

THE BOUSH CREEK DRAINAGE PROBLEM AT NORFOLK, VIRGINIA

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Before the war Boush Creek was a tidal marsh many acres in extent which served as the natural drainage basin for an area of more than two square miles. Its broad outlet opened toward the north to tide water and several miles of various width ditches had been cut in its mucky flats under the direction of the Norfolk Bureau of Mosquito Control to eliminate the prolific breeding of *Aedes sollicitans* and *A. taeniorhynchus*.

In 1940 construction on the great new Norfolk Naval Air Base was begun which included extensive hydraulic fill across the

mouth of Boush Creek. Many hangars and a network of concrete run-ways were installed there under which an artificial outlet in the form of a 12 foot flume nearly 5000 feet in length was created as a substitute for the natural water way.

Later, spoil from various dredging operations was deposited as hydraulic fill in other sections of the marsh, decreasing the area of the basin while the area of the watershed remained constant. The last of these fills cut off the intake end of the outlet flume except for a by-pass canal which failed to function properly. Im-

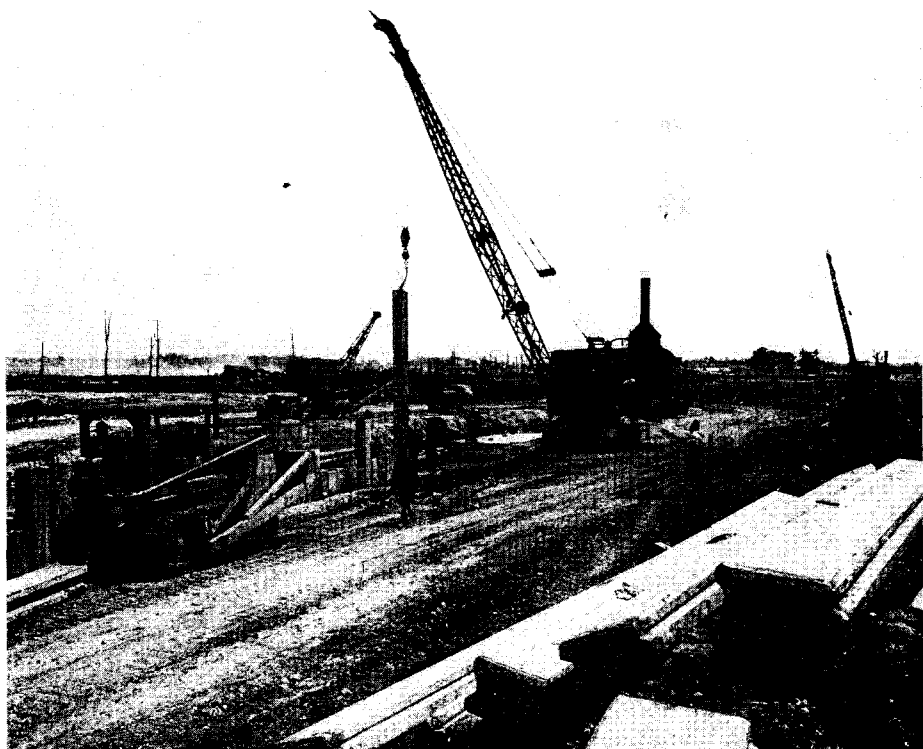


Fig. 1. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Placing and driving piling for 1,400 feet of 24 foot canal through an area of hydraulic fill.

poundment of water increased in former upland sections where conditions were favorable for the breeding of *Anopheles quadrimaculatus*, which had already been found. *Aedes sollicitans* appeared in the shrinkage cracks of the extensive hydraulic fills and the potential mosquito hazard in this area of war activities was plainly serious when in the spring of 1944 the situation was taken in hand by the Navy Medical Corps under the direction of Rear Admiral J. J. A. McMullin. Admiral McMullin's ability to grasp and cope with new problems had already been demonstrated in his organization of hospital facilities in Pearl Harbor after the disaster there in 1941 and with the able assistance of Captain J. M. Huff he lost no time in starting corrective measures. Field operations were in charge of Lt. Comdr. A. A. Weathersbee, of our Association, who was

later promoted to the rank of Commander in the Pacific theater of operations, and his knowledge and initiative were invaluable in carrying out the work to a successful conclusion.

Temporary relief was the first consideration by the use of larvicide and clearing out growth from the water edge. Permanent elimination of much potential breeding over the hydraulic fill areas was secured by resurfacing, grading and drainage, practically all of which was hand work done by enlisted personnel, although a modified tractor and disc harrow was effective in certain instances.

However, permanent and positive drainage facilities for the basin itself was the major problem which could be solved only by the cooperation of the Public Works and the Medical Department. In order to avail himself of expert advice, Admiral



Fig. 2. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Intake end of 24 foot canal. Two lines of wooden piling will be cut off to carry reinforcements for concrete floor while cross piling near machine will brace wing-wall.

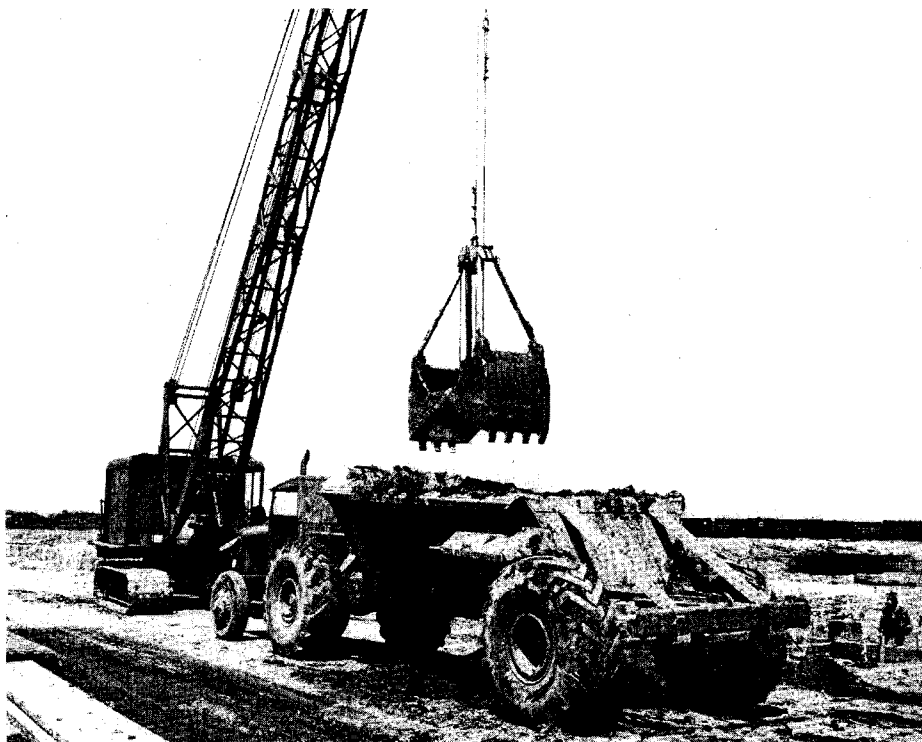


Fig. 3. Navy Drainage Project for Elimination of Mosquito Hazard, Bousch Creek, Norfolk, Virginia. Material between sheet pile walls of canal is excavated by bucket-crane and removed by heavy duty "bottom dump." Concrete floor of canal is then poured to grade and wooden bracing removed.

McMullin laid the matter before the Commandant of this Fifth Naval District with the result that an invitation to act as consultant was sent to Mr. Thomas D. Mulhern, Associate in Mosquito Control with the New Jersey Agricultural Experiment Station and Secretary of our Association. Mr. Mulhern came to Norfolk in August, 1944, and spent several days covering every phase of the situation. He made a very favorable impression on the Navy officials here and his subsequent report to Admiral McMullin was ably written and certainly had a considerable effect on the final plans and specifications accepted by the Navy.

The first phase of the project and the one calling for the greater portion of heavy construction work has just been completed and a good idea of what it entailed may be obtained from the accompanying official Navy photographs taken in May, 1945.

This phase contemplated the construction of a 24 foot canal with its floor at the low tide elevation of the outlet flume and extending nearly 1400 feet through hydraulic fill from the upper end of this flume to the area of impounded water above. This was through what had formerly been very unstable marsh and was a difficult engineering task which was carried to a successful completion by the Arundel Corporation of Baltimore.

The side walls of this canal were created by driving parallel lines of continuous tongue-and-groove reinforced concrete sheet piling down through the hydraulic fill into the old marsh floor below, the lines being 24 feet apart. (See cut No. 1) On account of the deep fluid mud overlaying the firm material, it was first necessary to drive the wooden piles which would support the flume bottom, providing sufficient

additional length so that their tops would temporarily project above the marsh and support a template for setting and bracing the two lines of concrete sheet piling, as is shown in cut No. 2 where the canal is emerging into the impounded water area. After the concrete sheeting was in place, the mud between the walls was excavated by bucket and removed with Euclid bottom dump trucks. (See cut No. 3) The wooden piles were then cut off to grade and the reinforced concrete bottom installed in the canal or flume, the timber template and additional timber bracing temporarily supporting the walls against the external pressure of the mud. After the floor was poured and set, the timbering was removed, a concrete coping was installed on each of the walls and an open 24 foot canal remained. Piped side openings were left at certain places to care for drainage from various areas brought in by ditches

such as the one shown being reconditioned in cut No. 4.

The 1400 foot canal has now been completed and physical connection made with the outlet flume. It has a dual purpose; first to carry off surface drainage and second, to provide a certain amount of reservoir space in storm periods. It has given evidence of performing its functions in a satisfactory manner although much additional work remains to be done. Adequate drainage channels are yet to be provided to the inlet end of the canal through the area that has for so long been flooded and after this work is completed there remains a rather difficult task of removing much silt from the covered flume. However, we feel sure that these objectives will be accomplished and when that is done there is reason to believe that our problem of Boush Creek mosquito breeding will have been permanently solved.



Fig. 4. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Several ditches, like the one being reconditioned here with a bucket-crane, will carry surface run-off to piped openings in the side walls of the 24 foot canal.