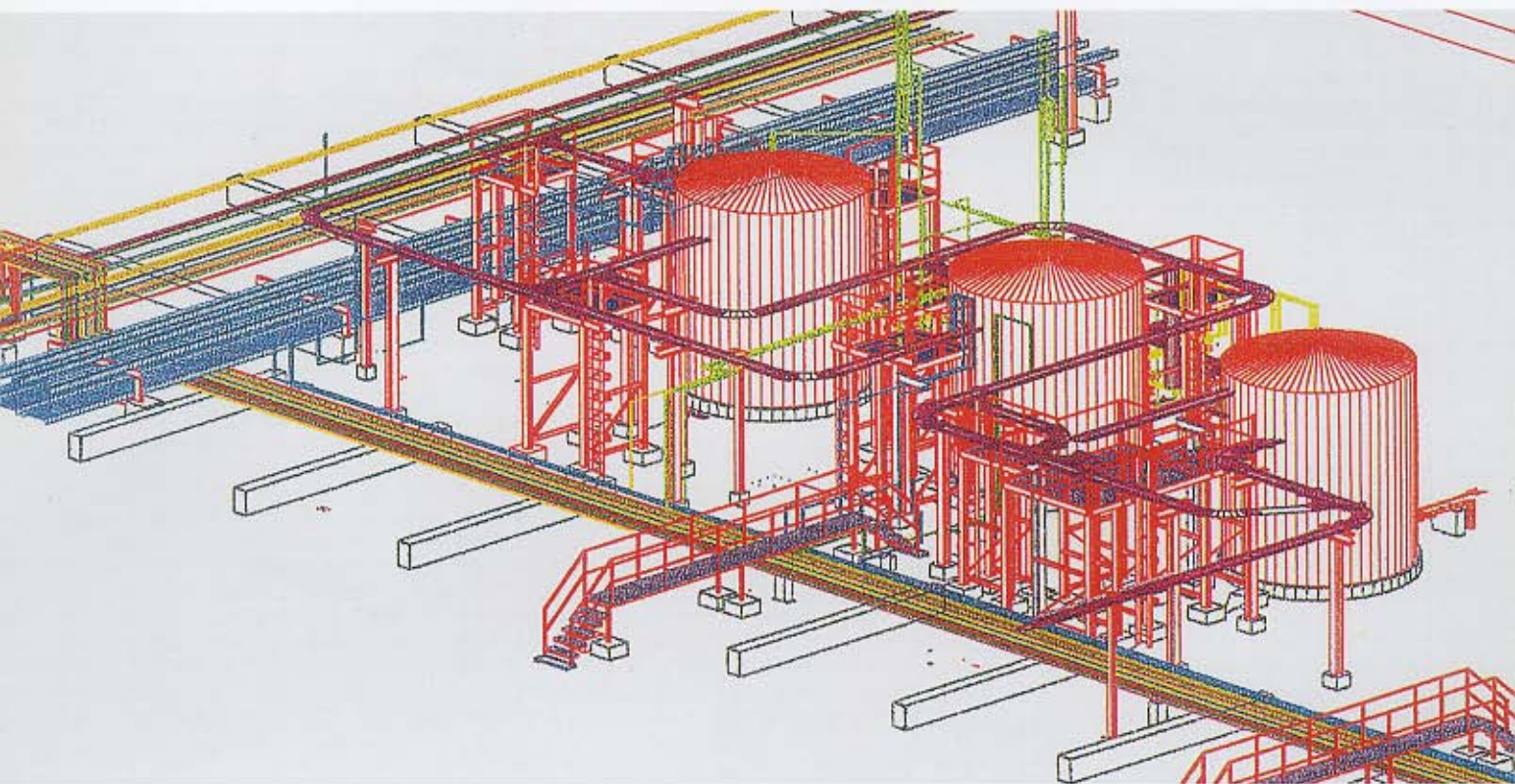


INDUSTRIAL WASTE WATER TREATMENT PLANT



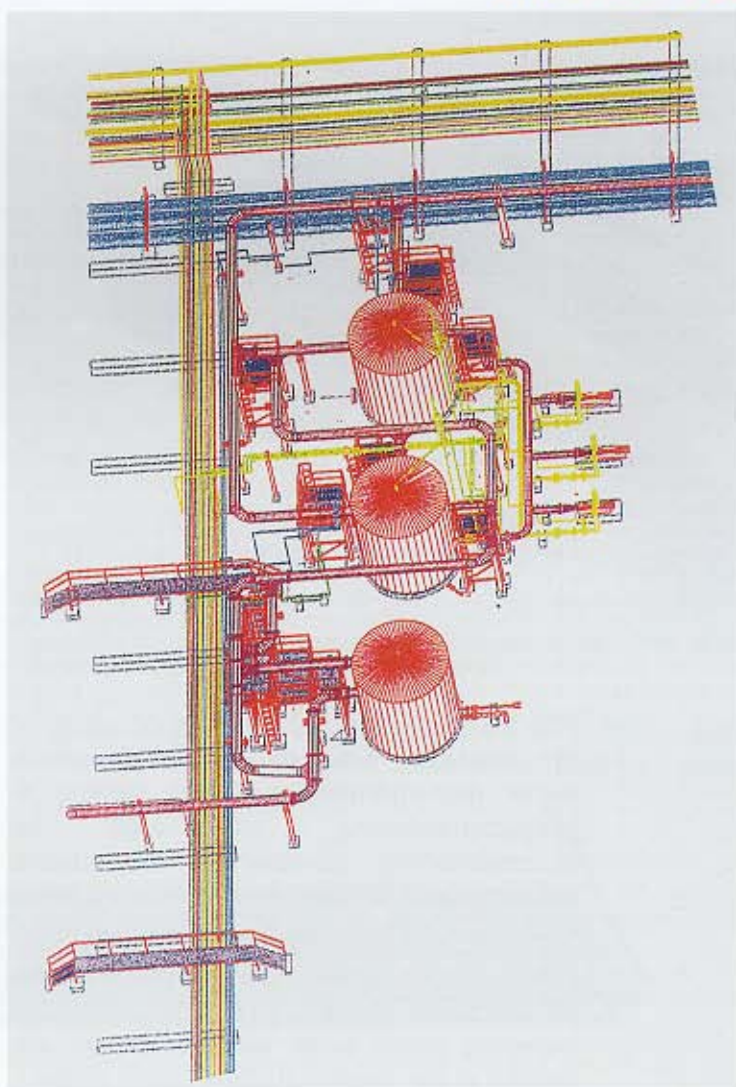
PROJECT NAME	INDUSTRIAL WASTE WATER TREATMENT PLANT CONTRACT # 45148/00
LOCATION	RAS TANURA
CLIENT	SAUDI ARAMCO
CONSTRUCTION PERIOD	28 MONTHS

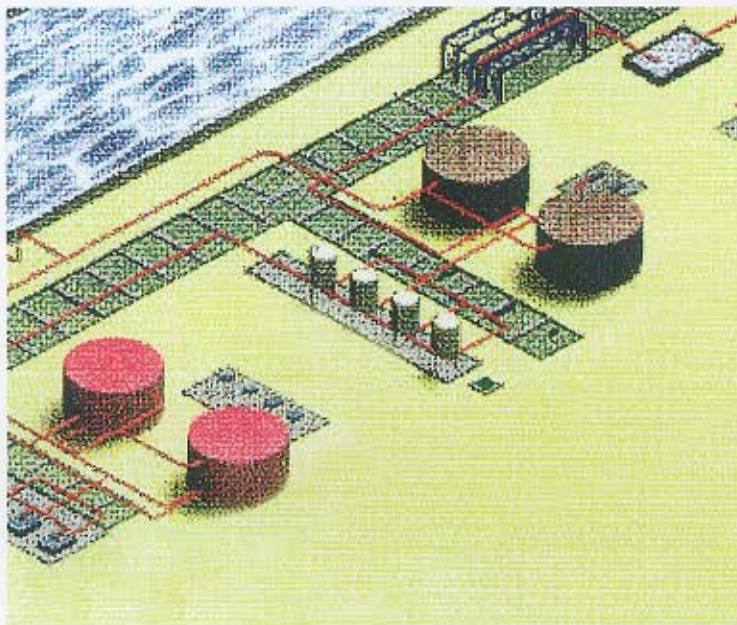
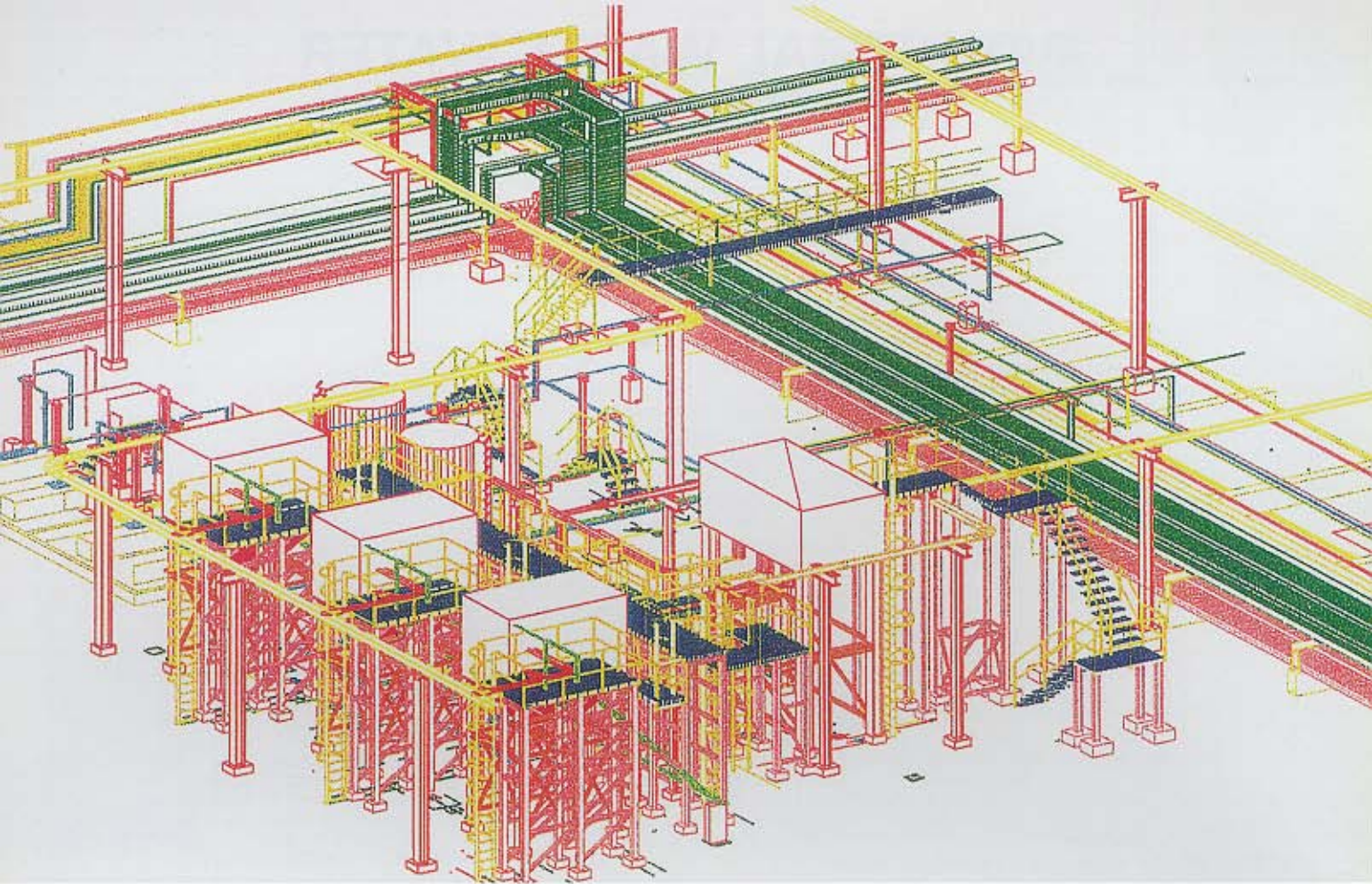
MAC Construction was awarded the Lump Sum Procure and Build Contract for the construction of an Industrial Waste Water Treatment Plant to support Saudi Aramco's Ras Tanura Refinery Upgrade Program. This project is known as Package No. 8 of the Upgrade Program.

The project was of prime importance to Saudi Aramco's management whose environmental protection policy was to ensure that all liquid waste streams from existing and new plants was collected, segregated and neutralized before final disposal.

The project was built on Saudi Aramco approved schedule to match the completion and commissioning dates of the newly built plants of the refinery's upgrade project.

This multi-disciplinary project involved 1.6 million manhours with a peak direct manpower of 380 plus 80 indirect men totalling 460 men.



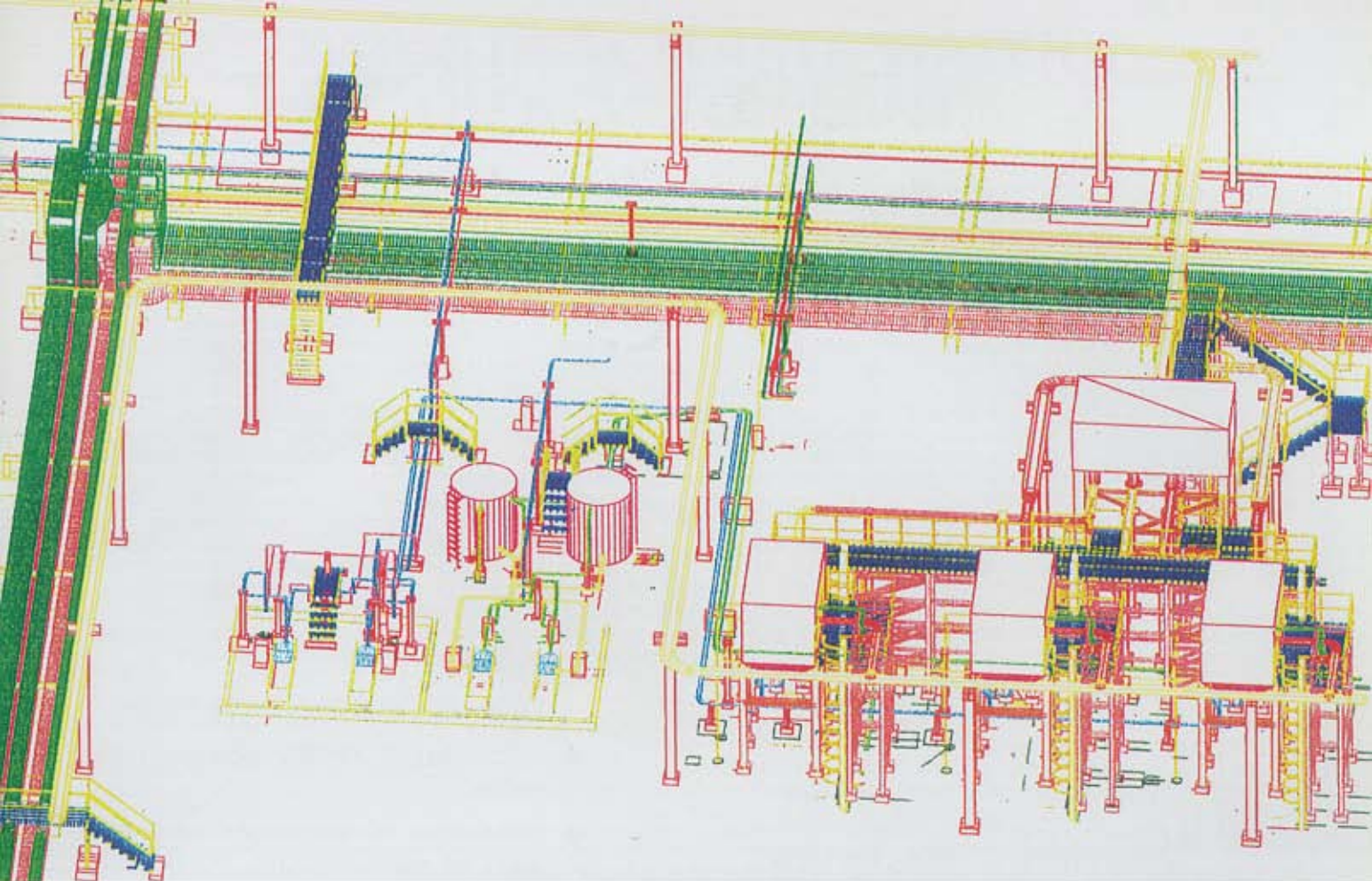


The scope of work included construction of two separate, different and unique waste water management systems; testing & precommissioning as well as commissioning assistance to ensure complete and functioning systems.

Industrial waste water like produced water, stripped sour water, oily water, desalter under carry sulfidic spent caustic and collected storm water surface runoffs are treated at the main industrial waste water

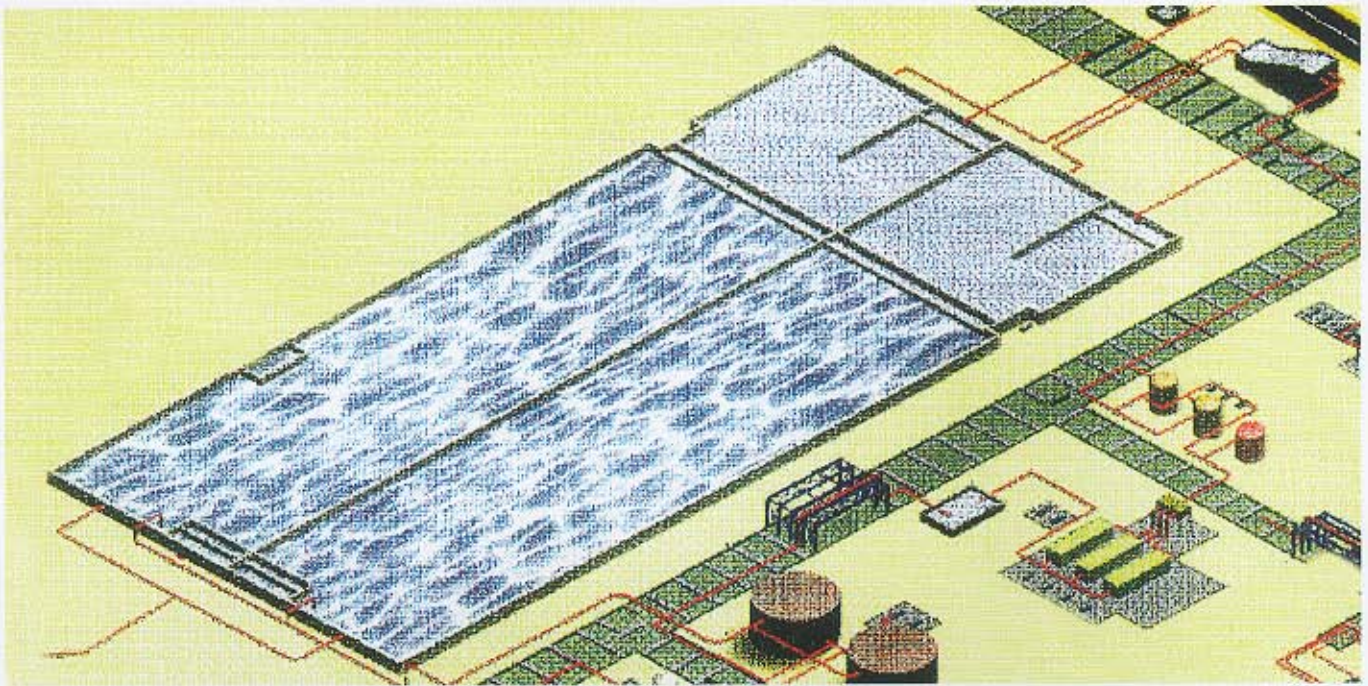
treatment plant, and the treated/neutralized effluent water is injected into an unusable salt water formation. The main components of this plant were:

- Reinforced concrete equalization basins (2 Nos.), capacity 800,000 Gal. each.
- Reinforced concrete stormwater and emergency storage basins (2 Nos.), capacity 2.75 million Gal. each.
- Influent pumping station with two 1800 GPM Archimedean screw type pumps (provision for 3rd pump), each installed within a concrete tank and trough accurately constructed (at 33° slope) to provide the required tolerances and smooth finish for optimal output.
- Corrugated Plate Interceptor (CPI) Separators (3 Nos.) used to separate oil from water, as well as to segregate settleable solids (oily sludge).
- Neutralization tanks (2 Nos.) designed for pH adjustment of the main stream combined with neutralization of sulfidic and non-sulfidic spent caustic by injection of fresh caustic and sulfuric acid.
- Induced Air Flotation units (3 Nos.)



- Chemical feed systems consisting of six separate chemical dosing packages incorporating tanks, agitators, and pumps, with interconnecting sophisticated piping and instrumentation.
- Filter feed tanks (2 Nos.), capacity 270,000 Gal. each; and filter feed pumps (2 Nos.) capacity 1800 GPM each.
- Pressure filters (4 Nos.) for down flow of 600 GPM per filter (900 GPM max. operational flow) with a backwash system.
- Injection feed tanks 2 Nos.), capacity 250,000 Gal. each.
- Deep well multistage centrifugal horizontal injection pumps (3 Nos.) 1000 drive HP at capacity 700 GPM and a maximum rated pressure 1850 psig for each pump.
- Other various type pumps, electrical and instrumentation equipment.
- Plant 37 instrumentation upgrade of tank D-58, D-101, pumps G-110 A/B, G-222 A/B including disassembling, relocating and installation in position DCS instrument indicators for the tanks and pumps.
- Substation (S/S #213) including transformer yard, structures and equipment.
- Process Interface Building (PIB J-37) including all equipment and furnishings.
- In-plant telephone stations located throughout the process area, PIB and main control room.
- Tie-in connections including site preparation and final paving, area





lighting and installation of all utilities; with:

- LSTK Utilities Contract Package No. 2 (Boilers, Desalination, Compressors, Utilities, Blending, Storage and Transfer) and associated pipe work tie-ins.
- LSTK Contract Package No. 4 (Hydrogen, Visbreaker and sulfur Plants).
- LSTK Contract Package No. 5 (Plant Automation System) including installation of the 30 KVA UPS from Substation # 43/51.
- LSPB Contract Package No. 7 (Power Distribution) for emergency power tie-in to Substation # 213 and Transformer Yard.
- Northern Area Oil & Gas Project titled Injection Wells Piping (ER-8250).

The second separate waste management system is for treatment of collected cooling water return from various units by once-through passing, using a corrugated plate interceptor prior to the return of this separate and segregated stream to the Arabian Gulf. The main components of work were:

- Construction of a reinforced concrete structure (K-113) comprising 46 cells for a design flow of 46000 GPM (1000 GPM per cell), located in two external channels, with the de-oiled water,

collected in a central effluent channel.

- Installation of 46 CPI Separator metal packs.
- Installation of accessory equipment such as weirs, troughs, sluice gates, etc.
- Tanks and agitators, sumps and pumps.
- Inflow and outflow piping including outfall pipelines which partly pass under an existing coastal road, and which terminate in a headwall structure at the shoreline.
- Riprapping for protection of the discharged water structure and outfalls.
- Instrumentation works.
- Pavement and maintenance accessways.
- Electrical and piping tie-ins.

