Howard Carter
Saco Water Resource Recovery Facility
Front Street
Saco, ME 04072
Re: Saco WRRF Resiliency Study

Saco WRRF Resiliency Study
Executive Summary for Water Resource Recovery Facility Effluent Pump Station, Wet-Weather Treatment Improvements, and Climate Adaptation Plan

Dear Mr. Carter:

Tighe & Bond is pleased to submit for review, the draft executive summary for the Water Resource Recovery Facility Effluent Pump Station, Wet-Weather Treatment Improvements, and Climate Adaptation Plan.

The executive summary presents:

- Project Understanding and Goals
- Summary of the Recommended Plan
- Opinion of Probable Cost for the Recommended Plan (OPC)

The complete Final Report will soon follow. We thank you for the time and opportunity to work collaboratively on this important assignment.

We look forward to discussing any additional comments and finalizing this study report. Should you have any questions, please feel free to contact me at 207.232.6071.

Very truly yours,

TIGHE & BOND, INC.

Daniel Bisson, PE
Senior Project Manager

Enclosures
CC: Stacy Thompson, Saco WRRF
    Joe Laverriere, Saco DPW
    Miles Moffatt, PE, Tighe & Bond
    Ryan Pavlica, Tighe & Bond
Water Resource Recovery Facility
Effluent Pump Station, Wet-Weather Treatment Improvements, and Climate Adaptation Plan

Saco Water Resource Recovery Facility
Saco, Maine
July 2019
Executive Summary

Project Understanding and Goals

The purpose of this study is to develop a resiliency plan for the City of Saco’s Water Resource Recovery Facility (WRRF) located on Front Street and adjacent to the Saco River. The WRRF’s direct proximity to the tidally influenced Saco River puts this facility at significant risk to the effects of sea level rise as well as flooding during extreme weather events. The facility has recently experienced known hydraulic impacts due to increases in wet weather sewerage flows and higher than normal tides elevations. Hydraulic backups throughout the plant process can be visually observed during periods of high tide and heavy rainfall. These concerns have prompted the City to seek measures for resiliency to protect the facilities and personnel from the effects of climate change. This study accounts for the three sources of the flooding that could potentially impact the operation of the WRRF including increase wastewater flows, stormwater collected at the site and sea level rise.

The key goals of this project for the City of Saco were to:

- Ensure that the Saco WRRF is resilient to flooding impacts from the following factors: sea level rise, quantity of wastewater entering the facility and site stormwater.
- Understand the hydraulic capacity of the WRRF to determine if additional wastewater flows could be directed to the plant in order to reduce the activity of or eliminate CSO #004.
- Develop a plan to provide improved treatment for wet weather flows at the WRRF to improve the effectiveness of the Wet Weather Treatment process.

The City of Saco and Tighe & Bond have developed a holistic approach in order to meet these key goals for this project which is described further below. The approach compared multiple resiliency guidelines, finding that TR-16 standards as the basis of the design to account for flood level protection based on a 100-year storm event + 3 feet of elevation, compares well with the other guidelines and is appropriate for the protection of the WRRF for the next 50 years. The recommended design coastal flood elevation for this site is elevation 12 feet based on NAVD88 vertical datum. Figure E-1 depicts the potential impact to the WRRF without flood protection measures based on the designated elevation of 12 feet.

Recommended Plan

Due to the multi-component nature of the study, the project was broken down into several sub-components to determine the preferred methods to meet each goal of the project. These sub-components were as follows:

- Wastewater flow flood mitigation and wet weather flow treatment
- Sea level rise resiliency for both flooding and plant hydraulics
- Stormwater flood mitigation

To determine the most beneficial means to handle each of these flood risks, the City of Saco and Tighe & Bond conducted an alternatives analysis for each sub-component of the project. Several alternatives were evaluated for effectiveness, constructability and cost.
Wastewater Flood Mitigation and Wet Weather Flow Treatment

In order to determine the flood risk due to increased sewerage flows, a hydraulic model of the WRRF was developed using elevation data collected from a limited field survey as well as record drawings provided by the City of Saco. The hydraulic model estimated that the maximum hydraulic capacity of the WRRF without the use of the StormKing bypass system was 10.8 million gallons per day (mgd), which does not account for biological treatment capacity, therefore treatment ability would be impacted when the WRRF receives flows of this magnitude. With the StormKing bypass, the overall hydraulic capacity was estimated to be 17.8 mgd. The model also concluded that tide levels significantly impact the hydraulic capacity of the WRRF.

In order to maximize the WRRF’s available hydraulic capacity, several pump station alternatives, sized for 11 mgd wastewater flows were evaluated. The use of a pump station would allow the facility to continue to discharge sewerage flows even in the event of experiencing high tide elevations up to 12-feet. The alternatives included repurposing the existing outfall distribution box as a pump station as well as a new pump station location adjacent the existing dechlorination structure. Three alternatives were analyzed and evaluated.

Based on discussions with key stakeholders, Alternative #3 which utilizes an overflow pump station located adjacent to the dechlorination structure was selected due to the ability to mitigate potential flooding risk and its minimized cost and impacts associated with maintaining plant operations during construction.

Additionally, alternatives to improve wet weather treatment capability at the WRRF were also evaluated. Several technologies including additional chlorine contact tanks, ultraviolet (UV) disinfection systems, cloth disk filters, additional StormKing capacity and a new CSO tank were included in the analysis.

Alternative #5, the CSO tank option, conceptually sized for 750,000 gallons to maximize available space constraints was selected for several reasons including:

- The CSO tank provides additional hydraulic capacity for the WRRF which is valuable in decreasing flood risk due to the wastewater flows.
- The new tank would reduce the flow to the StormKing, which allows for improved disinfection through this system as design flows would not be exceeded. The current means of disinfection would not require improvement.
- This alternative would limit use of CSO #004 and allow this flow to receive proper treatment through the WRRF.

Sea Level Rise Resiliency

Based on the design coastal flood elevation of 12 feet, several areas of the WRRF would become inundated including the majority of the facility’s treatment works as well as the plant access drive, Front Street.
To mitigate the coastal flooding impacts to the plant, several options were evaluated including the design and construction of a steel sheet pile sea wall limited to the critical areas where flooding is anticipated as well as a driveway dike alternative. An option of incorporating an alternative access point on the northern portion of the WRRF property was also evaluated. Based on discussions with key stakeholders, Alternative #1 was selected which includes the following features:

- Regrading portions of Front Street which are at risk of flooding to 12 feet and the construction of a retaining wall.
- Resetting the existing boat ramp off Front Street to account for the new street elevation.
- Design and construction of a new sheet pile flood wall at the southernmost portion of the WWRF property. The flood wall would be designed for a top elevation of 13 feet to provide freeboard and tolerance for some wave action at the design flood level. Additional resiliency measures anticipated include the ability to pump floodwater/stormwater from behind the floodwall during peak storm surge when gravity storm drains are not flowing.
- Incorporating a section of the riverwalk to be located up and over the new flood wall
- New check valves to be located at the stormwater and wastewater discharges to restrict flow from the river back into the WRRF site.
- Demolition of the existing Department of Public Works (DPW) garage for construction access (for both CSO tank construction and regrading of Front Street).

**Stormwater Flood Mitigation**

With the construction of a new flood wall, the potential for flooding due to the collected stormwater at the WRRF site increases. A stormwater hydraulic model was conducted to determine the potential stormwater flows rates during a 100-year storm event at the WRRF site. A preliminary analysis indicates that approximate peak stormwater flows at the site were calculated to be 16,000 gpm. This flow rate does not include the upland hill adjacent to the WRRF site. The City of Saco and Tighe & Bond determined that the most effective approach to mitigating storm water flood impacts would include the following:

- Limit additional flows to the WRRF from the upland hill by diverting stormwater flows from this location by incorporating new stormwater collection systems and tie into existing infrastructure
- Purchase a new standby trailer mounted pumping system which can mobilized during extreme weather events which has a capacity of 16,000 gpm. The pumping system would be staged near a downstream stormwater manhole and discharge to the existing drainage system outfall.

The overall recommended plan which includes the aforementioned flood mitigation components is depicted on Figure E-2.
### Opinion of Probable Cost

A budgetary opinion of probable cost is broken down for each of the sub-components of the project in Table E-1 below.

**TABLE E-1** Recommended Plan Summary and Opinion of Probable Cost

<table>
<thead>
<tr>
<th>PROJECT COMPONENT</th>
<th>SELECTED ALTERNATIVE</th>
<th>ALTERNATIVE DESCRIPTION</th>
<th>PLANNING LEVEL OPCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Station (Report Section 3)</td>
<td>3</td>
<td>New Pump Station Located Next to Dechlorination Structure (11 MGD)</td>
<td>$4,100,000³</td>
</tr>
<tr>
<td>Wet Weather Treatment (Report Section 3)</td>
<td>5</td>
<td>New CSO Tank</td>
<td>$3,600,000³</td>
</tr>
<tr>
<td>Sea Level Rise Resiliency (Report Section 4)</td>
<td>1</td>
<td>Fill Front Street Entrance, Sheet Pile Flood Wall and Additional Drainage</td>
<td>$2,400,000⁴</td>
</tr>
<tr>
<td>Stormwater Flood Mitigation (Report Section 5)</td>
<td>1</td>
<td>Trailer or Skid Mounted Stormwater Pumps</td>
<td>$700,000⁵</td>
</tr>
</tbody>
</table>

**Total Opinion of Probable Cost** $10,800,000

1. This is an engineer's Opinion of Probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the estimates of probable construction costs are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this estimate of the Probable Construction Cost.

2. The OPCC presented is currently at concept level. Expected accuracy for concept level OPCC's is currently +40% to -25%.

3. OPC includes 40% contingency, engineering and 15% for General Conditions.

4. OPCC includes 40% engineering and contingency and 15% for General Conditions.

5. OPCC includes 30% engineering and contingency.
FIGURE E-2
RECOMMENDED RESILIENCY PLAN OVERVIEW

CITY OF SACO, MAINE
WATER RESOURCE RECOVERY FACILITY
EFFLUENT PUMP STATION, WET-WEATHER TREATMENT IMPROVEMENTS, AND CLIMATE ADAPTATION PLAN

DATE: 07/31/19
SCALE: AS SHOWN
FIGURE: E-2

NOTE: GIS DATA PROVIDED BY THE CITY OF SACO, ME; DATA ALSO FROM PLAN BY DELUCA-HOFFMAN ASSOCIATES, INC. OF SOUTH PORTLAND, ME DATED DECEMBER 1994, AND THE MAINE OFFICE OF GIS. ELEVATIONS TO NAVD88.

LEGEND
- 12.0' FLOOD LEVEL
- PROPOSED DRAINAGE
- PROPOSED RETAINING WALL
- PROPOSED SHEET PILE WALL
- PROPOSED CSO TANK PIPING
- BUILDINGS TO BE DEMOLISHED
- PROPOSED FILL AREA

SCALE IN FEET
0 150' 300'
GRAPHIC SCALE