

## **ABSTRACT**

The role of constructed wetlands in wastewater treatment requires not only an understanding of natural wetlands and their functions but also conventional wastewater treatment methods. With this knowledge, a constructed wetland can be designed to harness the potential of wetlands in a controlled manner to enact the necessary processes generally completed by gray infrastructure methods. This thesis proposes the design of a free water surface (FWS) constructed wetland system to reduce the concentration of organic matter and total solids in wastewater from the City of Mowad in India to an acceptable level for use in irrigation of crops.

As the wetland effluent will be used for irrigation, there will not be a need to treat nitrogen and phosphorus. Thus, only FWS wetlands will be used for the design as there is no need for the anaerobic conditions provided by SSF wetlands. The proposal is based on the qualitative and quantitative studies of regional climate, local ecology and geology and typical water quality. The design is comprised of two equal size FWS cell system operating in series with a retention time of 3 days for each cell.

The proposed system has the potential to achieve an average of 86% BOD and 99% TSS removal efficiency annually. In warmer months (March to October), the wetland system achieves an average of 88% BOD removal efficiency, whereas in colder months (November to February) the system achieves 80% BOD removal efficiency. All months meet the desired effluent quality target of 100 mg/L of BOD for use in irrigation. Desired TSS removal is easily achieved in all months throughout the year. Integrating the proposed wetland system as part of Mowad's wastewater treatment system would make approximately 830 million liters of water available for use in irrigation of crops.