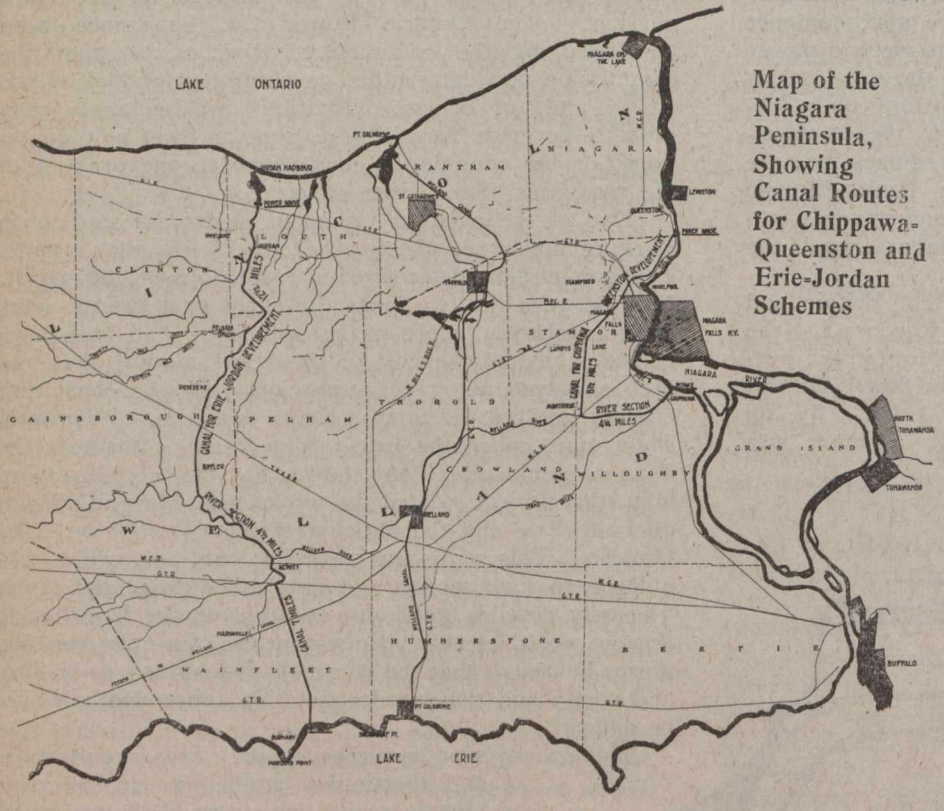
district were drawn and 2-ft. contours plotted. Test borings were taken every 500 ft. with an Ingersoll-Rand Calyx core drill, the cores still being stored for reference.

New Route Located

When the route was discovered which was tentatively decided upon, wash borings, or well-drill borings, were made every 500 feet on the centre line of the proposed canal, to provide an accurate sub-surface profile. A large number of photographs of the district were taken, and also photographs of ice conditions at the proposed intake. The Welland River was sounded, stream measurements were made on the Welland and Niagara Rivers, and the history of the levels of the Niagara River and Lake Erie for the past sixty years was closely studied. The directions of the lines of flow at the proposed intake were noted, and there were obtained all the data necessary for the construction of hydraulic similarity models.

As a result of the surveys and studies, it was decided to adopt for the Hydro Power Canal, the route shown on the accompanying map. This route is about 12¾ miles long, with the intake on the Niagara River at Hog Island, Chippawa, about two miles above Niagara Falls, and the tailrace on the Niagara River about one mile above Queenston. The intake will be in what is known as the Grass Island pool of the Niagara River. The mean monthly elevation of this pool varies about 1 ft.



Map of the Niagara Peninsula, Showing Canal Routes for Chippawa-Queenston and Erie-Jordan Schemes

Ideal Intake and Tailrace Location

The normal mean elevation of Lake Erie is 573; of Grass Island Pool, 561; of the Niagara River at the power house site, 245; and of Lake Ontario, 243. Probably no other river has more uniform regulation than the Niagara. The minimum flow is half the maximum, and the section is so large that over a period of fifty years the maximum difference in mean monthly levels under normal conditions, either at Chippawa or Queenston, amounts only to about six feet.

The ideal intake and the ideal power house location were first determined with a view to the maximum utilization of the available head, and contours and borings were then studied to decide by what route a canal could connect those two points to the best hydraulic and economic advantage. The intake was located at Hog Island partly on account of that point being just above the critical section at which the water begins to speed up for its passage over the falls. Location further up the river would have meant a larger canal; further downstream, a loss in head. Another reason quite equally important for locating the intake at Chippawa was the use which could be made of the natural channel of the Welland River—often called Chippawa Creek—which provides about 4¼ miles of the Hydro Power Canal, leaving only about 8½ miles to be excavated, although the Welland River will have to be somewhat deepened and widened. The flow of the Welland River, which is a sluggish stream with a very flat bed, will be reversed.

The Hydro Power Canal's 8½ miles of excavated section compares with 19½ miles for the Erie-Jordan scheme, and the gross head is 316 ft. compared with 299 ft. for the Erie-Jordan.

The ice troubles that would be experienced in the Erie-Jordan scheme will also be more readily obviated. Ice would have caused immense expense in the Erie-Jordan intake, particularly during east gales, but no such trouble is anticipated at Hog Island. There will be elaborate methods of ice protection at the intake and also at the forebay, to eliminate the troubles experienced at the existing plants.

Only 11 Ft. Loss of Head

The gradients adopted for the Hydro Power Canal average about 1 ft. per mile, or a total of about 8 ft. in the 8½ miles of excavated canal. The loss of head in the penstocks, due to friction, may amount to upwards of 2½ ft., and the loss in the Welland River from Hog Island to Montrose, where the excavated canal begins, will be about 6 inches under maximum load, so that the total loss of head will be only 11 ft., making the net effective head about 305 ft. under average normal conditions. Thus, of the 330 ft. normal difference in level between the two lakes, only 25 ft. head will be lost,—12 ft. between Lake Erie and Hog Island, 11 ft. between the intake and the tailrace, and 2 ft. between the point of discharge of the tail water and Lake Ontario.

The power house will be located down in the gorge, about three-quarters of a mile above the Lewiston Bridge, just at the end of the last rapids in the river. The location is ideal, the best on the Canadian side of the river and probably better than any on the American side, as it affords facilities for the extension of the power house to any degree desired, even to use the whole 40,000 c.f.s. which the U.S. War Department says is the maximum that should be diverted from the Niagara Rapids. The cliffs are nearly vertical at the power house site, which gives the ideal condition, as the gatehouse will be on the cliff just a couple of hundred feet back of the power house, with the results that the penstocks will be nearly vertical and only about 450 ft. long, so that their cost is reduced to the minimum, the loss of head in the penstocks is reduced to the minimum, and the use of surge tanks