Appendix I:

A rough calculation of hydraulic conditions in PTNI's section 1A in the case that the section through Oka park remains unchanged.

The calculations are based on the following numbers for various quantities:

- An operating pressure of 8280 kPa at the Montreal station, corresponding to the maximum acceptable operating pressure (MAOP).
- The value of the minimal required pressure at the extremity remains unknown to me at the time of this writing; I will use an assumed value of 100kPa. (Visual inspection of the graph in annex to DQ7.1 reveals actual extremity pressures roughly in the range 300-900 kPa).
- These first two quantities permit a maximum total pressure drop of 8180 kPa, from the Montreal station to the Como station.
- The exact length of existing 10-inch-diameter pipe through Oka park that is to be replaced by 16-inch pipe is unknown to me at the time of this writing. Among other considerations, there is a section leading to the under-water section that was to remain at the original 10-inch diameter; I will use an assumed value of 5km.
- For a flow rate of 21 000 cubic meters per day, the pressure gradient for 16-inch-diameter pipe is 45 kPa/km and for 10-inch pipe, 400 kPa/km.
- I don't know what the pressure gradients are for other flow rates. For my rough calculations below, I will assume that, at other flow rates, the pressure gradient in the 10-inch pipe changes much more than in the 16-inch pipe, and so ignore the latter change.

Section 1A, after upgrade, would consist of:

25.8 + 11.4 = 37.2 km at 16 inches
10.44 + 3.53 = 13.97 km at 10 inches

At a flow rate of 21 000 cubic meters per day, this would produces a total pressure drop of

1674 + 5588 = 7262 kPa,

which is less than the 8180 kPa limit cited above, as should be the case.

If the section in Oka park were not upgraded, we would instead have:

25.8 + 6.4 = 32.2 km at 16 inches
10.44 + 8.53 = 18.97 km at 10 inches

In order to keep within the same maximum pressure drop limit, the pressure in the 10-inch pipes would not be able to exceed 350 kPa/km.

I have insufficient information to state the flow rate that this new pressure gradient of 350 kPa/km corresponds to. If the relationship between the two quantities is linear, the flow rate would be about 10 percent less than the target flow rate. However, pressure gradient reduces much more quickly than linearly as the flow rate is reduced, so the real amount by which the flow rate would change is much less than this.
If, in addition, we take into account that the pressure gradient in the 16-inch pipes also drops at lower flow rates, the actual difference in flow rates could be as small as 1 or 2 percent, depending on the exact functional forms. To be conservative, I will assume a reduction value of 5 percent in my concluding statement.

Putting these numbers in perspective, leaving Oka Park untouched in the proposed upgrade would allow PTNI to augment their capacity from the current 10500 cubic meters per day to roughly 20500 cubic meters per day. When Oka Park is eventually upgraded, or circumnavigated, PTNI would gain from an additional increase of 500 cubic meters per day.