



هيئة الأشغال العامة
PUBLIC WORKS AUTHORITY

PREQUALIFICATION DOCUMENT FOR

Consultant Professional Services for Integrated Industrial Wastewater Treatment Works

PROJECT ID: IA/14-15/D/02/I

PART 2: PROJECT BRIEF

Authority

Public Works Authority
P.O. Box 22188
Doha
State of Qatar

July 2014

TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	General.....	1
2	PROJECT OBJECTIVES AND VISION	2
2.1	Overview.....	2
2.2	The Authority	2
2.3	The Authority’s Master Plan for Industrial Wastewater Management	3
2.4	The Project Outline	6
3	PROJECT DETAILS.....	10
3.1	Identification of Integrated Industrial Wastewater Treatment Facility	10
3.2	Design Considerations.....	12
3.3	Outline Scope of Consultancy Services	14
3.4	Staff Resourcing Requirements	15
3.5	Collaborative Working Requirements	17
3.6	Time for Completion of PSA Services.....	18

1 INTRODUCTION

1.1 General

- 1.1.1 The State of Qatar is a peninsula located on the northeast coast of the much larger Arabian Peninsula with a total land area of approximately 11,500 square kilometres. The population is approximately 1.7 million inhabitants (2010 census) with almost 83% of the inhabitants residing in Doha and its main suburb Al-Rayyan.
- 1.1.2 The State of Qatar has experienced rapid economic growth over the last several years. This economic growth has resulted in increased demand for the State to construct and provide first-class infrastructure such as government buildings (hospital, schools, and the like) transportation networks (harbours, airports, highways, pavements etc.) and services (power, water, sewerage, waste disposal etc.).
- 1.1.3 This increased demand has consequently placed unprecedented requirements on the relevant government entities and their resources. It has become necessary to enhance the capacity of these government entities in order to deliver the required infrastructure.
- 1.1.4 The Public Works Authority (PWA) also known as ASHGHAL, hereinafter referred to as the "Authority" is responsible for the planning, design, procurement construction, assets management, and delivery of infrastructure and building works in the State of Qatar.
- 1.1.5 The Authority contributes to the economic and social development of the State of Qatar through implementing public projects in accordance with the approved plans of the State. In coordination with other agencies in the State, the Authority implements and programs the execution of public projects consistent with the approved State objectives and allocated budget.
- 1.1.6 The Authority's tasks also include preparation of studies, designs, and technical specifications for the public projects, contracting for implementation of public projects and overseeing the work, implementing major maintenance projects according to the plans, programs and studies developed as well as implementation, management, operation and maintenance of drainage, groundwater, surface water and wastewater treatment projects.
- 1.1.7 Through its major departments, the Authority strives to develop the State's infrastructure and public amenities to the level of international standard achieved by developed countries and communities and in general, it contributes to the overall sustainable development of the State in both economic and social areas.
- 1.1.8 The Authority consists of administrative units set out below:
- First: Administrative units under the Minister of Municipality and Urban Planning (MMUP); The Internal Audit Unit.
 - Second: Administrative units under the President including the Office of the President, Public Relations and Communication Unit, Legal Affairs Department and Corporate Development & Planning Department.
- 1.1.9 The Authority's major business unit consists of five major sectors as below:
- Asset Affairs
 - Buildings Affairs
 - Infrastructure Affairs
 - Technical Support Affairs
 - Shared Services Affairs
- 1.1.10 **Asset Affairs:** This sector handles operation and maintenance of assets through two departments namely, Drainage Operation and Maintenance (O&M) Department and Road Operation and Maintenance (O&M) Department.

- 1.1.11 **Buildings Affairs:** This sector is subdivided into Designs and Projects Departments; dedicated to government building projects such as schools, ports, recreational facilities, healthcare facilities and other government buildings.
- 1.1.12 **Infrastructure Affairs:** This sector is subdivided into Local Roads and Drainage Designs and Projects Departments and, the Expressway Department.
- 1.1.13 **Technical Support Affairs:** this sector consists of three departments:
- Contracts Department which is responsible for procurement, process and procedures in the delivery of the Authority Projects.
 - Engineering Business Support Department which provides technical support for the Projects in terms of project planning, estimating, tracking and documentation.
 - Quality, Safety and Environment Department which is responsible for the quality control of projects, environmental protection and safety at work sites and offices.
- 1.1.14 **Shared Services Affairs:** All other departments that deal with technical support come under this sector including Administration and Finance Department, Human Resources Department, General Services Department and Information Services Department.
- 1.1.15 In addition to internal departments, the Authority has appointed a number of Program Management Consultants (PMC), General Engineering Consultants (GEC) and some Management Consultants (MC) to deliver their services on behalf of Infrastructure Affairs, Asset Affairs and Building Affairs sectors.

2 PROJECT OBJECTIVES AND VISION

2.1 Overview

- 2.1.1 Adhering to the Qatar National Vision 2030, the Authority contributes to the economic and social development of the State of Qatar, with a capital investment of QAR100 billion to be delivered within the next five to seven years.
- 2.1.2 The Authority has employed a powerful model of strategic outsourcing and partnerships with world leading establishments that will bring capacity and capabilities to Qatar at par with the most developed nations in the field of infrastructure.
- 2.1.3 With high aspirations for the future, the Authority is committed to undertake a huge infrastructure development that will support the future socio-economic growth of the country. Their contribution to the overall sustainable economic and social development of the State is pivotal to the future enhancement of Qatar.
- 2.1.4 The Authority operates in alignment with its corporate strategy that outlines its direction and the operational procedures which need to be followed in order to achieve the organization's mission and vision. In line with its strategies and objectives, the Authority works to deliver projects that deploy the best practices in infrastructure development and management.

2.2 The Authority

- 2.2.1 The Authority's mission is to deliver and manage state-of-the-art and sustainable world class buildings and infrastructure that will fulfill the Qatar National Vision 2030.
- 2.2.2 The Authority's vision is to be a dynamic, responsive and customer centric organisation that creates shared values for all stakeholders through outsourcing and partnerships with the world's best.

2.3 The Authority’s Master Plan for Industrial Wastewater Management

2.3.1 Regulatory Framework:

The regulatory framework intended to control and manage industrial wastewater falls under the responsibility of three agencies, namely: the Ministry of Energy and Industry (MEI), the Ministry of Environment (MoE) and the Public Works Authority (PWA). Each body has a role to play, which is described below.

Any application for an Industrial Permit made to MEI includes for a permit to discharge wastewater which has to be approved by the MoE. Domestic and industrial wastewater discharges are assessed and in many cases a conditional approval is issued to the applicant. In all cases each application must demonstrate the ability to meet the requirements of wastewater discharge standards as laid down in the Authority’s Table 60 below;

TABLE 60
STANDARDS FOR EFFLUENTS DISCHARGED INTO FOUL SEWERS
LEADING INTO PUBLIC WORKS AUTHORITY SEWAGE TREATMENT PLANTS

Flow rate (m ³ /d)	≤10	>10 and ≤100	>100 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	>800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
Determinand	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10
pH (standard units)	43	43	43	43	43	43	43	43	43	43	43	43	43
Temperature (°C)	1200	1000	900	800	800	800	800	800	800	800	800	800	800
Suspended Solids	100	100	100	100	100	100	100	100	100	100	100	100	100
Settleable Solids	1200	1000	900	800	800	800	800	800	800	800	800	800	800
BOD	3000	2500	2200	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
COD	100	100	50	50	50	40	30	20	20	20	20	20	20
Oil & Grease	30	25	25	25	15	12.5	10	7.5	5	3.5	2.5	2	1.5
Iron	8	7	6	5	4	3	2.4	1.6	1.2	0.8	0.6	0.5	0.4
Boron	8	7	6	5	4	3	2.4	1.6	1.2	0.8	0.6	0.5	0.4
Barium	0.2	0.15	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mercury	0.2	0.15	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	4	4	4	3	1.5	1.5	1	1	1	1	1	1	1
Copper	4	3	3	3	1.5	1	1	0.8	0.7	0.7	0.6	0.6	0.6
Nickel	2	2	2	2	1	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.1
Chromium	5	5	4	3	1.5	1.5	1	0.8	0.7	0.7	0.6	0.6	0.6
Zinc	4	3	3	2	1.5	1.5	1	0.8	0.7	0.7	0.6	0.6	0.6
Silver	2.5	2.2	2	1.5	1	0.7	0.6	0.4	0.3	0.2	0.15	0.12	0.1
Other toxic metals individually	10	10	8	7	3	2	2	1.6	1.4	1.2	1.2	1.2	1
Total Toxic Metals	2	2	2	1	0.7	0.5	0.4	0.27	0.2	0.13	0.1	0.08	0.06
Cyanide	1	1	1	1	0.7	0.5	0.4	0.27	0.2	0.13	0.1	0.08	0.06
Phenols	10	10	10	10	5	5	4	2	2	2	1	1	1
Sulphide	1000	1000	1000	1000	1000	1000	1000	900	800	600	600	600	600
Sulphate	200	200	200	200	200	200	200	100	100	100	100	100	100
Total Nitrogen	50	50	50	50	50	50	50	25	25	25	25	25	25
Total Phosphorus	200	150	50	40	30	25	25	25	25	25	25	25	25
Surfactants (total)													

All units in mg/l unless stated. All figures are upper limits unless otherwise indicated.

The MoE’s overall responsibility is to ensure that the treatment and disposal of all wastewater does not adversely affect the environment, health and safety of the Qatari population. The Authority manages and operates the infrastructure into which wastewater is transported, treated and disposed of through irrigation or other reuse opportunities.

2.3.2 Operation:

Qatar has industrial flows that arise not only from industrial areas, but also from various commercial sectors particularly in Doha. Therefore, management of industrial wastewater in Qatar needs to be considered as a whole, and not solely from the industrial area. It should be noted that the Authority’s Master Plan excludes the hydrocarbon industries of Oil & Gas sector in Mesaieed, Dukhan and Ras Laffan industrial cities. While there are toxic discharges that may not comply with Table 60, there are significant domestic flows arising from the Doha industrial area, mainly contributed by the migrant labour population residing within the catchment. The industrial area is largely made up of commercial, light industrial, transport and a large number of concrete precast yard activities. There are also many high density apartment blocks that accommodate labourers who work in the industrial area and the wastewaters generated from these accommodation sites contain a high fraction of domestic wastewater.

2.3.3 Existing Industrial Area:

The original industrial area is divided into north and south phases. The northern phase is completely sewered and there is an ongoing programme to connect the individual industrial plots to the network. The southern phase is not yet fully sewered but the recently completed western extension to the industrial area is completely sewered. Wastewater from the original industrial area is pumped from septic tanks and transported to either the Industrial Area Sewage Treatment Plant (IASTW) or the Al Karaana Lagoons. The new western industrial area is sparsely developed so the wastewater flows into the existing network are small at present. Going forward, the Authority proposes to construct under this Project a new 10,000 m³/day capacity plant on the same site alongside the existing IASTW, which will be dedicated to the treatment of high-strength industrial wastewaters generated from the trade and commercial sectors in Qatar. The Authority's prime objective in this regard is to provide a publically-owned facility to treat all industrial wastewaters from trade and commercial industries that are unable to install their own pre-treatment facilities on site and as a consequence, will continue to depend on Al Karaana lagoons to be used as a disposal site. It should be noted that all discharges to this Integrated Industrial Wastewater Treatment Works (IIWWTW) will be transported and hauled in only by road tankers.

The following map inset shows an aerial view of the Doha Industrial Area catchments, IASTW and Al Karaana lagoons;



2.3.4 Doha Commercial Area:

Random checks carried out by the Authority at some commercial sites in Doha have revealed the following:

- a. In the case of luxury hotels, RO (reverse osmosis) plants are used to treat potable water. The brine from this process is discharged into the surface water network as storm water;

- b. All other flows such as from swimming pool backwash systems are also combined with these flows;
- c. Evidences exist to suggest that some non-permitted wastewaters from commercial establishments are illegally discharged to the sewerage network.

2.3.5 Assessment of Industrial Wastewater Flows:

It is estimated that about 90% of wastewaters generated from the Doha Industrial Area (DIA) catchment is of domestic origin. Considering that at present, 70,000 m³/d is being transported to Al Karaana Lagoons and 20,000m³/d to Doha West STW and 10,000m³/d to IASTW, about 10,000m³/d can be considered to be the industrial component generated from this catchment. This equates to 10% of 100,000m³/d wastewater flows which is currently estimated to be produced by the whole of Doha Industrial Area catchment. A detailed flow survey of the whole of Doha will determine the full extent of industrial wastewater generation in the city, which is a task that has been initiated by the PWA's Asset Affairs, Drainage O&M Department. The challenge is however, to identify and isolate that industrial portion from the trade and commercial sectors so that the necessary changes to the network and treatment facilities could be made to effectively manage the industrial and domestic wastewater components.

2.3.6 Role of Mesaieed Industrial City (MIC) Operations:

In Mesaieed Industrial City (MIC) under the control and management of Qatar Petroleum (QP), there are separate waste management centers available for processing domestic solid wastes and considerably small quantities of hazardous liquid wastes as described below. However, it should be carefully noted that these MIC operations are conducted strictly outside the jurisdiction of the Authority and will offer no benefits to the Project, as these centers are not be capable of treating industrial wastewaters of large volumes hauled in by tankers.

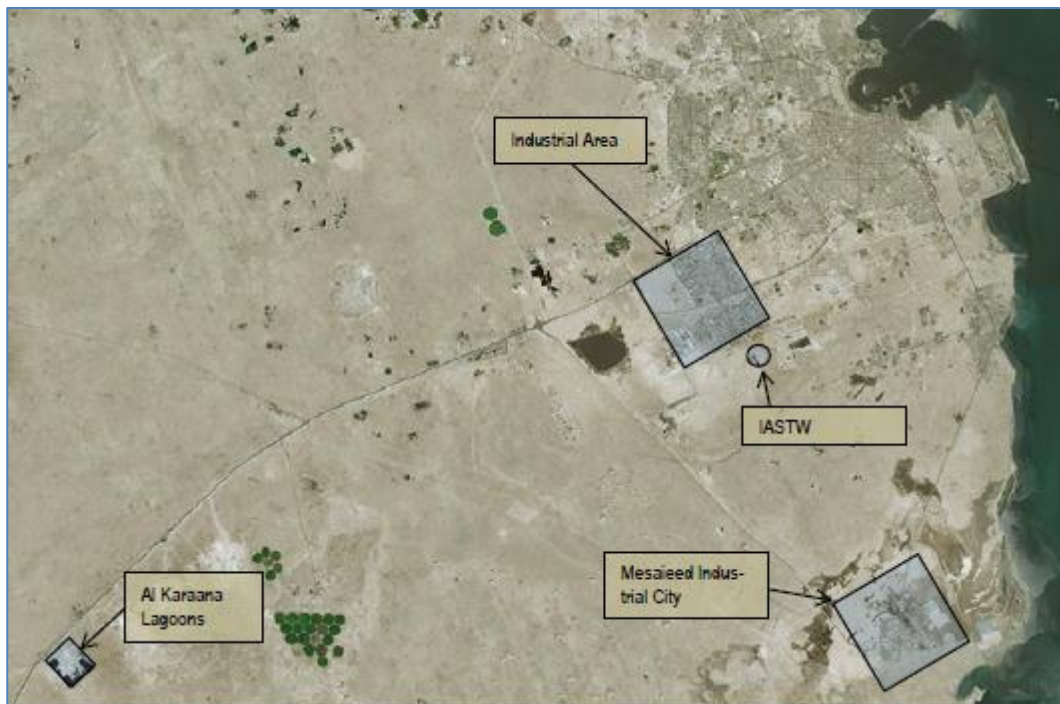
Domestic Solid Waste Management Centre (DSWMC);

Qatar Government through the MoE established an integrated Domestic Solid Waste Management Centre (DSWMC) in Mesaieed Industrial City. The operation of the DSWMC maximizes recovery of resources and energy from waste by using modern technologies for separation, pre-processing, mechanical and organic recycling, waste-to-energy (WtE) and composting technologies.

Hazardous Liquid Waste Treatment Centre (HLWTC);

Mesaieed Industrial City (MIC) as well as other industrial cities in the Oil & Gas sector such as Ras Laffan and Dukhan generates a variety of hazardous waste liquid by-products from many different types of heavy hydrocarbon industries. These hazardous liquid wastes are small quantities of undiluted chemicals that are brought into the MIC site in transportable containers and then, treated and safely disposed of through a well-designed plant in the Hazardous Liquid Waste Treatment Centre (HLWTC). The technologies used are based on neutralization, solidification and chemical stabilization methods and, land filling of the inert residues. The liquid stream is operated via a small batch processes each containing only a few cubic meters at a time.

The following map inset shows an aerial view of the locations of the Doha Industrial Area, IASTW, Al Karaana lagoons and MIC in relation to the city of Doha;



2.4 The Project Outline

2.4.1 Historical Investigations:

The report titled “*Detailed Feasibility Study for the Proposed Sustainable and Effective Integrated Industrial Wastewater Management in Doha Industrial Areas, Qatar*” was prepared by Kualiti Alam Sdn Bhd consultants in September 2010. This report concluded that certain ill-practices from trade and commercial units in Doha Industrial Area adversely affecting the characteristics of wastewater. These ill-practices are:

- a. wastes such as solvent, used oil, paint sludge and wastewater from machinery cleaning were indiscriminately dumped into sewage tanks;
- b. minimal effort from the industries made to segregate the different wastewaters at source;
- c. lack of awareness by industries about the impact of their activities has on the sewerage network.

This report recommended;

- a. refinement of statutory laws to make the management of industrial wastewaters more effective and efficient;
- b. consideration of legal amendments to include definitions of different types of wastes, waste inventory reporting, waste segregation, storage, labelling and packaging and consignment note systems;
- c. consideration of implementing the ‘*polluter pays*’ principle to recover the costs of treating industrial wastes;
- d. segregation of industrial wastewaters from hazardous and toxic waste elements to improve management of the industrial discharges and;

- e. amendment of standards to distinguish the industrial liquid waste, hazardous waste and toxic waste legal compliance requirements.

The report also identified;

- a. automotive industrial discharges contain poor separation of oils and grease from the generated wastewater flows.
- b. representative data with respect to waste characterizations could not be obtained as almost all trade and commercial units discharged the industrial wastewater to septic tanks.
- c. further study is required to characterize and profile different types of industrial wastewater.

A concise summary of sampled industrial wastewater quality average characteristics in comparisons with Table 60 limits are shown below;

<i>Item</i>	<i>Industrial Cluster</i>	<i>pH</i>	<i>BOD</i>	<i>COD</i>	<i>COD/ BOD</i>	<i>TSS</i>	<i>O&G</i>	<i>Sulphide</i>
	Table 60 limits	6 to 10	800	2,000	2.5	800	20	10 to 1 ⁸
1	Automotive	7.62	301	8260	27.4	3960	18,784	6.1
2	Food	6.46	116	360	3.1	80	12	23.1
3	Construction	6.79	101	251	2.5	30	8	12.6
4	Plastic	6.91	251	845	3.4	4150	25	15.8
5	Ferrous & Non-Ferrous	6.62	87	240	2.8	57	16	7.7
6	Printing	6.79	121	169	1.4	163	15	5.6
7	Detergent	7.51	281	510	1.8	78.0	3	15.3
8	Laundry	6.91	100	385	3.9	162	11	1.9
9	Recycling	8.05	151	332	2.2	58	3	0.4
10	Others	6.64	191	467	2.4	120	71	23.1

2.4.2 Review of Current Situation:

The State of Qatar has industrial flows that emanate not only from Doha Industrial Area, but also from various other trade and commercial business units located elsewhere in the city. Therefore, the management of wastewater in Qatar and the industrial component thereof needs to be considered as a whole and not solely from the industrial area itself. However, the Authority's Master Plan for industrial wastewater management excludes hydrocarbon industries of Oil and Gas sector in Mesaieed, Dukhan and Ras Laffan. These hydrocarbon industrial cities are managed by Qatar Petroleum (QP) who build, operate, maintain and manage their own wastewater treatment facilities to service each of these cities and areas. No wastewaters from QP industrial facilities are discharged to the Authority's infrastructure facilities for treatment.

While there are toxic discharges that may not comply with Table 60, there are significant domestic flows emanating from the Doha Industrial Area. The general make up of main industrial users can be broadly grouped into automotive (service centers, garages, etc.), food (processing, packing, etc.), construction (ready-mixing, pre-casting, steel fabrications, etc.), plastic (extrusion, moulding, etc.), ferrous and non-ferrous (fabricating, electroplating, coating, etc.), printing (digital, paper, signage, etc.), detergent (manufacturing, packing, storing, etc.), laundry (washing, bleaching, steaming, etc.), recycling (metals, plastics, paper, engine oils, etc.) and other outlets such as restaurants, groceries and retail shops.

2.4.3 Overview of Existing Treatment Facilities:

Doha Industrial Area Sewage Treatment Works (IASTW) is located approximately 2km southwest of the Doha Industrial Area with an area of approximately 15 hectares allocated to the existing works and its future extensions. The original design of the treatment works was for an ultimate design capacity of 24,000 m³/d which has been the originally forecast flow from the Industrial Area catchment by the year 2020. In this design, the ultimate capacity of the Works was to be achieved in two distinct construction phases each comprising 12,000m³/day. Only the first phase (PHASE I) had been constructed and being operated to date and therefore, at present the treatment plant is capable of only handling a designed hydraulic capacity of 12,000m³/d. During construction, PHASE I had made certain provisions for expansions of civil structures, pipe connections, plant and equipment, etc. for PHASE IIA works to minimise the disruption occurring during future construction works. In addition to this, the pipelines that are common to both PHASE I and PHASE IIA have been sized for a combined hydraulic capacity of 24,000m³/day. The construction works of PHASE IIA expansion to provide this design capacity of 24,000m³/day is currently underway and is due to be completed by the end of year 2014. Under this PHASE IIA expansion, it is anticipated that the contractor will add another 6,000m³/day to the plant making it a total of 30,000m³/day capacity available at completion. IASTW is now mostly connected to the sewerage network and it receives and treats on average 13,600m³/day of pumped sewerage and 900m³/day of septage flows arriving from road tankers all of which is originated from Doha Industrial Area catchment. This indicates that PHASE I plant is currently treating sewerage flows (ie: 14,500m³/day) marginally above its design capacity of 12,000m³/day.

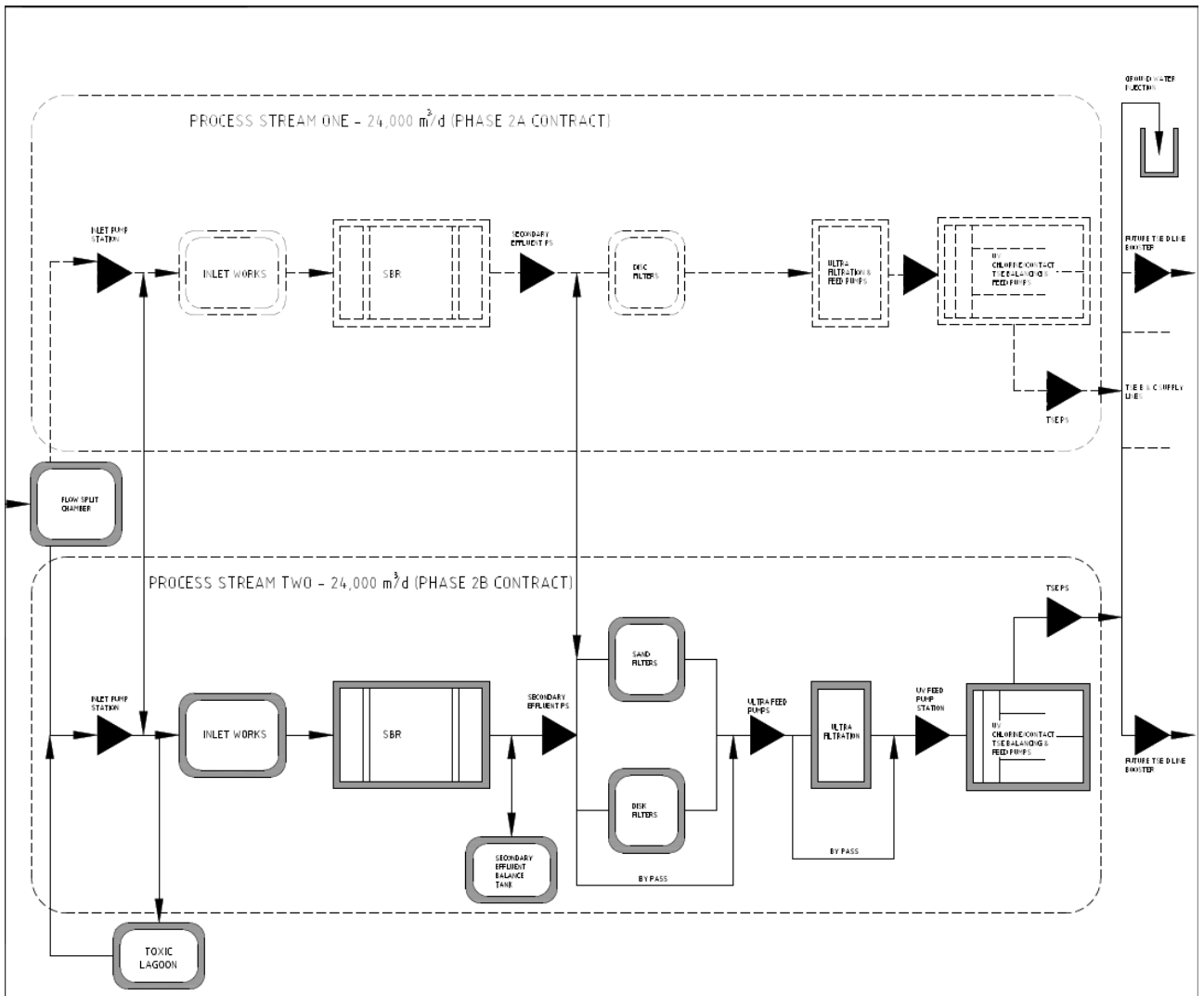
Flow projections from Doha Industrial Area to its revised design horizon 2030 necessitated PWA to quickly implement the next PHASE IIB expansion to add a further 24,000m³/day capacity the Works in a separate and independent flow stream. The design of PHASE IIB also required substantial modifications to the head works to ensure symmetric flow distribution to process streams which were subsequently redefined as STREAM I and STREAM II with hydraulic capacities of 24,000m³/day each. However, the contractor's further enhancements to be carried out during PHASE IIA construction meant that STREAM I will have a marginally increased capacity 30,000m³/day making flow apportioning between the two streams slightly asymmetric. This asymmetry will however be maintained by intelligent flow control of inlet penstocks between the streams during final plant commissioning. By design, flow STREAM II has been solely dedicated to the PHASE IIB expansion works which has just been tendered to select a contractor. The expected timescale for commissioning PHASE IIB works is April 2016. The Authority has also amended the scope of PHASE IIB (STREAM II) contract later on to allow for 30,000m³/day capacity, thus restoring hydraulic symmetry of two flow streams to its original configuration. As a result, the final IASTW will have an ultimate capacity of 60,000m³/day when all construction phases have been completed and fully commissioned.

The selected biological process for IASTW is suspended-growth activated sludge process based on an advanced Sequential Batch Reactor (adv-SBR) configuration, complete with internal mixed liquor recirculation through the reactor basin. Commercially, this treatment technology is marketed as the CASS™ process. The SBR is also equipped with biological nutrient removal (BNR) in compartmentalized regions comprising both anoxic and aerobic zones to allow nitrification, de-nitrification and phosphorous removal via microbial uptake and release functions. The other treatment units of the plant include an inlet flow distribution chamber, coarse screening, inlet pumping station, toxic dump facility, fine screening, vortex grit removal, sequential batch reactors (CASS™), secondary effluent pumping station, coarse granular media filtration, membrane ultrafiltration, UV disinfection, chlorination, contact tank, treated effluent storage and transfer pumping station. Sludge treatment facilities are also provided including thickening, aerobic stabilization and digestion, dewatering, sludge cake storage and off site transport. The necessary provisions have also been made to allow final treated sewage effluent (TSE) transfer to the proposed D-LINE transmission main for use in agriculture and other non-potable applications as defined by the Authority. However, the current method of TSE disposal is through ground injection with a temporary license from the Ministry of Environment (MOE) in the interim. This is mainly due to the unavailability of the TSE infrastructure for transferring flows out of the works into the network.

The following map inset shows an aerial view of the IASTW site and the property boundary demarcations of Authority's land ownership allocated for the Project area;



The following block diagram illustrates the arrangement of process trains (STREAM I and STREAM II) at the existing plant;



3 PROJECT DETAILS

3.1 Identification of Integrated Industrial Wastewater Treatment Facility

3.1.1 Strategic Overview:

The existing (and under-construction) IASTW can be broadly categorized as a Municipal Wastewater Treatment plant that functions predominantly through biological treatment processes. This means that the current plant is incapable of effectively treating hazardous and toxic wastewaters originating from industrial sources that contain high levels of non-biodegradable constituents. Therefore, the Authority have identified the immediate need for

providing a suitable facility to effectively treat such wastewaters containing high COD recalcitrant compounds in order to improve its biodegradability and then to allow further biological treatment through existing process streams.

It is the current understanding of the Authority that there will be a rapidly increasing demand for industrial wastewater treatment at the existing IASTW site over the next few years due to unprecedented developments taking place in trade and commercial sectors in Qatar, many of which are earmarked within the Doha Industrial Area. These increased flows are likely to be brought in to the IASTW via transport tankers and they are likely to contain high strength, hazardous and toxic wastewaters originating from trade and commercial discharges with the State of Qatar. It is therefore, the prime objective of this Project to provide additional and suitable treatment capabilities and capacity enhancements at the same site, as a permanent solution to the problem.

3.1.2 Predictions and Quantifications:

The current MMUP (Ministry of Municipal & Urban Planning) policy plan lacks clarity on trending of labour migrations and the extent of industrial growth within the catchment and hence, various conflicting figures have been proposed by different stakeholders as to how the demography might look like in the near future. It is therefore, the Authority's approach to take a holistic view of the Doha Industrial Area (DIA) mapping and then propose a further permanent expansion to the existing works to treat trade, commercial and industrial wastewaters of 10,000m³/d within the same site. Due to the absence of a dedicated industrial pipe network, wastewaters will be hauled in to the site via road tankers for which a tanker reception facility should also be allowed for. When completed, the entire facility will have an ultimate treatment capacity of 60,000m³/d as illustrated below, out of which 10,000m³/d would be dedicated to high strength wastewaters of industrial origins;

- | | |
|------------------------------------|--|
| 1) IASTW, Phase I (operating) | – 12,000m ³ /d |
| 2) IASTW, Phase IIA (construction) | – 18,000m ³ /d |
| 3) IASTW, Phase IIB (tendering) | – 30,000m ³ /d |
| 4) IWWTW, Phase III (proposed) | – 10,000m ³ /d (distributed to 1,2 & 3 above) |

3.1.3 Programme Alignment:

This approach is also in line with the current Inner Doha Re-sewerage Implementation Scheme (IDRIS) construction programmes where once completed, all domestic and municipal wastewaters originating from Doha Industrial Area catchment will be diverted to the proposed New Doha South Sewage Treatment Works (NDSSTW) for treatment. In addition to this, the Authority's overall Qatar Integrated Drainage Master Plan (QIDMP) recommends that all hazardous wastewaters of industrial origin will be best handled at the existing IASTW site whilst ordinary municipal discharges up to the limits of Table 60 could be diverted to the proposed interceptor sewer for transferring it to New Doha South Sewage Treatment Works (NDSSTW) which is scheduled to be built and commissioned in 2020 under the IDRIS scheme.

3.2 Design Considerations

3.2.1 Stakeholder Engagement:

Although there are proper Industrial Wastewater discharge procedures, permitting and penalties in place, incidents of illegal discharges do occur in Qatar on a regular basis. Most industrial units, trade outlets and commercial establishments collect their wastewater in septic tanks which is then transported away by road tankers for the disposal at Al Kharaana lagoons. These wastewater lagoons are however, scheduled to close down in the next few years at which point that effective segregation and licensing of permitted and non-permitted industrial discharges would be crucial for the Authority. When regulated via stakeholder engagement, the Authority will accept permitted industrial discharges (below the limits prescribed in Table 60) directly to the sewer network whilst all other non-permitted discharges (above the limits prescribed in Table 60) should be transported directly to the proposed IWWTW via road tankers. When these measures were implemented, the risks of receiving high pollutant industrial loads at existing municipal treatment plant will significantly decrease. At present, the regulation and control of trade and commercial wastewater discharges fall under the jurisdiction of the following three ministries;

- 1) Ministry of Environment (MoE)
- 2) Ministry of Energy and Industry (MEI)
- 3) Ministry of Municipal and Urban Planning (MMUP)

The operation and maintenance of the wastewater network, treatment and disposal infrastructure is however controlled by the Authority under the delegated powers from the MMUP.

3.2.2 Industrial Wastewater Discharge Monitoring:

Currently, there is limited monitoring of trade effluent discharges being carried out by Asset Affairs' Drainage Operation & Maintenance (O&M) Department, predominantly to gain knowledge of the levels of compliance being achieved by various industrial user permit holders. Despite this occasional monitoring, Authority have concluded that the expansion of the DIA catchment sewerage network will eventually place an added risk on the existing treatment works from illegal discharges and accidental spillages that may migrate through the network pipelines.

3.2.3 Industrial Wastewater Discharge Problems:

There are some major areas of concern for trade effluent discharges in Qatar. Primarily, they are as follows;

- 1) Many industrial units are not currently segregating their trade effluents from sewage wastewater leading to widespread industrial wastewater accumulation within sewer network pipes and causing contamination of sewage treatment plant influent
- 2) Existing regulations on wastewater lagoon discharges are barely followed by many industries resulting illegal dumping of untreated wastewater to Al Kharanaa lagoons
- 3) Newly developed industrial areas (MEI zones) will eventually increase the quantity of hazardous industrial wastewater generation and the level of pollution at source

The following Table shows some measured ranges of industrial wastewater pollutants present in samples collected from the septic tanks of industrial, trade and commercial establishments located within the Doha Industrial Area (DIA) catchments;

Parameter	Type of Industry									
	Automobile (1)	Food (2)	Construction (3)	Plastic (4)	Fe/ Non-Fe (5)	Printing (6)	Detergent (7)	Laundry (8)	Recycling (9)	Others (10)
pH	6.27-7.80	6.34-6.96	6.50-11.75	6.91	6.37-7.49	6.79	7.51	8.05	6.91	6.54-7.31
DO (mg/l)	1.01-16.48	0.28-8.12	0.96-8.97	0.83	1.23-9.90	7.2	3.62	6.14	17.27	2.40-23.70
Conductivity (µs)	483-2980	377-1628	824-4530	1421	665-1547	1061	1520	1221	1757	669-1903
Temp (C)	20.9-30.6	26.8-31.1	23.3-33.7	24.6	24.0-33.7	25.5	25.8	31.1	27	26.0-30.6
BOD (mg/l)	30-697	<1-140	46-343	251	58-393	121	281	151	100	133-770
COD (mg/l)	288-28250	4-360	251-848	845	169-707	169	510	332	385	522-6170
TSS (mg/l)	134-20830	8-206	30-9655	4150	10-415	163	78	58	162	56-10880
O&G (mg/l)	3-174815	1.3-28	8.0-43.0	25	11.0-36.0	15	3	3	11	11-10884
Sulphide (mg/l)	0.5-25.4	0.1-70.5	2.6-55.6	15.8	3.6-19.8	5.6	15.3	0.4	1.9	1.5-23.1
NH3-N (mg/l)	0.9-236.2	0.7-58.1	1.4-122.4	15.3	33.8-102.9	59.2	80.7	8.8	143.4	17.6-108.1
TKN (mg/l)	12.6-240.4	3.9-403	5.9-163.0	36.2	38.6-165.1	76	87.2	40.2	163	31.7-187.1
TP (mg/l)	<0.1-78.7	<0.1-8.4	<0.1-28.6	<0.1	<0.1-34.0	7.7	19.3	59.9	41.2	2.0-34.4
TDS (mg/l)	377-1459	200-798	457-2219	595	370-758	520	745	598	852	328-933
Al (mg/l)	0.393-0.9215	NT	NT	NT	NT	NT	NT	NT	NT	NT
Cr (mg/l)	ND-0.9215	0.010-0.0197	ND-0.3179	0.026	ND-0.4367	0.2825	0.3505	0.4261	ND	ND
Co (mg/l)	ND-0.177	ND	ND	ND	ND-0.0127	ND	ND	ND-0.0148	ND	ND
Cu (mg/l)	0.019-1.899	0.039-0.1082	0.024-0.1134	0.139	0.00122-0.5877	0.06759	0.05193	0.08875	0.09519	0.00349-0.5498
Fe (mg/l)	0.4968-194.1	0.571-3.229	0.09781-128.3	4.547	0.5154-17.69	0.2292	1.139	0.7815	3.155	1.832-25.98
Pb (mg/l)	ND-0.506	ND	ND-0.0871	0.117	ND	ND	ND	ND	ND	ND
Mn (mg/l)	ND-0.32	ND	ND	0.566	ND-0.029	ND	ND	ND	ND	ND
Ni (mg/l)	0.00802-0.419	0.0365-0.059	0.0696-0.125	0.081	0.017-0.127	0.091	0.074	0.106	ND	ND
Zn (mg/l)	0.019-5.203	0.285-1.604	ND-4.591	3.072	0.1143-4.277	0.1135	0.1879	0.3296	2.005	0.2378-2.163

(Courtesy of PWA's Quality, Safety and Environment Department study report in 2010)

3.2.4 Management and Operational Strategy:

At present, the Public Works Authority (PWA) do not have a separate department dedicated to promote, manage and monitor the trade effluent and industrial wastewater discharges to the sewer network. It is therefore, concluded that the long term drainage planning strategy of PWA must include for increasing departmental capacity to manage trade effluents and industrial wastewater discharges and the consequential risks associated with it, to prevent adverse operational and environmental impacts. The publication of the draft Water Act has been identified as a good opportunity for PWA to take the lead in order to control and manage industrial wastewater discharges for the long term protection of drainage assets. The following actions were therefore, recommended in the Qatar Integrated Drainage Master Plan (QIDMP) as an implementation strategy of future Industrial Wastewater Management practices;

- Surveys and Enabling Works; sampling and analysis of manholes, domestic and industrial wastewater discharges from all industrial premises in Qatar and then comprehensively review all the permits issued by MEI for compliances.
- Industrial Wastewater Management Structure; establish the management team organogram within the PWA Asset Affairs directorate.
- Long Term Strategy; implement monitoring, regulation, control and management of industrial wastewater discharges originating from industrial, trade and commercial sector business.
- Expansion; extend the management of industrial wastewater discharge regulations beyond the city of Doha to the remainder of Qatar.
- Asset Retention; retain IASTW to serve as a safeguard facility in future to protect the proposed new Doha South STW from risks of contamination arising from illegal or accidental discharges into the sewer network.

- f) Permitting; instruct Qatar trade and commercial industries to include segregation at source for hazardous liquid wastes including, toxic wastewaters, solvents, fats, oils, grease and other polluting substances.
- g) Licensing; enforce medium to large industries to provide suitable wastewater pre-treatment facilities on site so that trade effluents from those industries will meet Table 60 requirements prior to disposal at the public sewerage network.

3.3 Outline Scope of Consultancy Services

In general, the successful Consultant shall be expected to provide all professional services as prescribed in the Professional Services Agreement (PSA) 2010 including, but not limited to, the following major tasks and components. It should be noted that the detailed project brief is still under development and therefore, the following are not intended to represent a full Project Brief which will be formally issued to prequalified Applicants at the invitation to tender.

- 3.3.1 All field investigation works and services as required by the Project to be used for both Environmental Impact Assessment (EIA) studies and the Works designs as applicable.
- 3.3.2 Topographical Surveys.
- 3.3.3 Geotechnical Investigations/Surveys.
- 3.3.4 Geophysical and Geo-environmental Investigations/Surveys.
- 3.3.5 Baseline Air Quality Monitoring (BAQM) Surveys as directed by the Ministry of Environment
- 3.3.6 Baseline Groundwater Quality Monitoring (BGWQM) Surveys as directed by the Ministry of Environment.
- 3.3.7 Doha Industrial Area catchment flow surveys, industrial wastewater profiling, grouping and mapping, wastewater sampling, laboratory testing and analyses as applicable to the Consultant's designs.
- 3.3.8 Wastewater characterization surveys/ studies of the receiving flows (both sewerage and tanker discharges) at the Works to establish influent wastewater quality design parameters.
- 3.3.9 All Sketch, Concept, Preliminary and Reference Design services including industrial wastewater catchment boundaries assessments, industrial and non-industrial wastewater flow projections, occupancy assessments, hazardous and non-hazardous discharge load assessments, etc. as required by the Consultant's design and to match ongoing MMUP policy plan developments and the Authority's Master Plan strategic alignment.
- 3.3.10 All project permitting services to secure statutory, mandatory and third-party permits and approvals as required by the Project and their subsequent renewals as applicable.
- 3.3.11 DC1 Building Permits.
- 3.3.12 KAHRAMAA Approvals & Permits.
- 3.3.13 Environmental Impact Assessment (EIA) Approvals.
- 3.3.14 Environmental Permits (EP).
- 3.3.15 No Objection Certificates (NOC) from all other relevant utility providers and stakeholders as and when required, during the project implementation period.

- 3.3.16 All Reference Design (Client's Base Design) services as relevant and as required by the Project in order to produce an acceptable base design for the Authority. This Reference Design is not intended to be used for construction but it shall comprise sufficient details to serve as the design base for the Authority to draw comparisons between that and the detailed designs to be produced by the successful Contractor. It should be noted that the level of details required to be presented in the final Reference Design drawings shall be as directed by the Authority during the course of the project life cycle.
- 3.3.17 Environmental Impact Assessment (EIA) study reports including the all associated pre-submissions such as the IEA (Initial Environmental Authorizations), the ToR (Terms of References) and the ESD (Environmental Scoping Documents), etc. as required by the Ministry of Environment (MoE) to process and issue the Environmental Permit (EP) for the Project.
- 3.3.18 Project Whole Life Costing, NPV Calculations, Budget Cost Estimates, CESSM3 format Bill of Quantities (BoQ) and the Schedule of Prices (SoP), etc. for the proposed Works prepared in accordance with the prevailing Authority requirements, in order to secure financial approvals for the contract procurement.
- 3.3.19 Contractor prequalification for the successful selection of prospective bidders for the proposed Works with all associated works and services including prequalification document preparations, submissions, facilitating stakeholder reviews, approvals, publishing, bidder clarifications, bid evaluations, presentations, recommendations, reporting, etc. as per the Authority requirements.
- 3.3.20 Tender Documentation for the proposed Works based on the Authority's standard Form of Design, Build, Operate & Maintain (DBO&M) Contract or on the Authority approved modified Form of Contract to suit Turn-Key contract procurement, either of which will be specified by Authority prior to the commencement of bidder prequalification process.
- 3.3.21 Tendering Services for the selection of the successful Contractor and the Contract Award of the proposed Works, including all associated works and services such as tender documentation, preparation, compilation, submissions, stakeholder reviews, approvals, issuance, bidder clarifications, tender circulars and addendums if applicable, bid evaluations, presentations, recommendations, reporting, etc. as per the Authority's directions at the time.
- 3.3.22 All services associated with the Contract Award and, preparation and issue of the Contract Documentation as directed at the time by the Authority.
- 3.3.23 Various stakeholder presentations as and when directed or requested by the Authority. The number of stakeholder presentations shall not be limited but shall be as requested by the Authority.
- 3.3.24 Preparation, compilation and submission of the final Engineering Report of the Project for the Authority's approval.
- Completion of PWA's Infrastructure Affairs Document Control Unit (DCU) clearance procedures prevailing at the time.

3.4 Staff Resourcing Requirements

The provision of the prescribed and specified minimum Project Team in terms of the management structure, roles, responsibilities, qualifications, experience, location, and dedication of individuals to the Project on the basis of either full time or part time commitments shall be absolutely essential to the services that the successful Consultant must provide in the fulfilment of the duties and responsibilities under their Professional Services Agreement (PSA).

3.4.1 The successful Consultant shall assign their staff resources to the Project in the manner that it is acceptable to the Authority and in order to maintain the optimum level of resource utilization to the Project at all times. The successful Consultant shall also maintain unreserved commitment and continuity of all allocated staff members during the project life cycle. Any changes to staff personnel and roles shall only be permitted with prior written approval of the Authority with such being made only under the special and unavoidable circumstances that are justifiable to the Authority.

3.4.2 If any staff member(s) were to display poor performances, lacking competence, expertise or capabilities at any point during the project life cycle, the Authority shall reserve the right to instruct changes to such individuals to which the successful Consultant shall unreservedly and unconditionally obliged at all times. At all circumstances, the successful Consultant's staff replacements, whether they are proposed by the Authority or the Consultant, shall only be made with prior written approval of the Authority followed by a successful face-to-face interview of the individual by the nominated representatives of the Authority.

3.4.3 The successful Consultant shall provide and maintain permanently assigned key Project Team Members as approved by the Authority, for the following leading roles as a minimum requirement. All these key individuals shall be present in client meetings at all times as directed by the Authority;

- | | |
|-----------------------------------|---------------------------|
| a) Project Manager | (Doha Resident) |
| b) Lead Chemical Process Engineer | (Residency Not Specified) |
| c) Lead Civil Engineer | (Residency Not Specified) |
| d) Lead Mechanical Engineer | (Residency Not Specified) |
| e) Lead Electrical Engineer | (Residency Not Specified) |
| f) Lead ICA Engineer | (Residency Not Specified) |
| g) Lead Environmental Expert | (Doha Resident) |

3.4.4 The Consultant shall also provide and maintain the other Key Members of the Project Team as approved by the PWA, for the following prominent roles as a minimum requirement. All these Key Members shall be present in relevant Client meetings at appropriate as directed by the PWA;

- | | |
|--------------------------------|---------------------------|
| a) Senior Quantity Surveyor | (Residency Not Specified) |
| b) Senior Contracts Specialist | (Doha Resident) |
| c) Senior Legal Expert | (Residency Not Specified) |

3.4.5 The minimum requirements and criteria for the relevant qualifications and experiences of the Project Team members shall be as follows and shall be strictly adhered to at all times;

Project Manager:

- shall be degree qualified with relevant UK, US, Western European, Australian or New Zealand registered (licensed) Chartered/ Professional Engineer or accredited equivalent.
- shall have at least fifteen (15) years of post-chartered/ post-licensed professional experiences in this role.

Lead Chemical Process Engineer, Lead Civil Engineer, Lead Mechanical Engineer, Lead Electrical Engineer and Lead ICA Engineer:

- shall be degree qualified with relevant UK, US, Western European, Australian or New Zealand registered (licensed) Chartered/ Professional Engineer or accredited equivalent.
- shall have at least ten (10) years of post-chartered/ post-licensed professional experiences in this role.

Lead Environmental Expert:

- a) shall be degree qualified with relevant UK, US, Western European, Australian or New Zealand registered (licensed) Chartered/ Professional Engineer or accredited equivalent.
- b) shall have at least ten (10) years of post-chartered/ post-licensed professional experiences in this role.

- 3.4.6 All other design team members shall be suitably degree qualified with professional status and with at least ten (10) years of relevant and demonstrable experiences in their specialist field.
- 3.4.7 Project Manager shall be a permanent resident (ie: Qatar Resident Permit holder) in Doha and shall be fully dedicated to the Project at all times. It shall also be an absolute requirement that the Project Manager has a well-proven track record of adequate knowledge and experiences in the design and management of Wastewater Treatment projects.
- 3.4.8 Lead Chemical Process Engineer shall be professionally qualified and fully licensed and/or chartered Chemical Engineer/ Process Engineer with relevant United Kingdom, United States, Western Europe, Australian or New Zealand affiliations. It shall also be an absolute requirement that the Lead Chemical Process Engineer possesses a substantial knowledge and experience in designing modern Industrial Wastewater Treatment plants of the latest technologies, together with a well-proven track record of direct involvement in projects of similar categories.
- 3.4.9 Lead Chemical Process Engineer, Lead Civil Engineer, Lead Mechanical Engineer, Lead Electrical Engineer and Lead ICA Engineer shall be at least fifty percent (50%) each dedicated to the Project at all times.
- 3.4.10 Lead Environmental Expert shall also be a permanent resident (ie: Qatar Resident Permit holder) in Doha and shall be at least thirty percent (30%) dedicated to the Project at all times whilst making him/her fully available to provide all services associated with environmental aspects of the Project.
- 3.4.11 Senior Contracts Specialist shall also be a permanent resident (ie: Qatar Resident Permit holder) in Doha and shall be at least thirty percent (30%) dedicated to the Project at all times whilst making him/her fully available to provide all services associated with contractor pre-qualification, tender preparation, tender evaluation and contract preparation aspects of the Project.
- 3.4.12 Senior Quantity Surveyor and Senior Legal Expert shall be engaged for project services as and when required but with their full commitment to the Project during the cost estimation, tendering and contract award stages.
- 3.4.13 All designs, reporting, correspondences, submissions, liaisons, consultations, etc. relating to the Project shall be conducted only through the successful Consultant's office located in Doha and, all such shall only be coordinated via the designated Project Manager of the Consultant.

3.5 Collaborative Working Requirements

The Authority will take the Client leading role in the Project and, will cooperatively and proactively participate in all stages of the Project lifecycle, especially in the design stages to ensure that the Project meets all its technical objectives at all times. The Authority will also extend their collaborative practices through tendering and right up to the contract award.

- 3.5.1 The Authority's participation is intended to add value to the project objectives by discussing options and alternatives at early stages without constraining the works Contractor or their consultants in the timely and cost-efficient execution of the implementation work.
- 3.5.2 The main forum for these collaborative working practices shall be through regular progress meetings between all stakeholders to the Project. The members of the internal stakeholders will be determined by the Authority and sourced from senior staff members of the Drainage Design Department, Drainage Projects Department, Drainage Operation & Maintenance (O&M) Department, Quality, Safety & Environment Department, Contracts Department and the Engineering Business Support Department.
- 3.5.3 The relevant members of the internal stakeholders will provide expert client reviews of the technical, contractual, regulatory, compliance and policy aspects of the proposed Project. The successful Consultant shall also mirror this level of effort in order to achieve all project objectives including those associated with regulatory acceptances and public health aspects of the proposed Project.

3.6 Time for Completion of PSA Services

- 3.6.1 The time for completion of PSA services has not yet been fully determined at this stage. However, the Authority envisages that the engagement of the successful Consultant may span over a timescale between nine (9) to twelve (12) calendar months. The Applicant shall note that the Authority may set a different timescale to this at the time of invitation to tender.