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Lake Manzala Engineered Wetland Port Said, Egypt



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Water Crisis In Arid Countries

Arid countries, such as Egypt (among other Middle Eastern countries), are facing a water scarcity crisis, which requires optimizing the use of all available water resources.



Reuse of Drainage Water

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Due to water scarcity, reuse of drainage water is becoming an increasingly important water source in Egypt. However, large quantities of water in the drainage network can not be used as they contain high contaminant loads.



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Bahr El-Baqar Drain

- has an average flow of 3 million cubic meters per day at the outlet.
- carries large amounts of industrial, domestic and agricultural pollution loads.
- water quality is not suitable for reuse.



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Status of Northern Lakes

- Egyptian northern lakes have been regarded highly as a fishery and a temporary sanctuary for winter migrating birds.
- While drainage water input to the northern lakes is important for maintaining their ecology, in some cases, it is a source of serious pollution loads.





Lake Manzala

- Is located in the north eastern edge of the Nile Delta.
- Receives the highly polluted water of Bahr El-Baqr drain as well as water from two other drains and two pumping stations.





Lake Manzala



Lake Manzala have been severely impacted by pollutants inflow so that:

- **Dissolved oxygen levels are depressed.**
- **Aquatic diversity has declined.**
- **Fish, produced by the lake or fish farms in the area, are not suitable for human consumption.**





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Faraskor P.S.

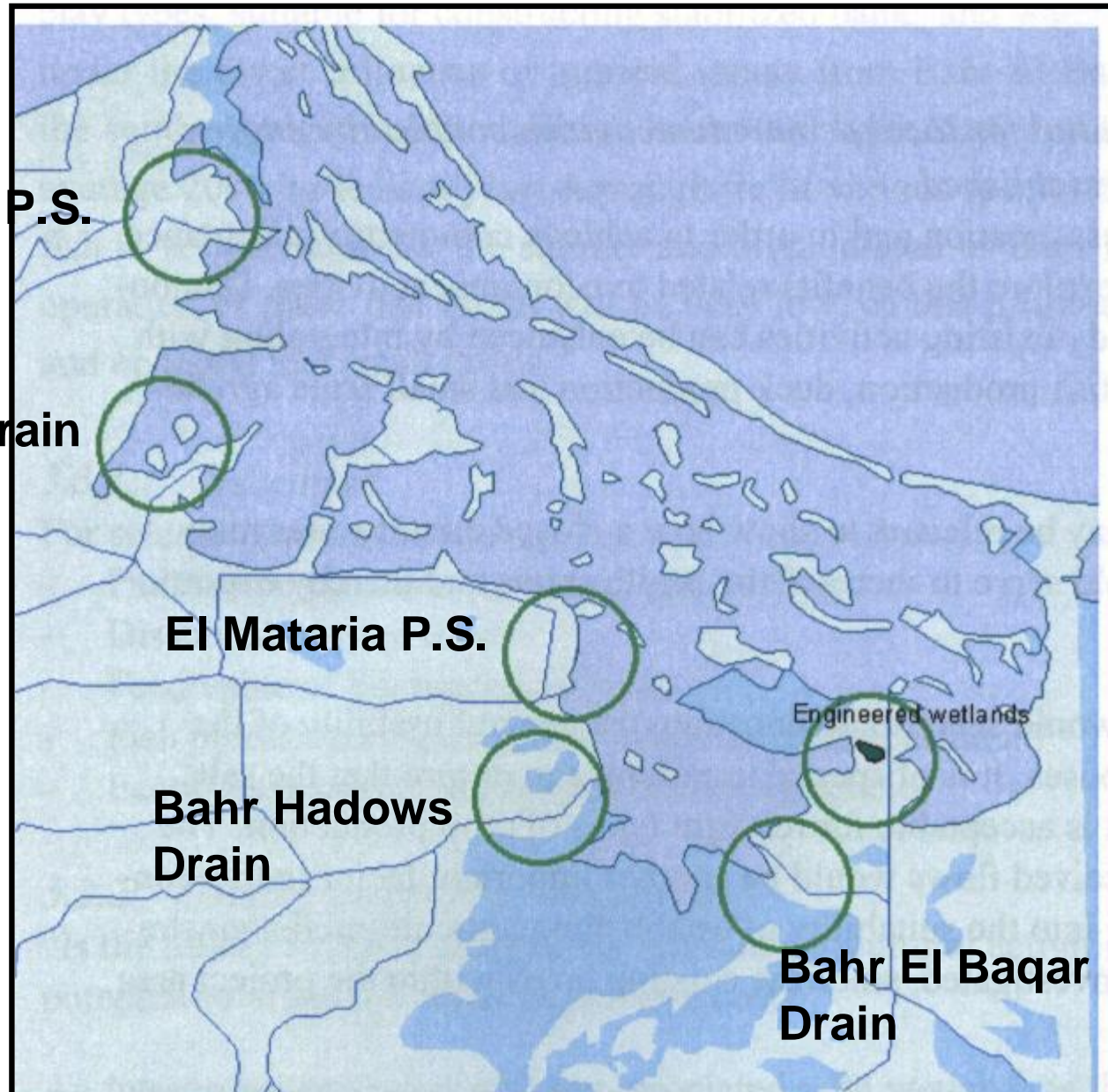
El Serw Drain

El Mataria P.S.

**Bahr Hadows
Drain**

Engineered wetlands

**Bahr El Baqar
Drain**





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Engineered Wetland

Studies (conducted in the 1980's) suggested the use of Engineered Wetland to improve the water quality of Bahr El-Baqar drain, before entering the Lake Manzala.



Lake Manzala Engineered Wetland Project

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In the early 1990's, a project for constructing an engineered wetland, at the Bahr El-Baqr drain outlet, was approved as a collaborative effort among the GEF, UNDP and EEAA.



Lake Manzala Engineered Wetland Project



Lake Manzala Engineered Wetland Project





Project Purposes



- Assess feasibility of engineered wetland system to improve environmental conditions at Lake Manzala.
- Assess feasibility of engineered wetland system to improve water quality so that it becomes suitable for different uses.
- Assist in transferring wetland technology to Egypt and other neighboring countries.





The project is designed to achieve the following:

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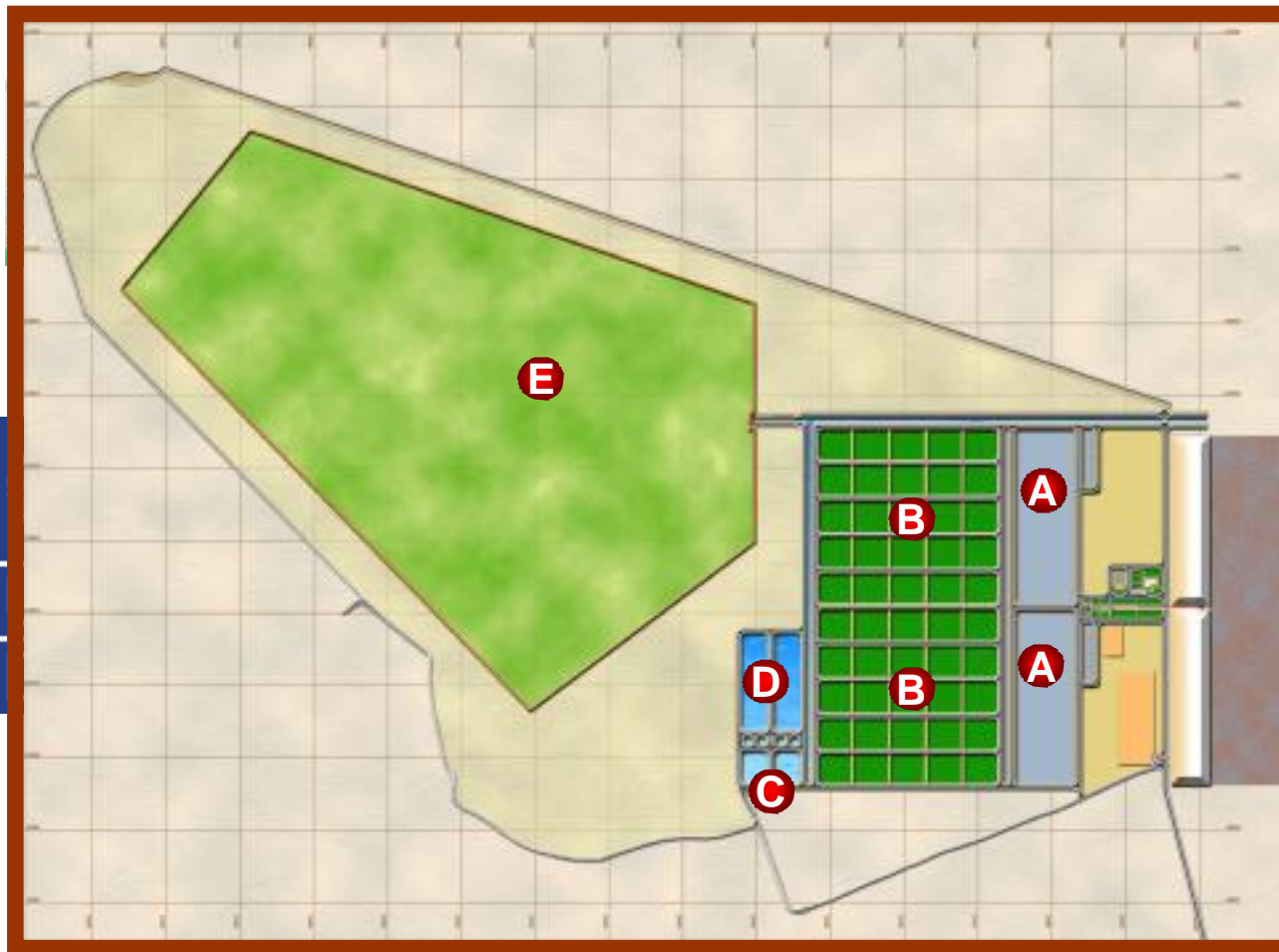
- Provide local employment
- Serve as training center for water management and low cost wastewater treatment technologies.
- Project planning, design, construction, and operation will be accomplished so as to maximize stakeholders participation.



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Lake Manzala Engineered Wetland

Main Project elements



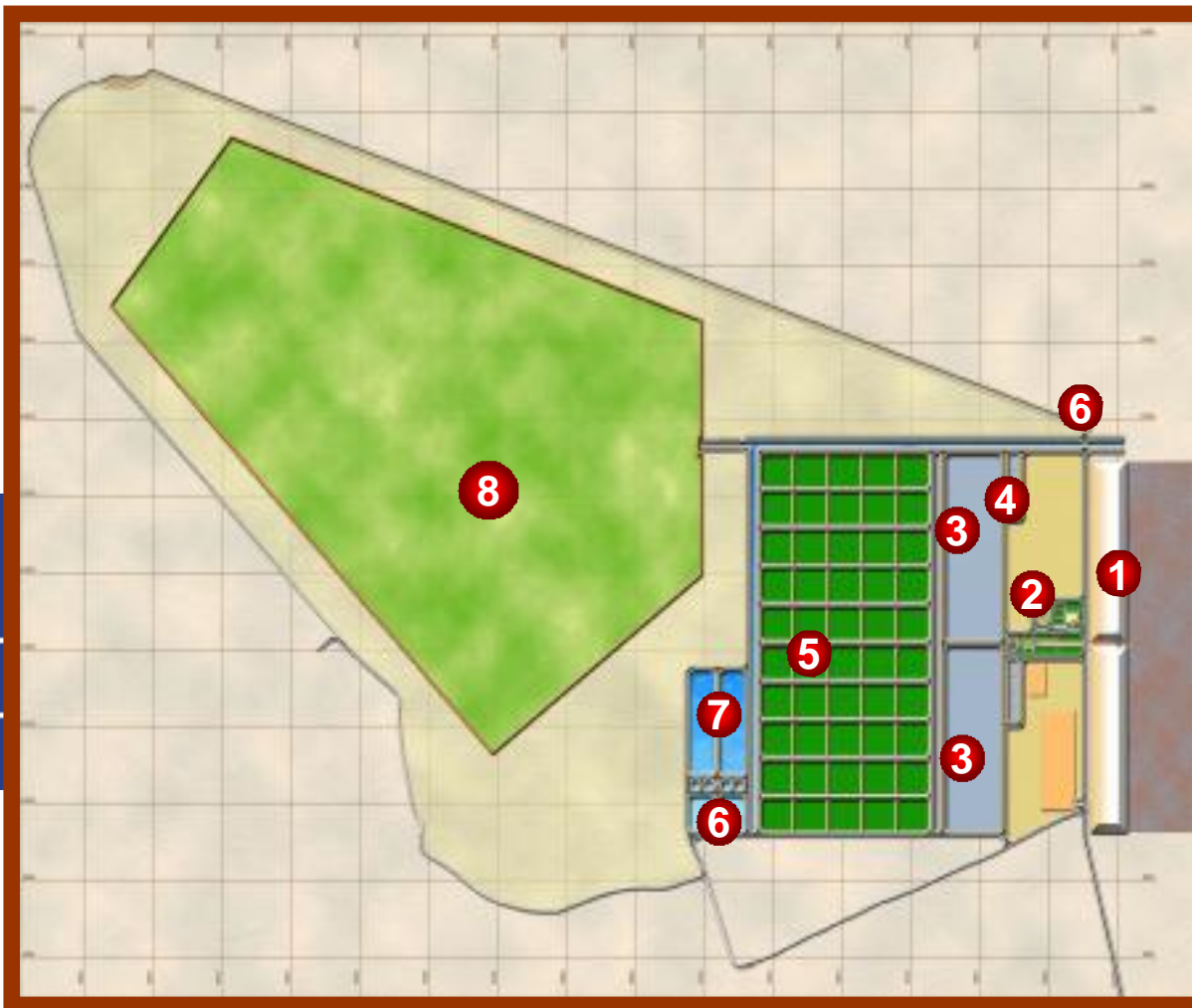
- ◆ Sedimentation Basin **A**
- ◆ Surface flow beds **B**
- ◆ Subsurface flow beds **C**
- ◆ Fish ponds **D**
- ◆ Reuse zone **E**



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Lake Manzala Engineered Wetland

Detailed Project Elements



I. Collection works:

- 1- Intake channel
- 2- Pumping station

II. Treatment works:

- 3- Sedimentation basins
- 4- Drying Beds
- 5- Surface flow beds
- 6- Subsurface Flow beds

III. Treated effluent disposal:

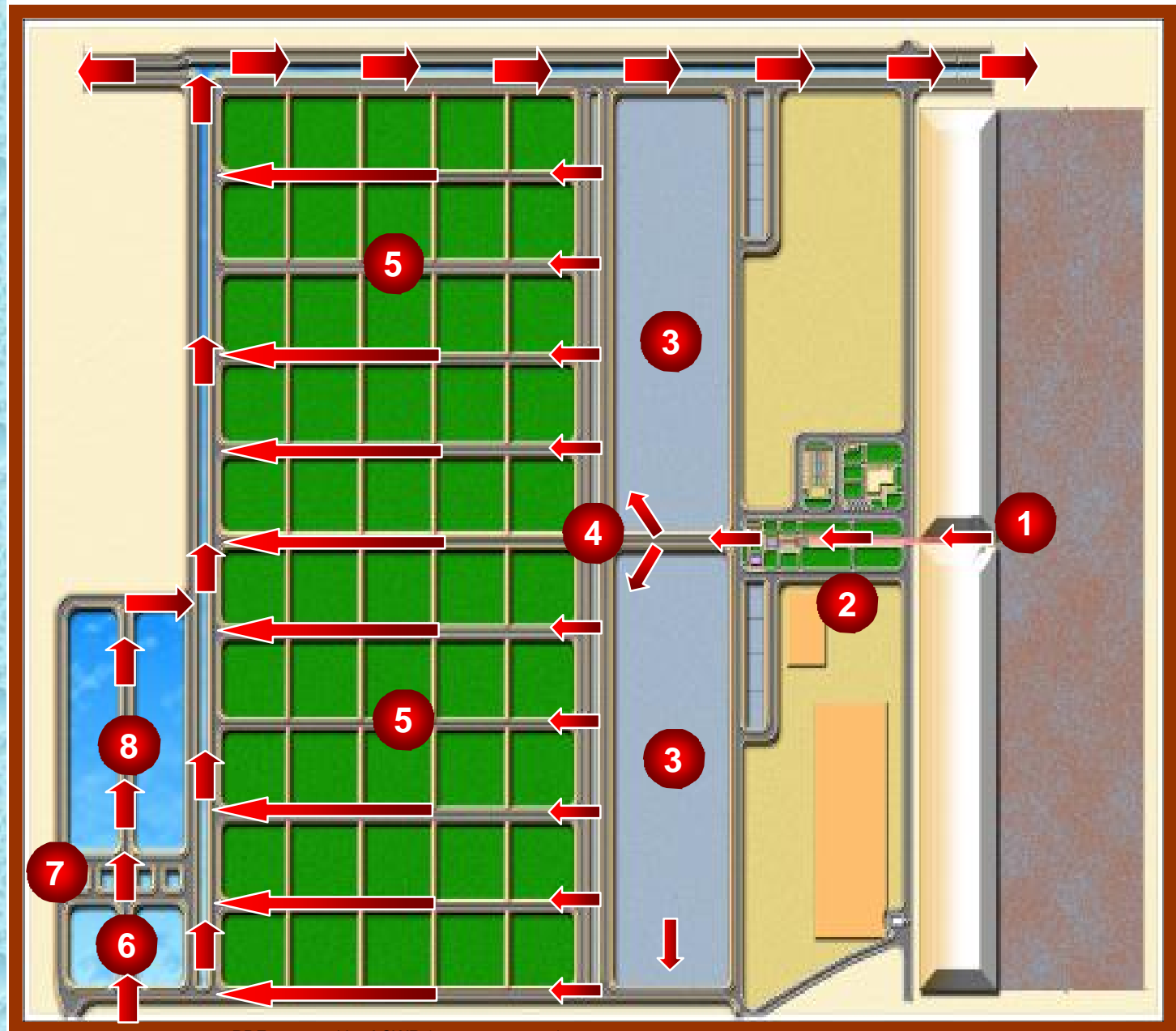
- 7-To Bahr El Baqr Drain
- 8-To Reuse area
- 9-Fish ponds

Lake Manzala Engineered Wetland

Wetland Elements

Main Project
(25,000m³/ Day)

- 1- INTAKE
- 2- PUMP STATION
- 3- SEDIMENTATION BASIN
- 4- DISTRIBUTION Channel
- 5- SURFACE FLOW BEDS
- 6- RECIPROCATING (SUBSURFACE) CELLS
- 7- HATCHERY PONDS
- 8- FINGERLING PONDS





Treatment System Components

Parameter	Units	Sediment Basin	High Flow Wetland	Low Flow Wetland	Reciprocating Cells	Hatchery Ponds	Fingerling Ponds
Flow	M ³ /d	25,000	21,500	3,000	500	50	450
Depth	M	1.5	0.5	0.5	1.2	1.1	1.1
Area	M ²	33,300	50,000	50,000	2,100	640	10,300
Volume	M ³	50,000	25,000	25,000	1,000	700	11,250
Retention time	Day	2	1.2	8.3	2	14	25



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Inflow Design Criteria

Flow	25,000 m³/d
BOD	40 mg/l
COD	100 mg/L
Suspended Solids	160 mg/L
Phosphorus	5 mg/L
Nitrogen	12 mg/L



Estimated Effluent Concentrations (mg/L)

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Parameter	Sediment Basin	High Flow Wetland	Low Flow Wetland	Reciprocating Cells
BOD	24	19.3	6.8	2.4
TSS	32	8.4	4.8	8
Total P	4	3.4	1.4	2
Total N	12	10.3	3.9	1.2



Estimated Treatment Efficiencies(%)

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Parameter	Sediment Basin	High Flow Wetland	Low Flow Wetland	Reciprocating Cells
BOD	40	20	72	90
TSS	80	74	85	75
Total P	25	15	65	50
Total N	0	14	68	90



Reuse of Wetland Effluent



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The project is exploring the possibilities of reuse of the wetland effluent:

- Reuse for aquaculture (4 hatchery ponds and 2 fingerling ponds).
- Reuse for irrigated agriculture (cooperation with the NAWQAM project).



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Project Status

- The project is currently going through the Operation, Monitoring and Evaluation phase.
- The Mechanical and Electrical Department of the Ministry of Water Resources and Irrigation is contracted for the operation and maintenance of the mechanical and electrical equipment of both the pilot and the main facility



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Project Status

- For the implementation of the Monitoring and Evaluation Plan a contract for Wetland Consultation commenced with the international consultant (NIRAS) in joint venture with the Egyptian consulting firm ECMA since April 2005
- Due to complete all the experiments needed to find out the design criteria under the prevailing condition of Egypt a new agreement signed between the project management and NIRAS to extend the contract till the end of Dec 2006 under no additional fees



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Project Status

- **The National Water Research Center is contracted for the sampling and analysis of water, plant, sediment and fish samples according to the Performance Monitoring Plan (PMP) prepared by the International Consultant (Komex) then the updated PMP prepared by the international Consultant (NIRAS).**

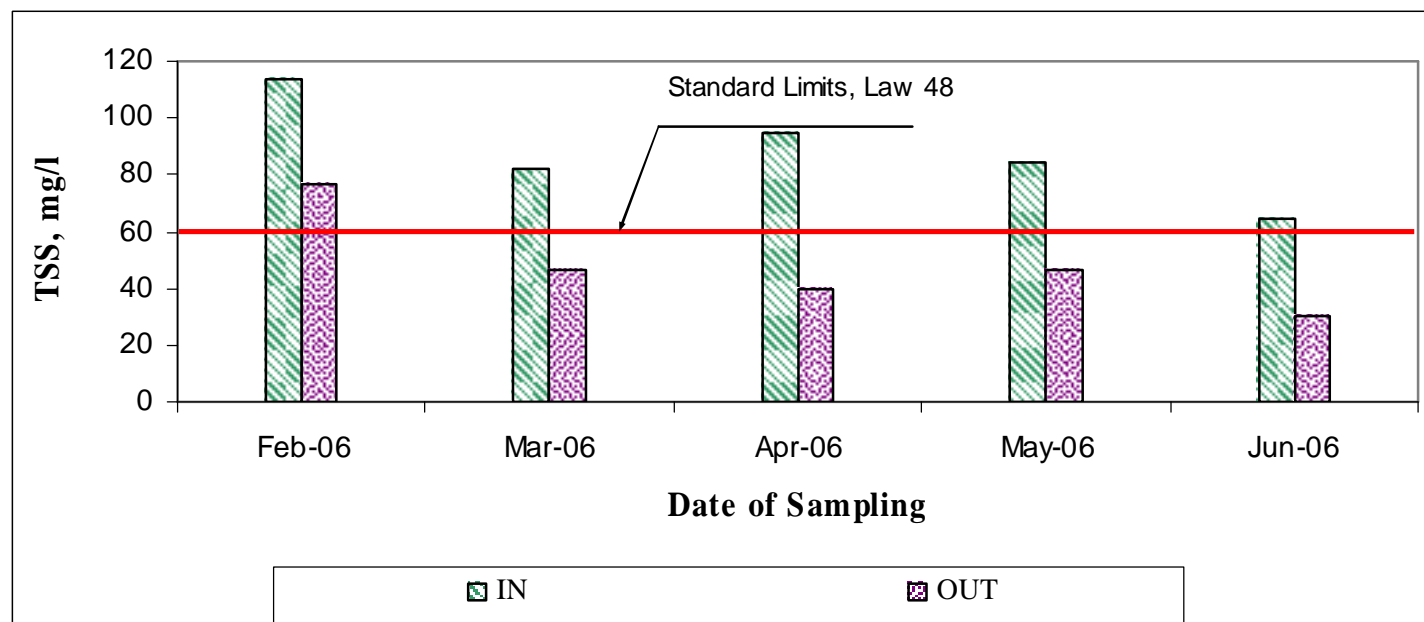
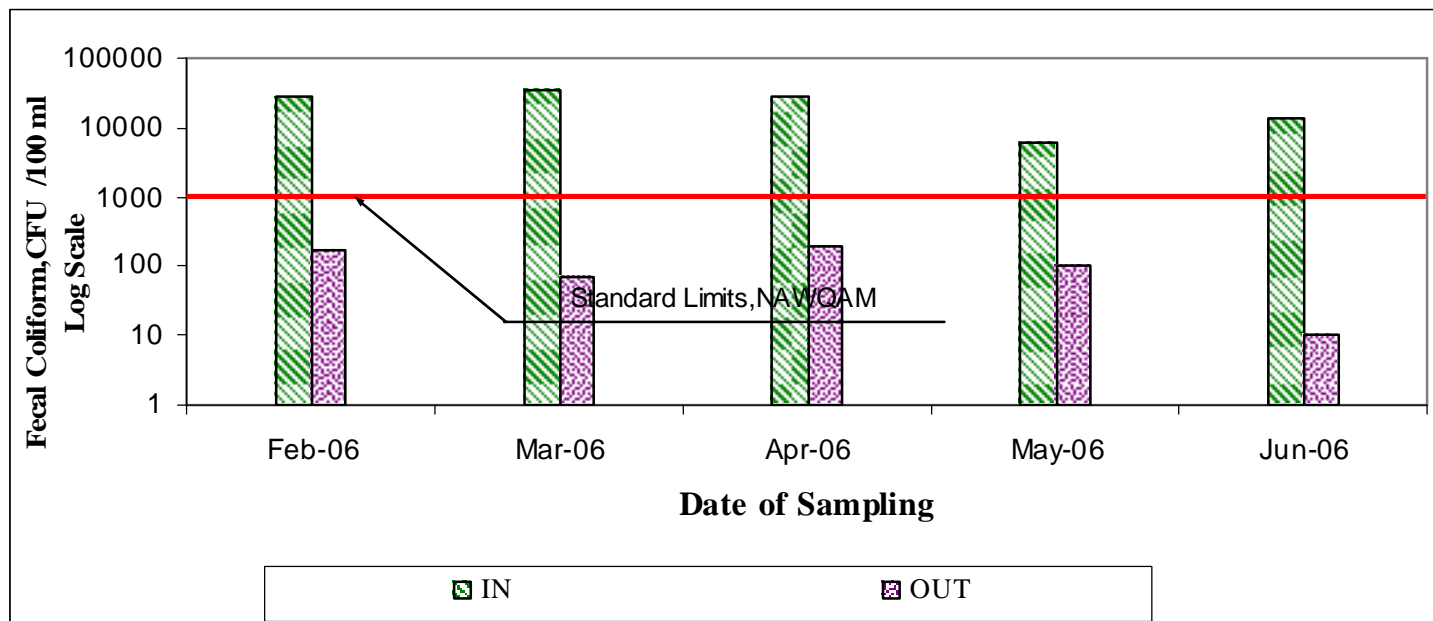


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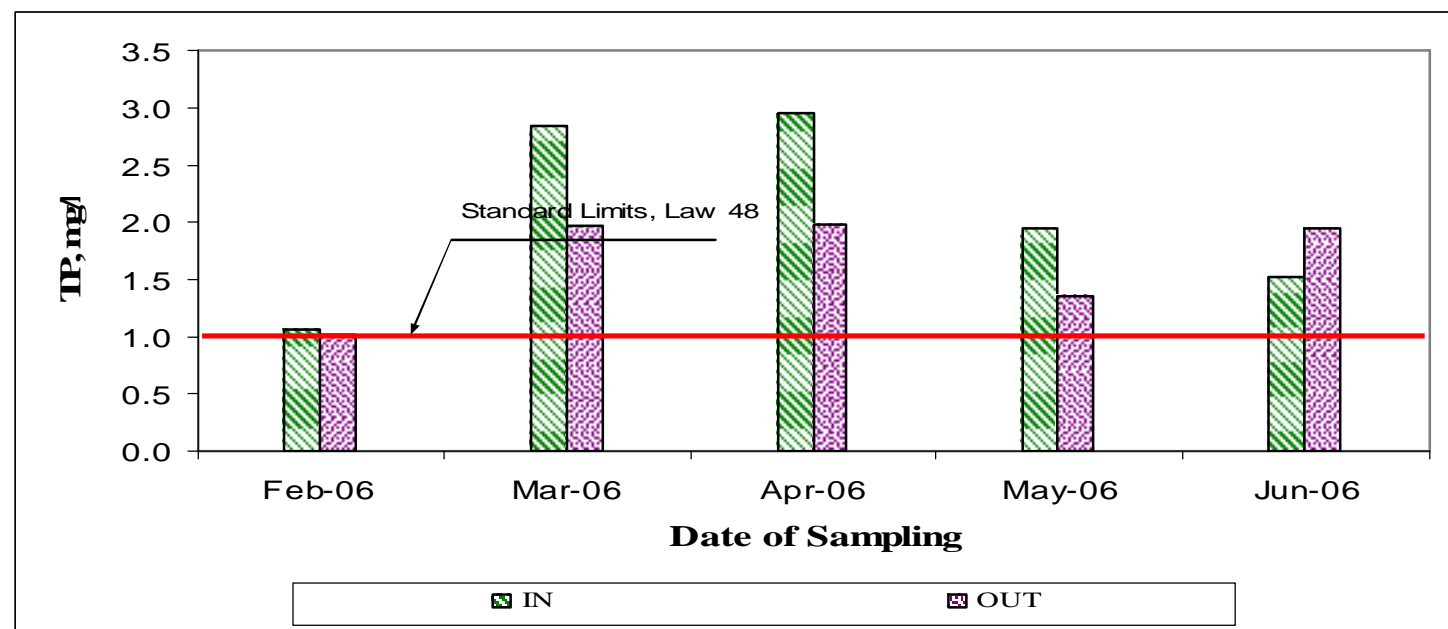
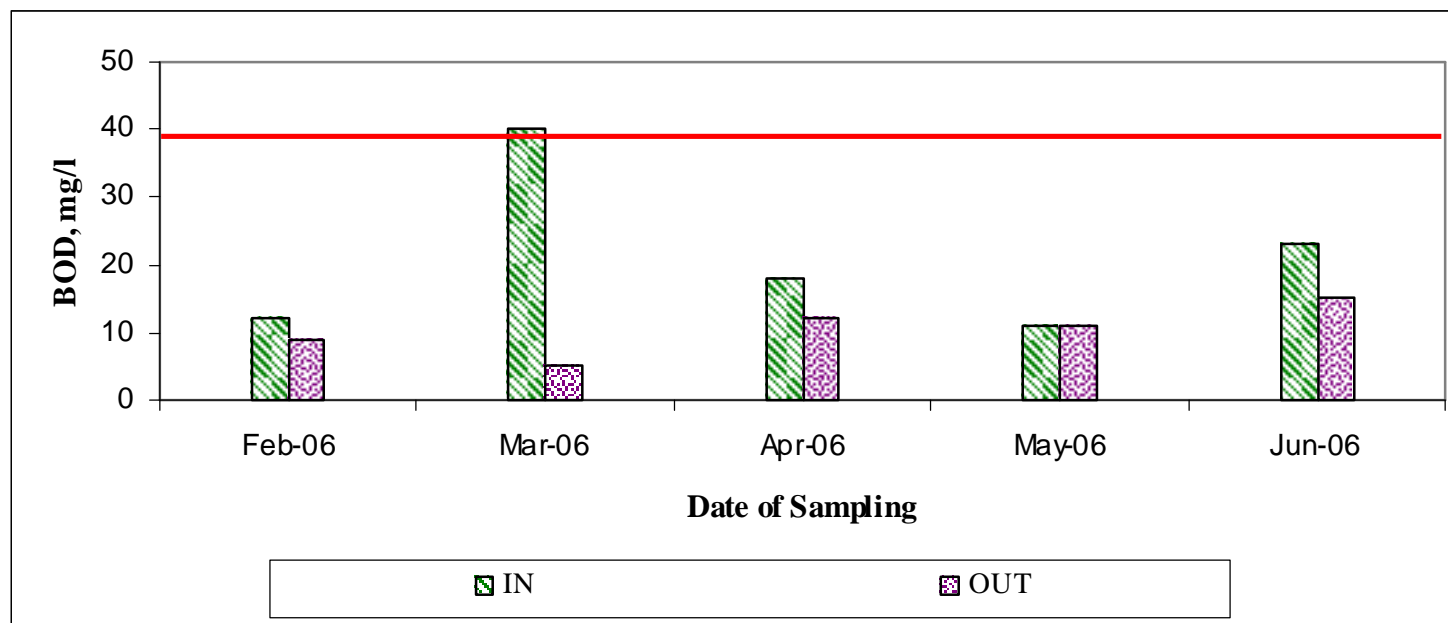


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Project Status

- Construction of an area of 60 feddan of fish ponds is starting with the end of August. The contractor supplied almost 40% of the needed soil. The base layer and the first layer are finished. The end of the contract will be Dec 31, 2006. The value of the contract is L.E. 2,155,200.

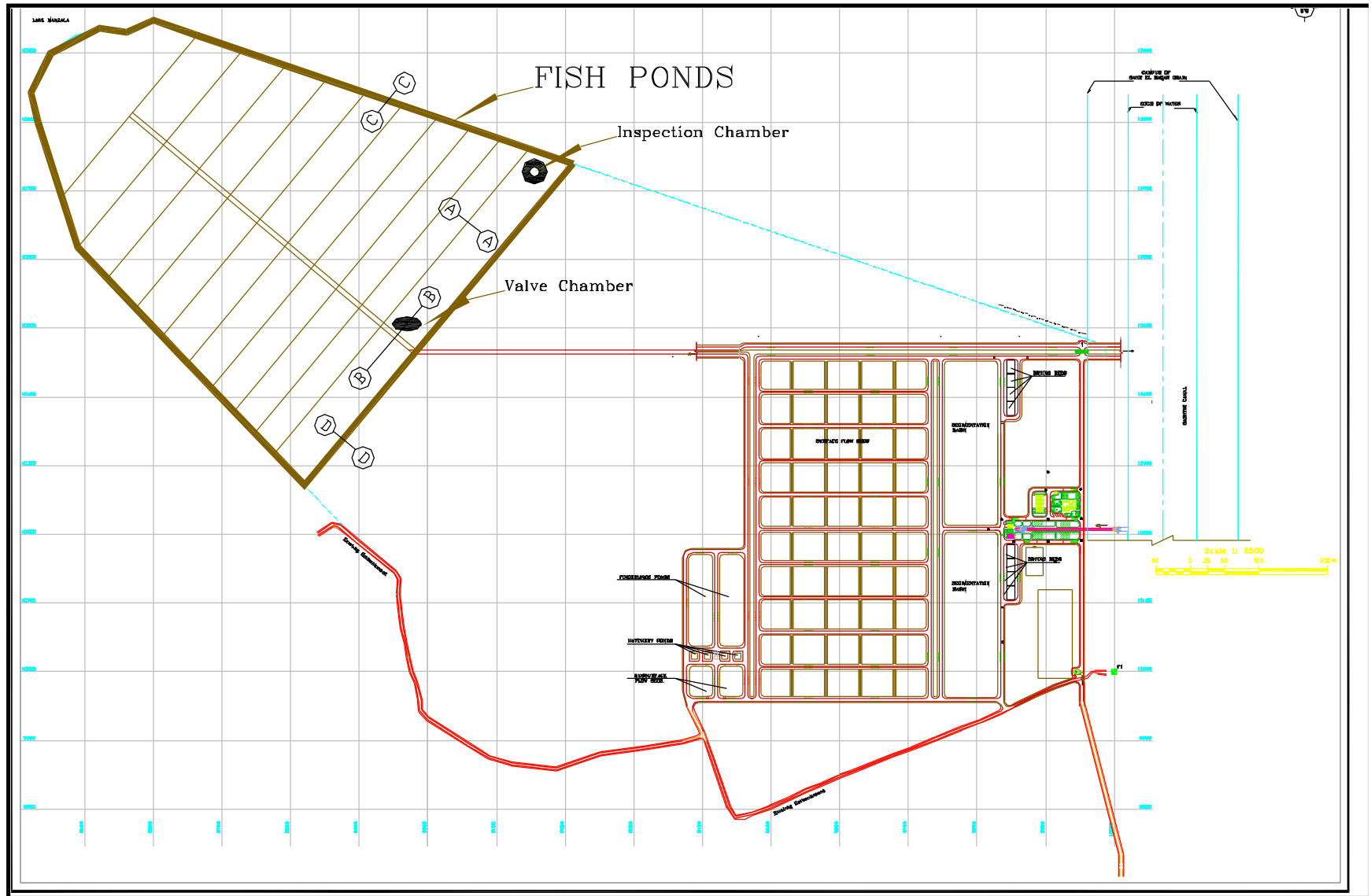


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Modifications on the Facility

- **Change the gravity flow at the inlets and outlets to controlled valves with ultrasonic sensors to accurately measure the discharges**
- **Planting some sub-cells with papyrus. The papyrus is cash crop and has very high income. The raising of papyrus could be cover the expenditures of the operation and maintenance of the facility**





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Construction of fish ponds



Plantation of Papyrus



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Bahr El Baqar Drain



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Inlet Structure and Pump Stations



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Sedimentation Pond



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Drying Beds



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Inlet of the Free Surface Cells



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Aquatic Plants at Beginning



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Trenches between Sub-cells



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Outlet of the Free Surface Cells

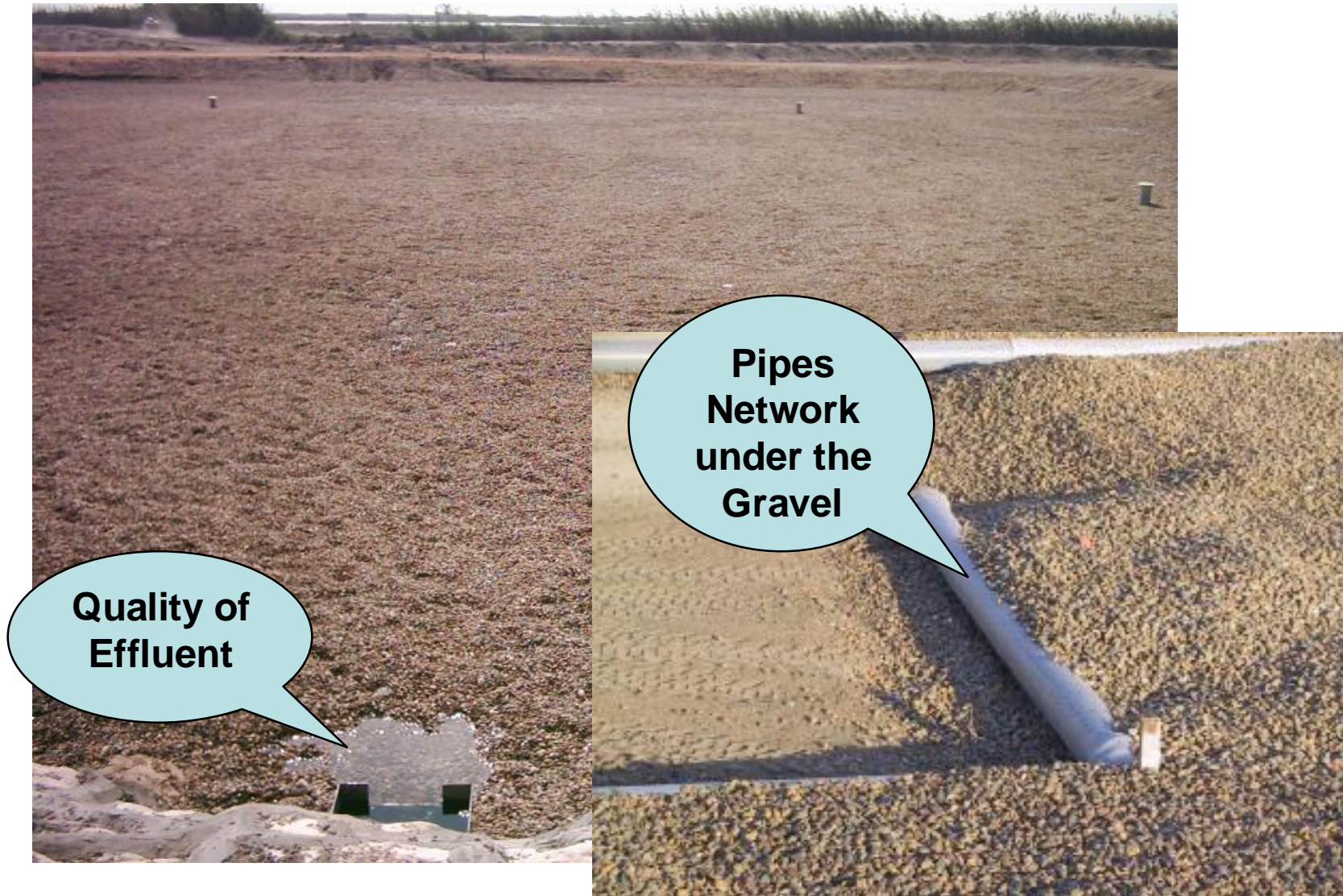


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Inlet and Pump Stations



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Hatchery Ponds



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Fingerlings Ponds



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Inlet and Pump Stations



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Pilot Wetland



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Administration Building



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Laboratory Equipments



Thank you for your
kind attention

Dia El Din El Quosy