Appendix 18
Mount Hope Bay (Shore) Drainage Area Assessment and Listing Decision Summary

Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle

CN: 505.1

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2018/20 Cycle Impairment Changes

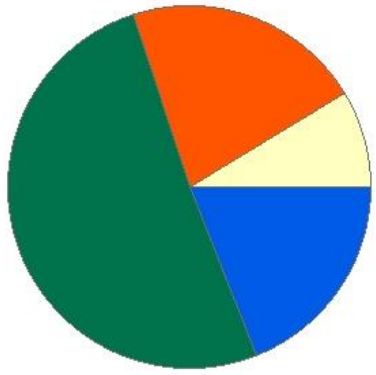
Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Mount Hope Bay	MA61-06	5	5	Dissolved Oxygen		Added
Mount Hope Bay	MA61-06	5	5	Temperature		Removed
Mount Hope Bay	MA61-07	5	5	Temperature		Removed
Quequechan River	MA61-05	5	5	Trash		Changed

Cole River (MA61-03)

Location:	Wood Street, Swansea to Route 6, Swansea.
AU Type:	RIVER
AU Size:	1.6 MILES
Classification/Qualifier:	B: WWF

Cole River - MA61-03

Watershed Area: 11.77 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	11.69	5.18	2.66	1.64
Agriculture	8.6%	10.5%	9.4%	14%
Developed	21.5%	28.1%	9.9%	12.2%
Natural	51%	47.5%	45.8%	47.8%
Wetland	18.9%	13.8%	34.9%	26%
Impervious Cover	8.2%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

2016 IR Decision Summary:

MassDEP staff sampled at the Cole River below the outlet of Milford Pond at Milford Road, Swansea (W0641) between May and August 2009. Most water quality data (DO, temp, pH, ammonia) indicative of generally good conditions (meeting Class B warm water) although DO was as low as 4.4 mg/L, and the max temperature as high as 28.7°C with the maximum 24-hour rolling average temperature 26.8°C (August 24 - 26, 2009 deployment). There were no indications of enriched conditions based on physicochemical indicators although total phosphorus concentration was somewhat elevated (0.14 mg/L max and 0.1 mg/L average). The former impairment for fish passage barrier is being carried forward.

The Aquatic Life Use for this Cole River AU(MA61-03) will continue to be assessed as Not Supporting based on the barriers to diadromous fish passage.

Cole River (MA61-04)

Location:	Route 6, Swansea to the mouth at Mount Hope Bay at old railway grade, Swansea.
AU Type:	ESTUARY
AU Size:	0.35 SQUARE MILES
Classification/Qualifier:	SA: SFO

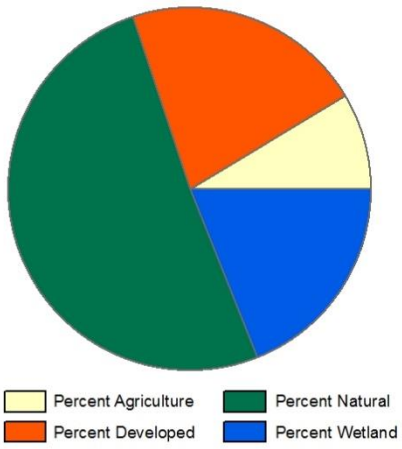
Fish, other Aquatic Life and Wildlife Use: Not Supporting
2016 IR Decision Summary: No new data for this Cole River AU (MA61-04) so keep same impairments.

Cole River (MA61-10)

Location:	Headwaters, south of Wellington Street, Dighton to Wood Street, Swansea.
AU Type:	RIVER
AU Size:	6.4 MILES
Classification/Qualifier:	B: WWF

Cole River - MA61-03

Watershed Area: 11.77 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	11.69	5.18	2.66	1.64
Agriculture	8.6%	10.5%	9.4%	14%
Developed	21.5%	28.1%	9.9%	12.2%
Natural	51%	47.5%	45.8%	47.8%
Wetland	18.9%	13.8%	34.9%	26%
Impervious Cover	8.2%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

2016 IR Decision Summary:

MassDEP biologists conducted benthic sampling in the Cole River ~40m upstream of Hortonville Road in Swansea (B0778) in September 2009. The RPBIII analysis indicated non-impacted conditions compared to the West Branch Palmer River (B0777) reference site. Two backpack electrofishing surveys were conducted in the river near Hortonville Road in August 2006 and September 2009. Both samples contained larger (stocked sized) Eastern brook trout (none <140 mm) but samples also contained moderately tolerant species. MassDEP staff conducted water quality monitoring in the Cole River at Hortonville Road, Swansea (W0661) between May and August 2009. All water quality data (DO, temp, pH, ammonia) were indicative of generally good conditions although DO was low as 4.3 mg/L. The maximum temperature measured during the long-term thermistor deployed from June through September 2009 was 24.1°C. There was no indication of enriched conditions based on physicochemical indicators although total phosphorus concentrations were somewhat elevated (0.2 mg/L max and 0.14 mg/L average).

The Aquatic Life Use for this Cole River AU (MA61-10) is assessed as Fully Supporting based on the results of the biological (benthic and fish sampling) and water quality monitoring conducted during the summer of 2009.

Cook Pond (MA61001)

Location:	Fall River, MA/Tiverton, RI.
AU Type:	FRESHWATER LAKE
AU Size:	157 ACRES
Classification/Qualifier:	B

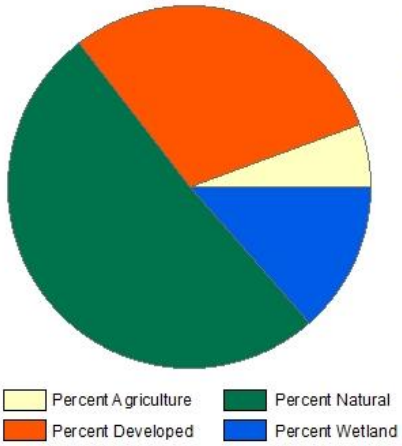
Fish, other Aquatic Life and Wildlife Use: Not Assessed
2016 IR Decision Summary: No data were available to assess the Aquatic Life Use for Cook Pond so it is Not Assessed.

Kickamuit River (MA61-08)

Location:	Headwaters, outlet Warren Reservoir, Swansea, to state line, Swansea, MA/Warren, RI.
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B

Kickamuit River - MA61-08

Watershed Area: 3.63 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.61	3.45	0.91	0.91
Agriculture	5.6%	5.8%	3.6%	3.6%
Developed	29.8%	30.3%	21.6%	21.6%
Natural	51.1%	50.2%	51.4%	51.4%
Wetland	13.5%	13.6%	23.4%	23.4%
Impervious Cover	10.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

2016 IR Decision Summary:

MassDEP staff conducted water quality monitoring in the Kickamuit River at Bushee Road, Swansea (W1961) between May and August 2009. All water quality data (DO, temp, pH, ammonia) were indicative of generally good conditions (meeting Class B warm water). No indication of enriched conditions based on physicochemical indicators either.

The Aquatic Life Use for the Kickamuit River is assessed as Fully Supporting based on the water quality data collected during the summer of 2009. The former alert for a fish passage obstruction in RI is being carried forward.

Lee River (MA61-01)

Location:	From confluence with Lewin Brook, Swansea to Route 6, Swansea/Somerset.
AU Type:	ESTUARY
AU Size:	0.02 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Supporting
2016 IR Decision Summary: Original listing in 1992 reporting cycle based on very limited data, no new information is available for this Lee River AU (MA61-01) so keep same impairments.

Lee River (MA61-02)

Location:	Route 6, Swansea/Somerset to mouth at Mount Hope Bay, Swansea/Somerset.
AU Type:	ESTUARY
AU Size:	0.51 SQUARE MILES
Classification/Qualifier:	SA: SFO

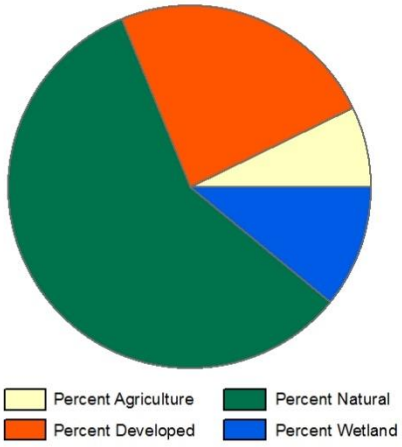
Fish, other Aquatic Life and Wildlife Use: Not Supporting
2016 IR Decision Summary: While no newer data/available information was available since the information compiled in last water quality assessment report, the Brayton Point intake from this segment was eliminated in October 2011 as part of conversion of the power plant from once-through to closed-loop cooling water. The Aquatic Life Use for this Lee River AU (MA61-02) was assessed as Not Supporting with the former impairments carried forward.

Lewin Brook (MA61-09)

Location:	Headwaters, west of Sharps Lot Road, Swansea to the inlet of the unnamed impoundment north of Lewin Lane, Swansea (impoundment upstream of dam, NAT ID# MA03247).
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B

Lewin Brook - MA61-09

Watershed Area: 2.6 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.6	2.6	0.78	0.78
Agriculture	7.4%	7.4%	5.5%	5.5%
Developed	24.5%	24.5%	18.2%	18.2%
Natural	59.4%	59.4%	60.5%	60.5%
Wetland	11.2%	11.2%	16.5%	16.5%
Impervious Cover	6.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

2016 IR Decision Summary:

MassDEP staff conducted water quality monitoring in Lewin Brook near Robin Brook Road, Swansea (W0654) between May and September 2009. All water quality data (DO, temp, pH, ammonia) were indicative of generally good conditions (meeting Class B warm water). DO was as low as 6.3 mg/L. Instream temperature was as high as 23.2°C. No indication of enriched conditions based on physicochemical indicators either (max TP 0.079 mg/L).

The Aquatic Life Use for Lewin Brook was assessed as Fully Supporting based on the water quality data collected during the summer of 2009.

Lewin Brook Pond (MA61011)

Location:	Swansea.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
2016 IR Decision Summary: No data were available to assess the Aquatic Life Use for Lewin Brook Pond so it is Not Assessed.

Mount Hope Bay (MA61-06)

Location:	The Massachusetts portion just upstream of the Braga Bridge, Fall River/Somerset to the state border Fall River, MA/Tiverton, RI to the line from Brayton Point Somerset to MA/RI border approximately 3/4 of a mile due east of Spar Island, RI.
AU Type:	ESTUARY
AU Size:	2.32 SQUARE MILES
Classification/Qualifier:	SB: SFR, CSO

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Dissolved Oxygen		Added
5	5	Temperature		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting

2016 IR Decision Summary:

Nutrient related impairments (chlorophyll a and total nitrogen) were kept as impairments from prior reporting cycle and although temperature and impingement/entrainment impacts from Brayton Point Station have been reduced (May 2012 NPDES permit effective as conversion from once-through to closed-cycle cooling operation occurred) since permit for heat/flow ~ 96% lower. Water temperatures were decreasing at Station C during some but not all summer months. Some upwards trends in certain fish species in Mount Hope Bay as well as some peaks in abundance, however none appears to be sustained in subsequent years according to Brayton Points 2014 Annual Report. Winter flounder and populations of other fishes in this embayment, and in Greater Narragansett Bay have undergone dramatic changes since ~1984, the year that Brayton Point added its fourth electro-generating unit. These populations have not rebounded to levels before the collapse even after the facility dramatically reduced its impingement/entrainment and heated discharge stress. Part of the reason for this lack of return to pre-1984 community structure may be increasing water temperatures associated with climate change. WPP feels it is currently premature to remove the Aquatic Life Impairment status of this waterbody as the effect of Brayton's long-term entrainment/impingement and heat effects on the bay do not yet appear to have been resolved. These effects may never be resolved due to climate change and the relative abundance of different species of fish and other aquatic organisms in this embayment may have reached a different point of stability than in previous years.

2018/2020 IR Update:

Analysis of Brayton's 2015 to 2017 datasets across beach seine sampling, trawl surveys, and hydrological data collection sites indicated no exceedances of temperature criteria values at any depth in this AU. Analysis of Brayton's 2015 to 2017 DO datasets can be summarized as follows: One of the ten beach seine sampling events had low DO (3.98mg/L). During trawl surveys, no exceedances at the surface but low DO at depth (3.97% <5.0mg/L (average 0.18 mg/L below for those excursions) and 12.09% (average 2.89 mg/L below for those excursions) at mid and bottom-depths, respectively. Further, hydrological data across the AU indicated 10.09% of samples <5.0mg/L (averaging 1.02 mg/L below for those excursions). A continuous water quality monitoring "Taunton" buoy was deployed for MassDEP in this Mount Hope Bay AU (MA61-06). DO and temperature were recorded at two depths: Surface (~1.0m below surface), and Bottom (~ 0.5m above sea floor) between May and November in 2017, 2018, and 2019. These data can be summarized as follows: Except for daily mean temperatures >26.7°C that occurred eight times at the surface and four times at the bottom, representing eight unique days during the summer of 2018, all other temperature measurements met acute and chronic criteria. The DO concentrations varied between May and November with larger diel shifts during the summer months. Bottom DO concentrations were significantly lower than surface waters (minimum 2.01 and 2.96mg/L and 4.95 and 4.38mg/L in 2017 and 2018, respectively) with 14% of measurements below 5.0mg/L. Bottom waters

typically experienced more frequent, prolonged, and severe excursions. All pH data ranged from 7.2 to 8.4SU with lower measurements near the bottom.
The Aquatic Life Use for this Mount Hope Bay AU (MA61-06) will continue to be assessed as Not Supporting with the chlorophyll a, total nitrogen, and fishes bioassessment impairments being carried forward. Low DO is being added as a cause of impairment since 14% of Taunton Buoy measurements were below 5.0mg/L (below 3.0mg/L near the bottom). Temperature is being delisted as a cause of impairment (see additional justification in removal comment).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Temperature	Applicable WQS attained, due to restoration activities	As of May 31st, 2017, the Brayton Point Power Station ceased operations – eliminating their non-contact cooling water discharge to this Mount Hope Bay AU (MA61-06). A reduction of their thermal impact began in May 2012, when the Station was converted to a closed-cycle cooling operation that operated under their May 2012 NPDES permit (heat and flow limits 95% lower than their prior permit). According to their 2017 Annual Report, sampling by Brayton's consultants demonstrated that water temperatures in Mount Hope Bay were decreasing at the sampling location near Brayton Point (Station C), with sampling in 2017 showing cooler than average temperatures for surface waters for all sampling months, and cooler temperatures for bottom waters for all sampling months except May (+0.1°C deviation). Between 2017 and 2019, continuous water quality monitoring data were collected at the "Taunton" buoy deployed between May and November for MassDEP. Temperature data were collected at 15-minute intervals at two depths: Surface (~1.0m below the surface), and Bottom (~ 0.5m above the sea floor). Data collected in 2017 and 2018 are finalized data while the 2019 data included in this discussion for comparison with 2017 and 2018 are preliminary, draft, and represented raw values that have not undergone any quality control checks or processes by MassDEP. The Taunton buoy data had no days in either 2017 or 2019 where daily mean temperature exceeded 26.7°C, regardless of depth (surface or bottom). In the summer of 2018, there were eight days when the daily mean temperature at the surface exceeded 26.7°C and four days at the bottom. These exceedances occurred on a total of 8 days. Neither surface nor bottom temperature measurements exceeded 29.4°C (daily maximum) any year. Since there were no acute or chronic temperature exceedances in 2017 or 2019 and a total of only 8 days of chronic temperature exceedances in the summer of 2018 (the 2018 CALM guidance manual allows 11 exceedances), temperature is being delisted from this Mount Hope Bay AU (MA61-06). This delisting is justified by the long-term, continuous monitoring buoy 2017 to 2019 temperature

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		data and the closure of the Brayton Point Power Station as of May 2017 (the historical source of the thermal impairment).

Supporting Information for Delisted Impairments

Temperature

As of May 31st, 2017, the primary source for historical temperature impairments in Mount Hope Bay, the Brayton Point Power Station, ceased operations. This was five years after converting to a closed-loop cooling system in 2012, which had resulted in significant reductions in heated water exchange with Mount Hope Bay. Temperature data were collected at two continuous monitoring stations (the Taunton and Cole buoys) at two depths (near surface and near bottom) in Mount Hope Bay between May and November 2017, 2018, and 2019. Data collected in 2017 and 2018 were all validated/finalized while temperature data for 2019, included in the analysis for comparison with 2017 and 2018, were preliminary (raw values that have not undergone any quality control checks or processes). Temperature criteria for Class SA waters dictate that temperature shall not exceed 29.4 °C nor a maximum daily mean of 26.7 °C, and the rise in temperature due to a discharge shall not exceed 0.8 °C. For Class SB, temperature shall not exceed 29.4 °C nor a maximum daily mean of 26.7 °C, and the rise in temperature due to a discharge shall not exceed 0.8 °C during the summer months (July through September) nor 2.2 °C during the winter months (October through June). For both classes, there shall be no change from natural background that would impair any uses assigned to this class including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms (MassDEP 2013).

Data supporting the temperature delisting:
Mount Hope Bay Buoy Data Report: 2017 and 2018 Fixed-Site Continuous Monitoring (MassDEP 2020):

Beginning in 2017, continuous water quality monitoring buoys and sondes were deployed in Mount Hope Bay to help address coastal monitoring data gaps. The buoys also facilitate a more comprehensive assessment of water quality in Mount Hope Bay. In addition, these buoys were deployed just as Brayton Point Power Station ceased operations, so it provides an immediate, short-term look at water quality parameter impacts from the facility halting its operations. One monitoring buoy was deployed in each Mount Hope Bay AU from May to November in approximately the same locations in 2017 and 2018 (see image below). One buoy was deployed near the mouth of Taunton River ("Taunton buoy") within MA61-06 (41.70112 N, 71.187607W). The second buoy was deployed nearer the mouth of the Cole River ("Cole buoy") within MA61-07 (41.702001 N, 71.215952 W).

The 2018 CALM instructs analysts to evaluate large (> one month, usually all summer) datasets by determining whether the 24-hour average is exceeded > 11 times for chronic evaluation, and for acute evaluations, analysts determine whether there is more than one day exceeding the maximum temperature value (MassDEP 2018).

Surface water temperatures were typically higher than bottom waters, peaking in the late summer months of July and August. While 2017 saw no exceedances of the temperature criteria, there were 14 days in 2018 where daily mean temperature was above 26.7 °C (see below) and two days where maximum daily temperatures exceeded 29.4°C. While it is too early to tell if 2018 is representative of long-term temperature trends in Mount Hope Bay, temperature data for 2019 (using preliminary, draft, unedited data) indicate water temperatures more similar to 2017 data.

The 2018 CALM instructs analysts to evaluate large (> one month, usually all summer) datasets by determining whether the 24-hour average is exceeded > 11 times for chronic evaluation, and for acute evaluations, analysts determine whether there is more than one day exceeding the maximum temperature value (MassDEP 2018).

Table 1 contains temperature exceedances for the two buoys in Mount Hope Bay (MassDEP 2020). Daily mean temperature was calculated using the average reported temperature values from 0000 to 2359 for each calendar day. The Taunton Buoy had zero days in 2017 where daily mean temperature exceeded 26.7 °C, regardless of depth. 2018 had eight days at the surface and four days at the bottom where daily mean temperature exceeded 26.7 °C. Temperature data for 2019 (using

preliminary, unedited, and draft data) were explored to see any potential temperature trends, due to the difference between 2017 and 2018 regarding temperature exceedances. Neither surface nor bottom temperatures exceeded 29.4 °C (daily maximum) in 2019 and there were no exceedances of the daily mean temperate at the Taunton buoy at either depth either.

TABLE 1. TEMPERATURE EXCEEDANCES.

Site	Depth	Maximum Temperature (°C)			Number of times Temperature exceeded 29.4 °C			Number of days Temperature exceeded 29.4 °C			Number of Days Daily Mean Temperature Was Above 26.7 °C		
		2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
Cole	Surface	28.4	29.7	28.2	0	7	0	0	2	0	0	9	1
Cole	Bottom	24.7	28.1	25.7	0	0	0	0	0	0	0	5	1
Taunton	Surface	27.7	29.4	27.7	0	0	0	0	0	0	0	8	0
Taunton	Bottom	24.5	28.0	25.6	0	0	0	0	0	0	0	4	0

For Taunton, there were 8 unique days where daily mean temperature exceeded the criteria. Based on the 2018 CALM, evaluation for meeting or not meeting temperature criteria requires the determination whether the 24-hour average is exceeded > 11 times for chronic evaluation. Since there were only eight days where the daily mean temperature criteria were exceeded, temperature was determined to meet the 2018 CALM guidance of support for aquatic life.

Mount Hope Bay (MA61-07)

Location:	The Massachusetts portion from mouth of Cole River (at old railway grade), Swansea to state border Swansea, MA/Warren, RI to the line from Brayton Point, Somerset to MA/RI border approximately 3/4 of a mile due east of Spar Island, RI to the line between Bay Point, Swansea and Brayton Point, Somerset (the mouth of the Lee River).
AU Type:	ESTUARY
AU Size:	1.84 SQUARE MILES
Classification/Qualifier:	SA: SFO

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Temperature		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting

2016 IR Decision Summary:

Nutrient related impairments (chlorophyll a, total nitrogen, and low dissolved oxygen) were kept as impairments from prior reporting cycle and although temperature and impingement/entrainment impacts from Brayton Point Station have been reduced (May 2012 NPDES permit effective as conversion from once-through to closed-cycle cooling operation occurred) since permit for heat/flow were ~96% lower these impairments were also retained. Water temperatures were decreasing at Station C during some but not all summer months. Some upwards trends in certain fish species in Mount Hope Bay as well as some peaks in abundance were noted, however none appears to be sustained in subsequent years according to Brayton Points 2014 Annual Report. Winter flounder and populations of other fishes in this embayment, and in Greater Narragansett Bay have undergone dramatic changes since ~1984, the year that Brayton Point added its fourth electro-generating unit. These populations have not rebounded to levels before the collapse even after the facility dramatically reduced its impingement/entrainment and heated discharge stress. Part of the reason for this lack of return to pre-1984 community structure may be increasing water temperatures associated with climate change.

2018/2020 IR Update:

Analysis of Brayton's 2015 to 2017 datasets of trawl surveys and hydrological data collection sites indicated no exceedances of temperature criteria values at any depth in this AU. Continuous thermistor data indicated one max. daily temperature exceedance between 2015 to 2017, and daily mean temperature criteria exceedances 15 days over those three sampling years with 13 days in 2016, and 2 in 2015. Analysis of Brayton's 2015 to 2017 DO datasets indicate some excursions below the assessment criteria. During trawl surveys, there were no exceedances in surface waters; however, 0.79% of samples were below the criterion for mid and bottom depths (average 4.14 and 4.7mg/L below for those excursions, respectively; n=1). Further, hydrological data indicated 5.08% of samples were below the criterion, averaging 1.59mg/L below for those excursions. A continuous water quality monitoring "Cole" buoy was deployed for MassDEP in this Mount Hope Bay AU (MA61-07). DO and temperature were recorded at two depths: Surface (~1.0m below the surface), and Bottom (~ 0.5m above the sea floor) between May and November in 2017, 2018, and 2019. These data can be summarized as follows: Except for daily mean temperatures >26.7°C that occurred 10 times at the surface and six times at the bottom, representing nine unique days during the summer of 2018, and one unique day in 2019 all other temperature measurements met acute and chronic criteria. The DO concentrations varied between May and November with larger diel shifts during the summer months. Bottom DO concentrations were significantly lower than surface waters (minimum 0.84 and 2.43mg/L and 5.27 and 4.61mg/L in 2017 and 2018, respectively) with 32% of measurements below 6.0mg/L. Bottom waters typically experienced more frequent, prolonged, and severe excursions. Approximately 7% of Cole Buoy surface samples in 2017) were above 8.5SU (max. 9.3SU which occurred at the surface for ~2 weeks in June 2017), all other pH data ranged from 7.0 to 8.4SU with lower

measurements near the bottom. Due to high daily pH variability during this time, the return pH within standards for the rest of 2017 and 2018, the lack of frequent (>10%) excursions above criteria, and no correlation with other factors measured by the buoys during this time, pH is not identified as cause of impairment at this time. The Aquatic Life Use for this Mount Hope Bay AU (MA61-07) will continue to be assessed as Not Supporting with the chlorophyll a, total nitrogen, dissolved oxygen, and fishes bioassessment impairments being carried forward. Temperature is being delisted as a cause of impairment (see additional justification in removal comment).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Temperature	Applicable WQS attained, due to restoration activities	As of May 31st, 2017, the Brayton Point Power Station ceased operations – eliminating their non-contact cooling water discharge to Mount Hope Bay (AUs MA61-06 and MA61-07)). A reduction of their thermal impact began in May 2012, when the Station was converted to a closed-cycle cooling operation that operated under their May 2012 NPDES permit (heat and flow limits 95% lower than their prior permit). According to their 2017 Annual Report, sampling by Brayton's consultants demonstrated that water temperatures in Mount Hope Bay were decreasing at the sampling location near Brayton Point (Station C), with sampling in 2017 showing cooler than average temperatures for surface waters for all sampling months, and cooler temperatures for bottom waters for all sampling months except May (+0.1°C deviation). Between 2017 and 2019, continuous water quality monitoring data were collected at the "Cole" buoy deployed between May and November for MassDEP. Temperature data were collected at 15-minute intervals at two depths: Surface (~1.0m below the surface), and Bottom (~ 0.5m above the sea floor). Data collected in 2017 and 2018 are finalized data while the 2019 data included in this discussion for comparison with 2017 and 2018 are preliminary, draft, and represented raw values that have not undergone any quality control checks or processes by MassDEP. There were no days in either 2017 or 2019 when daily mean temperature at the Cole buoy exceeded 26.7°C, regardless of depth (surface or bottom). In the summer of 2018, there were nine days when the daily mean temperature at the surface exceeded 26.7°C and five days at the bottom. These exceedances occurred on a total of 9 days. Neither surface nor bottom temperature measurements exceeded 29.4°C (daily maximum) in 2017 or 2019 but there were two days when the maximum temperature exceeded 29.4°C in 2018. The maximum possible time above 29.4°C on August 9th was 90 minutes and on August 10th 75 minutes for a total of 165 minutes representing 0.05% of the temperature measurements taken over 3900 hours at the Cole Buoy. The maximum water temperature measured was 29.7°C. Although

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		Brayton Point Power Station was by far the largest contributor of thermal stress to Mount Hope Bay, a review for all other NPDES discharges in the near vicinity of the Mount Hope Bay buoys was conducted: Somerset Power (MA0001856) was decommissioned in 2010, the Taunton Municipal Lighting Plant (MA0002241), located further upstream in the Taunton River, reported minimal discharges during the month of August 2018, and POTW discharges (e.g., Taunton POTW) do not contain temperature monitoring requirements or limits since they do not contribute thermal stress to receiving waters. Furthermore, no rain was recorded at NOAA's Somerset Station either after a storm on 5 August so the influence from nonpoint source/stormwater runoff (e.g., heated pavement runoff) was also eliminated as potential source contributing thermal stress. Weather conditions at the time of the exceedances documented that a heat wave (defined as air temperatures exceeding 90°F on three or more consecutive days) was occurring in the Mount Hope Bay area at that time. Based on the review of these data, the temperature exceedances at the Cole buoy in Mount Hope Bay were determined to result from the naturally occurring heat wave conditions and not a result of anthropogenic influences. Since excursions from criteria due to natural conditions should not be interpreted as violations of standards, temperature is being delisted as an impairment for this Mount Hope Bay AU (MA61-07).

Supporting Information for Delisted Impairments

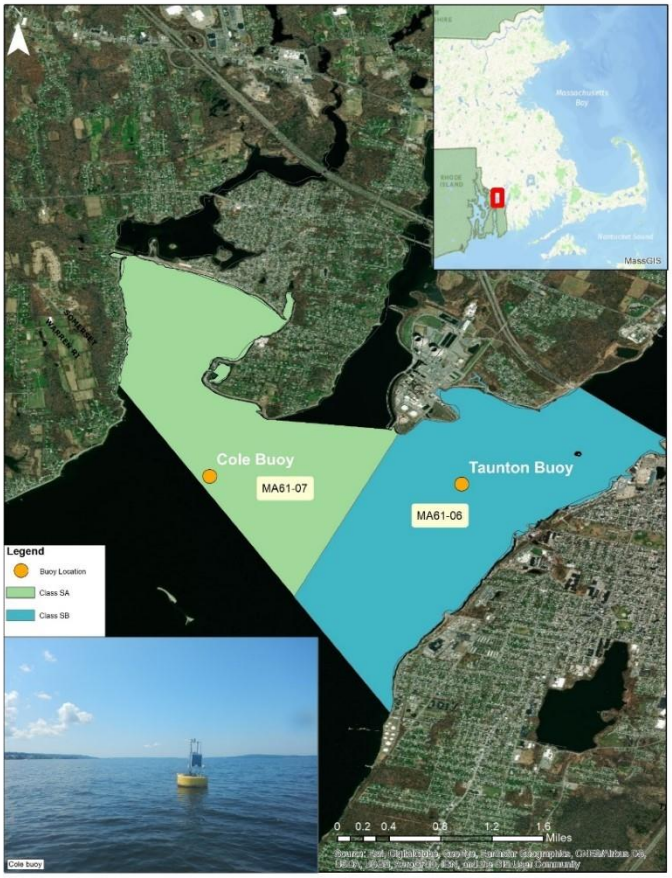
Temperature

As of May 31st, 2017, the primary source for historical temperature impairments in Mount Hope Bay, the Brayton Point Power Station, ceased operations. This was five years after converting to a closed-loop cooling system in 2012, which had resulted in significant reductions in heated water exchange with Mount Hope Bay. Temperature data were collected at two continuous monitoring stations (the Taunton and Cole buoys) at two depths (near surface and near bottom) in Mount Hope Bay between May and November 2017, 2018, and 2019. Data collected in 2017 and 2018 were all validated/finalized while temperature data for 2019, included in the analysis for comparison with 2017 and 2018, were preliminary (raw values that have not undergone any quality control checks or processes). Temperature criteria for Class SA waters dictate that temperature shall not exceed 29.4 °C nor a maximum daily mean of 26.7 °C, and the rise in temperature due to a discharge shall not exceed 0.8 °C. For Class SB, temperature shall not exceed 29.4 °C nor a maximum daily mean of 26.7 °C, and the rise in temperature due to a discharge shall not exceed 0.8 °C during the summer months (July through September) nor 2.2 °C during the winter months (October through June). For both classes, there shall be no change from natural background that would impair any uses assigned to this class including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms (MassDEP 2013).

Data supporting temperature delisting:

Mount Hope Bay Buoy Data Report: 2017 and 2018 Fixed-Site Continuous Monitoring (MassDEP 2020)**:**

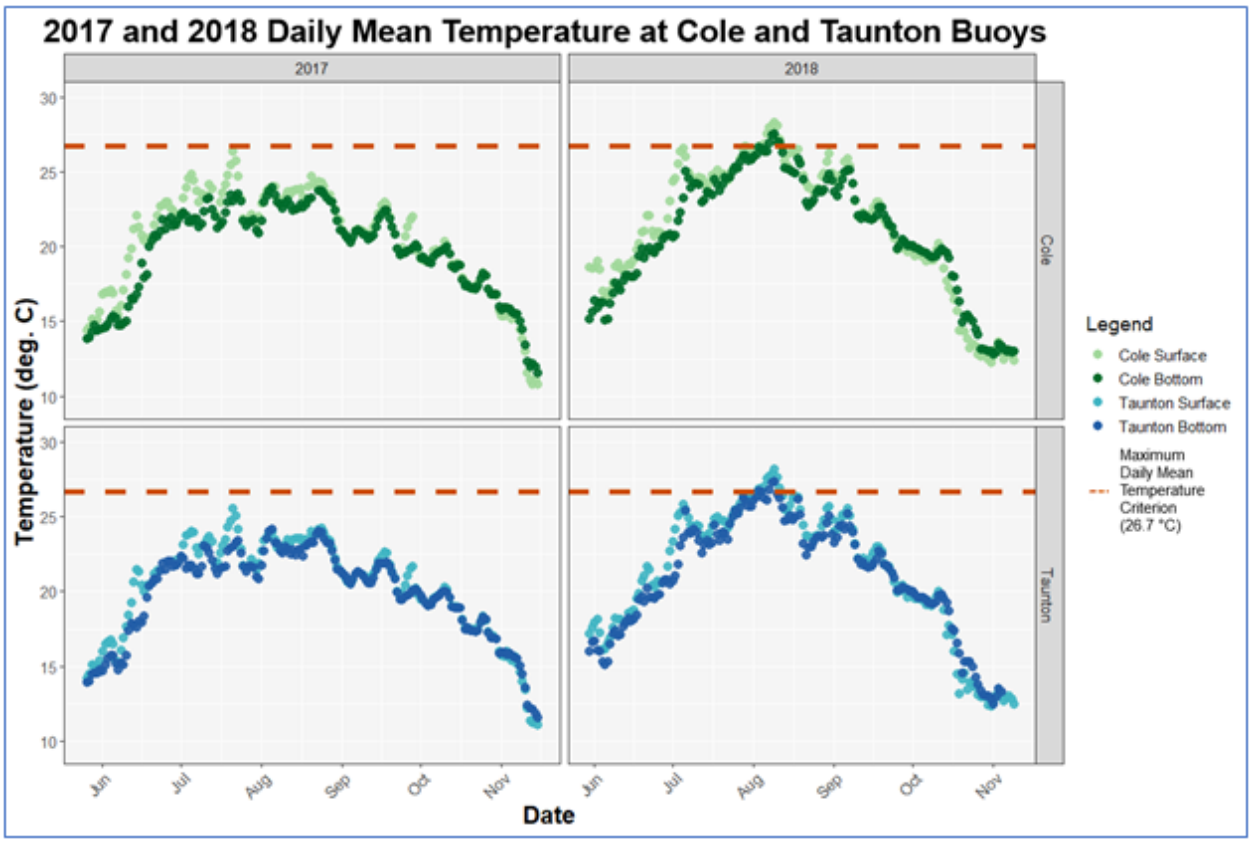
Beginning in 2017, continuous water quality monitoring buoys and sondes were deployed in Mount Hope Bay to help address coastal monitoring data gaps. The buoys also facilitate a more comprehensive assessment of water quality in Mount Hope Bay. In addition, these buoys were deployed just as Brayton Point Power Station ceased operations, so it provides an immediate, short-term look at water quality parameter impacts from the facility halting its operations. One monitoring buoy was deployed in each Mount Hope Bay AU from May to November in approximately the same locations in 2017 and 2018 (see image below). One buoy was deployed near the mouth of Taunton River ("Taunton buoy") within MA61-06 (41.70112 N, 71.187607W). The second buoy was deployed nearer the mouth of the Cole River ("Cole buoy") within MA61-07 (41.702001 N, 71.215952 W).



The 2018 CALM instructs analysts to evaluate large (> one month, usually all summer) datasets by determining whether the 24-hour average is exceeded > 11 times for chronic evaluation, and for acute evaluations, analysts determine whether there is more than one day exceeding the maximum temperature value (MassDEP 2018).

Surface water temperatures were typically higher than bottom waters, peaking in the late summer months of July and August. While 2017 saw no exceedances of the temperature criteria, there were 14 days in 2018 where daily mean temperature was above 26.7 °C (see below) and two days where maximum daily temperatures exceeded 29.4°C. While it is too early to tell if 2018 is representative of

long-term temperature trends in Mount Hope Bay, temperature data for 2019 (using preliminary, draft, unedited data) indicate water temperatures more similar to 2017 data.



The temperature data were summarized (Table 5) as follows:

Table 5. Summary statistics for temperature data in degrees Celsius (°C) for the Cole and Taunton buoys deployed in Mount Hope Bay.

Temperature Statistics	CRS17	CRB17	CRS18	CRB18	TRS17	TRB17	TRS18	TRB18
				(°C)				
Minimum	10.2	10.6	10.0	12.3	10.4	11.3	11.2	12.2
Q1	18.2	17.3	18.7	18.2	17.9	17.7	18.5	19.1
Median	21.1	20.7	21.9	21.4	21.0	20.8	22.0	21.6
Mean	20.5	19.7	21.4	21.0	20.3	19.8	21.3	21.1
Q3	23.1	22.1	25.0	24.4	22.9	22.0	24.9	24.1
Max	28.4	24.7	29.7	28.1	27.7	24.5	29.4	28.0

Temperature exceedances for the two buoys in Mount Hope Bay were also summarized (Table 1). Daily mean temperature was calculated using the average reported temperature values from 0000 to 2359 for each calendar day. 2017 had zero days where daily mean temperature exceeded 26.7 °C, regardless

of site or depth. 2018 had multiple days at all sondes where daily mean temperature exceeded 26.7 °C, with surface sites having ~2 times as many days exceeding the criteria compared to their respective bottom waters. Temperature data for 2019 (using preliminary, unedited, and draft data) were explored to see any potential temperature trends, due to the difference between 2017 and 2018 regarding temperature exceedances. Neither surface nor bottom temperatures at the Cole Buoy exceeded 29.4°C in 2019.

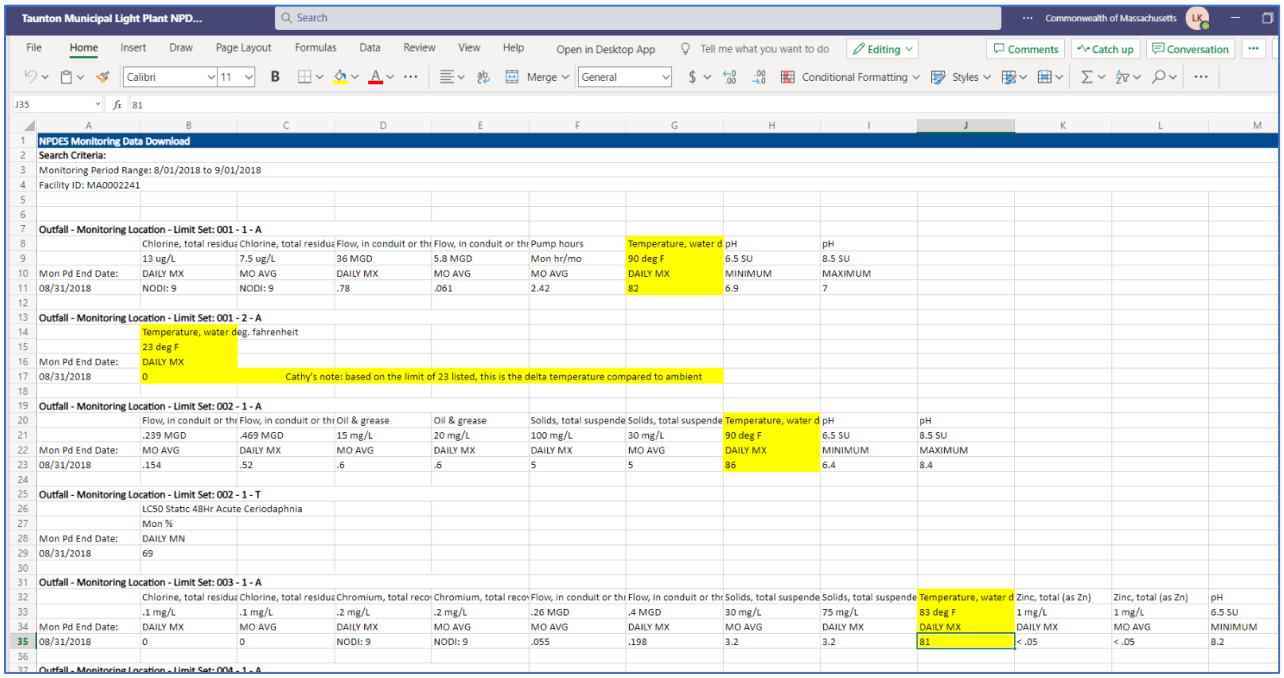
TABLE 1. TEMPERATURE EXCEEDANCES.

Site	Depth	Maximum Temperature (°C)			Number of times Temperature exceeded 29.4 °C			Number of days Temperature exceeded 29.4 °C			Number of Days Daily Mean Temperature Was Above 26.7 °C		
		2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
Cole	Surface	28.4	29.7	28.2	0	7	0	0	2	0	0	9	1
Cole	Bottom	24.7	28.1	25.7	0	0	0	0	0	0	0	5	1
Taunton	Surface	27.7	29.4	27.7	0	0	0	0	0	0	0	8	0
Taunton	Bottom	24.5	28.0	25.6	0	0	0	0	0	0	0	4	0

At the Cole Buoy, there were 9 unique days where daily mean temperature exceeded the daily mean temperature criteria (>26.7°C) in 2018 and one day in 2019. Since these exceedances were <11 times, temperature is considered supporting the Aquatic Life Use according to the 2018 CALM guidance.

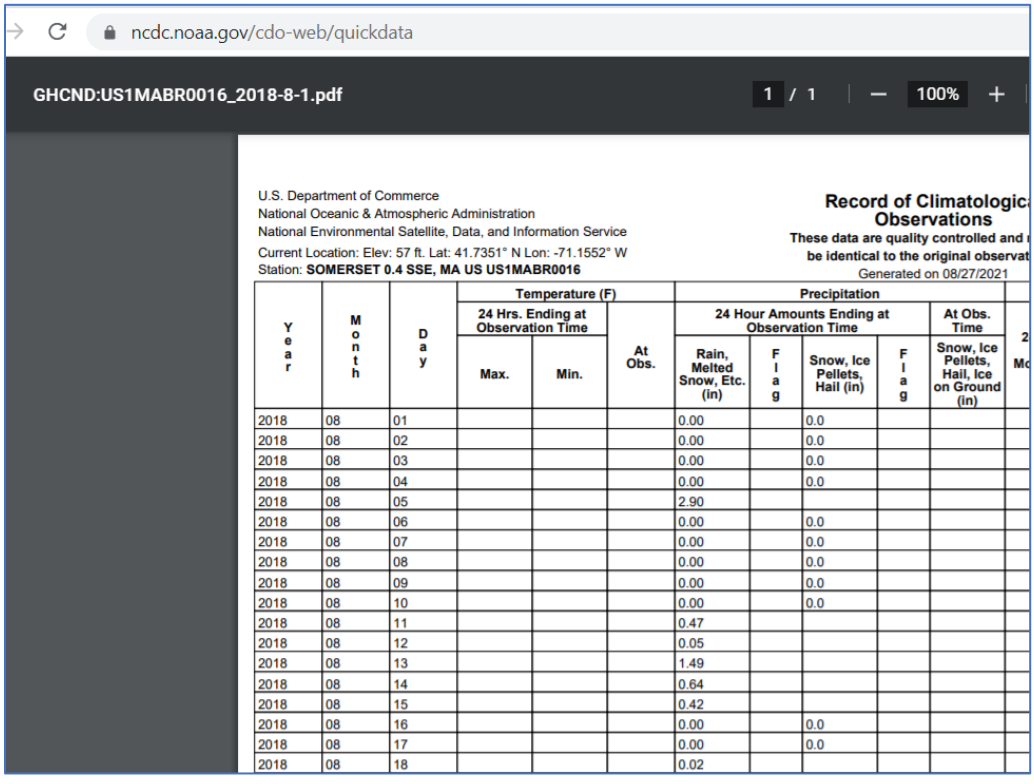
MassDEP analysts retrieved information related to NPDES cooling water discharges in the near vicinity of the Mount Hope Bay buoys. The largest facility, Brayton Point Power Station had ceased all operations as of May 2017, Somerset Power (MA0001856) was decommissioned in 2010, and the third discharger of cooling water, the Taunton Municipal Lighting Plant (MA0002241) further upstream in the Taunton River, reported minimal discharges during the month of August 2018 (see flow and temperature information from EPA ECHO database below) so none were considered to be responsible for the elevated temperature in the Mount Hope Bay AU MA61-07. None of these discharges were considered to be factors in the elevated temperatures in the Mount Hope Bay AU (MA61-07), nor were POTW discharges (none contain temperature monitoring requirements or limits since they do not contribute thermal stress to receiving waters). Furthermore, there was no rain in the area either after a storm on 5 August (see precipitation recorded at NOAA Somerset Station below) thereby eliminating any influence from nonpoint source/stormwater runoff (e.g., heated pavement runoff) from contributing thermal

stress.



NPDES Monitoring Data Download
Search Criteria:
Monitoring Period Range: 8/01/2018 to 9/01/2018
Facility ID: MA0002241

Outfall - Monitoring Location - Limit Set: 001 - 1 - A											
	Chlorine, total residua	Chlorine, total residua	Flow, in conduit or thr	Flow, in conduit or thr	Pump hours	Temperature, water d	pH	pH			
	13 ug/L	7.5 ug/L	36 MGD	5.8 MGD	Mon hr/mo	90 deg F	6.5 SU	8.5 SU			
Mon Pd End Date:	DAILY MX	MO AVG	DAILY MX	MO AVG	MO AVG	DAILY MX	MINIMUM	MAXIMUM			
08/31/2018	NODI: 9	NODI: 9	.78	.061	2.42	82	6.9	7			
Outfall - Monitoring Location - Limit Set: 001 - 2 - A											
	Temperature, water deg. fahrenheit										
	23 deg F										
Mon Pd End Date:	DAILY MX										
08/31/2018	0	Cathy's note: based on the limit of 23 listed, this is the delta temperature compared to ambient									
Outfall - Monitoring Location - Limit Set: 002 - 1 - A											
	Flow, in conduit or thr	Flow, in conduit or thr	Oil & grease	Oil & grease	Solids, total suspende	Solids, total suspende	Temperature, water d	pH	pH		
	.239 MGD	.469 MGD	15 mg/L	20 mg/L	100 mg/L	30 mg/L	90 deg F	6.5 SU	8.5 SU		
Mon Pd End Date:	MO AVG	DAILY MX	MO AVG	DAILY MX	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM		
08/31/2018	.154	.52	.6	.6	5	5	86	6.4	8.4		
Outfall - Monitoring Location - Limit Set: 002 - 1 - T											
	LC50 Static 48Hr Acute Ceriodaphnia										
	Mon %										
Mon Pd End Date:	DAILY MN										
08/31/2018	69										
Outfall - Monitoring Location - Limit Set: 003 - 1 - A											
	Chlorine, total residua	Chlorine, total residua	Chromium, total recov	Chromium, total recov	Flow, in conduit or thr	Flow, in conduit or thr	Solids, total suspende	Solids, total suspende	Temperature, water d	Zinc, total (as Zn)	Zinc, total (as Zn)	pH
	.1 mg/L	.1 mg/L	.2 mg/L	.2 mg/L	.26 MGD	.4 MGD	30 mg/L	75 mg/L	83 deg F	1 mg/L	1 mg/L	6.5 SU
Mon Pd End Date:	DAILY MX	MO AVG	DAILY MX	MO AVG	MO AVG	DAILY MX	MO AVG	DAILY MX	DAILY MX	DAILY MX	MO AVG	MINIMUM
08/31/2018	0	0	NODI: 9	NODI: 9	.055	.198	3.2	3.2	81	< .05	< .05	8.2



GHCND:US1MABR0016_2018-8-1.pdf

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Current Location: Elev: 57 ft. Lat: 41.7351° N Lon: -71.1552° W
Station: **SOMERSET 0.4 SSE, MA US US1MABR0016**

Record of Climatologic Observations
These data are quality controlled and be identical to the original observat
Generated on 08/27/2021

Year	Month	Day	Temperature (F) 24 Hrs. Ending at Observation Time Max.	Temperature (F) 24 Hrs. Ending at Observation Time Min.	Temperature (F) At Obs.	Precipitation 24 Hour Amounts Ending at Observation Time Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Precipitation At Obs. Time Snow, Ice Pellets, Hail, Ice on Ground (in)	2 Mc
2018	08	01				0.00		0.0			
2018	08	02				0.00		0.0			
2018	08	03				0.00		0.0			
2018	08	04				0.00		0.0			
2018	08	05				2.90					
2018	08	06				0.00		0.0			
2018	08	07				0.00		0.0			
2018	08	08				0.00		0.0			
2018	08	09				0.00		0.0			
2018	08	10				0.00		0.0			
2018	08	11				0.47					
2018	08	12				0.05					
2018	08	13				1.49					
2018	08	14				0.64					
2018	08	15				0.42					
2018	08	16				0.00		0.0			
2018	08	17				0.00		0.0			
2018	08	18				0.02					

MassDEP analysts also reviewed weather conditions at the time of the exceedances and documented that a heat wave (defined as temperatures exceeding 90°F on three or more consecutive days) was occurring in the Mount Hope Bay area at that time (see Somerset air temperature data below documenting the extreme heat conditions four days prior and during the two days when Mount Hope Bay water temperature at the Cole Buoy was higher than 29.4 C on 9 and 10 Aug 2018):

Somerset, MA air temperature (°F) data (retrieved https://www.almanac.com/weather/history/ma/Somerset):

Date	5 Aug 2018	6 Aug 2018	7 Aug 2018	8 Aug 2018	9 Aug 2018	10 Aug 2018
Min Air Temp	62.6	63.0	64.9	75.0	75.0	61.0
Mean Air Temp	77.1	80.6	82.4	81.9	81.6	76.1
Max Air Temp	93.0	95.0	95.0	93.0	91.9	91.0

The temperature exceedances at the Cole buoy in Mount Hope Bay are considered to be the result of the naturally occurring heat wave conditions and not a result of anthropogenic influences. Since excursions from criteria due to natural conditions (in this case the extended heat wave) should not be interpreted as violations of standards as described in the 2018 CALM Guidance Manual and the MA SWQS, the delisting of the temperature impairment for MA61-07 is appropriate.

North Watuppa Pond (MA61004)

Location:	Fall River/Westport.
AU Type:	FRESHWATER LAKE
AU Size:	1728 ACRES
Classification/Qualifier:	A: PWS, ORW

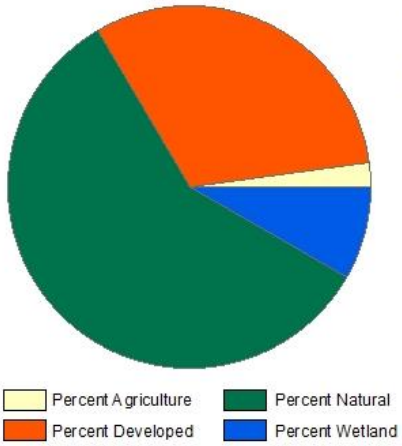
Fish, other Aquatic Life and Wildlife Use: Not Assessed
2016 IR Decision Summary: There were no data available to assess the Aquatic Life Use for North Watuppa Pond so it was Not Assessed.

Quequechan River (MA61-05)

Location:	Outlet South Watuppa Pond, Fall River to confluence with Mt. Hope Bay at mouth of Taunton River (just upstream of the Braga Bridge), Fall River.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B: WWF, CSO

Quequechan River - MA61-05

Watershed Area: 30.18 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	23.79	10.22	4.36	1.91
Agriculture	2.2%	0.4%	2%	0.5%
Developed	31.2%	54.4%	29.4%	46.4%
Natural	58.3%	42.4%	52.3%	43.2%
Wetland	8.2%	2.8%	16.3%	9.9%
Impervious Cover	15.3%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Trash		Changed

Fish, other Aquatic Life and Wildlife Use: Not Supporting

2016 IR Decision Summary:

MassDEP staff conducted water quality sampling in the Quequechan River at the culvert entrance southeast of the intersection of Routes 81 and 195, Fall River (W1962) between May and August 2009 (just upstream from where the river is culverted underground). Habitat impairment resulting from this channelization lower 0.9 miles of this segment remains. Some of the water quality data (DO, pH, temperature, ammonia) were indicative of generally poor conditions; DO as low as 3.3mg/L, instream temperature as high as 29.8°C with the maximum 24-hour rolling average temperature 28.2°C (August 24 - 26, 2009 deployment). There were also some indications of enriched conditions based on physicochemical indicators (max daily DO change 4.5 mg/L, max saturation 134%) although total phosphorus concentrations were not elevated (0.074 mg/L max and 0.045 mg/L average). There were observations of algal mats as well as moderate amounts of duckweed present. Flow regime alterations likely also problem but not captured in source codes.

The Aquatic Life Use for the Quequechan River will continue to be assessed as Not Supporting with the former impairments being carried forward.

Sawdy Pond (MA61005)

Location:	Westport/Fall River.
AU Type:	FRESHWATER LAKE
AU Size:	369 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
2016 IR Decision Summary: There are no data available to assess the Aquatic Life Use for Sawdy Pond so it is Not Assessed.

South Watuppa Pond (MA61006)

Location:	Fall River/Westport.
AU Type:	FRESHWATER LAKE
AU Size:	1473 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
2016 IR Decision Summary: There are no data available to assess the Aquatic Life Use for South Watuppa Pond so it is Not Assessed.

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