

# City of Brockton, Massachusetts

## Resource Management Plan Scope of Work

### **Task 1 – Project Scoping and Regulatory Coordination**

#### *Summary*

This task includes preparation of the Resource Management Plan (RMP) scope of work, a public comment period including a public meeting, compilation of written public comments and response to written public comments. Included in this work are meetings between the City of Brockton and MassDEP (Massachusetts Department of Environmental Protection) intended to define project requirements and objectives, identify information sources, and specify any procedural/regulatory guidelines or requirements that must be satisfied. This task addresses the requirements of Administrative Consent Order (ACO) Item 34.

#### *Detailed Scope of Work*

- Meet with MassDEP representatives to review the requirements ACO for the Resource Management Plan (RMP) and discuss specific requirements of the draft RMP scope of work.
- Prepare a draft scope of work that addresses the RMP requirements of the ACO.
- Publish the draft RMP scope of work for public review and comment. The draft RMP scope of work will be available for public review on the City of Brockton website, and paper copies of the document will be available at Brockton City Hall, and the Halifax and Hanson Town Halls. Public comment period will be a minimum of 30 days. Written public comments will be accepted until February 26, 2018. Details are included in the public notification.
- Publish a notification of the availability of the RMP scope of work and solicit public comment in the Environmental Monitor, Brockton Enterprise and Patriot Ledger.
- Hold a public meeting to present the draft RMP scope of work and solicit public comment. The public meeting will be on February 6, 2018. Details are included in the public notification.
- Collate written public comments received on the draft RMP scope of work and prepare a response to comments.
- Meet with MassDEP to discuss the public comments received, the draft response to comments, and proposed modifications to the draft RMP scope of work.
- Finalize the proposed RMP scope of work, with modifications as warranted based on review of public comments received and MassDEP input.
- Submit the final RMP scope of work, public comments, and response to comments to MassDEP for review and approval.

- Publish the final RMP scope of work and response to comments on the City of Brockton website, and paper copies of the document will be available at Brockton City Hall, and the Halifax and Hanson Town Halls. Copies of the final RMP scope of work and response to comments will also be forwarded to each person/group who provided written public comments. Town of Halifax will also be requested to post these documents on the Town website with other Monponsett Pond documents.
- Meet with MassDEP to formally kick off the project.

## **Task 2 – Document Historical Practices and Existing Pond Uses and Conditions, and Develop Monthly Pond Water Level Targets**

### *Summary*

This task addresses ACO Item 33a by documenting the City of Brockton’s current and historic operating practices, and reviewing specific triggers, timing and respective water levels related to overall Monponsett Pond management, releases to Stump Brook, diversions to Silver Lake and flood control.

Possible changes to operating practices will also be examined that consider current pond uses water quality issues, water supply needs, flood control, and the corresponding water level requirements. Current pond uses include, in no particular order:

- Water supply
- Recreation (boating, fishing and bathing)
- Agricultural (cranberry cultivation)
- Residential (shoreline development)
- Stream flow to Stump Brook (future fish passage)
- Wildlife habitat

Input will be solicited from MassDEP, Massachusetts Department of Fish and Game (Division of Fisheries & Wildlife (MassWildlife), Massachusetts Division of Ecological Restoration (MassDER), Office of Fishing and Boating Access, and Marine Fisheries), Massachusetts Department of Public Health (MassDPH), local Boards of Health, Cape Cod Cranberry Growers Association (CCCGA), and University of Massachusetts (UMass) Cranberry Station. This information and literature searches will be used to develop monthly target pond elevations to accommodate existing uses.

### *Detailed Scope of Work*

- Brockton Water Department and Veolia (water treatment plant contract operator) staff will review up to five years of historical operations practices and issues and summarize historical average monthly Monponsett Pond water levels. Historical operations reviewed will include specific requirements of the Acts, water level management, diversions to Silver Lake, releases to Stump Brook, flood control measures, water quality restrictions, water supply requirements, recreational uses, habitat needs and agricultural requirements, as available.

Groundwater, stream flow and precipitation data will also be reviewed and compared with water level data. For groundwater and streamflow data, local United States Geologic Survey (USGS) data will be reviewed. For precipitation data, local Department of Conservation and Recreation (DCR) and/or National Weather Service (NWS) data will be reviewed.

- Solicit input from MassDEP, MassWildlife and Office of Fishing and Boating Access, CCCGA and UMass Cranberry Station, MassDPH, and various Halifax and Hanson town departments related to overall knowledge of the area, Monponsett Pond water quality data, cranberry growers' operations, stormwater discharges, and historical documents on file. Summarize findings.
- Solicit input from the MassWildlife and Office of Fishing and Boating Access, Mass DPH, and local Boards of Health regarding boating, fishing and bathing uses at Monponsett Pond, and required depths to support these uses. Summarize findings.
- Solicit input from the MassWildlife Natural Heritage & Endangered Species Program (NHESP) regarding habitat requirements for listed species present at Monponsett Pond. Summarize findings.
- Solicit input from the Halifax and Hanson Boards of Health regarding requirements and actions regarding septic systems near the Monponsett Pond shoreline. Summarize findings.
- Solicit input from the CCCGA and UMass Cranberry Station regarding cranberry agriculture management. Summarize findings.
- Review data on flood related diversions versus Stump Brook Dam releases. Data is expected to include elevations of Monponsett Pond, Silver Lake and local groundwater table for the week leading to and including the diversion/release event. The amount of the diversion/release will also be estimated. For groundwater data, local USGS data will be reviewed.
- Perform a literature search for reports and/or articles on Monponsett Pond, including documents prepared for/by MassDEP, MassDER, the towns of Halifax and Hanson, the Monponsett Pond Wastershed Association, and the Jones River Watershed Association.
- Perform a cursory review of available recent and historic pond bathymetry by others, as available.
- Summarize available recent and historic pond water quality data obtained from MassDEP, MassDPH, recent studies, and other sources, as available. Summarize applicable regulations, Acts of the legislature granting water rights to Monponsett Pond, Water Management Act registrations, Chapter 91 license and other documents that apply to management of Monponsett Pond.
- Brockton Water Department and Veolia staff will explore possible changes to operating procedures that could:

- improved flushing in West Monponsett Pond to help control algal blooms/cyanobacteria impacts,
  - a flow path from East Monponsett Pond to West Monponsett Pond, during algal blooms, to minimize the potential for reversal of flow and degradation of East Monponsett Pond.
  - adequate water supply and water quality for diversion to Silver Lake,
  - better flood control (including timing, benefits and/or impacts of flood control diversions to Silver Lake and/or Stump Brook),
  - adequate water depth for bathing, boating, fishing and cranberry cultivation (agriculture),
  - suitable habitat for NHESP species of concern, and
  - future fish migration in Stump Brook.
- Develop monthly target pond elevations, or elevation ranges to accommodate existing uses noted above based on anticipated inflow and withdrawal patterns, suggested water depths for each use, and seasonality of each use.

### **Task 3 – Research Historical Pond Elevations**

#### *Summary*

ACO Item 33b requires that the City “research historical pond elevation information using available data from United States Geological Survey (USGS) and other agencies....” In addition to the City’s historical Monponsett Pond level data, this task will include a cursory review of pond levels shown on historical mapping to compare pre-water supply and water supply pond elevations.

#### *Detailed Scope of Work*

- Review historical City of Brockton pond elevations and trends for Monponsett Pond for the last 20 years.
- Review historical USGS Hanover, MA Quadrangles that indicate Monponsett Pond elevation. Mapping sources include the University of New Hampshire and UMass Lowell.
- Review historical pond elevations in 1923 Chapter 91 license (ACO requirements for the RMP). It is understood that this document refers to a reference point that most likely has been disturbed/lost. Information will be gleaned from this document, to the extent practicable.
- Solicit historical mapping of Monponsett Pond from the Massachusetts Historical Commission, and town engineers and/or historical commissions in Halifax and Hanson. Investigate sources of historical mapping provided by the Jones River Watershed Association during the public comment period. An extensive document search is not included in this task.
- A search of the Registry of Deeds is not included in this task.

- Based on available historical (pre-water supply) mapping, compare pre-water supply pond elevations to historical water supply operating elevations.

#### **Task 4 – Collect Flow Data at the Route 58 Box Culvert**

##### *Summary*

ACO Item 33c requires “collection of flow data to correlate Silver Lake diversion rates with flow rates from West Monponsett Pond to East Monponsett Pond during diversions to Silver Lake.” The natural flow path is from East Monponsett Pond to West Monponsett Pond and Stump Brook. The intent of this requirement is to assess the potential for the flow of degraded water from West Monponsett Pond to pass through the culvert to East Monponsett Pond, given that the City of Brockton’s diversions are from the east pond. The City will collect data and estimate the flow patterns in the Route 58 box culvert between East and West Monponsett Ponds under varied conditions. Flow measurements will aid in understanding the hydraulic connection between the ponds. The flow measurement methodology is expected to be, by necessity, simplistic given that typical continuous flow metering devices are expected to have limited accuracy due to the culvert configuration and wind and kayak/canoe interference, and would be subject to tampering, vandalism and/or theft given this remote location.

##### *Detailed Scope of Work*

- Develop a protocol for City or Veolia staff use. Flow measurement methodology is envisioned to track the rate of travel of an orange or other object through the Route 58 box culvert. A round object, like an orange, will be less influenced by wind than a flat object floating at the water surface.
- Collect field measurements of the box culvert to define an average cross-sectional area and traverse length at different pond water levels. Install a staff gauge on the structure; the gauge will be tied via survey to a local benchmark that the local water elevation at the time of flow measurements.
- Flow measurement observations will be performed in a manner that does not conflict with the requirements of the Acts of 1964 and as amended by the Acts of 1981, such that at least 900,000 gallons per day (gpd) is released to Stump Brook during times of diversion to Silver Lake. It is understood that releases to Stump Brook can be temporarily reduced when there is no diversion to Silver Lake, with written approval of MassDEP. Allow two days for the ponds to stabilize under test conditions prior to data collection. Data will be collected for each flow condition specified below with the goal of obtaining several measurements during each season, when the condition is allowed per requirements of the Act. Data will be collected will target calm, dry weather and open water (at the culvert as minimum) conditions:
  - Full diversion rate to Silver Lake with at least 900,000 gpd release to Stump Brook (October to May)
  - 75 percent diversion rate to Silver Lake with at least 900,000 gpd release to Stump Brook (October to May)

- 50 percent diversion rate to Silver Lake with at least 900,000 gpd release to Stump Brook (October to May)
  - 25 percent diversion rate to Silver Lake with at least 900,000 gpd release to Stump Brook (October to May)
  - No diversion to Silver Lake with at least 900,000 gpd release to Stump Brook (year-round)
  - No diversion to Silver Lake with at least 600,000 gpd release to Stump Brook (June to September)
  - No diversion to Silver Lake with at least 300,000 gpd release to Stump Brook (June to September)
  - No diversion to Silver Lake and no release to Stump Brook (June to September)
  - Flood control and/or pond flushing scenarios, as negotiated in advance with MassDEP. The intent is to simulate flood conditions and/or a late spring flush period for water quality purposes. MassDEP has indicated that it may allow impounding of water (by temporarily waiving the ACO-required 900,000 gpd release to Stump Brook) when there is no diversion to Silver Lake.
- Correlate diversion rate and Stump Brook release rate with observed flow rates at the Route 58 culvert. Tabulate and graph findings.
  - Collect grab samples at four locations and perform water quality testing for total phosphorus, total nitrogen, ammonia, color and turbidity, dissolved oxygen, temperature, pH, and conductivity during up to four selected flow release/diversion scenarios above. Sampling locations are anticipated to be:
    - Northern East Monponsett Pond (near Stetson Brook)
    - Southern East Monponsett Pond (near the Silver Lake diversion structure/East Monponsett Ramp)
    - Southern West Monponsett Pond (downstream of the Route 58 culvert)
    - Stump Brook Dam or alternate shoreline access point on Northern West Monponsett Pond

## **Task 5 – Estimate Seasonal Releases to Stump Brook**

### *Summary*

ACO Item 33d requires an evaluation of high-rate spring flushing to potentially reduce stagnation and algal blooms. The analysis will define the maximum water level at which the Monponsett Pond can be held without causing flooding and possible pond flushing scenarios. It will consider the release constraints of the Stump Brook Dam, the natural sill of West Monponsett Pond and the

invert of the Route 58 box culvert dividing the ponds. The outcome sought is to estimate the water residence time for various scenarios and perform a qualitative assessment as to whether this might change water quality in West Monponsett Pond without creating downstream flooding of Stump Brook.

#### *Detailed Scope of Work*

- Define the maximum water level at which the pond can be held without causing flooding.
- Based on available drawings and data, assess flow relationships and constraints for flows released from the Stump Brook Dam structure, including sluice gate, fish ladder and spillway.
- Based on available drawings and measurements collected in Task 4, assess flow relationships and constraints for flows through the Route 58 box culvert connecting East and West Monponsett Pond
- Field reconnaissance will be conducted to identify the natural sill elevation of West Monponsett Pond.
- Assess stage/storage relationship for pond volumes considering vertical constraints of Stump Brook Dam release points, the natural sill of West Monponsett Pond, and the invert of the culvert dividing the ponds.
- Surface and groundwater inflow rates of East and West Monponsett will be approximated using readily available information including work done in previous studies. The estimates will be annual or seasonal, depending on their use in the subsequent analyses.
- Construct a spreadsheet and perform a high-level desktop analysis of potential seasonal pond operation changes to induce increased spring release rates to Stump Brook for pond flushing. The analysis will consider bounding scenarios where flow from East Monponsett Pond minimally and fully mixes with the waters of West Monponsett Pond, and additional scenarios where the East Monponsett Pond flow mixes with the upper waters (defined by the controlling vertical constraint and the typical summer epilimnion depth). A seasonally appropriate steady inflow from groundwater/surface water will be assumed based on previous studies of the pond by others. Water entering West Monponsett Pond from East Monponsett Pond and the groundwater are expected to contain less phosphorus, which is expected to reduce algal blooms.
- Based on the desktop analysis, consider the change in water residence time for various operations scenarios and make a qualitative assessment as to whether each scenario might change/improve water quality in West Monponsett Pond. Consider possible water supply impacts that may occur due to changes to Silver Lake diversion timeframe and minimum pond depth required to accommodate these scenarios.

## **Task 6 – Operating Procedures for Silver Lake Diversion & Stump Brook Dam**

### *Summary*

As required by ACO Items 33e and 33f, Monponsett Pond operating procedures manuals will be prepared for the Silver Lake diversion infrastructure and the Stump Brook dam. The results of Tasks 2 through 5 above will be used as the basis for developing separate operating guideline procedures manuals for Stump Brook dam and Silver Lake diversion structure.

### *Detailed Scope of Work*

- Prepare separate operating procedures manuals for Stump Brook Dam and Silver Lake Diversion Structure. Based on the results of Tasks 2 through 5, modify and expand existing operations protocols to include goals, timeframes, and triggers for operations decisions regarding:
  - pond water elevations,
  - water supply diversions to Silver Lake, and
  - releases to Stump Brook.

## **Task 7 – Recommended Action Items and Preliminary Feasibility Assessment**

### *Summary*

In accordance with ACO Item 33g, the City will prepare a recommended actions list with a preliminary feasibility assessment. This actions list will largely include additional measures that are beyond the City's jurisdictional authority but could be performed by other stakeholders. These actions include, but are not limited to, septic system upgrades/improvements, improved stormwater management, improved land use management, in-pond treatment, and agricultural best management practices.

### *Detailed Scope of Work*

- Compile a list of recommended actions from previous studies and MassDEP's *Draft West and East Monponsett Pond System Total Maximum Daily Loads for Phosphorus (CN 446.0)*.
- Recommend and list additional studies/actions based on the outcome of Tasks 1 through 6 above.
- Perform a cursory (preliminary) feasibility assessment and possible responsible parties for each action item listed.

## **Task 8 – Draft Report Preparation and Public Comment**

### *Summary*

In accordance with ACO Item 36, this task includes preparation of the draft RMP, a meeting between the City and MassDEP to present the findings prior to public review, a public comment period with a public meeting, compilation of public comments, a response to comments, and a meeting between the City and MassDEP to discuss the comments prior to finalizing the RMP.

### *Detailed Scope of Work*

- Prepare the draft RMP based on the results of Tasks 2 through 6.
- Prepare for and attend a meeting between the City and MassDEP to present the draft RMP prior to its release for public review.
- Publish the draft RMP for public review and comment. The draft RMP will be available for public review online on the City of Brockton website, and copies of the document will be available at Brockton City Hall, and the Halifax and Hanson Town Halls. Written public comments shall be accepted for 30 days from the publish date.
- Publish a notification of the availability of the draft RMP to solicit public comment in the Environmental Monitor, Brockton Enterprise and Patriot Ledger.
- Hold a public meeting to present the draft RMP and solicit public comment.
- Collate public comments on the draft RMP and prepare a response to comments.
- Prepare for and attend a meeting with MassDEP to discuss the public comments and response prior to finalizing the RMP.
- Finalize the RMP and submit the document to MassDEP.

