Results of a Preliminary Shoreline Shellfish Sanitary Survey near Banjul, Gambia Conducted on 18 June 2011

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Executive Summary

A preliminary shoreline survey was conducted along the Bund Road (frequently referred to as Bond Road) levee and the Banjul-Serrekunda Highway in the northern Tanbi Wetlands oyster harvesting area in the metropolitan Banjul area. In part this was designed as a training exercise for Gambian officials will be assuming responsibility for future shoreline surveys in the Gambia. Key identified areas of concern include the Banjul fish landing area on Bund Road utilized by a number of artisanal fishers; an over-water toilet facility for fishers near the fish landing site; evidence of illegal waste and rubbish dumping along Bund Road; an inoperable floodgate and flood control pumping station allowing sewage and runoff waters to from Banjul without treatment to flow unchecked into the Tanbi Wetlands; and a large rubbish dump located in the northern end of the Tanbi Wetlands likely to be a source of considerable contamination.

In addition to the hazards to sanitary water quality identified in this report, our observation of the poor condition of the Bund Road Levee and its associated flood control gates and pumping station may be of interest from a flood control standpoint. The new National Assembly Building is currently under construction is in low-lying land at the northern edge of the Tanbi Wetlands that is drained by the canal system feeding the floodgate-pumping station on Bund Road. The Bund Road Levee and its associated flood gate and pumping station were constructed in 1952 in response to the severe 1947 Bathurst (Banjul) floods in which hundreds of lives were lost. It is recommended that attention to improvements to the Bund Road Levee and its associated pumping station be given a high priority especially in the light of the location of the new National Assembly Building and the likelihood of sea level rise and greater flood potential in Banjul.

Introduction

The National Shellfish Sanitation Program (NSSP) of the United States governs the production, harvest, shipment and sales of uncooked molluscan shellfish in all of the shellfish-producing states and in foreign countries wishing to conduct sales of shellfish into the United States markets. According to Section IV, Chapter II.03 of the NSSP, sanitary quality begins with periodic shoreline surveys to identify potential sources of contamination, and that shoreline surveys form the foundational basis for water quality classification. Section IV, Chapter II.03 of the NSSP sets forth the minimum requirements for shoreline surveys and sets the frequency in which they need to be updated in order to maintain certification in the program[1] The purpose of this study is to establish a baseline sanitary shoreline survey for the Northern Tanbi Estuary oyster harvest grounds along Bund Road (frequently referred to as Bond Road) and the Banjul-Serrekunda Highway nearest to Banjul. In addition to shellfish sanitation hazard, we incidentally note some possible deficiencies in the local flood control system that might negatively impact shellfisheries and infrastructure should severe flooding once again occur in Banjul.

[1] [1] NSSP (U.S.) Section IV, Chapter II.03 (2009) http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FederalStatePrograms/NationalShellfishSanitationProgram/ucm053724.htm

Methods

Beginning 09:30 on 18 June 2011at the Banjul Container Port at the eastern end of Bund Road, we proceeded westerly along Bund Road stopping periodically to document potential sources of contamination of waters in the Tanbi Estuary that support harvests of the mangrove oyster Crassostrea gasar (= C. tulipa). In lieu of using a hand-held GPS receiver to pinpoint exact location of identified potential contaminant sources, detailed field notes were taken and locations of the sites was determined by examination of Google Earth images and transcribing the longitude and latitude coordinates to the nearest thousandth of arc minute. As part of the record, digital photographs of potential contaminate sources were taken and images from Google Earth are employed to supplementarily document sources of contamination along the Bund Road Levee area. As required, areal measurements were estimated using simple dimensional analysis of Google Earth images by the summation of multiple polygons method.

Results & Discussion

Beginning from the eastern end of Bund Road in the Banjul Port Area, potential contamination sources were identified as follows:

1. Fish landing area (13o 26.736'N, 16o 34.727'W). The Banjul Fish landing area is a location of considerable boat and shore activity (Figure 1). There is no evidence for adequate sanitary toilet facilities around the port for fishers and fish market personnel to use. Unless there is clear demonstration of control of sanitary wastes the Fish Landing Area should be best classified as a prohibited marina/port area under NSSP water quality classification definitions.

2. Fishing boat dockage area (13o 26.755'N, 16o 34.766'W). Associated with the Banjul Fish Landing Area are boat dockages along the shore of the Bund Road Levee. For the convenience of the fishermen, toilet facilities discharging directly into the Gambia River at the outer edges of the Tanbi Wetlands. Toilets discharging directly into a water body are clearly a contaminant source which should be removed. In lieu of toilets discharging directly into the river, it is recommended that toilets with holding tanks be used and periodically pumped out for transport and waste disposal at some upland site in which septage waste can be treated or composted. This use of over-water toilets is further evidence that the fish landing area and its associated dockage areas should be prohibited for shellfishing.

3. There is considerable (possible illegal) dumping of refuse on both sides of the Bund Road Levee, with evidence of burning of discarded tires. One example of a dump site along the levee can be found at 13o 26.999'N, 16o 35.244'W. It is clear that Bund Road is a critical part of the Banjul infrastructure, serving not only as the flood control levee for the city, but as the main road for commercial truck traffic into and out of the Banjul Port Area. But it seems to be a convenient dump area as well. Water quality could benefit by efforts to control rubbish dumping along both sides of the Bund Road Levee.

4. The floodgate and pumping station on Bund Road (13o 27.133'N, 16o 35.366'W) was first constructed in 1952 along with the levee after the Great Bathurst (Banjul) Floods of 1947 (according to a dedication plaque placed on the pump house building). The flood gates and pump house were refurbished in 1994 (according to a dedication plaque at the site) clearly to serve the dual purpose of flood control and use of constructed wetland technology for the treatment of drainage water and some sewage water from the City of Banjul prior to discharge into the northern part of the Tanbi Wetlands (Figure 2). The Bund Road Levee as constructed, walled off an area of the Tanbi Wetlands Complex such that the only drain form the walled off section and drainage from the city was through the floodgates in the levee. The area of the wetlands enclosed by the levee is approximately 110 hectares. During the dry season the floodgates would be raised periodically to flood the Banjul wetlands during an incoming tide. Drainage water from Banjul would drain into the wetland and be treated by natural wetland water and soil processes prior to discharge into the Tanbi by use of the pumps at the pump station or by raising the flood gates on an outgoing tide (Figure 3). During the wet season, the gates would remain closed keeping rainwater and drainage confined in the interior portion of the enclosed Banjul wetlands, and pumping out the treated water in a metered fashion.

   At present, the flood gates at the pumping station are stuck in an open position and of the three pumps originally installed at the pumping station, two are missing and one is not operational. Without closed floodgates at the pumping station, all drain water with possible sewage contaminants coming from Banjul are free flowing through the wetland canals and rapidly discharged into the Tanbi Wetlands where oyster harvesting is occurring.

   It is recommended that Mr. Foday Konteh of the Gambian Water Resources Agency who is undertaking a study of bacterial water quality (total coliform and fecal coliform) in the Tanbi Wetlands add the discharge canal of the pumping station to his standard stations so that dry season and wet season discharges coming from Banjul can be assessed. This spot is potentially the single greatest point source of fecal coliforms entering the Tanbi Wetlands complex.

   It is further recommended that attention be given to upgrading and maintaining the floodgates and pumps at the Bund Road pumping station as well as raising the Bund Road Levee for the sake of water quality maintenance and flood control (see further comments in section 6 below).

5. Examining Google Earth images in proximity to Bund Road and the Banjul-Serrekunda Highway is a possible rubbish dump of approximately 7 hectares in area centered at 13o 27.717'N, 16o 36.046'W (Figure 4). This may be a substantial source of contamination to the estuary.

6. In addition to observations related to sources of contamination along the Bund Road Levee, we also offer some observation as to flood control in the context of rising sea levels and global climate change. While traveling on Bund Road near high tide in the Gambia River, it was not difficult to notice that the height of the water in comparison to the top of the levee or roadway (the freeboard of the levee) was only a few centimeters. Clearly during storm

conditions or during exceptionally high tides or high water in the Gambia River, water would be spilling over Bund Road in several locations. It seems that when the levee was designed after the 1947 floods, there was enough freeboard to accommodate expected high water from the river. Since the levee completion in 1952, it is unclear if the levee has been maintained or "topped off" during the intervening 59 years. Undoubtedly there has been settling and subsidence of the levee over the years. It is recommended that attention to raising the height of the freeboard of Bund Road Levee be given priority, not only for sanitary water quality considerations, but for flood control purposes as well. This is particularly true since the recent construction of the new National Assembly Building at 13o 27.717'N, 16o 36.046'W falls within the drained area of the Tanbi Estuary that is enclosed by the Bund Road Levee (Figure 3).

Figures

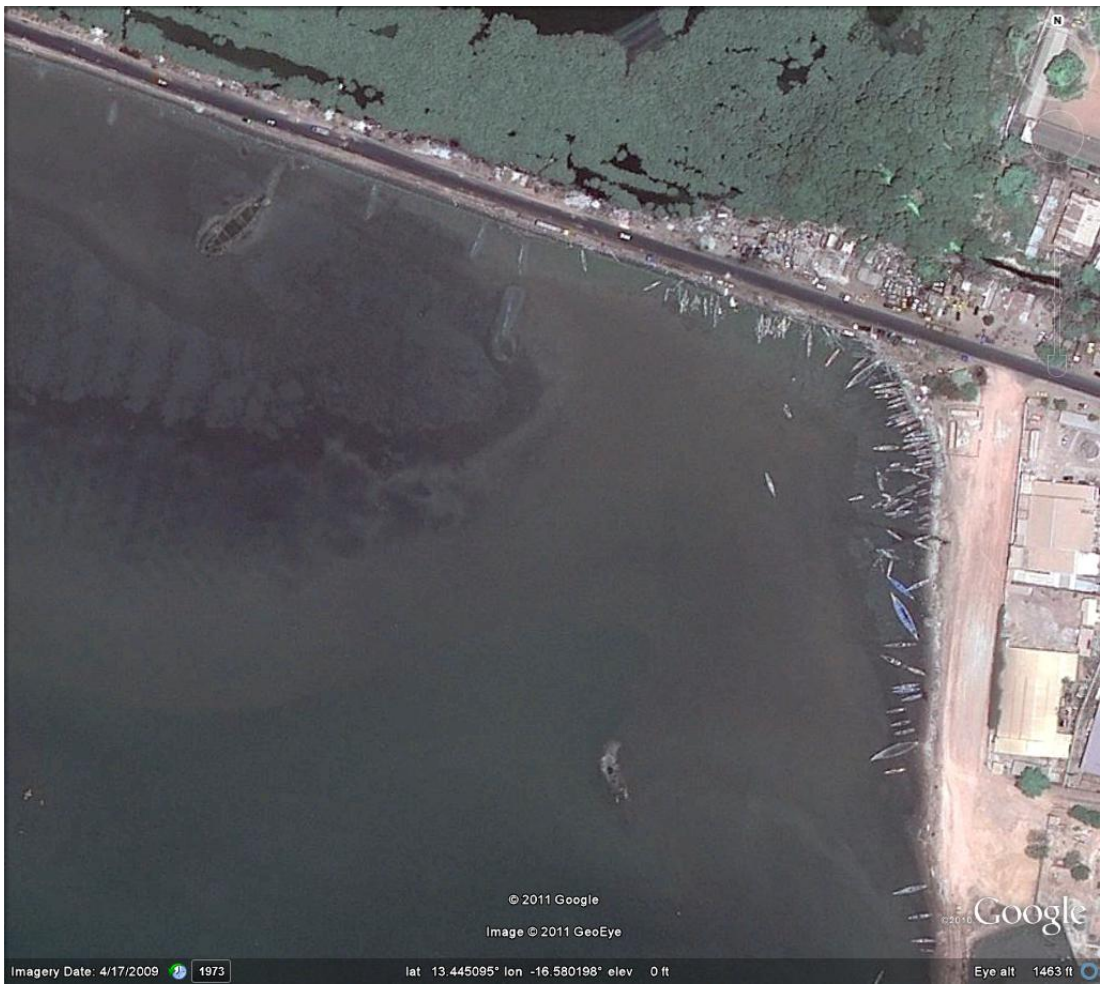

Figure 1. The Banjul fish landing area along the Bund Road Levee near the Port facilities. There is no evidence of adequate sewage disposal in this are despite large numbers of boats and fish buyers frequenting the area.

Figure 2. Bund Road Levee showing the Northern Tanbi Wetlands (lower left) and a portion of the Banjul wetlands enclosed by the levee (right) a portion of the urbanized portion of Banjul is visible at the upper right. The drain canal passing under a bridge and the pumping station is the sole normal discharge point of drainage water from Banjul.

Figure 3. Satellite imagery of Banjul showing the Bund Road Levee and associated drainage area in metropolitan Banjul.

Figure 4. Rubbish dumping area in the Tanbi Wetlands area (center) near the intersection of Bund Road (right) and the Banjul-Serrekunda Highway (top).