# Section 6. Assessment of Actions (Task 6)

## 6.0 Proposed Methodology for Assessment

In order to assess potential action options for the Grand Canal, current conditions in the Grand Canal and adjacent wetlands must be first assessed in terms of ecological and public health. Data collection must be performed in order to determine if the Grand Canal is experiencing impaired conditions. Examples of data that should be collected and analyzed from throughout the study area include: water quality parameters (e.g., dissolved oxygen, salinity); hydrographic data (e.g., water depth, bottom sediment composition); tidal flushing and stream flow data; flora data (e.g., vegetation types, presence of invasive species); fauna data (e.g., benthic community composition, fisheries); sediment contamination; and water contamination, among others. Current conditions for the Grand Canal were assessed and described in this study.

Next, if impairments are found or if existing conditions are expected to lead to future impairments, potential action options to address these issues must be proposed. Analyses should be then undertaken to determine if existing impairments in the Grand Canal may be improved through the listed potential actions. Table 16 outlines the proposed methodology for assessing action options in the Grand Canal.

**Table 17. Methodological Approach for Assessing Action Options in The Grand Canal**

| Step | Description |
|---|---|
| 1. Define study area | Define study area (e.g., location, size) |
| 2. Review existing data | Review existing data pertaining to study area (e.g., historical photographs, prior studies) |
| 3. Collect and analyze data | a. Determine data necessary to assess current condition of study area<br>-Data should address physical, biological, and chemical conditions<br>-Data should enable an assessment of the study area's ecological and public health condition<br>b. Collect and analyze data |
| 4. Determine need for action | a. Based on analyzed data, determine condition of study area, particularly if impairments exist<br>b. Define objectives of potential actions (e.g., improve ecological health of study area) |
| 5. List potential actions | Determine action options for achieving objectives |
| 6. Define additional data requirements | a. Determine what additional data are necessary to fully assess action options<br>b. Collect these data to allow for informed decision making<br>c. Define uncertainties and assumptions of action assessment |
| 7. Evaluate action options | Evaluate potential action options in terms of:<br>- Potential to address impairments in study area<br>- Financial costs of action<br>- Stakeholder concerns |
| 8. Assess impediments to success | a. Physical constraints to alternative actions (e.g. private, deteriorated bulkheads, channel width/bulkhead set-backs)<br>b. Regulatory approvals from involved agencies (e.g. NYSDEC tidal wetland permits)<br>c. Continued anthropogenic sources of contamination (e.g. stormwater, septics) |
| 9. Select preferred action | Select the best action option |
| 10. Implement selected action | a. Implement selected action<br>b. Conduct regular monitoring of key parameters to assess effects of action<br>c. If action is not achieving desired outcomes, identify reasons why |

## 6.1 Need for Action

In order to assess potential action options for the Grand Canal, current conditions in the Grand Canal and adjacent wetlands were assessed in terms of ecological health (see section 3 of this report as well as Appendix I ‘Grand Canal Ecological Health Evaluation Report’ and Appendix H ‘Wetland Habitat Condition and Health Assessment Report’) and public health (see Appendix C ‘Grand Canal Public Health Evaluation Report and Sediment Risk Assessment’). Numerous factors were examined to determine if the Grand Canal has been experiencing impaired conditions, and effort was placed on determining whether these impairments may be improved through various actions. The objectives of conducting actions within the Grand Canal would be to address the numerous impairments identified within the Grand Canal.

Based on field data and the wetland health assessment (Appendix H), the marshes in the study area were all found to be severely-stressed, particularly when compared to large salt marsh complexes in less disturbed landscape settings. Each assessed marsh in the Grand Canal Pickman-Remmer system is surrounded by intensive development which has reduced protective buffers, halted the ability of the marsh to shift landward with increasing sea levels, and has subjected the marshes to inputs of contaminants, sediments, freshwater, yard waste and other debris. All marshes are artificially ditched, two of the three marshes (northwest and east) have significant restrictions in tidal flow from the Grand Canal (which itself is somewhat restricted), and all are experiencing some shoreline erosion from wave action. In addition, invasive common reed occurs throughout all marsh complexes and is dominant in two of the three systems (east and northwest). Furthermore, a review of historic aerial images (Suffolk County, 2015) and hydric soil mapping (USDA, 2014) show significant loss of wetlands in the Grand Canal study area.

Results from water quality monitoring conducted in the Grand Canal study area as part of the present study (data collected in 2014, 2015, and 2016), as well as data collected in 2004 as part of the prior Grand Canal environmental study, indicated that the canal and connected tidal areas are significantly impacted by sediment and nutrient enrichment, as evidenced by low dissolved oxygen levels, high levels of nitrogen and phosphorus, elevated coliform bacteria levels, elevated levels of volatile organic compounds (VOCs) and semi-volatile organics (SVOCs), highly turbid water, and brown algae blooms. The data generally indicated that water quality conditions in the Grand Canal have worsened over the past decade. Results from the sediment monitoring conducted in the Grand Canal study area as part of the present study (data collected in 2015), as well as data collected in 2004 as part of the prior Grand Canal environmental study, indicated that some sediments from the Grand Canal were contaminated with DDT and its constituents at moderate to high levels, indicating chronic to acute toxicity to aquatic life. The sediment analysis also indicated that some samples had moderate metal contamination.

These impaired water quality and sediment conditions can be harmful to both public and ecological health. Poor tidal flushing, petroleum products used in boats, and storm water runoff input from adjacent developed areas and storm drains have been identified as significant contributing factors to impairments in the Grand Canal. During this study, limited tidal flushing, stagnant areas of the canal and marshes, brown algal blooms, possible input of sanitary system effluents from residences, storm water runoff via storm drains into marshes, oil sheen on marsh and open water surfaces, and erosion, were all observed.

## 6.2 List of Potential Actions

It can be concluded that the Grand Canal and adjacent wetlands are experiencing severe impairments. To address these impairments, several potential actions may be undertaken. Table 17 describes several potential action options for the Grand Canal. It should be noted that although the Canal is considered to have severe impairments, the extent of impairments is comparable to that found in other surface waters subject to similar anthropogenic impacts.

**Table 18. Potential Actions for the Grand Canal**

| Action | Description | Potential Results |
|---|---|---|
| Alternative 1: No Action **(Not Preferred)** | No additional action to improve conditions in the canal. | If no action is taken to improve ecological and public health risks in the canal, the conditions within the canal will continue to worsen. |
| Alternative 2: Channel Dredging only. **(Not Preferred)** | Dredge the channel within the canal to a 5-foot below mean low water depth. | The major sediment deposition within the interior of the canal system appears to be the result of deteriorated bulkheads and berm erosion. Without these two sources being addressed the sedimentation within the canal will continue with or without dredging. |
| Alternative 3. IMM and Berm Alteration (**Preferred Action**) | Initiate an Integrated Marsh Management Program (IMM) and entire/partial berm removal | An IMM action will benefit the overall health of flora and fauna inhabiting the wetlands associated with the canal system. Partial or total removal of the berm that is currently restricting water movement into the wetlands will help to increase water movement/exchange in the canal by opening up a larger surface area for the water to flow into during tidal exchanges. This will also help to mitigate residential flooding issues during storm events. . |
| Alternative 4. IMM, Berm Alteration, and Selective Dredging (**Action if needed)** | In addition to the preferred action above, selectively dredging areas where sediment deposition appears to be restricting water movement. | Selective dredging would most likely pertain to areas at the mouth of both the northern and southern entrances of the canal were sediment may be entering the canal system from the bay and river. Sediment buildup across these areas may be restrictive to water flow entering the canal. |

As indicated in the above table, the preferred method to improve ecological and health risk issues associated with Grand Canal is to initiate an IMM action and berm alteration. The alteration of the berm will allow water entering the canal to disperse into the wetland permitting a larger volume of tidal water to enter the system. This larger volume of water entering the canal system with each tidal cycle will help increase the flushing capacity of the canal and help improve water quality. An IMM will increase the amount of tidal water that disperses throughout the wetland which will help mitigate invasive flora species that flourish in low salinity environments as well as increasing the diversity of fauna that feed on insects and their larva (such as mosquitos).

However, it should be noted that although this alternative will help improve water quality within the canal and its associated wetlands by increasing the area within the canal system to water flow, it is imperative that the anthropogenic sources creating the ecological and human health risks be addressed. If these sources are not mitigated, any action will have a limited effectiveness. It should be noted that the narrow configuration of the south entrance may place upper limits on the amount of water exchange that can be achieved under this alternative.

## 6.3 Additional Data Requirements

Additional work is needed to fully evaluate the options and assess the cost-benefits of the various management recommendations. A detailed assessment of the financial costs of the proposed actions (Alternatives 2 through 4 in Table 18) in the Grand Canal must be performed. The financial cost may dictate which action is undertaken, or the order that they are performed. For instance, it may be feasible to first perform Alternative 3, determine the impacts, and then, if necessary, conduct selective dredging (Alternative 4) at a later time. Similarly, it is necessary to secure funding for the project.

More research is necessary to define contaminant sources to the Grand Canal, particularly for bacterial contaminants. Even if dredging and berm removal were performed, contaminant may still be entering and impairing the study area if contaminant sources are not addressed. It will, therefore, be important to identify these contaminant sources and address them in conjunction with the other action options selected.

## 6.4 Action Evaluation

The '2005 Grand Canal Ecological Health Evaluation Report' (Appendix I) concluded that dredging and IMM in the Grand Canal may alleviate the numerous documented impairments. However, further investigations conducted during this study appear to indicate that an aggressive IMM action in combination with berm alterations will be more effective in improving the ecological and human health risk currently impacting the canal system. IMM will facilitate fish access and reduce stagnant waters in wetlands, both of which may reduce mosquito breeding near the Grand Canal. Increased tidal flow through potential actions, particularly berm removal, may also help to reduce the retention time of bacteria and nutrients within the canal, resulting in lower observed coliform and nutrient levels, as well as improve impaired water quality parameters, such as DO. Increased tidal flow and IMM can also serve to improve the health of the wetlands near the Grand Canal by: reducing common reed populations; increasing native vegetation; increasing vegetative diversity; and improving wildlife maneuverability throughout marshes adjacent to the Grand Canal. Lastly, selective dredging can serve as a means to remove obstructions within the canal system (e.g., shoaling at the entrances of canal, debris) that may be restricting water movement into the canal from the Great South Bay and Connetquot River.

The 'Wetland Habitat Condition and Health Assessment' (Appendix H) concluded that removal of portions of the man-made berm along the west perimeter of the east marsh complex to allow for increased tidal flow throughout the marsh would likely improve the health of the marsh system and potentially also provide flood control. This removal would allow water to enter the natural marsh system where it can be contained and slowly absorbed. The Report recommends that berm removal be conducted first, and then, if necessary, dredging can be implemented later.

IMM, including berm removal, will facilitate fish access and reduce stagnant waters in wetlands, both of which may reduce mosquito breeding near the Grand Canal. Increased tidal flow through potential actions, particularly berm removal, may also help to reduce the retention time of bacteria and nutrients within the canal, resulting in lower observed coliform and nutrient levels, as well as improve impaired water quality parameters, such as DO. Increased tidal flow and IMM can also serve to improve the health of the wetlands near the Grand Canal by: reducing common reed populations; increasing native vegetation; increasing vegetative diversity; and improving wildlife maneuverability throughout marshes adjacent to the Grand Canal.

The 'Grand Canal Public Health Evaluation Report and Sediment Risk Assessment' (Appendix C) also concluded that potential actions may be an effective way to improve tidal flow to the canal and wetlands, and therefore potentially reduce negative risks to human health from the Grand Canal. The report found that in terms of bacteriological quality, the surface waters in the Grand Canal are unlikely to be safe for primary contact recreation. Additionally, the quality of the fish inhabiting the Grand Canal may be compromised (e.g., for purposes of human consumption) by the microbiological contamination.

The Essential Fish Habitat Assessment (Appendix D) for the Grand Canal concluded that the proposed action in the Grand Canal would have no indirect adverse impacts or cumulative adverse impacts to EFH species. The only species listed in the Grand Canal study area that may be slightly affected by possible proposed actions would be the winter flounder which tends to start their inshore migration to spawning grounds in late fall to early winter. Because adults and juveniles are mobile, it is expected that they will avoid the study area during any dredging disturbances. Furthermore, because proposed action is expected to be conducted in winter months when the winter flounder does not inhabit the study area, little adverse impacts are expected.

## 6.5 General Recommendations

It can be concluded that the Grand Canal and adjacent wetlands are severely stressed and experiencing multiple impairments. The stressors contributing to these conditions must be addressed in order to retain the remaining functions and values provided by the study area and to prevent further decline of the Grand Canal. Therefore, Alternative # 1 (No Action) and Alternative #2 (Channel Dredging Only) are not recommended for the study area.

The recommended action to help improve the ecological and human health issues in the Grand Canal is to implement Alternative #3 (IMM and Berm Alteration). This desired action option was based on its ability to achieve multiple objectives, including ecological restoration, habitat enhancement, invasive plant control in wetlands, and public health improvements. However, as stated in other sections of this report, if the anthropogenic sources creating the ecological and human health risks are not addressed, the canal and surrounding wetlands will continue to receive inputs impacting the system. Implementation of these actions in the Grand Canal will require coordination between various municipal agencies and the public, securing sources of funding for the project, and developing procedures for monitoring and assessing the results of the implemented action.

To address the declining condition of the Grand Canal and adjacent marshes, the following general recommendations are offered:

1. Increase tidal flow into the canal and marsh system through IMM and berm removal or alteration.
2. Identify and address sources of bacterial contamination to the Grand Canal (e.g., residential septic systems).
3. Address locations of storm water inputs into the Grand Canal and marsh system and assess them for opportunities to reduce sediment loading, contaminates, and freshwater input into marshes.
4. Identify and address sources of trash, debris, cuttings, and fertilizer use.
5. Identify opportunities to reduce wave action from boats, jet skis, etc., which are contributing to shoreline erosion and degradation of bulkheads and berms.
6. Continue monitoring. Increase level of effort and/or add sampling efforts for parameters deemed most important in restoration efforts.