

- 2 -

KUWAIT EFFLUENT UTILIZATION PROJECT - CONCEPT & IMPLEMENTATION

R.B. Beynon at Partner, John Taylor & Sons (Middle East)

R.O. Cobham Principal, Cobham Resource Consultants

Strategies for treated effluent utilization from the Ardiyah

Construction has recently been completed on Phase 2 of the Kuwait

the advanced agricultural strategy for treated effluent from the Ardiyah

Effluent Utilization Project the aim of which is to enable the safe

utilization of the mainly domestic sewage effluent of municipal Kuwait

for intensive agricultural crop production and for the development of

low density environmental forestry. The completion of the Phase 2

development with the effluent being transferred

construction brings the total expenditure to date on this Project to

to the western agricultural area.

some KD 55 million (£120 million).

The engineering works required to achieve the agricultural/forestry goals

The Kuwait Ministry of Public Works appointed Consultants in mid 1978

included tertiary treatment works at the three STWs, with an effluent

to produce a Master Plan and subsequent detailed designs for a project

standard of 10 mg/l suspended solids and 10 mg/l 5 Day Biochemical Oxygen

to utilize the treated effluent from the two new sewage treatment works

located at Riqqa and Jahrah on the southern and western outskirts

gravel bed filtration and post filtration chlorination. In addition, at

respectively of Kuwait City for agriculture and afforestation. The brief

all the works, the effluent had to be filtered by coarse sand to

was later extended to include the existing City sewage treatment works at

ensure that the tertiary filters could be founded at an economic level

Ardiyah. All these works had already been designed to provide secondary

treatment to the sewage by extended aeration/activated sludge processes.

The design horizon flows for year 2010 from these works for average and

peak daily flows total 380,000 and 684,000 cubic metres per day respectively.

Priority was to be given to the irrigation of land suitable for agriculture.

Consulting Engineering, Agricultural and Health Specialists worked in

conjunction with the Ministry of Public Works and other involved governmental

authorities to produce a Master Plan which was approved for design

implementation at the end of 1978. A wide range of engineering and

agricultural options were considered. These included the alternative uses

of effluent for aquifer recharge, industrial process water, fish farming

and potable water supply. Single purpose agricultural, horticultural and

office facilities and analytical laboratories monitoring effluent quality

forestry strategies as well as a range of multi purpose land use strategies for treated effluent produced from the various works were studied.

The chosen agricultural strategy for treated effluent from the Ardiyah and Jahrah works was for priority for forage production for a high concentrates dairy system with vegetables grown in rotation. The first priority for treated effluent from the Riqqa works was for environmental forestry development with the ultimate surplus effluent being transferred to the western agricultural area.

The engineering works required to achieve the agricultural/forestry goals included tertiary treatment plants at the three STWs, with an effluent standard of 10 mg/l suspended solids and 10 mg/l 5 Day Biochemical Oxygen Demand or better. The works comprised pre-filtration chlorination, rapid gravity sand filtration and post filtration chlorination. In addition, at all the works, the secondary effluent had to be lifted by screw pumps to ensure that the tertiary filters could be founded at an economic level.

Following tertiary treatment the effluent is pumped from the Ardiyah STW via 23km of twin 1200mm diameter ductile iron pipe and from Jahrah STW via 11km of single 1100mm diameter ductile iron pipe to a storage and distribution complex at Sulaiibiyah known as the Data Monitoring Centre (DMC). The DMC complex is adjacent to an existing 850 hectare farm which has been using up to 100,000 cubic metres per day of Ardiyah secondary effluent for agricultural production since 1976. The DMC complex includes two 170,000m³ ground storage reservoirs and associated works necessary to transfer treated effluent to the existing farm or to an adjacent new farm complex of 820 hectares developed as part of the KEUP project. At the DMC extensive workshop and stores facilities have been constructed in addition to office facilities and analytical laboratories for monitoring effluent quality

and long term effects on soil and crops requiring effluent irrigation.

At the new farm a further two 170,000m³ ground storage reservoirs are located adjacent to the irrigation pumping station which can supply up to 145,000 cubic metres per day of effluent at 90 metre head to the farm irrigation network. This is designed to allow extensive field crops to be irrigated by side roll sprinklers or the same fields can be converted to 1 hectare plots irrigated in blocks of 8 by drip and trickle strip systems for row crops.

The 1000 hectares of environmental forestry now ready for planting is supplied from the Riqqa STW via six identical 2500m³ storage reservoirs and associated pumping stations. The irrigation system uses overground polyethylene tubing and pressure compensating drip emitters.

The Project was reviewed in March 1982 by a team of WHO Consultants under the leadership of Dr. Robert Dean of WHO Copenhagen. They concluded that "The plan for reuse of effluent from the tertiary treatment of sewage in agriculture and forestry is devoid of significant public health risk".

The works will be commissioned in April 1984 once final electrical power supply connections are complete.