



GROTON UTILITIES

At Your Service

December 4, 2023

Connecticut Department of Public Health  
Drinking Water Section  
Attention: Mr. Isaac Quansah  
410 Capitol Avenue, MS# 12DWS  
P.O. Box 340308  
Hartford, CT 06134-0308

Re: 2023 – Stage 2 DBPR Operational Evaluation Level Report, 3<sup>rd</sup> Quarter  
LWPCA Ledyard Center PWSID # CT0727091

Dear Mr. Quansah,

As required, Ledyard Center OEL Evaluation for site #LC117 11 Village Dr. for 2022, 1<sup>st</sup> quarter is submitted.

If you have any questions, please feel free to contact me at (860) 446-4080 or [dietrichs@grotonutilities.com](mailto:dietrichs@grotonutilities.com).

GROTON UTILITIES

Stephen Dietrich  
Groton Utilities, Water Quality Manager

Attachments (4)



**Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR)  
 Operational Evaluation Reporting Form**

**I. General Information**

<b>A. Public Water System (PWS) Information</b>		<b>B. Date Prepared:</b> <u>12/4/23</u>
PWSID: <u>CT0727091</u>		
PWS Name: <u>LWPCA Ledyard Center</u>		
Population Served: <u>3,294</u>		
<b>System Type</b>	<b>Primary Source Water Type</b>	<b>Buying/Selling Relationships</b>
<input checked="" type="checkbox"/> CWS <input type="checkbox"/> NTNC	<input checked="" type="checkbox"/> Surface Water or Ground Water Under the Direct Influence of Surface Water (Subpart H) <input type="checkbox"/> Ground Water	<input checked="" type="checkbox"/> Consecutive System <input type="checkbox"/> Wholesale System <input type="checkbox"/> Neither
<b>C. Contact Person</b>		
Name: <u>Honorable Fred Allyn III</u>		
Mailing Address: <u>741 Colonel Ledyard Highway</u>		
City/Town: <u>Ledyard</u> State: <u>CT</u> Zip Code: <u>06339-1511</u>		
Title: <u>Mayor</u>		
Business Phone #: <u>860-464-3222</u> Ext: _____ Fax #: <u>860-464-8455</u>		
E-mail: <u>mayor@ledyardct.org</u>		

**II. Compliance Information**

A. Compliance Period of OEL Exceedance(s):	<u>3<sup>rd</sup> quarter 2023</u>
B. Number of monitoring sites that exceeded the TTHM OEL:	<u>1</u>
C. Number of monitoring sites that exceeded the HAA5 OEL:	<u>0</u>
D. Has an OEL exceedance occurred at these monitoring sites in the past?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
E. Was the cause determined for the previous exceedances?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
F. Are the previous evaluations/determinations applicable to the current OEL exceedance?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
G. Did the State allow you to limit the scope of the operational evaluation? <i>If yes, attach written correspondence from the State.</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

### III. Monitoring Results

Summarize the results of the Operational Evaluation Level exceedances in the table below.

Stage 2 Monitoring Site ID	Analyte	Result from Two Quarters Ago	Result From Prior Quarter	Result From Current Quarter	Operational Evaluation Value
		A	B	C	$D = (A+B + (2 \cdot C))/4$
LC117 13 Village Drive	<input checked="" type="checkbox"/> TTHM <input type="checkbox"/> HAA5	56.3	62.9	110.6	85.1
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
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	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				
	<input type="checkbox"/> TTHM <input type="checkbox"/> HAA5				

Note: The operational evaluation value is calculated by summing the two previous quarters of TTHM or HAAS values plus twice the current quarter value, divided by four. If the value exceeds 0.080 mg/L for TTHM or 0.060 mg/L for HAAS, an OEL exceedance has occurred.

#### IV. Operational Evaluation Findings

<p>A. Did the <b>distribution system</b> cause or contribute to your OEL exceedance(s)? <i>If yes or possibly, explain below (attach additional pages if necessary).</i></p> <p>See attachment 1 and Distribution System, Item I of this report</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Possibly</p>
<p>B. Did the <b>treatment system</b> cause or contribute to your OEL exceedance(s)? <i>If yes or possibly, explain below (attach additional pages if necessary).</i></p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Possibly</p>
<p>C. Did source water quality cause or contribute to your OEL exceedance(s)? <i>If yes or possibly, explain below (attach additional pages if necessary).</i></p> <p>Groton Utilities was only able to blend one of two low-TOC water sources with Poquonnock Reservoir, which may have limited TOC reduction at POE, also limiting how low THMs might be, leaving their WTP. See attachment 1 for more information.</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Possibly</p>
<p>D. Is all supporting operational or other data that support the determination of the cause(s) of your OEL exceedance(s) attached to this report?</p>	<p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>E. If you are unable to determine the cause(s) of the OEL exceedance(s), list the steps that you can use to better identify the cause(s) in the future (attach additional pages if necessary):</p>	
<p>F. List steps that could be considered to minimize future OEL exceedances (attach additional pages if necessary)</p> <p>We began our routine flushing program in Ledyard Center in late March, flushing twice a week, and continue this twice-a-week flushing through the summer and fall. Our flushing program used to consist of once a week flushing from July to October, but due to warmer water temperatures persisting over a broader timespan of the year, we feel that this expanded flushing program is necessary for maintaining the best possible water quality in Ledyard Center. Additionally, we have taken steps to overflow Ledyard Center Tank at varying intervals to flush out water with high water age and bring fresher water into the tank, thereby reducing the water age in the tank (dechlorination of overflow water was performed at each instance of overflowing the tank).</p>	
<p>G. Total Number of Pages Submitted, Including Attachments and Checklists: 18</p>	

## TTHM and HAA5 Sample Collection and Handling Checklist

PWS ID: CT0727091 PWS Name: LWPCA - Ledyard Center

Compliance Period of OEL Exceedance(s): Q3 2023

Yes	No	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you obtain appropriate sample collection vials from the laboratory?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did the sample vials contain the proper preservative and dechlorinating agents?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Was each vial labeled using waterproof labels and indelible ink?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did each vial contain the following information on the label?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unique sample ID System name
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample location
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample date and time
<input checked="" type="checkbox"/>	<input type="checkbox"/>	An analysis required, if not already on label
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you remove the aerator from the tap if there was one present?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you open the water tap and allow the system to flush until the water temperature had stabilized (usually about 3-5 minutes)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you adjust the flow so that no air bubbles were visually detected in the flowing stream?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you slowly fill the sample vial almost to the top without overflowing?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Were you careful not to rinse out any of the preservative/dechlorinating agent during this process?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	After the bottle was filled, did you invert it three or four times to mix the sample with the preservative and dechlorinating agents?
<input type="checkbox"/>	<input type="checkbox"/>	If you collected a TTHM sample that requires acidification, did you : Let the sample set for about 1 minute, allowing the dechlorinating chemical to take effect?
<input type="checkbox"/>	<input type="checkbox"/>	Carefully open the vial and adjust the pH of the TTHM sample to < 2 by adding approximately 4 drops of hydrochloric acid for every 40 mL of sample (amount of acid needed will depend on buffering capacity of sample)?
<input type="checkbox"/>	<input type="checkbox"/>	Recap the vial, and invert three or four times?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you invert the vial and tap it to check for air bubbles?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If bubbles were detected, did you carefully open the vial and add more sample water using the cap to achieve a headspace-free sample? (Note that air bubbles would more likely lead to a lower level of THMs or HAAs.)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you immediately cool the samples to 4°C by placing them in a cooler with frozen refrigerant packs or ice, or in a refrigerator? Samples should be maintained at this temperature during shipping to the laboratory.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you complete the Sample Chain of Custody provided by the laboratory and include it with the sample shipment?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Was the sample holding time of 14 days exceeded?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Was the extract holding time exceeded? <i>EPA Method 551.1: 14 days at a temperature less than -10°C</i> <i>EPA Method 552.1: 48 hours at 4°C or less</i> <i>EPA Method 552.2: 7 days at 4 °C or 14 days at a temperature less than -10°C</i> <i>EPA Method 552.3: 21 days for MTBE extraction solvent at -10 °C or less</i> <i>OR 28 days for TAME extraction solvent at -10 °C or less</i> <i>Standard Method 6251 B: 21 days at -11 °C</i>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Did the laboratory invalidate the sample?

**Notes/Comments** (attach additional sheets if necessary)

Our subcontract lab uses EPA method 524.3 for THM analyses. Preservatives are ascorbic acid and maleic acid, both in powder form. The 40 mL vials come with preservatives already added.

## Distribution System Evaluation Checklist

PWS ID: CT0727091 PWS Name: LWPCA - Ledyard Center

Compliance Period of OEL Exceedance(s): Q3 2023

A. Do you have disinfectant residual or temperature data for the monitoring location where you experienced the OEL exceedance?  Yes  No

*If yes, answer the following questions:*

**Yes**      **No**

- |                          |                                     |  |
|--------------------------|-------------------------------------|--|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Was the water temperature higher than normal for that time of the year at that location?     |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Was the disinfectant residual lower than normal for that time of the year at that location?  |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Was the disinfectant residual higher than normal for that time of the year at that location? |

B. Do you have maintenance records available for the time period just prior to the OEL exceedance?  Yes  No

*If yes, answer the following questions:*

**Yes**      **No**

- |                          |                                     |   |
|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Did any line breaks or replacements occur in the vicinity of the exceedance?                        |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Were any storage tanks or reservoirs taken off-line and cleaned?                                    |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Did flushing or other hydraulic disturbances (e.g., fires) occur in the vicinity of the exceedance? |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Were any valves operated in the vicinity of the OEL exceedances?                                    |

C. If your system is metered, do you have access to historical records showing water use at individual service connections?  Yes  No

**If yes,** was overall water use in your system unusually low, indicating higher than normal water age?  Yes  No

D. Do you have high-volume customers in your system (e.g., an industrial processing plant)?  Yes  No

**If yes,** was there a change in water use by a high-volume customer?  Yes  No

E. Is there a finished water storage facility hydraulically upstream from the monitoring location where you experienced the OEL exceedance?  Yes  No

*If yes, review storage facility operations and water quality data to answer the following questions for the period in which the OEL exceedance occurred:*

**Yes**      **No**

- |                                     |                                     |  |
|-------------------------------------|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Was a disinfectant residual detected in the stored water or at the tank outlet?  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Do you know of any mixing problems with the tank or reservoir?   |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Does the facility operate in "last in-first out" mode?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Was the tank or reservoir drawn down more than usual prior to OEL exceedance, indicating a possible discharge of stagnant water? |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Was there a change in water level fluctuations that would have resulted in increased water age within the tank or reservoir?     |

F. Does the system practice booster chlorination?  Yes  No

**If yes,** was there an increase in booster chlorination feed rates?  Yes  No

G. Did you have customer complaints in the vicinity of the OEL exceedance?  Yes  No

**If yes,** explain below:

## Distribution System Evaluation Checklist

H. Did concern about complying with a rule other than Stage 2 DBPR, such as the Lead and Copper rule, the TCR, or any other rule constrain your options to reduce the DBP levels at this site? For example, are you limited by the need to maintain a detectable disinfectant residual in your ability to control DBP levels in the distribution system?

Yes  No

If yes, explain below and consult EPA's *Simultaneous Compliance Guidance Manual* for alternative compliance approaches:

### I. Conclusion

Did the distribution system cause or contribute to the OEL exceedance(s)?  
If yes or possibly, explain below (attach additional pages if necessary).

Yes  No  
 Possibly

When water temperatures warm up, which seems to happen earlier in the year than it used to (and seems to stay warmer longer) the distribution system can contribute to an OEL exceedance due to residence time in the system, which is why, since 2021, we have expanded routine flushing to twice a week from late spring to mid-fall. We have also verified that water age in the Ledyard Center Tank can play a significant role in increasing the water age in the system at times. Please see attachment 1 for more information.

## Treatment Process Evaluation Checklist

PWS ID: CT0727091 PWS Name: LWPCA - Ledyard Center

Compliance Period of OEL Exceedance(s): Q3 2023

A. Review finished water data for the time period prior to the OEL exceedance(s) and compare to historical finished water data using the following questions.

- |   |   |  |                              |
|---|---|--|------------------------------|
| Were DBP precursors (TOC, DOC, SUVA, bromide, etc.) higher than normal?                                 | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | <input type="checkbox"/> N/A |
| Was finished water pH higher or lower than normal?  | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |                              |
| Was the finished water temperature higher than normal?  | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |                              |
| Was finished water turbidity higher than normal?  | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | <input type="checkbox"/> N/A |
| Was the disinfectant concentration leaving the plant(s) higher than normal?                             | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |                              |
| Were finished water TTHM/HAA5 levels higher than normal?  | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |                              |
| Were operational and water quality data available to the system operator for effective decision making? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            |                              |

B. Does the treatment process include pre-disinfection?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

- | Yes                      | No                       |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Was disinfected raw water stored for an unusually long time?                           |
| <input type="checkbox"/> | <input type="checkbox"/> | Were treatment plant flows lower than normal?  |
| <input type="checkbox"/> | <input type="checkbox"/> | Were treatment plant flows equally distributed among different trains?                 |
| <input type="checkbox"/> | <input type="checkbox"/> | Were water temperatures high or warmer than usual?                                     |
| <input type="checkbox"/> | <input type="checkbox"/> | Were chlorine feed rates outside the normal range?                                     |
| <input type="checkbox"/> | <input type="checkbox"/> | Was a disinfectant residual present in the treatment train following pre-disinfection? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were online instruments utilized for process control?                                  |
| <input type="checkbox"/> | <input type="checkbox"/> | Did you switch to free chlorine as the oxidant?  |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there a recent change (or addition) of pre-oxidant?                                |

C. Does your treatment process include pre-sedimentation?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

- | Yes                      | No                       |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Were flows low?  |
| <input type="checkbox"/> | <input type="checkbox"/> | Were flows high?   |
| <input type="checkbox"/> | <input type="checkbox"/> | Were online instruments utilized for process control?          |
| <input type="checkbox"/> | <input type="checkbox"/> | Was sludge removed from the pre-sedimentation basin?           |
| <input type="checkbox"/> | <input type="checkbox"/> | Was sludge allowed to accumulate for an excessively long time? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do you add a coagulant to your pre-sedimentation basin?        |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there a problem with the coagulant feed?                   |

D. Does your treatment process include coagulation and/or flocculation?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

- | Yes                                 | No                                  |   |
|-------------------------------------|-------------------------------------|---|
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were there any feed pump failures or were feed pumps operating at improper feed rates?                      |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | Were chemical feed systems controlled by flow pacing?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were there changes in coagulation practices or the feed point?  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Did you change the type or manufacturer of the coagulant?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Do you suspect that the coagulant in use at the time of the OEL exceedance did not meet industry standards? |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Did the pH or alkalinity change at the point of coagulant addition?   |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were there broken or plugged mixers?  |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | Were flow rates above the design rate or was there short-circuiting?  |



## Treatment Process Evaluation Checklist

E. Does your treatment process include sedimentation or clarification?  Yes  No DAF process

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

**Yes      No**

- Were there changes in plant flow rate that may have resulted in a decrease in settling time or carry-over of process solids?
- Were settled water turbidities higher than normal?
- Was there any disruption in the sludge blanket that may have resulted in carryover to the point of disinfection?
- Was there any maintenance in the basin that may have stirred sludge from the bottom of the basin and caused it to carry over to the point of disinfectant addition?
- Was sludge allowed to accumulate for an excessively long time or was there a malfunction in the sludge removal equipment?

F. Does your treatment process include sedimentation or clarification?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

**Yes      No**

- Was there an increase in individual or combined filter effluent turbidity or particle counts?
- Was there an increase in turbidity or particle loading onto the filters?
- Was there an increase in flow on to the filters or malfunction of the rate of flow controllers?
- Were any filters taken offline for an extended period of time that caused the other filters to operate near maximum design capacity and created the conditions for possible breakthrough?
- Were any filters operated beyond their normal filter run time?
- Were there any unusual spikes in individual filter effluent turbidity (which may indicate particulate or colloidal TOC breakthrough) in the days leading to the excursion?
- Were all filters run in a filter-to-waste mode during initial filter ripening?
- If GAC filters are used, is it possible the adsorptive capacity of the GAC bed was reached before reactivation occurred (leave blank if not applicable)?
- If biological filtration is used, were there any process upsets that may have resulted in the breakthrough of TOC (leave blank if not applicable)?

G. Does your treatment process include primary disinfection by injecting chlorine prior to a clearwell?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

**Yes      No**

- Was there a sudden increase in the amount of chlorine fed or an increase in the chlorine residual?
- Was there an increase in clearwell holding time?
- Was the plant shutdown or were plant flows low?
- Was there an increase in clearwell water temperature?
- Did you switch to free chlorine recently as the primary disinfectant?
- Was the inactivation of *Giardia* and/or viruses exceptionally high?
- Was there a change in the mixing strategy (i.e., mixers not used, adjustment of tank level)?

H. Does your plant recycle spent filter backwash or other streams?  Yes  No

*If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:*

**Yes      No**

- Did a change in the recycle stream quality contribute to increased DBP precursor loading that was not addressed by treatment plant processes?
- Did a recycle event result in flows in excess of typical or design flows?

### Treatment Process Evaluation Checklist

I. Do you inject a disinfectant after your clearwell to maintain a distribution system residual?  Yes  No

If yes, answer the following questions for the period in which the OEL exceedance(s) occurred:

Yes      No

- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Was there a sudden increase in the amount of chlorine fed?                   |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there a switch from chloramines to free chlorine for a burnout period?   |
| <input type="checkbox"/> | <input type="checkbox"/> | If using chloramines, was the chlorine to ammonia ratio in the proper range? |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there a problem with either chlorine or ammonia mixing?                  |

J. Did concern about complying with a rule other than Stage 2 DBPR, such as the Lead and Copper Rule, the LT2ESWTR, or any other rule constrain your options to reduce the DBP levels? For example, are you limited by other treatment targets/requirements in your ability to control precursors in coagulation/flocculation?  Yes  No

If yes, explain below and consult EPA's *Simultaneous Compliance Guidance Manual* for alternative compliance approaches:

#### I. Conclusion

Did treatment factors and/or variations in the plant performance contribute to the OEL exceedance(s)?

Yes  No

If yes or possibly, explain below (attach additional pages if necessary).  Possibly

## Source Water Evaluation Checklist

PWS ID: CT0727091 PWS Name: LWPCA - Ledyard Center

Compliance Period of OEL Exceedance(s): Q3 2023

A. Do you have source water temperature data?

Yes  No

If yes, was the source water temperature high?

Yes  No

*If yes, answer the following questions for the time period prior to the OEL exceedance(s):*

**Yes      No**

- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Was the raw water storage time longer than usual?   |
| <input type="checkbox"/> | <input type="checkbox"/> | Did you place another water source on-line?   |
| <input type="checkbox"/> | <input type="checkbox"/> | Were river/reservoir flow rates lower than usual? If yes, indicate the location of lower flow rates and the anticipated impact on the OEL exceedance. |
| <input type="checkbox"/> | <input type="checkbox"/> | Did point or non-point sources in the watershed contribute to the OEL exceedance?   |

B. Do you have data that characterizes organic matter in your source water (e.g., TOC, DOC, SUVA, color, THM formation potential)?

Yes  No

If yes, were these values higher than?

Yes  No

*If yes, answer the following questions for the time period prior to the OEL exceedance(s):*

**Yes      No**

- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Did heavy rainfall or snowmelt occur in the watershed?   |
| <input type="checkbox"/> | <input type="checkbox"/> | Did you place another water source on-line?  |
| <input type="checkbox"/> | <input type="checkbox"/> | Did lake or reservoir turnover occur?  |
| <input type="checkbox"/> | <input type="checkbox"/> | Did point or non-point sources in the watershed contribute to the OEL exceedance?                                  |
| <input type="checkbox"/> | <input type="checkbox"/> | Did an algal bloom occur in the source water?  |
| <input type="checkbox"/> | <input type="checkbox"/> | If algal blooms were present, were appropriate algae control measures employed (e.g., addition of copper sulfate)? |
| <input type="checkbox"/> | <input type="checkbox"/> | Did a taste and odor incident occur?   |

C. Do you have source water bromide data?

Yes  No

If yes, were the bromide levels higher or lower than normal?

Yes  No

*If yes, answer the following questions for the time period prior to the OEL exceedance(s):*

**Yes      No**

- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Has salt water intrusion occurred?                       |
| <input type="checkbox"/> | <input type="checkbox"/> | Are you experiencing a long-term drought?                |
| <input type="checkbox"/> | <input type="checkbox"/> | Did heavy rainfall or snowmelt occur in the watershed?   |
| <input type="checkbox"/> | <input type="checkbox"/> | Did you place another water source on-line?              |
| <input type="checkbox"/> | <input type="checkbox"/> | Are you aware of any industrial spills in the watershed? |

D. Do you have source water turbidity or particle count data?

Yes  No

If yes, were the turbidity values or particle counts higher than normal?

Yes  No

*If yes, answer the following questions for the time period prior to the OEL exceedance(s):*

**Yes      No**

- |                          |                          |                                       |
|--------------------------|--------------------------|---------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | Did lake or reservoir turnover occur? |
|--------------------------|--------------------------|---------------------------------------|

### Source Water Evaluation Checklist

- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Did heavy rainfall or snowmelt occur in the watershed?    |
| <input type="checkbox"/> | <input type="checkbox"/> | Did logging, fires, or landslides occur in the watershed? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were river/reservoir flow rates higher than normal?       |

E. Do you have source water pH or alkalinity data?

Yes  No

If yes, was the pH or alkalinity different from normal values?

Yes  No

*If yes, answer the following questions for the time period prior to the OEL exceedance(s):*

**Yes**      **No**

- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Was there an algal bloom in the source water?                       |
| <input type="checkbox"/> | <input type="checkbox"/> | If algal blooms were present, were algae control measures employed? |
| <input type="checkbox"/> | <input type="checkbox"/> | Did heavy rainfall or snowmelt occur in the watershed?              |
| <input type="checkbox"/> | <input type="checkbox"/> | Has the PWS experienced diurnal pH changes in source?               |

## Source Water Evaluation Checklist

### I. Conclusion

Did source water quality factors contribute to your OEL exceedance?

Yes  No

*If yes or possibly, explain below (attach additional pages if necessary).*

Possibly

Groton Utilities was only able to blend one of two low-TOC water sources with Poquonnock Reservoir, which may have limited TOC reduction at POE, also limiting how low THMs might be, leaving their Water Treatment Plant. See attachment 1 for more information.

December 1, 2023

LWPCA-Ledyard Center, PWSID # CT0727091

LWPCA Ledyard Center water system (PWS ID # CT0727091) is a consecutive system to Groton Utilities, receiving its water supply via a water main traveling up Route 117 from Groton to Ledyard Center. Although there are some businesses in Ledyard Center, primarily on Route 117, none of them utilizes large quantities of water, and the remainder of Ledyard Center is residential. There is a centrally-located water standpipe (Ledyard Center Tank) which supplies additional water pressure, fire protection, and water storage to Ledyard Center.

With respect to THMs, Ledyard Center has the same kind of challenges that consecutive systems in general must overcome. Water age, warm water temperatures, and free chlorine are factors which affect THM formation in Ledyard Center. We have noticed a trend toward distribution water temperatures warming up earlier in the spring and staying warm later in the fall. We must have adequate free chlorine residual to maintain resistance to microbial growth in the distribution system (and we do). We cannot affect water temperatures and we are limited in our ability to reduce free chlorine; the factors over which we can exert some control are source water blending, prior to the Groton Utilities Water Treatment Plant, and, in Ledyard Center, the water age.

In the past, we maintained a once-a-week routine flushing program in Ledyard Center, which typically ran from July through the end of October. This was successful in moderating water age, and keeping the Ledyard Center system in compliance with the THM MCL, as well having an acceptable OEL calculation. Quarterly results (and therefore OEL calculations) began to rise and triggered OEL reports intermittently through the years, starting in the fourth quarter of 2016.

In July 2021 we experienced an unusually high THM result, which was unprecedented even for the third quarter (typically our highest-THM quarter)—139 ppb at 11 Village Drive and 131 ppb at the Village Market DBP2 sampling locations. When we received these results in August 2021, we immediately revised our flushing program to twice-a-week flushing through the end of October 2021.

Our Q4 2021 THM results were at the low end of typical Q4 ranges, demonstrating that the increased flushing was helping. Due to the very high Q3 2021 result, however, an OEL report was triggered for the 4<sup>th</sup> quarter just as it was for the 3<sup>rd</sup> quarter, but the RAA was still below 80 ppb at the Village Drive sample location.

Due to the resident at 11 Village Drive moving away and the new resident being unable to accommodate our request to continue sampling at that address, we submitted a new THM/HAA5 site for Ledyard Center, via the SSP form: 13 Village Drive, which is right next-door to 11 Village Drive. At that same time we requested to switch from Village Market to Ledyard Town Hall, as the more representative site in that vicinity of Ledyard Center. These site changes were approved by DPH, and we initiated sampling at those sites in April of 2022, and have continued using those locations since then.

In 2023, we continued the twice-a-week flushing protocol as in 2022. In addition, Groton Utilities once again blended several raw water sources with Poquonnock Reservoir, as they did in 2022 (the other sources are lower in TOC than Poquonnock Reservoir; the goal is to reduce TOC in POE water by reducing the TOC of the water entering treatment). They were only able to blend one water source (Smith Lake) with Poquonnock in July, which was helpful, but limited the reduction in TOC at the POE, compared to blending with several sources.

We have also recognized the role the Ledyard Center Tank plays in affecting the water age in Ledyard Center. In late summer of 2022, the Ledyard Center Tank was intentionally overflowed (all outflow was successfully dechlorinated), to good effect. The water age in the tank was greatly reduced, so when the tank was flowing back into the water system, its contribution to the water age in the system was not as significant.

We were unable to overflow the Tank in early-to-mid-summer of 2023 for operational reasons; later in the summer, we were able to do so at various intervals, and the effect was beneficial to the system but came too late to benefit the 3<sup>rd</sup> quarter results.

Our goal is to reduce water age in Ledyard Center enough to produce lower THM results for all quarters going forward, and in particular to see a return to typical or lower than typical results in the 4<sup>th</sup> quarter, if possible. Attachment #3 highlights the fact that water usage during the summer of 2023 was greatly reduced compared to the summer of 2022; the most likely reason being the consistently rainy summer of 2023. Reduced use increases water age, adding another challenge to Q3 2023. Attachment #2 compares the POE THMs to the quarterly Ledyard Center THMs (all samples collected the same day). Even though the POE THMs in July 2023 was nearly the same as in July 2021, the Ledyard Center THM values were much lower, although still higher than desirable. This was despite the usage in July 2023 being almost half that of July 2021 (see attachment #3); this shows that our efforts at blending raw water source at the Groton Water Treatment Plant and the twice-a-week flushing in Ledyard are producing positive results, and we are always working to produce even better results, if possible.

Another tool in reducing THMs in the water system is monitoring and optimizing treatment at Groton Utilities' Water Treatment Plant, to produce the lowest-TOC water possible. They have always tried to maintain the optimal PACL coagulant dose for this purpose, but one factor which has proved challenging is the incoming TOC in the raw water. The higher the raw TOC, the higher the POE TOC, since there is a limit to how much TOC they can remove even with optimal treatment. Please see attachment #4 for Groton WTP data through the recent years.

GU has blended Smith Lake water into Poquonnock Reservoir intake in past summers, since it is slightly lower in TOC than Poquonnock, but that has had a limited impact. In the past, they have been unable to take advantage of another source, Production Well #3, which is very low in TOC but relatively high in manganese, because it created a level of manganese in the raw water that the old Water Treatment Plant could not effectively remove. Their new DAF plant has a post-filtration treatment—manganese contactors—that effectively removes manganese from the finished water.

So now they are able to blend low-TOC Production Well #3 water with Poquonnock Reservoir water during the warm-water season. Unfortunately, they were unable to use production well #3 in July; it was run in conjunction with Smith Lake in August of this year, with good results.

As can be seen, our approach going forward is three-pronged: GU will continue to optimize treatment for maximum TOC removal, blend Production Well #3 and Smith Lake water with Poquonnock Reservoir water when possible and necessary to reduce finished water TOC, and continue to do routine twice-a-week flushing in Ledyard Center, in order to reduce LWPCA Ledyard Center THMs during the warm water season and return to compliance with the THM MCL. In addition, we will try to overflow Ledyard Center Tank as necessary during the warm-weather warm-water-temperature times of the year, while still being judicious in the use of this technique.

We anticipate that even with a good result for Q4 2023 THMs, Ledyard Center will likely experience a continued OEL exceedance in the fourth quarter (due once again to the high Q3 2023 result), but we believe that a good (typical or lower) result in Q1 2024 will drop the OEL calculation below the 80 ppb trigger.

Our detailed Action Plan for LWPCA-Ledyard Center is as follows (as noted in narrative):

- Expand the routine flushing season to include late March through the end of October
- Continue twice-a-week routine flushing as faithfully as possible during that timeframe
- Continue to optimize treatment at the GU WTP to remove as much TOC as possible

- Blend low-TOC water from Production Well #3 and/or Smith Lake with Poquonnock Reservoir at the GU WTP to reduce incoming raw TOC, as much as possible
- Overflow Ledyard Center Tank as necessary, but no more than necessary, while dechlorinating the outflow

Please also see the attached spreadsheets for further information regarding our water treatment and OEL data.



Ledyard Center TTHM data

Attachment #2

Date	POE	Ledyard Center TTHMs		Village Dr. - Village Mkt	Raw Temp (°C)	TOCs			%removal	Center Gro P. S.		LC Tank
		TTHMs	11 Village Dr			Village Market	Raw	POE		On / Off	Flow (CFM)	
01/11/18	13.6	49.3	43.5	5.8	2.3	5.04	2.01	60%	On	60.6	rising	
04/11/18	14.7	49.6	47.9	1.7	7.0	3.37	1.42	58%	Off		falling	
07/18/18	31.2	97.5	94.9	2.6	27.2	4.02	1.81	55%	On	67.5	rising	
10/10/18	32.7	94.9	94.2	0.7	21.1	5.58	2.17	61%	Off		falling	
01/09/19	11.6	47.8	41.4	6.4	3.9	-----	-----		On	31	rising	
04/10/19	15.2	47.3	48.9	(1.6)	12.7	3.15	1.26	60%	Off		falling	
07/08/19	27.7	95.1	93.8	1.3	26.3	3.82	1.49	61%	Off		falling	
10/09/19	42.7	99.2	97.3	1.9	18.7	3.80	2.04	46%	Off		falling	
01/15/20	14.2	55.4	59.0	(3.6)	12.4	3.74	1.24	67%		No data		
04/15/20	19.8	61.6	58.7	2.9	15.9	3.78	1.34	65%		No data		
07/15/20	37.0	77.7	95.3	(17.6)	27.0	4.21	1.61	62%	On	79	rising	
10/14/20	28.2	73.7	76.5	(2.8)	15.5	3.57	1.69	53%	Off		falling	
01/13/21	14.6	43.3	46.8	(3.5)	5.8	4.28	1.39	68%	Off		falling	
04/21/21	21.1	54.9	58.4	(3.5)	13.4	3.95	1.44	64%		No data		
07/14/21	43.0	139.1	130.9	8.2	24.2	3.67	1.28	65%	Off		falling	
10/13/21	32.4	77.6	77.0	0.6	21.2	4.00	1.90	53%	Off		falling	
01/12/22	13.3	55.7	49.7	6.0	1.3	3.80	1.60	58%	Off		falling	
		13 Village Dr.	Led. Town hall									
04/13/22	22.4	50.8	39.1	11.7	14.7	3.20	1.30	59%	On	53.3	rising	
07/13/22	41.1	93.3	98.2	(4.9)	26.1	3.90	1.80	54%	Off		falling	
10/12/22	16.8	57.4	51.7	5.7	15.1	2.70	1.40	48%	Off		falling	
01/18/23	13.4	56.3	40.9	15.4	5.7	3.60	1.40	61%	Off		falling	
04/20/23	21.3	62.9	52.6	10.3	14.5	3.40	1.30	62%	On	83.2	rising	
07/19/23	39.2	110.6	100.1	10.5	27.3	3.80	1.60	58%	Off		falling	

parentheses (x.x) indicate a negative number.

Ledyard Center Water Usage, 2020 vs. 2021

Attachment #3

	2020		2021		Difference 2020 vs. 2021	2022		2023		Difference 2022 vs. 2023		
	117 to Led. (cu. ft.)	117 to Gro (cu. ft.)	117 to Led. (cu. ft.)	117 to Gro (cu. ft.)		117 to Led. (cu. ft.)	117 to Gro (cu. ft.)	117 to Led. (cu. ft.)	117 to Gro (cu. ft.)			
January	547740	42360	3780242	776320	211100	4227846	992180	198930	5933510	1318564	718367	4489474
February	567940	59460	3803430	814430	191380	4660414	685580	117270	4250959	1308941	706327	4507553
March	544780	45720	3732969	793790	176610	4616506	825920	107480	5373931	1167581	643445	3920537
April	599870	49650	4115646	794600	195810	4478949	962458	678656	2122839	1164713	696212	3504387
May	568160	51670	3863345	871040	181600	5157011	1489590	565029	6915716	1365973	785148	4344571
June	1155030	118510	7753170	914260	154960	5679564	1285534	544283	5544557	1405951	543529	6450917
July	756530	41440	5348873	852250	6100	6329202	1233107	505445	5442912	983432	549088	3248893
August	832690	62240	5762966	879050	132400	5584942	1372471	411893	7185123	1404451	716153	5148469
September	678310	90860	4394126	791590	145700	4831257	1426484	560653	6476416	783433	401536	2856590
October	704490	97450	4540659	821810	125870	5205631	792514	486503	2288962	1091873	532601	4183355
November	627050	117190	3813753	840930	158220	5106671	1201481	774369	3194798	0	0	0
December	710500	162830	4096572	955850	198470	5665202	1261832	681111	4343793	0	0	0
Sum	8293090	939380	55005751	61543196	437,131	59073517	42654745	0	0	0	0	42654745

Red = warm water data, May - September



**Groton WTP data 2015 - 2023**

**Attachment # 4**

<b>Raw Water Temp (°C)</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	26	26	24	27	27	26	25	23	26
October	15	16	20	18	17	17	21	15.2	
<b>Raw Water Turbidity</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	0.73	0.80	0.76	0.83	0.83	1.31	0.87	0.91	0.96
October	0.40	0.68	0.54	0.86	0.72	0.80	0.48	0.38	
<b>Raw Water pH</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	7.1	6.9	6.5	6.7	6.7	6.8	6.6	6.5	6.4
October	7.0	6.9	7.0	6.6	7.0	6.9	6.6	6.6	
<b>PACI dose (mg/L)</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	40	43.9	47.7	46.2	39.6	43.8	29	29	33
October	38.3	45.7	48.7	48.9	36	37.8	32.9	30	
<b>Raw TOC (mg/L)</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	4.1	4.1	4.2	4.2	3.8	3.9	4.3	3.9	3.7
October	3.4	3.5	3.7	4.8	3.8	3.7	4.2	2.9	
<b>POE TOC (mg/L)</b>	monthly average								
	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	1.6	1.7	1.8	1.8	1.6	1.6	1.6	1.9	1.7
October	1.7	1.6	1.7	1.7	1.9	1.6	1.9	1.3	

*Chlorine data at Village Market when collecting TTHM samples*

<b>Village Market Chlorine (mg/L)</b>					<b>11 Village Drive Chlorine (mg/L)</b>				
	(Ledyard Town Hall after April 2022)					(13 Village after April 2022)			
Year	Jan	Apr	July	Oct	Year	Jan	Apr	July	Oct
2016	0.85	1.26	0.50	0.43	2016	0.27	0.45	0.54	0.42
2017	0.26	0.74	0.22	0.14	2017	0.19	0.61	0.32	0.26
2018	0.83	0.93	0.16	0.13	2018	0.50	0.91	0.20	0.04
2019	1.19	0.86	0.57	0.56	2019	0.89	1.10	0.16	0.12
2020	0.82	1.03	0.24	0.55	2020	0.28	0.85	0.51	0.22
2021	0.88	0.76	0.07	0.46	2021	1.09	0.54	0.07	0.38
2022	0.98	1.36	0.51	0.90	2022	0.72	0.80	0.61	0.64
2023	1.21	1.09	0.41		2023	0.82	0.98	0.13	

**Quarterly THMs (ppb)**

<b>POE Groton WTP</b>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	32.8	34.2	38.8	31.2	27.7	37.0	43.0	41.1	39.2
October	22.9	19.7	24.0	32.7	42.7	28.2	32.4	16.8	

**Quarterly THMs (ppb)**

<b>Village Market, Led. Ctr.</b>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	89.3	108.9	105.0	94.9	93.8	95.3	130.9	98.2	100.1
October	57.2	89.3	77.1	94.2	97.3	76.5	77.0	51.7	

**Quarterly THMs (ppb)**

<b>11 Village Dr., Led. Ctr.</b>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>
July	89.3	80.2	97.8	97.5	95.1	77.7	139.1	93.3	110.6
October	59.5	77.0	74.9	94.9	99.2	73.7	77.6	57.4	