FINAL REPORT

GRAND CANAL ECOLOGICAL AND PUBLIC HEALTH ASSESSMENT

Report Tasks 1-6

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Suffolk County Department of Health Services

Division of Environmental Quality

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Abstract

An ecological and public health assessment study was completed in 2016 for the Grand Canal and adjacent wetlands in the Town of Islip, Suffolk County, New York. The objective of the study was to collect and analyze data needed to evaluate both the public and ecological health of the Grand Canal, and to develop a methodology for assessing whether dredging combined with Integrated Marsh Management (IMM) would alleviate documented impairments. Conclusions regarding the environmental condition of the Grand Canal and adjacent wetlands are made, and recommendations for actions to improve the health of the study area are discussed. Data collected as part of the study included: surface water samples, water quality parameters, sediment cores, bathymetric data, tidal flow and flushing characterization data, flora and fauna data (vegetation, benthic, fishery, avian), and wetland characterization data. Past reports and existing data were also reviewed as part of the assessment.

The study found that the Grand Canal has experienced impaired environmental quality due to pollution sources (such as septics and stormwater) and excessive nutrient enrichment which has been exacerbated by canal geometry, inadequate tidal flow and flushing. Cultural eutrophication is evidenced by the poor water quality observed within the canal system, particularly the low levels of dissolved oxygen and elevated nutrient levels (nitrogen and phosphorus). Bacterial indicator testing showed that bacterial contamination is a potentially significant public health issue throughout the Grand Canal, as elevated coliform levels were frequently observed. Additionally, results of chemical analysis of sediments collected from the study area were found to contain some chemical constituents, including DDT and its related breakdown products, as well as various heavy metals. However, concentrations were generally consistent with other surface water bodies in the area. Bathymetric surveys of the Grand Canal indicated reduced channel depths throughout the canal system. The marshes in the study area were found to be severely stressed, particularly due to invasive species proliferation and limited tidal flushing.

The public health assessment indicated that, due to bacterial contamination, surface waters in the Grand Canal are unlikely to be safe for primary contact recreation, and that the quality of the fish inhabiting the Canal may also be compromised (e.g., for purposes of human consumption) due to contamination. Potential human health risks from the chemical contaminants detected in surface water and sediment did not exceed non-cancer thresholds or USEPA target cancer risk range. These impairments are not considered to be unique to the Grand Canal; other canals in Suffolk County have been documented as experiencing similar conditions due to the proximity of homes, recreational activities (e.g., boats), and stormwater runoff. Mosquito breeding public health risk has not been documented.

Dredging and deepening of inner portions of the canal, without widening or deepening of its connections to the Connetquot River or adjacent wetlands, would not improve flushing rates for the canal. It is not feasible to widen the canal entrances because there is residential and commercial properties on each side. In fact, deepening of the canal without increasing water flow could result in greater volumes of stagnant water in the canal and could potentially worsen environmental conditions. There are multiple anthropogenic sources of contamination associated with existing land uses that will continue to affect the canal unless long-term abatement measures are taken.

Erosion of the banks, especially along the man-made berm, is continuing along with shoreline failure from deteriorated bulkheads. These sources of sediments will continue, and dredging could actually accelerate sedimentation by causing increased instability of the canal bottom and banks. Sediment control measures, including shoreline stabilization, are needed to prevent further sedimentation in the canal. Even if dredging were determined to be a beneficial action, standard Suffolk County protocols and procedures relating to set backs from shorelines and bulkheads and maximum allowed side slopes of dredge areas could not be followed in many areas of the canal because the canal is very narrow and its banks contain bulkheads on private property.

The wetlands adjacent to the canal along the south side are experiencing continued serious degradation from inadequate tidal exchange, reduced salinity, and the spread of invasive species. Although the wetland still provides a valuable habitat for water fowl, fish and other wildlife, the quality of the wetland will continue to degrade unless remedial measures are taken. Long-term health and viability of the wetlands can be improved by implementing marsh management which significantly increases tidal exchange into and out of the wetlands. Integrated Marsh Management (IMM) would have multiple benefits of improving the quality of the wetland, improving water quality conditions in the canal, decreasing the potential for mosquito larvae production and need for mosquito control measures, and providing improved coastal resiliency and buffering during coastal storms and long-term sea level rise. Tidal exchange into the wetlands could be increased by removing significant portions or all of the man-made berms presently separating the wetlands from the canal. Significantly improving tidal exchange for the wetland would provide improved flushing of the canal by providing additional volumes of water within the tidal range which would be subject to tidal action on a daily basis. Removing the berm would allow greater volumes of water to enter and exit the canal with each tidal cycle. IMM improvements including berm alterations for the adjacent wetlands would provide long-term water quality and habitat improvements to the canal and associated wetlands.

In summary, this evaluation recommends a preferred action of an integrated marsh management (IMM) program and berm removal, to benefit the health of the proximate marsh, as well as to increase water movement/exchange in the canal. This would help alleviate eutrophic stresses, which are manifested in high nutrient concentrations and low dissolved oxygen. Selective dredging at the mouths of the northern and southern entrances to the canal could further improve circulation, but this action would be ancillary to the primary remedial measure of IMM.

Overall, this evaluation demonstrates that dredging the canal itself would not alleviate potential public health risks from pathogens, or improve an ecological impairment. Source reduction (e.g., upgrade on-site sanitary systems, or connect them to a community sewer system) could decrease discharge of bacteria and nutrients and assist in long-term water quality improvement. Further investigation beyond the scope of this study would be needed to accurately determine level of contribution from on-site sanitary systems, as well as evaluation of alternatives and design of a preferred alternative.

Executive Summary

This report presents the findings and recommendations of an ecological and public health assessment study completed in 2016 for the Grand Canal and adjacent wetlands in the Town of Islip, Suffolk County, New York. The objective of the study was to collect and analyze data in order to evaluate both the public and ecological health of the Grand Canal, and to use these data to develop a methodology for assessing whether dredging combined with Integrated Marsh Management (IMM) will alleviate impairments documented for the study area. Conclusions regarding the environmental condition of the Grand Canal and adjacent wetlands are made, and recommendations for actions to improve both the ecological and public health of the study area are discussed. Data which were collected as part of the study from the Grand Canal and adjacent wetlands included: surface water samples, water quality parameters, sediment cores, bathymetric data, tidal flow and flushing characterization data, flora and fauna data (vegetation, benthic, fishery, avian), and wetland characterization data.

Section One, *Introduction and Overview*, includes an overview of the present study, including study objectives, as well as a description of the study area. Section Two, *Review of Existing Data,* provides a review of existing data on the Grand Canal, including historical aerial photographs and data collected as part of prior studies. This section also describes studies conducted in other canal and wetland systems similar to the Grand Canal. Some of the techniques applied in these systems may also prove successful in the Grand Canal and its adjacent wetlands. Section Two also includes water quality data collected during this study within a reference area (Indian Creek) near the Grand Canal. This reference area was similar to the study area, but the ecological health was considered good. Section Three, *Data Collection and Analysis,* describes the data which were collected as part of the present study. Subsections focus on physical and biological characteristics of the Grand Canal, sediment sampling, water quality sampling, and wetlands characterization and assessment. Section Four, *Public Health Problem Evaluation and Report,* includes a detailed assessment of the public health risks associated with the study area. Section Five, *Ecological Health Evaluation and Report,* includes a detailed assessment of the ecological health of the study area. Section Six, *Assessment of Actions*, proposes a methodology for assessing potential action options for

addressing impairments in the Grand Canal and adjacent wetlands. The need for action in the study area is described, followed by a listing of alternative action options. These actions are evaluated and recommendations are provided. Section Seven, *Conclusion*, summarizes the main findings of the study and provides overall conclusions and recommendations. Technical support documentation provided in Appendices A through H.

The study found that the Grand Canal has experienced impaired environmental quality due to pollution sources (such as septics and stormwater) and excessive nutrient enrichment which has been exacerbated by canal geometry, inadequate stream flow and tidal flushing. This is evidenced by the poor water quality observed within the canal system, particularly the low levels of dissolved oxygen, high levels of bacterial contaminants (coliforms), and elevated nutrient levels (nitrogen and phosphorus). Additionally, sediments collected from the study area were found to contain DDT and metals. Bathymetric surveys of the Grand Canal indicated reduced channel depths throughout the canal system. The marshes in the Grand Canal study area were all found to be severely-stressed, particularly due to invasive species proliferation, limited tidal flushing, and shoreline erosion. Bacterial indicator testing showed that bacterial contamination is a significant public health issue throughout the Grand Canal, as elevated coliform levels were frequently observed. Surface waters in the Grand Canal are unlikely to be safe for primary contact recreation. It should be noted that there are no bathing beaches on the canal. The quality of the fish inhabiting the Grand Canal may also be compromised (e.g., for purposes of human consumption) by the contamination. It is considered likely that many of these impairments are not unique to the Grand Canal; other canals in Suffolk County have been documented as experiencing similar conditions due to the proximity of homes, recreational activities (e.g., boats), and storm water runoff to these waterways.

These impairments have been documented for over a decade in the Grand Canal as evidenced in the 2005 ‘Grand Canal Environmental Assessment Report’ published by Suffolk County Department of Health Services and Suffolk County Department of Public Works. This report was based on data collected in the Grand Canal in 2004. Generally conditions have appeared to have worsened over the past decade.

Summary of Conclusions and Recommendations

The investigation of water quality, sediments, and physical conditions of the Grand Canal performed as part of this study indicated that the subject water body is in a stressed degraded condition resulting from input of containments and nutrients, poor circulation, shoreline erosion, and degraded wetland systems adjacent to the canal. Impaired water quality conditions were observed and further indicated by sample collection and analysis. The overall conclusions of this study and recommendations for follow-up actions are presented below:

- Bacteria levels in canal water are elevated, and discharges from on-site sanitary systems appear to be major contributors. Improvements and upgrade of on-site sanitary systems would decrease discharge of bacteria and nutrients to surface waters and assist in long term water quality improvement. Further investigation beyond the scope of this study would be required to determine the level of contribution from the on-site sanitary systems.
- Dredging and deepening of inner portions of the canal, without widening or deepening of its connections to the Connetquot River or adjacent wetlands, will not improve flushing rates for the canal. However, due to the commercial and residential development at the mouths of the canal, widening these areas is not a feasible option. In fact, deepening of the canal without increasing water flow could result in greater volumes of stagnant water in the canal. The exception would be dredging the shoals located in the southern portion of the canal, which could provide slight increase in tidal exchange by slightly reducing partial barriers to water exchange between the canal and Connetquot River. Improvements would be minimal and short-lived as sediments re-accumulate.
- Dredging would result in the removal of contaminated sediments; however, the removal would not result in improved long-term conditions unless the sources of contamination are controlled (e.g., sanitary waste, stormwater, etc.). There are multiple anthropogenic sources of contamination associated with existing land uses that will continue to affect the canal unless long-term abatement measures are taken.
- Erosion of the banks, especially along the man-made berm, is continuing along with shoreline failure from deteriorated bulkheads. These sources of sediments will continue, and dredging could actually accelerate sedimentation by causing increased instability of

the canal bottom and banks. Sediment control measures, including shoreline stabilization, are needed to prevent further sedimentation of the canal.

- The public health and environmental risk assessments performed for surface water and sediments did not indicate a level of risk higher than would be expected in a water body subject to anthropogenic inputs in a semi-developed area. In other words, the risks from contamination are not higher than usual for similar developed areas in the region.
- The wetlands adjacent to the canal along the south side are experiencing continued serious degradation from inadequate tidal exchange, reduced salinity, and the spread of invasive species. Although the wetland still provides a valuable habitat for water fowl, fish and other wildlife, the quality of the wetland will continue to degrade unless remedial measures are taken.
- Long-term health and viability of the wetlands can be improved by implementing marsh management which significantly increases tidal exchange into and out of the wetlands. Integrated Marsh Management (IMM) would have multiple benefits of improving the quality of the wetland, improving water quality conditions in the canal, decreasing the potential for mosquito larvae production and need for mosquito control measures, and providing improved coastal resiliency and buffering during coastal storms and long-term sea level rise. Tidal exchange into the wetlands could be increased by removing significant portions or all of the man-made berms presently separating the wetlands from the canal.
- Significantly improving tidal exchange for the wetland would provide improved flushing of the canal by providing additional volumes of water within the tidal range which would be subject to tidal action on a daily basis. Removing the berm would allow great volumes of water to enter and exit the canal with each tidal cycle.
- IMM improvements including berm alterations for the adjacent wetlands would provide long-term water quality and habitat improvements to the canal and associated wetlands. IMM measures should include creation of additional channels and areas of open water, removal of invasive species, and grading modifications to provide improved water flow.
- Although not found to be the primary effect on bacterial levels in the canal, direct stormwater discharges contribute to the input of nutrients and other containments. Actions to eliminate direct discharges and provide increased treatment of stormwater runoff,

through application of bio-swales, constructed wetlands, and similar technologies, will contribute to long-term water quality improvements.

- The investigation indicated that significant portions of the canal have debris including tree debris, limbs and cuttings. This debris, especially within the portion of the water column in the tidal range, can restrict water flow and accelerate the sedimentation and accumulation of additional debris. Action to remove the limbs, cuttings and similar debris would improve water flow, reduce accumulation of additional debris, and have short-term benefits to water quality.
- Even if dredging was determined to be a beneficial action, standard Suffolk County protocol and procedures relating to set backs from shorelines and bulkheads and maximum allowed side slopes of dredge areas could not be followed in many areas of the canal because the canal is very narrow and it banks contain bulkheads on private property. Granting of legal releases, hold-harmless agreements and similar legal protection to the County by home owners may protect the County from liability relating to damaged or undermined bulkheads, but would not prevent the physical erosion of the shoreline and accelerated release of sediment to the channel that would occur from shoreline failures relating to bulkhead failures.
- It should be noted that the New York Rising Oakdale / West Sayville Report (March 2014) identified an improvement project that would improve tidal exchange to the Pickman-Remmer Wetland by installing seven 24-inch pipes through the berm and other improvements. Benefits would include improved tidal flow into the wetlands and greater capacity of the wetland to absorb storm surge and stormwater runoff. The findings of the present investigation concur with this finding, except that considerations should be given to providing even greater channels for tidal exchange by removal of the berm or portions of the berm.