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Water Resources Projects in Iraq, Main Drains

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Abstract

Iraq has a unique system of drainage. Soil texture, groundwater depth, water quality and other factors lead to the adaption of getting rid the drainage water away to the sea in order to control water quality. The system of drainage is not completed yet, however, the backbone of the system, which is Main Outfall Drain (MOD) was completed in 1992. Other main drains were completed and connected and others are still in progress of implementation where the most important drain after MOD is Eastern Euphrates Drain.

Keywords: Main Outfall Drain, MOD, Great Gharraf Drain, East Euphrates Drain.

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1. Introduction

A main drain has been proposed between Tigris and Euphrates for the first time in Willcocks report. The first study of the master plans of the main drains was presented by the American company TAMS in 1952, where it proposed the path of the MOD and to flow in Hammar Marsh. Many of the main drains have been implemented, and there are still proposed and studied drains such as East Tigris Drain and Western Euphrates Drain.

There are other proposed drains such as East Tigris Drain, West Euphrates Drain, and some of the evaporation lakes, but still no action.

2. Main Outfall Drain (MOD)

MOD is the backbone of drainage in Mesopotamian plain, extending from the end of the Ishaqi project and continuing to Shatt Al-Basra which is connected to Arab Gulf, the length is 565km. MOD is draining an estimated 6 million dunams of land, completed in 1992.

After the study by TAMS, a study by Sir M. McDonald in 1963 was presented regarding the drainage in Mesopotamia. By the early 1970s, Soviet companies were contracted to carry out excavations of MOD, where the first phase were excavated from 1973 until 1977, this is the middle sector where the path was 156 km long. Then, Philip Hullzmann and Polenski were contracted to implement the southern sector, after adopting an alternative proposal to link MOD to Arab Gulf instead of Hammar Marsh. This phase was completed in 1986, Basra Bay were developed also for a distance of 44km.

In 1984, the Brazilian company Mendes began implementing Siphon structure and pumping station on Euphrates River, then, the company left the site in 1990, without completing the work in its final form. For the period 1981-1983, Nedeco prepared a study about the Northern sector which is linked to Ishaqi main drains.

Finally, Iraqi companies began implementing the northern sector and expanding the middle sector and completed their work in 1992. Figure 1 shows the route of MOD.

Figure 1: Route of MOD. (Source: [1]).

MOD consists of the following parts.

2.1 Northern Sector

It starts from the end Ishaqi project drains to Dalmaj Lake, where it passes through siphon structure below Tharthar-Tigris Canal. This sector is 206km long and the discharge capacity 98m^3/s at Dalmaj Lake site.

2.2 Middle Sector

This sector starts from the north of Dalmaj Lake to the intersection of MOD with Euphrates River. The route within this section is 187 km long and discharge is 200 m^3/s, it is functioning as a navigation route for river vessels. One of the most important parts of this sector is Lake Dalmaj, an ancient marsh first used as an evaporation lake for the drainage of Musayab project in 1956. The lake has a capacity of 200 million cubic meters and a surface area of 200km^2. It is surrounded by a 72km dykes. The role of Dalmaj Lake is to act as a balance reservoir within the course of MOD. The following facilities are also located within this sector:

a. Cross regulator on MOD in the distance of 330 kilometers. This system consists of 4 openings with dimensions 4m×4m and passes a maximum discharge of 100m^3/s. It is in the final stages of implementation. This regulator controls the discharges entering Dalmaj Lake.
b. Outlet regulator of Dalmaj Lake, which is located at the beginning of the

drainage canal that links Dalmaj Lake to MOD. The regulator consists of 4 openings of dimensions 3m×3.5m, it was completed in 1988.

c. Cross regulator on MOD in the distance of 249 kilometers. This system consists of 3 openings with dimensions (3m×3.5m. It is located upstream of the drainage canal that links MOD with Dalmaj Lake, to maneuver with discharges. It was completed it in 1990.
d. Emergency Escape, located at the 172km distance, upstream the pumping station by 11km. This escape does the function of passing excess water to nearby marshes in case the pumping station stops. The escape consist an escape canal located on the left of MOD and a head regulator consisting of 10 openings with dimensions 2.5m×4m of discharge capacity 200m^3/s. This escape was implemented in 2012.

2.3 Southern Sector

This sector starts from the pumping station and the siphon to Shatt Al-Basra Shatt. The length of the route is 172km and discharge capacity is 300m^3/s. Also, it is functioning as a navigation canal, which is connected to the middle sector by navigation locks that did not implemented yet, these planned navigation locks are located at the intersection of MOD with Euphrates River. This sector includes the following facilities:

a. MOD Pumping Station: the station is upstream the siphon structure, at the 161km distance, one of the largest pumping stations in MENA region, and the largest pumping station in Iraq. The station lifts the water of MOD to the inlet of the siphon. The implementation of the station was started in 2002 and opened in 2008 and comprises 12 pumping units, each of which is 20m^3/s discharge capacity. Figure 2 shows a general view of MOD pumping station from the inside.
b. Siphon Structure at intersection with Euphrates River: Siphon structure consists of three openings, two in service and one standby. The dimensions of each opening are 4m×5m, the length of the siphon below Euphrates river is 320m, and the discharge capacity is 200m^3/s can pass. Figure 3 shows and outline for the intersection of Euphrates River and MOD.

Figure 2: General view of MOD pumping station from the inside. (Source: [2]).

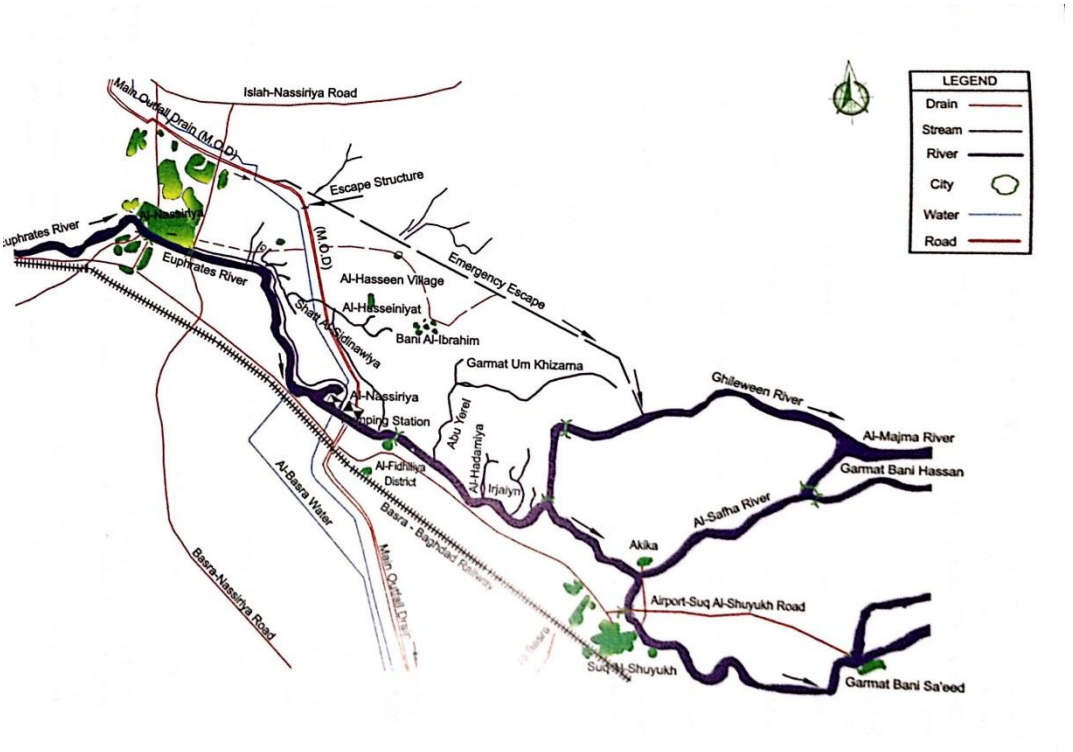

Figure 3: Outline of the intersection of Euphrates River and MOD. (Source: [3]).

c. Shatt Al-Basra Regulator: The last structure located on MOD. The regulator consists of two sets of gates. The first group is 5 gates with dimensions 4m×4m and the second group two flood gates with dimensions of (4×6) m. The gates pass the discharge of 500m^3/s. The regulator includes a fish ladder and a navigational lock with dimensions of 16.5m×191m. The regulator was completed in 1973. It was damaged due to the military actions that accompanied the occupation of Iraq in 2003. Hence, it is currently out of service [4, 5, 6, 7, 8].

3. Eastern Euphrates Drain

It is one of the main and partially implemented drains. After full development, the drain is 261km long and the discharge capacity is 85m^3/s. It is connected with MOD at the 189km distance. The project was started in 2001 and it is an ongoing project. Two main drains are connected with this drain, Eastern Shamiya, which became part of Eastern Euphrates Drain and the Western Shamiya. Eastern Euphrates Drain is carried out until the border of Kifl-Shinafiyah project, but the connection with the drains of project has not been completed, where siphon structure is required under Shamiya Branch to pass the waters of the Western Shamyia Drain. Regarding Shamiya Drains, the detail as following:

3.1 Eastern Shamiya Drain

This drain is a part of Eastern Euphrates Drain of the kilometer distance (168-261). The implementation started by General Irrigation Directorate in 1943 and was developed in later stages, to drain the projects of Hilla-Kifl, Hilla-Diwaniya, and parts of Kifl-Shinafiyah project.

At the beginning of the drain, the evaporator is Hour Ibin Najem, which is used as a balance reservoir to reduce the peak discharge Eastern Shamiya Drain, where the evaporator has an area of 16.7 thousand dunams. This drain continues to flow into Euphrates River in Shamiya Branch and causes a rise in the salinity of the water.

3.2 Western Shamiya Drain

This drain is disposing the drainage water between Kufa Branch and Shamiya Branch. Implementation of the drain was started in 1953 and is still being expanded after the completion of the Designs of Kifl-Shinafiyah project. The drain is 74 km long and the discharge after development is 30.3m^3/s. It currently flows into Shamiya Branch and has the same negative impact on Euphrates River as Eastern Shamiya Drain [4, 8, 9].

4. Great Gharraf Drain

It is one of the main drains and was also called Shatra Drain, which is 157 km long and its discharge is 46m^3/s. It is draining the lands of Middle-Tigris project in addition to Dalmaj and West Gharraf projects. Great Gharraf Drain is connected with MOD at the 217km distance; also West Gharraf is flowing in this drain [4].

5. Conclusion

It is worth to highlight the below points about the main drainage system in Iraq, which are:

1. The main carrier for drainage (MOD) was in operation for about 3 decades, it will be easy to complete the connection of the remaining main drains of irrigation projects.
2. Completing East Euphrates Drain is important to improve water quality downstream Shinafiyah.
3. Irrigation authorities made a very successful project which is rare to exit in a similar configuration around the world.
4. There are a lot of alternatives to maximize the benefits from the drains, by re-use the drainage water in many applications.
5. MOD could provide costly and environmentally effective alternative for transportation of goods from Basra to Baghdad. This is still not utilized yet.

References

[1] Lecollinet, J. and Cattarossi, A. (2015). Reuse of drainage water in Iraq. Proceedings of the 26th Euro-Mediterranean Regional Conference and Workshops “Innovate to improve Irrigation performances”, pp. 1–4.
[2] Resources, M. of W. (2019). Ministry of Water Resources Official Page on Facebook Available online: https://www.facebook.com/waterresources2/ (accessed on Jun 14, 2019).
[3] Resources, M. of W. (2005). The Encyclopedia of Irrigation in Iraq, February 1918-February 2005.
[4] AL-Simawi, H. (2011). Large Main Drains in Iraq and their Status until 2011.
[5] AL-Simawi, H. (2011). Irrigation and Drainage Pumping Stations in Iraq (in Arabic).
[6] AL-Simawi, H. (2014). Irrigation Regulators in Iraq until the end of the year 2013.
[7] Al-Jabbari, M.H and Nawfal, B.F. (2001). Saddam River (in Arabic).
[8] AL-Simawi, H. (2010). Irrigation and Drainage Projects in Iraq.
[9] Ministry of Irrigation. Euphrates East Drain Project, Contract 1, Volume II.