

APPENDIX B.—RELATION OF THE ANACOSTIA DAM TO  
TIDAL SCOUR.

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**A**SIDE from the question as to whether the summer current of the Anacostia, unassisted by a tidal ebb and flow, is sufficient to maintain the basins above the proposed dam without danger of stagnation, there is another objection which might be raised against any interference with the normal tidal movement by a dam, namely, that it would reduce the scouring current, which would otherwise tend to prevent silting in the commercial channel lower down.

The general theory of tidal scour has been made a subject of special study by the United States engineer officers in charge of harbor and river improvements, and its application to the problem of the Anacostia can be most safely worked out by them; but without assuming any intimate technical knowledge of the matter we will state the special facts bearing on this case:

The water of the Potomac always carries a large amount of silt, which begins to settle on the bottom whenever the current ceases to move rapidly. The slower the current the more silt is deposited.

When at the head of any channel there is a large basin, over the whole area of which the water must rise and fall at every tide, a correspondingly large volume of water must pass in and out through the channel at every tide, and the amount of water passing in or out through a limited opening during the few hours that the tide runs in one direction obviously determines the speed of the current. If the basin be doubled, about twice as much water must pass through the opening in a given time and it must move about twice as fast to do it. If the proposed basins on the Anacostia above Massachusetts avenue could be made of sufficient area and the tide were allowed to flow freely in and out, it is clear that the current could be made swift enough in the lower channel, first up and then down, to keep the silt always stirred up so that none of it would settle on the bottom and no dredging would be required to maintain the channel. That is the theoretically perfect condition of tidal scour, as we understand it.

But, while the conditions would be perfect in the channel, in the

broad basin above there would be practically no current and the deposition of silt would take place there very rapidly.

If, on the other hand, by the construction of a dam at Massachusetts avenue, the channel were brought practically to a dead end at that point its upper portion would be in substantially the same condition as the whole basin under the first arrangement, that is, without current, and the deposition of silt would take place there very rapidly. The lower end of the channel would have some current, though much less than before. On the average, then, the channel would have a comparatively sluggish current, and silt would be deposited throughout its length only a little less rapidly than in the basin under the first arrangement. As the area of the channel, however, is very small as compared with that of the basin, the total amount of silt deposited within it must be but a small fraction of that deposited upon the extensive bottom of the basin under the first plan.

When, as often happens, a tidal basin can be cheaply provided and no important interests are affected if it becomes gradually shoaled, it is obviously wise to avoid the necessity for constant channel dredging by its use; but where, as on the Anacostia, the basin must be first dredged out and then, for sanitary reasons, maintained by dredging at a constant depth, it would appear to be more economical in the long run to keep the silt from flowing into the basin at all and to confine the future maintenance dredging to the much smaller area of the channel, where it will be assisted by at least some tidal current.

So far as the silt of the Anacostia River itself is concerned, although for its size a very turbid stream, the material which it carries in suspension is not large in total amount and is comparatively coarse, and it would therefore be deposited in the first still water at the head of the basin, whence it could be removed from time to time as necessary.

Thus, if the muddy tide of the Potomac should be excluded completely from the basin, not only would the total maintenance dredging for the system be less and the park lakes be free from the objectionable and inconvenient tidal fluctuation, but the water would be clear and clean instead of constantly muddy. The possibility of attaining this result appears to depend, as stated in the body of the report, upon whether the summer flow of the Anacostia is sufficient to supply the evaporation from the large lake surface and furnish a surplus for the renewal of the water. On this point the Commission has been unable to obtain sufficiently reliable data upon which to base a conclusion.

#### APPENDIX C.—A LETTER RELATIVE TO THE PROPOSED TREATMENT OF ANACOSTIA PARK.

35 FAIRVIEW AVENUE, SOUTH ORANGE, N. J.,

*November 29, 1901.*

DEAR SIR: Referring to the questions relative to the proposed establishment of a water park at Washington, D. C., which were under discussion at the interview with the Park Commission at the Capitol in October, I beg leave to state that Colonel Allen requested me (inasmuch as the surveys and the preparation of the plans for the Anacostia River improvement had been placed by him in my immediate charge) to take up the consideration of the questions in reference to which you desired suggestions and to write you in regard to the same.

The desirability of the establishment of a water park in the upper part of the Anacostia basin seems to me to be beyond question. When the project for the proposed Anacostia improvement was under consideration in 1898 we were confronted with the problem of reclaiming or utilizing in some way the wide area of flats and marshes lying between the Pennsylvania Railroad Bridge and the District line. The extreme upper limit of commercial development of the river desirable seemed, at that time, to be Benning Bridge, on a main line of travel, but even then I was very doubtful about the practicability or advisability of using any part of the wide flats just below Benning Bridge and west of the river channel, when reclaimed, for residential purposes, for they consist of the lightest alluvium and are saturated with sewage. Between Benning Bridge and the District line conditions seemed to require some form of park development, and with this view I made studies for lakes with curved shore lines, which we termed tidal reservoirs, working on the basis of balancing the cut and fill, the reservoirs to be so arranged that they might be utilized in any possible future park development and at the same time serve to impound tidal water

to aid in the maintenance of the navigation channels of the river below. Owing largely to the lack of funds and available time, it was found impracticable to develop this part of the project at that time, and therefore it was left open and referred to only in a brief and general way on page 12 of the report. The plan of the Commission for the establishment of a water park on this part of the Anacostia will, therefore, not only not conflict in any way with the proposed river improvement, but, on the contrary, furnishes a most happy solution of the difficulty in the treatment of the wide area of flats here found.

The channel improvement proposed for the Anacostia had two objects in view—(1) a channel sufficient to meet the needs of naval vessels from the mouth to Navy-Yard Bridge, and (2) a sufficient channel for commercial vessels loaded with lumber, building materials, coal, etc., destined for the northeastern section of the city. Washington is not a manufacturing city, however, and so much heavy freight is now carried by rail that the needs of this part of the city, in the matter of water transportation, would probably be sufficiently met if the 16-foot channel proposed above the Navy-Yard Bridge had its upper terminus at the line of Massachusetts avenue extended, which, as I recall, is the proposed lower limit of the water park. This arrangement would have the advantage that the proposed bridge on the line of Massachusetts avenue extended, could be made much simpler in character and less expensive.

The question as to whether the tide should be allowed to ebb and flow in the lakes of the water park is one of considerable importance. All the authorities agree that the tidal prism of such a river should be preserved in order to maintain the integrity of the channels below. I made computations on this point and found that with the improvement proposed in the report of 1898 the tidal prism would be inadequate to maintain, in the channels proposed below Navy-Yard Bridge, a velocity sufficient to prevent silt deposit, and if the tidal flow be excluded from the water park these adverse conditions would, of course, be increased. At the same time I am aware that from a landscape point of view the rise and fall of the tide presents practical difficulties in the maintenance of a neat shore line. In the tidal reservoir of Potomac Park we built a masonry wall with a considerable batter, which served well, a slope wall having been found unsatisfactory. With Potomac River water, a sand or gravel beach would soon become covered with silt and be unsightly. To my mind, however, there is

nothing comparable to a clean-cut line of contact between the water surface of the lake and the grass slopes of the shore, which can, of course, only be secured by impounding the water at a fixed level. This, however, would probably be impracticable, by reason of the probable contamination of the fluvial waters of the Anacostia above the District limits by the discharge into the stream of its tributaries of raw or partially treated sewage, which conditions would undoubtedly render the impounded water unhealthful, if not offensive. It would, probably, be needful, therefore, to provide for the ebb and flow of the tide, at least between half tide and high tide, in order to secure a sufficient circulation of water. The channels below can, of course, be maintained by dredging, which would probably be needed to some extent even if no part of the tidal prism were impounded. It is suggested that a level of high tide (3 feet above low tide) would be most convenient for the maximum water line of the lakes.

As the tides in the Potomac often rise to a height of 4 to 5 feet under the influence of easterly winds, provision would need to be made for excluding these higher tides as well as freshets, for which purpose an earthen embankment or dam, with suitable sluiceways and gates, would suffice. Such an embankment might be built along the line of Massachusetts avenue, and serve also as a roadway in lieu of the proposed bridge, the sluiceways passing under the roadway. The top of the embankment would need to have a minimum grade of 14 feet above low tide to be secure against the backwater of freshets, but the park areas might, it is suggested, have a general level of 6 feet above low tide and be efficiently drained, inasmuch as the Potomac freshets do not reach their maximum height until some two or three days after the local rains have ceased.

During my connection with the Potomac River improvement, dating from the inception of the work in 1882 and continuing to 1899, I made a special study of the various physical conditions appertaining to the river and the reclamation of its flats, and it may be that there are other points on which I can give you information or make some suggestion. If this should be the case, I shall be glad to be of service to you.

Very truly, yours,

JOHN B. DUNCKLEE,  
*Civil Engineer.*

Mr. FREDERICK LAW OLMDSTED, JR.