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Technical Memorandum

To: Adam Ricker - Town of New London, NH File No. 2362.08
Cc: Ross Baker – Underwood Engineers
From: David J. Mercier, P.E.
Date: November 21, 2018
Subject: **NEW LONDON PLACE SENIOR HOUSING WATER & SEWER
DEMAND EVALUATION**

BACKGROUND:

The Town of New London, NH has been approached by the New London Hospital Association (NLHA) to consider a new elderly housing complex that would be built on Tax Map 72, Lot 17 off of County and Parkside Roads in New London, NH. The Town of New London has requested that Underwood Engineers (UE) perform an assessment of the potential water consumption and wastewater production numbers for the proposed facility as prepared by the NLHA's engineer. In addition to confirming consumption and production numbers, the Town also requested UE assess the impact of those numbers on the existing water and sewer utilities which the proposed facility would connect to. The water utilities are owned by the New London/Springfield Water Precinct, and the sewer utilities are owned by the Town of New London.

The purpose of this Technical Memorandum is to present UE's opinion of the appropriateness of the water and sewer projections for the new facility, and what (if any) modifications might be required to existing infrastructure to accommodate them. The evaluation will include UE's design flow calculations based on the New Hampshire Department of Environmental Services (NHDES) regulations, and conclusions regarding the remaining capacities of the existing water and sewer mains based on discussions with of the New London/Springfield Water Precinct and New London Public Works.

EVALUATION:

The following paragraphs summarize the analyses performed to project the water and wastewater flows. The analyses reference the Jones & Beach July 2018 drawings and the design flow information provided by the NLHA's engineer, as well as the NHDES regulations for public water system classification and design (Env Dw 405), and sewage disposal system design (Env Wq 1000). The UE design flow calculations can be seen attached to this memo, along with the flows provided by the NLHA for comparison.

Wastewater Evaluation

UE's methodology for projecting wastewater flows differed slightly from that provided by the NLHA. The calculated flows for the independent living (rental and condominium), assisted living, memory care, and cottages were found to be the same. The discrepancy between the UE calculated flows and the NLHA's flows occurs in the laundry and kitchen section of the calculations. According to the NHDES Env Wq 1000 Table 1008-1 Unit Design Flows, the design flow for "Laundromats" is 500 GPD/Machine. The flow calculations from the NLHA used different unit design flows of 200 GPD/Machine for the residential laundry units, and a flow of 2,500 GPD/Machine for the commercial laundry unit. In Table 1008-1 the unit design flow for "Food Service – cafeteria with table service, toilet, and kitchen waste" is 40 GPD/Seat. The design flow used by the NLHA was 35 GPD/Seat. In the end, the UE total projected flow was 19,900 GPD, which is slightly less than the total projected flow of 20,200 GPD calculated by the NLHA. Given the degree of accuracy of these projections, these two numbers are the same.

In order to find the maximum day and peak hour wastewater flows, NHDES Env Wq 700 regulations and the Ratio of Extreme Flow to Average Daily Flow graph (TR-16) were used. According to Env Wq 704.03(d), a peaking factor of 6 was used due to the average daily flow being less than 100,000 GPD. The maximum day peaking factor was estimated to be 3 by using the lowest average daily flow of 100,000 GPD on the TR-16 graph. After multiplying the average daily flow by the peaking factors, the estimated maximum day flow is 60,000 GPD, and the peak hourly flow is 120,000 GPD.

The Jones & Beach overall utility plan indicates that the proposed sewer lines will connect to an existing manhole on Parkside Road. Based on discussions with Sam Clarke of New London Public Works, there are no current issues with that manhole or section of sewer main. It is unclear if the sewer main is 8" or 10" pipe at the connection manhole, since sewer pipe maps indicate Parkside Road is 8" until it switches to 10" in the final segment before connecting to the 12" sewer on Main Street. To be conservative, the existing main where the proposed sewer lines will connect to is assumed to be 8". Given the capacity of an 8" pipe at minimum slope is in excess of 1,000,000 GPD, and considering the current wastewater flows in the area, the Parkside Road sewer can handle the new wastewater flow from the proposed facility.

The wastewater produced by the proposed facility will travel to the Main Pump Station located off of South Pleasant Street on Lyon Brook Drive. In order to evaluate if the Main Pump Station can handle additional flow from the new facility, the historic pump run times were analyzed. After looking at the pump run time data for calendar year 2018, it was found that during the wetter months of April and May each pump ran between 2 to 5 hours per day. During the dryer months of July, August, and September, each pump ran between 1 to 3 hours per day. Since the pumps do not run very long even during the wetter times of the year, the additional wastewater generated by the proposed facility should not exceed the capacity of the Main Pump Station



which is 910 GPM (1,310,400 GPD) at 185 ft TDH. The new flow only represents 9% of the station's peak capacity.

Water Evaluation

Typically, water consumption flows are assumed to be equal to wastewater production flows for new developments. However, using Table 405-1 Unit Design Flows in the Env Dw 405 regulations, UE performed similar calculations for water consumption to compare to the wastewater production flows. The "Elderly Housing – one bed and two bed" unit design flows were used for the independent living (rental and condominium), assisted living, memory care, and cottage buildings. The regulations do not specify water consumption design flows for commercial kitchens or laundry machines, and that flow is considered to be included in the housing design flows. After performing the flow calculations for water, the total projected flow was found to be 23,050 GPD (rounded to 23,000 GPD), slightly greater than the 19,900 GPD average daily wastewater flow projection.

Peak hour and maximum day peaking factors were estimated using the NHDES Env Dw 400 regulations Table 405-5 peaking factor graphs. A peak hour factor of 6 was found assuming 150 units for residential use. A peak hour factor of 4 was found using the school graph and assuming 200 people. Since 6 is more conservative, that peak hour flow factor was utilized. The NHDES regulations do not have a standard for determining a maximum day factor for water usage, and no historical data is available since the facility doesn't exist yet. Because of this, the wastewater maximum daily flow factor of 3 was also used for water consumption. The maximum daily water usage flow was then calculated as 69,000 GPD, and the peak hour flow was found to be 138,000 GPD.

The utility site plan drawings from Jones & Beach indicate that the proposed facility water lines will connect to the existing 8" water main on Parkside Road, and to the existing 12" water main on County Road. (It should be noted that on the Jones & Beach drawings, the water main on County Road is shown as a 10" main, but after reviewing UE records and speaking with Rob Thorpe of the New London/Springfield Water Precinct (NLSWP), the main is actually 12".) The NLSWP used to provide 100 M GPY of water to the Town but now only provides 80 M GPY. Water is taken from an underground aquifer which has a finite life. The three wells that draw from the aquifer are refurbished every three years, and produce around 500,000 GPD but can achieve up to 700,000 GPD. Rob Thorpe believes they can provide the projected water usage flows to the new facility without improvements. Rob noted the Town should be aware that an increase in water usage will result in more frequent well maintenance which will increase yearly costs, as well as reduce the aquifer's life.

An important consideration brought up by the NLSWP is the temporary worker housing for construction of the new facility. Seventy (70) units of temporary housing are proposed to be located a half mile down the road from the site. According to Rob Thorpe, this housing will add 10,000 GPD of water consumption and wastewater production during construction. UE is unaware if the temporary housing will be connected to the existing Town sewer or the NLSWP



water system, and if so, how the connections will be paid for. The Town of New London should be aware that the temporary housing will add additional water and wastewater flow not estimated in this analysis for the duration of construction.

Conclusion

The average design flow of 20,200 GPD (water and wastewater) submitted by the NLHA's engineer falls in between the UE estimated 23,000 GPD water flow and 19,900 GPD wastewater flow. UE does not take exception to the projected flows calculated by the NLHA's engineer. The small difference in the numbers is within the range of accuracy of these types of projections. Further, based on a review of the existing available infrastructure and discussions with the Public Works and NLSWP, adequate capacity exists to serve the new facility's water and sewer needs without improvements.

UE recommends that the Town investigate further the temporary worker housing water and sewer sources. Once the new facility is on-line, the Town should monitor wastewater and water flows closely for the first 12 months to ensure the mains, pump station, and NLSWP wells are not adversely affected as a result of the increase in flows.

NLHA Flow Projections

New London Place
Senior Housing

BUILDINGS	UNITS	BEDROOMS	STATE REQUIREMENTS	GPD
Independent Living (condominium)	26	35		
Independent Living (rental)	13	15		
Assisted Living	47	47		
Memory Care	20	20		
Care Building Total	106	117	118/2 = 59 X 125 GPD	7,375
Cottages	33	2	33 X 125 GPD	4,125
Senior Housing Total				11,500
Commercial Kitchen	160 Seats		160 X 35 GPD	5,600
Residential Laundry	3 Units		3 X 200	600
Commercial Laundry	1 Unit		1 X 2,500	2,500
Services Total				8,700
Project Total				20,200 GPD

Client: New London, NH
 Project Name: Hospital Facility Water Consumption & Sewer Production Assessment
 Engineer: Underwood Engineers, Inc.
 Project #: 2362
 Calcs performed by: RMB
 Date: 11/21/2018

Note: Differences between UE and NLHA engineer's numbers are highlighted in yellow

1. New London Place Senior Housing Design Flow Analysis

Wastewater Flows

BUILDINGS	UNITS	BEDROOMS	STATE REQUIREMENTS (ENV-WQ 1000 TABLE 1008-1)	MATH	FLOW (GPD)
Independent Living (condominium)	26	35	125 GPD/2 Bedroom Unit	35-26=9 2 bed units * 125 GPD/2 bed unit =	1,125
				26-9=17 1 bed units/2 * 125 GPD/2 bed unit =	1,063
Independent Living (rental)	13	15	125 GPD/2 Bedroom Unit	15-13=2 2 bed units * 125 GPD/2 bed unit =	250
				13-2=11 1 bed units/2 * 125 GPD/2 bed unit =	688
Assisted Living	47	47	125 GPD/2 Bedroom Unit	48/2 * 125 GPD/2 bed unit =	3,000
Memory Care	20	20	125 GPD/2 Bedroom Unit	20/2 * 125 GPD/2 bed unit =	1,250
Care Building Total					7,375
Cottages	33	2	125 GPD/2 Bedroom Unit	33 * 125 GPD/2 bed unit =	4,125
Senior Housing Total					11,500
Commercial Kitchen	160	(seats)	40 GPD/Seat	160 seats * 40 GPD/seat =	6,400
Residential Laundry	3	(units)	500 GPD/Unit	3 units * 500 GPD/unit =	1,500
Commercial Laundry	1	(unit)	500 GPD/Unit	1 unit * 500 GPD/unit =	500
Services Total					8,400
Project Total					19,900

Water Flows

BUILDINGS	UNITS	BEDROOMS	STATE REQUIREMENTS (ENV-DW 400 TABLE 405-1)	MATH	FLOW (GPD)
Independent Living (condominium)	26	35	150 GPD/1 Bedroom Unit 100 GPD/bedroom for 2 or more beds	35-26=9 2 bed units * 100 GPD/bedroom * 2 =	1,800
				26-9=17 1 bed units * 150 GPD/unit =	2,550
Independent Living (rental)	13	15	150 GPD/1 Bedroom Unit 100 GPD/bedroom for 2 or more beds	15-13=2 2 bed units * 100 GPD/bedroom * 2 =	400
				13-2=11 1 bed units * 150 GPD/unit =	1,650
Assisted Living	47	47	150 GPD/1 Bedroom Unit 100 GPD/bedroom for 2 or more beds	47 * 150 GPD/unit =	7,050
Memory Care	20	20	150 GPD/1 Bedroom Unit 100 GPD/bedroom for 2 or more beds	20 * 150 GPD/unit =	3,000
Care Building Total					16,450
Cottages	33	2	150 GPD/1 Bedroom Unit 100 GPD/bedroom for 2 or more beds	33 * 125 GPD/2 bed unit =	6,600
Project Total					23,050

2. Peaking Factor Analysis

ANALYTE	FLOW TYPE	DEVELOPMENT TYPE	PEAKING FACTOR	SOURCE	DESIGN FLOW (GPD)
Water	Peak Flow	Residential	6	Env-dw 405.19 Table 405-5: Residential flow with around 150 services or 150 persons	138,000
Water	Max Day Flow	-	3	Assumption: No historical data, assumed to be a PF=3 like TR-16 wastewater peaking graph	69,000
Wastewater	Max Day Flow	-	3	Assumption: Using wastewater peaking graph from TR-16, the lowest flow of 100,000 GPD has a max day PF=3 so assumed PF=3	60,000
Wastewater	Peak Flow	-	6	Env-wq 704.03(d): Average Daily Flow<100,000 GPD	120,000