TATTON DRAIN WEIR – PUMP INSTALLATION

Overview
A pumping station is required to pump water at a flow rate of 100 litres per second (LPS), from a 3m x 3m concrete pit, through a new proposed pipeline into Lake Albert. Outlet of the pipe will be in a location to be determined, but for this exercise, somewhere in the drain channel at the northern end of the lake.

The concrete pit is to be have a sump that will allow the pump intake to draw water from below the floor of the pit. Depth of the sump is to be determined, but I have allowed a sump depth of 1.0m. The water coming into the pit will flow through a pipe with a turbidity meter that will automatically open and close a weir gate to allow inflow into concrete pit. Therefore, water should be relatively clean with minimal debris. It is assumed that all the pump components that can be safely submerged in water, will be housed in the concrete pit – all electrical components not rated to be submerged will be housed in the proposed electrical pillar control box.

Electricity is to be supplied by an existing power source from a pole located on the south side of Lakeside Drive. It would be proposed that a lockable electrical pillar control box be installed to house the VFD, pump level controls and all other electrical components required to operate the proposed pumping station. It is also noted that in times of blackout, when no power is available (maybe in a flood event), that the control box be fitted with a generator input to still allow the pump to operate. This location would also permit the pump system to run while the Tatton drain was flooding.

The pump will be controlled via an electronic ultrasonic level transmitter that will automatically adjust the output flow to varying water levels. These levels can be programmed on commissioning, and changed as the system is being used if need be.

Calculations
The static height from the bottom of the pit (188.6m less 3m) to the lake level (191.5) is 5.9m, and the distance from the pit to the proposed pipe outlet is approximately 100m. At a flow rate of 100 litres per second and a maximum water velocity of 1.5 meters per second, you will lose 4.7m / 1000m in friction loss through a 355mm PE100 PN10 Poly Pipe. (Note: I have chosen a heavy walled pipe that what is required to allow for the vehicular loads that will on the pipe under the roads). I have also added another 3m for losses through any valves for fittings that may be installed, therefore, total dynamic head (TDH) at 100 LPS is 9.37m – I will round it to 10m.

Recommendations
I have selected a Grundfos VFD Dual Pump Station that includes 2 pumps that will deliver 50 LPS each (total of 100LPS) at the desired TDH. These pumps will be installed on guiderails with auto locking couplings in the pit for easy removal for repairs and maintenance. The main reason I chose a dual system over a single pump, is so the systems can handle a wide range of flow rates and keep the motors running in the most efficient and cost-effective zone. For lower flow rates, one pump will be able to run and handle flow rates from 1-50 LPS, and when the need arises, the other pump will start and run at higher flow rates of 51-100 LPS. The pumps will also alternate to keep the wear and tear even over the lifetime both pumps.

PUMP UNITS & ASSOCIATED EQUIPMENT

2 x Grundfos 7.5kW 415V Single Channel Super Vortex Water Pump
• DN100 Inlet and Outlet
• Grundfos Blueflux High Efficiency Motor
2 x Auto Coupling complete with Guide Rails and Stainless Steel Lifting Chain
2 x 150mm Cast Iron Flanged T/D Sluice Gate Valve
2 x 150mm Cast Iron Flanged T/D Check Valve
1 x Associated Fittings to connect to 355mm Poly Pipe
1 x Concrete Valve Pit

PIPELINE
9 x 355mm x 12m PE100 PN10 Poly Pipe
9 x 355mm PN10 EF Couplings
1 x Associated Fittings to connect to pump station

CONTROL SYSTEM
1 x Grundfos Dual 7.5kW Danfoss VFD Level Starter complete with:
• Pump 1 and Pump 2 Run Lights
• Pump 1 and Pump 2 Overload Lights
• Ultrasonic Level Transmitter for pit level control
• Hours run Meter for each pump
• Pump Alternating relay
• Emergency Stop Button
• Lockable 3 phase Generator input plug on side of box
• Power Available Light
• Over Temperature Protection for Each pump
• Contactor for Each Pump
• Main Isolation Switch for local isolation
• Motor Rated Circuit Breakers for each pump
• Thermal Overload for each pump
• SCADA Interface ready
• Manual / Auto / Off Selector Switch for Each Pump
• House in lockable vandal proof proof 900mmW x 1000mmH x 450mmD Metal Pillar Enclosure

INSTALLATION
1 x Install Pump Units and Guide Rails into Existing concrete pit
1 x Install all Discharge Pipework inside and outside pit including concrete Valve Pit
1 x Install and Weld 355mm Pipeline into existing trench. (Trench Not Included)
1 x Install all electrical components including metering, Turret Box and connection of power into control system and to pump units
1 x Testing and Commissioning

TOTAL BUDGET PRICING $112,348.00 + GST

NOTES:
NO ALLOWANCE HAS BEEN MADE FOR ANY TRANSFORMERS AT PROPOSED POWER TAKE OFF SITE. AN APPROXIMATE COST FOR A 16KVA TRANSFORMER WOULD BE $15-20,000.