

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

**THE PUMPING STRATEGY OF WATER INTAKE FOR DESALINATION
PLANT BASED ON WATER QUALITY AND HYDROLOGICAL
INFLUENCES AT PENGKALAN DATU RIVER, KELANTAN**

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Pengkalan Datu River is one of Pantai Senok's economic resources, which includes tourism and agriculture. However, the river can be affected with water quality deterioration due to natural factors and human activities. Clogging of water intake and membrane efficiency at desalination treatment plant should be resolved for better management practices. Three main objectives were formulated to assess the best strategies for water intake pumping; to examine the trend of water yield, to examine the trends of water pollutants fluctuation at different seasons and tides and lastly to recommend the best strategies for intake point pumping at the desalination plant. To achieve those objectives, two research approaches were performed: computer modelling for water yield trend and physical sampling for pollutant fluctuations. The trend of water yield enables the scrutinization of dry, wet and intermediate season. The fluctuation of pollutants at each season enables the determination of low concentration of pollutants near the water intake. The result from SWAT simulation shows that the average annual water yield and surface runoff was high which are 1733 and 1650 mm respectively. Based on the model as well, the wet, dry and intermediate seasons are spans from October-January, February-May and June-September respectively. The trend of pollutants was analysed based on these seasons. It was found that the salinity concentration was extremely high during the dry season and high tide (28 to 31 ppt) while very low during the wet season and low tide (1 to 15 ppt). In contrast, the

ammoniacal nitrogen concentration quite high during the wet season and low tide (0.10 to 0.30 mg/L) whereas rather low during the dry season and high tide that ranged between 0.04 to 0.10 mg/L. Therefore, three ratings for pumping strategies were suggested which are good, average, and bad ratings. To achieve a good rating, the appropriate time of pumping operation should be performed during the wet season and high tide. It is postulated that both salinity (10-24 ppt) and ammoniacal nitrogen (<0.15 mg/l) are within the range of recommended values given by the manufacturer to ensure the durability of membrane operation.

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**STRATEGI MENGEPAK PENGAMBILAN AIR UNTUK LOJI
NYAHGARAMAN BERDASARKAN KUALITI AIR DAN PENGARUH
HIDROLOGI DI SUNGAI PENGKALAN DATU, KELANTAN**

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Sungai Pengkalan Datu merupakan salah satu sumber ekonomi penduduk di Pantai Senok termasuklah aktiviti pelancongan dan pertanian. Walau bagaimanapun, sungai boleh terjejas oleh kemerosotan kualiti air disebabkan oleh faktor semula jadi dan aktiviti manusia. Pam air yang tersumbat dan kecekapan membran di loji rawatan nyahgaram perlu diselesaikan untuk pengurusan yang lebih baik. Tiga objektif utama dirangka bagi menilai strategi terbaik pengabstrakan air di muka suak; iaitu untuk memeriksa kecenderungan hasil air, memeriksa kecenderungan turun naik bahan pencemar air pada musim dan pasang surut yang berbeza dan yang terakhir untuk mengesyorkan strategi terbaik pengabstrakan air di loji nyahgaram. Untuk mencapai objektif berkenaan, dua pendekatan telah dilaksanakan: permodelan komputer untuk menilai kecenderungan hasil air and persampelan fizikal bagi turun naik bahan pencemar. Kecenderungan hasil air membolehkan penelitian terhadap musim kering, lembab dan pertengahan dapat dibuat. Turun naik bahan pencemar di setiap musim membolehkan penentuan terhadap kepekatan rendah bahan pencemar berhampiran muka suak. Keputusan daripada simulasi SWAT menunjukkan purata tahunan hasil air dan air larian adalah tinggi iaitu 1733 mm dan 1650 mm. Berdasarkan permodelan ini juga, di dapati bahawa musim lembab, kering dan pertengahan berlaku antara bulan Oktober-Januari, Februari-Mac dan Jun-September. Kecenderungan bahan pencemar dianalisis berdasarkan kepada musim berkenaan. Didapati bahawa kepekatan kemasinan adalah sangat tinggi semasa musim kemarau

dan air pasang (28 hingga 31 ppt) manakala sangat rendah semasa musim hujan dan air surut (1 hingga 15 ppt). Sebaliknya, kepekatan nitrogen ammonia agak tinggi semasa musim hujan dan air surut (0.10 hingga 0.30 mg/L) manakala rendah semasa musim kemarau dan air pasang yang berjulat dari 0.04 hingga 0.10 mg/L. Justeru, tiga penarafan bagi strategi pengabstrakan air dicadangan iaitu 'baik', 'sederhana' dan 'tidak disyorkan'. Bagi mencapai rating yang 'baik', waktu yang sesuai bagi aktiviti pengabstrakan air adalah sewaktu musim lembab dan air pasang. Adalah didapati bahawa kedua-dua kemasinan (10-24 ppt) dan ammoniacal nitrogen (<0.15 mg/l) berada di dalam lingkungan yang dicadangkan oleh pembekal bagi memastikan ketahanan operasi membran.