

A. SSO Inventory (from Town of Ludlow IDDE)

Table 3: SSO Inventory
Town of Ludlow, Massachusetts
Revision Date: September 30, 2024

SSO Location ¹	Discharge Statement ²	Date ³	Time Start ³	Time End ³	Estimated Volume ⁴	Description ⁵	Mitigation Completed ⁶	Mitigation Planned ⁷
44 Center Street	Discharge to catch basin into Chicopee River	1/21/2020	12:30 PM	12:35 PM	100 gallons	Sewer System Blockage	Jetted the sewer line to clear blockage.	N/A

¹ Location (approximate street crossing/address and receiving water, if any)

² A clear statement of whether the discharge entered a surface water directly or entered the MS4

³ Date(s) and time(s) of each known SSO occurrence (i.e., beginning and end of any known discharge)

⁴ Estimated volume(s) of the occurrence

⁵ Description of the occurrence indicating known or suspected cause(s)

⁶ Mitigation and corrective measures completed with dates implemented

⁷ Mitigation and corrective measures planned with implementation schedules

B. Structural BMP Tracking and Estimated Nitrogen Removal

Town of Ludlow BMP Tracking

Revised: September 2024

BMP ID or Description	Location	BMP Type from Plans	Functional BMP Type to Match Model	Total Drainage Area (Ac)	Impervious Drainage Area (Ac)	Estimated Storage Volume (cf)	Estimated Nitrogen Removal (lb/yr)
BMP-CHE03-01	End of Isabel Lane before Chicopee River	Detention Basin	Dry Pond/Detention Basin	2.17	0.86	717	4.0
BMP-CHW05-01	Riverside Drive, inside manhole just upstream of CHW05 outfall	Hydrodynamic Separator	Proprietary	9.32	7.13	N/A	0.0
BMP-CHW06-01	Cumberland Farms, subsurface trench	Underground Detention System	Dry Pond/Detention Basin	0.69	0.67	4,224	5.7
BMP-CHW11-01	North of Riverside Drive	Rain Garden	Bioretention	5.12	3.54	16,000	30.0
BMP-CHW11-02	North of Riverside Drive	Rain Garden	Bioretention	1.03	0.87	5,375	8.1
BMP-CHW11-03	Riverside Drive, inside of manhole upstream of CHW11 outfall and to the east	Hydrodynamic Separator	Proprietary	6.13	4.42	N/A	0.0
BMP-CHW11-04	Riverside Drive, inside of manhole upstream of CHW11 outfall and to the west	Hydrodynamic Separator	Proprietary	0.73	0.45	N/A	0.0
BMP-CHW11-05	North of Riverside Drive and South of the Healthsouth Rehabilitation Hospital	Infiltration Basin	Infiltration Basin (or practice)	3.70	2.51	41,740	26.1
BMP-CHW11-06	North of Riverside Drive and West of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	1.06	0.64	633	3.0
BMP-CHW11-07	North of Riverside Drive and West of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	1.54	0.69	787	3.5
BMP-CHW11-08	North of Riverside Drive and East of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	2.95	0.57	1,344	4.1
BMP-CHW11-09	North of Riverside Drive and South of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	0.48	0.42	1,134	3.0
BMP-CHW11-10	North of Riverside Drive and South of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	0.64	0.36	1,187	2.8
BMP-CHW11-11	North of Riverside Drive and South of the Healthsouth Rehabilitation Hospital	Bioretention	Bioretention	0.24	0.13	543	1.1
BMP-CHW12-01	North of Riverside Drive	Infiltration Trench	Infiltration Trench	0.79	0.41	3,300	4.1
BMP-CHW12-02	North of Riverside Drive	Rain Garden	Bioretention	0.86	0.48	2,468	4.2
BMP-CHW12-03	Riverside Drive, inside 2nd manhole upstream of CHW12 outfall	Hydrodynamic Separator	Proprietary	2.33	1.47	N/A	0.0
BMP-HGB10-01	At the Cul-de-sac of Harris Lane and discharges into harris pond	Detention Basin	Dry Pond/Detention Basin	15.05	5.01	18,184	41.0
BMP-MBT09-01	End of Irla Drive (second Cul de sac)	Underground Infiltration Chamber	Infiltration Basin (or practice)	1.01	0.39	1,410	3.2

Town of Ludlow BMP Tracking

Revised: September 2024

BMP ID or Description	Location	BMP Type from Plans	Functional BMP Type to Match Model	Total Drainage Area (Ac)	Impervious Drainage Area (Ac)	Estimated Storage Volume (cf)	Estimated Nitrogen Removal (lb/yr)
BMP-MCP01-01	BMPs Connected halfway up King Street	Leaching Galley	Infiltration Trench	2.02	0.84	509	3.3
BMP-MCP01-02	BMPs Connected halfway up King Street	Leaching Galley	Infiltration Trench				
BMP-MCP01-03	BMPs Connected halfway up King Street	Leaching Galley	Infiltration Trench				
BMP-MCP01-04	Connected at the end of King St	Leaching Galley	Infiltration Trench	0.70	0.61	339	2.0
BMP-MCP01-05	Connected at the end of King St	Leaching Galley	Infiltration Trench				
BMP-MCP03-01	At the end of Bowles Avenue	Leaching Basin	Infiltration Trench	2.44	0.59	1,553	4.4
BMP-MCP03-02	At the end of Bowles Avenue	Leaching Basin	Infiltration Trench				
BMP-TCH01-01	Between Parker Ln and Miller St	Detention Basin	Dry Pond/Detention Basin	12.00	3.94	14,300	40.2
BMP-TCH01-02	Parker Lane	Detention Basin	Dry Pond/Detention Basin	11.15	1.97	7,139	22.1
BMP-TCS02-01	Northwood Circle first drainage pipe	Detention Basin	Dry Pond/Detention Basin	5.58	2.03	5,793	17.0
BMP-WHA01-01	Allison Lane	Wet Pond	Wet Pond	13.00	2.25	36,694	18.5
BMP-XXX-01	Applewood Drive	Gravel Wetland	Gravel Wetland	1.32	0.75	3,300	3.7
BMP-XXX-02	Applewood Drive	Infiltration Trench	Infiltration Trench	0.44	0.20	420	1.4
BMP-XXX-03	Applewood Drive	Infiltration Trench	Infiltration Trench	0.30	0.13	420	1.0
BMP-XXX-04	Applewood Drive	Infiltration Trench	Infiltration Trench	0.58	0.23	420	1.4
BMP-XXX-05	Applewood Drive	Infiltration Trench	Infiltration Trench	0.31	0.14	420	1.1
BMP-XXX-06	Autumn Ridge Road	Infiltration Basin	Infiltration Basin (or practice)	15.96	1.93	6,992	24.9
BMP-XXX-07	Intersection of Autumn Ridge Rd and Turning Leaf Rd	Infiltration Basin	Infiltration Basin (or practice)	15.65	1.93	6,992	27.2
BMP-XXX-08	At end of Avelino Way at court	Wet Pond	Wet Pond	8.22	1.64	5,968	9.8
BMP-XXX-09	At intersection of Avelino and Alden St	Infiltration Trench	Infiltration Basin (or practice)	0.81	0.16	904	1.8
BMP-XXX-10	At intersection of Avelino and Alden St	Infiltration Trench	Infiltration Basin (or practice)	0.81	0.16	904	1.8
BMP-XXX-11	End of Brook Hollow Drive	Dry Well	Infiltration Trench	4.57	1.23	267	3.0
BMP-XXX-12	Intersection of Brook Hollow and Church St	Dry Well	Infiltration Trench	0.29	0.16	107	0.6
BMP-XXX-13	Intersection of Brook Hollow and Church St	Dry Well	Infiltration Trench	2.88	0.71	68	1.7
BMP-XXX-14	Intersection of Colonial Dr. and Munsing St.	Dry well	Infiltration Trench	0.19	0.06	170	0.5
BMP-XXX-15	Intersection of Colonial Dr. and Munsing St.	Dry Well	Infiltration Trench	0.26	0.15	170	0.8
BMP-XXX-16	Lower basin--Closer to Cady Street between Daisy and Focosi	Wet Pond	Wet Pond	9.22	2.09	7,575	10.1
BMP-XXX-17	Upper basin--at intersection of Daisy and Focosi	Wet Pond	Wet Pond	3.82	0.89	3,225	4.3
BMP-XXX-18	Daisy Lane	Detention Basin	Dry Pond/Detention Basin	2.59	0.75	2,707	6.1

Town of Ludlow BMP Tracking

Revised: September 2024

BMP ID or Description	Location	BMP Type from Plans	Functional BMP Type to Match Model	Total Drainage Area (Ac)	Impervious Drainage Area (Ac)	Estimated Storage Volume (cf)	Estimated Nitrogen Removal (lb/yr)
BMP-XXX-19	Deer Hill Circle	Detention Basin	Dry Pond/Detention Basin	2.92	0.88	18,700	11.3
BMP-XXX-20	Jerad Dr btwn lot 1 and 2	Detention Basin	Dry Pond/Detention Basin	4.70	0.95	3,452	9.8
BMP-XXX-21	Jerad Dr btwn lot 4 and 5	Detention Basin	Dry Pond/Detention Basin	2.95	1.04	3,768	9.4
BMP-XXX-22	West of Jerad Drive Bend	Detention Basin	Dry Pond/Detention Basin	6.58	2.29	8,322	20.9
BMP-XXX-23	Between Emma way and Mariana lane	Wet Pond	Wet Pond	7.36	2.13	7,728	11.8
BMP-XXX-24	Dinis Ave	Detention Basin	Dry Pond/Detention Basin	5.66	1.95	7,090	18.3
BMP-XXX-25	Pinewood Circle	Detention Basin	Infiltration Basin (or practice)	12.39	4.17	50,901	49.7
BMP-XXX-26	Rosewood Dr. larger basin	Infiltration Basin	Infiltration Basin (or practice)	14.43	2.29	59,833	33.6
BMP-XXX-27	Rosewood Dr. smaller basin	Infiltration Basin	Infiltration Basin (or practice)	12.69	1.37	34,763	21.8
BMP-XXX-28	At Sportsman Rd and Service Area Access Rd	Detention Basin	Dry Pond/Detention Basin	1.56	0.82	2,964	6.6
BMP-XXX-29	Near Baird Middle School	Detention Basin	Dry Pond/Detention Basin	4.42	2.58	2,291	11.3
BMP-XXX-30	At Spring Meadow Dr and Sunbriar Ln	Detention Basin	Dry Pond/Detention Basin	6.81	2.45	17,500	26.1
BMP-XXX-31	Watson Lane	Detention Basin	Dry Pond/Detention Basin	10.09	2.89	10,476	27.4
BMP-XXX-32	North of Wedgewood Drive	Detention Basin	Dry Pond/Detention Basin	9.23	2.77	35,925	31.9
BMP-XXX-33	Westover Road near the air force base	Wet Pond	Wet Pond	4.63	0.00	246,586	0.7
BMP-XXX-34	Woodside Road	Detention Basin	Dry Pond/Detention Basin	2.23	0.93	15,300	9.8
BMP-XXX-35	Woodland Circle 1B	Detention Basin	Dry Pond/Detention Basin	4.03	1.55	5,623	14.6
BMP-XXX-36	Woodland Circle 2C	Detention Basin	Dry Pond/Detention Basin	6.44	2.27	8,226	21.4
BMP-XXX-37	Woodland Circle 2D	Detention Basin	Dry Pond/Detention Basin	9.93	2.44	8,845	25.3
BMP-XXX-38	Woodland Circle 2A	Detention Basin	Dry Pond/Detention Basin	4.31	1.47	5,329	13.4
BMP-XXX-39	DPW Yard	Dry Well	Infiltration Trench	0.41	0.37	170	1.1
BMP-XXX-40	DPW Yard	Dry Well	Infiltration Trench	0.43	0.42	170	1.0
BMP-XXX-41	Holiday Inn parking lot (west side)	Leaching Basins	Infiltration Trench	0.10	0.10	2,775	1.0
BMP-XXX-42	Taco Bell parking lot (east side)	Leaching Basins	Infiltration Trench	0.07	0.07	2,081	0.8
BMP-XXX-43	Holiday Inn parking lot (central)	Detention Basin	Dry Pond/Detention Basin	1.31	1.24	8,838	11.9

Town of Ludlow BMP Tracking

Revised: September 2024

BMP ID or Description	Location	BMP Type from Plans	Functional BMP Type to Match Model	Total Drainage Area (Ac)	Impervious Drainage Area (Ac)	Estimated Storage Volume (cf)	Estimated Nitrogen Removal (lb/yr)
BMP-XXX-44	Southwest of Santina Drive and Chapin Street intersection	Bioretention	Bioretention	0.42	0.06	491	0.6
BMP-XXX-45	West of Santina Drive cul-de-sac	Bioretention	Bioretention	0.65	0.17	383	1.2
BMP-XXX-46	South of Santina Drive cul-de-sac	Bioretention	Bioretention	0.21	0.06	115	0.4
BMP-XXX-47	Southeast of Santina drive cul-de-sac	Bioretention	Bioretention	0.58	0.05	317	0.5
BMP-XXX-48	East of Santina Drive (midblock)	Bioretention	Bioretention	0.24	0.04	220	0.4
BMP-XXX-49	Southeast of Santina Drive and Chapin Street intersection	Infiltration Basin	Infiltration Basin (or practice)	1.09	0.86	12,570	8.9
BMP-XXX-50	Northwest and southwest of main Harris Brook Elementary building	Infiltration Trench	Infiltration Trench	6.53	3.55	24,163	37.8
BMP-XXX-51	North of main Harris Brook Elementary building	Water Quality Unit (Downstream Defender)	Proprietary	0.17	0.17	N/A	0.0
BMP-XXX-52	Northwest corner of northern Harris Brook Elementary parking lot	Water Quality Unit (Downstream Defender)	Proprietary	1.10	1.00	N/A	0.0
BMP-XXX-53	Southeast corner of northern Harris Brook Elementary parking lot	Water Quality Unit (Downstream Defender)	Proprietary	0.29	0.02	N/A	0.0
BMP-XXX-54	Northeast corner of northern Harris Brook parking lot	Water Quality Unit (Downstream Defender)	Proprietary	0.67	0.54	N/A	0.0
BMP-XXX-55	Intersection of Fuller Street and Harris Brook Elementary School driveway	Water Quality Unit (Downstream Defender)	Proprietary	0.06	0.06	N/A	0.0
BMP-XXX-56	Veterans Park Elementary School	N/A	Conversion of Impervious Area to Pervious Area	2.27	2.27	N/A	23.6

Totals: 320.9 104.8 817

C. Lake Phosphorus Control Plan Performance Evaluation

Memorandum

Subject	Lake Phosphorus Control Plan Year 6 Performance Evaluation - DRAFT
To	James Goodreau
From	Suzanne Newman, P.E.
Our reference	MS4 Permit Support Year 6, 507108568
Date	September 12, 2024

1 Background

The 2016 National Pollution Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Separate Storm Sewer Systems (MS4) in Massachusetts includes requirements for waterbodies with approved Total Maximum Daily Loads (TMDLs). The Town of Ludlow (the Town) discharges to Minechoag Pond, which is subject to an approved Lake and Phosphorus TMDL; the Town is therefore subject to the requirements of Appendix F, Part II.1 of the Permit. Per this Appendix, a Lake Phosphorus Control Plan (LPCP) was created for Minechoag Pond in 2023. As outlined in the LPCP and in accordance with the Permit, yearly performance evaluations are required beginning in Year 6. These performance evaluations shall include calculation of phosphorus reductions achieved by implemented non-structural and structural controls consistent with Appendix F Attachments 2 and 3, respectively. Performance evaluations shall also include increases in phosphorus loading resulting from development calculated consistent with Attachment 1 to Appendix F, as well as the resulting estimated yearly phosphorous export rate from the LPCP Area in mass/year. This Memorandum is intended to provide a performance evaluation for Year 6 according to the Permit and the procedures outlined in the LPCP. Note, the most current information for annual updates to the Town's LPCP progress is included in this memorandum and its associated appendices, rather than within the appendices of the LPCP as indicated in Section 2.1 of the LPCP.

2 Non-Structural Controls Implemented in Year 6

The Town implemented the following non-structural controls in Year 6:

- Monthly sweeping of the Minechoag Pond Watershed 9 out of 12 months of the year.
- Weekly sweeping of the Minechoag Pond Watershed between September 1, 2023 and December 1, 2023 for the Organic Waste and Leaf Litter Collection Program.

The Town was not able to inspect and clean all catch basins in the Minechoag Pond watershed semi-annually. Therefore, no catch basin cleaning credit has been claimed for the Year 6 reporting period.

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The associated phosphorus reductions from the non-structural controls implemented in Year 6 are presented in **Table 1**. See **Appendix A** for more details on non-structural control calculations. The total estimated phosphorus reduction from the non-structural controls implemented in Year 6 is 2.25 lbs/yr.

Table 1: Implemented Non-Structural Control Summary

Planned Non-Structural BMP	Average Annual Acres Managed	Average Estimated Annual P-Reduction (lbs./yr.)
Street Sweeping	23.1	0.70
CB Cleaning	0	0
Organic Waste and Leaf Litter Collection Program	23.1	1.55
<i>Total Estimated Phosphorus Credit from Implemented Non-Structural Controls</i>		2.25

3 Structural Controls Implemented in Year 6 and All Previous Years

The Town maintained the seven existing structural control measures within the Minechoag Pond Watershed that were implemented prior to Year 6 of the Permit. These structural control measures were inspected during the week of June 24th, 2024. The Town did not implement additional structural control measures during Year 6.

The associated phosphorus reductions from the structural controls implemented in Year 6 and all previous years are presented in **Table 2**. See **Appendix B** for more details on structural control calculations. The total estimated phosphorus reduction from the structural controls implemented in Year 6 and all previous years is 2.09 lbs/yr.

Table 2: Implemented Structural Control Summary

Name of Lake/Pond Watershed in which BMP is Located	BMP ID(s)	Current Functional Structural BMP Type	Number of BMPs	Total Acres Managed	Average Estimated Annual P-Reduction (lbs./yr.)
MCP01	BMP-MCP01-01 BMP-MCP01-02 BMP-MCP01-03	Infiltration Trenches in Series	3	2.02	0.59
MCP01	BMP-MCP01-04 BMP-MCP01-05	Infiltration Trenches in Series	2	0.70	0.38
MCP03	BMP-MCP03-01 BMP-MCP03-02	Infiltration Trenches	2	2.72	1.12
<i>Total Estimated Phosphorus Credit from Current Structural BMPs</i>					2.09

4 Changes to Phosphorus Load

No known development occurred within the Minechoag Pond Watershed in Year 6 that would impact the calculated baseline phosphorus load.

5 Certifications

Appendix F Part II.2 requests the certification of inspection and maintenance of all structural controls in accordance with manufacturer or design specification. The Permit further requests the certification of management of all municipally owned and maintained turf grass areas in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses. These certifications are included within the Year 6 Annual Report.

6 Conclusion

The Town has successfully reduced phosphorus to Minechoag Pond through implementation of non-structural and structural controls in Year 6. **Table 3** below summarizes the total phosphorus reduction through non-structural and structural controls as well as the estimated yearly phosphorous export rate from the LPCP Area. See **Appendix C** for additional performance evaluation summary calculations, including estimated milestones and the remaining phosphorus reduction requirement.

Table 3: Summary of Year 6 Phosphorus Loads and Reductions

Parameter	Value (lbs/yr)
Baseline Load	100.47
Allowable Load	52.25
Calculations to Update to Current Conditions	
Changes in Phosphorus Load Since Baseline	0
Current Phosphorus Load = Baseline +/- Impacts	100.47
Updated Phosphorus Reduction Required to Meet Allowable Load	48.22
Phosphorus Credits for Year 6	
Total Reduction from Non-Structural BMPs	2.25
Total Reduction from Structural BMPs	2.09
Total Reduction from Implemented BMPs	4.34
Yearly Phosphorus Export Rate for Year 6	
Estimated Yearly Phosphorous Export Rate from the LPCP Area	96.13

As outlined in the LPCP completed in 2023, the Town faces significant barriers in reaching the phosphorus load reductions outlined in the Permit due to the existing land use distribution, the presence of wetlands restricting additional development that would include structural controls, and the lack of Town-owned properties in the watershed, among additional factors. Nonetheless, the Town has planned for significant phosphorus reduction through planned non-structural and structural controls that are dependent upon funding and manpower, and the Town made progress in Year 6 towards these planned controls.



Appendix A

Supporting Calculations for Non-Structural Controls Implemented in Year 6

Supporting Calculations for Non-Structural Controls Implemented in Year 6

			Street Sweeping			Catch Basin Cleaning		Organic Waste and Leaf Litter Collection Program	
Catchment Area	Impervious Area (acres) ¹	P Load Export Rate (lbs. P/acre/year) ²	Phosphorus Reduction Factor ³	Annual Frequency of Sweeping ³	Phosphorus Credit (lbs. P/year)	Phosphorus Reduction Factor ⁴	Phosphorus Credit (lbs. P/year)	Nutrient Reduction Factor ⁵	Phosphorus Credit (lbs. P/year)
MCP01	8.0	1.34	0.03	0.75	0.24	0.00	0.00	0.05	0.54
MCP02	4.6	1.34	0.03	0.75	0.14	0.00	0.00	0.05	0.31
MCP03	10.5	1.34	0.03	0.75	0.32	0.00	0.00	0.05	0.70
MCP04	0.0	1.34	0.03	0.75	0.00	0.00	0.00	0.05	0.00
				Total Street Sweeping Credit (lbs. P /year)	0.70	Total Catch Basin Cleaning Credit (lbs. P /year)	0.00	Total Organic Waste and Leaf Litter Collection Program Credit (lbs. P /year)	1.55

¹ Calculated using 2016 Land Cover/Land Use Mass GIS data set (<https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use>) and Town of Ludlow GIS files. Note, for the Catch Basin Cleaning credit, the impervious drainage area to the catch basins has been assumed to be the impervious roadway area only.

² Assuming "Highway" for Phosphorus Source Category by Land Use for all roadway areas swept. P Load Export Rate was determined using Table 2-1 in MS4 Permit Attachment 2 to Appendix F.

³ Monthly sweeping of the Minechoag Pond Watershed with a mechanical broom 9 out of 12 months of the year. Phosphorus Reduction Factor identified using Table 2-4 in MS4 Permit Attachment 2 to Appendix F.

⁴ Town was not able to inspect and clean all catch basins in the Minechoag Pond watershed semi-annually in Year 6. Therefore, no credit taken in this reporting period for catch basin cleaning under the Phosphorus Reduction Factor specified in Table 2-5 in MS4 Permit Attachment 2 to Appendix F.

⁵ Weekly sweeping with a mechanical broom between September 1 to December 1. Per MS4 Permit Attachment 2 to Appendix F, assuming a 5% nutrient reduction factor for organic waste and leaf litter collection program in the watershed.



Appendix B

Supporting Calculations for Structural Controls Implemented in Year 6

Supporting Calculations for Structural Controls Implemented in Year 6 and All Previous Years

BMP ID or Description	Location	BMP Type from Plans	Functional BMP Type to Match Model	Total Drainage Area (acres)	Impervious Drainage Area (acres)	Estimated Storage Volume (cf)	Runoff Depth Captured for Use in %-P Reduction (in.)	Phosphorus Load (lb. P/year) ¹	Assumed Infiltration Rate (in./hr.)	BMP Phosphorus Reduction Rate (%) ⁴	Estimated Phosphorus Removal (lb. P/yr.)	Date of Last Completed Maintenance and Inspection
BMP-MCP01-01	East side of King Street across from 93 King Street	Leaching Galley	Infiltration Trench	2.02	0.84	509	0.17	1.40	1.02 ²	42%	0.59	Week of June 24th, 2024
BMP-MCP01-02	East side of King Street across from 93 King Street	Leaching Galley	Infiltration Trench									
BMP-MCP01-03	East side of King Street across from 93 King Street	Leaching Galley	Infiltration Trench									
BMP-MCP01-04	In front of 148 King Street	Leaching Galley	Infiltration Trench	0.70	0.61	339	0.15	0.97	1.02 ²	39%	0.38	Week of June 24th, 2024
BMP-MCP01-05	In front of 148 King Street	Leaching Galley	Infiltration Trench									
BMP-MCP03-01	Within island in center of cul-de-sac at south end of Bowles Avenue	Leaching Basin	Infiltration Trench	2.44	0.59	1,553	0.68	1.13	8.27 ³	99%	1.12	Week of June 24th, 2024
BMP-MCP03-02	Within island in center of cul-de-sac at south end of Bowles Avenue	Leaching Basin	Infiltration Trench									

¹ Calculated using 2016 Land Cover/Use MassGIS Data Set and P Export Rate from Table 3-1 in MS4 Permit Attachment 3 to Appendix F.

² Assumed sandy loam soil type per USDA NRCS Web Soil Survey (<https://websoilsurvey.nrcs.usda.gov/app/>). Therefore, assumed design infiltration rate 1.02 in./hr. per "Massachusetts Stormwater Handbook Volume 3 Chapter 1: Documenting Compliance with the Massachusetts Stormwater Management Standards," (<https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards#-stormwater-handbook-volume-3->)

³ The "Extension of Bowles St. Hydrology & Drainage Calculations" report provides conductivity calculations that indicate high soil conductivity and classifies the soil as "sand" for the Bowles Avenue leaching basins. Therefore, assumed an 8.27"/hr. infiltration rate per "Massachusetts Stormwater Handbook Volume 3 Chapter 1: Documenting Compliance with the Massachusetts Stormwater Management Standards," (<https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards#-stormwater-handbook-volume-3->)

⁴ Phosphorus reduction rate identified using Infiltration Trench BMP Performance Curves from MS4 Permit Attachment 3 to Appendix F.



Appendix C

Performance Evaluation Summary for Year 6

Performance Evaluation Summary for Year 6

The Town of Ludlow (the Town) has completed the required Performance Evaluation that assesses our LPCP progress for Minechoag Pond through Year 6. Documentation of the Land Development Impacts and Phosphorus Credits for this effort is included in this Memorandum and Appendices.

A summary of the Town's performance through Year 6 is included in the table below.

Table 1. Year 6 Performance Evaluation Summary

Parameter	Value (lbs/yr)
Baseline Load	100.47
Allowable Load	52.25
Calculations to Update to Current Conditions	
Changes in Phosphorus Load Since Baseline	0
Current Phosphorus Load (Baseline +/- Changes in Phosphorus Load)	100.47
Updated Phosphorus Reduction Required to Meet Allowable Load (Current Phosphorus Load – Allowable Load)	48.22
Year 8 Milestone: 20% of Reduction (lbs/yr)	9.64
Year 10 Milestone: 40% of Reduction (lbs/yr)	19.29
Year 13 Milestone: 70% of Reduction (lbs/yr)	33.75
Year 15 Milestone: 100% of Reduction (lbs/yr)	48.22
Phosphorus Credits for Year 6	
Total Reduction from Non-Structural BMPs	2.25
Total Reduction from Structural BMPs	2.09
Evaluation	
Remaining Phosphorus Reduction Requirement (Updated Phosphorus Reduction Required to Meet Allowable Load – Total Reductions)	43.88

Based on this year's evaluation, the Town has successfully reduced phosphorus by 4.34 lbs/yr.

D. Dry Weather Screening Log and Sample Testing Results

Dry Weather Outfall Screening Summary

Note: Screening team was not able to locate outfalls with "N/A" indicated in the screening data listed below. Coordination to locate these outfalls is ongoing as of the submission of the Year 6 Annual Report. Additionally, outfalls that were submerged at the time of screening to be revisited during catchment investigations.

Outfall ID	Receiving Water	Date of most Recent Inspection	Screened By	Precipitation in Previous 48 Hours	Weather	Pipe or swale?	Dimensions	Shape	Material	Latitude	Longitude	Physical Condition	Flow?	Indicators of Potential Non-Stormwater Discharges? (Y/N)	If yes, what indicators?	Testing Conducted (Y/N)
CHE01	Chicopee River (MA36-23)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	24"	Round	Concrete	42.157308	-72.424488	Good	Dry	No	N/A	
CHE02	Chicopee River (MA36-23)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	12"	Round	Clay Tile	42.1573	-72.4240	Good	Dry	No	N/A	
CHE03	Chicopee River (MA36-23)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	18"	Round	Concrete	42.166612	-72.412867	Good	Dry	No	N/A	
CHW01	Chicopee River (MA36-24)	1/10/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	15"	Round	Concrete	42.1624	-72.5004	Good	Dry	No	N/A	
CHW02	Chicopee River (MA36-24)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	24"	Round	Corrugated Metal	42.162556	-72.497313	Crumbling	Moderate	No	N/A	
CHW03	Chicopee River (MA36-24)	1/8/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	18"	Round	Concrete	42.1629	-72.4875	Good	Dry	No	N/A	
CHW04	Chicopee River (MA36-24)	1/10/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	42"	Round	Corrugated Metal	42.1580	-72.4861	Fair	Dry	No	N/A	
CHW05	Chicopee River (MA36-24)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	32"	Round	Plastic	42.155748	-72.481896	Good	Trickling	No	N/A	Yes
CHW06	Chicopee River (MA36-24)	1/10/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	60"	Round	Concrete	42.1558	-72.4819	Good	Submerged	No	N/A	
CHW07	Chicopee River (MA36-24)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Concrete	#N/A	#N/A	Poor	Submerged	Yes	Slight odor	
CHW08	Chicopee River (MA36-24)	1/14/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	24"	Round	Concrete	42.1539	-72.4786	Good	Dry	No	N/A	
CHW09	Chicopee River (MA36-24)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Metal	42.153870	-72.478048	Fair	Dry	No	N/A	
CHW10	Chicopee River (MA36-24)	1/24/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	24"	Round	Concrete	42.1542	-72.4757	Good	Trickling	No	N/A	
CHW11	Chicopee River (MA36-24)	1/10/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	42"	Round	Concrete	42.1541	-72.4734	Good	Dry	No	N/A	
CHW12	Chicopee River (MA36-24)	8/18/2021	Town of Ludlow DPW	Unknown	Unknown	Pipe	12"	Round	Plastic	42.1538	-72.4687	Good	Dry	No	N/A	
CHW13	Chicopee River (MA36-24)	8/22/2023	Mott MacDonald	0"	Partly cloudy, low 57°F, high 79°F	Pipe	36"	Round	Concrete	42.159494	-72.454066	Good	Dry	No	N/A	
CHW15	Chicopee River (MA36-24)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	12"	Round	Plastic	42.153558	-72.469983	Good	Dry	No	N/A	
CHW16	Chicopee River (MA36-24)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	18"	Round	Corrugated Metal	42.153873	-72.477530	Good	Dry	No	N/A	
HGB01	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Corrugated Metal	42.175517	-72.502256	Good	Dry	No	N/A	
HGB02	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Concrete	42.177859	-72.500340	Good	Dry	No	N/A	
HGB03	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Concrete	42.178269	-72.497900	Good	Dry	No	N/A	
HGB04	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Plastic	42.179627	-72.497563	Good	Dry	No	N/A	
HGB05	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	10"	Round	Corrugated Metal	42.179427	-72.497437	Fair	Dry	No	N/A	
HGB06	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Plastic	42.179642	-72.497410	Good	Dry	No	N/A	
HGB07	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	32"	Round	Concrete	42.179737	-72.496137	Good	Submerged	No	N/A	
HGB08	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Concrete	42.178139	-72.493218	Good	Dry	No	N/A	
HGB09	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Concrete	42.179717	-72.492768	Good	Submerged	No	N/A	
HGB10	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	24"	Round	Concrete	42.176923	-72.491027	Good	Moderate	No	N/A	Yes
HGB11	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Concrete	42.179034	-72.489618	Fair	Dry	No	N/A	
HGB12	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	24"	Round	Concrete	42.178783	-72.487087	Good	Submerged	No	N/A	

Outfall ID	Receiving Water	Date of most Recent Inspection	Screened By	Precipitation in Previous 48 Hours	Weather	Pipe or swale?	Dimensions	Shape	Material	Latitude	Longitude	Physical Condition	Flow?	Indicators of Potential Non-Stormwater Discharges? (Y/N)	If yes, what indicators?	Testing Conducted (Y/N)
HGB13	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
HGB14	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
HGB15	Higher Brook (MA36-42)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Corrugated Metal	42.180291	-72.479227	Good	Submerged	No	N/A	
HGB16	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	30"	Round	Concrete	42.176115	-72.473082	Good	Trickling	No	N/A	Yes
HGB17	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Corrugated Metal	42.176111	-72.472810	Good	Dry	No	N/A	
HGB18	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Plastic	42.175981	-72.472508	Good	Dry	No	N/A	
HGB19	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	12"	Round	Concrete	42.175895	-72.472016	Fair	Dry	No	N/A	
HGB20	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
HGB21	Higher Brook (MA36-42)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	18"	Round	Corrugated Metal	42.173592	-72.459276	Good	Moderate	Yes	Algae	Yes
HGB22	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	18"	Round	Concrete	42.175888	-72.471925	Good	Dry	No	N/A	
HGB23	Higher Brook (MA36-42)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	18"	Round	Concrete	42.175802	-72.471827	Good	Dry	No	N/A	
HRB01	Harris Brook (Tributary to Higher Brook)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Corrugated Metal	42.199689	-72.487153	Good	Moderate	No	N/A	Yes
HRB02	Harris Brook (Tributary to Higher Brook)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	12"	Round	Corrugated Metal	42.197918	-72.484815	Fair	Submerged	No	N/A	
HRB03	Harris Brook (Tributary to Higher Brook)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
HVP01	Haviland Pond	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	N/A	N/A	N/A	42.173979	-72.472820	N/A	Submerged	N/A	N/A	
HVP02	Haviland Pond	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	Pipe	8"	Round	Plastic	42.173908	-72.471611	Good	Dry	No	N/A	
MBT01	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	N/A	N/A	N/A	N/A	42.160300	-72.442950	N/A	N/A	N/A	N/A	
MBT02	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	Pipe	12"	Round	Concrete	42.161760	-72.442803	Good	Submerged	N/A	N/A	
MBT03	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	Pipe	12"	Round	Concrete	42.161742	-72.442861	Good	Submerged	N/A	N/A	
MBT04	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	Pipe	16"	Round	Concrete	42.163461	-72.442828	Fair	Submerged	No	N/A	
MBT05	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	Pipe	18"	Round	Concrete	42.163770	-72.440286	Good	Trickling	No	N/A	Yes
MBT06	Minechoag Brook Tributary to Chicopee River (MA36-24)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	24"	Round	Concrete	42.1587	-72.4400	Good	Trickling	No	N/A	
MBT07	Minechoag Brook Tributary to Chicopee River (MA36-24)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	60"	Round	Concrete	42.1587	-72.4400	Good	Moderate	No	N/A	
MBT08	Minechoag Brook Tributary to Chicopee River (MA36-24)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	24"	Round	Corrugated Metal	42.1593	-72.4396	Fair	Dry	No	N/A	
MBT09	Minechoag Brook Tributary to Chicopee River (MA36-24)	9/20/2023	Mott MacDonald	<0.1" in the previous 24-hour	Mostly sunny, low 47°F, high 73°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
MCP01	Minechoag Pond	8/29/2024	Mott MacDonald	0"	Cloudy, low 52°F, high 73°F	Pipe	24"	Round	Corrugated Metal	42.165009	-72.459908	Fair	Dry	No	N/A	
MCP02	Minechoag Pond	8/29/2024	Mott MacDonald	0"	Cloudy, low 52°F, high 73°F	Pipe	36"	Round	Plastic	42.164987	-72.459915	Good	Dry	No	N/A	
MCP03	Minechoag Pond	8/22/2023	Mott MacDonald	0"	Partly cloudy, low 57°F, high 79°F	N/A	N/A	N/A	N/A	42.164594	-72.456548	Crumbling	N/A	No	N/A	
MCP04	Minechoag Pond	8/29/2024	Mott MacDonald	0"	Cloudy, low 52°F, high 73°F	Pipe	12"	Round	Corrugated Metal	42.165004	-72.459886	Crumbling	Dry	No	N/A	
MPP01	Murphy Pond	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	24"	Round	Concrete	42.172361	-72.495474	Good	Dry	No	N/A	
MPP02	Murphy Pond	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Plastic	42.170322	-72.492209	Good	Dry	No	N/A	
TBR01	Tributary to Harris Brook (Off of Rood St.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	24"	Round	Concrete	42.188470	-72.477772	Fair	Submerged	No	N/A	

Outfall ID	Receiving Water	Date of most Recent Inspection	Screened By	Precipitation in Previous 48 Hours	Weather	Pipe or swale?	Dimensions	Shape	Material	Latitude	Longitude	Physical Condition	Flow?	Indicators of Potential Non-Stormwater Discharges? (Y/N)	If yes, what indicators?	Testing Conducted (Y/N)
TCA01	Tributary to Chicopee River (MA36-24) (Near Davis St.)	1/8/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	48"	Round	Concrete	42.1639	-72.4866	Good	Moderate	No	N/A	
TCD01	Tributary to Chicopee River (MA36-23) (Near Deponte Dr.)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
TCE01	Tributary to Chicopee River (MA36-23) (Near Elizabeth Dr.)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	36"	Round	Concrete	42.1638	-72.4201	Good	Trickling	No	N/A	
TCH01	Tributary to Chicopee River (MA36-23) (Starting near Deer Hill Circle)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
TCH02	Tributary to Chicopee River (MA36-23) (Starting near Deer Hill Circle)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	36"	Round	Concrete	42.164468	-72.430448	Good	Moderate	Yes	Foam	Yes
TCH03	Tributary to Chicopee River (MA36-23) (Starting near Deer Hill Circle)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	18"	Round	Plastic	42.160052	-72.429484	Good	Dry	No	N/A	
TCH04	Tributary to Chicopee River (MA36-23) (Starting near Deer Hill Circle)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	30"	Round	Concrete	42.1662	-72.4307	Good	Trickling	No	N/A	
TCM01	Tributary to Chicopee River (MA36-23) (Miller St. to Chapin Street)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	12"	Round	Concrete	42.1583	-72.4301	Good	Dry	No	N/A	
TCM02	Tributary to Chicopee River (MA36-23) (Miller St. to Chapin Street)	1/30/2020	Town of Ludlow DPW	Unknown	Unknown	Pipe	18"	Round	Concrete	42.1583	-72.4301	Good	Trickling	No	N/A	
TCO01	Tributary to Chicopee River (MA36-23) (Starting near Dowd Ct.)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	24"	Round	Plastic	42.185700	-72.421813	Good	Dry	No	N/A	
TCO02	Tributary to Chicopee River (MA36-23) (Starting near Dowd Ct.)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	24"	Round	Plastic	42.185984	-72.421539	Good	Dry	No	N/A	
TCO03	Tributary to Chicopee River (MA36-23) (Starting near Dowd Ct.)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	24"	Round	Concrete	42.183851	-72.420527	Fair	Submerged	No	N/A	
TCS01	Tributary to Chicopee River (MA36-23) (Starting near Southwood Dr.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	18"	Round	Plastic	42.192279	-72.414462	Good	Dry	Yes	Sheen, algae	
TCS02	Tributary to Chicopee River (MA36-23) (Starting near Southwood Dr.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	18"	Round	Concrete	42.194757	-72.413198	Fair	Dry	No	N/A	
TCS03	Tributary to Chicopee River (MA36-23) (Starting near Southwood Dr.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	12"	Round	Plastic	42.195404	-72.412588	Good	Dry	No	N/A	
TCT01	Tributary to Chicopee River (MA36-24) (Near Tait St.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	24"	Round	Concrete	42.162643	-72.508893	Good	Moderate	Yes	Algae	Yes
TCT02	Tributary to Chicopee River (MA36-24) (Near Tait St.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	Pipe	24"	Round	Concrete	42.162653	-72.508863	Good	Trickling	Yes	Foam	Yes
THB01	Tributary to Higher Brook (MA36-42) (Behind Bruni Ave.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	24"	Round	Concrete	42.173320	-72.508556	Good	Submerged	No	N/A	
THB02	Tributary to Higher Brook (MA36-42) (Behind Bruni Ave.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Concrete	42.173139	-72.507323	Good	Trickling	No	N/A	Yes
THK01	Tributary to Harris Brook (Starting near Kendall St.)	8/14/2024	Mott MacDonald	0"	Partly cloudy, low 56°F, high 85°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	
THK02	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	36"	Round	Corrugated Metal	42.184031	-72.485568	Fair	Moderate	No	N/A	Yes
THK03	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Corrugated Metal	42.183350	-72.484345	Fair	Dry	No	N/A	
THK04	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Corrugated Metal	42.183618	-72.483657	Good	Submerged	No	N/A	
THK05	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Corrugated Metal	42.183232	-72.481848	Good	Dry	No	N/A	
THK06	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	24"	Round	Unknown	42.183217	-72.481803	Good	Dry	No	N/A	
THK07	Tributary to Harris Brook (Starting near Kendall St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	12"	Round	Corrugated Metal	42.181887	-72.481527	Fair	Dry	No	N/A	
THL01	Tributary to Higher Brook (MA36-42) (Crossing Lyon St.)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	18"	Round	Concrete	42.195165	-72.454069	Good	Dry	No	N/A	
THR01	Tributary to Higher Brook (MA36-42) (Starting near Reservoir Road)	8/13/2024	Mott MacDonald	0"	Partly cloudy, low 54°F, high 82°F	Pipe	12"	Round	Concrete	42.194054	-72.434913	Fair	Submerged	Yes	Algae	
WHA01	Wetland adjacent to Higher Brook (MA36-42) (Near Alwood St.)	10/25/2023	Mott MacDonald	0"	Mostly cloudy, low 41°F, high 70°F	Pipe	18"	Round	Plastic	42.173411	-72.502432	Good	Dry	No	N/A	
WHB01	Wetland adjacent to Higher Brook (MA36-42) (Behind Brookhaven Dr.)	10/24/2023	Mott MacDonald	0"	Partly cloudy, low 32°F, high 60°F	N/A	N/A	N/A	N/A	#N/A	#N/A	N/A	N/A	N/A	N/A	

Dry Weather Outfall Screening - Sample Testing Results

				Field Tests						Lab Tests					Analysis	
Outfall ID	Receiving Water	Class ¹	Date of most Recent Inspection	Ammonia (mg/L)	Surfactants (ppm)	Chlorine (mg/L)	Conductivity (microS/cm)	Salinity (ppt)	Temperature (°F)	E. Coli ² (MPN/100 mL)	TKN ³ (mg/L)	Nitrate/Nitrite ⁴ (mg/L)	Total Phosphorus	Fecal Coliform ² (MPN/100 mL)	Total Coliform ² (MPN/100 mL)	Indicator Based on Ammonia/Surfactants and Chlorine or E. Coli ⁵
MBT05	Minechoag Brook Tributary to Chicopee River (MA36-24)	B (WWF&CSO)	9/20/2023	0.25	3.0	0.07	501	0.20	73.6	30	0.53	0.44	N/A	>2419.6	>2419.6	NO
CHW05	Chicopee River (MA36-24)	B (WWF&CSO)	10/24/2023	0.25	0.25	0.10	373	0.20	52.1	34	ND	2.3	N/A	2000	>2419.6	NO
HGB16	Higher Brook (MA36-42)	B	10/24/2023	0.00	0.25	0.04	314	0.10	60.8	3.1	0.28	1.2	N/A	N/A	730	NO
HGB10	Higher Brook (MA36-42)	B	10/25/2023	0.25	0.50	0.00	443	0.20	53.3	160	1.6	0.42	N/A	N/A	>2419.6	NO
THB02	Tributary to Higher Brook (MA36-42) (Behind Bruni Ave.)	B	10/25/2023	0.00	0.50	0.05	308	0.10	64.4	20	ND	5.6	N/A	N/A	>2419.6	NO
THK02	Tributary to Harris Brook (Starting near Kendall St.)	B	10/25/2023	0.00	1.00	0.02	181.3	0.00	66.1	1400	0.18	1.1	N/A	N/A	>2419.6	NO
HRB01	Harris Brook (Tributary to Higher Brook)	B	10/25/2023	0.00	0.75	0.01	493	0.20	65.7	7.5	ND	4.5	N/A	N/A	>2419.6	NO
HGB21	Higher Brook (MA36-42)	B	8/13/2024	0.00	0.25	0	1572	0.70	68.9	MISSING ⁶	0.92	0.92	N/A	N/A	MISSING ⁶	NO
TCH02	Tributary to Chicopee River (MA36-23) (Starting near Deer	B (WWF&CSO)	8/13/2024	0.00	0.00	0.1	620	0.30	67.1	MISSING ⁶	0.72	1.3	N/A	N/A	MISSING ⁶	NO
TCT01	Tributary to Chicopee River (MA36-24) (Near Tait St.)	B (WWF&CSO)	8/14/2024	0.00	0.25	0.1	314	0.10	73.5	110	0.71	0.054	N/A	130	>2419.6	NO
TCT02	Tributary to Chicopee River (MA36-24) (Near Tait St.)	B (WWF&CSO)	8/14/2024	0.00	0.50	0.1	1588	0.70	78.4	870	0.51	0.54	N/A	1100	>2419.6	NO

¹ Per MassDEP Water Quality Data Viewer <https://arcgisserver.digital.mass.gov/massdepwaterquality/Home/Index>

² Analyzed by SM 9223B - Colilert 18

³ Analyzed for EPA 351.2 by Pace Analytical Services Melville

⁴ Analyzed for EPA 353.2 by Pace Analytical Services Melville

⁵ Per the MA MS4 General Permit (Section 2.3.4.7.c.ii footnote 6), likely sewer input indicators are any of the following:

1

Olfactory or visual evidence of sewage

2

Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or

3

Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

⁶ Lab samples were not processed by the lab within allowable hold time for bacteria analyses. Outfalls to be revisited in the future to grab new samples for analysis.

ND

Not Detected

WWF

Warm water fishery

CSO

Combined Sewer Overflow

E. Wet Weather Outfall Sample Testing Results

Wet Weather Outfall Sample Testing Results

						Visual Inspection															
Outfall ID	Receiving Water	Date of most Recent Inspection	Screened By	Precipitation in Previous 48 Hours	Weather	Color	Odor	Turbidity	Excessive Sediment	Sanitary Waste	Pet Waste	Floatable Solids	Oil Sheen	Bacterial Sheen	Foam	Algae	Orange Staining	Excessive Vegetation	Optical Enhancers	Other	
CHW04	Chicopee River (MA36-24)	5/8/2024	Mott MacDonald	0.27" in the previous 24 hour period	Light Rain, 56°F	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	
CHW06	Chicopee River (MA36-24)	5/10/2024	Mott MacDonald	1.45" in the previous 48 hour period	Light Rain, 50°F	No	No	No	No	No	No	No	No	No	No	No	No	No	No	~5" standing water from river (submerged)	

Outfall ID	Field Tests						Lab Tests						Analysis
	Ammonia (mg/L)	Surfactants (ppm)	Chlorine (mg/L)	Conductivity (microS/cm)	Salinity (ppt)	Temperature (°F)	E. Coli ² (MPN/100 mL)	TKN ³ (mg/L)	Nitrate/Nitrite ⁴ (mg/L)	Total Phosphorus	Fecal Coliform ² (MPN/100 mL)	Total Coliform ² (MPN/100 mL)	Indicator Based on Ammonia/Surfactants and Chlorine or E. Coli ⁵
CHW04	0.75	0.25	0.10	53.1	0.00	61.2	1400	0.86	0.17	N/A	>2419.6	>2419.6	YES
CHW06	0.50	0.35	0.04	679	0.30	54.6	>2419.6	0.48	2.6	N/A	>2419.6	>2419.6	YES

F. Outfall Inventory and Priority Ranking

Infrastructure and Investigation Information							Catchment Composition						Receiving Water			Ranking Output	
Outfall ID	Stream Segment	Known/ Suspected Problem and/or Complaints?	Past Sewer Conversion or CSO in Catchment?	Culverts Longer Than Street Crossing In Catchment?	Previous Screening Results Indicate Likely Sewer Input? ¹	Infrastructure Score	Catchment Area	Weighted Business Loading Score ²	Weighted Residential Housing Age Score ³	Sewer Pipe Density Score	Septic System Density Score ⁴	Catchment Score	Discharging to Area of Concern to Public Health? ⁵	Stormwater Related Impairments	Receiving Water Score	Outfall Score for Catchment Investigation	Priority Rank
Information Source		Town of Ludlow Staff	Town of Ludlow Staff, GIS Maps	Town of Ludlow Staff, GIS and Storm Sewer Maps	Outfall inspections and sample results	-	GIS	Town of Ludlow Staff, Parcel IDs/GIS	Town of Ludlow Parcel Maps	GIS Mapping	GIS Mapping	-	GIS Maps	Impaired Waters List	-	-	-
Scoring Criteria		0 or 1 (if 1 automatically problem)	0 or 1	0 or 1	0 or 1 (if 1 automatically problem)	0 to 100	acres	0 to 1	0 to 1	0 to 1	0 to 1	0 to 100	0, 1, 2, or 3 (if >0 automatically high)	0 or 1 (0= Long Island Sound Impairment, 1= Other Impairments, 2 = Fecal Coliform & E. Coli Impairment; if >1 automatically high)	0 to 100	0 to 100 (weighted average of the three scores)	Problem, High, or Low
CHE01	MA36-23	0	0	0	0	0	23.81	0.67	1.00	0.06	0.04	44	0	0	0	14.7	LOW
CHE02	MA36-23	0	0	0	0	0	0.27	0.00	0.00	0.00	0.00	0	0	0	0	0.0	LOW
CHE03	MA36-23	0	0	0	0	0	2.17	0.33	0.33	0.00	0.14	20	0	0	0	6.7	LOW
CHW01	MA36-24	0	0	0	0	0	10.41	0.33	1.00	0.20	0.00	38	0	2	50	29.5	HIGH
CHW02	MA36-24	0	0	0	0	0	43.05	0.33	0.67	0.10	0.00	28	0	2	50	25.8	HIGH
CHW03	MA36-24	0	0	0	0	0	8.42	0.00	0.67	0.13	0.00	20	0	2	50	23.3	HIGH
CHW04	MA36-24	1	1	0	0	50	35.99	1.00	0.67	0.19	0.00	46	1	2	75	57.1	PROBLEM
CHW05	MA36-24	0	0	0	0	0	8.79	0.00	0.67	0.13	0.00	20	1	2	75	31.6	HIGH
CHW06	MA36-24	1	1	0	0	50	106.98	1.00	1.00	0.19	0.00	55	1	2	75	59.9	PROBLEM
CHW07	MA36-24	0	0	0	1	25	0.26	0.00	0.67	0.00	0.00	17	1	2	75	38.9	PROBLEM
CHW08	MA36-24	0	0	0	0	0	0.42	0.00	0.67	0.00	0.00	17	1	2	75	30.6	HIGH
CHW09	MA36-24	0	0	0	0	0	0.37	0.00	0.67	0.00	0.00	17	1	2	75	30.6	HIGH
CHW10	MA36-24	0	0	0	0	0	6.06	0.00	0.67	0.03	0.00	18	1	2	75	30.8	HIGH
CHW11	MA36-24	0	1	0	0	25	69.57	0.33	1.00	0.16	0.00	37	1	2	75	45.8	HIGH
CHW12	MA36-24	0	0	0	0	0	5.20	0.00	0.67	0.17	0.00	21	1	2	75	31.9	HIGH
CHW13	MA36-24	0	0	0	0	0	21.36	0.00	1.00	0.14	0.00	28	1	2	75	34.5	HIGH
CHW14	MA36-24	1	1	0	0	50	51.98	1.00	1.00	0.29	0.00	57	0	2	50	52.4	PROBLEM
CHW15	MA36-24	0	0	0	0	0	6.64	0.00	0.67	0.01	0.00	17	1	2	75	30.7	HIGH
CHW16	MA36-24	0	0	0	0	0	0.31	0.00	0.00	0.00	0.00	0	1	2	75	25.0	HIGH
HGB01	MA36-42	0	0	0	0	0	22.40	0.00	0.67	0.19	0.00	22	0	0	0	7.2	LOW
HGB02	MA36-42	0	0	0	0	0	7.25	1.00	0.67	0.21	0.00	47	0	0	0	15.6	LOW
HGB03	MA36-42	0	0	0	0	0	5.52	0.33	1.00	0.02	0.05	35	0	0	0	11.7	LOW
HGB04	MA36-42	0	0	0	0	0	7.58	0.00	0.67	0.24	0.00	23	0	0	0	7.5	LOW
HGB05	MA36-42	0	0	0	0	0	0.87	0.00	0.67	0.00	0.35	25	0	0	0	8.5	LOW
HGB06	MA36-42	0	0	0	0	0	4.22	0.00	1.00	0.05	0.47	38	0	0	0	12.6	LOW
HGB07	MA36-42	0	0	0	0	0	57.21	0.33	1.00	0.08	0.02	36	0	0	0	11.9	LOW
HGB08	MA36-42	0	0	0	0	0	2.12	0.00	0.67	0.00	1.00	42	0	0	0	13.9	LOW
HGB09	MA36-42	0	0	0	0	0	14.07	0.00	0.67	0.17	0.00	21	0	0	0	7.0	LOW
HGB10	MA36-42	0	0	0	0	0	15.05	0.33	1.00	0.07	0.11	38	1	0	25	21.0	HIGH
HGB11	MA36-42	0	0	0	0	0	1.19	0.00	0.67	0.16	0.00	21	0	0	0	6.9	LOW
HGB12	MA36-42	0	0	0	0	0	12.71	0.00	1.00	0.17	0.00	29	1	0	25	18.1	HIGH
HGB13	MA36-42	0	0	0	0	0	9.46	0.67	0.67	0.23	0.00	39	0	0	0	13.1	LOW
HGB14	MA36-42	0	0	0	0	0	2.15	0.00	0.67	0.23	0.00	22	0	0	0	7.5	LOW

Infrastructure and Investigation Information							Catchment Composition						Receiving Water			Ranking Output	
Outfall ID	Stream Segment	Known/ Suspected Problem and/or Complaints?	Past Sewer Conversion or CSO in Catchment?	Culverts Longer Than Street Crossing In Catchment?	Previous Screening Results Indicate Likely Sewer Input? ¹	Infrastructure Score	Catchment Area	Weighted Business Loading Score ²	Weighted Residential Housing Age Score ³	Sewer Pipe Density Score	Septic System Density Score ⁴	Catchment Score	Discharging to Area of Concern to Public Health? ⁵	Stormwater Related Impairments	Receiving Water Score	Outfall Score for Catchment Investigation	Priority Rank
HGB15	MA36-42	0	0	0	0	0	8.00	0.00	0.67	0.17	0.00	21	0	0	0	7.0	LOW
HGB16	MA36-42	0	0	0	0	0	34.36	1.00	1.00	0.10	0.00	53	1	0	25	25.8	HIGH
HGB17	MA36-42	0	0	0	0	0	1.52	0.33	0.67	0.17	0.30	37	0	0	0	12.2	LOW
HGB18	MA36-42	0	0	0	0	0	0.40	0.00	0.00	0.28	0.00	7	0	0	0	2.3	LOW
HGB19	MA36-42	0	0	0	0	0	0.05	0.00	0.00	1.00	0.00	25	0	0	0	8.3	LOW
HGB20	MA36-42	0	0	0	0	0	27.55	0.00	0.67	0.15	0.00	21	1	0	25	15.2	HIGH
HGB21	MA36-42	0	0	0	1	25	2.70	0.00	0.00	0.00	0.00	0	1	0	25	16.7	PROBLEM
HGB22	MA36-42	0	0	0	0	0	0.43	0.00	0.00	0.00	0.00	0	0	0	0	0.0	LOW
HGB23	MA36-42	0	0	0	0	0	0.27	0.00	0.00	0.00	0.00	0	0	0	0	0.0	LOW
HGB24	MA36-42	0	0	0	0	0	8.36	0.00	0.00	0.00	0.00	0	1	0	25	8.3	HIGH
HRB01	N/A	0	0	0	0	0	11.37	0.67	1.00	0.00	0.12	45	0	0	0	14.9	LOW
HRB02	N/A	0	0	0	0	0	6.84	0.00	0.67	0.00	0.07	18	0	0	0	6.1	LOW
HRB03	N/A	0	0	0	0	0	36.67	0.00	1.00	0.00	0.10	27	0	0	0	9.2	LOW
HVP01	N/A	0	0	0	0	0	1.20	0.33	0.67	0.30	0.00	33	1	0	25	19.2	HIGH
HVP02	N/A	0	0	0	0	0	0.63	0.00	0.67	0.14	0.00	20	1	0	25	15.0	HIGH
MBT01	MA36-24	0	0	0	0	0	12.49	0.33	0.67	0.08	0.00	27	0	2	50	25.7	HIGH
MBT02	MA36-24	0	0	0	0	0	4.15	0.00	0.33	0.19	0.00	13	0	2	50	21.0	HIGH
MBT03	MA36-24	0	0	0	0	0	48.51	1.00	1.00	0.07	0.00	52	0	2	50	33.9	HIGH
MBT04	MA36-24	0	0	0	0	0	20.91	0.00	1.00	0.09	0.00	27	0	2	50	25.7	HIGH
MBT05	MA36-24	0	0	0	0	0	1.66	0.00	0.33	0.34	0.00	17	0	2	50	22.3	HIGH
MBT06	MA36-24	0	0	0	0	0	16.81	0.33	1.00	0.18	0.00	38	0	2	50	29.3	HIGH
MBT07	MA36-24	0	0	0	0	0	5.67	0.00	1.00	0.35	0.00	34	0	2	50	27.9	HIGH
MBT08	MA36-24	0	0	0	0	0	69.34	0.33	0.67	0.08	0.00	27	1	2	75	34.0	HIGH
MBT09	MA36-24	0	0	0	0	0	2.80	0.00	0.33	0.08	0.00	10	0	2	50	20.1	HIGH
MCP01	N/A	0	1	0	0	25	75.36	0.33	1.00	0.08	0.01	36	1	1	50	36.9	HIGH
MCP02	N/A	0	0	0	0	0	24.78	1.00	1.00	0.19	0.00	55	0	1	25	26.5	LOW
MCP03	N/A	0	0	0	0	0	95.69	1.00	1.00	0.10	0.00	53	0	1	25	25.9	LOW
MCP04	N/A	0	1	0	0	25	0.13	0.00	0.67	0.00	0.00	17	0	1	25	22.2	LOW
MPP01	N/A	0	1	0	0	25	26.42	0.33	1.00	0.08	0.19	40	0	0	0	21.7	LOW
MPP02	N/A	0	0	0	0	0	5.36	0.00	0.67	0.11	0.11	22	0	0	0	7.4	LOW
TBR01	N/A	0	0	0	0	0	13.99	0.00	0.67	0.00	0.00	17	0	0	0	5.6	LOW
TCA01	MA36-24	1	1	1	0	75	128.43	1.00	1.00	0.14	0.00	54	1	2	75	67.9	PROBLEM
TCD01	MA36-23	0	0	0	0	0	7.05	0.00	0.67	0.00	0.19	21	0	0	0	7.2	LOW
TCE01	MA36-23	0	0	0	0	0	47.67	0.00	1.00	0.00	0.07	27	0	0	0	8.9	LOW
TCH01	MA36-23	0	0	0	0	0	29.30	0.00	1.00	0.07	0.08	29	0	0	0	9.6	LOW
TCH02	MA36-23	0	0	0	1	25	2.32	0.00	0.00	0.00	0.00	0	0	0	0	8.3	PROBLEM
TCH03	MA36-23	0	0	0	0	0	4.76	0.00	0.33	0.00	0.22	14	0	0	0	4.6	LOW
TCH04	MA36-23	0	0	0	0	0	26.64	0.00	0.67	0.00	0.22	22	0	0	0	7.4	LOW
TCM01	MA36-23	0	0	0	0	0	1.26	0.00	1.00	0.15	0.00	29	0	0	0	9.6	LOW
TCM02	MA36-23	0	0	0	0	0	20.54	1.00	0.33	0.09	0.00	36	0	0	0	11.9	LOW
TCO01	MA36-23	0	0	0	0	0	1.15	0.00	0.00	0.00	0.00	0	0	0	0	0.0	LOW
TCO02	MA36-23	0	0	0	0	0	2.92	0.33	0.67	0.00	0.26	31	0	0	0	10.5	LOW
TCO03	MA36-23	0	0	0	0	0	8.02	0.33	0.67	0.00	0.09	27	0	0	0	9.1	LOW
TCS01	MA36-23	0	0	0	1	25	3.81	0.00	0.33	0.00	0.44	19	0	0	0	14.7	PROBLEM
TCS02	MA36-23	0	0	0	0	0	5.58	0.33	0.33	0.00	0.30	24	0	0	0	8.0	LOW
TCS03	MA36-23	0	0	0	0	0	2.62	0.33	0.33	0.00	0.17	21	0	0	0	7.0	LOW
TCT01	MA36-24	0	0	0	1	25	18.32	0.00	0.00	0.05	0.03	2	0	2	50	25.7	PROBLEM

Infrastructure and Investigation Information							Catchment Composition						Receiving Water			Ranking Output	
Outfall ID	Stream Segment	Known/ Suspected Problem and/or Complaints?	Past Sewer Conversion or CSO in Catchment?	Culverts Longer Than Street Crossing In Catchment?	Previous Screening Results Indicate Likely Sewer Input? ¹	Infrastructure Score	Catchment Area	Weighted Business Loading Score ²	Weighted Residential Housing Age Score ³	Sewer Pipe Density Score	Septic System Density Score ⁴	Catchment Score	Discharging to Area of Concern to Public Health? ⁵	Stormwater Related Impairments	Receiving Water Score	Outfall Score for Catchment Investigation	Priority Rank
TCT02	MA36-24	0	0	0	1	25	1.45	0.00	0.67	0.46	0.00	28	0	2	50	34.4	PROBLEM
THB01	MA36-42	0	0	0	0	0	4.04	0.00	0.67	0.00	0.64	33	0	0	0	10.9	LOW
THB02	MA36-42	0	0	0	0	0	8.33	0.00	0.67	0.00	0.16	21	0	0	0	6.9	LOW
THK01	N/A	0	0	0	0	0	96.19	0.00	0.67	0.03	0.00	17	0	0	0	5.8	LOW
THK02	N/A	0	0	0	0	0	16.99	0.33	1.00	0.01	0.00	34	0	0	0	11.2	LOW
THK03	N/A	0	0	0	0	0	4.86	0.67	0.67	0.07	0.00	35	0	0	0	11.7	LOW
THK04	N/A	0	0	0	0	0	1.84	0.00	0.67	0.12	0.00	20	0	0	0	6.5	LOW
THK05	N/A	0	0	0	0	0	2.43	0.33	0.67	0.22	0.00	31	0	0	0	10.2	LOW
THK06	N/A	0	0	0	0	0	2.31	0.00	0.33	0.26	0.26	21	0	0	0	7.1	LOW
THK07	N/A	0	0	0	0	0	2.64	0.00	0.67	0.18	0.00	21	0	0	0	7.1	LOW
THL01	MA36-42	0	0	0	0	0	1.75	0.00	1.00	0.00	0.26	31	0	0	0	10.5	LOW
THR01	MA36-42	0	0	0	1	25	1.18	0.00	0.00	0.00	0.26	6	0	0	0	10.5	PROBLEM
WHA01	MA36-42	0	0	0	0	0	5.41	0.00	0.33	0.00	0.62	24	0	0	0	7.9	LOW
WHB01	MA36-42	0	0	0	0	0	9.27	0.33	0.67	0.19	0.00	30	0	0	0	10.0	LOW

Notes:

¹ Town of Ludlow has not conducted any recent outfall screenings. Screening results indicate likely sewer input if any of the following are true:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

² The weighted business loading scores are based on the presence of high and medium loading businesses within each catchment. High loading businesses were given twice the weighting of the medium loading businesses.

Medium Loading businesses were defined as: auto repair facilites/automotive vehicles or supplies sales and service, automobile parking lots or garages, bus transportation facilites and related properties, campgrounds/RV parks, car dealers, car washes, food stores and wholesale beverage/supermarkets, small retail and services stores, eating and drinking establishments, gasoline stations/fuel service areas, marinas, nurseries and garden centers, oil change shops, restaurants, chemical products, food processing, rubber and plastics, colleges and universities, airports, rental car lots, US postal service trucking companies and distribution centers.

High Loading businesses were defined as: heavy construction equipment rental and leasing, building and heavy construction (for land disturbing activites), buildings for manufacturing operations, apparel and other fabrics, auto recyclers and scrap yards, boat building and repair, chemical products, food processing, garbage truck washout activities, leather tanners, paper and wood products, petroleum storage and refining/gas production plants, tanks holding fuel and oil for retail distribution, natural or manufactured gas storage, textile mills, transportation equipment, landfills and hazardous waste material disposal, maintenance depots, streets and highways construction, metal production, planting and engraving operations, ports, railroads, petroleum bulk stations or terminals, research and development facilites; and facilites providing business material, hardware, farm equipment, heating, hardware, plumbing, lumber supplies and equipment.

³ The weighted residential housing age scores are based on the presence of houses which are older than 40 years and houses which are between 20 and 40 years of age. Houses older than 40 years were given twice the weighting of the houses which are between 20 and 40 years of age.

⁴ The septic system density scores are based on a scale of 0 to 1, where the catchment with the highest number of septic systems per acre will be given a score of 1, and all other catchments are scored proportionally to the catchment with the highest septic system density.

⁵ Outfalls/interconnections that discharge to or in the vicinity of any of the following areas: public beaches, recreational areas, drinking water supplies, or shellfish beds

**G. Catchment Investigations Completed During Permit
Reporting Period and Prior to Submission of Annual
Report**

Memorandum

Subject CHE01 Catchment Investigation Technical Memorandum

To James Goodreau

From Suzanne Newman, P.E.

Our reference 2022 MS4 Permit Support, 507106794

Date September 28, 2022

1 Background

The 2016 National Pollution Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Separate Storm Sewer Systems (MS4) in Massachusetts requires catchment investigations as part of an Illicit Discharge Detection and Elimination (IDDE) Program. The procedures for this investigation are detailed in the Town of Ludlow's IDDE Plan. Mott MacDonald has completed the catchment investigation for outfall CHE01, the results of which are summarized below. This Memorandum is intended to document how the investigation was completed per the requirements of the permit, specifically Section 2.3.4.8.c.iii, which states: "All data collected as part of the dry and wet weather catchment investigations shall be recorded and reported in each annual report".

2 Catchment Description

Catchment Area CHE01 is located in the southeastern section of the Town of Ludlow, Massachusetts, as shown on the map provided in **Appendix A**. The area is bounded, in general, by Interstate 90 to the north, Chapin Street and Miller Street to the south, Miller Street to the west, and, to the east, a line of demarcation based on topography and drawn roughly north to south, that encompasses the southern end of Bluebird Circle, passes through the western half of Ravenwood Drive, and follows the perimeter of the Lee Tool Company on 40 Ravenwood Drive.

The infrastructure of CHE01 consists of stormwater lines that run from east to west down Bluebird Circle, and then north to south down Miller Street. The stormwater collected on these streets continues to an outfall west of Miller Street, which discharges to the Chicopee River. Also included within the CHE01 Catchment is the western half of Ravenwood Drive and the western portion of the entrance to the Eversource Liquefied Natural Gas (LNG) Plant. Surface runoff from these paved surfaces sheds towards Miller Street and is collected by catch basins along the eastern edge of Miller Street.

Key junction manholes investigated in the CHE01 Catchment include:

- **DMH-460**, which directs stormwater collected on Bluebird Circle and Miller Street.
- **DMH-1084**, which directs stormwater collected on Miller Street southwest towards the outfall into the Chicopee River.

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The upstream junction manhole DMH-460 was investigated first, followed by the downstream junction manhole DMH-1084.

3 Catchment Investigation

Mott MacDonald utilized the catchment investigation procedures developed in the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan. Prior to conducting field investigations, historic maps and plans were reviewed and System Vulnerability Factors (SVFs) were identified. Mott MacDonald then monitored weather forecasts for potential dry weather days on which the investigations could be conducted.

- On August 5th, 2022, Mott MacDonald and the Town of Ludlow commenced investigation of the CHE01 Catchment Area, including the dry weather manhole inspections of DMH-460 (intersection of Bluebird Circle and Miller Street), and DMH-1084 (Miller Street, north of the Green-Towne Bridge).
- On August 29th, 2022, Mott MacDonald performed additional investigations to confirm drain alignments and connections within the CHE01 Catchment Area.

3.1 Maps, Plans and Other Data Sources

Mott MacDonald reviewed the plans titled “As Built Sanitary Sewer & Storm Drain, Miller Street, Ludlow – Mass.”, dated 1991. These plans detail the installation of separate storm and sanitary sewer lines that serve Bluebird Circle and tie into existing infrastructure on Miller Street. The plan “Springfield Gas Light Company Water Main Construction”, dated 1973, was reviewed for information on the existing storm drain on Miller Street at the intersection of Ravenwood Drive. Additionally, “Site Plan, 5 Miller St – Ludlow, Mass., For Timothy Pelletier”, dated 2004, was reviewed for information on the area where the storm drain on Miller Street turns southwest and runs cross country to the outfall into the Chicopee River. Based on town records, the homes and businesses on Bluebird Circle and Miller Street are currently connected to public sanitary sewers, with the exception of 5 Miller Street, which uses a septic system. The homes and businesses on Ravenwood Drive use septic systems, including 19, 31, 40, 45, and 80 Ravenwood Drive, which are all within or close to the CHE01 Catchment. GIS data was reviewed and compared to the historic plans, and Mott MacDonald has updated the GIS data to reflect both the plans and field observations where applicable.

Table 1 summarizes the historic plans which were reviewed for this task.

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Table 1. Supplemental Historic Plans

TOWN PLAN IDENTIFIERS	STREETS	PLAN NAME	PLAN TYPE	PLAN DATE
Drawer 30 Plan 124B	Miller Street	Site Plan, 5 Miller Street – Ludlow, Mass., For Timothy Pelletier	Site Plan	2004
Drawer 04 Plan 53A	Bluebird Circle and Miller Street	As Built Sanitary Sewer & Storm Drain, Miller Street, Ludlow – Mass.	As Built Plan for Separate Sanitary and Storm Sewer	1991
Drawer 03 Plan 68 C-609-002	Ravenwood Drive and Miller Street	Springfield Gas Light Company Water Main Construction	Issue for Bid Water Main Installation	1973

3.2 Manhole Inspection Methodology

Mott MacDonald, with the assistance of the Ludlow DPW, performed dry weather inspections at two (2) key junction manholes in the CHE01 Catchment Area (DMH-460 and DMH-1084 shown in **Appendix A**). Manhole inspections followed the steps identified in the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan for dry weather inspections. Manholes were opened to check for signs of illicit flows and to confirm connection locations and sources. Signs of illicit flows include olfactory evidence (odors such as sewage smell, mustiness, rotten eggs / sulfur, ammonia, and/or petroleum) and visual evidence (floatable matter, pet waste, oily sheen, sanitary waste, algae, and/or foams). No flow was observed at any of the manholes inspected, and therefore no samples were taken. Additionally, no olfactory or visual evidence of illicit flows were present in any of the manholes inspected, and therefore the area was not flagged for further upstream investigation.

3.3 System Vulnerability Factors (SVF)

During the review of historic records, Mott MacDonald reviewed any system vulnerabilities within the CHE01 Catchment Area and has updated the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan accordingly. A copy of the System Vulnerability Factors (SVFs) can be found in **Appendix B**. No system vulnerability factors were identified but, as noted in Appendix B, a section of the infrastructure in Catchment CHE01 is over 40 years, which is not a SVF, but is a consideration for assessing the overall system state. This infrastructure is considered to be over 40 years old since the stormwater lines on the southern section of Miller Street are shown on plans from 1973. Additionally, a Sanitary Sewer Overflow (SSO) event due to a sewer system blockage was recorded at the Miller and Chapin Street intersection in 2015, but because this SSO is over five (5) years old with no other events

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occurring within the catchment area, this event is no longer considered an SVF. There are no known issues associated with the septic systems on Ravenwood Drive or 5 Miller Street that have been noted by the Town Board of Health, and therefore the presence of septic within Catchment CHE01 does not constitute an SVF.

During the dry weather inspection of key junction manholes in the CHE01 Catchment Area, no evidence of illicit discharges was detected, including those due to sewage infiltration from a combined trench or those due to the age of infrastructure.

3.4 Key Junction Manholes and Piping

Two (2) key junction manholes in the CHE01 Catchment Area were opened and investigated in accordance with the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan. A manhole inspection form was completed for each inspected manhole, included in **Appendix C**. Attributes of the key junction manholes investigated are listed below (DMH identifications correspond to map labels as found in **Appendix A**):

- **DMH-460** (intersection of Bluebird Circle and Miller Street)
 - Inlets: from upstream DMH-458 on Bluebird Circle, flowing southwest, and from two catch basins at the intersection of Bluebird Circle and Miller Street
 - Outlet: to downstream DMH-461 on Miller Street, flowing southeast
- **DMH-1084** (Miller Street, north of Green Towne Bridge)
 - Inlets: from upstream DMH-1271 on Miller Street, flowing southeast, and from a catch basin on Miller Street.
 - Outlet: to downstream DMH-1083 west of Miller Street, flowing southwest cross country.

All pipes are constructed of either reinforced concrete or corrugated metal pipe and appear to be in good condition. The age of the storm infrastructure on Bluebird Circle and the portion of Miller Street upstream of DMH-462 is approximately 31 years. No record plans were available for the drainage infrastructure on the southern end of Miller Street (downstream of DMH-462), but it is shown as existing drainage on a 1973 plan for work done on Ravenwood Drive, and therefore is at least 50 years old. No flow was observed, no signs of illicit discharges were observed, and no olfactory evidence was noticed during dry weather investigations.

Additionally, Mott MacDonald noted three drain manholes between DMH-1079 and DMH-1084 that were not identified on the existing GIS records (DMH identifications correspond to map labels as found in **Appendix A**). The southernmost drain manhole was opened and confirmed to be a part of the storm drain system. DMH-1203 and several catch basins were also opened to verify the drainage alignments within the CHE01 Catchment.

As a result of this investigation, the CHE01 Catchment Area limits and drain alignments were updated as presented in **Appendix A**.

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4 Catchment Investigation Results

Mott MacDonald has completed the dry weather catchment investigation of the CHE01 Catchment Area.

Dry Weather Sampling: No samples taken as no flow was observed at either of the two (2) manholes inspected.

Conclusion:

The dry weather catchment investigation for CHE01 is complete. No illicit discharges were identified. Wet weather sampling is not required as no System Vulnerability Factors (SVFs) were identified.

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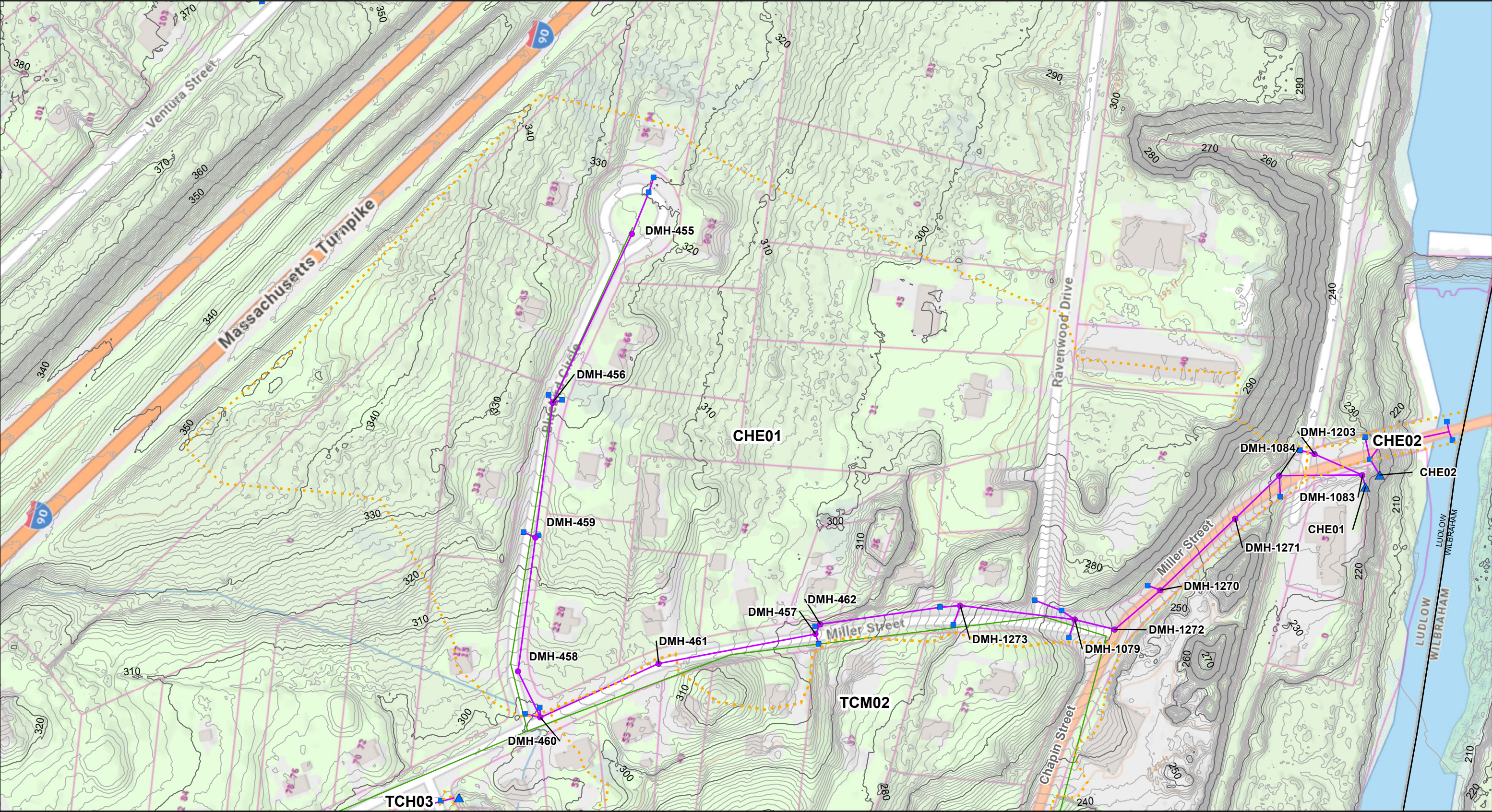
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Appendix A

Catchment Area Map



Storm Drain Manhole

- In-Service
 - Abandoned
- Storm Drain Pipe**
- In-Service
 - Abandoned

- ▲ Discharge Outfall
- Catch Basin
- Sanitary Manhole
- Sanitary Pipe

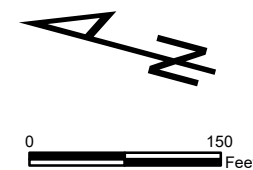
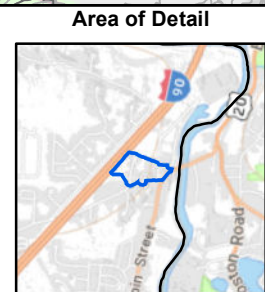
- 10-ft Contour
- 1-ft Contour
- Catchment Area
- Town Boundary



Catchment Area - CHE01

Department of Public Works

Town of Ludlow, Massachussets



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Appendix B

System Vulnerability Factors

Outfall Catchment System Vulnerability Factor (SVF) Inventory
Town of Ludlow, Massachusetts
Revision Date: September 28, 2022

Presence/Absence Evaluation Criteria for SVFs										Additional Considerations not Included as SVFs			
Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	1 SSO Potential in Event of System Failures	2 Sanitary and Storm Drain Infrastructure >40 years Old	3 Septic with Poor Soils or Water Table Separation	4 History of BOH Actions Addressing Septic Failure
CHE01	MA36-23	No	No	No	No	No	No	No	No	No	Yes	No	No

Presence/Absence Evaluation Criteria for SVFs:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
- Common or twin-invert manholes serving storm and sanitary sewer alignments
- Common trench construction serving both storm and sanitary sewer alignments
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations

Additional Considerations not Included as SVFs:

- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
- Any sanitary sewer and storm drain infrastructure greater than 40 years old
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)



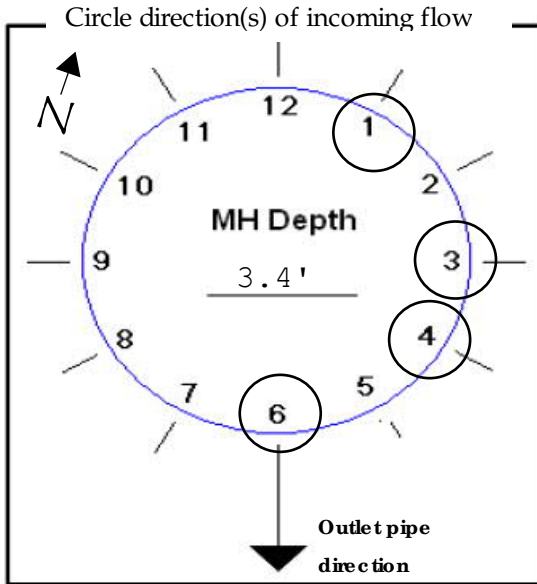
Appendix C

Manhole Inspection Forms

Manhole Inspection Form



Catchment ID CHE01	Date/ Time 5 Aug 2022 8:00 AM
Structure ID DMH_460	Last Rain Date/ Amount 2 Aug 2022: 0.12in
Location Description Miller St / Bluebird Circle 42.160664° -72.426748°	
Inspector Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(1) RCP	12	3' down from rim	CB	Damp
(3) RCP	12	3.3' down from rim	MH	Damp
(4) RCP	12	3' down from rim	CB	Damp
(6) RCP	15	3.4' down from rim	MH	Damp

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

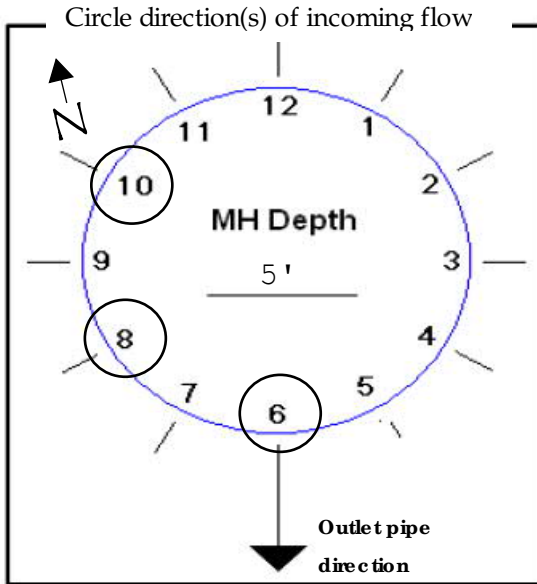
Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: Minor sand, soil, leaf debris. Minor spalling of concrete invert.
Further investigation needed? ☐ Yes ☒ No

Manhole Inspection Form



Catchment ID CHE01	Date/ Time 5 Aug 2022 8:38 AM
Structure ID DMH_1084	Last Rain Date/ Amount 2 Aug 2022: 0.12in
Location Description Miller St, 180ft N of Bridge 42.157757° -72.424146°	
Inspector Tanmay Bahtt, Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(6) RCP	24	NA	MH	Damp
(8) RCP	12	NA	CB	Damp
(10) RCP	24	NA	MH	Damp

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: Damp, potential groundwater infiltration through brick structure.
Further investigation needed? ☐ Yes ☒ No

Memorandum

Subject CHW04 Catchment Investigation Technical Memorandum

To James Goodreau

From Suzanne Newman, P.E.

Our reference 2022 MS4 Permit Support, 507106794

Date September 28, 2022 (Rev. 9/12/2024)

1 Background

The 2016 National Pollution Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Separate Storm Sewer Systems (MS4) in Massachusetts requires catchment investigations as part of an Illicit Discharge Detection and Elimination (IDDE) Program. The procedures for this investigation are detailed in the Town of Ludlow's IDDE Plan. Mott MacDonald has completed the catchment investigation for outfall CHW04, the results of which are summarized below. This Memorandum is intended to document how the investigation was completed per the requirements of the permit, specifically Section 2.3.4.8.c.iii, which states: "All data collected as part of the dry and wet weather catchment investigations shall be recorded and reported in each annual report".

2 Catchment Description

Catchment area CHW04 is located in the southwestern section of the Town of Ludlow, Massachusetts, as shown on the map provided in **Appendix A**. The area is bounded, in general, by Hubbard Street to the north, East Street to the south, Lower Whitney Street to the east, and Center Street to the west.

A stormwater trunk line within the CHW04 Catchment runs east to west along East Street, from the intersection of Whitney Street and East Street to an outfall west of Center Street, near the Putts Bridge Hydro Plant, at the Chicopee River. Stormwater lines collect runoff on the southern segment of Sewall Street (south of the Hubbard Street intersection), on Chestnut Street, Park Place, Park Terrace, and on the western end of Winsor Street, directing stormwater in a southerly direction to the aforementioned East Street trunk line. Additional catch basins at Memorial Park, at the parking lot for Stevens Memorial Apartments, and at the corner of East Street and State Street tie these areas into the CHW04 Catchment as well.

The eastern portion of the East Street trunk line, from the intersection of Lower Whitney Street and East Street (DMH-706 in **Appendix A**) to the intersection of State Street and East Street (DMH-700 in **Appendix A**), no longer appears to be in service, with a more recent stormwater line constructed in the year 1996 now collecting stormwater in this area and directing it to the outfall of Catchment Area CHW05.

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Key junction manholes investigated in the CHW04 Catchment include:

- **DMH-696**, which directs stormwater collected on the southern segment of Sewall Street (south of the Hubbard Street intersection) to the trunk line running west along East Street.
- **DMH-692**, which directs stormwater collected on Chestnut Street and the parking lot for Stevens Memorial Apartments to the trunk line running west along East Street
- **DMH-690**, which directs stormwater collected on Park Place, Park Terrace, the western portion of Winsor Street, and Memorial Park to the trunk line running west along East Street.
- **DMH-686**, which directs stormwater collected from the southern end of Center Street to the trunk line running west along East Street
- **DMH-716**, which directs stormwater collected from the western end of Winsor Street (between Center Street and Chestnut Street) to the stormwater line running south along Park Place.

Because Catchment Area CHW04 is relatively small in size but located in a densely populated section of town, all manholes listed above were considered key junction manholes for which investigation was required, and therefore they were inspected in the order of logistical convenience rather than by a systematic upstream or downstream method.

3 Catchment Investigation

Mott MacDonald utilized the catchment investigation procedures developed in the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan. Prior to conducting field investigations, historic maps and plans were reviewed and System Vulnerability Factors (SVFs) were identified. Mott MacDonald then monitored weather forecasts for potential dry weather days on which the investigations could be conducted.

- On August 5th, 2022, Mott MacDonald and the Town of Ludlow commenced investigation of the CHW04 Catchment Area, including the dry weather manhole inspection of DMH-696 at the intersection of Sewall Street and East Street.
- On August 8th, 2022, Mott MacDonald and the Town of Ludlow performed further investigations of the CHW04 Catchment Area and Outfall to confirm stormwater line alignment in the catchment area.
- On August 29th, 2022, Mott MacDonald and the Town of Ludlow concluded investigation of the CHW04 Catchment Area and performed dry weather manhole inspections of DMH-692, DMH-690, DMH-686, and DMH-716.

3.1 Maps, Plans and Other Data Sources

Mott MacDonald reviewed as-built plans titled “East Street Area Improvement Project”, dated 1983. These plans detail the installation of the stormwater line system that currently serves the entire CHW04 Catchment Area. Record plans from the 1996 “Combined Sewer Separation Overflow Abatement Project” on East Street were also reviewed and found to show that the eastern portion of the 1983 “East Street Area Improvement Project” (from the intersection of Whitney Street and East Street to the intersection of State Street and East Street), is no longer in service, with stormwater runoff from this area now directed to Catchment CHW05. Additionally, a site survey titled “Plan of Land in Ludlow, Massachusetts Surveyed for Wright-Pierce” and dated 2020, was compared to the stormwater line plans. These records were used to outline field activities and assess system vulnerability factors. Information related to historic septic systems were not available. Based on Town records, it is believed that the homes and businesses in the area are currently connected to public sanitary sewers. GIS data

was reviewed and compared to the historic plans, and Mott MacDonald has updated the GIS data to reflect both the plans and field observations where applicable.

Table 1 summarizes the historic plans which were reviewed for this task.

Table 1. Supplemental Historic Plans

TOWN PLAN IDENTIFIERS	STREETS	PLAN NAME	PLAN TYPE	PLAN DATE
DWG 6726wo01	East Street, State Street	Plan of Land in Ludlow, Massachusetts Surveyed for Wright-Pierce	Plan of Land / Existing Condition Survey	2020
C.T.M. DWG No. 98-124	East Street, State Street	Combined Sewer Separation Overflow Abatement Project	Record Plan Stormwater Line	1996
Drawer 24 Plan A-14	Center Street, East Street, Sewall Street, Chestnut Street, Park Place, Park Terrace, Winsor Street	East Street Area Improvement Project	As Built Stormwater Line	1983

3.2 Manhole Inspection Methodology

Mott MacDonald, with the assistance of the Ludlow DPW, performed dry weather inspections at five (5) key junction manholes in the CHW04 Catchment Area (DMH-696, DMH-692, DMH-690, DMH-686, and DMH-716 in **Appendix A**). The outfall for Catchment Area CHW04 into the Chicopee River was also inspected at this time. Manhole inspections followed the steps identified in the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan for dry weather inspections. Manholes were opened to check for signs of illicit flows and to confirm connection locations and sources. Signs of illicit flows include olfactory evidence (odors such as sewage smell, mustiness, rotten eggs / sulfur, ammonia, and/or petroleum) and visual evidence (floatable matter, pet waste, oily sheen, sanitary waste, algae, and/or foams). No flow was observed at any of the manholes inspected, and therefore no samples were taken. Additionally, no olfactory or visual evidence of illicit flows were present in any of the manholes inspected, and therefore the area was not flagged for further upstream investigation.

3.3 System Vulnerability Factors (SVF)

During the review of historic records, Mott MacDonald identified system vulnerabilities within the CHW04 Catchment Area and has updated the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan accordingly. A copy of the System Vulnerability Factors (SVFs) can be found in **Appendix B**. A history of Sanitary Sewer Overflow (SSO) events is considered an SVF. SSO events occurred twice at 21 Park Terrace in 2018, and at 44 Center Street in 2020. In all cases, sewer lines were jetted to clear blockages, causing overflows to the streets and subsequent discharging to the catch basins draining into the Chicopee River. No other known SSO events have occurred in this area. The CHW04 Catchment Area has been served by separated sanitary and storm sewers since the 1983 East Street Area Improvement Project. However, the former presence of combined sewers on East Street, Winsor

Street, and the southern portion of Chestnut and Sewall Streets constitute a SVF due to the increased potential for illicit connections.

During the dry weather inspection of key junction manholes in the CHW04 Catchment Area, no evidence of illicit discharges was detected, including those due to SSO events or those from illicit connections to the separated storm sewer.

3.4 Key Junction Manholes and Piping

Five (5) key junction manholes in the CHW04 Catchment Area were opened and investigated in accordance with the Town of Ludlow Illicit Discharge Detection and Elimination (IDDE) Plan. A manhole inspection form was completed for each inspected manhole, included in **Appendix C**. Attributes of the key junction manholes investigated are listed below (DMH identifications correspond to map labels as found in **Appendix A**):

- **DMH-696** (intersection of Sewall Street and East Street)
 - Inlets: from upstream DMH-702 on East Street, flowing west, and from upstream DMH-705 on Sewall Street, flowing south
 - Outlet: to downstream DMH-695 on East Street, flowing west
- **DMH-692** (intersection of Chestnut Street and East Street)
 - Inlets: from upstream DMH-694 on East Street, flowing west, and from upstream DMH-693 on Chestnut Street, flowing south.
 - Outlet: to downstream DMH-691 on East Street, flowing west.
- **DMH-690** (intersection of Park Place and East Street)
 - Inlets: from upstream DMH-691 on East Street, flowing west, and from upstream DMH-712 on Park Street, flowing south.
 - Outlet: to downstream DMH-689 on East Street, flowing west.
- **DMH-686** (north of intersection of Center Street and East Street)
 - Inlets: from upstream DMH-688 on East Street, flowing northwest, and from upstream DMH-687 on Center Street, flowing south.
 - Outlet: to downstream DMH-685, flowing west.
- **DMH-716** (intersection of Winsor Street and Park Place)
 - Inlets: From upstream DMH-718 on Winsor Street, flowing east, and from upstream DMH-717 on Winsor Street, flowing west.
 - Outlet: to downstream DMH-715 on Park Place, flowing south.

All pipes are constructed of reinforced concrete and appear to be in good condition. The storm infrastructure was installed as part of the 1983 East Street Area Improvement project, and its age is therefore approximately 39 years. No flow was observed, no signs of illicit discharges were observed, and no olfactory evidence was noticed during dry weather investigations.

Additionally, Mott MacDonald opened the following stormwater manholes to verify the delineations of Catchment Areas CHW04 and CHW05 (DMH identifications correspond to map labels as found in **Appendix A**).

- DMH-702 determined to be in CHW04 Catchment
- Catch basin on the southwest corner of the State Street / East Street intersection, found to be a junction for stormwater lines from upstream DMH-1015 on State Street and DMH-701 on East Street, and flowing towards downstream DMH-698. This was therefore determined to be in CHW05 Catchment

- DMH-1188 Determined to be in CHW04 Catchment
- DMH-1015 Determined to be in CHW05 Catchment
- DMH-700 Determined to be in CHW04 Catchment
- DMH-701 Determined to be in CHW05 Catchment
- DMH-708 Determined to be in CHW04 Catchment, but no longer in service
- DMH-706 Determined to be in CHW04 Catchment, but no longer in service
- DMH-703 Determined to be in CHW05 Catchment

As a result of this investigation, the CHW04 Catchment Area limits were revised as presented in **Appendix A**. Overall updates to the Town GIS system were made based on the above information.

4 Catchment Investigation Results

Mott MacDonald has completed the dry weather and wet weather work associated with the catchment investigation of the CHW04 Catchment Area.

Dry Weather Sampling: No samples taken as no flow was observed at any of the five (5) manholes inspected.

Wet Weather Sampling: Wet weather samples were taken on May 8th, 2024. As recorded by the NOAA weather station (KCEF) Westover Air Force Base, at the time of our sampling, 0.27" of rain had fallen within the past 3 hours. The rainfall event started approximately two hours before sampling; therefore, the first flush is presumed to have passed. Samples were taken from the outfall and field screened for ammonia, chlorine, conductivity, salinity, surfactants, and temperature. Samples were lab-tested for E. Coli. In accordance with the MA MS4 General Permit, samples were also tested for applicable pollutants of concern. Given that this outfall discharges to the MA36-24 segment of Chicopee River, which is a water quality limited water, and given that the Town is subject to a Total Maximum Daily Load (TMDL) for Nitrogen for the Long Island Sound, samples were lab tested for Fecal Coliform and Nitrogen (Total) as S-Total Kjeldahl Nitrogen (S-TKN). S-Nitrate-N/Nitrite-N. Results are summarized below in **Table 2**.

Per the MA MS4 General Permit Section 2.3.4.7.c.ii footnote 6, likely sewer input indicators are any of the following:

1. Olfactory or visual evidence of sewage.
2. Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
3. Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

Additionally, per 314 CMR 4.00: Massachusetts Surface Water Quality Standards, section 4.05.5(f)1a, concentrations for E. Coli shall not exceed 126 colony-forming units (cfu) per 100 mL for the geometric mean of all samples collected within a 90-day interval, and no more than 10% of all samples shall exceed 410 cfu per 100 mL.¹ Assuming that 1 cfu/mL is approximately equivalent to 1 most probable number (MPN)/mL, and given that only one sample was taken at the outfall, the mean 126 cfu/100 mL threshold has been taken as the relevant standard.

Per the results outlined below, the wet weather testing conducted indicated likely sewer input under cases (2) and (3) outlined above. In case (2), the ammonia recorded was 0.75 mg/L (≥ 0.5 mg/L), surfactants recorded was 0.25 mg/L (≥ 0.25 mg/L), and E. Coli was 1400 MPN/100 mL (≥ 126 cfu/100 mL). In case (3), the ammonia and surfactants thresholds were surpassed as in case (2), and detectable levels of chlorine

¹ Massachusetts Water Quality Standards: <https://www.epa.gov/system/files/documents/2023-06/mawqs-2023.pdf>

were identified (0.10 mg/L > 0.02 mg/L). Additionally, although there was not an overt olfactory or visual evidence of sewage, foam was noted at the outfall.

Table 2. Wet Weather Sampling Summary

Parameter	Benchmark	Test Results	Field Test Equipment	Lab Test Method
Ammonia	<.50 mg/L	0.75 mg/L	Chemetrics K-1420 Test Kit	-
Chlorine	<0.02 mg/L	0.10 mg/L	HACH Pocket Colorimeter	-
Conductivity	2000 µS/cm	53.1 µS/cm	Oakton CTSTestr 50	-
Salinity	0.99 g/L ^A	0.00 g/L ^B	Oakton CTSTestr 50	-
Surfactants	<.25 mg/L	0.25 mg/L ^C	Chemetrics K-9400 Test Kit	-
Temperature	-	61.2°F	Oakton CTSTestr 50	-
E. Coli	<126 cfu/100 mL	1400 MPN/100 mL	-	SM 9223B - Colilert 18
Fecal Coliform	-	>2419.6 MPN/100 mL	-	SM 9223B - Colilert 18
TKN	-	0.86 mg/L	-	EPA 351.2
Nitrate/Nitrite	-	0.17 mg/L	-	EPA 353.2
Nitrogen (Total)	-	1.03 mg/L	-	-

^A Salinity benchmark converted from conductivity: mS/cm^{1.0878} * .4665 = g / L

^B Note, original test results were in parts per thousand (ppt) and converted to g/L: 1ppt = 1 g/L

^C Note, original test results were in parts per million (ppm) and converted to mg/L: 1ppm = 0.9989 mg/L

Conclusion:

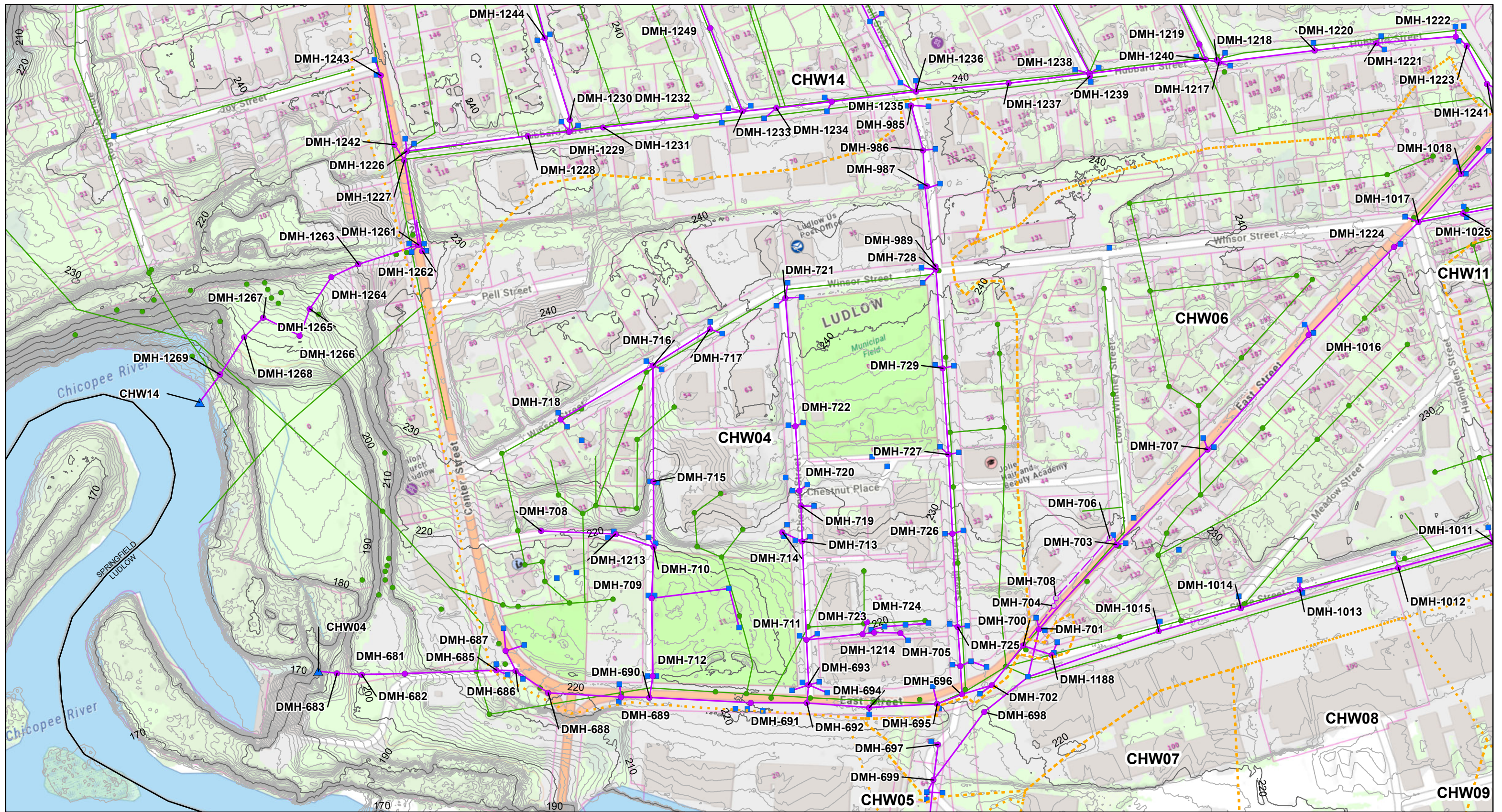
The dry weather catchment investigation for CHW04 is complete. No illicit discharges were identified during dry weather investigations. Wet weather sampling was required due to the System Vulnerability Factors (SVFs) identified. The MA MS4 General Permit Section 2.3.4.8.c.ii.1.b.1 states that “where a minimum of one (1) SVF is identified based on previous information or the investigation, a wet weather investigation must be conducted at the associated outfall”. Therefore, the outfall was sampled during wet weather. As outlined above, the wet weather sampling completed indicated possible contaminants. It is recommended that the Town further investigate the catchment area during wet weather to attempt to identify any illicit discharges that may be occurring.

Note, Section 2.3.4.10 requires that “upon completion of all catchment investigations pursuant to part 2.3.4.8.c and illicit discharge removal and confirmation (if necessary) pursuant to paragraph 2.3.4.8.e, each outfall or interconnection shall be reprioritized for screening in accordance with part 2.3.4.7.a and scheduled for ongoing screening once every five years”.



Appendix A

Catchment Area Map



Storm Drain Manhole

- In-Service
 - Abandoned
- #### Storm Drain Pipe
- In-Service
 - - - Abandoned

- ▲ Discharge Outfall
- Catch Basin
- Sanitary Manhole
- Sanitary Pipe

- 10-ft Contour
- - - 1-ft Contour
- ▨ Catchment Area
- Town Boundary

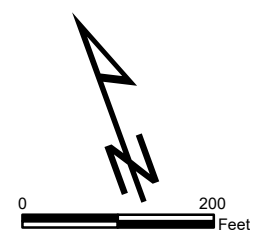
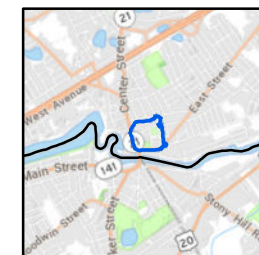


Catchment Area - CHW04

Department of Public Works

Town of Ludlow, Massachusetts

Area of Detail



M
M
MOTT
MACDONALD



Appendix B

System Vulnerability Factors

Outfall Catchment System Vulnerability Factor (SVF) Inventory
Town of Ludlow, Massachusetts
Revision Date: September 19, 2022

Presence/Absence Evaluation Criteria for SVFs										Additional Considerations Not Included as SVFs			
Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	1 SSO Potential in Event of System Failures	2 Sanitary and Storm Drain Infrastructure >40 years Old	3 Septic with Poor Soils or Water Table Separation	4 History of BOH Actions Addressing Septic Failure
CHW04	MA36-24	Yes	No	No	No	No	No	Yes	No	No	No	No	No

Presence/Absence Evaluation Criteria for SVFs:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
- Common or twin-invert manholes serving storm and sanitary sewer alignments
- Common trench construction serving both storm and sanitary sewer alignments
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations

Additional Considerations Not Included as SVFs:

- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
- Any sanitary sewer and storm drain infrastructure greater than 40 years old
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)



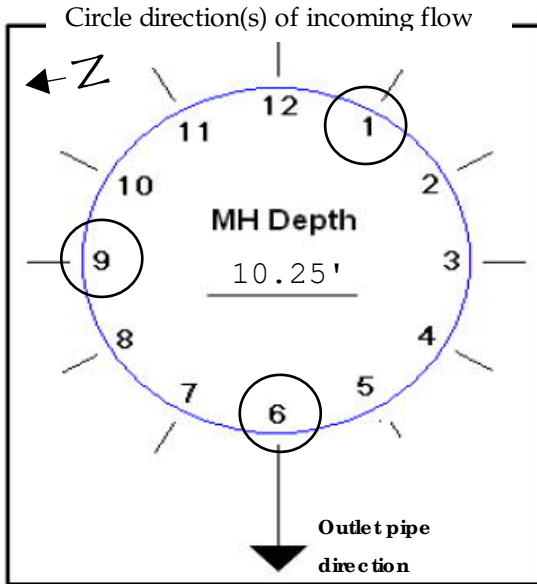
Appendix C

Manhole Inspection Forms

Manhole Inspection Form



Catchment ID CHW04	Date/ Time 29 Aug 2022 09:30 AM
Structure ID DMH_686	Last Rain Date/ Amount 26 Aug 2022: 0.29in
Location Description Center St at Hydro Plant Entrance 42.157599° -72.484637°	
Inspector Wiktor Tomkiewicz, Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(1) RCP	36	10.2' down from rim	MH	Slightly Damp
(6) RCP	42	10.25' down from rim	MH	Slightly Damp
(9) RCP	18	8.2' down from rim	MH	Slightly Damp

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

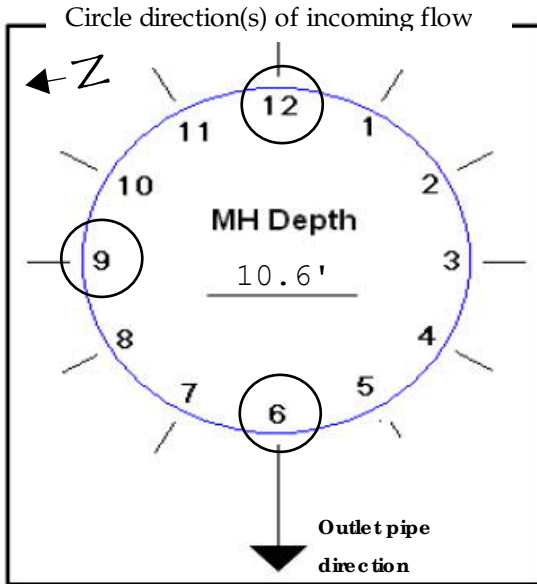
Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: No indication that minor dampness is caused by illicit discharges.
Further investigation needed? ☐ Yes ☒ No

Manhole Inspection Form



Catchment ID CHW04	Date/ Time 29 Aug 2022 09:20 AM
Structure ID DMH_690	Last Rain Date/ Amount 26 Aug 2022: 0.29in
Location Description East St / Park Place 42.157176° -72.483687°	
Inspector Wiktor Tomkiewicz, Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(6) RCP	36	10.6' down from rim	MH	Damp
(9) RCP	18	9.2' down from rim	MH	Damp
(12) RCP	36	10.6' down from rim	MH	Damp

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

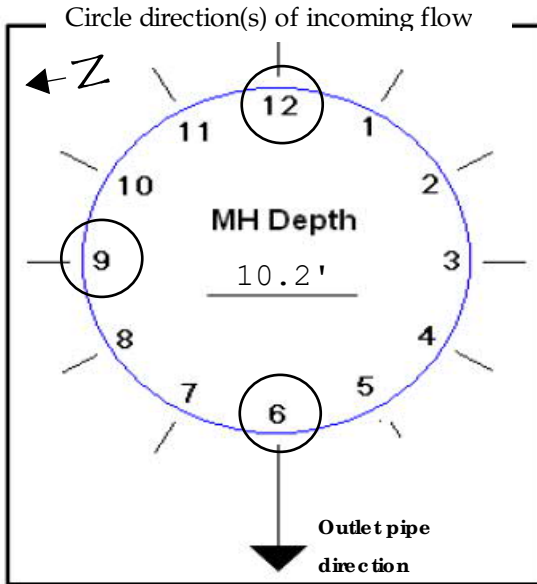
Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: No indication that dampness along inverts is caused by illicit discharges.
Further investigation needed? ☐ Yes ☒ No

Manhole Inspection Form



Catchment ID CHW04	Date/ Time 29 Aug 2022 09:15 AM
Structure ID DMH_692	Last Rain Date/ Amount 26 Aug 2022: 0.29in
Location Description East St / Chestnut St 42.156802° -72.482472°	
Inspector Wiktor Tomkiewicz, Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(6) RCP	36	10.2' down from rim	MH	Damp
(9) RCP	18	8.7' down from rim	MH	Damp
(12) RCP	36	10.2' down from rim	MH	Damp

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

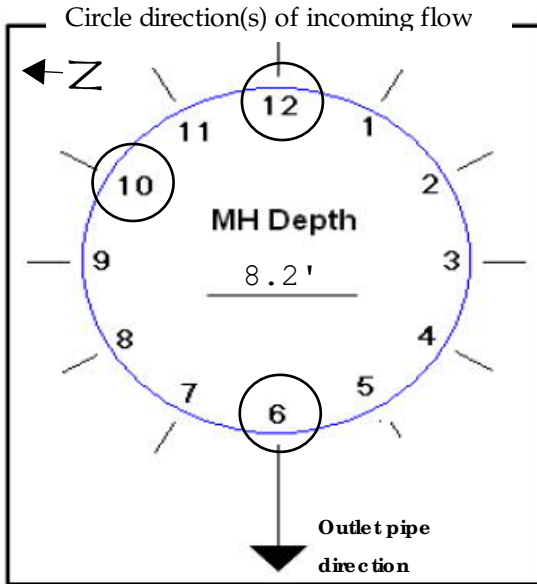
Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: No indication that dampness along inverts is caused by illicit discharges.
Further investigation needed? ☐ Yes ☒ No

Manhole Inspection Form



Catchment ID CHW04	Date/ Time 5 Aug 2022 11:00 AM
Structure ID DMH_696	Last Rain Date/ Amount 2 Aug 2022: 0.12in
Location Description East St / Sewall St 42.156577° -72.481312°	
Inspector Tanmay Bahtt, Martin Rubino	



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(6) RCP	36	8.2' down from rim	MH	Dry
(10) RCP	18	6.8' down from rim	MH	Dry
(12) RCP	30	7.3' down from rim	MH	Dry

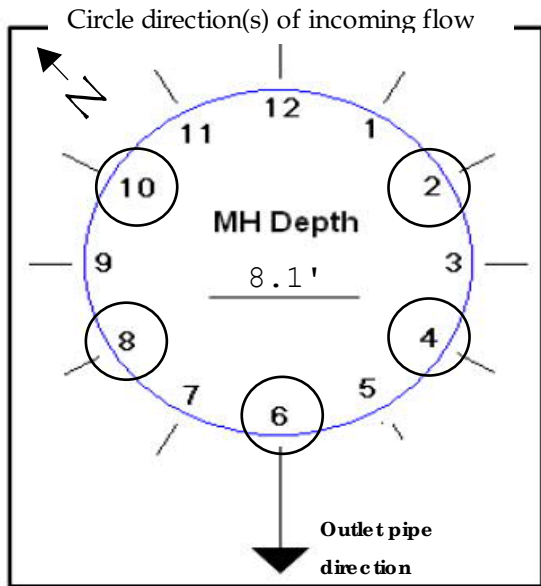
Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate
Evidence of Flow: ☐ Yes ☒ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
		Ammonia	NA

COMMENTS: Chalky residue along invert. Signs of dampness and/or water infiltration. Noted that roadwork is currently being performed in this area.
Further investigation needed? ☐ Yes ☒ No

Catchment ID	CHW04	Date/ Time	29 Aug 2022 09:40 AM
Structure ID	DMH_716	Last Rain Date/ Amount	26 Aug 2022: 0.29in
Location Description	Winsor St / Park Place 42.159049° -72.482758°		
Inspector	Wiktor Tomkiewicz, Martin Rubino		



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/ Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
(2) RCP	15	7.9' down from rim	MH	Dry
(6) RCP	18	8.1' down from rim	MH	Dry
(8) RCP	15	7.9' down from rim	MH	Dry
(4) RCP	12	4.1' down from rim	CB	Dry
(10) RCP	12	5.5' down from rim	CB	Dry

Cover Conditions: Diameter of clear opening (in.) 24 ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate						
Evidence of Flow: ☐ Yes ☒ No		If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High				

Visual Evidence of Illicit Discharge (select all that apply) Visual Inspection: ☒ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam
Olfactory Evidence of Illicit Discharge (select all that apply) Olfactory Inspection: ☒ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results			
Chlorine	NA	Surfactants	NA
Ammonia	NA		

COMMENTS:

Further investigation needed? ☐ Yes ☒ No



Appendix D

Wet Weather Outfall Inspection Forms



Outfall I.D.: CHW04 Date: 5/8/24
 Inspector: Noah Palmer / Marbin
 Time of Inspection: 9:35am
 Street Name: Center Street
 Last rainfall event: 7:30am start

WET WEATHER OUTFALL INSPECTION SURVEY

Visual Inspection:	Yes	No	Comments (Include probable source of observed contamination):
Color	☐	☒	
Odor	☐	☒	
Turbidity	☐	☒	
Excessive Sediment	☐	☒	
Sanitary Waste	☐	☒	
Pet Waste	☐	☒	
Floatable Solids	☐	☒	
Oil Sheen	☐	☒	
Bacterial Sheen	☐	☒	
Foam	☒	☐	See red circle in photo
Algae	☐	☒	
Orange Staining	☐	☒	
Excessive Vegetation	☐	☒	
Optical Enhancers	☐	☒	
Other			

Sample Parameters	Analytical Test Method	Benchmark*	Field Screening Result	Full Analytical?
Ammonia ¹	EPA 350.2/SM4500-NH3C	>0.5 mg/L		☐ Yes ☐ No
Specific Conductance ¹	SM 2510B	>2,000		☐ Yes ☐ No
Detergents & Surfactants ²	EPA 425.1/SM5540C	> 0.25 mg/L		☐ Yes ☐ No
Fluoride ²	EPA 300.0	>0.25 mg/L		☐ Yes ☐ No
pH ¹	EPA 150.1/SM 4500H	<5		☐ Yes ☐ No
Potassium ¹	EPA 200.7	>20 mg/L		☐ Yes ☐ No

Comments: See next page for field test results

¹ – Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection and Robert Pitt of University of Alabama, 2004, p. 134, Table 45.

² – Appendix I – Field Measurements, Benchmarks and Instrumentation, Draft Massachusetts North Coastal Small MS4 General Permit, 2009.

CHW04

Conductivity: 53.1 $\mu\text{S}/\text{cm}$

Temperature: 61.2 $^{\circ}\text{F}$

Salinity: 0.00 ppt

Ammonia: 0.75 mg/L

Chlorine: 0.10 mg/L

Detergents: 0.25 ppm

Figure 1: CHW04
Outfall Location



May 8, 2024 at 09:37:07
+42.158052, -72.486015
119° SE
Altitude: 192.7ft

Figure 2:
CHW04 Foam



May 8, 2024 at 09:39:41
+42.157955, -72.486144
104° E
Altitude: 178.7ft



Appendix E

Lab Test Results

May 17, 2024

Suzanne Newman
Mott MacDonald - PA
325 Chestnut Street Suite 300
Philadelphia, PA 19106

Project Location: Ludlow, MA
Client Job Number:
Project Number: 00139606 - Water Testing
Laboratory Work Order Number: 24E1234

Enclosed are results of analyses for samples as received by the laboratory on May 8, 2024. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Kyle K. Stuckey
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332Mott MacDonald - PA
325 Chestnut Street Suite 300
Philadelphia, PA 19106
ATTN: Suzanne Newman

REPORT DATE: 5/17/2024

PURCHASE ORDER NUMBER: 00139606

PROJECT NUMBER: 00139606 - Water Testing

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 24E1234

The results of analyses performed on the following samples submitted to CON-TEST, a Pace Analytical Laboratory, are found in this report.

PROJECT LOCATION: Ludlow, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
CHE01	24E1234-01	Water		-	NY10478; M-NY026
				EPA 351.2	NY10478; M-NY026
				EPA 353.2	NY10478; M-NY026
				SM 9223B - Colilert 18	
CHW04	24E1234-02	Water		-	NY10478; M-NY026
				EPA 351.2	NY10478; M-NY026
				EPA 353.2	NY10478; M-NY026
				SM 9223B - Colilert 18	

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

The results of analyses reported only relate to samples submitted to Con-Test, a Pace Analytical Laboratory, for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington
Technical Representative

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Ludlow, MA

Sample Description:

Work Order: 24E1234

Date Received: 5/8/2024

Field Sample #: CHE01

Sampled: 5/8/2024 09:30

Sample ID: 24E1234-01

Sample Matrix: Water

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Coliform, Total	>2419.6	1.0	MPN/100 mL	1		SM 9223B - Colilert 18	5/8/24	5/8/24 16:18	JEC
E. Coli	>2419.6	1.0	MPN/100 mL	1		SM 9223B - Colilert 18	5/8/24	5/8/24 16:18	JEC

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Ludlow, MA

Sample Description:

Work Order: 24E1234

Date Received: 5/8/2024

Sampled: 5/8/2024 09:30

Field Sample #: CHE01

Sample ID: 24E1234-01

Sample Matrix: Water

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
See Attached Subcontracted Report	-	-	mg/L	1		EPA 353.2	5/13/24	5/13/24 10:29	PACELI
See Attached Subcontracted Report	-	-	mg/L	1		EPA 351.2	5/14/24	5/14/24 11:45	PACELI

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Ludlow, MA

Sample Description:

Work Order: 24E1234

Date Received: 5/8/2024

Field Sample #: CHW04

Sampled: 5/8/2024 11:15

Sample ID: 24E1234-02

Sample Matrix: Water

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Coliform, Fecal	>2419.6	1.0	MPN/100 mL	1		SM 9223B - Colilert 18	5/8/24	5/8/24 16:27	JEC
Coliform, Total	>2419.6	1.0	MPN/100 mL	1		SM 9223B - Colilert 18	5/8/24	5/8/24 16:18	JEC
E. Coli	1400	1.0	MPN/100 mL	1		SM 9223B - Colilert 18	5/8/24	5/8/24 16:18	JEC

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Ludlow, MA

Sample Description:

Work Order: 24E1234

Date Received: 5/8/2024

Sampled: 5/8/2024 11:15

Field Sample #: CHW04

Sample ID: 24E1234-02

Sample Matrix: Water

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
See Attached Subcontracted Report	-	-	mg/L	1		EPA 353.2	5/13/24	5/13/24 10:30	PACELI
See Attached Subcontracted Report	-	-	mg/L	1		EPA 351.2	5/14/24	5/14/24 11:46	PACELI

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332**Sample Extraction Data****SM 9223B - Colilert 18**

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
24E1234-02 [CHW04]	B373770	100	100	05/08/24

SM 9223B - Colilert 18

Lab Number [Field ID]	Batch	Initial [mL]	Final [mL]	Date
24E1234-01 [CHE01]	B373775	100	100	05/08/24
24E1234-02 [CHW04]	B373775	100	100	05/08/24

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL**Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total) - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch B373770 - SM 9223B - Colilert 18**Blank (B373770-BLK1)**

Prepared & Analyzed: 05/08/24

Coliform, Fecal	ND	1.0	MPN/100 mL
-----------------	----	-----	------------

Batch B373775 - SM 9223B - Colilert 18**Blank (B373775-BLK1)**

Prepared & Analyzed: 05/08/24

Coliform, Total	ND	1.0	MPN/100 mL
E. Coli	ND	1.0	MPN/100 mL

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332**FLAG/QUALIFIER SUMMARY**

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS**Certified Analyses included in this Report**

Analyte	Certifications
---------	----------------

SM 9223B - Colilert 18 in Water

Coliform, Fecal	MA,CT,RI,ME
E. Coli	MA,CT,RI

Con-Test, a Pace Environmental Laboratory, operates under the following certifications and accreditations:

Code	Description	Number	Expires
MA	Massachusetts DEP	M-MA100	06/30/2024
CT	Connecticut Department of Public Health	PH-0821	12/31/2024
NY	New York State Department of Health	10899 NELAP	04/1/2025
NH	New Hampshire Environmental Lab	2516 NELAP	02/5/2025
RI	Rhode Island Department of Health	LAO00373	12/30/2024
NC	North Carolina Div. of Water Quality	652	12/31/2024
ME	State of Maine	MA00100	06/9/2025
VA	Commonwealth of Virginia	460217	12/14/2024

[illegible]

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Log In Back-Sheet

Notes regarding Samples/COC outside of SOP:

	True	False
Received on Ice	☒	☐
Received in Cooler	☒	☐
Custody Seal: DATE	☐	☒
Custody Seal: TIME	☒	☐
COC Relinquished	☒	☐
COC/Samples Labels Agree	☒	☐
All Samples in Good Condition	☒	☐
Samples Received within Holding Time	☒	☐
Is there enough Volume	☒	☐
Proper Media/Container Used	☒	☐
Splitting Samples Required	☐	☒
MS/MSD	☐	☒
Trip Blanks	☐	☒
Lab to Filters	☐	☒
COC Legible	☒	☐
COC Included. (Check all included)		
Client ☒	Analysis ☒	Sampler Name ☒
Project ☒	IDs ☒	Collection Date/Time ☒
All Samples Proper pH: N/A ☒		

Note: West Virginia requires all samples to have their temperature taken. Note any outliers.

Table of Contents

	DC#_Title: ENV-FRM-ELON-0001 v07_Sample Receiving Checklist
	Effective Date: 07/13/2023

Sample	Soils Jars	
	(Circle Amb/Clear)	
1	16oz Amb/Clear	
2	8oz Amb/Clear	
3	4oz Amb/Clear	
4	2oz Amb/Clear	
5	Unpreserved	
6	HCL	
7	Sulfuric	
8	Sulfuric	
9	Phosphoric	
10	HCl	
11	Unpreserved	
12	Unpreserved	
13	Sulfuric	
14	Unpreserved	
15	Sulfuric	
16	Unpreserved	
17	Sulfuric	
18	Unpreserved	
19	Sulfuric	
20	Unpreserved	
Sample	Ambers	
1	1 Liter	
2	250mL	
3	100mL	
4	1 Liter	
5	500mL	
6	Unpreserved	
7	Sulfuric	
8	Unpreserved	
9	Sulfuric	
10	Unpreserved	
11	Trizma	
12	Sulfuric	
13	Nitric	
14	NaOH	
15	Ammonium Acetate	
16	NaOH/Zinc	
17	Unpreserved	
18	HCl	
19	MeOH	
20	D.I. Water	
Sample	VOA Vials	
1	BiSulfate	
2	Col/Bact	
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Sample	Plastics	
1	250mL	
2	Unpreserved	
3	Trizma	
4	Sulfuric	
5	Nitric	
6	NaOH	
7	Ammonium Acetate	
8	NaOH/Zinc	
9	Unpreserved	
10	HCl	
11	MeOH	
12	D.I. Water	
13	BiSulfate	
14	Col/Bact	
15		
16		
17		
18		
19		
20		
Sample	Other / Fill in	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
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15		
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17		
18		
19		
20		



May 14, 2024

Kyle Stuckey
Pace-Contest
39 Spruce St.
East Longmeadow, MA

RE: Project: 24E1234
Pace Project No.: 70297488

Dear Kyle Stuckey:

Enclosed are the analytical results for sample(s) received by the laboratory on May 10, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Melville

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Matthew T. Nemeth
matthew.nemeth@pacelabs.com
516-370-6042
Project Manager

Enclosures

cc: Raymond McCarthy, Pace Analytical Services - New
England
elon reports



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: 24E1234
Pace Project No.: 70297488

Pace Analytical Services Long Island

575 Broad Hollow Rd, Melville, NY 11747
Connecticut Certification #: PH-0435
Delaware Certification # NY 10478
Maryland Certification #: 208
Massachusetts Certification #: M-NY026
New Hampshire Certification #: 2987

New Jersey Certification #: NY158
New York Certification #: 10478 Primary Accrediting Body
Pennsylvania Certification #: 68-00350
Rhode Island Certification #: LAO00340
Virginia Certification # 460302

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ANALYTICAL RESULTS

Project: 24E1234
Pace Project No.: 70297488

Sample: 24E1234-01		Lab ID: 70297488001		Collected: 05/08/24 09:30		Received: 05/10/24 08:00		Matrix: Water	
Parameters		Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Melville							
Nitrogen, Kjeldahl, Total		0.77	mg/L	0.10	1	05/14/24 03:42	05/14/24 11:45	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2 Pace Analytical Services - Melville							
Nitrate-Nitrite (as N)		1.2	mg/L	0.050	1		05/13/24 10:29	7727-37-9	

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Date: 05/14/2024 03:15 PM



ANALYTICAL RESULTS

Project: 24E1234

Pace Project No.: 70297488

Sample: 24E1234-02		Lab ID: 70297488002		Collected: 05/08/24 11:15		Received: 05/10/24 08:00		Matrix: Water	
Parameters		Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Melville							
Nitrogen, Kjeldahl, Total		0.86	mg/L	0.10	1	05/14/24 03:42	05/14/24 11:46	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2 Pace Analytical Services - Melville							
Nitrate-Nitrite (as N)		0.17	mg/L	0.050	1		05/13/24 10:30	7727-37-9	

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Date: 05/14/2024 03:15 PM

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QUALITY CONTROL DATA

Project: 24E1234

Pace Project No.: 70297488

QC Batch: 347908

Analysis Method: EPA 351.2

QC Batch Method: EPA 351.2

Analysis Description: 351.2 TKN

Laboratory: Pace Analytical Services - Melville

Associated Lab Samples: 70297488001, 70297488002

METHOD BLANK: 1798872

Matrix: Water

Associated Lab Samples: 70297488001, 70297488002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	ND	0.10	05/14/24 11:43	

LABORATORY CONTROL SAMPLE: 1798873

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	4	4.2	105	90-110	

MATRIX SPIKE SAMPLE: 1798874

Parameter	Units	70297488002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	0.86	4	5.2	108	90-110	

SAMPLE DUPLICATE: 1798875

Parameter	Units	70297488002 Result	Dup Result	RPD	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	0.86	0.95	11	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 24E1234

Pace Project No.: 70297488

QC Batch: 347776

Analysis Method: EPA 353.2

QC Batch Method: EPA 353.2

Analysis Description: 353.2 Nitrate + Nitrite, preserved

Laboratory: Pace Analytical Services - Melville

Associated Lab Samples: 70297488001, 70297488002

METHOD BLANK: 1797656

Matrix: Water

Associated Lab Samples: 70297488001, 70297488002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrate-Nitrite (as N)	mg/L	ND	0.050	05/13/24 10:17	

LABORATORY CONTROL SAMPLE: 1797657

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrate-Nitrite (as N)	mg/L	1	0.98	98	90-110	

MATRIX SPIKE SAMPLE: 1797658

Parameter	Units	70297246001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrate-Nitrite (as N)	mg/L	2.2	1	3.1	97	90-110	

MATRIX SPIKE SAMPLE: 1797660

Parameter	Units	70297499001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrate-Nitrite (as N)	mg/L	6.5	2.5	8.9	94	90-110	

SAMPLE DUPLICATE: 1797659

Parameter	Units	70297246001 Result	Dup Result	RPD	Qualifiers
Nitrate-Nitrite (as N)	mg/L	2.2	2.2	1	

SAMPLE DUPLICATE: 1797661

Parameter	Units	70297499001 Result	Dup Result	RPD	Qualifiers
Nitrate-Nitrite (as N)	mg/L	6.5	6.5	0	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: 24E1234

Pace Project No.: 70297488

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 24E1234
Pace Project No.: 70297488

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
70297488001	24E1234-01	EPA 351.2	347908	EPA 351.2	347917
70297488002	24E1234-02	EPA 351.2	347908	EPA 351.2	347917
70297488001	24E1234-01	EPA 353.2	347776		
70297488002	24E1234-02	EPA 353.2	347776		

REPORT OF LABORATORY ANALYSIS

SUBCONTRACT CHAIN OF CUSTODY
Pace New England
24E1234

WO#: 70297488



SENDING LABORATORY:

Pace New England
39 Spruce Street
East Longmeadow, MA 01028
Phone: 413.525.2332
Fax: 413.525.6405
Project Manager: Kyle K. Stuckey

RECEIVING LABORATORY:

Pace Analytical Services - Long Island, NY
575 Broad Hollow Road
Melville, NY 11747
Phone: (516) 370-6000
Fax: -

Analysis	Sample Name	Due	Expires	Comments
Sample ID: 24E1234-01	CHE01	Water	Sampled: 05/08/24 09:30	
S-Total Kjeldahl Nitrogen (TKN)		05/22/24 14:00	06/05/24 09:30	TKN (351.2)
S-Nitrate/Nitrite - N (NO3/NO2)		05/22/24 14:00	06/05/24 09:30	Nitrate/Nitrite (353.2)
Containers Supplied:				
500 mL plastic + H2SO4 (				
Sample ID: 24E1234-02	CIW04	Water	Sampled: 05/08/24 11:15	
S-Total Kjeldahl Nitrogen (TKN)		05/22/24 14:00	06/05/24 11:15	TKN (351.2)
S-Nitrate/Nitrite - N (NO3/NO2)		05/22/24 14:00	06/05/24 11:15	Nitrate/Nitrite (353.2)
Containers Supplied:				
500 mL plastic + H2SO4 (				

Released By

Date

Received By

Date

Released By

Date

Received By

Date

QCL Title: ENV-FRM-MELV-0034 v07-SCUR
Effective Date: 4/12/2024

WO#: 70297488

PM: MN2 Due Date: 05/21/24
CLIENT: Pace-CON

Client Name: Pace-Con Project #

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Parcel ☐ Other

Tracking #:

Custody Seal on Cooler/Box Present: ☒ Yes ☐ No Seals Intact: ☐ Yes ☐ No Temperature Blank Present: ☒ Yes ☐ No

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ Ziploc ☐ None ☐ Other Type of Ice: ☒ Wet ☐ Blue ☐ None

Thermometer Used: TH211 Correction Factor: -0.4 ☐ Samples on ice cooling process has begun

Cooler Temperature (°C): 1.6 Cooler Temperature Corrected (°C): 1.2 Date/Time 5035A kits placed in freezer

Temp should be stable freezing to 6.0°C

USDA Regulated Soil (☐ M/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, HI, GA, IL, IA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA (check map)? ☐ Yes ☐ No

Did samples originate from a foreign source including Hawaii and Puerto Rico? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (ENV-FRM-MELV-0076) and include with SCUR/COG paperwork.

Date and Initials of person examining contents: SH 5/10/24

		COMMENTS:
Chain of Custody Present:	☒ Yes ☐ No	1.
Chain of Custody Filled Out:	☒ Yes ☐ No	2.
Chain of Custody Relinquished:	☒ Yes ☐ No	3.
Sampler Name & Signature on COC:	☒ Yes ☐ No <u>N/A</u>	4.
Samples Arrived within Hold Time:	☒ Yes ☐ No	5.
Short Hold Time Analysis (<72hr):	☒ Yes ☐ No	6.
Rush Turn Around Time Requested:	☒ Yes ☐ No	7.
Sufficient Volume: (Triple volume provided for MS/MSD)	☒ Yes ☐ No	8.
Correct Containers Used:	☒ Yes ☐ No	9.
Pace Containers Used:	☒ Yes ☐ No	10.
Containers Intact:	☒ Yes ☐ No	10.
Filtered volume received for Dissolved tests	☒ Yes ☐ No <u>N/A</u>	11. Note: If sediment is visible in the dissolved container.
Sample Labels match COC:	☒ Yes ☐ No	12.
Includes date/time/ID/Analysis Matrix:	<u>SL</u> <u>WT</u> <u>OIL</u> <u>OTHER</u>	

Date and Initials of person checking preservation: SH 5/10/24

All containers needing preservation have been	☒ Yes ☐ No ☐ N/A	13.	☐ HNO ₃ ☐ H ₂ SO ₄ ☐ NaOH ☐ HCl
pH paper Lot # <u>211821A</u>			Sample #
All containers needing preservation are found to be in compliance with method recommendation? (HNO ₃ , H ₂ SO ₄ , HCl, NaOH > 9 Sulfide, ☒ Yes ☐ No ☐ N/A NAOH-12 Cyanide)			
Exceptions: VOA, Coliform, TOC/DOC, Oil and Grease, DRO/8015 (water).			
Per Method, VOA pH is checked after analysis			
Samples checked for dechlorination:	☒ Yes ☐ No <u>N/A</u>	14.	Initials when completed. Lot # of added preservative. Date/Time preservative added:
KI starch test strips Lot #			
Residual chlorine strips Lot #			Positive for Res. Chlorine? Y N
SM 4500 CN samples checked for sulfide	☒ Yes ☐ No <u>N/A</u>	15.	Positive for Sulfide? Y N
Lead Acetate Strips Lot #			
Headspace in ALK Bottle (>8mm):	☒ Yes ☐ No <u>N/A</u>	16.	
Headspace in VOA Vials (>8mm):	☒ Yes ☐ No <u>N/A</u>		
Zip Blank Present:	☒ Yes ☐ No <u>N/A</u>	17.	
Tri Blank Custody Seals Present:	☒ Yes ☐ No <u>N/A</u>		

Client Notification/ Resolution:

Field Data Required? Y / N

Person Contacted:

Date/Time:

Comments/ Resolution:

* Data (Project Manager) review (which includes the SCUR) is documented electronically in LIMS.

H. Outfall Catchment System Vulnerability Factor Inventory

Table 9: Outfall Catchment System Vulnerability Factor (SVF) Inventory
Town of Ludlow, Massachusetts
Revision Date: September 30, 2024

Presence/Absence Evaluation Criteria for SVFs										Additional Considerations Not Included as SVFs			
Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	1 SSO Potential in Event of System Failures	2 Sanitary and Storm Drain Infrastructure >40 years Old	3 Septic with Poor Soils or Water Table Separation	4 History of BOH Actions Addressing Septic Failure
CHE01	MA36-23	No	No	No	No	No	No	No	No	No	Yes	No	No
CHE02	MA36-23	No	No	No	No	No	No	No	No	No	Yes	No	No
CHW04	MA36-24	Yes	No	No	No	No	No	Yes	No	No	No	No	No
CHW05	MA36-24	No	No	No	No	No	No	No	No	No	No	No	No
CHW11	MA36-24	No	No	No	No	No	No	Yes	No	No	Yes	No	No
CHW12	MA36-24	No	No	No	No	No	No	No	No	No	No	No	No
CHW14	MA36-24	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No

Presence/Absence Evaluation Criteria for SVFs:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
- Common or twin-invert manholes serving storm and sanitary sewer alignments
- Common trench construction serving both storm and sanitary sewer alignments
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations

Additional Considerations Not Included as SVFs:

- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
- Any sanitary sewer and storm drain infrastructure greater than 40 years old
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)