

PROPOSED DAM SITE AT LAKE ST. CLAIR

This report is the result of a brief examination of the point of outlet of the Derwent River from Lake St. Clair, where it is proposed to construct a low dam in connection with the Hydro-Electric scheme of the Derwent River. The examination was made to ascertain if there were any adverse geological features or conditions at the proposed dam site.

From the Derwent Bridge upstream to the lake the river banks are composed of river gravels. These range in thickness up to 10 or 12 feet and form an alluvial plain of varying widths along the river.

The underlying rocks are exposed at only a few places. At the old road bridge, horizontal sandy clays are visible below the gravels and probably represent interglacial beds. At the Derwent Bridge at low water, somewhat consolidated conglomerates are visible. Similar rocks occur on the Navarre River, 2 miles south of the West Coast Road (at an old road bridge into a Mr. Pearce's house), and also in the Guelph River. These rocks are sufficiently consolidated to suggest at first Permo-Carboniferous rocks, but an examination of the pebbles shows that many of them are diabase (dolerite). These rocks are therefore regarded as being part of the Pleistocene glacial series.

The surface of the plain country both north and south of the West Coast Road is marked by numerous diabase boulders. The containing beds have been removed by denudation and these boulders left at the surface, but it is certain that they were shed from the later wide-spread glacial beds (moraine) of the Pleistocene epoch. There is a distinct possibility that the course of the glaciers was not southwards down the valley of the present Derwent River, but rather to the east towards the Clarence and Nive rivers. However this phase was not sufficiently investigated to permit a decision to be made and does not greatly affect the problem under consideration.

The hills to the west of the river and north of the West Coast Road are occupied by diabase, and is also the Mt. Charles range to the east of the river.

As the source of the Derwent is approached the river gravels end and the last 20 chains is occupied by boulders of diabase, and the river has a steep grade. These boulders represent probably morainal material but whether lateral or terminal was not investigated. These boulder beds may have been more extensive than now and the numerous boulders on the surface to the south represent the remnants of such beds after erosion.

The ridge formed by the boulder beds extends in a general east-west direction from near Cynthia Bay on the west to at least half a mile beyond the Derwent on the east. The present form of the lake is due to this ridge which has resisted erosion. The river has worn a course through the greater part of the width of the ridge and it would be only a short time (geologically) before the ridge was cut through and the level of the lake lowered considerably.

It is proposed to construct a dam across the river where it starts from Lake St. Clair, the dam being raised only six feet above present lake level. The dam would extend

across the river from the unbroken ridges on either side. The foundations of the dam would be in the boulder beds representing morainal material. It would appear from the surface that boulders would form a large percentage of this material. From the engineering aspect several factors will now be briefly discussed.

Strength of Foundations. The dam is to be a low one only (about 12 feet) and the pressure on the foundations will be exceedingly small. The boulder beds would be more than sufficiently strong to withstand any pressures likely to be caused by the dam.

Stability of Foundations. The boulder beds with the large percentage of boulders should be quite stable.

Leakage through Foundations. From the features observed at the surface, this is not likely to occur. Nevertheless in order to be sure both of this and the immediately preceding factor, it would be advisable to sink shafts (bore-holes would probably be useless owing to the boulders) down to the foundation level and several feet lower. This would prove the depth of the boulder beds as far as required, and the nature of the matrix. The material from the shafts could be geologically examined if required.

Scour below dam. The water from the discharge from the dam would be under 12 feet more pressure head than is the case at present in the river. This would give the water a greater scouring effect. The numerous boulders in the river bed, plus any broken boulders from the excavations placed on the downstream side of the dam, should be sufficient to prevent any serious scouring. Any small scouring effect adjacent to the outlet would have to be controlled by engineering means and provided for when the nature of the foundations is proved by the shafts.

Origin of Lake St. Clair. Lake St. Clair is undoubtedly of glacial origin. As it is exceedingly deep (up to 600 or 700 feet) at places, it has probably not been formed wholly by a damming effect due to morainal material. A considerable part of the deep basin it occupies is probably one scoured out by the glaciers. It is probable therefore that rock (possibly diabase) may be comparatively close to the surface at the outlet of the lake. The upper portion, i.e. the higher levels of the lake are, of course, formed by damming by morainal material.

Conclusions. The site of the proposed dam is considered to be quite safe as regards strength and stability of foundations and also as regards leakage and scour. The only precautions necessary are the testing of the site by a few shafts to prove that the boulder beds extend below foundation level and also the nature of the matrix. It will probably be found that the boulder beds extend below foundation level and that the matrix is generally of a clayey nature and relatively small in amount. If interglacial sands or clayey sands were encountered, the question would have to be reconsidered.

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