parcels located within 330 feet of the main tributary entering Palmer Lake were assumed to directly contribute to the lake's annual TP load. Under this scenario only 5 of the 13 parcels were included in the model (Labels #3, #4, #5, #11 and #12) and would generate an estimated 10.0 lbs of TP per year from existing septic systems. Thus, the total existing wastewater load (WWTP + septic) would be 20.7 lbs. In contrast, the proposed load under the expansion of the WWTP and decommissioning of the septic systems would still be 15.7 lbs of TP per year. Thus, even if only 5 of the 13 parcels directly contribute to the annual TP load entering Palmer Lake, expanding the WWTP and decommissioning those septic systems would result in a net decrease in the total wastewater TP load by 5.0 lbs per year (20.7 lbs vs. 15.7 lbs).

In conclusion, the proposed expansion of the Kent Manor WWTP will result in a net increase of 5.0 lbs of TP per year. However, the reductions in TP with decommissioning the existing septic systems associated with the 13 parcels within the Palmer Lake watershed, that will be included in the sewerred plan, will result in a net reduction in the annual TP load by 13.8 lbs. Even if a more conservative model scenario is established and run, where only 5 of the 13 parcels directly contribute to the annual TP load entering Palmer Lake, there is a net decline in the annual wastewater TP load by 5.0 lbs. In conclusion, expanding the Kent Manor WWTP, which includes sewerred 13 parcels within the Palmer Lake watershed, will result in a net reduction in TP entering Palmer Lake as long as the 0.05 mg/L discharge limit is adhered to. Thus, the proposed expansion of the Kent Manor WWTP will not have a negative impact on Palmer Lake, relative to phosphorus loading, as described in the Draft SPDES Permit.

Thank you for your time and if you have questions on this desk top analysis, please feel free to contact me at our Exton, PA office (610-524-4220).

Sincerely,



Fred S. Lubnow, Ph.D.  
Director of Aquatics Program

cc: D.K. Gordon, Attorney at Law  
J. Miller, P.E., CFM, CSM, Princeton Hydro, LLC

#### **Literature Cited**

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