



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

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Lieutenant Governor

Matthew A. Beaton
Secretary

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December 7, 2018

MaryBeth Weiser
Lincoln Water Department
16 Lincoln Road
Lincoln, MA 01773

Re: City/Town: Lincoln
PWS Name: Lincoln Water Department
PWS ID #: 3157000
Program: Sanitary Surveys
Action: Survey Report
Activity #: N/A

Dear Ms. Weiser:

A Sanitary Survey of the Lincoln Water Department (Lincoln) was conducted by the Massachusetts Department of Environmental Protection (MassDEP or the Department) Drinking Water Program. A sanitary survey is an on-site review of the water sources, facilities, equipment, administrative, financial, operation and maintenance of a public water system, conducted to evaluate its ability to produce and distribute safe drinking water. Any violations of the Massachusetts Drinking Water Regulations or deficiencies with regard to MassDEP standards, guidelines, or policies or violations of the Massachusetts Drinking Water Regulations which were discovered in the course of this survey, are listed in the attached Inspection Report and/or other updated information.

Any person who owns or operates a public water system is responsible for the safety of the system under his or her control. If violations or deficiencies or violations have been noted, you should proceed to take the corrective actions specified in Table A, B and/or C by the date(s) specified without delay.

As part of the sanitary survey, an assessment of the system's capacity of conducted. That assessment determined that the Lincoln Water Department has Adequate capacity.

MassDEP was represented at the survey by Sean Griffin. Please contact him at (978) 694-3404 if you have any questions or comments. Please return one (1) signed copy of this document to the Department at the above address by January 15, 2019.

Sean Griffin

Thomas Mahin, Section Chief

Received by _____ for the above-referenced public water system.

File name: Y:\DWP Archive\NERO\Lincoln-3157000-Sanitary Surveys-2018-12-7

**REGIONAL OFFICE
DRINKING WATER PROGRAM
SANITARY SURVEY INSPECTION REPORT**

PWS NAME: Lincoln Water Department	PWS ID#: 3157000	TOWN: Lincoln
DONE BY: NERO	DATE:	SYSTEM TYPE: <input checked="" type="checkbox"/> C; <input type="checkbox"/> NTNC; <input type="checkbox"/> NC
PERSON INTERVIEWED:		TITLE:
Heather Clary		Primary Treatment Operator
MaryBeth Wisner		Superintendent/Secondary Treatment Operator
William MacInnes		Primary Distribution Operator
NUMBER OF SOURCES: 2	TREATMENT: <input checked="" type="checkbox"/> YES; <input type="checkbox"/> NO	
LAST SURVEY DATE: 11/17/2015	ANY CHANGES SINCE LAST INSPECTION: <input type="checkbox"/> YES; <input checked="" type="checkbox"/> NO	
IF YES, DESCRIBE IN DETAIL IN COMMENTS SECTION AND UPDATE RESPECTIVE LONG FORM(S)		

	ANY DEFICIENCY LAST INSPECTION YES/NO	DEFICIENCY CORRECTED YES/NO	PRESENT STATUS SEE 1. & 3. BELOW	REMEDIAL ACTION REQUIRED YES/NO	WATERSHED & RADIUS PROTECTION SEE 1. BELOW	COMMENTS YES/NO SEE 5. BELOW
SECTION 1: SOURCES AND SOURCE PROTECTION						
SOURCE NAME/SOURCE ID#						
1. GENERAL	N	N/A	N/A		S	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
01G-TOWER RD GP WELL	N	N/A	A/S	Y	S	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
02G-FARRAR POND GP WELL	N	N/A	E/S	N	S	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
01P-WESTON SUPPLY	N	N/A	A/S	N	S	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
01S-FLINTS POND	N	N/A	A/S	N	S	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
PUMP STATIONS (included in comments on Sources)						
1.			/			<input type="checkbox"/> Yes; <input type="checkbox"/> No

1. S = SATISFACTORY U = UNSATISFACTORY N/A = NOT APPLICABLE
2. USE SECTION 5 FOR DETAILED WRITTEN COMMENTS
3. A = ACTIVE I/A = INACTIVE SB = STANDBY E = EMERGENCY

	ANY DEFICIENCY LAST INSPECTION YES/NO	DEFICIENCY CORRECTED YES/NO	PRESENT STATUS SEE 1. BELOW	REMEDIAL ACTION REQ'D YES/NO	COMMENTS YES/NO SEE 2. BELOW
SECTION 2: TREATMENT					
RAPID MIX	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CHEMICAL STORAGE:	N	N/A	U	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CHEMICAL ADDITION	N	N/A	U	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
PRE-OXIDATION	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
TYPE:	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
COAGULATION	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CLARIFICATION	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
FILTRATION	N	N/A	S	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
TYPE: Microfiltration	////////////////	////////////////	S	////////////////	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CONDITION	N/A	N/A	S	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
BACKWASH	N/A	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CLEARWELL	Y	Y	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
TURBIDITY	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
RANGE	////////////////	////////////////	S	////////////////	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
DISINFECTION	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CORROSION CONTROL	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
TYPE: pH Adjustment, phosphate addition	////////////////	////////////////	S	////////////////	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
FLUORIDATION	N	N/A	S	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
SLUDGE DISPOSAL	Y	Y	S	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
Monitoring/Automation	Y	Y	U	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
Operations & Maintenance	N	N/A	S	N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No

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	ANY DEFICIENCY LAST INSPECTION YES/NO	DEFICIENCY CORRECTED YES/NO	PRESENT STATUS SEE 1. BELOW	REMEDIAL ACTION REQ'D YES/NO	COMMENTS YES/NO SEE 2. BELOW
SECTION 3: STORAGE, DISTRIBUTION AND DISINFECTION					
STORAGE					
GENERAL	N	NA		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
Town Hill Reservoir	N	NA	U	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
DISTRIBUTION					
PRESSURE	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
FLUSHING PROGRAM	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
INTERCONNECTION	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
SECONDARY DISINFECTION	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
TYPE: Free Chlorine	////////////////////	////////////////////		////////////////////	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
SAFETY	N	N/A	U	Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
RESIDUAL	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CONTACT TIME	N	N/A		N	<input type="checkbox"/> Yes; <input checked="" type="checkbox"/> No
SECTION 4: RECORD KEEPING, MANAGEMENT, EMERGENCY PLAN AND SAFETY					
CROSS CONNECTION	N	NA		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CERTIFIED OPERATOR	N	N/A		Y	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
COMPLAINT LOG	N	N/A		N	<input type="checkbox"/> Yes; <input checked="" type="checkbox"/> No
LABORATORY	N	N/A		Y	<input type="checkbox"/> Yes; <input checked="" type="checkbox"/> No
SAMPLING PLANS	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No

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	ANY DEFICIENCY LAST INSPECTION YES/NO	DEFICIENCY CORRECTED YES/NO	PRESENT STATUS SEE 1. BELOW	REMEDIAL ACTION REQ'D YES/NO	COMMENTS YES/NO SEE 2. BELOW
REPORTS, MAPS	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
EMERGENCY PLAN	N	NA		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
EMERGENCY POWER	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
CAPACITY RANKING	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
LEAD AND COPPER RULE COMPLIANCE	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
SCHOOLS LEAD EDUCATION	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No
OTHER	N	N/A		N	<input checked="" type="checkbox"/> Yes; <input type="checkbox"/> No

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2. USE SECTION 5 FOR DETAILED WRITTEN COMMENTS

SECTION 5:

GENERAL COMMENTS:

The Sanitary Survey inspection was initiated on August 22, 2018. Information about the water distribution system was obtained through interviews and reviews of records and maps provided by Lincoln.

The Lincoln Water Department (Lincoln) is a community public water system providing potable water and fire service to the approximately 80% of the population of the Town of Lincoln and small portions of the Towns of Concord, Waltham, Wayland, and Weston. In the 2014 Annual Statistical Report (ASR), Lincoln reported that it provides service to approximately 5128 people through approximately 1718 service connections. For major components of its water system, MassDEP records indicate that Lincoln has two active sources, two active treatment facilities, and one distribution system.

Water Use: Lincoln's reported water use is summarized below:

Year	Net Annual Water Consumption	Average Daily Demand	Max Daily Demand
2015	223.71 MG	0.61 MG	1.103 (5/14/15)
2016	223.45 MG	0.61 MG	1.398 (7/26/2016)
2017	182.77 MG	0.5 MG	1.083 (8/8/2017)

In 2017, Lincoln reported that it sold water to the following PWSs:

System Name	PWS ID#	Total Volume Sold (MG)
TOWN OF WESTON	3333000	2.140
TOWN OF WAYLAND	3315000	1.194
TOWN OF WALTHAM	3035000	0.762
TOWN OF CONCORD	3067000	0.653

Enforcement Actions: MassDEP records indicate that there has been one enforcement action since the last sanitary survey inspection for exceeding the TTHM Disinfection Byproduct Rule MCL (ACOP 00003940) and failure to collect samples and analyze for E. Coli (NON 00005463).

Approvals: Since the previous sanitary survey, Lincoln received BRP WS Approval for a Tank Mixer Installation on September 28, 2017 (X276208).

Section 1: Sources

Lincoln has two active sources of water: one is a well, and the other is a surface water source. Lincoln reported that 82% of its water reported came from its surface water source. Lincoln also has a source classified as an emergency source. As part of the survey, each of the active sources was inspected, available inspection reports were reviewed, and the information from the Annual Statistical reports for the years 2015 through 2018 was reviewed. A summary of select information from these sources along with observations made during the inspections is presented below.

1. GENERAL:

- a. **Production Capacity & Approved Use:** Lincoln is authorized under its Water Management Act (WMA) registration to withdraw up to 0.35 million gallons per day (MGD) and under its WMA permit to withdraw an additional 0.15 MGD, for a total WMA authorized annual average rate of 0.50 MGD. In 2015, 2016 and 2017 Lincoln pumped 0.61, 0.64 and 0.56 MGD, respectively, exceeding its authorized rate in all three years. Lincoln's WMA permit issued in 2010 also includes conditions for two PWS performance standards: Residential Gallons per Capita Day (RGPCD) of 65 gallons/day/resident and Unaccounted for Water (UAW) of 10%. In 2015 and 2016 Lincoln exceeded RGPCD (79 and 77, respectively). In 2017 RGPCD was 63, in compliance with the standard of 65. High RGPCD is associated with high summertime outdoor water use, especially lawn watering. In 2015, 2016 and 2017 Lincoln exceeded UAW (24%, 24% and 25%, respectively). High UAW can have several causes, one of which is high leakage from water mains and service connections.

The WMA program may take enforcement action against Lincoln if annual withdrawal rates continue to exceed the authorized rate of 0.50 MGD. Enforcement could include, but not be limited to, requiring actions aimed at lowering RGPCD and UAW.

Lincoln is required by its 2010 WMA permit to submit RGPCD and UAW compliance plans to the Water Management Act program if the standards (65 RGPCD and 10% UAW) are not met. Appendix A of the 2010 WMA permit outlines the contents of an Individual RGPCD Compliance Plan, which require at a minimum that Lincoln implement a program to provide water saving devices at cost, rebates for low flow appliances, and the adoption of local regulations to require moisture sensors or other weather-related control technology on automatic irrigation systems. Appendix B of the 2010 WMA permit outlines the requirements of a UAW compliance plan. To comply with the 2010 WMA permit, Lincoln must submit UAW and RGPCD Compliance Plans.

- b. **Unaccounted for Water - Beaver Pond Road Leak:** The Department understands that Lincoln identified a leak on Beaver Pond Road which was ongoing for years. Rough calculations indicated that the loss of water was approximately 45 gallons a minute and accounted for potentially 40% of the unaccounted for water. Lincoln reported 24.9% unaccounted for water in 2017. If the leak calculations are correct this will significantly improve Lincoln's water management.
 - c. **Water Use in Other Communities:** As previously noted, Lincoln has customers located in other communities. Several issues related to this arrangement were discussed during the sanitary survey.
 - i. **Consumer Confidence Reporting:** Lincoln is aware of the need to provide its consumer confidence reports to its customers located in other communities.
 - ii. Lincoln reported that there are a number of Lincoln residents that are connected to the Weston distribution system.
2. **01G-TOWER RD GP WELL:** Safe Yield: NA. Approved yield: 0.53 MGD. GWUI: N. Own Zone I: Y. Used 254 days during 2017. Average daily use: 0.185 MG. Maximum daily use in 2014: 0.543 MG.
- a. **Routine Inspections:** Lincoln reported that an operator inspected the well daily. Lincoln should continue its routine inspections of its sources.
 - b. **Meter Calibration:** Lincoln reported that the raw water meter is calibrated annually.
 - c. **Water Quality Concerns:**
 - i. **Surface Water Influence Changes:** MassDEP previously determined that the well was found to be exempt from classification as Ground Water Under the Direct Influence of Surface Water. The well is located adjacent to a wetland area. Observations of the grounds surrounding the pump house have provided indications of potential surface water influences to the well. Additionally, reviews of Department records and improved geopositioning

of well head locations have determined that the well is less than 150 feet from a surface water feature requiring testing to determine if it is under the influence of surface water.¹ Additional information regarding the MPA testing requirements is enclosed with this survey.

- d. Raw Water Monitoring: Lincoln collects samples to check for coliform as required under the Total Coliform Rule. Additionally, Lincoln is actively taking steps and monitoring to protect the watershed. The SWAP report may provide information on the possible threats to the well and any associated contaminants to monitor. A wellhead protection plan is not required, but is recommended.
 - e. Ground Water Rule (GWR) Issues:
 - i. Disinfection Capability: The potential for Lincoln to provide 4-log virus inactivation was discussed during the sanitary survey. As noted, Lincoln has a tap that could be used to add chlorine at the well should contamination be detected. To determine if its system could provide 4-log virus inactivation, Lincoln would need to determine the amount of contact time between the point where the chlorine is added and the first customer. To implement disinfection meeting the requirements of the GWR, Lincoln would also need to provide continuous monitoring at that point to demonstrate effective treatment.
3. 01S-FLINTS POND: Safe Yield: 0.568. Approved yield: NA. Used 333 days during 2017. Average daily use: 0.384 MG Maximum daily use in 2017: 0.749 MG. Raw water storage volume; 900,000,000 gallons as reported by Lincoln.
- a. Raw Water Monitoring: Lincoln routinely monitors the water coming into the treatment plant for the presence of coliform, color, pH, temperature and turbidity. Monitoring for disinfection by-product precursors was also discussed with Lincoln during the survey.
 - b. Source Water Treatment: Lincoln reported that it has not had to treat the water in the reservoir directly or identified any unusual issues.
 - c. Cyanobacteria: During the sanitary survey concerns regarding Cyanobacteria were discussed. Lincoln indicated that algae had not been an issue. Cyanobacteria are photosynthetic bacteria that share some properties with algae and are found naturally in lakes, streams, ponds, and other surface waters. Similar to other types of algae, when conditions are favorable, cyanobacteria can rapidly multiply in surface water and cause "blooms." Cyanobacterial blooms can be harmful to the environment, animals, and human health. (EPA, Cyanobacteria and Cyanotoxins: Information for Drinking Water Systems, 2014). AWWA Manual of Water Supply Practices – M57, First Edition includes guidance on basic information, methods, and recommended management practices associated with algae. EPA released 10-day Health Advisory levels for certain cyanotoxins in May of 2015. EPA has established a health advisory (HA) levels at or below 0.3 micrograms per liter for microcystins and 0.7 micrograms per liter for cylindrospermopsin in drinking water for children pre-school age and younger. For school-age children through adults, the recommended HA levels for drinking water are at or below 1.6 micrograms per liter for microcystins and 3.0 micrograms per liter for cylindrospermopsin. Young children are more susceptible than older children and adults as they consume more water relative to their body weight. Testing of the reservoir identified microcystis bacteria, but subsequent testing was non-detect for microcystin. EPA encourages PWSs consider developing a Cyano Preparation and Response Plan or an alternative approach to addressing cyanotoxins in advance of cyanotoxin occurrence.
 - d. Source Protection: Lincoln did not identify any particular source water protection concerns. According to the Department records, Lincoln has an approved Watershed Protection Plan. Upon request by Lincoln a 0.5-log credit could be granted to Lincoln. Lincoln should contact the Department for additional information. Sandy Pond Road which passes close to the pond has a robust guard rail and speed bumps to slow traffic. Lincoln has a robust watershed inspection plan. Lincoln reported that it owns 92% of the watershed.
 - i. The 2017 ASR did not identify any new sources of contamination within the Zone 1 or Zone II of the wells or within the watersheds of the surface water sources.
 - ii. SWAP Report Recommendations: MassDEP prepared a Source Water Assessment and Protection Report for Lincoln in 2003. That report identified threats to the water supply and characterized the susceptibility of the sources to contamination, with sources 01G a High susceptibility and source 01S having moderate susceptibility. The report also presented recommendations to improve protection, to include certain educational measures.

¹ MPA Testing

Lincoln should implement the recommendations of the SWAP report and take any additional measures it may find as important to protect the water quality of its sources².

- iii. Due to the attractive nature of the pond to people, Lincoln needs to remain vigilant to ensure that the pond is not improperly used. Lincoln should continue to deter people from using the pond.
 - iv. Geese have been identified as a seasonal nuisance. Lincoln should continue to deter foul from nesting near the reservoir and develop SOPs for additional deterrence should it become necessary.
 - e. Raw Water Intake: The intake had not been inspected recently; however, Lincoln indicated that they intend to have it inspected.³
4. 02G-FARRAR POND GP WELL: Listed as an Emergency Source effective 01 Dec 2000. Reported as last used in 1987/88. Approved yield: 0.77 MGD. GWUI: N. Own Zone I: Y.
- i. Wellhead: Although the well may have an effective insect screen, it is not visible and there are no records that the screen has been checked.⁴

Section 2: Treatment

The Flint Pond WTP treats the water from its source (01S) and the Tower Road GP Well treats water from the Tower Road GP Well (01G). The Flint Pond WTP has a capacity of 2 MGD. The plant operates on-demand, with the plant staffed when in operation. At the time of the survey, the facility was in operation. On December 17, 2012 the Department reclassified the Flint Pond Treatment Plant as a Class 2T facility.

5. 01T-FLINTS POND: Capacity: 2 MG. Classification: 2T. Treatment processes: 999-Microfiltration for Particulate removal; 401-Chlorination for Post Disinfection using Chlorine gas; 403-Chlorination for Pre Disinfection using Chlorine gas; 445-Inhibitor Addition for Corrosion Control using Zinc Orthophosphate; 741-pH Adjustment using Sodium Hydroxide for Corrosion Control; 380-Fluoridation using Sodium Fluoride
- a. Chemical Storage
 - i. Zinc orthophosphate which had been delivered was not on containment and was blocking the first aid station in the chemical room⁵.
 - b. Chemical Addition:
 - i. Siphon Protection:
 1. Siphon Protection: Lincoln had back-pressure valves on its chemical feed lines to prevent siphoning. Lincoln is reminded of the need to periodically inspect and maintain these valves so that they will operate as intended. Such maintenance shall be documented.
 - ii. Chemical Feed Pump Calibration:
 1. Feed Rate Validation: Lincoln is reminded that all instrumentation shall be calibrated in accordance with the manufacturer's recommendations in order to insure a reliable and safe system. MassDEP recommends that the system implement a validation program to insure the reliability of all instrumentation.
 2. Feed Pump Calibration Curves: Lincoln is reminded that the Guidelines call for preparing calibration curves for all chemical feed pumps, and that chemical feed pump manufacturer O&M guidance often calls for calibration curves to be prepared as part of routine O&M. Such curves can be useful when changing feed rates and validating the capacity of the pump.
 3. Scales: Weighing scales have not been calibrated. Weighing scales should be accurate to measure increments of 0.5 percent of the load and therefore should be calibrated periodically.⁶
 - iii. Safety

² SWAP Report

³ Intake Inspection

⁴ Well vent screen.

⁵ Containment

⁶ Scale Calibration

1. Chemical Application: The caustic, acid, sodium hypochlorite, and orthophosphate storage tanks and pumps are placed in the filtration building adjacent to the filtration units. The LMI pumps with attached four filter valves are against the wall next to a common walkway. Unexpected releases under pressure of these chemicals increases the risk to those people working in the area⁷. Additionally, although not adjacent to each other, the acid (for the wash) and caustic (pH adjustment/ corrosion control) are in relative proximity to each other⁸.
 2. Drum Placement: The chemical drums in the filter building are placed on containment using two wheel hand trucks. A short ramp is used to elevate the drums approximately 6-inches to placement on containment. Although no accidents have occurred to date from the manual process of chemical placement this process has the potential for significant injury to operators; either physically from movement of heavy drums or due to chemical release.⁹
 - iv. Chemical Deliveries: Lincoln reported that they are updating chemical delivery SOPs to include use of hydrometer to measure specific gravity. Lincoln should continue to improve QA/QC procedures for chemical deliveries.
 - v. Analyzer discharges: Lincoln analyzer discharge is piped to a holding tank prior to discharging. Process and instrumentation waste from things such as continuous analyzers and sampling sinks may be discharged to sewer or other method as approved in writing by MassDEP. In locations where sewer is unavailable, such as remote pump stations, such discharges normally do not require a Groundwater Discharge Permit, but must discharge to a UIC Class V well. The Class V well must be registered using registration form BRP WS 06, selecting well type "c" for a 5G30 well. See DWP/SOP #08-01 "Registration of Discharges to the Ground from Pump Houses and Other Public Water System Facilities Including Discharges from In-line Analyzers."¹⁰
 - c. Pre-Oxidation: Lincoln does not add an oxidant to the raw water prior to filtration.
 - d. Coagulation: Lincoln does not add a coagulant to prior to filtration.
 - e. Filtration
 - i. Turbidity
 1. Monitoring: Lincoln reported that it monitors the turbidity of its filtered water using an on-line monitor installed on a tap on the membrane filtrate line.
 2. Validation/Calibration Records: Lincoln has implemented a program for validating its on-line instrument. As described by Lincoln, the program included daily comparisons of the readings from the on line instrument to the measurements made with a bench-top instrument. The Department has previously given its approval to Lincoln to operate the facility in automatic mode, which requires the use of the on-line monitor. Lincoln has applied for and received approval for a validation protocol for using its on-line analyzer in lieu of using grab samples (attached).
 - ii. Condition: An inspection of the Filtration system was conducted by the manufacturer, EVOQUA. It has been several years since the filtration plant has had an inspection. A report provided by the manufacturer indicated that the backwash recovery units were in poor operating condition due to lack of periodic maintenance. The report indicated that the high feed actuator valves were frozen shut and when the valves were removed there was a heavy amount of mud observed indicating that these valves had not been operational for a "long, long time." Spare valves were not available and Lincoln needed to borrow valves from a system in CT. There were also several modules that needed pinning and numerous adjustments required to improve operation¹¹. Lincoln reported that the manufacturer discontinued making modules for the filtration system¹².
6. Sludge Disposal:
- a. NPDES Inspection: Lincoln has a discharge from its lagoons that requires coverage under the NPDES General permit. During the survey, an inspection of the discharge at the point where Lincoln collects its samples was made. At that time, there was discharge coming from the lagoons. That inspection did not find any evidence of solids or

⁷ Chemical Feed Protection

⁸ Incompatible Liquids

⁹ Drum Placement

¹⁰ Analyzer Discharge

¹¹ Filter Maintenance

¹² Modules

impacts on the water quality of the reservoir. DMRs are completed and submitted to the Department for review. Additionally, in accordance with the General Permit for discharges from potable water treatment facilities, Lincoln is required to submit signed and dated original DMRs, postmarked no later than the 15th day of the month following the completed reporting period to EPA. The General Permit can be viewed on the Department's Web Site at <https://www3.epa.gov/region1/npdes/mass.html#fgp>.

- b. Lincoln conducts acid and sodium hypochlorite CIP procedures periodically. Liquid waste that is generated is neutralized and dechlorinated with sodium hydroxide and sodium bisulfite, respectively. Sampling is conducted to ensure that the discharge is within limits prior to discharge. However, DMR reporting demonstrates that Lincoln consistently discharges water that exceeds the minimum pH limit and maximum daily amounts of chlorine residual. An inspection of the tanks also found that a pump had been manually lowered into the neutralization tank to provide additional mixing. The primary operator suspected that ineffective mixing was the cause of the exceedances even though sampling prior to discharge indicated that the parameters were within limits prior to discharge.¹³ Lincoln follows a Discharge Management Plan
7. 03T-TOWER ROAD GP WELL: Capacity: None listed. Classification: 1T. Treatment processes: 740-pH Adjustment using Potassium Hydroxide for Corrosion Control; 445-Inhibitor Addition for Corrosion Control using Zinc Orthophosphate; 380-Fluoridation using Sodium Fluoride. No emergency power.
- i. Chemical Addition:
 1. There are two bulk KOH storage tanks in at the Tower Road water treatment plant. One of the bulk tanks is leaking and in disrepair. It is unclear if there is sufficient bulk storage capacity for the facility with only one tank in operation. Locked out with note. It is unclear if the Town has 30 day supply of chemical on hand without the second tank.¹⁴
 2. The design of the bulk storage tank has the delivery connection inside of the chemical storage area. The bulk tanks do not have overflows¹⁵. Although functional, the access road and approach could be improved for better access by chemical delivery trucks¹⁶.
 3. Zinc Orthophosphate: Only one zinc orthophosphate pump was installed at the Tower Road Well¹⁷.
 - ii. Safety: On the day of the survey the operating day tank was about 2/3 full. The operator filled the day tank by opening a valve to transfer the chemical, which occurs by gravity and occurs slowly taking from 15 to 30 minutes to complete. The bulk and day tanks are in a recessed pit, which would fill if the bulk tank continued to drain and failed to be manually closed. Furthermore, the light switch for the room is awkwardly placed behind the entrance to the room which creates a safety hazard. In combination with the manual transfer operation and the extended time in the chemical room containment the risks are further increased¹⁸. The KOH pulses strongly into a high pressure line 100 psi pipe. Although there is no sign of deterioration of the injection port or the chemical feed line, failure of the line could spray chemical creating a safety issue. Orthophosphate chemical is brought over from the Flit Pond WTP. Handling procedures create additional risks for operators and should be re-evaluated to improve safety. Orthophosphate chemical is brought over from the Flit Pond WTP. Handling procedures create additional risks for operators and should be re-evaluated to improve safety.
 - iii. The pH sample water for the amperometric pH analyzer runs continually even when the pump station is not running¹⁹. Water which contains chlorine should be dechlorinated with a chemical such as sodium bisulfate in order to prevent impacts to sensitive environmental receptors. As with the Flint Pond Water Treatment Plant, analyzer wastes which discharge from the treatment plant may need to
 - iv. Only one potassium hydroxide system feed pump is contained in the treatment building²⁰.
 - v. The sodium fluoride day tank does not have containment.²¹

¹³ NPDES

¹⁴ Bulk Supply

¹⁵ Overflow

¹⁶ Pump Station Access for Chemical Deliveries

¹⁷ Zinc Ortho Phosphate

¹⁸ Chemical Transfer/Safety

¹⁹ pH Sample Water

²⁰ Redundant Chemical Feed Pump

²¹ Sodium Fluoride Containment

- vi. The packing drainage enters a hole in the basement floor and it is unclear where the outlet to the drainage is. Lincoln should identify the outlet of the packing water to ensure that it is not undermining the building or contaminating the well.

8. Disinfection

- a. Primary Disinfection: Lincoln provides primary disinfection by adding sodium hypochlorite to filtered water prior to the clearwell.

- i. Compliance Requirements Review:

1. A review of primary disinfection performance as reported on Form I found that Lincoln has been able to provide adequate primary disinfection (CT) during peak hour. For the forms reviewed, the minimum reported compliance ratio was 1.1, which occurred on February 1st and 4th, 2018. The Department also observed that on February 6th, 2018 the disinfection residual was 10.30 mg/L and the inactivation ratio was 21.4. This was presumed to be a typographical error. Additionally, a typographical error was identified on February 1, 2018 that reported the pH as 56.51. A review of the calculations indicated that they are being calculated accurately. Review of forms is an important part of ensuring optimized operation of a treatment facility and Lincoln is reminded to review forms for error or anomalies. A review of the Form I appeared to demonstrate that the maximum flow is generally consistent from day to day with a maximum flow of approximately 600 to 700 gpm.

- a. Clearwell: The clearwell is a 285,000-gallon concrete clearwell. An inspection of the clearwell was conducted on August 14, 2018 and determined that it was generally in sound condition with approximately 1/32-inch of sediment in the clearwell, which was removed. Some corrosion was observed on pipes within the vault and cracks were identified for future inspection to ensure that spall does not occur. The inspection found that the overflow was located in a vault and that a lock should be placed on the vault to prevent access to the overflow. Lincoln should continue to have the clearwell inspected periodically.

2. A review of the inactivation ratios found that at several times throughout the year the inactivation ratio was close to 1. Lincoln is reminded that primary disinfection is required at all times, and the Regulations require reporting in a timely manner if the inactivation ratio drops below 1.0. Lincoln may also want to establish a SOP that ensures that its operators understand any required reporting to the Department so that reports are submitted as required. Lincoln should have procedures in place to ensure that any water that does not fully comply with all regulatory requirements is not pumped into the distribution system

- ii. Monitoring:

1. The benefits of having a chlorine analyzer immediately after hypochlorite is added were discussed with Lincoln during the survey. Such monitoring can be used to validate that chlorine has been being added to all water being produced.
2. Validation of On-Line Instruments: On July 23, 2012, the Department issued an approval of the Flint Ponds protocol for validating measurements of turbidity made using a continuous turbidity monitor. Lincoln has online analyzers to measure the pH and chlorine at the point of entry to the distribution system as required under the Strategy. As a validation measure, Lincoln reported that it compared the readings from the on-line analyzers to measurements made using bench-top instruments daily. These comparisons can allow for the timely identification of potential problems with the on-line analyzers. The Surface Water Treatment Rule also requires at least weekly comparisons between the analyzer used to continuously monitor the chlorine entering the distribution system and bench-top instrument. Comparisons between measurements made using bench top instruments and readings from the online analyzers made during the inspection found differences that Lincoln reported were within acceptable ranges. Lincoln is reminded to maintain a record of all validation measurements, and discrepancies and instrument maintenance.
3. Calibration of Equipment: Observations of source water testing have measured chlorine residuals greater than what could be expected to occur from interferences. A discussion with Evoqua Water Technologies, who inspected the filter valves and piping, indicated that they don't believe that it is possible for chlorine to backflow into the raw water and suggested that it may have been instrument calibration. Raw water

chlorine was measured at 0.17 mg/L. It was unclear by looking at the benchtop equipment if annual calibration had been conducted in accordance with ²²manufacturer's recommendations.

b. Secondary Disinfection:

i. Performance/Meeting 0.2 mg/l: A review of disinfection records at the point of entry did not identify any periods where the chlorine residual dropped below 0.2 mg/L.

ii. Monitoring & Validation:

1. Instrument Method: Lincoln's point-of-entry on-line chlorine analyzer uses an amperometric method. The Guidelines allow for the use of instruments that use other than the DPD method provided that EPA Method 334 is followed. Lincoln uses Method 334 for the use of its chlorine analyzer for compliance purposes.

c. LT2: Lincoln is currently conducting testing in compliance with the LT2 Surface Water Treatment Rule. Sampling is scheduled through September. Lincoln is reminded to submit their BIN calculations following completion of sampling in accordance with the rule following completion of sampling.

9. Waste Management: NPDES Inspection: Lincoln has a discharge from its lagoons that requires coverage under the NPDES permit. During the survey, an inspection of the discharge at the point where Lincoln collects its samples was made. At that time, there was discharge coming from the lagoons. That inspection did not find any evidence of solids or impacts on the water quality of the reservoir. DMRs are completed and submitted to the Department for review. Additionally, in accordance with the General Permit for discharges from potable water treatment facilities, Lincoln is required to submit signed and dated original DMRs, postmarked no later than the 15th day of the month following the completed reporting period to EPA. The General Permit can be viewed on the Department's Web Site at <https://www3.epa.gov/region1/npdes/mass.html#fgp>.

10. Monitoring/Automation

a. Chemical Safety Control Strategy: Lincoln feeds chlorine, and caustic as part of its treatment. Because those chemicals have been identified as critical chemicals, those feed systems are required to meet the requirements of the Chemical Safety Control Strategy.

i. Immediate Action Levels: During the inspection, the immediate action levels for the chemicals used by Lincoln were discussed. Specifically, Lincoln was informed that pH levels greater than 11, chlorine levels greater than 25 mg/l, and fluoride levels greater than 10 mg/l would be of immediate concern and would require an immediate action on the part of Lincoln to prevent health risks.

ii. Critical Alarm Testing: As part of the implementation of the Chemical Safety Control Strategy, all PWS are required to test alarms for any critical chemicals quarterly and document that the testing was completed. Lincoln reported that it has been completing all of the alarm testing as required and documenting the testing as required. Lincoln is reminded to maintain a log for testing all critical chemicals. The log shall include the procedures for testing each interlock and a record of alarm testing.

iii. Validation of On-Line Instruments: Lincoln has online analyzers to measure the pH and chlorine at the point of entry to the distribution system as required under the Strategy. As a validation measure, Lincoln reported that it compared the readings from the on-line analyzers to measurements made using bench-top instruments daily. These comparisons can allow for the timely identification of potential problems with the on-line analyzers. The Surface Water Treatment Rule also requires at least weekly comparisons between the analyzer used to continuously monitor the chlorine entering the distribution system and bench-top instrument. Comparisons between measurements made using bench top instruments and readings from the online analyzers made during the inspection found differences that Lincoln reported were within acceptable ranges.

iv. SCADA: Lincoln reported that a single server is used for Supervisory Control and Data Acquisition. The operator reported that the treatment system cannot be operated for any length of time without the SCADA by the operators²³. Additionally, the information contained on SCADA is not backed up. Lincoln has not been testing the SCADA battery. Lincoln is reminded to follow manufacturer recommendations for inspection and replacement of the SCADA battery backup²⁴,

b. Chlorine Monitoring

²² Laboratory Equipment Calibration

²³ Filter Training

²⁴ SCADA

- i. Instrument Method: Lincoln’s point-of-entry on-line chlorine analyzer uses an amperometric method. The Guidelines allow for the use of instruments that use other than the DPD method provided that EPA Method 334 is followed. Lincoln uses Method 334 for the use of its chlorine analyzer for compliance purposes.
 - c. Process Control Monitoring
 - i. Lincoln applies sodium hypochlorite after the filter and before the clearwell. Although the chlorine residual is measured after the clearwell Lincoln should consider adding an analyzer prior to the clearwell in order to understand the chlorine demand in the clearwell and to identify any issues with chemical feed in a timely manner²⁵. Lincoln should develop procedures for wasting the clearwell in the event that the water in the clearwell is not suitable for drinking. Procedures should include dechlorination, if necessary.
11. Operations and Maintenance
- a. Operations and Maintenance Procedures: Lincoln had operations and maintenance manuals and procedures manuals available.

Section 3: Storage and Distribution

Lincoln reported that its distribution system consists of approximately 58 miles of water mains and one storage tanks. Based on the population, the distribution system is considered to be classified as a Class II-D system. Lincoln reported that it has a total of 1718 service connections. Piping within its distribution system consists of Asbestos Cement (56%), Cast Iron (25%), Ductile Iron (16%), Cement Lined Cast Iron (2%), and PVC. Lincoln reported that 68% of the pipe is 8-inch, 11% is 10-inch, 7% is 12-inch 0.2% is 16-inch, 1% is 4-inch and 13% is 6-inch. Lincoln reported that the staff has been trained on handling of asbestos pipe. Disposal includes double bagging and shipping to a contracted asbestos waste disposal companies. Lincoln is reminded to review the Department’s guidance on managing asbestos pipe (<https://www.mass.gov/files/documents/2016/08/wc/acpguid.pdf>).

20. Storage

Tank	Tank Height	Tank Overflow	High Water	Low Water	Sample Site
Clearwell	14'		12.9'	3.8'	Pre pH line
Bedford Road	20'	20'	19.5'	16'	002-RS (Sample station)

- a. Routine Visual Inspections:
 - i. Condition: Lincoln reported that the tank is inspected monthly and Monthly Tank Inspection Reports are completed and filed for later review. A structural interior inspection and cleaning (sediment removal) of the Bedford Road Concrete Water Storage Tank was conducted by Underwater Solutions Inc. on August 21, 2018. Although there were no obvious penetrations which could be presumed to be leaking water into the tank, the tank has significant signs of wear which create potential risk for outside contamination. Additionally, the operator indicated that soils adjacent to the tank are typically wet, which could indicate a leaking tank. Underwater solutions characterized the condition of the roof as “fair”²⁶. There is cracking and effervescence visible from the exterior of the roof and interior. The report noted sealant which had previously been applied to the roof and which was in need of replacement. An additional crack was observed on the interior tank wall. Although screened, the vent screen was not 24-mesh and requires replacement with a 24 mesh screen²⁷.
- b. Operational Practices and Performance

²⁵ Pre-Clearwell NaOH Monitoring

²⁶ Tank Maintenance

²⁷ Vent Screen

- i. **Water Quality Issues:** Lincoln has a sampling point at the tank that it uses as a routine sample site in its Total Coliform Rule monitoring plan. In June of 2017 Lincoln had consecutive positive total coliform samples resulting from low chlorine residual concentrations which Lincoln attributed to increased use of the Tower Road Well which does not chlorinate.
- ii. **Operating Practices and Turn Over:** During the inspection, the operational practices of the distribution storage tank were discussed. The discussion included the concept of turn-over. The Guidelines recommend a complete turn-over of every three to five days as a starting point and a tank specific turn-over determined based on the characteristics of the tank. Lincoln reported that below 16' in the tank the system begins to experience pressure issues. Due to the short band of usable water Lincoln needs to fill and drain the tank greater than one cycle throughout the day in order to achieve 20 percent turnover. Lincoln installed a tank mixing system to improve water quality following the Level 1 assessment required due to total coliform detections. Lincoln should continue to monitoring the quality of water in the tank; in the event that any issues are identified, Lincoln may want to re-evaluate its operational practices and provide for increased turn-over. Lincoln indicated that the residual in the tank was low throughout the year. Lincoln should evaluate options for increasing residual concentrations in the storage tank or otherwise improve water quality in the tank. Options include, but are not limited to, drawdown, booster chlorinating, and tank mixing systems. The operator reported that the tank mixing system can be controlled through SCADA.
- iii. **Critical Tank Levels:** During the inspection, critical tank levels, or levels that must be maintained to provide service, were discussed with Lincoln. An understanding of the critical levels for each tank, such as the level needed to maintain the volumes required for fire protection requirements, is important in the event of an emergency or changes in operating levels. As previously discussed the narrow band of turnover could result in low pressure throughout the system if there is a main break or fire demand when the elevation is close to the low pressure height of 16'. Lincoln should keep this in mind when cycling water levels in the tank. The addition of the mixing system may help to improve water quality throughout the tank while continuing to cycle the tank levels in order to keep emergency or fire demand capacity. Storage facilities should have sufficient capacity, as determined from engineering studies, to meet domestic demands, and fire flow demands where fire protection is provided. Lincoln reported that it has two days' worth of water storage.
- c. **SOP:** Lincoln developed standard operating procedures for managing its tanks as was recommended in the previous sanitary survey.
- d. **Sampling:** As noted, Lincoln has a sample tap at the tank that it uses as a routine site as part of its Total Coliform Rule monitoring plan. Lincoln reported that it has been collecting samples when the tank was draining so that any samples would be of water that had been in the tank.

21. Distribution System:

- a. **Pipes:**
 - i. **Layout & Redundancy:** The distribution system's layout and redundancy were discussed with Lincoln during the inspection. Lincoln did not identify any significant issues with the layout of the distribution system.
 - ii. **Pipe Installation and Repairs:**
 1. **Installation and Repair Procedures:** Main installation and repair practices were discussed during the sanitary survey. Lincoln reported that it had standards for the installation and repair of its mains and appurtenances that reflected AWWA standards.
 2. **Record-Keeping:** Lincoln is reminded that it should maintain records to document that any repairs or main installations followed AWWA Standards. Such records could include pressure test results.
 3. **Disinfection Practices:** Disinfection practices during main installation and repair were discussed during the survey. As part of the discussion, components of the AWWA standard for disinfection were reviewed. Lincoln should be aware that the AWWA standard on pipe disinfection includes provisions for sampling after repairs. See AWWA Standard C-651 reference attached.
- b. **Valves**
 - i. **Layout:** Lincoln reported that it had sufficient valves within its distribution system to allow it to minimize the number of customers that would lose service in the event of a main break.
 - ii. **Leak Detection and Repair:** Lincoln reported doing a leak detection survey every year. Lincoln conducts in-house services monitoring to identify additional leaks.

- c. Inventory: Lincoln has inventory for some repairs to the distribution system and treatment process, but not all critical components. Lincoln should maintain sufficient inventory to maintain resiliency and minimize disruptions in the public water system.

22. Pressure:

- a. General: Lincoln reported that the pressures in its distribution system range from about 25-30 psi near its storage tank to over 100 psi. The Guidelines recommend a normal working pressure in the distribution system of 60-80 psi and not less than 35 psi. Lower pressures are near the tank where houses have individual booster pumps. Where pressure exceeds 80 psi Lincoln may want to provide pressure reducing valves to prevent excessive water loss from leaks or impacts on plumbing.

23. Flushing:

- a. General: Lincoln reported that it flushes its entire distribution system once per year in the spring (May), with flushing done during the day. Depending upon water needs, Lincoln conducts fall flushing. Flushing is generally unidirectional and velocities are recorded. Lincoln should continue its practices of flushing its entire system annually and areas with water quality concerns more frequently.
- b. Dead Ends: Lincoln reported that it has the ability to flush all dead ends. Lincoln reported that there are numerous dead ends with some as long as 1,000 feet long²⁸. The Department requires minimization of dead ends where practical.

24. Service Meters: Lincoln Reported that all residential service water meters have recently been replaced.

25. Interconnections: Lincoln has interconnection with the following PWS: Weston, Lexington, and Wayland

- a. Flushing/Exercising: It is recommended that all interconnections be periodically flushed and exercised to better ensure that the interconnections will be operable if needed. This is especially critical for the interconnections in locations that may be more easily isolated. Lincoln does not have a formal valve exercising program²⁹. Lincoln should also work closely with the Fire Department to ensure proper training and use of hydrants.
- b. Hydraulic/Water Quality Characteristics: It is recommended that the flow capacity and water quality at each interconnection be determined so that Lincoln would have a clear understanding of how each interconnection would operate and affect its system if the interconnections were made active.

26. Post Disinfection:

- a. General: Lincoln's secondary disinfectant is free chlorine. Lincoln indicated that disinfection by-products have been elevated in the clearwell, indicating that the water may contain disinfection by-product precursors. In light of that, Lincoln should consider monitoring for disinfection byproduct pre-cursors, like TOC, or a surrogate like UV254, to better characterize any trends in disinfection by-product precursors.
- b. Low Disinfectant Residual: A review of the chlorine/chloramine reports found that the average monthly chlorine residuals in the system typically ranged from approximately 0.1 mg/L to over 0.3 mg/L. However, the month of November in 2016 averaged 0.04 mg/L and several sites where effectively non detect for chlorine residual often. Residual concentrations appeared random with regard to month or season. The Surface Water Treatment Rule calls for testing of HPC when chlorine residual is not detected. Lincoln has been conducting HPC testing as required. Historically, Lincoln's target level for chlorine residual at the plant tap has been 0.7 mg/L. Finished water pH is 7.75 S.U.
- c. Chlorine Meter Calibration: Lincoln is reminded to continue to have its chlorine analyzer routinely calibrated, as noted in the previous sanitary survey report.

27. Distribution System Water Quality:

- a. Coliform Bacteria: The Department approved Lincoln's TCR sampling plan is dated 10/29/2013. A map of this plan was submitted on 08/23/2016. Since then, they have had two Level 1 assessments required due to positive detections in the system; one in June of 2017 and one in August of 2018. The August 2018 Level 1 Assessment was required because no downstream repeat samples were collected³⁰. The June 2017 Level 1 Assessment was

²⁸ Dead Ends

²⁹ Valve Exercising

³⁰ Tower Road Well Downstream Sample

due to low chlorine residual levels at the tank. Lincoln has sense installed a tank mixer to improve water quality in the tank.

- b. Disinfection Byproducts: On May 15, 2018, the Department issued an ACO to Lincoln for exceeding the LRAA for disinfection byproducts in 2017. Lincoln is currently working with the Department to evaluate options for maintaining compliance with the Disinfection Byproduct Rule. Lincoln's current LRAA is below regulatory threshold of 0.08 PPM.
- c. Lead and Copper: Lincoln has been monitoring lead and copper levels. Lincoln has been meeting the Action Levels for both lead and copper since prior to the previous sanitary survey. The Department last issued a Lead and Copper Sampling Plan Approval on March 3, 2017.

Period Begin	Period End	Lead Level (mg/L)
01 Jan 2009	31 Dec 2011	0.007
01 Jan 2012	01 Jan 2014	0.005
01 Jan 2015	01 Jan 2017	0.002

Section 4: Record Keeping, Management, Emergency Plan And Safety

- 28. Staffing: Lincoln hired a new Superintendent in 2018. The superintendent is designated as a secondary treatment operator. Lincoln is reminded to update the Annual Statistical Report with the correct operator designation and information to include removal of the previous superintendent³¹.
- 29. Cross Connection Control Program/New Program Plan Requirement: Department records indicate Lincoln has completed a cross connection control plan. The system has Cross Connection rules which are not by-laws. Lincoln is reminded that complete records on all devices shall be maintained onsite for the life of the device including as-built plans and design data sheets. Inspection and Maintenance Report Forms for tests conducted shall be maintained for seven years. Communication with other Town departments is critical for identifying new devices or entities requiring surveys. See Table B for PWS responsibilities record keeping responsibilities.³²
- 30. Sampling Plans:
 - a. TCR Sampling:
 - i. Plan Status: The Department approved Lincoln's TCR Monitoring Plan on October 29, 2013.
 - ii. Reporting: Lincoln should ensure that the information being reported accurately reflects its approved sample plan.
 - b. Stage 2 Disinfection Byproduct Rule Sampling:
 - i. Lincoln stated during the survey that a piping configuration that leads to older water results in high THM levels. Lincoln addresses this through flushing. Lincoln has two Stage 2 monitoring sites: Lincoln North and Sam Brooks House. The Locational Running Annual Average (LRAA) for these two sites is 71.75 ppb and 75.5 ppb, respectively, and the Operational Evaluation Level (OEL) is 77 ppb and 79.5 ppb, respectively. If the OEL exceeds 80 ppb the regulations stipulate that Lincoln respond to the Department with an evaluation as outlined in the regulations. If the LRAA exceeds 80 ppb is a violation of the MCL. Lincoln should continue to flush to address elevated disinfection by-products and evaluate additional options for a long-term solution to elevated disinfection by-product formation.
 - c. Map: Lincoln was reminded that the Regulations call for maps to include wells, surface water intakes, treatment facilities, pumping stations, storage tanks, hydrants, direction of flow, pressure zones, sample collection points and other information, such as piping materials and pipe sizes. Wright –Pierce maintains a hydraulic model of the system that they occasionally use. A review of the Map indicated that it needs to be updates.³³

³¹ Staffing Plan

³² Cross Connection

³³ Distribution Map

- d. System Study Report: Lincoln had a system study report available that included capital improvements.
31. ERP:
- a. Status from ASR: Lincoln indicated on its 2017 ASR that it completed an ERP. Lincoln is a member of WARN. Lincoln is reminded to update the ERP as required in accordance with the regulations.
 - b. Training Plan Implementation: Lincoln reported on its 2017 ASR that it did not have an annual training plan for its ERP. Discussion during the survey indicated that Lincoln has conducted training. For example, Lincoln has a full day of training scheduled to be performed by their consultant and will include the fire and police departments. Lincoln should prepare specific ER training documentation and record keeping procedures. Following preparation of a formal plan reporting on the ASR should be reflected. Guidance can be found on the Department's web site.
 - c. Alarm Testing: Lincoln reported that it has been testing its critical alarms as required.
 - d. Emergencies: Lincoln did not report that it had any Level 3 or higher emergencies on its 2014 ASR.
 - e. Reporting/Recordkeeping: The emergency record-keeping and reporting requirements were discussed during the survey. Lincoln was reminded that 310 CMR 22.15(9) details reporting requirements for emergencies. Those requirements include reporting some emergencies within three hours. Other requirements include documenting Level 1 and 2 emergencies, and maintaining those records on file for MassDEP review, if requested.
 - f. Interconnections: Lincoln reported that the interconnections are not exercised. In order to assure that the interconnections are available in the event of an emergency, Lincoln should work with adjacent communities to develop an agreement regarding maintenance of the interconnections and then adhere to that agreement.
 - g. A capital improvement plan for the system was developed in 2011. Asset management was discussed and Lincoln should continue to practice asset management techniques and develop a formal Asset Management Program. EPA has developed asset management software (CUPPS) for use by systems with less than 10,000 people. More information regarding this software can be found at <https://www.epa.gov/dwreginfo/information-about-public-water-systems>. Lincoln does not have a long-term replacement plan for large equipment purchases or construction projects that will be needed over the next 20 years³⁴. This should consider the lifecycle of the treatment plant. Lincoln reported that they maintain an inventory of coupons removed from the distribution system as a record of pipe condition. This type of tracking can be useful for determining pipe replacement and asset management. Lincoln reported that it using Munis to track all work and is now also using to track complaints.
 - h. Preventative Maintenance: Although Lincoln reported that they do not have a preventative maintenance plan on the Managerial and Financial Questions worksheet, they do have an SOP Draft. Completion of the preventative maintenance plan will assist the PWS in becoming a proactive system versus reactive system which will improve efficiency and prevent interruption in service³⁵.
32. Communication: Cellular communication within Lincoln is spotty and hardwired communication is limited. Lincoln should develop communication methods to maintain continuity of communication.
33. Emergency Power: The emergency generator is exercised every Monday; however, records indicated that the generator had not been serviced since August of 2014. Lincoln is reminded to have the emergency generator serviced in accordance with the manufacturers regulations and should consider exercising it under load.
34. Safety: The sanitary survey identified several potential safety concerns related to chemical storage and injection. Lincoln should consider hiring a safety professional to evaluate potential safety issues and provide recommendations for improved safety system wide.
35. Capacity Assessment:
- Capacity is the ability of a public water system to plan for, achieve, and maintain financial, managerial & technical compliance with applicable federal and state drinking water standards for the foreseeable future. Capacity also requires the demonstration of effective controls in all three areas. The Lincoln Water Department is determined to have Adequate Capacity. This system is currently complying with all National Primary Drinking Water Standards and MA DEP drinking water regulations and is expected to continue this level of compliance well into the future. In addition to meeting all drinking water regulations, the system demonstrates a willingness and ability to plan for a wide variety of future impacts.

³⁴ Long Term Planning

³⁵ Preventative Maintenance Plan

SANITARY SURVEY COMPLIANCE PLAN - SECTION A - VIOLATIONS

This compliance plan ___ is / ___ is not [check one] included as part of a Notice of Noncompliance. (See attached Sanitary Survey Report.)

T/F/M	Reference#	Violations of Regulations or Statute	Corrective Actions	Deadline for Taking Corrective Actions	GWR SD
		NO VIOLATIONS NOTED			<input type="checkbox"/> Yes; <input type="checkbox"/> No

T=Technical, F=Financial, M=Managerial

* Periodic progress reports should be submitted to MassDEP, e.g., quarterly (each January 1st, April 1st, August 1st, December 1st, etc., for as long as necessary) or as otherwise agreed.

GWR SD = Ground Water Rule Significant Deficiency

SANITARY SURVEY COMPLIANCE PLAN - SECTION B - DEFICIENCIES

Deficiencies should be addressed in order to improve the protection of drinking water and the public health. MassDEP/DWP will provide technical assistance to systems responding to these deficiencies. Please call your regional DWP office for referral to the appropriate staff person.

T/F/M	Ref #	Regulations or Statute Issue	Corrective Actions	Deadline for Taking Corrective Actions	GWR SD
T	1	310 CMR 4.18, Surface Water Treatment Rule Requirements	Lincoln shall conduct MPA sampling analysis of the Tower Road Well beginning in the Spring of 2019 in accordance with the Department's Guidelines. The results of testing shall be submitted to the Department within 60 days of the completion of testing.	31 Dec 2019	
M	4	Guidelines, Chapter 4	Lincoln shall certify that the well screen is located in the well and that it is in working condition.	28 Feb 2019	
M	5	Guidelines, Section 6.1.11	Lincoln shall store chemicals as required in the Guidelines.	Ongoing	
M	7	Guidelines, Section 6.3.4	Lincoln shall evaluate the safety of the chemical application in the Flint Pond Water Treatment Plant and propose changes which will reduce health and safety risks to operators.	15 April 2019	

T	8	Guidelines, Section 6.0.3, Incompatible liquids shall not be fed, stored or handled together.	Lincoln shall submit a plan for minimizing the risk of incompatible chemicals interacting in accordance with the Guidelines.	31 March 2019	
T	9	Guidelines, Section 6.3.4	Lincoln shall evaluate the safety of the chemical drum placement at the Flint Pond Water Treatment Plant and propose changes which will reduce health and safety risks to operators.	15 April 2019	
M	10	Guidelines Sections 5.10.1, General Information and 5.10.4, Discharge of Analyzer Waste	Lincoln shall apply for a UIC registration to dispose of the analyzer waste or have analyzer waste properly disposed. Lincoln shall include a description of the analyzer waste disposal methods into the facility waste management plan as required. Lincoln shall certify that this has been done to the Department.	31 March 2019	
T	11	AWWA G100-17 states that a review cycles shall be established for operation and maintenance of the plant to verify that the limits of the operational control policy are satisfied, including, for example, water quality, laboratory operations, and mechanical equipment. The review cycle could range from daily to annually but is recommended to occur at a frequency no less than once per year.	Lincoln shall establish review cycles to ensure that the filtration plant is maintained in accordance with manufacturer's recommendations. The review cycle shall include a schedule of inspection and calibration of laboratory and who will be performing the inspection and calibration.	15 February 2019	
T	12	Lincoln reported that manufacturer no longer manufactures the modules for the Memcor Low Pressure Low Pressure Membrane System	Lincoln shall determine the lifecycle of the remaining filter modules and use that assessment to determine when to incorporate module replacement into the Capital Improvements Plan.	31 March 2019	
T	13	NPDES, Permit MAG640051, pH and Chlorine Limits	Lincoln shall provide a plan and schedule for coming into compliance with the NPDES permit. This plan shall include upgrades to the equalization tank, if necessary, to improve mixing and treatment of backwash water prior to discharge.	31 January 2019	

T	14	Guidelines Section 6.1.11.2	Lincoln shall submit calculations showing that there is 30 day supply of KOH to meet average treated water demand with one tank in service or submit plans for repairing or replacing the out-of-service tank.	31 March 2019
T	15	Guidelines Section 6.1.11.1	Lincoln shall certify that the tanks have vents and overflows that conform to the Guideline requirement or submit a plan for bringing the tanks into compliance.	15 April 2019
T	17	The Zinc Orthophosphate chemical feed system has just one pump when Chapter 6 in the Guidelines Requires two.	Lincoln shall install a second zinc orthophosphate chemical feed pump or certify that a dedicated standby pump is available and can readily be installed if the primary pump is not functioning.	15 February 2019
M	18	Guidelines Section 2.16, Safety: The lighting switch and slow transfer of chemical creates increased risk. Guidelines, Section 6.1.11, Chemical Storage and Process Tanks	Lincoln shall provide a plan and schedule for bringing the day tank into compliance with the Guideline requirements. Lincoln shall take steps to ensure that the KOH feed line will not spray building occupants in the event of a feed line failure. Lincoln should evaluate the chemical handling procedures to maximize safety.	31 March 2019
	19	6.1.3.3 Instrumentation, Water Management Act	Lincoln shall evaluate options for managing pH analyzer discharge waste, as necessary, and determine if dechlorination is necessary to prevent impacts to sensitive receptors.	28 February 2019
T	17	The KOH chemical feed system has just one pump when Chapter 6 in the Guidelines Requires two.	Lincoln shall install a second KOH chemical feed pump or certify that a dedicated standby pump is available and can readily be installed if the primary pump is not functioning.	15 February 2019
T	21	Guidelines Section 6.1.11, Chemical Storage and Process Tanks	Lincoln shall provide containment of the sodium fluoride day tank and certify that it is on containment as required in the Guidelines.	15 February 2019

M	22	Laboratory Equipment Calibration	Lincoln shall certify that compliance laboratory equipment has been calibrated within the past year or provide a schedule for conducting equipment calibration. Lincoln shall provide the sampling of the raw water location and demonstrate that it does not contain chlorine or provide a plan for determining the source of chlorine in the raw water.	31 January 2019
M	22	Guidelines Section 2.8, Laboratory equipment and facilities shall be compatible with the raw water source, intended use of the treatment plant and the complexity of the treatment process involved. Testing equipment and supplies provided shall be adequate for the purpose intended and recognized procedures must be used. Analyses conducted to determine compliance with drinking water regulations must be performed in an appropriately certified laboratory in accordance with latest "Standard Methods for the Examination of Water and Wastewater" or approved alternative methods. Methods for verifying adequate quality assurances and for routine calibration of equipment shall be provided.	AWWA G100-17 states that a review cycles shall be established for operation and maintenance of the plant to verify that the limits of the operational control policy are satisfied, including, for example, water quality, laboratory operations, and mechanical equipment. The review cycle could range from daily to annually but is recommended to occur at a frequency no less than once per year. Lincoln shall establish review cycles as identified above to ensure quality control of the water treatment plant. The review cycle shall include a schedule of inspection and calibration of laboratory and who will be performing the inspection and calibration. Lincoln shall certify to the Department that this has been completed.	28 February 2019
M	23	Guidelines, Chapter 5: All treatment facilities shall be overseen by a certified operator that has been properly trained in the operation and maintenance of each piece of equipment.	Lincoln shall certify that operators have been trained in the daily maintenance and operation of the filtration system or provide a plan and schedule for providing training.	15 February 2019
T	24	The Flint Pond WTP requires SCADA to operate. The treatment plant has only one SCADA server.	Lincoln shall add an additional SCADA server to the system or certify SOPs have been established to operate manually without the SCADA computer. SOPs shall	31 March 2019

			include all compliance monitoring and recording requirements.	
T	26	Tank Maintenance, Guidelines Chapter 8, Finished Water Storage	Lincoln shall provide a plan and schedule for performing maintenance on the storage tank, as needed, and identified in the tank inspection report.	15 February 2019
T	27	Guidelines chapter 4,	Lincoln shall certify that the tank vent screen has been replaced with the correct mesh screen.	31 January 2019
T	28	Guidelines, Section 9.3: Dead Ends - Dead ends shall be minimized by looping of all mains whenever practical. Dead ends shall be equipped with a means to provide adequate flushing which will give a velocity of at least 2.5 feet per second in the water main being flushed.	Lincoln should develop a policy for looping dead ends and continue to flush dead ends when needed.	
M	30	Tower Road Downstream Sample	Lincoln shall submit a copy of the Coliform Sampling Plan that is being used to comply with the Revised TCR.	31 January 2019
T	31	Operator Staffing	Lincoln shall submit an updated staffing plan to the Department for review.	31 January 2019
M	32	PWS recordkeeping responsibilities under 310 CMR 22.22	Maintaining on the public water system premises in a readily accessible form the following documentation: 1. a schedule of all facilities inspected and surveyed; 2. records of all device locations; 3. related correspondence, including notices of violation; and 4. list of devices and inspections of approved backflow prevention devices.	Ongoing

T=Technical, F=Financial, M=Managerial

* MassDEP reserves the right to exercise its Order authority under M.G.L. Chapter 111, Section 160, or to take other appropriate action as permitted by law, in order to prevent the pollution and to secure the sanitary protection of the water supply and to ensure the delivery of a fit and pure water supply to all consumers, including without limitation if sufficient progress to meeting a recommended deadline is not achieved.

** MassDEP requests that periodic progress reports be submitted, e.g., quarterly (each January 1st, April 1st, August 1st, December 1st, etc., for as long as necessary) or otherwise.
GWR SD = Ground Water Rule Significant Deficiency

SANITARY SURVEY COMPLIANCE PLAN- SECTION C - RECOMMENDATIONS

Recommendations to improve the protection of drinking water and the public health. MassDEP/DWP will provide technical assistance to systems responding to these recommendations. Please call your regional DWP office for referral to the appropriate staff person.

T/E/M	Ref#	Identified Concern	Corrective Actions	Recommended Deadline for Taking Corrective Actions
M	2	MassDEP prepared a Source Water Assessment and Protection Report for Lincoln in 2003. That report identified threats to the water supply and characterized the susceptibility of the sources to contamination, with sources 01G as having a High susceptibility and sources 01S having a Moderate susceptibility to contamination. The report also presented recommendations to improve protection, to include certain educational measures.	Lincoln should implement the recommendations of the SWAP report and take any additional measures it may find as important to protect the water quality of its sources.	NA (No report required)
M	3		Lincoln should continue with plans to inspect the Flint Pond intake.	NA (No report required)
	6	Guidelines, Guidelines, Section 6.1.2	Lincoln should certify that the scales have been calibrated and that they are accurate within 0.5 percent of the load.	NA (No report required)
M	34	Lincoln does not have a long term plan for large equipment purchases or construction projects that will be needed over the next 20 years.	The Department recommends that a long-term plan be developed for replacement large equipment purchases or construction projects.	NA (No report required)
T	16		Lincoln should consider improving the chemical delivery access at the Tower Road well.	NA (No report required)
T	25	Pre-clearwell NaOH Monitoring	Lincoln should consider adding chlorine residual monitoring prior to the clearwell.	NA (No report required)
M	33	Lincoln should update the system distribution map to		NA (No report required)

M	29	During the sanitary survey, Lincoln indicated that it did not have a formal exercising program in place.	MassDEP recommends annual valve exercising.	NA (No report required)
T	33	Distribution Map Updating	Lincoln should continue to update the distribution map to ensure its accuracy.	NA (No report required)
M	34	Long Term Planning	A lack of planning can lead to many problems including an inability to respond to drinking water emergencies. MassDEP expects all systems to adequately plan and has the authority under MGL Chapter 111 Section 160 and 310 CMR 22.04(1) to require systems to plan. All water systems shall have written long and short-term plans which can identify present and future needs and set forth a means for addressing those needs. T	NA (No report required)
M	35	Preventative Maintenance	Lincoln should complete the preventative maintenance plan and implement it.	NA (No report required)
M		Disinfection practices during main installation and repair were discussed during the survey.	It is recommended that Lincoln periodically review the AWWA Standard with its operators and ensure that the procedures in the Standard are properly followed.	NA (No report required)

T=Technical, F=Financial, M=Managerial

* MassDEP requests that periodic progress reports be submitted, e.g., quarterly (each January 1st, April 1st, August 1st, December 1st, etc., for as long as necessary) or otherwise.

