MEMORANDUM

SUBJECT: THE VILLAGE IN THE HUDSON VALLEY
RESPONSES TO WATER AND SEWER RELATED COMMENTS

TO: TOWN OF LLOYD PLANNING DEPARTMENT

FROM: DONALD R. SNYDER, JR P.E.

DATE: AUGUST 3, 2021

Background

The memorandum has been prepared to respond to comments provided by CPL with regards to the application with the Town of Lloyd Planning Department. The information and calculations provided in this memorandum were based The New York State Department of Environmental Conservation Division of Water "New York State Design Standards for Intermediate Sized Wastewater Treatment Systems, March 5, 2014" and the Ten States Standards were used to calculate the projected wastewater flows and sewer sizing required for the new Village in the Hudson Valley development.

Sewerage Flow Calculations

The proposed development at The Village in the Hudson Valley will consist of approximately 178 two-bedroom single family cottages, an Assisted Living Facility with approximately 125 one-bedroom units and a two-story 11,600 SF clubhouse. (Note: The estimated usage above is approximate based on the developer's concept. The calculations and pipe network sizing are conservative to allow for changes in planned use without impact to the pipe sizing.) Table B-3 from Section B.6.b of the New York State Design Standards for Intermediate Sized Wastewater Treatment Systems was used to calculate the projected wastewater flows for the new community. As listed in Table B-3, a single-family residence produces 110 gpd/bedroom of wastewater discharge. When calculating the projected flows for the Assisted Living Facility, multiple factors were accounted for including number of housing units, number of employees and capacity of the onsite banquet hall. According to a Utility Report prepared by Willingham Engineering on September 20, 2020, the total number of living units within the assisted living building will be 135, with a total of 98 employees and a 135-seat banquet hall. From Table B-3, the assisted living building will produce 120 gpd/unit, 15 gpd/employee and 10 gpd/seat. The proposed Clubhouse at The Village in the Hudson Valley will have a maximum capacity of 70 patrons according to the Utility Report prepared by Willingham and have a project wastewater flow of 10 gpd/patron as stated in Table B-3. Using the information provided and as displayed in Table 1 below, the total average daily wastewater flow was found to be 78,680 gpd.

Table 1 – Estimated Average Sewerage Flows

	Number of Units	Flow per Unit (GPD)	Avg. Wastewater Flow (GPD)	Avg. Wastewater Flow (GPH)
Upper Cottages	356	110	39,160	1,632
ALF Residents	135	120	16,200	675
ALF Staff	98	15	1,470	61
ALF Banquet Hall	135	10	1,350	56
Clubhouse	70	10	700	29
Total			**58,880 GPD**	**2,453 GPH**

To determine the appropriate pipe sizing for the sanitary sewer pipe, the peak daily flow is needed. From the Ten States Standards, the peak daily flow is calculated using the population (P) in thousands and the average daily flow. The equation used to calculate the peak daily flow is (See Table 2 for calculated values):

$Q_{Peak\ Hourly} / Q_{Average\ Hourly} = (18 + \sqrt{P})/(4 + \sqrt{P})$
Note: The right side of the equation can be referred to as a peaking factor.

Table 2 – Estimated Peak Sewerage Flows

	Avg. Wastewater Flow (GPH)	Population (P)	Peaking Factor	Peak Wastewater Flow (GPH)
Upper Cottages	1,632	356	4.046	6,601
Assisted Living	675	135	4.206	2,839
Assisted Living Staff	61	98	4.246	260
Assisted Living Banquet Hall	56	135	4.206	237
Clubhouse	29	70	3.895	114
Total				**10,050 GPH**

Once the peak hourly flow was calculated, the appropriate sanitary sewer pipe size was determined using the Ten States Standards. The Ten States Standards requires a minimum flow velocity of 2 ft/s when flowing full based on using the Manning's equation with a roughness coefficient (n) of 0.009 for PVC pipe and a minimum pipe diameter of 8 inches. The Ten States Standards also provides a minimum required slope (S) for each nominal pipe size, which for 8-inch diameter pipe is 0.4ft/100ft or S=.004. Using these inputs, as shown in Equation 1 below, an 8-inch diameter sewer pipe can carry a flow of 713,000 gpd (29,700 gph) at the minimum slope.

Equation 1:

$v = (1.486/n) \times (Dia./4)^{(2/3)} \times S^{(1/2)}$
$= (1.486/0.009) \times (.667ft/4)^{(2/3)} \times (.004)^{(1/2)}$
$= 3.16$ ft/s

$Q = v \times A \rightarrow (2.19ft/s) \times ((\pi \times (.667)^2)/4)$
$= 0.76ft^3/s \rightarrow (0.76ft^3/s) \times (7.48gal/ft^3) \times (86{,}400s/day)$
$= 713{,}000$ gpd (29,700 gph)

The proposed sanitary sewer piping within the development is sufficient to carry the expected flow with sufficient factor of safety to accommodate reasonable changes to the number of units and use category of the clubhouse or related buildings. Furthermore, the calculations provided here are based on a minimum slope recommended for the pipe, however a majority of the pipe exceeds the minimum slope and thus will have a greater capacity than conservatively calculated in this memorandum.

Grease Interceptor Sizing

The grease interceptor size shown on the plan has been sized based on Table D-1 of the New York State Design Standards for Intermediate Sized Wastewater Treatment Systems. Based on the flow calculations provided in the previous section of this memorandum, the total estimated peak flow of the Assisted Living Facility is 3,336 GPH or 55.6 gpm. Based on this flowrate, a 2,000 gallon nominal interceptor volume was selected and shown on the plans.