

### ESTABROOK PARK DAM

This dam is being constructed as part of a flood relief project, which has been under way since the fall of 1933, following an intense study of the flow from the area drained by the Milwaukee River, consisting of 640 square miles.

The Milwaukee River has its source about 60 miles northwest of the city of Milwaukee, and enters Lake Michigan at approximately the center of the City. Flood troubles started at the south end of Estabrook Park, and from that point to the Silver Spring Road, a distance of about  $3\frac{1}{2}$  miles, were a source of annoyance and damage to the built-up urban area, both within and without the City. From Silver Spring Road north for several miles damage by reason of flood occurred to the colonies of summer residences located along the river banks, and to truck gardens and green houses located on the river flats.

The cause of the trouble north of Capitol Drive was a limestone reef or outcrop about a mile long, over which the river flowed. This outcrop had an elevation of about 36 feet above lake level, and occurred approximately 7 miles upstream from the outlet, so that once the water passed beyond the obstruction there was sufficient fall for its rapid disposal. For a distance of 3 miles upstream from the outcrop there was no fall in the river bed; in fact, successive floods had gouged out the river bottom to such an extent that in this area most of the river bed was well below the top of the outcrop, thereby creating a body of still water as wide as the river and 3 miles long. In this area the river banks are only a few feet above normal water level and at flood stage the water soon rose above the banks. The area flooded was not large, but the damage was large in proportion to the area flooded, due to urban development.

As the result of successive floods, individuals, civic organizations, and delegations from the flooded district repeatedly invoked the aid of the various governmental bodies. Their petitions resulted in an exhaustive study

of the condition.

In the fall of 1933 removal of the rock outcrop was inaugurated as a CWA project, Milwaukee County working on that portion lying east of Port Washington Road bridge and extending thru Estabrook Park. The City worked on the portion west of the bridge and extending through Lincoln Park. Consolidation of City and County parks, effective January 1, 1937, made Lincoln Park a part of the County system. About a year prior to this time, however, the County's portion of the work was taken up by the CCC, which carried it on to completion. The CCC is also carrying on construction of the dam.

Residents of the homes and cottages along the river bank located there with the idea of using the river for swimming, boating, canoeing, and the like, because the river was deep enough for such sports. In Lincoln Park a bathing pavilion and beach have been in use for many years. It was therefore necessary to maintain the normal river level during stages of ordinary flow. Removal of the rock outcrop caused the water to drop to such an extent that all recreational use was eliminated, and construction of a dam was necessary to maintain water at its previous level. The dam had to be designed to take care of flood waters, and to permit the flood relief work that had been done by removal of the rock to become effective.

The dam is located at the point farthest downstream at which it may be constructed without causing damage to adjacent property. This is also the location at which the structure best fits into the landscape. Observation of flood conditions resulted in the conclusion that it would be advisable to construct a dam with gates. It was felt that the gate section was necessary by reason of economy and operation. It was further determined, as a result of these studies, that a wier or crest section should be provided, over which ice could be permitted to pass. In order to present a completed structure of

most pleasing appearance, and one that would blend with the landscape to best advantage, the landscape architects for the County suggested that the gate and crest sections of the dam be separated by a small island. The dam has been designed accordingly, with a gate section and a crest or spillway section.

The gate section of the dam is located in a channel 155 feet wide with a 3 to 1 slope on each side. This section is built of reinforced concrete with 10 vertical gates of the sliding type, each 11 feet 6 inches wide. At each end of the gate section there is a 10 foot 4 inch spillway and an abutment containing stairs leading to the operating bridge, which extends across the dam over the gates. In lowered position the gates form a spillway with top elevation of 36.30. It is desired to direct the water over the crest or curved spillway, except for a small amount, which will pass over the 10 foot 4 inch spillway at each end of the gate section.

At the entrance to the 155 foot channel containing the gates, there is to be placed a line of reinforced concrete ice guards 11 feet 6 inches on centers, in order to divert the larger blocks of floating ice away from the gates and direct this ice toward the curved spillway.

On the face of the stone spillway a fish ladder will be constructed, consisting of a series of small pools, each being a slight elevation above the other, so as to permit migratory fish to travel upstream.

9-1-39

Mr. M. W. Torkelson  
Director  
State Regional Planning Commission  
Madison, Wisconsin.

Dear Mr. Torkelson,

This letter will acknowledge receipt of your letter of August 23, relative to work that has been done upon the Milwaukee River with respect to flood control. You asked me to review the statement submitted with your letter, and this I am gladly doing. I have looked back over our files and have reviewed especially the information submitted to the Government at the time the dam being built in Estabrook Park was designed. The following is a summary taken from this data, and covers, I believe, the points set forth in your summary:

The Milwaukee River, draining a watershed of approximately 840 square miles, has its source about 60 miles northwest of Milwaukee, in what is known as the Kettle Moraine District. The river empties into Lake Michigan at approximately the center of the City of Milwaukee.

Flood troubles experienced in Milwaukee County have taken place to the north of Lincoln Park, extending northerly to Kletzsch Park. To the north of Lincoln Park there have been two sources of trouble: That occurring in the lowlands along the river north of Silver Spring Road, where there are quite a large number of houses and cottages, some of which are used the year round - the other on Mud Creek, now known as Lincoln Creek, which empties into the Milwaukee River at Lincoln Park after flowing easterly through the northern portion of the City of Milwaukee.

The stormsewer for this portion of the City of Milwaukee empties into Lincoln Creek and, when the Milwaukee River reaches extreme flood stage, water backs up in Lincoln Creek into the stormsewer system, and has caused the City of Milwaukee considerable difficulty as a result. The difficulties north of Silver Spring Road, where a number of houses and cottages are located, comes about by reason of either floods caused by extremely heavy rainfall in the summertime, or by reason of a lesser amount of rainfall with the river congested by ice during the winter or spring.

Estabrook Park is located just to the east of Lincoln Park and both of these parks, as well as the river and the roads mentioned herein are shown upon the County map we are attaching.

Until 1933 a rock ledge about a mile long was located

across the river channel at the southern end of Lincoln Park and the northern end of Estabrook Park. This ledge extended along the river about a half mile each way from Port Washington Road Bridge. The elevation of the ledge at its highest point, just to the west of the Port Washington Road Bridge, was approximately 36 feet above datum, which is the level of the river at the point where it empties into Lake Michigan. Lincoln Park is about 7 miles upstream. Therefore, with a fall of 36 feet in approximately 7 miles, flood conditions were not experienced downstream from Lincoln Park and the difficulty from floods occurred on the upstream side of Lincoln Park. Most of the complaints came from that area north of Silver Spring Road. The rock ledge or outcrop referred to acted as a dam. For a distance of 3 miles upstream from this ledge there was no fall in the river, but successive floods gouged out the river to such an extent that in this 3 mile area the river bed, for the most part, was ~~not~~ lower in elevation than the top of the rock ledge, thereby creating, in effect, a body of still water as wide as the river and about 3 miles long. It was in this area that the river banks were only a few feet above normal water level and in flood stage the water rose above the banks. The area flooded was not large.

In the fall of 1933 removal of the rock ledge was inaugurated as a CWA project, Milwaukee County working on that portion lying east of Port Washington Road Bridge, and the City of Milwaukee operating the portion to the west of the bridge. Lincoln Park was then a City park, but has since been turned over to Milwaukee County. Removal of the ledge to a channel width of 200 feet and to a straight grade with a depth of 6 to 7 feet below the crest of the former ledge was completed a couple of years ago, and since that time the City of Milwaukee, and now Milwaukee County has continued with cutting through of the ox bow bends in Lincoln Park, which work will probably be completed next summer, thereby straightening the channel and increasing its capacity. Consideration is being given to continuing the channel deepening as far north as Klettsch Park.

The level of the water in Estabrook and Lincoln Parks is to be regulated by a dam now being constructed in Estabrook Park. The crest of the dam will be at elevation 36, corresponding with the crest of the rock ledge removed, so as to maintain the same water level upstream as existed in the years past, in order that the water level at cottages and homes along the river north of Silver Spring Road will be maintained as previously, and also in order to increase water recreation facilities in Lincoln Park.

The dam now being built consists of a gate section that can be manually operated so as to lower the flood waters, and a rather long serpentine crest section, over which the water will flow at normal river stage. Elevation 36 was determined upon as the elevation of the crest of the dam in order to maintain the water level in the river at the same elevation that existed before removal of the rock ledge. Elevation 38, a 2 foot rise, was decided upon as the maximum permissible increase in head for a 14,700 foot flow over the dam. This elevation was determined as the maximum permissible by the engineers of the City of Milwaukee, in order to avoid flooding of the streets of that portion of the City of Milwaukee draining into Lincoln Creek.

Our records indicate the maximum flood recorded in the

Milwaukee River was that of August, 1924, at which time a discharge of 14,700 c.f.s. took place. There had been any number of lesser floods, ranging from about 4,000 c.f.s. to 12,000 c.f.s. The City Engineer's office of the City of Milwaukee has made a rather extensive study of past floods and probable floods and their conclusion with respect to flood volume on the Milwaukee River is as follows:

1% chance flood (1 in 100 years (computed) .....	23,400	c.f.s.
4% " " (1 in 25 years) (maximum on record 1924) .....	14,700	"
30% " " (1 in 3 years) .....	6,400	"
Ordinary spring and fall flow .....	1,000	"
Minimum dry weather flow - August 18, 1934 .....	9	"

We are enclosing print prepared in this office on river discharges for whatever value it may be to you.

The gate section of the dam consists of 10 gates set in a channel with 155 foot width and the crest section of the dam is 562 feet long at elevation 36. Our computations are that when the water reaches elevation 38 the gate section will be able to discharge 8,970 c.f.s., and that the discharge over the spillways will be 5,960, or a total of 14,930 c.f.s.

We believe that the work now being done will quite adequately take care of the situation with respect to Mud Creek, and will very considerably help the situation north of the Silver Spring Road. However, we make no predictions with respect to the actual effect north of Silver Spring Road, inasmuch as the channel has not been cleaned out, widened, or deepened north of Lincoln Park, and the other, and possibly more important factor of ice jams occurring during the winter months. During the winter of 1937-8 difficulty was experienced north of Silver Spring Road by reason of water and ice at a time when the river gauges showed a flow of ~~45,000~~ c.f.s., which during time when there was no ice in the river would not be considered a severe flood.

*4000 to 5000*

Your statement is correct that the maximum floods have caused no substantial damage below the dam being built in Estabrook Park. As to the statement that the City of Milwaukee is no longer interested in any future measures for flood control above the City limits, and that the City Councilmen are against annexing areas to the north of Milwaukee, we have no information upon this, and therefore are unable to advise you with respect thereto.

What we have set forth above is rather long and pertains to the flood conditions in Milwaukee County only. We presume you will want to condense this information, but we are giving you to you somewhat in detail. If there is anything further we can furnish from our files, or from the plans and data we have on hand, do not hesitate to call upon us.

Yours very truly,  
REGIONAL PLANNING DEPARTMENT

by \_\_\_\_\_  
Supervising Engineer