

INTERNAL HYDRAULIC DESIGN OF A LONG DIFFUSER IN SHALLOW WATER: BUENOS AIRES SEWAGE DISPOSAL IN RIO DE LA PLATA ESTUARY

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A new program for internal diffuser hydraulics is applied for the design of the Berazategui sewage outfall serving the metropolitan region of Buenos Aires, Argentina. It is planned to discharge treated sewage with a maximum flow of 33.5 m³/s via a 7.5 km long outfall including an exceptionally three km long multiport diffuser section into the very shallow waters of the Rio de la Plata delta with about 4 to 7 m water depth at the diffuser location and tidal influenced currents (Fig. 1).

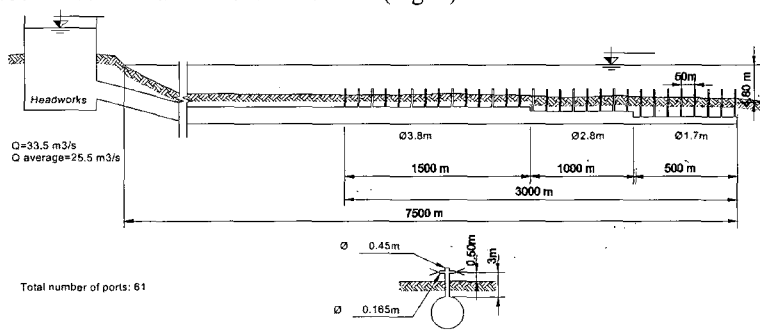


Fig. 1 Side view an diffuser cross-section of Berazategui outfall

Detailed calculations for the internal manifold hydraulics in the outfall pipes show a strong sensitivity on the representation and formulation of local losses even for relatively simple riser/port configurations. A major effort was necessary to account for all losses in multiport diffusers, which are often neglected in common programs.

Diameter reductions in long diffusers allow to maintain scouring velocities, but change the discharge distribution. An optimization methodology yielded a homogeneous discharge distribution along the diffuser, minimization of the total head and prevention of sedimentation or ambient water intrusion in the diffuser under varying inflow and ambient conditions. The additional application of Duckbill valves cause higher velocities and achieve only slightly more uniform distribution for low flows, but higher total head and additional costs (Fig. 2).

The final design achieves more economic and accurate solutions for material use and operation as well as the minimization of environmental impacts and operational stability for off-design conditions.

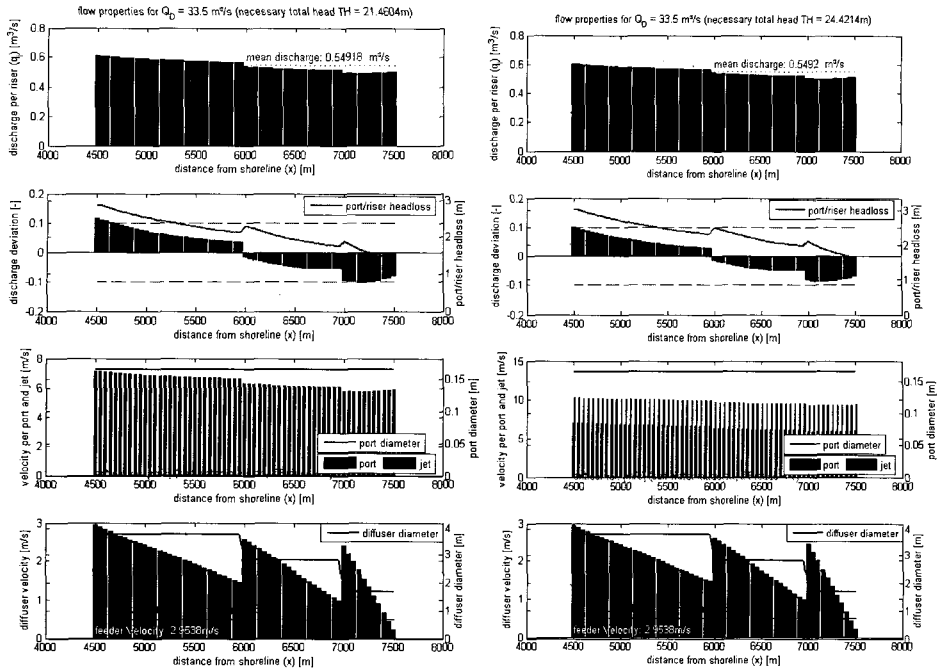


Fig. 2 Flow characteristics for final design at maximum flow: left without and right with Duckbill Valves. Top-down: Individual riser flow distribution along diffuser, riser flow deviation from mean, losses in port/riser configurations (line), port and jet discharge velocities and diffuser pipe velocities, port and diffuser diameter (lines)