gallons per diem, or sufficient for the needs of the city for many years. The level of Pemichangaw Lake varies between about 554 and 552 feet above datum, and the lake is separated by a narrow neck of land known as Point Comfort from Thirty-One Mile Lake, which is about 30 feet lower in level. This neck of land acts as a natural barrier, which retains water at the higher level in Pemichangaw, and is traversed by a narrow gorge, through which the water is discharged into Thirty-One Mile Lake. This gorge is blocked by a wooden dam provided with sluices, and the fall of water from one lake to the other is utilized for a saw-mill. Water also finds its way into Thirty-One Mile Lake from Pemichangaw through debris overlying the rock, filling the bottom of what no doubt was at one time a valley of discharge from one lake to the other. There are underground fissures connecting the two lakes, and the measurements which have been taken this summer show that when the water level in Pemichangaw stood at 554 feet above datum the amount of water which got through this debris or surface fissures in the rock amounted to approximately 8,000,000 gallons per diem; but when the water level in the lake had fallen to 552 feet above datum the discharge was very small, indeed, showing that the water was really finding its way from one lake to the other

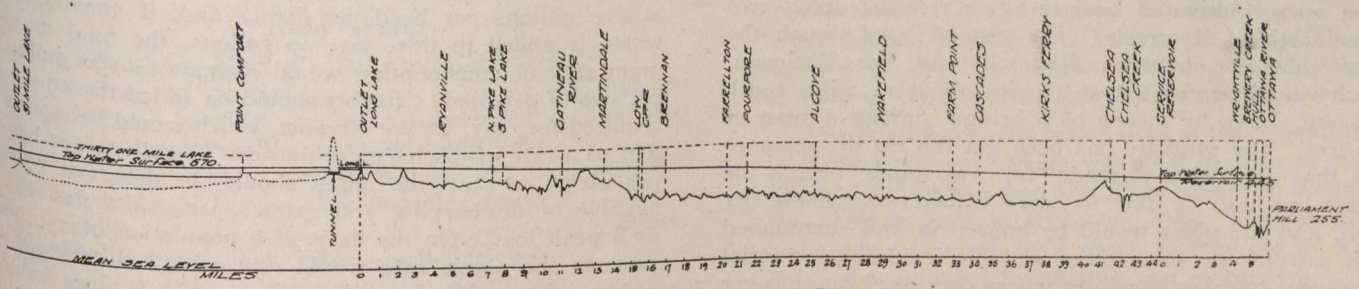

Fig. 2.—Profile of Lakes and Pipe Line.

through a comparatively shallow channel. It is proposed to open a trench first of all across the old channel, and fill with concrete so as to cut off the supply that would leak away when the water level is raised to 554. This would enable the water to be retained in Pemichangaw Lake, upon which the city could draw as soon as the aqueduct is completed. The present water area of Pemichangaw is about 6 square miles, and 5 feet in depth on that area would represent the total storage required for the first instalment of 25,000,000 gallons per diem. Assuming that the minimum draw-off level was to be 549 feet above datum, or 3 feet below the present level, the maximum level at which the water would overflow would be 554 feet above datum.

The dam at the outlet of Mitchell's Lake should be proceeded with as soon as the necessary arrangements could be made, so that Thirty-One Mile Lake can be gradually raised to such a level as to flow towards Ottawa by means of the aqueduct. The report includes in the estimate for the supply of 25,000,000 gallons the cost of the dam at Mitchell's Lake, and also the necessary clearing to bring Thirty-One Mile Lake and Pemichangaw Lake to the level of 570 feet above datum, when storage will be provided for the full yield of the drainage area, or 81,000,000 gallons a day.

Tunnel between Pemichangaw and Long Lakes.—To bring the water of Pemichangaw into Long Lake, from which lake the aqueduct would start, will necessitate constructing a tunnel through the height of land between the two lakes, a distance of about 3,000 feet. This tunnel should be made about 7 feet internal diameter so as to permit of the whole available yield, namely, 81,000,000 gallons per diem, being passed through into Long Lake without appreciable loss of head.

The best location for the invert of the tunnel would be about 6 feet below the present level of Pemichangaw, or at about 546 feet above datum, 24 feet below top water level when brought up to 570 feet above datum.

This tunnel would terminate at each end in covered shafts, the water entering and leaving the shaft well below the water level of the respective lakes, to remove all danger of freezing.

Works at Long Lake.—Long Lake varies in depth from about 20 feet to 50 feet, being shallow towards the north end and deep towards the south. This lake, like Pemichangaw, is formed by a natural barrier, and the water issuing from it passes over this barrier by means of a series of small falls and cascades to the valley below, dropping 50 or 60 feet in a short distance. A short cutting through this barrier will, therefore, enable the water to be drawn down 20 or 30 feet without any difficulty.

The shores of the lake are steep and rocky, but at times during and after windy weather the sediment in the bottom is stirred up by wave action. This action does not extend to any great depth, probably not much below 10 feet. It is, therefore, proposed to remove the sediment, logs, etc., when the lake is drawn down so as to prevent similar action taking place in the future.

The outlet works would consist of a straining tower about 50 feet high, covered at the top, and provided with copper gauze screens; the water entering the tower at a depth of 7 or 8 feet below the minimum water level of the lake and after passing through the screens leaving by means of a culvert through the natural barrier already referred to, to the commencement of the pipe. It is proposed to install a small water-driven turbine so as to work a pump for supplying high-pressure water for washing the screens. The power for this turbine would be supplied by allowing water to pass from the lake to the valley below, the turbine being situated at the foot of the fall, which has already been referred to. The screens would be made so that they can be lifted in rotation for cleaning purposes without interfering with the flow of water, and the dirty water, after cleaning, would be discharged into the valley below the straining tower.

Description of Pipe Line.—The top water level of the service reservoir would be 445 feet above datum. The distance between the outlet and the service reservoir is about 235,000 feet, and allowing for losses of head at the reservoir, the hydraulic gradient would be approximately 1 in 1960, and with this gradient a welded or lock-bar steel pipe, 54 inches in diameter, would deliver 25,000,000 gallons a day, allowing for future encrustation. If rivetted steel pipes were used the internal friction is slightly greater on account of the rivet heads and the diameter of the pipe would be slightly larger to discharge the same quantity of water. The