OCCUPATIONAL FRAMEWORK
WATER SERVICES INDUSTRY

JABATAN PEMBANGUNAN KEMAHIRAN
KEMENTERIAN SUMBER MANUSIA

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ABSTRACT

An Occupational Framework (OF) is the outcome of the analysis conducted in identifying the work scope of the occupational areas in terms of competencies. It is used to analyse human resource skills competency requirement for the industry. The development of the Occupational Structure is a preliminary process in developing relevant National Occupational Skills Standard (NOSS). The NOSS in turn will be developed and to be used as the basis to conduct skills training and certification of competent personnel. This document is divided into several chapters, the first two chapters being an industrial overview highlighting the definition and scope of the industry, the current analysis of the local industry and its skilled worker requirements, Government bodies and development plans supporting the growth of the industry, then the next chapter will explain the methodology used in Occupational Framework development such as qualitative analysis through brainstorming and discussion sessions. Workshops were held to get a better understanding of the organisational structure, job titles, hierarchy objectives and main activities of the specified positions. Chapter 4 will discuss the findings that are translated into the Occupational Structure, Occupational Description and Skills In Demand. Finally, Chapter 5 recommends the development of the National Occupational Skills Standard (NOSS) document for certain job areas in demand. The NOSS will serve not only as a reference of skills standards for certification but also as a guide to develop the skills training curriculum.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

DESCUM	Development of Standard and Curriculum
DSD	Department of Skills Development
OF	Occupational Framework
OD	Occupational Description
OS	Occupational Structure
MOSQF	Malaysian Occupational Skills Qualification Framework
MQA	Malaysia Qualification Agency
MSC	Malaysian Skills Certificate
NOSS	National Occupational Skills Standard

CHAPTER 1: INTRODUCTION

1.1 CHAPTER INTRODUCTION

This chapter will explain the objectives, scope and problem statement of the Occupational Framework for the Water Services Industry. The concept of the Occupational Framework and its function in skills training and curriculum development is also elaborated in this chapter.

There have been various National Occupational Skills Standard (NOSS) documents developed for the Water Services Industry. However, a complete analysis on the Occupational Structure of the Water Services Industry has not been undertaken before this by the Department of Skills Development (DSD) or known as *Jabatan Pembangunan Kemahiran* (JPK). Therefore, in order to identify the overall structure and available career paths in the industry, the Occupational Framework analysis must be done on the Water Services Industry.

Below are descriptions of important elements of the research.

i. National Skills Development Act 2006 (Act 652)

The National Skills Development Act 2006 (Act 652) came into effect on 1st September 2006 after it was officially gazetted on 29th June 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected therewith. The Act 652 is significant because for the first time in the history of skills training in Malaysia, a national legislation has been enacted solely and exclusively for skills training and development. In addition, the meaning and scope of skills training has been clarified and given a statutory interpretation that can be used to distinguish it from other components of the country's national education and training system. The Act 652 also provides for the implementation of a Malaysian Skills Certification System, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1,2 and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma.

ii. Malaysia Qualification Framework (MQF)

The Malaysia Qualification Framework refers to the policy framework that satisfies both the national and international recognized qualifications. It comprises of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Elements of the qualification framework indicate the achievement for each qualification title. It will also provide progression routes for all the graduates in the respective occupational fields.

The MQF has eight levels of qualification in three sectors and supported by lifelong education pathways as shown in the Figure 1.1. JPK governs the skills sector, in which there are five (5) levels of skills qualification. The definition for each level of skills qualification is specified in Malaysian Occupational Skills Qualification Framework (MOSQF).

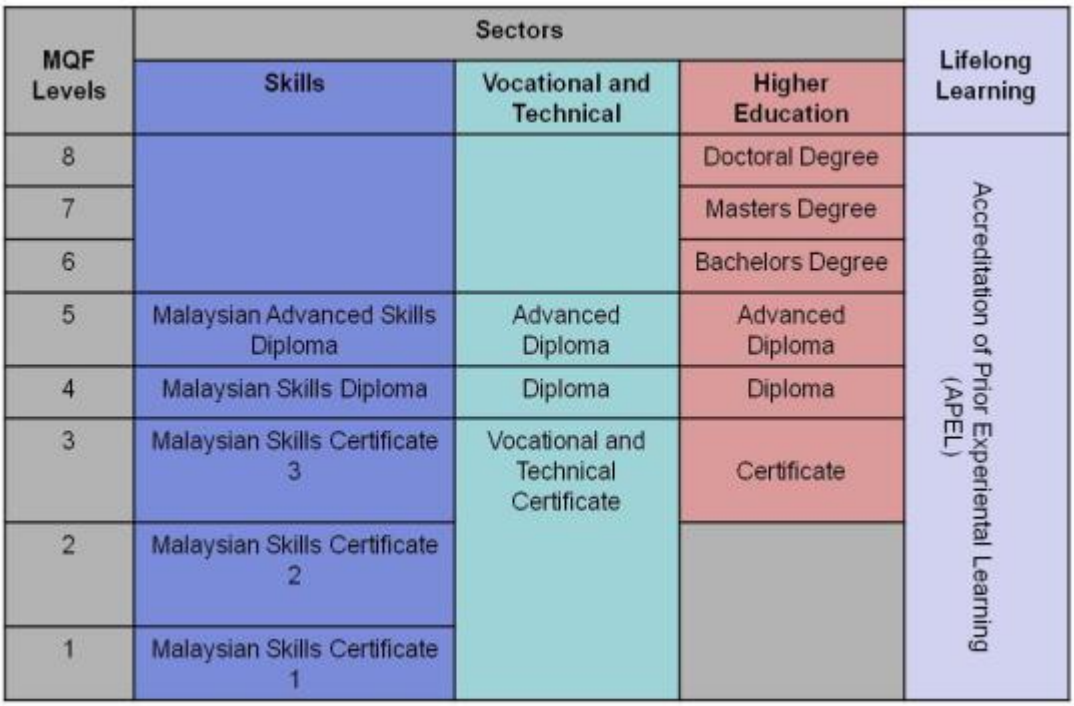

Figure 1.1: MQF Chart

iii. National Occupational Skills Standard (NOSS)

National Occupational Skills Standard (NOSS) is defined as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level and pathway to achieve the competencies and is gazetted in Part IV of National Skills Development Act 652. NOSS is developed by

the industry experts based on the needs of the industry and is utilised as the main tool in the implementation of Malaysian Skills Certification System in which the performance of existing industry workers and trainees are assessed based on the NOSS for the purpose of awarding the Malaysian Skills Certificate.

iv. Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasises on what a person can do in a work place as a result of education and training obtained. CBT is based on performance standards which are set by the industry with main focus on measuring the performance while taking into account knowledge and attitude rather than the duration taken to complete the course. CBT is a learner-centric; outcome-based approach to training which allows each individual to develop skills at their own pace for a similar outcome, thus meaning training practices can be customised for each individual to achieve a similar outcome. The CBT concept is the basis of the Malaysian Skills Certification system which is coordinated by JPK.

v. Occupational Framework

The Occupational Framework is the outcome of the occupational analysis process to identify the occupational structure of an industry. Occupational Framework which was previously known as Occupational Analysis (OA) consists of Occupational Structure (OS), Job Description (JD) and Skills in Demand. The development of the Occupational Framework is a preliminary process in developing relevant National Occupational Skills Standard (NOSS). The NOSS shall then be used as the basis to conduct skills training and skills certification of competent personnel.

1.2 OBJECTIVES OF STUDY

The objectives of the study are as below:

- To produce the Occupational Structure (OS) from data analysis, interviews, site visits and focus group;
- To determine job descriptions of job titles in the OS; and
- To investigate the skills in demand in the industry.

1.3 SCOPE OF STUDY

The scope of work for the study to develop occupational framework are as listed below:

- To conduct literature review on the current industry;
- To consult with relevant industry representatives to obtain expert input from industry;
- To develop, disseminate and analyse survey and questionnaire data from industries via industry representatives;
- To perform focus group discussion with the industry representatives, interviews, site visits and/or any other methods in order to achieve the study outcome.

1.4 BACKGROUND OF THE WATER SERVICES INDUSTRY IN MALAYSIA

Reforms in the Water Services Industry in Malaysia began in January 2005 with the amendment of the Federal Constitution to transfer water services from the State List to the Concurrent List. With the coming into force of the Water Services Industry Act 2006 [Act 655] and *Suruhanjaya Perkhidmatan Air Negara* Act 2006 [Act 654], water services industry in Peninsular Malaysia and Federal Territory of Labuan is regulated by *Suruhanjaya Perkhidmatan Air Negara* (SPAN). Water services industry in Sabah and Sarawak, however, remains status quo.

The two main objectives of the reforms were to address the efficiency and effectiveness of water services in Peninsular Malaysia and Labuan as well as addressing the funding issues faced by the operators in implementing development works.

Amongst the many provisions in the Water Services Industry Act (WSIA) in addressing efficiency is licensing of water and sewerage operators for both public and private systems. Specific key performance indicators (KPIs) are imposed as licensing conditions that need to be complied, thus increasing the efficiency level. Other industry players such as water and sewerage contractors, product suppliers and consultants are also regulated.

On the financial reforms, the government has set up a water asset holding company, known as Pengurusan Aset Air Berhad (PAAB) that is tasked with the responsibility to facilitate the raising of funds for the industry at the lowest interest rate possible. States are required to transfer their water assets to enable PAAB to raise funds in order to develop capital works (CAPEX). The water operators would then pay lease rental for the use of the assets

For sewerage, the largest sewerage operator is Indah Water Konsortium Sdn. Bhd. (IWK) that operates and maintains sewerage systems all over Peninsular Malaysia, except for the State of Kelantan and Districts of Johor Bahru and Pasir Gudang in Johor. Majari Services Sdn Bhd provides sewerage services in Kelantan whereas services in Johor Bahru and Pasir Gudang are provided by the respective local authorities. A modern and efficient sewerage system is vital for the country so as to ensure that wastewater is treated before being discharged into our rivers. This will help preserve the country's waste resources, protect public health and provide a cleaner and safer environment.

With the reforms in place, the industry is envisaged to remain robust due to the increasing efforts of ensuring quality and accessible services provision. Water supply and sewerage in Malaysia is characterised by numerous achievements, as well as some challenges. Universal access to water supply at affordable tariffs is a substantial achievement. A number of challenges remain, where some of which have been addressed by the reforms. Water and sewerage tariffs are low, thus making cost recovery difficult at current levels. Non-Revenue Water (NRW) levels remains high as efforts and funding in reducing them are not sufficient. Per capita water use is still high despite efforts on water demand management. Public awareness in conservation remains low despite various campaigns.

As for areas of competency, it is a requirement under WSIA that all personnel managing and operating the water supply and sewerage system be qualified and certified competent by the Commission. In this respect, SPAN recognises and advocates the competency framework as set up by JPK. Thus it is imperative that this Occupational Framework for the Water Services Industry meet SPAN's requirement and is adhered to.

1.5 CHAPTER CONCLUSION

In the light of recent economic development plans by Malaysia, the demand for sufficient skilled personnel has increased and the development of skilled manpower is timely. With the Occupational Structure clearly defined, the industry stakeholders will be able to identify sub-areas that will require more intensive efforts in human capital development. Although there have been past efforts in National Standards Development for the industry, the need for an Occupational Framework is required to determine the overall sub-areas that may not yet been focused on. The Occupational Structure that will be the outcome of this analysis shall be utilised as a 'blueprint' of the manpower planning for the Water Services Industry.

CHAPTER 2: LITERATURE REVIEW

2.1 CHAPTER INTRODUCTION

This chapter will focus on the explanation of the Water Services Industry, the current scenario in Malaysia, introduction to government policies, development plans, government bodies and industrial competitiveness at the international level pertaining to the Water Services Industry.

Findings in this chapter were obtained via literature review, observation, interviews with industry practitioners and discussions during workshops with development panel members. This literature review was further discussed with panel members to obtain insight on the matters at hand from a practitioner's perspective.

2.2 STAKEHOLDERS

The stakeholders of the Water Services Industry include:-

i. Regulatory Bodies and other related agencies

The Regulatory Bodies that are empowered by the legislations according to the scope and powers given in the Acts that regulate the Water Services Industry in Malaysia. Other related agencies are responsible for coordination matters relevant to the Water Services Industry.

ii. Water Operators

Water operators are organisations that manage and operate the Water activities in their respective states.

iii. Sewerage Operator

Sewerage operators are organisations that manage and operate sewerage activities.

iv. Water Association

The Malaysian Water Association assists the industry, in terms of industry expertise and advice.

v. Water/Sewerage Training Centres

Training Centres dedicated to provide training locally or at regional level in areas related to the Water Services Industry.

Refer to Table 2.1 for the list of stakeholders in the Water Services Industry.

Table 2.1: List of Stakeholders in the Water Services Industry

NO.	ORGANISATIONS	ROLES, FUNCTIONS AND RESPONSIBILITIES
A.	**REGULATORY BODIES AND OTHER RELATED AGENCIES**	
1.	Ministry of Energy, Green Technology and Water (KeTTHA)	Ministry of Energy, Green Technology and Water Malaysia (KeTTHA) was established on 9 April 2009. KeTTHA covers the provision of water services and sewerage services. There are 3 divisions of the Water sector under this ministry which are the Water Services Regulatory Division, Water Sewerage Services Division and Water Supply Services Industry Division [1]
2.	Ministry of Natural Resources and Environment	NRE is responsible for Forest management, Irrigation and drainage management, Wildlife management and Minerals management.[2]
3.	Department of Water Supply, (Jabatan Bekalan Air), Ministry of Energy, Green Technology and Water	The Water Supply Department was established under the Ministry of Energy, Water and Communications in 2004.[3] The functions include : • To provide technical advisory services to the ministry and other agencies in planning, designing, implementing and managing water supply programmes • To plan, implement, coordinate and monitor national water supply development programmes/projects to meet the targets that fulfil the needs of the people and nation • To plan, monitor and implement the development of water resources • To monitor the quality of raw water at intakes in Malaysia and of treated water in Sabah and Sarawak • To carry out safety monitoring on high-risk water supply dams and tanks on slopes • To serve as committee member (SIRIM and SPAN) in preparing the list of approved materials for water supply projects • To act as certifying agent for the Sungai Langat Water Treatment Plant implemented by

[1]Ministry of Energy, Green Technology and Water (KeTTHA).http://www.kettha.gov.my/portal/index.php?r=kandungan/index&menu1_id=4&menu2_id=47&menu3_id=167#.Vrf5kfl97IU
[2]Ministry of Natural Resources and Environment.http://www.nre.gov.my/en-my/Pages/default.aspx
[3]Department of Water Supply.http://www.jba.gov.my/index.php/en/hubungi/hubungi-kami

NO.	ORGANISATIONS	ROLES, FUNCTIONS AND RESPONSIBILITIES
		PAAB • To plan, implement and monitor NRW programmes • To plan, prepare and maintain water supply infrastructure for domestic and industrial requirements in Federal Territory of Labuan
4.	Department of Irrigation & Drainage (J*abatan Pengairan dan Saliran*-JPS) , Ministry of Natural Resource & Environment (NRE)	The Department which is under the direction of the Ministry of Natural Resource & Environment.[4] JPS 's duties encompass : • River Basin Management and Coastal Zone • Water Resources Management and Hydrology • Special Projects • Flood Management • Eco-friendly Drainage
5.	Suruhanjaya Perkhidmatan Air Negara (SPAN)	SPAN is a technical and economic regulatory body for the water supply and sewerage services in Peninsular Malaysia ad Federal Territories of Kuala Lumpur ,Putrajaya and Labuan. SPAN regulates the water services industry in accordance to the Water Services Industry Act 2006 (Act 655). SPAN regulates entities in the water and sewerage industry including water supply and sewerage services operators, public and private water supply and sewerage contractors, permit holders and suppliers of approved products for water supply and sewerage. [5]
6.	Sewerage Services Department (SSD) *Jabatan Perkhidmatan Pembentungan (JPP)*	Sewerage Services Department (SSD) was established on March 1, 1994 after the Parliament approved the Sewerage Service Act 1993 (Act 508). Currently, SSD focuses on projects implementation and providing technical advices to KeTTHA in sewerage services related issues. [6]

[4]Department of Irrigation & Drainage.http://www.water.gov.my/about-us-mainmenu-243/profile/our-background-mainmenu-508?lang=en
[5] Content provided by SPAN officer
[6]Sewerage Service Department (SSD). http://www.jpp.gov.my/index.php/en/jpp/perihal-jpp/profile

NO.	ORGANISATIONS	ROLES, FUNCTIONS AND RESPONSIBILITIES
7.	Pengurusan Aset Air Berhad (PAAB)	Pengurusan Aset Air Berhad (PAAB) was established on 5th May 2006.[7] PAAB's primary responsibility is to develop the nation's water infrastructure in Peninsular Malaysia and the Federal Territories of Kuala Lumpur ,Putrajaya and Labuan in line with the Water Services Industry Act 2006 (Act 655). PAAB's objectives are: • Construct, refurbish, improve, upgrade, maintain and repair water infrastructure and all other assets in relation to the water systems. • Source and obtain competitive financing for the development of the nation's water assets and lease such assets to water operators licensed by Suruhanjaya Perkhidmatan Air Negara (SPAN) for operations and maintenance. • Assist SPAN to restructure the nation's Water Services Industry towards achieving the Government's vision for efficient and quality water services.
8.	National Water Resources Council (NWRC)	Ensures coordination with the various State Governments in the management of the water resources.[8]
9.	Water State Regulators / Agencies	i. Sarawak Water Resources Council ii. Sabah Water Resources Council iii. Selangor Waters Management Authority (SWMA) iv. Perlis Public Works Department (Water Supply Section) v. Sarawak Public Works Department (Water Supply Section) vi. WP Labuan Water Supply Department vii. Johor State Water Regulatory Body viii. Kelantan Water Department ix. Penang State Water Regulatory Body x. Terengganu Water Supply Department xi. Melaka State Water Regulatory Body

[7] Pengurusan Aset Air Berhad.(PAAB) http://www.paab.my/inside-paab
[8]Malaysia. Doing Business and Investing in Malaysia Guide.(2016) International Business Publications. Washington DC, USA. ISBN 978—1-5145-2714-6.Page 110.

NO.	ORGANISATIONS	ROLES, FUNCTIONS AND RESPONSIBILITIES
		xii. Pahang Water Regulatory Body
B.	**OPERATORS**	
1.	Water Operators	i. Syarikat Bekalan Air Selangor Sdn Bhd (SYABAS) ii. SAJ Holdings Sdn. Bhd. iii. Perbadanan Bekalan Air Pulau Pinang (PBAPP) Sdn Bhd iv. Pengurusan Air Pahang Berhad v. Syarikat Air Negeri Sembilan Sdn. Bhd. (SAINS) vi. Air Kelantan Sdn. Bhd vii. Syarikat Air Darul Aman Sdn. Bhd. viii. Syarikat Air Melaka Berhad ix. Syarikat Air Terengganu Sdn. Bhd. x. LAKU Management Sdn. Bhd. xi. Kuching Water Board xii. Sibu Water Board xiii. Perak Water Board xiv. Sabah State Water Department
2.	Sewerage operators	i. Indah Water Konsortium Sdn. Bhd. ii. Majari Services Sdn.Bhd. iii. MajlisBandaraya Johor Bahru iv. MajlisPerbandaranPasirGudang

NO.	ORGANISATIONS	ROLES, FUNCTIONS AND RESPONSIBILITIES
C.	**ASSOCIATION**	
1.	Malaysian Water Association	The national association regardingnetworking and technological advancement for water professionals involved in the complete water cycle. Membership comprises of professionals from policy makers, water operators, consultants, contractors and suppliers.[9]
D.	**TRAINING CENTRES**	
1.	Malaysian Water Academy	MyWA is an institution, established by Malaysian Water Association (MWA) , which develops and provides integrated and accredited education, training, and capacity building programme. It offers training in areas such as Water Resources Management, Wastewater Sludge Treatment, Water Treatment, Water Distribution, Wastewater Collection and Wastewater Treatment[10]
2.	Indah Water Training Centre (IWTC)	Indah Water established a Training Centre in February 2006. The training centre is a dedicated location for technical training on sewerage system that focuses on theory and practical for the staff and wider public.[11]
3.	Penang Water Services Academy (PWSA)	The Penang Water Services Academy (PWSA) was jointly founded by PBA Resources Sdn Bhd (PBAR) and the Penang Skills Development Centre (PSDC) in December 2007. On 1 November 2013, the academy was officially certified as an 'Authorised Training Provider' by the National Water Services Commission (SPAN). With this certification, PWSA is now authorised to offer the Water Distribution Competency Course (WDCC) Levels 1 and 2, and Water Treatment Competency Course (WTCC) Levels 1 and 2. At the same time, the PWSA also conducts Malaysian Skills Certification.[12]
4.	Water Academy, SAJ	Is the training facility for SAJ Holdings

[9]The Malaysian Water Association.www.mwa.org.my
[10]The Malaysian Water Association.www.mwa.org.my
[11]https://www.iwk.com.my/iwtc/contact-us. IWK Technical Training Centre.
[12] http://www.pwsa.com.my/?page_id=491

2.3 GOVERNMENT INITIATIVES, ACTS AND POLICIES

2.3.1 Government Initiatives and Policies

i. Eleventh Malaysia Plan

Under **Strategy C1,**which is entitled **'Extending Provision Of Rural Basic Infrastructure.** In increasing the provision of road, water and electricity supply, The Rural Water Supply programme, aimed to supply clean and treated water directly to each household, will be expanded and will involve connecting households to the reticulation systems. In addition, alternative systems such as gravity feed, tube wells and rain water harvesting will be used in remote and isolated areas. 99% coverage of access of clean and treated water will be provided to rural houses reaching 90,000 additional houses[13].

ii. Government Transformation Programme (GTP)

In the Government Transformation Programme, under the area of Improving Rural Basic Infrastructure, 35% of the Malaysian population live in rural areas with minimal access to proper roads, water and electricity supply. Through the GTP, development in East Malaysia had to be increased to ensure these basic rights are delivered for the long run in the identified areas. The target was to connect seven times as many houses to clean water during the activation of the GTP. Therefore in Sabah and Sarawak, the percentage of rural houses with access to clean or treated water was to be increased by 57%. Finding least cost and fast ways to deliver through usage of alternative sources like tube wells, gravity wells or rain water harvesting for areas that are far from reticulation networks[14].

iii. Economic Transformation Plan (ETP)

In the three business opportunities identified in the Greater KL/KV area are the "reinvigorating" of the administrative capital, Putrajaya, where much of the basic infrastructure is already in place but is under-utilised; providing the right mix of housing (moving from 81%of upper middle cost housing in 2009 to 85% by 2020); and to improve basic water and sewerage services

[13]Eleventh Malaysia Plan . Chapter 3: Enhancing inclusiveness towards an equitable society. Focus area C Transforming rural areas to uplift wellbeing of rural communities. Page 3-28
[14]Government Transformation Programme.http://www.epu.gov.my/en/goverment-transformation-programme

by accelerating the development of water treatment facilities for both phases of Langat 2[15].

iv. National Water Resources Policy (NWRP)

The Tenth Malaysia Plan stated that there was a need to formulate a NWRP that serves as a comprehensive guide to aid water and water resources governance nationwide. This Policy is to ensure that existing and proposed policy directions from multiple sectors related to water as a whole are complementary. It will look at ways to ensure uniformity of existing legal provisions, institutional mandates and policy directions, and consolidate the same through effective and efficient measures and mechanisms. In addition, it will provide guidance to help address knowledge gaps, as well as strengthen methods and practices to ensure that water resources are not just managed in an integrated manner, but geared towards sustainable development and use. It is important to note also that the NWRP will not specifically address the water supply industry. It will focus on water as a resource, bearing in mind that it is a continuum of which water supply, distribution and services form part of. The emphasis will be to secure and sustain water resources so that it can continue to support both human and environmental needs. Hence, the National Water Resources Policy (NWRP) that has been formulated is an important resolution in outlining the strategies and action plans to address the issues and challenges in managing water resources.[16]

v. Drinking Water Quality Surveillance Program

In response to the need for a realistic and appropriate set of guidelines regarding safe and potable water supply throughout Malaysia, the Drinking Water Quality Surveillance Unit, Engineering Services Division, Ministry of Health Malaysia prepared a set of guidelines. This was done under the guidance of experts from the World Health Organization, Western Pacific Regional Centre for the Promotion of Environmental Planning and Applied Studies (WHO)/PEPAS. A panel comprising of representatives from Public Works Department (PWD), Department of Chemistry (DOC) and Department of Environment (DOE), which are agencies directly or indirectly

[15] http://etp.pemandu.gov.my/upload/ETP_TheEdge_Pull_out.pdf
[16] http://www.nre.gov.my/ms-my/PustakaMedia/Penerbitan/Dasar%20Sumber%20Air%20Negara.pdf

involved in the surveillance of drinking water quality in this country, was formed to vet through this set of guidelines, after which the National Guidelines for Drinking Water Quality 1983 was published. The following year saw the launching and implementation of the National Drinking Water Quality Surveillance Programme throughout the nation resulting in an increase in the number of workers involved in water quality.[17]

2.3.2 Acts

i. Water Services Industry Act 2006 (Act 655)

Act 655 aims at establishing a licensing and regulatory framework for regulatory intervention to promote the national policy objectives for the water supply services and sewerage services industry.[18] This Act applies to Peninsular Malaysia and the Federal Territories of Putrajaya and Labuan. It does not encroach nor does it affect the general application of existing laws on environmental quality and land matters and existing state powers over the water source. Amongst the objective of WSIA is to establish the framework to regulatory intervention and to promote the National Policy Objective for the water supply and sewerage services industry. The Act sets out requirements and procedures to apply for individual or class licenses and provide for duties and obligations of licenses. Individual licenses are issued to owners of public water supply and sewerage systems or to those who provide treated water or sewerage services to the public while class licenses are issued to owners of private water supply and sewerage systems or to those who provide treated water or sewerage services for private use only.[19]

Requirement of qualifications and competencies in the Water Services Industry are described in the Water Services Industry Act 2006.

Under Section 49 (1) of the Act; no part of any water supply system or sewerage system shall be worked, managed or operated or cause to be worked, managed or operated except by and under the control of persons

[17] http://kmam.moh.gov.my/index.html
[18] Food and Agriculture Organisation of the United Nations. http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=075261&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL
[19] http://www.span.gov.my/pdf/law/bi/act655_bi_2006.pdf

possessing such qualifications and holding such certificates as may be provided in this Act or as may be prescribed.

Section 49 (2) stipulates that a person who contravenes subsection (1) commits an offence and shall, on conviction, be liable to a fine not exceeding fifty thousand ringgit.

ii. Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654)

Act 654 is to provide for the establishment of the Suruhanjaya Perkhidmatan Air Negara with powers to supervise and regulate the water supply and sewerage services and to enforce the water supply and sewerage services laws and for related matters. [20]

iii.Waters Act 1920 (Revised 1989)

The Waters Act 1920 is an Act of Parliament but implemented by almost all States in Peninsula Malaysia. It provides for the management of rivers, its banks, water abstraction and discharge of poisonous, noxious or polluting matter into rivers. [21]

iv. Sewerage Services Act 1993 (Act 508)

Act 508 is an act to amend and consolidate the laws relating to sewerage systems and sewerage services for East Malaysia for the purpose of improving sewerage and the environment and promoting public health.[22]

v. Environmental Quality Act 1974

The legislation that is related to the prevention, abatement, control of pollution and enhancement of the environment in Malaysia is the Environmental Quality Act, 1974. The Act restricts the discharge of wastes into the environment in contravention of the acceptable conditions[23]. A person is deemed to have polluted any inland waters if:

- Places waste in or on any waters or in any place where it may gain access to water;

[20] http://www.span.gov.my/pdf/law/bi/act654_bi_2006.pdf
[21] http://www.fao.org/fileadmin/user_upload/groundwatergovernance/docs/Shijiazhuang/Presentations-PDFs/Day1/PS2_SuratmanSaim.pdf
[22] http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=026023&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL
[23]Summary of Environmental Quality Act (1974). http://myconstmanagehub.blogspot.my/2013/01/summary-of-environmental-quality-act.html

- Places any waste in a position where it can gain access to water;
- Causes the temperature of the receiving waters to be raised or lowered by more than the prescribed limits;

There are penalties for discharge of environmentally hazardous substances, pollutants or waste in Malaysian waters exceeding acceptable conditions[24].

Specific regulations pertaining to the Sewerage sub-sector are as below:

- Environmental Quality (Sewage) Regulations 2009
- Environmental Quality (Industrial Effluent) Regulations 2009

There are various acts relevant to water services for the respective states;such as listed below:

i. Sabah Water Resources Enactment 1998
ii. Sabah Water SupplyEnactment 2003
iii. Sabah Drainage and Irrigation Ordinance 1956
iv. Sarawak Water Ordinance1994
v. Selangor Waters Management Authority Enactment 1999(LUAS)
vi. Perlis Water Supply Enactment 1952
vii. Pahang Water Resources Enactment 2007
viii. Kedah Water Supply Enactment 1991
ix. Kedah Water Resources Enactment 2008
x. Johor Water Supply Enactment 1993
xi. Negeri Sembilan Water Supply Enactment 1997
xii. Terengganu Water Supply Enactment 1998
xiii. Kelantan Water Supply Enactment 1995
xiv. Penang Water Supply Enactment 1998
xv. Pahang Water Resources Enactment 2007
xvi. Water Supply (Federal Territory of Kuala Lumpur) Act 1998
xvii. Water Resources (State of Malacca) Enactment 2014

[24] http://faolex.fao.org/docs/pdf/mal13278.pdf

2.4 INDUSTRY INTELLIGENCE

Industry intelligence is critical for developing strategies in the areas of manpower development and the impact of those developments.

i. Overview of the industry in Malaysia

The country's water sector benefits from large volumes of available water and a moderately strong project pipeline. However, supplies can vary from region to region, and this, in conjunction with an incoherent water management structure, can pose risks to water utilities companies, as can further aggravate the high levels of water losses and hence increase non revenue water (NRW). As with many of its Asian peers, rapid urbanisation is creating environmental degradation as flooding, water pollution, sedimentation and squatters establishment along rivers. These issues are compromising the quality of raw water and are contributing to higher water shortage frequency. Among the most significant beneficiaries of the infrastructure improvement drive will be the wastewater treatment and sewerage sectors with a strong growth in the capacity and quality of wastewater treatment facilities[25].

The legal framework for the water and sewerage sector differs between Peninsular Malaysia and East Malaysia. While a water reform was enacted for Peninsular Malaysia in 2006, the previous legal and institutional framework was maintained in East Malaysia[26].

Two main laws passed in 2006 formed the legal frameworks of the water and sewerage sector in peninsular Malaysia which were the Water Services Industry Act (WSIA) and the National Water Services Commission Act that established the Suruhanjaya Perkhidmatan Air Negara (SPAN). The acts separated the functions of policy making (government), regulation (SPAN), asset ownership (PAAB) and service provision (state water companies) from each other[27]. The laws were enacted after extensive public consultations over two years. As part of the reform process, for the first time in Malaysian history a draft bill had been made available for public discussion before it was presented to Parliament.

[25] http://www.bmiresearch.com/malaysia
[26] https://en.wikipedia.org/wiki/Water_supply_and_sewerage_in_Malaysia
[27] http://www.paab.my/regulations/national-water-services-industry-restructuring-initiatives/

Licenses are issued by SPAN and these licenses can be revoked if key performance indicators are not met or other standards are not respected. The standards are set and monitored by SPAN. In East Malaysia water supply remains a responsibility of state governments and sewerage a responsibility of local governments[28].

Within the executive branch of the Federal government, the Ministry of Energy, Green Technology and Water is in charge of setting water supply and sewerage policies. It is assisted by two technical agencies under its supervision: The Water Supply Department (JBA) and the Sewerage Services Department (JPP). The latter was established through the Sewerage Services Act of 1994 as a regulatory agency for the private sewerage company IWK. When IWK was taken over by the government in 2000, the Sewerage Services Department became responsible for the development of infrastructure while IWK remained in charge of operation and maintenance. The regulatory functions of JPP ceased in 2007[29].

ii. Global outlook of the industry

Water Operators in Malaysia have potential in extending their services to other countries in the region especially in training. For example PWSA has expanded training to the region, where in the period 2014-2016, PWSA will serve as the training centre for the JICA Partnership Programme on "NRW Reduction Training and Capacity Building in Malaysia"[30]. IWK has also extended training on sewerage and sludge management to Vietnam,Philippines,India and African countries.

Other organisations such as Ranhill Water Services and SAJ Holdings provide expert advice in collaboration with the United States Agency for International Development (USAID) and ECO-Asia , to other water service providers in the region such as the Provincial Waterworks Authority of Thailand, Bach Ninh Water Supply & Sewerage Company, Vietnam, providing uninterrupted water supply to India's third largest state Maharashtra Jeevan Pradhikaran, improving pressure management in the distribution network of PDAM Surabaya and provides PDAM Kota

[28]Reforming the Water Sector in Malaysia, by Lee Koon Yew, National Water Services Commission of Malaysia, 2010
[29] http://www.jpp.gov.my/index.php?option=com_content&view=article&id=231&Itemid=195&lang=bm
[30]About Us.PWSA. http://www.pwsa.com.my/?page_id=491

Denpasar knowledge transfer and trainings with key support from Water link and the Indonesia Water Supply Association, plus with the Davao Water District in Philippines to tackle the Non Revenue Water issues. [31]

iii. International regulatory bodies, international legislative structure and international benchmarks related to industry, employment and training

(a) International Water Association

The International Water Association (IWA) is the global network of water professionals working on the most pressing water issues to deliver equitable and sustainable water solutions. Thematic Programmes provide IWA with a mechanism to respond to global challenges and support progressive agendas for the water and sewerage sector[32].

(b) IWA Research on Human Resource Requirement in the Global Water Services Industry

The human resource (HR) requirement to meet the water and sewerage targets has been relatively unknown in relation to the numbers of staff, qualifications and their practical experience. IWA has taken the learning from the health and education sectors and developed an assessment method to collect data on human resource gaps (skills) and shortages (number of workers) in the water and sewerage sector. Tested in 15 countries in Asia and Africa under (IWA HRCG study), the results are staggering. IWA calls upon decision makers in government, capacity development providers and organisations in the Water, Sanitation and Health (WASH) sector for concerted action at national, regional and global level, to collect HR data, strengthen the evidence, and jointly develop national capacity development strategies.

There are not enough appropriately skilled water professionals to support the attainment of universal access to safe water and sewerage. The current availability of data on the human resource demand, capacity, supply and shortages for water and sewerage services, is poor. Without

[31]Ranhill Utilities.UN Millennium Development Goals. http://www.ranhill.com.my/doc/Ranhill%20Utilities.pdf
[32]International Water Association. http://www.iwa-network.org/

credible evidence to support estimates of the real human resources shortages across all components of water, sewerage and hygiene provision, the WASH sector will not be able to make a business case that will attract sufficient investment. Water and sewerage are crosscutting issues, affecting nearly all other elements of socio-economic development within developing economies. Investment in, and strengthening of, the human resource base for the delivery of water and sewerage services can alleviate the pressure on human as well as financial resources in other sectors[33].

Key findings and recommendations are as follows:

- Sewerage services are significantly undermined by a poor supply of professionals when compared to water services;
- Low levels of access to and inadequate coverage of courses in tertiary education institutes is a significant bottleneck to meeting human resource demands;
- Female professionals are underrepresented, particularly in technical fields. This trend is mostly observed in the public and private sectors, the non-governmental sector has a greater gender balance; the number of female graduates from technical courses at universities was also reported to be low;
- Operation and maintenance of water and sewerage systems are chronically neglected, with human resources inadequately allocated;
- Education and skills development requirements to operate and maintain specific technologies have not been appropriately assessed; such assessments would greatly benefit the WASH sector;
- The dependence on communities, volunteers and semiskilled workers in rural areas is not sustainable without adequate institutional and operational support from local government and structured, formalised support from the professional sector. Investment in human resources has the potential to have multiple benefits across sectors.

[33] http://www.iwa-network.org/project/human-resource-capacity-gaps-study

- The Sustainable Development Goals must give consideration to the use of human resource capacity data for WASH as an "enabling environment" indicator;
- Appropriate public policies need to be developed and implemented to support job creation, including investing in skills to support labour supply and enabling private sector engagement to stimulate an increase in labour demand;
- Incentives to attract newly qualified and skilled personnel and retain experienced personnel within the sector and reverse a professional drain to other sectors are required;
- Developing specific programmes and promoting greater investment to engage and encourage female participation at the educational level and at the professional level could provide a solution to human resources shortages, but will require a mind-set shift;
- Improve coordination and cooperation between WASH sector organisations and the education sector to enhance alignment between human resources demand and supply;
- Make technical and vocational training a pivotal element in human resources development in both urban and rural service provision.
- Provide an equitable and attractive remuneration package for water and sewerage sectors so as to attract qualified professionals and skilled workers (*60 percentile of the high salary in the country*)

(c) Water Safety Plan Manual

The Water Safety Plan Manual prepared by the World Health Organisation (WHO) and IWA is referred as a guideline to provide safe drinking water by drinking water suppliers around the world[34]. Malaysia is adopting the practice and is stipulated in the Water Services Industry Act (WSIA) for operators to prepare their Water Safety Plan and monitored by SPAN. The Engineering Division under the Ministry of Health has taken steps to implement the practices stated in the WHO- IWA Water Safety Plan Manual by preparing the National Standards for Drinking Water

[34]Water Safety Plan Manual. http://apps.who.int/iris/bitstream/10665/75141/1/9789241562638_eng.pdf

Quality in the year 2000. Monitoring on water quality is done by the Ministry of Health (MOH) by referring these Water Quality standards.

(d) Knowledge Sharing On Reducing Non Revenue Water

Many foreign and local consultants has been working on reduction of non revenue water in Malaysia. There have been consultants and water companies from Japan and Denmark helping water utilities in Malaysia. Around the world, the effort to decrease water losses through knowledge-sharing projects have been implemented in Malaysia, China, Thailand, Georgia, Taiwan, Turkey, Abu Dhabi, Saudi Arabia, Mali and South Africa. Non-revenue water is one of the lowest hanging fruits in order to improve the efficiency of water utilities around the world. The water losses in the distribution systems are obvious when analysing data from water utilities. Danish water supplies have over the last decades worked intensively on reducing non-revenue water and managed to significantly decrease[35].

(e) International Benchmark for Water Services Industry Regulatory Body

The Water Services Regulation Authority, or OFWAT, is the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales. OFWAT is primarily responsible for setting limits on the prices charged for water and sewerage services, taking into account proposed capital investment schemes (such as building new wastewater treatment works) and expected operational efficiency gains. The most recent review was carried out in 2014; reviews are carried out every five years, and thus the next will take place in 2019. OFWAT consists of a board, plus an office of staff which carries out work delegated to them by the board.

(f) International Benchmark Country for Water Management – Singapore

With a population of over five million people living in just 710 sq km, and limited freshwater resources, Singapore has plenty of experience in

[35]http://www.iwa-network.org/blog2/reduction-of-non-revenue-water-around-the-world

developing innovative solutions to meet its water management needs. Singapore-based companies are well-versed in providing holistic and fully-integrated water management solutions across the entire value chain, specialising in anything from desalination and reverse-osmosis to municipal and industrial water treatment.

The Water Services Industry has been identified as a key growth area for Singapore36.According to International Enterprise (IE) Singapore, the Government agency driving Singapore's external economy, the Republic has a vibrant cluster of more than 100 local water companies that have built up expertise across the water and wastewater treatment sectors. Their track record exhibits a global footprint, with numerous projects in Asia, the Middle East and even further afield to Latin America and Africa. From wastewater treatment to decentralised water management and the cleaning of industrial wastewater, Singapore companies have been tackling water problems globally[37].

iv. Challenges faced by the Water Services Industry

The water supply and sewerage services as well as water resource and environmental management in Malaysia face a number of challenges. Generally these challenges can be overcome by effective water planning, water sector transformation initiatives, sustainability and efficient management of water system and raising awareness of value of water.

(a) The Water And Sewerage Sectors Currently Work In Silo

Ideally these sectors should be integrated and work together for example in countries such as Singapore and the United Kingdom, where there is a complete and comprehensive cycle of water and sewerage such as effluent as water resources. The mentality of working 'in silo' is no longer tenable as water is a shared resource[38]. The growing competing use of water resources among sectors, rapid urbanization and population growth, wasteful consumption due to low tariffs etc. have put tremendous pressure on the existing water resources to meet the future demand. As such, policy makers and water managers must take in account the 'water

[36] Iesingapore. http://www.iesingapore.gov.sg/Partner-Singapore/Singapore-Industry-Capabilities/Environment-and-Infrastructure-Solutions/Water/Infrastructure-Hub
[37] http://www.channelnewsasia.com/news/business/singapore-firms-make/2515802.html
[38] http://www.mwa.org.my/pdf/wm-issue29_final.pdf

sensitive' element when deciding or formulating the national development plan. This includes the need to carefully consider implementing such plan as part of the bigger picture of land and water uses.

(b) Non Revenue Water (NRW)

It has been a nagging problem for developing countries, including Malaysia, in tackling this issue. Tackling Non Revenue Water (NRW) or water losses require both the technical know-how and the management skills. The NRW programme should be regarded as an on-going venture rather than as project based with constant monitoring and implementation. To overcome NRW requires more skilled manpower and budget[39].

(c) Catchment Development Impacts On Water Security

Almost 4.8 billion (80 per cent) people in the world live in areas with significant water security problems or threats to river biodiversity such as areas of intensive agriculture (catchment disturbances) and concentrated settlements (with associated pollution by nutrients, pesticides and organic loads)[40].The development of public utilities such as water supply, sewerage, and urban drainage and flood mitigation programmes helps to promote economic growth and improve the quality of life. However, this economic development and the resulting rapid urbanization and industrialization have given rise to problems of increased water pollution. River water quality and pollution control need to be addressed urgently since 98 percent of the total water used originates from rivers. Almost all of the investments in water-related infrastructure depend on reasonable river water quality.

(d) Competing For Same Water Resource

The current scenario is when different agencies are competing for the same water resource but for different usage for example when water is to be used for irrigation or water supply use. The increased demand for the limited and diminishing supply of clean water available has led to competition among the various water users, a competition the continued economic growth exacerbates increasingly. In addition, as the readily

[39] Planning for A Water Blueprint in Malaysia. Malaysian Water Association Quarterly. http://www.mwa.org.my/pdf/wm-issue29_final.pdf
[40] http://ec.europa.eu/environment/integration/research/newsalert/pdf/219na1_en.pdf

available portion of water resources has already been developed for use in practically all regions of major water demand, future water resources development will require the construction of more storage dams. These are not only costly to build: there's a high price to pay in environmental terms as well. Furthermore, the practicable limit of surface water resources development has been reached in some regions of high demand, and it has become necessary to consider inter-basin and interstate surface water transfer schemes[41].

(e) No Provision For Water Security

It is becoming increasingly demanding that the water services and resource-based activities be managed sustainably in order to ensure the future viability of the resources to cater for the demand of all who depend on it. This means resolving issues such as increasing demand and wastages, declining and uncertain supply in some areas due to climate change and poor pricing policies, etc[42]. The water supply should be able to meet demand and provide for reserve resource capacity especially in recent situations of severe drought that had caused insufficient supply of water. Ideally it should be able to provide according to demand plus reserve. The growth in population and GDP over the last three decades has resulted in heavy demand for water. The problem of population growth is particularly felt in the urban areas, due to rural-urban migration and growing urbanization. The exponential growth in urban population has stretched the government's ability to answer infrastructure and service needs and provide the environmental conditions required for better living. Often the supporting infrastructure for the collection, treatment and disposal of sewage and solid wastes is inadequate to cope with the amounts generated. This state of affairs raises problems of water and air pollution, public health and urban environmental degradation[43].

[41]Malaysia's Water Vision: The Way Forward - The Malaysian Water Partnership.http://www.fao.org/docrep/004/ab776e/ab776e02.htm
[42] Planning For A Water Blueprint In Malaysia. Malaysian Water Association Quarterly. Http://Www.Mwa.Org.My/Pdf/Wm-Issue29_Final.Pdf
[43]Malaysia's Water Vision: The Way Forward - The Malaysian Water Partnership.http://www.fao.org/docrep/004/ab776e/ab776e02.htm

(f) Low Water And Sewerage Tariff Rates

Low water tariffs and wastewater charges have mostly remained below the cost of supply for many years. In moving forward, cost recovery and the "polluter pays principle" need to be integrated into the drinking water tariffs and wastewater charges. The application of these principles will then heighten awareness of the value of water as a resource, thus minimizing unnecessary water use. Water as an economic goods attaches a value to water. It works on the basis that water tariffs must take in account the various cost components – the raw water, treatment and distribution, billing and collection, customer service, the financial cost etc. – to bring water to the homes[44]. To fulfil this role, many governments have resorted to private companies in the various forms of privatization, from short-term lease or management contracts to long-term full fledge build, operate and transfer (BOT) or build, own, operate and transfer (BOOT). Ideally the tariff should be able to accommodate water and sewerage operation and lease rental costs where this will lead to more quality services provided[45].

2.5 OCCUPATIONAL STRUCTURE OVERVIEW

The occupational structure overview includes a brief description on each sector/subsector of the water service industry. The Malaysia Standard Industry Classification (MSIC) was used as reference for the classification of sector/subsector. In the MSIC 2008, the Water Services Industry specifically falls under Section E (Division 36 and 37), whereas the areas under Support Services mainly fall under Section F (Division 49 and 52), Section M (Division 71) and Section C (Division 33) as listed below:-

▪ **Section**	**: E**	**Water Supply; Sewerage, Waste Management And Remediation Activities**
▪ Division	: 36	Water Collection, Treatment And Supply
▪ Division	: 37	Sewerage
▪ **Section**	**: F**	**Transportation**
▪ Division	: 49	Land Transportation

[44]Malaysian water sector reform.Policy and performance. Ching Thoo Kim. 2012. Wageningen University
[45]European Environment Agency.Assessment of cost recovery through water pricing. (2013). ISSN 1725-2237

▪ Division	: 52	Warehousing
▪ **Section**	**: M**	**Professional, Scientific and Technical Activities**
▪ Division	: 71	Architectural And Engineering Activities; Technical Testing And Analysis
▪ **Section**	**: C**	**Manufacturing**
▪ Division	: 33	Repair And Installation Of Machinery And Equipment

The DSD has developed 24 NOSS for the Water Services Industry up until the year 2016 which can be found under the Chemical section of the NOSS Registry. Based on recent development, NOSS for the **Desludging** area has also been developed in 2016 and will be included in the NOSS registry end of year 2016. The existing NOSS are as follows:

Table 2.2: Summary of NOSS developed under the Water Services Industry in the DSD NOSS Registry (May 2016)

Sector/ Level	Level 5	Level 4	Level 3	Level 2	Level 1
Water Distribution,	Water Distribution Management	Water Distribution Operation Management	Water Distribution Supervision	Water Distribution Operation	Not Available
Water Instrumentation	Water Distribution Instrumentation Manager	Water Distribution Instrumentation Executive	Water Distribution Instrumentation Senior Technician	Water Distribution Instrumentation Technician	Not Available
Non Revenue Water	Not Available	Not Available	Non Revenue Water Operation Control	Non Revenue Water Operation	Non Revenue Water Operation
Sewage Treatment	Waste Water Treatment Plant Operatio Management	Waste Water Treatment Plant Operatio Management	Sewage Treatment Supervision	Sewage Treatment Maintenance	Not Available
Water Treatment	Water Treatme Plant Operatio Management	Water Treatment Plant Operation Management	Water Treatment Operation Supervision	Water Treatment Operation Services	Not Available
Conveyance (Sewage)	Not Available	Not Available	Conveyance Operation and maintenance supervision	Conveyance Operation and maintenance	Not Available
Water Resource	Not Available	Not Available	Dam Safety Management and Supervision	Dam Safety Management and Operation	Dam Safety Mgt and Operation

2.6 CHAPTER CONCLUSION

It can be summarised in this chapter that the Malaysian Water Services Industry is an important industry in Malaysia as water security and adequate provision of water to the nation is a basic necessity to its people. Increasing accessibility to water supply and ensuring the quality of water is crucial, where this requires sufficient and skilled workforce. Therefore, it is imperative that the Occupational Framework be identified in order to plan a structured development of manpower for the industry. This is not only a matter nationally, but also globally as identified by the International Water Association though its research on the Water Services Industry workforce in several countries and found that there is still insufficient skilled workers in the industry.

CHAPTER 3: METHODOLOGY

3.1 CHAPTER INTRODUCTION

This chapter describes the methodology of the overall Occupational Framework process that was conducted throughout the Water Services Industry Occupational Framework analysis.

3.2 RESEARCH METHODOLOGY

Qualitative analysis was selected as the main method of obtaining input throughout this study. Qualitative research investigates the why and how of decision making, not just what, where, when. Hence, smaller but focused samples are more often used than large samples. It focuses on unique themes that illustrate the range of the meanings of the subject matter rather than the statistical significance of the occurrence. This process uses inductive reasoning, by which themes and categories emerge from the data through the researcher's careful examination and constant comparison. Qualitative research typically relies on the following methods for gathering information: Participant Observation, Non-participant Observation, Field Notes, Structured Interview, Semi-structured Interview, Unstructured Interview, and Analysis of documents and materials. A combination of these methods is applied in this study such as semi-structured interviews, participant observation, and discussion workshops.

Below are the relevant methods used throughout the research conducted on the Water Services Industry:

Step 1: Preliminary Info Gathering

Preliminary information gathering was done via literature review/research and survey/questionnaires.

i. Literature Review

A literature review on the Water Services Industry was carried out to get some insight of this industry in the context of the Malaysian scenario. The scope covered under this search includes definitions, current analysis of the sub-sectors/areas, current status of the Water Services Industry, skilled workers requirement in the local sub-sector and the industrial participation at international level.

The literature review was presented to industry members to confirm the accuracy and relevancy to the industry.

ii. Semi-Structured Surveys

Semi-structured surveys also served as a source of information, please refer to Annex 3: Questionnaire. The survey was used as the instrument to confirm the findings obtained though qualitative analysis obtained in the workshop sessions. The respondents consisted of representatives from the organisations/agencies relevant to the sub-sectors of the Water Services Industry.

The questionnaire was developed by referring the findings from the workshops with industry panel members. The sub-sectors, areas, job titles and skill sets were adapted to become guiding questions in the questionnaire.

The questionnaire consisted of questions that were semi-structured and asked respondents on the industry workforce requirements and industry background relevant to them.

Step 2: Engaging Industrial Experts

Industry experts are engaged by applying various mediums such as brainstorming, focus group, interview, on-site visit, emails etc.

Experts from the Water Services Industry were identified for further communication and contact. The list of experts are included in the list of development panel members in Annex 2: List of Contributors. In the process of gathering the information, two (2) methods were adopted, namely; brainstorming and Development of Standard & Curriculum (DESCUM) session. The brainstorming and DESCUM sessions were attended by development panel members who discussed the different sub-sectors and areas. Facts obtained during the literature review were also discussed and presented to the development panel members. The information gathered was then used as input to the Occupational Framework of the said sub-sector.

Workshops and interviews were conducted during the development of the Water Services Industry Occupational Framework. Follow up discussions with the expert panel members were done in smaller groups to verify the findings of the Occupational Framework. The details of the workshops are as below:

Table 3.1: List of Occupational Framework Development Sessions

Date	Venue	Activity
7th – 8th May 2016	IBIS Styles Cheras Hotel	• Confirmation of Literature Review Development of Questionnaire • Identification of Occupational Structure (Preliminary)
7th – 8th August 2016	IBIS Styles Cheras Hotel	• Development of Occupational Structure • Development of Occupational Descriptions
28th August 2016	Water Academy, SAJ , Johor	• Industry Engagement

Step 3: Data Analysis

Based on the activities done as above, substantial data and information were collected. The data and information were discussed and analysed in development workshops, focus group discussions and interviews attended by selected key persons or experts from the public and private sub-sector. The presence of the key persons or experts ensured that the development of the Occupational Framework is current and relevant.

Throughout the development process, the Water Services Industry is analysed using the above methodology to identify the following:

(a) Scope of the Industry and its sub-sectors ;
(b) Main areas;
(c) Occupational groups of the sub-sector;
(d) Job title;
(e) Skills in Demand;
(f) Hierarchy structure (Level 1 – 8); and
(g) Occupational Description.

Step 4 : Occupational Structure (OS) Development

The Occupational Structure Development technique is explained in detail in the following section, 3.2.1, Occupational Structure Development.

Several elements were referred when developing the Occupational Structure (OS) such as the following:

- Identification of sub-sector/area/sub-areas (MSIC)
- Identification of Job Title (Organization Structure etc)
- Identification of levelling based on MOSQF

Step 5: Job Description Development

The Job Description Development technique is explained in detail in the following section, 3.2.2, Occupational Description Development. The Job Description shall reflect the competencies performed for a particular job.

Step 6: Finalising OA Document

The collated documents are finalised and presented in the format as prescribed by JPK.

3.2.1 Occupational Structure Development

The Occupational Structure was developed based on the following processes:

(a) Identification of industry scope and boundaries with other relevant industries

The identification the industry scope is important so that when identifying the relevant sub-sectors and areas under the industry, it will define the segmentation of the particular industry to other relevant industries. This will eliminate the possibility of duplication between common areas. The rule of thumb is to avoid taking into account the organization chart as this will include many other industries such as marketing, administration, human resources and public relations. These areas are common across various industries and have a different set of skill sets. Grouping based on similar skill sets in terms of technical abilities is a determining factor.

The MSIC and existing Occupational Structures in the DSD NOSS Registry were also used as a point of reference.

(b) Identification of sub-sector/area/sub-area

The coverage of a sub-sector should be able to accommodate a number of areas and sub-areas where applicable. Sub-sectors are identified as being components of an industry and can be clustered in terms of classification, segmentation or process driven.

(c) Identification of job titles

In order to identify job titles, it is important to obtain consensus from expert panel members that the job title is common between organizations either Small, Medium or Enterprise (SME) and is easily accepted by practitioners in the industry.

(d) Identification of Levelling

Levelling of a job title is done based on the level of competency required to be deemed competent at a specific designation. The level descriptors in Annex 1 is used as reference when determining the different levels relevant to a specific job title.

3.2.2 Occupational Description Development

The Occupational Description (OD) is the detailed description of the main job scope of the job title. The OD is developed using a combination of brainstorming sessions with panel members and then the Occupational Descriptions would be compared to other available descriptions for the same job title. Below are the main steps in producing an OD for the respective job titles:

(i) determine the main areas and sub-areas in the sub-sector;

(ii) identify the job titles; and

(iii) identify the job scope.

To describe the Occupational Description clearly, the statement must consist of a ***Verb, Object*** and ***Qualifier***. The rationale of determining the description attributes is to facilitate NOSS development especially in job and competency analysis.

a) Object

The object is determined first before the verb and qualifier. It is the main determinant to distinguish one job to another. The objects are acquired from the industrial experts during a brainstorming session and written on DACUM (**D**evelopment of **A C**urricul**um**) cards so that all the experts can see the objects identified.

Objects of those in the related sub-sector or area are determined as in the example below:

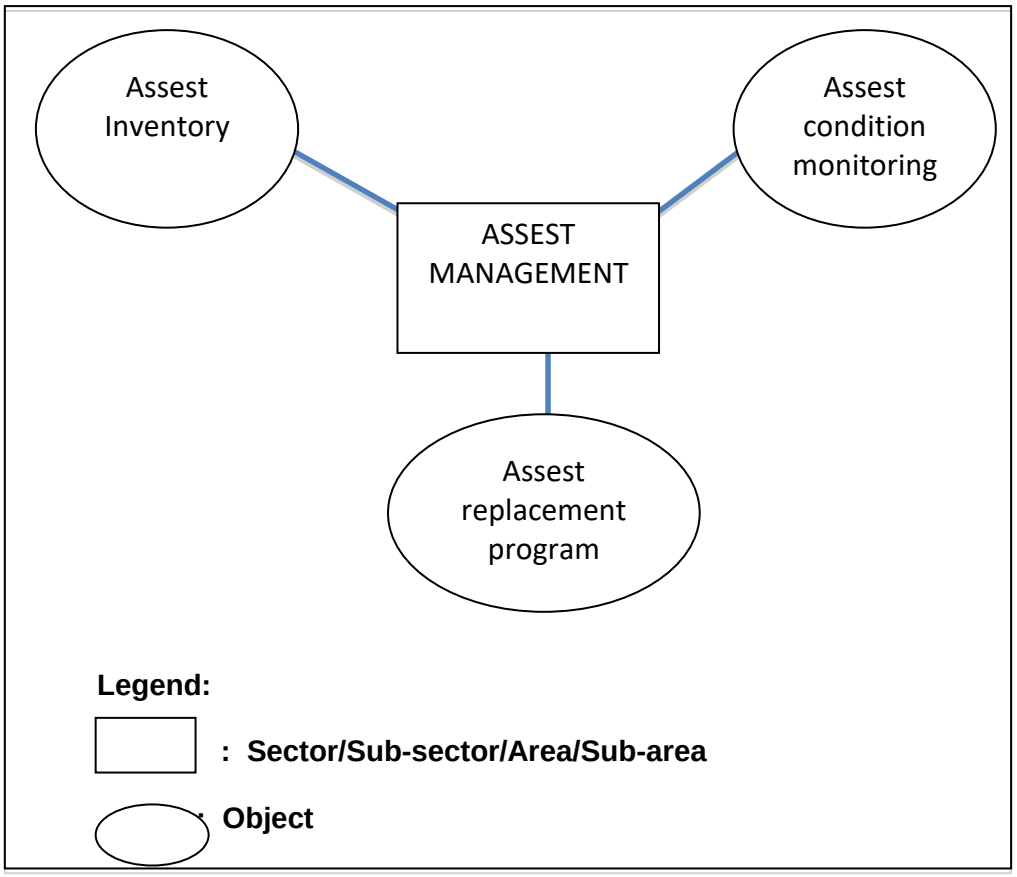

Figure 3.1: Example of Identifying Objects

b) Verb

The verb is then determined based on the level of difficulty of the identified job titles, such as below:

- ***Object*** *:Asset Monitoring*
- ***Verb for Level 3 : Carry Out***
- ***Verb for Level 4 : Coordinate***
- ***Verb for Level 5 : Manage***

Hence, the contents of the job definitions will be as below:

- Asset Management Engineer (Level 5)
  - ✓ ***Manage*** *asset condition monitoring + (qualifier)*

- Technical Executive (Level 4)
  - ✓ ***Coordinate*** *asset condition monitoring+ (qualifier)*
- Senior Technician (Level 3)
  - ✓ ***Carry out****asset condition monitoring + (qualifier)*

c) Qualifier

Based on the example above, the statement is not clear as there is no qualifier for the object, therefore a qualifier must be added to further clarify it. Below is an example:

Coordinate *asset condition monitoring of critical equipment*

3.3 CHAPTER CONCLUSION

This chapter has elaborated on the methodology used in the study which is through literature review, brainstorming sessions and the DESCUM (Development of Standard and Curriculum) approach. The development of the Occupational Structure, Occupational Description and skills in demand identified through focus groups and industry surveys will be presented in the next chapter, Chapter 4, Findings.

CHAPTER 4: FINDINGS

4.1 CHAPTER INTRODUCTION

The identified sectors and sub-sectors for the Water Services Industry were obtained through discussions with industry experts during the development workshop sessions and interviews. Based on the discussions held during development workshops, the development panel members had identified that the Water Services Industry in Malaysia is defined to be segregated into 3 sub-sectors which are:-

a) Water Supply
b) Sewerage
c) Support Services

Research instruments used were focus group discussions, semi-structured surveys and interviews. Information was initially obtained from available material. This information was then analysed and used as the basis for the focus group workshops. During the focus group workshops, the information was analysed and grouped into three key theme areas which were:

- Industry Background
- Occupational Structure
- Skills in Demand

These key theme areas were then used as a guide to obtain information through focus group discussions with relevant stakeholders. The feedback and input obtained from the focus group discussions were then analysed to determine the current industry scenario in Malaysia.

In order to obtain information on skills in demand and industry intelligence, semi-structured surveys were distributed to the respondents who were representatives of the relevant organisations. The input acquired from the meetings, interviews and survey responses were then reviewed.

4.2 COMPARATIVE STUDY ANALYSIS

This section consists of the outcome of comparing the existing Occupational Analysis (OA), NOSS and other relevant industry framework in other countries.

4.2.1 International Occupational Frameworks

i. Canada

The Government of Canada has developed a very useful tool for analysing occupations in the country which is known as the National Occupational Classification (NOC).46The NOC organizes over 40,000 job titles into 500 occupational group descriptions.

It can be used to manage the collection and reporting of occupational statistics and to provide understandable labour market information. The Employment and Social Development Canada (ESDC), in partnership with Statistics Canada (STC), update the NOC according to 5-year Census cycles. Revisions are based on extensive occupational research and consultations conducted across the country, reflecting the evolution of the Canadian labour market. Specifically for the Water Services or Utilities sector in Canada, there are several related occupational groups such as below:

Group 9 – Occupations in Manufacturing and Utilities

The occupations under Group 9 are categorised to possess Skills Level B, where these occupations usually require a college education or apprenticeship training in Canada.

Major Group 92:

Processing, manufacturing and utilities supervisors and central control operators

Division:

921 Supervisors, processing and manufacturing occupations

922 Supervisors, assembly and fabrication

923 Central control and process operators in processing and manufacturing

924 Utilities equipment operators and controllers

[46]. Government of Canada. http://www5.hrsdc.gc.ca/NOC/English/NOC/2011/AboutNOC.aspx

Specifically under Division 924 is 9243 which groups the Water and waste treatment plant operators.
Next are the occupations grouped under Skill Level A, where according to the NOC, these occupations usually require university education.

Division:

091 Managers in manufacturing and utilities

Specifically under Division 091 is 0912 which includes Utilities managers. This unit group includes managers who plan, organize, direct, control and evaluate the operations of utility companies. The services provided include treatment of water and waste, distribution of water to residential, commercial and industrial consumers, waste disposal and waste recycling.

ii. Singapore

Singapore's Occupational Framework can be referenced in the Singapore Workforce Skills Qualifications (WSQ). It is a national credentialing system that trains, develops, assesses and recognises individuals for the key competencies that companies look for in potential employees.[47]

The WSQ related to the Water Services Industry in Singapore falls under the Process Industry WSQ. The Singapore Workforce Skills Qualifications System for Process (Process WSQ) comprises key competencies and qualification pathways for sectors such as Chemicals, Engineering Services, Pharmaceuticals & Biologics and Environmental Technology. These pathways cover all major occupations in the Process industry from the operational, supervisory to managerial levels. Environmental Technology comprises Energy Management, Water and Waste Management sectors. The Water sector is a vibrant industry with many growth opportunities, and is categorised into Used Water Treatment, Water Treatment, Water Distribution & Conservation and Water/Used Water Collection.

[47]Workforce Development Agency. http://www.wda.gov.sg/content/wdawebsite/L207-AboutWSQ/L301-WSQIndustryFramework-ProcessIndustry.html

Qualifications available under the WSQ are the WSQ Certified Used Water Treatment Operator, WSQ Certified Water Treatment Operator and WSQ Certified Used Water Treatment Technician.

4.2.2 Current Occupational Structures and National Occupational Skills Standards (NOSS)

Currently there are several Occupational Structures (OS) and NOSS (National Occupational Skills Standards) developed by the Department of Skills Development, that are relevant to the sub-sectors and areas in the Water Services Industry Occupational Structure. The job areas that are included in Occupational Structure and Occupational Descriptions that will be developed will be the job areas specific and unique to the Water Services Industry.

As stated in chapter 3, the Occupational Structure is not to be confused with the organisational chart, where job areas that are common to all industries are not included. These job areas are such as:

- Finance
- Information Technology
- Human Resource
- Sales and Marketing

However, there are overlapping of some industry specific job areas, although the MSIC and sectors in the NOSS registry indicate these job areas to fall under other sectors or industries. These OS and NOSS are as listed below:-

- Building and Construction – for job areas under Facility Maintenance
- Finance and Business Services – for job areas related to customer service
- Electrical – for job areas under M & E that are specific to competent personnel, i.e. Chargeman.
- Automotive - for transportation management or fleet management

Given the fact that there are existing OS and NOSS for the job areas identified under the sectors as elaborated below, the Occupational

Descriptions for those job areas will be referred to. Future development of the NOSS will also be under the respective sectors' stakeholders.

i. Building& Construction OA

With reference to Table 4.1, the Building and Construction Occupational Structure developed by the DSD includes the job scope for Mechanical & Electrical and Networking and Geographical Information System (GIS) under the Support Services sub-sector. The related job areas are highlighted in Table 4.1.

ii. Business and Finance OA

The job areas such as Accounts and Administration are similar to the NOSS developed under the Business and Finance sector included in the NOSS Registry.

Please refer to Table 4.2, for the job titles of the Public Relations NOSS and Occupational Structure for Finance.

iii. Relevant NOSS

There are areas identified relevant to the Water Services Industry but are developed as NOSS under other industries such as shown in Table 4.3 till Table 4.7.

iv. Comparison Between The Related OS Versus Water Services Industry OS

With reference to Table 4.8below, shows the matrix of existing OA and NOSS against the sectors identified under the Water Services Industry. This will serve as reference as to whether the development of the relevant NOSS or review of existing NOSS is required. The existing Occupational Structures; i.e. Building and Construction and Administration and Finance, will be referred to in terms of the Occupational Descriptions for the similar occupations.

Table 4.1 : Buidling & Construction Occupational Structure

Sub-sector	Area	Job Area
1. Town & Country Planning	Pre-Consultancy	Project Assessment
		Technical
2. Building Survey	Consultancy	Project
		Technical
3. Architecture	Consultancy	Project
		Technical
	Construction	Project
4. Civil Engineering	Consultancy	Project
		Technical
	Construction	Roadwork
		Bridge
		Water Reticulation & Sewerage
		Earthwork / Retaining Wall / Geotechnical
		Structure/Fencing & Gate
5. Quantity Survey	Consultancy	Project
	Construction	Technical
6. Geometrics & Land Survey	Consultancy	Management
		Cadastral/Engineering Survey (C/Es)
		Utility Mapping
		Photogrammetry
		Hydrography
		Remote Sensing
		Geographic Information System (GIS)
7. Mechanical & Electrical Engineering	Consultancy	Project
		Technical
	Construction (Mechanical Engineering)	HVAC
		Plumbing
		Infrastructure
		Fire Protection
	Construction (Electrical Engineering)	HVAC Plumbing Infrastructure Fire Protection
8. Landscape Architecture	Consultancy	Project
		Technical
9. Safety, Health & Environment	Consultancy	Project
		Technical
	Construction	Safety & Health
		Traffic
		Environment

10. Industrialized Building System (IBS)	Manufacturing	Precast
		Block
		Trusses – Steel & Timber
		Framing – Steel & Timber
		Formwork
	Installation	Precast
		Block
		Trusses – Steel & Timber
		Frame – Steel & Timber
		Formwork
11. Construction Machinery Plant & Operations	Construction	Crane
		Earthwork
		Building Machinery
		Road Construction
		Project
		Transport
		Workshop
12. Building Materials	Ready Mixed Concrete (RMC) Plant(Operation)	Production Plant
		Quality Control (QC)
13. Facility Maintenance	Post Construction	Mechanical
		Electrical
		Automation
		Piping
		Civil

Source: *Building and Construction Occupational Analysis, Department of Skills Development*

Table 4.2 : Business and Finance Occupational Analysis (OA) Job Area

LEVEL / AREA	PUBLIC RELATIONS
L5	**FB-051-5:2014** Public Relations Support Management
L4	**FB-051-4:2014** Public Relations Support Administration
L3	**FB-051-3:2014** Public Relations Support Services
L2	Not Available
L1	Not Available

LEVEL	FINANCE
L8	Chief Finance Officer (CFO)
L7	Finance Senior Manager
L6	Finance Manager
L5	Finance Assistant Manager
L4	Finance Executive
L3	Finance Officer
L2	Finance Clerk
L1	No Level

Source: *Business and Finance Occupational Analysis, Department of Skills Development*

Table 4.3: Electrical – Chargeman NOSS

	Low Voltage Electrical Chargeman		
L5	Not Available		
L4			
L3	**EE-302-3:2014** Electrical Chargeman A0 (Low Voltage) (28-11-95) (25-10-10) (02-04-2014)	**EE-303-3:2014** Electrical Chargeman A1 (Low Voltage) (28-11-95) (25-10-10) (02-04-2014)	**EE-304-3:2014** Electrical Chargeman A4 (Low Voltage) (28-11-95) (25-10-10) (02-04-2014)
L2	No Level		
L1			

Table 4.4: Professional Fleet Operation (Transportation) NOSS

	Public Services	Goods Vehicles	Heavy Vehicles	Emergency Vehicles
L5	Not Available			
L4				
L3	**TP-320-3:2012** Professional Fleet Operation (23-10-2012)			
L2	**TP-320-2:2012** Heavy, Public Service, Goods & Emergency Vehicles Driving (23-10-2012)			
L1	**TP-320-1:2012** Light, Public Service & Goods Vehicle Driving (23-10-2012)			

Source: NOSS Registry May 2016

Department of Skills Development

Table 4.5: Chemical Analysis NOSS

	Chemical Analysis
L5	Not Available
L4	
L3	**CM-070-3:2014** Chemical Laboratory Operation (25-09-2014)
L2	**CM-070-2:2014** Chemical Laboratory Operation (25-09-2014)
L1	No Level

Source: *NOSS Registry May 2016*

Department of Skills Development

Table 4.6: Geographical Information System (GIS) NOSS

	DATA CENTER (Geographical Information System (GIS)
L5	**IT-081-5** Geospatial Manager (10-12-10)
L4	**IT-081-4** Geospatial Executive (10-12-10)
L3	**IT-081-3** Geospatial Technician (10-12-10)
L2	No Level
L1	

Source: *NOSS Registry May 2016*

Department of Skills Development

Table 4.7: Store Job Area NOSS

	Logistic-Warehouse Fleet
L5	*Not Available*
L4	
L3	**FB-012-3** *Store Supervisor* (01-10-09)
L2	**FB-012-2** *Storekeeper* (01-10-09)
L1	**FB-012-1** Storehand (01-10-09)

Source: *NOSS Registry May 2016*

Department of Skills Development

Table 4.8: Matrix of Existing OF and NOSS against Water Services Industry Sub-sectors/Job Areas

No	WATER SERVICES INDUSTRY		EXISTING OA/OF		NOSS												
	SUB-SECTOR	JOB AREAS	Building & Construction	Business & Finance	Dam Safety	Water Instrumentation	Water Distribution	Non Revenue Water	Water Treatment	Sewage Treatment	Conveyance (Sewage)	Electrical – Chargeman	Professional Fleet Operation (Transportation)	Chemical Analysis	Desludging	Geographical Information System (GIS)	Store
1	**Water Supply**	Water Resource			X												
		Water Treatment							X								
		Water Distribution					X										
		Non Revenue Water						X									
		Consumer /Customer Service		X													
		Water Infra-structure Development	X														
2	**Sewerage**	Sewerage Network									X						
		Sewerage Treatment								X							
		Desludging													X		
		Customer service	X														

No	WATER SERVICES INDUSTRY		EXISTING OA/OF		NOSS												
	SUB-SECTOR	JOB AREAS	Building & Construction	Business & Finance	Dam Safety	Instrumentation	Water Distribution	Non Revenue Water	Water Treatment	Sewage Treatment	Conveyance (Sewage)	Electrical – Chargeman	Fleet Operation (Transportati	Chemical Analysis	Desludging	Geographical Information System (GIS)	Store
3	Support Services	Mechanical & Electrical (M&E)	X									X					
		Water Quality /Laboratory												X			
		Instrumentation				X											
		Fleet Management											X				
		Geographical Information System (GIS) Network Modelling														X	
		Store															X

4.3 SURVEY ANALYSIS

Based on the main key themes, a semi-structured survey was formulated to address each of the areas of discussion that will ultimately lead to the objective of the project. The survey comprised of several questions which were divided into 2 sections revolving the key themes identified during the focus group discussion. A sample of the interview/survey questions is included in this report in Annex 3.

Generally during each meeting the main topics of discussion revolved around the topics in the questionnaire. One-on-one interviews with relevant personnel were conducted during the workshops but most workshop discussions consisted of a more collective discussion of pertaining issues. Material and samples of relevant documentation were provided for further comprehension during the meetings whereas web links and material were emailed to the researcher by the corresponding organisations. Table 4.9 shows a summary of the qualitative analysis done throughout this research.

Table 4.9: Qualitative Analysis of Industry Survey

Research Objective	No. of Respondents	Location	Instrument/ Method	Related Annex
To produce occupational structure (OS) from data analysis, interviews, site visits and focus group;	6	IBIS Styles Hotel	Working Group/ Discussion Workshop	Refer Occupational Structure
To determine job descriptions of each job title from the OS;	6	IBIS Styles Hotel	Focus Group Discussion	Refer Job Descriptions
To investigate the skills in demand in the industry.	10	Various	Semi-structured Surveys	Refer Section 4.6 Chapter 4
Total respondents	**16**	**-**	**-**	**-**

4.4 OCCUPATIONAL STRUCTURE

The identified sub-sectors for the Water Services Industry were obtained through and discussions with industry experts during the development workshop sessions and interviews. The Occupational Structures and summary of job titles for these sub-sectors are included in this section.

Table 4.10: Summary of Job Titles

No	SECTOR	SUB-SECTOR	LEVEL								NUMBER OF JOB TITLES IDENTIFIED
			1	2	3	4	5	6	7	8	
1	Water Supply	Water Resource	1	1	1	1	1	1	-	-	48
		Water Treatment	1	1	2	1			-	-	
		Water Distribution	2	2	2	2	1	1	-	-	
		Non Revenue Water	-	1	1	1	1	1	-	-	
		Consumer /Customer Service	-	3	3	3	1	1	-	-	
		Water Infra-structure Development	-	3	2	2	2	2	-	-	
2	Sewerage	Sewerage Network	1	2	1	1	1	1	-	-	41
		Sewerage Treatment	2	2	1	1			-	-	
		Desludging	1	1	1	1			-	-	
		Customer Service	2	3	3	3	1	1	-	-	
		Sewerage Infra-structure Development	-	3	2	2	2	2	-	-	
3	Support Services	Water Quality/ Laboratory	-	1	1	1	1	1	-	-	26
		Instrumentation	-	-	-	1	1	1	-	-	
		Fleet Management	-	-	1	1	1	1	-	-	
		GIS & Network Modelling	-	-	-	1	1	1	-	-	
		Store	-	-	1	1	1	1	-	-	
TOTAL NO. OF JOB TITLES IDENTIFIED			**10**	**24**	**23**	**25**	**17**	**16**	**0**	**0**	**115**

A total of 115 job titles have been identified for the Water Services Industry. With the majority of 48 job titles under the Water Supply sub-sector. With reference to Table 4.10 above, below is a brief description of each sub-sector:

i. Water Supply @ Division 36: Water Collection, Treatment And Supply

a) Water Resource

The occupations under this area deal with the water resource such as rivers and dams in terms of management.

b) Water Treatment

Deals with the treatment of raw water from the resource before being distributed to the consumer.

c) Water Distribution

Is responsible for the distribution of water to the consumers.

d) Non Revenue Water

This area deals with the ongoing problem of Non Revenue Water. The impact is loss of water supply that cannot be accounted for.

e) Consumer / Customer Service

This area is responsible for dealing with water consumers in terms of account management and customer relations.

f) Water Infrastructure Development

The jobs under this area are responsible for the project management, asset management, planning and research of suitable locations for water infrastructure till the construction of the infrastructure.

ii.Sewerage Water @ Division 37: Sewerage

a) Sewerage Network

Those under this area are responsible for the operation and maintenance of the sewerage network.

b) **Sewerage Treatment**

Those under this area are responsible for the operation and maintenance of the sewerage treatment plant & pumping station

c) Desludging

Those under this area are responsible for the desludging operation and processes

d) Customer Service

This area is responsible for dealing with sewerage consumers in terms of account management and customer relations.

e) Sewerage Infrastructure Development

The jobs under this area are responsible for the project management, asset management, planning and research of suitable locations for sewerage infrastructure till the construction of the infrastructure.

iii. Support Services

a) Water Quality/Laboratory

Personnel under this area are responsible for testing and analysing the water quality through laboratory testing of the water and sewage.

b) Facilities M&E

Personnel under this area are responsible for maintenance and troubleshooting of Mechanical and Electrical aspects in water and sewerage infrastructure and facilities.

c) Instrumentation

Responsible for instrumentation work in the water and sewerage systems

d) Fleet Management

Manages the transportation or fleet provided to meet the requirements of the water and sewerage operations

e) Geographical Information System (GIS) and Network Modelling

Responsible for carrying out network modelling and applying information from GIS in work involving geographical elements

f) Store

Responsible for the management and operations of the store

4.5 OCCUPATIONAL DESCRIPTION

The Occupational Description describes the occupations under the Occupational Structure in terms of competencies and duties that they are designated to carry out as competent personnel. These Occupational Descriptions can be used as reference for employees, employers, practitioners, trainers and academicians alike.

The Occupational Descriptions for the critical Job Titles have been developed as a result of this research. Please refer the details of these Occupational Descriptions in Annex 5 of this report.

4.6 SKILLS IN DEMAND

This section will highlight the skills in demand which is projected to be skilled personnel requirement in the Water Services Industry. Job titles under this category reflect the immediate industry requirement for skilled workers. The identification of critical job titles is the essence of developing the Occupational Standards for the job so that formal training can be carried out and skilled workers can be produced and supplied to the industry.

It must be highlighted that other job titles not considered as in demand were because the current number of personnel under these categories were sufficient. Findings for this section were obtained via qualitative analysis during discussions and analysis of survey results.

Table 4.11: Skills In demand

SKILLS IN DEMAND	RATIONALE	POTENTIAL STRATEGIES AND PROPOSED SOLUTIONS
1. SHORTAGES OF SKILLED WORKFORCE		
Water Resource Operator until Engineer/ Technical Manager	Water Resource is an important concern in ensuring consistent supply of water	Provide specialised certification courses for this area
Water Treatment Operator until Engineer/ Technical Manager	Skilled Water Treatment personnel at entry level till supervisory level are still in demand	Provide specialised certification courses for this area
Water Distribution Operator until Technician level	Sufficient and skilled personnel at these levels are required in Water Distribution	Provide specialised certification courses for this area
Non Revenue Water Fitter till Engineer/ Technical Manager level	Non Revenue Water is a main concern not only in Malaysia but globally	Provide specialised certification courses for this area
User Accounts Administration Clerk and Supervisors	Requires personnel who are formally trained	Provide specialised certification courses for this area
Meter Reading and Billing meter readers till supervisor level	Requires personnel who are formally trained	Provide specialised certification courses for this area
Customer Relations Representatives till supervisors	Requires personnel who are formally trained as they are the front end and represent the organisation	Provide specialised certification courses for this area
Water Infrastructure Development Technician till Senior Technician	Competencies are required to be enhanced under this job area	Provide specialised certification courses for this area
Sewerage Network operator until Technician level	Requires personnel who are formally trained	Provide specialised certification courses for this area

SKILLS IN DEMAND	RATIONALE	POTENTIAL STRATEGIES AND PROPOSED SOLUTIONS
Sewerage /Treatment & Pumping Station operator until technician level	Requires skilled and certified manpower	Provide specialised certification courses for this area
Desludging operator until technician level	Requires skilled and certified manpower	Provide specialised certification courses for this area
Sewerage (Sewerage Network, Desludging, Treatment & Pumping Station) Technical Manager	Requires skilled personnel in planning and design	Provide specialised certification courses for this area Include in tertiary education syllabus
Senior Technical Manager, Technical Manager	Requires skilled personnel on catchment area studies, planning strategies etc.	Requires personnel with planning and design competencies
Electrician / Chargeman under Support Services/ Mechanical & Electrical (M&E)	Is required especially in highly regulated locations where only competent personnel are allowed	Certification is provided by the Energy Commission
Lab Assistant/Lab Technician till Chemists under Support Services/ (Water Quality /Laboratory)	Is required for daily sampling and chemists are required in accreditation of laboratories	Training and certification is already provided under the chemical sector
Instrumentation Technician under Support Services/ Instrumentation	Requires skilled and certified manpower	Training and certification is already provided under the water sector
GIS and Network Modeling Executive	Support Services/ Geographical Information System (GIS) and Network Modeling	Training and certification is already provided under the ICT sector
Store Assistant under Support Services/ Store	Requires skilled and certified manpower	Training and certification is already provided under the logistics sector
2. TECHNICAL SKILLS		
Water Resources Planning and Operation	Planning–utilise available resources to augment existing resource. Operation – understand and	Include required skills in training

SKILLS IN DEMAND	RATIONALE	POTENTIAL STRATEGIES AND PROPOSED SOLUTIONS
	operate resource release economically by Raw Water balance method. Apply WSP to identify resource risk and put up control measures.	
Water Treatment Planning and Operation	Planning – explore new augmentation resource for existing WTP to sustain longer droughts, El Nino and climate change. Operation – always comply with drinking water quality standards. Apply WSP to identify risk elements and put up control measures.	Include required skills in training
Water distribution Planning, Operation.	Planning – all new development areas to be incorporated in the master network to identify network weakness. Operation – all network links weakness to be identified and further appropriate actions taken.	Include required skills in training
Non Revenue Water training Planning and Operation.	Training – Sufficient number of personnel required managing and reducing NRW to an economic level. Planning – District Metering Zones (DMZ) to be completed immediately to facilitate prioritising leak detection initiative. Operation – effective leak detection and repair to be carried out.	Include required skills in training
Water Infrastructure Development planning	Mapping all development applications and water supply need by each year and phase. Utilise network modeling to accommodate new demand areas. New distribution augmentation works to be identified.	Include required skills in training
Consumer / Customer Service Operation	Requires technical knowhow, communication skills and negotiation skills when engaging with customers	Include required skills in training
Facilities M&E Operation	Understand how M&E equipment works to establish preventive maintenance schedule and implementation.	Include required skills in training

SKILLS IN DEMAND	RATIONALE	POTENTIAL STRATEGIES AND PROPOSED SOLUTIONS
Water Quality/ Laboratory Operation.	Required for accreditation of lab and to conduct regular sample testing as per schedule.	Include required skills in training
Difficulty in preparing business plan	Lack of commercial acumen and exposure	Provide training and set KPI for high performing organisation
Meter management (under M&E dept)	Required for activities such as tracking and monitoring , Metering, Meter sizing and Maintenance	Include required skills in training
Asset Management	Required in planning of assets	Include required skills in training
Risk management	Management tool for planning /preventive tool in areas such as Water security and NRW	Include required skills in training
Corrosion Protection system	Required for Distribution and Treatment personnel	Include required skills in training
3. EMERGING SKILL NEEDS		
Water security Raw Water Balance, Groundwater exploration,ORS development, Pollution control/reduction	For areas under Water Resources	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Groundwater systems and Membrane systems	For areas that require automation suitable for groundwater and systems/membrane systems	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Network modeling, SCADA system GIS	For efficient and balanced distribution system and for water asset management.	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Leak Detection	For areas under NRW	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Pressure management control	For areas under NRW	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Customer relations information systems. Work order management systems.	For areas under Consumer/Customer Relations	Conduct research on these areas and methods on how to train personnel in acquiring these skills

SKILLS IN DEMAND	RATIONALE	POTENTIAL STRATEGIES AND PROPOSED SOLUTIONS
Predictive/Condition-based maintenance (CBM) tools such as oil analysis, vibration analysis and infrared thermography	To ensure a robust and comprehensive maintenance environment	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Recycled Water, Ground Water Exploration, Sea Water Desalination	Research on options of water resources	Conduct research on these areas and methods on how to train personnel in acquiring these skills
Green technology	To ensure sustainibility through Renewable Energy, Energy management , Carbon footprint Knowledge and Skills required to fulfill ISO requirements (50001) and ISO 14000	Conduct research on these areas and methods on how to train personnel in acquiring these skills

4.7 CHAPTER CONCLUSION

Based on this chapter, the sectors that have been identified reflect the main sectors in the Water Services Industry. The visual representations of the Occupational Structures will enable the industry to be interpreted at a glance in terms of levels of competency and available career paths.

The Occupational Descriptions are elaborated in Annex 6 of this report, which outline the responsibilities of a particular job. The skills in demand identified via the surveys and working groups can assist the industry in identifying the rationale and challenges plus the proposed strategies to overcome skills shortage in the industry.

The National Occupational Skills Standards (NOSS) and the education and training curriculum can be developed from the job titles listed in the Water Services Industry Occupational Structure.

CHAPTER 5:

DISCUSSION, RECOMMENDATION &CONCLUSION

This chapter will further elaborate the conclusion obtained based on the synthesis of findings. This will be followed by the recommendations as put forth by the researcher based on input throughout the development of this Occupational Framework

5.1 DISCUSSION

This section will highlight the Critical Job Titles which reflect skilled personnel requirement in the Water Services industry. Job titles under this category reflect the immediate industry requirement for skilled workers. The identification of critical job titles are the essence of developing the Occupational Standard for the job so that formal training can be carried out and skilled personnel can be produced and supplied to the industry. It must be highlighted that other job titles are not considered as critical because the current number of personnel under these categories is sufficient, however this does not mean that it is not important.

Critical job titles are defined based on the following scenarios in order of importance:

a) Shortages of skilled workers supply in the industry
b) Shortages of workers for a particular job area in the industry
c) Strategic assessment in terms of direction for both short term and long term periods

Table 5.1: List of Critical Job Titles

Item	Critical Job Title	Sub-Sector/Job Area	Level
1.	Water Resource Operator	Water Resource	1
2.	Water Resource Senior Operator	Water Resource	2
3.	Water Resource Technician	Water Resource	3
4.	Technical Assistant / Senior Technician	Water Resource	4
5.	Engineer /Technical Manager/Plant Manager	Water Resource / Water Treatment	5
6.	Water Treatment Operator	Water Treatment	1
7.	Water Treatment Senior Operator	Water Treatment	2
8.	Water Treatment Technician	Water Treatment	3
9.	Pipe Fitter	Water Distribution/Network	1
10.	Senior Fitter	Water Distribution/Network	2
11.	Technician	Water Distribution/Network	3
12.	Pump Operator	Water Distribution /Distribution Installation	1
13.	Senior Pump Operator	Water Distribution /Distribution Installation	2
14.	Technician	Water Distribution /Distribution Installation	3
15.	NRW Fitter	Non Revenue Water (NRW)	2
16.	NRW Technician	Non Revenue Water (NRW)	3
17.	Technical Assistant / Senior Technician/ Executive	Non Revenue Water (NRW)	4
18.	Engineer /Technical Manager/ Section Head	Non Revenue Water (NRW)	5
19.	Clerk	User Accounts Administration	2
20.	Senior Clerk	User Accounts Administration	3
21.	Meter Reader	Meter Reading and Billing	2
22.	Supervisor/ Senior Meter Reader	Meter Reading and Billing	3

Item	Critical Job Title	Sub-Sector/Job Area	Level
23.	Customer Service Rep / Call Centre Rep/ Front Desk Rep	Customer Relations	2
24.	Supervisor	Customer Relations	3
25.	Technician	Water Infrastructure Development/ Planning and Design	2
26.	Technician	Water Infrastructure Development/ Asset Management	2
27.	Senior Technician	Water Infrastructure Development/ Planning and Design , Asset Management	3
28.	Technician	Water Infrastructure Development/ Project Management	2
29.	Senior Technician	Water Infrastructure Development/ Project Management	3
30.	Operator	Sewerage Network	1
31.	Senior Operator	Sewerage Network	2
32.	Technician/Supervisor	Sewerage Network	3
33.	Operator	Sewerage Treatment	1
34.	Senior Operator	Sewerage Treatment	2
35.	Technician/ Supervisor	Sewerage Treatment	3
36.	Operator	Desludging	1
37.	Senior Operator	Desludging	2
38.	Supervisor / Technician	Desludging	3
39.	Technical Assistant / Senior Technician	Desludging	4
40.	Technical Manager/Engineer	Sewerage /Network, Desludging, Treatment	5
41.	Technician	Sewerage Infrastructure Development/ Planning and Design	2
42.	Technician	Sewerage Infrastructure Development/ Asset Management	2
43.	Senior Technician	Sewerage Infrastructure Development/ Planning and Design, Asset Management	3

Item	Critical Job Title	Sub-Sector/Job Area	Level
44.	Technician	Sewerage Infrastructure Development/Project Management	2
45.	Senior Technician	Sewerage Infrastructure Development/Project Management	3
46.	Chargeman *	Support Services/ Mechanical & Electrical (M&E)	4
47.	Lab Technician *	Support Services/ (Water Quality /Laboratory)	3
48.	Instrumentation Technician*	Support Services/ Instrumentation	4
49.	Executive*	Support Services/ Geographical Information System (GIS) and Network Modelling	4
50.	Store Assistant*	Support Services/ Store	3

*Note : The Occupational Description for the job titles marked with * are not included in this document, please refer relevant industry documents.*

Table 5.1 above, shows the summary of job titles according to sub-sectors and job areas. It can be seen that there are a total of 50 critical job titles. Most of these critical job titles are in the job areas of Water Resources, Non Revenue Water and Sewerage Treatment. Job titles highlighted to be critical were mostly at level 1, as an Operator until Technician at level 3.

It must be noted that not all the critical job titles will be developed as a NOSS. Considerations for job titles that already have relevant NOSS developed or are under different industry sectors will be deliberated.

5.2 RECOMMENDATION

Referring to Malaysia's economic plans and vision for the coming years, a framework of the Water Services Industry workforce has been identified. It is hoped that the result of this Occupational Framework will be used as a reference to fulfil the future plans of developing skilled personnel and certifying Malaysians in this industry

towards improving the quality of the services provided in terms of water supply and sewerage.

There are several options when addressing or mitigating workforce gaps which may include establishing and maintaining partnerships with other Government agencies or departments, or educational institutions to increase external talent pools and also through the training of existing staff in line with new skills requirements.

Based on the above, specific recommendations are as follows:

a) To continue and streamline efforts in NOSS development for areas under the Water Services Industry in line with the findings of this analysis. This includes the development of the NOSS for the sectors and sub-sectors that are in demand and have not been developed. The list of areas recommended for NOSS development are such as:
    - Water Resources
    - Sewerage Treatment

    NOSS development for jobs areas at level 1 till level 3 which do not have a NOSS yet is encouraged, in order to provide a platform to train and certify workers in the Water Services Industry.

b) To encourage apprenticeship training (National Dual Training System –NDTS) in the industry to be run for the areas identified suitable.

c) Promote certification of existing and experienced personnel in the industry through Accreditation via Prior Achievement (*Pengiktirafan Pencapaian Terdahulu – PPT).*

5.3 CONCLUSION

The conclusion is divided based on the earlier objectives of the OF as elaborated below:

Objective 1: Occupational Structure

As a result of the Water Services Industry Occupational Framework conducted together with expert panel members from various organizations, a total of 3 main sectors, and 115 job titles have been identified. A total of 50 critical job titles were identified in the focus group workshops and survey results from various areas of

expertise. By planning and conducting the training and certification of Water Services Industry personnel in the near future, it is hoped that there will be a steady flow of local skilled and certified workers.

Objective 2: Occupational Descriptions

The Occupational Descriptions will serve as reference of job scope and the required competencies for NOSS development. Please refer the Occupational Descriptions in Annex 5.

Objective 3: Skills In Demand

Based on the survey findings, the survey respondents highlighted the skills in demand which mainly consisted of skills required in planning and operation and in ensuring water security. (Please refer the details according to the respective areas in table 4.3). The skills above are encouraged to be included in the training curriculum according to the respective areas in order to develop a Water Services Industry workforce ready to provide efficient, reliable and quality services. In order to train personnel in new emerging skills, knowledge transfer programmes and benchmarking visits are recommended to countries that have implemented them.

Overall Conclusion

Referring to Malaysia's economical plans and vision for the coming years, a framework of the Water Services Industry workforce has been identified. It is hoped that the result of the research and development work of the Occupational Framework for the Water Services Industry will be able to be used as reference as how to fulfil the future plans of developing skilled personnel and certifying Malaysians in the Water Services Industry.

REFERENCES

1. Ministry Of Energy, Green Technology And Water (Kettha). Http://Www.Kettha.Gov.My/Portal/Index.Php?R=Kandungan/Index&Menu1_Id=4&Menu2_Id=47&Menu3_Id=167#.Vrf5kfl97iu
2. Ministry Of Natural Resources And Environment. Http://Www.Nre.Gov.My/En-My/Pages/Default.Aspx
3. Department Of Irrigation & Drainage. Http://Www.Water.Gov.My/About-Us-Mainmenu-243/Profile/Our-Background-Mainmenu-508?Lang=En
4. Pengurusan Aset Air Berhad.(Paab) Http://Www.Paab.My/Inside-Paab
5. Sewerage Service Department (Ssd). Http://Www.Jpp.Gov.My/Index.Php/En/Jpp/Perihal-Jpp/Profile
6. Indah Water Konsortium Berhad. Https://Www.Iwk.Com.My/
7. Department Of Water Supply. Http://Www.Jba.Gov.My/Index.Php/En/Hubungi/Hubungi-Kami
8. The Malaysian Water Association. Www.Mwa.Org.My
9. Eleventh Malaysia Plan (11th Mp). Chapter 3: Enhancing Inclusiveness Towards An Equitable Society. Focus Area C Transforming Rural Areas To Uplift Wellbeing Of Rural Communities. Page 3-28
10. Government Transformation Programme. Http://Www.Epu.Gov.My/En/Goverment-Transformation-Programme
11. Http://Etp.Pemandu.Gov.My/Upload/Etp_Theedge_Pull_Out.Pdf
12. Water Malaysia. The Malaysian Water Association Quarterly. Issue No. 29. Issn: 1675-2392 Http://Www.Mwa.Org.My/Publication-Magazine.Html
13. Water Services Industry Act 2006 .Act 655. Http://Www.Span.Gov.My/Pdf/Law/Bi/Act655_Bi_2006.Pdf
14. Suruhanjaya Perkhidmatan Air Negara Act 2006 Act 654.Span.
15. Http://Www.Span.Gov.My/Pdf/Law/Bi/Act654_Bi_2006.Pdf
16. Strengthening The Institutions And Regulations, And To Increase R&D Activities: Focus On Malaysia Saim Suratman National Hydraulic Research Institute Of Malaysia (Nahrim). Http://Www.Fao.Org/Fileadmin/User_Upload/Groundwatergovernance/Docs/Shijiazhuang/Presentations-Pdfs/Day1/Ps2_Suratmansaim.Pdf
17. Malaysia: Sewerage Services Act, 1993 (No. 508)Http://Faolex.Fao.Org/Cgi-Bin/Faolex.Exe?Rec_Id=026023&Database=Faolex&Search_Type=Link&Table=Result&Lang=Eng&Format_Name=@Erall
18. Sabah Water Resources Act 1998.Http://Ww2.Sabah.Gov.My/Phb/Wp-Content/Uploads/2011/05/Sabahwaterresourcesenactment1998.Pdf
19. Environmental Law And Policy In Sabah: From Ridge To Reef Volume 7: Water Resources. Http://Foreversabah.Org/Wp-Content/Uploads/2015/08/Environmental-Law-And-Policy-In-Sabah-Vol.-7-Water-Resources.Pd
20. Sabah Water Supply Enactment 2003. Http://Ww2.Sabah.Gov.My/Phb/Wp-Content/Uploads/2011/05/Sabahwatersupplyenactment2003.Pdf
21. Laws Of Sarawak. Water Ordinance 1994.
22. Http://Www.Luas.Gov.My/Index.Php?Option=Com_Content&View=Article&Id=118&Itemid=108&Lang=En
23. Http://Www.Luas.Gov.My/Perundangan/Enakmen%20luas%20(Eng).Pdf
24. Summary Of Environmental Quality Act (1974). Http://Myconstmanagehub.Blogspot.My/2013/01/Summary-Of-Environmental-Quality-Act.Html

25. Environmental Quality Act (1974)Http://Faolex.Fao.Org/Docs/Pdf/Mal13278.Pdf
26. Bmi Research. Malaysia. Http://Www.Bmiresearch.Com/Malaysia
27. Https://En.Wikipedia.Org/Wiki/Water_Supply_And_Sewerage_In_Malaysia
28. Http://Www.Paab.My/Regulations/National-Water-Services-Industry-Restructuring-Initiatives/
29. Reforming The Water Sector In Malaysia, By Lee Koon Yew, National Water Services Commission Of Malaysia, 2010
30. Latarbelakang JPP. Http://Www.JPP.Gov.My/Index.Php?Option=Com_Content&View=Article&Id=231&Itemid=195&Lang=Bm
31. About Us. PWSA. Http://Www.Pwsa.Com.My/?Page_Id=491
32. Ranhill Utilities. Un Millennium Development Goals. Http://Www.Ranhill.Com.My/Doc/Ranhill%20utilities.Pdf
33. International Water Association. Http://Www.Iwa-Network.Org/
34. Https://Www.Iwk.Com.My/Iwtc/Training-Courses
35. Human Resource Capacity Gaps Study.Http://Www.Iwa-Network.Org/Project/Human-Resource-Capacity-Gaps-Study
36. Søren Hvilshøj. Ramboll Global Market Director Reduction Of Non-Revenue Water Around The World Http://Www.Iwa-Network.Org/Blog2/Reduction-Of-Non-Revenue-Water-Around-The-World
37. About Us. Http://Www.Ofwat.Gov.Uk/
38. Http://Www.Mwa.Org.My/Pdf/Wm-Issue29_Final.Pdf
39. Malaysia's Water Vision: The Way Forward - The Malaysian Water Partnership. Http://Www.Fao.Org/Docrep/004/Ab776e/Ab776e02.Htm
40. Planning For A Water Blueprint In Malaysia. Malaysian Water Association Quarterly. Http://Www.Mwa.Org.My/Pdf/Wm-Issue29_Final.Pdf
41. Malaysian Water Sector Reform. Policy And Performance. Ching Thoo Kim. 2012. Wageningen University
42. NOSSRegistry . February 2016.Department Of Skills Development
43. Malaysian Standard Industrial Classification. MSIC 2008. Department Of Statistics.

ANNEX 1

MOSQF LEVEL DESCRIPTORS

MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF) LEVEL DESCRIPTOR

LEVEL	LEVEL DESCRIPTION
1	Competent in performing a range of varied work activities, most of which are **routine and predictable.**
2	Competent in performing **a significant range of varied work activities**, performed in a variety of context. Some of the **activities are non-routine** and required individual responsibility and autonomy.
3	Competent in performing **a broad range of varied work activities**, performed in a variety of context, most of which are **complex and non-routine.** There is considerable responsibility and autonomy and **control or guidance of others** is often required.
4	Competent in performing **a broad range of complex technical or professional work** activities carried out in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present.**Higher level of technical skills** should be demonstrated.
5	Competent in applying a significant range of **fundamental principles and complex techniques across** a wide and often unpredictable variety of contexts. Very **substantial personal autonomy** and often significant responsibility for the work of others and for the allocation of substantial resources feature strongly, as do personal accountabilities for **analysis and diagnosis, design, planning, execution and evaluation**. Specialisation of technical skills should be demonstrated.
6	Achievement at this level reflects the ability to **refine** and use relevant understanding, methods and skills to address **complex problems that have limited definition**. It includes taking responsibility for planning and developing courses of action **that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment.** It also reflects an understanding of different perspectives, **approaches of schools of thought and the theories that underpin them**
7	Achievement at this level reflects the ability to **reformulate** and use relevant understanding, methodologies and approaches to address **problematic situations** that involve many interacting factors. It includes taking responsibility for **planning and developing** courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding **of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work**
8	Achievement at this level reflects the **ability to develop original understanding** and extend an sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complexes, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge, or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.

ANNEX 2

LIST OF CONTRIBUTORS

LIST OF INDUSTRY PANEL MEMBERS FOR THE WATER SERVICES INDUSTRY OCCUPATIONAL FRAMEWORK DEVELOPMENT

NO	NAME	EXPERTISE	POSITION	ORGANISATION
1	Datuk Ir. Hj. Mohd.Khalid Bin Hj. Nasir	Water	Chief Executive Officer	Syarikat Air Melaka Berhad
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ANNEX 3

QUESTIONNAIRE

WATER SERVICES INDUSTRY
OCCUPATIONAL FRAMEWORK SURVEY

SOAL SELIDIK KERANGKA PEKERJAAN
INDUSTRI PERKHIDMATAN AIR

Salam 1 Malaysia.

In collaboration with the Department of Skills Development (DSD), Ministry of Human Resources, the researcher is currently conducting an analysis on the Occupational Framework of the Water Services Industry. From this analysis, the industry framework, occupational structure , occupational job titles, and job description will be summarised for the use of the Government, private sector, investors , employers, employees, educators or any personnel involved either directly or indirectly with this industry. The main objective of this research is to enhance skills training in this industry via input from the industry.

We would like to extend our heartfelt gratitude upon your cooperation in answering this survey. This survey will be used as field data in order to conduct a comprehensive analysis of the Occupational Framework in the industry.

Please fill in where necessary in the forms provided. Any inconvenience caused is deeply regretted. Do advise us if you wish to remain anonymous in your survey response. There will be further communication with survey respondents in order to verify our findings.

Penyelidik sedang menganalisa Kerangka Pekerjaan Industri Perkhidmatan Air dengan kerjasama Jabatan Pembangunan Kemahiran (JPK), Kementerian Sumber Manusia. Melalui analisis ini, rangka kerja industri, struktur pekerjaan, tajuk pekerjaan, dan deskripsi kerja akan didapati untuk kegunaan Kerajaan, sektor swasta, pelabur, majikan, pekerja, pendidik atau mana-mana kakitangan yang terlibat sama ada secara langsung atau tidak langsung dengan industri ini. Tujuan utama kajian ini adalah untuk meningkatkan latihan kemahiran bagi industri ini melalui maklumat yang diberi oleh industri.Kami ingin mengucapkan ribuan terima kasih atas kerjasama anda dalam menjawab soal selidik ini. Dapatan ini akan digunakan sebagai data lapangan untuk menjalankan analisis yang menyeluruh dalam Kerangka Pekerjaan Industri.

Sila isi tempat kosong yang disediakan.Sebarang kesulitan amat dikesali. Sila maklumkan kepada kami jika anda ingin kekal tanpa nama dalam maklum balas kaji selidik anda. Komunikasi lebih lanjut dengan responden akan dilakukan untuk mengesahkan hasil kajian kami.

Survey Respondent Details/ Butiran Responden

Name / *Nama* : _____

Position/ *Jawatan* : _____

Organisation/ *Organisasi* : _____

Date / *Tarikh* : _____

Please answer the questions below in the space provided, additional pages may be added if necessary. There are 10 questions in this 16 page survey.
Sila jawab soalan di ruang yang disediakan.terdapat 10 soalan didalam 16 halaman borang soal selidik ini.

SECTION 1 : INDUSTRY WORKFORCE /
BAHAGIAN*1 : TENAGA KERJA INDUSTRI*

2. Do you agree with the segmentation of the water supply sub-sector as shown below? Please explain areas you do not agree with and why. */Adakah anda bersetuju dengan pembahagian terhadap sub-sektor Bekalan Air seperti yang ditunjukkan dibawah? Sila nyatakan bidang yang anda tidak setuju dan mengapa.*

Table 1: Water Services Industry – Water Supply Sub-sector

Sector	Water Services Industry												
Sub-Sector	Water Supply												
Area	Water Resource		Water Treatment		Water Distribution		Non Revenue Water			Consumer / Customer Service			Water Infra-structure Development
Sub-Area/ Level	Catchment / Rivers	Dams	Production	Maintenance	Pump House	Network	District Meter Zone Development	Leak Detection	Monitoring	User Account Administration	Meter Reading and Billing	Customer Relations	
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
6	Senior Engineer				Senior Engineer		Senior Engineer			Senior Manager			Senior Technical Manager
5	Engineer /Technical Manager				Engineer /Technical Manager		Engineer /Technical Manager			Manager			Technical Manager
4	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Senior Technician / Technical Assistant	Executive	Executive	Executive	Executive
3	Technician	Technician	Technician	Technician	Technician	Technician	Technician	Technician	Technician	Supervisor	Supervisor	Supervisor	Senior Technician
2	Operator	Operator	Operator	Plant Fitter /Handyman	Pump Operator	Pipe Fitter/ Handyman	NRW Fitter	NRW Fitter	NRW Fitter	Senior Clerk	Senior Meter Reader	Call Centre Rep	Technician
1	No Level	No Level No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	Clerk	Meter Reader	Front Desk Rep	No Level

3. Do you agree with the segmentation of the sewerage sub-sector as shown below? Please explain areas you do not agree with and why. / *Adakah anda bersetuju dengan pembahagian terhadap sub-sektor Pembetungan seperti yang ditunjukkan dibawah? Sila nyatakan bidang yang anda tidak setuju dan mengapa.*

Table 2: Water Services Industry – Sewerage Sub-sector

Sector	Water Services Industry						
Sub-Sector	Sewerage						
Area	Sewerage Network	Treatment & Pumping Station		Desludging	Customer Service		
Sub-Area/ Level		Treatment Plant	Pump Station		Account Administration	Billing	Customer Relations
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	No Level	No Level	No Level	No Level	No Level	No Level
6	Senior Technical Manager				Senior Manager		
5	Technical Manager				Manager		
4	Executive	Executive		Executive	Executive	Executive	Executive
3	Supervisor	Supervisor		Supervisor	Supervisor	Supervisor	Supervisor
2	Technician/ Jettor Driver	Technician	Technician	Technician	Senior Clerk	Senior Clerk	Call Centre Rep
1	Operator	Operator	Operator	Operator	Clerk	Clerk	Front Desk Rep

4. Do you agree with the segmentation of the support services sub-sector as shown below? Please explain areas you do not agree with and why. / *Adakah anda bersetuju dengan pembahagian terhadap sub-sektor Perkhidmatan Sokongan seperti yang ditunjukkan dibawah? Sila nyatakan bidang yang anda tidak setuju dan mengapa.*

Table 3: Water Services Industry – Support Services Sub-sector

Sector	Water Services Industry							
Sub-Sector	Support Services							
Area / Sub-Area/ Level	M&E		Water Quality /Laboratory	Instrumentation	Transportation	Geographical Information System (GIS)	Network Modelling	Store
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
6	Senior Manager		Senior Manager	Senior Manager	Senior Manager	Senior Manager	Senior Manager	Senior Manager
5	M&E Technician	Chargeman	Lab Manager	Manager	Manager	Manager	Manager	Manager
4	M&E Assistant Technician	Electrician	Lab Asst Manager	Instrumentation Technician	Executive	Executive	Executive	Executive
3	M&E Fitter		Lab Assistant	No Level	Mechanical Fitter	No Level	No Level	Store Assistant
2	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level

5. Please fill in and list down the Job Titles and Job Scope according to the specified job area relevant to your area of work. / *Sila isi dan senaraikan Tajuk Pekerjaan serta skop kerja mengikut bidang kerja yang berkaitan dengan anda*.

   Your Area of Work / *Bidang kerja yang berkaitan dengan anda*:_____

Job Levels / ***Tahap Pekerjaan***	**Job Titles /** ***Tajuk Pekerjaan***	**Job Scope/** ***Skop kerja***
SAMPLE ANSWER/CONTOH JAWAPAN: Technical Management / Pengurusan teknikal	Senior Engineer, Engineer /Technical Manager	Designing how to obtain water/ Merekabentuk kaedah mendapatkan air
i. Specialisation and Innovation / Pengkhususan dan inovasi		
ii. Technical Management / Pengurusan teknikal		
iii. Coordination (Supervision)/ Penyelarasan (penyeliaan)		
iv. Operation /Production / Operasi /pengeluaran		

Legend/Nota:

i. **Specialisation and Innovation :**
The personnel should possess competency in innovation and specialization relevant to the specific area
Pengkhususan dan Inovasi:
Pekerja perlu mempunyai kecekapan dalam inovasi dan pengkhususan berkaitan dengan bidang kerja tertentu.

ii. **Technical Management:**
The personnel is responsible for managing the technical aspects of the job area
Pengurusan Teknikal:
Pekerja yang bertanggungjawab untuk menguruskan aspek teknikal bagi bidang kerja tertentu

iii. **Coordination (Supervision):**
The personnel is responsible for supervising a group of subordinates and coordinating work activities at the work site.
Penyelarasan (Penyeliaan):
Pekerja bertanggungjawab untuk menyelia sekumpulan pekerja bawahan dan menyelaras aktiviti kerja di tempat kerja.

iv. **Operation /Production:**
The personnel is responsible for operation of machineries, equipment and etc. They may also involved directly in the production process.
Operasi /pengeluaran:
Pekerja bertanggungjawab terhadap operasi jentera, peralatan dan lain-lain. Mereka juga boleh terlibat secara langsung dalam proses pengeluaran.

6. Please tick the jobs in demand, and the rationale.
/Sila tanda tajuk pekerja yang mempunyai permintaan terhadap pekerjaan (pekerjaan kritikal) dan nyatakan nama pekerjaan yang mempunyai permintaan serta rasionalnya.

Examples of reason for demand */Contoh punca permintaan*:

- Insufficient Manpower/*Kekurangan Tenaga Kerja*
- Not skilled, low performing/*Tidak berkemahiran, prestasi rendah*
- To fulfill Key Performance(KPI)/ *Untuk memenuhi KPI*

(a) **Sub-Sector /Sub-*Sektor***	**(b)** **Job Areas/ *Bidang Kerja***	**(c)** **Please tick (√) Jobs In Demand/ *Sila tanda (√) Tajuk Pekerjaan Yang Mempunyai Permintaan***		**(d)** **Please state if your organsation uses another job title/ *Sila nyatakan jika di organisasi anda menggunakan tajuk pekerjaan yang berbeza***	**(e)** **Please state reason of demand / *Sila nyatakan punca permintaan***
SAMPLE ANSWER / CONTOH JAWAPAN:		Senior Engineer	√	Senior Technical Manager	Insufficient Manpower/*Kekurangan Tenaga Kerja*
Water Supply /Bekalan Air	Water Resource/ *Sumber Air*	Senior Engineer			
		Engineer /Technical Manager			
		Senior Technician / Technical Assistant			
		Technician			
		Operator			
	Water Treatment/ *Rawatan Air*	Senior Engineer			
		Engineer /Technical Manager			
		Senior Technician / Technical Assistant			
		Technician			
		Operator /Fitter			

(a) **Sub-Sector /Sub-*Sektor***	(b) **Job Areas*/Bidang Kerja***	(c) **Please tick (√) Jobs In Demand*/Sila tanda (√) Tajuk Pekerjaan Yang Mempunyai Permintaan***		(d) **Please state if your organsation uses another job title/*Sila nyatakan jika di organisasi anda menggunakan tajuk pekerjaan yang berbeza***	(e) **Please state reason of demand /*Sila nyatakan punca permintaan***
Water Supply /Bekalan Air	Water Distribution /Pengagihan Air	Senior Engineer			
		Engineer /Technical Manager			
		Senior Technician / Technical Assistant			
		Technician			
		Operator /Fitter			
	Non-Revenue Water / *Air Tidak Berhasil*	Senior Engineer			
		Engineer /Technical Manager			
		Technical Assistant / Senior Technician			
		Technician			
		NRW Fitter			
	Water Infrastructure Development */Pembangunan Infrastruktur Air*	Senior Technical Manager			
		Technical Manager			
		Executive			
		Senior Technician			
		Technician			
	Consumer / Customer Service *Khidmat Pelanggan*	Senior Manager			
		Manager			

(a) **Sub-Sector /Sub-*Sektor***	(b) **Job Areas /*Bidang Kerja***	(c) **Please tick (√) Jobs In Demand /*Sila tanda (√) Tajuk Pekerjaan Yang Mempunyai Permintaan***		(d) **Please state if your organsation uses another job title/ *Sila nyatakan jika di organisasi anda menggunakan tajuk pekerjaan yang berbeza***	(e) **Please state reason of demand / *Sila nyatakan punca permintaan***
Water Supply /Bekalan Air	Consumer / Customer Service *Khidmat Pelanggan*	Executive			
		Supervisor			
		Clerk			
Sewerage/ Pembetungan	Sewerage Network/ *Rangkaian Pembetungan*	Senior Technical Manager			
		Technical Manager			
		Executive			
		Supervisor			
		Jettor Driver			
		Driver			
		Operator			
	Treatment & Pumping Station/ *Stesyen Rawatan dan Pengepaman*	Senior Technical Manager			
		Technical Manager			
		Executive			
		Supervisor			
		Technician			
		Operator			
	Desludging	Senior Manager			
		Manager			

(a) **Sub-Sector /Sub-*Sektor***	(b) **Job Areas *Bidang Kerja***	(c) **Please tick (√) Jobs In Demand *Sila tanda (√) Tajuk Pekerjaan Yang Mempunyai Permintaan***		(d) **Please state if your organsation uses another job title/*Sila nyatakan jika di organisasi anda menggunakan tajuk pekerjaan yang berbeza***	(e) **Please state reason of demand /*Sila nyatakan punca permintaan***
Sewerage/ Pembetungan	*Desludging*	Executive			
		Supervisor			
		Tanker Driver			
		Operator			
	Customer Service /*Khidmat Pelanggan*	Senior Manager			
		Manager			
		Executive			
		Supervisor			
		Clerk			
Support Services/ *Khidmat Sokongan*	M&E	Senior Manager			
		Manager			
		Executive			
		Chargeman			
		Electrician			
		M&E Fitter			
	Water Quality / Laboratory *Kualiti Air /Makmal*	Senior Manager			
		Lab Manager			
		Lab Assistant			

(a) **Sub-Sector /Sub-*Sektor***	(b) **Job Areas *IBidang Kerja***	(c) **Please tick (√) Jobs In Demand *ISila tanda (√) Tajuk Pekerjaan Yang Mempunyai Permintaan***		(d) **Please state if your organsation uses another job title/*Sila nyatakan jika di organisasi anda menggunakan tajuk pekerjaan yang berbeza***	(e) **Please state reason of demand /*Sila nyatakan punca permintaan***
Support Services/ *Khidmat Sokongan*	Instrumentation / *Instrumentasi*	Manager			
		Executive			
		Instrumentation Technician			
	Transportation / *Pengangkutan*	Manager			
		Executive			
		Mechanical Fitter			
	Geographical Information System (GIS)	Manager			
		Executive			
	Network Modelling/*Pemodelan Rangkaian*	Manager			
		Executive			
	Store /*Stor*	Manager			
		Executive			
		Store Assistant			

(f) Please state possible solution to increase jobs in demand / *Sila nyatakan penyelesaian bagi menambahkan pekerjaan yang mempunyai permintaan*

_____

_____

6.Which of the following challenges do you agree are present in the industry? Please fill in the suitable solution to the issues and challenges that you feel are present. /*Yang manakah diantara cabaran dibawah yang anda setuju wujud dalam industri ini? Sila isikan penyelesaian yang sesuai bagi isu dan cabaran tersebut.*

(a) **Issues and Challenges In the Water Services Industry /*Isu dan Cabaran Industri Perkhidmatan Air***	**(b)** **Agree /*Setuju*?** **(√)**	**(c)** **Proposed Solution(s) To Issues and Challenges /*Cadangkan Penyelesaian kepada Isu dan Cabaran***
SAMPLE ANSWER / CONTOH JAWAPAN: The Water And Sewerage Sectors Currently Work In Silo/*Sektor Air dan Pembetungan bekerja berasingan*	√	Put in place a complete and comprehensive cycle of water and sewerage /Mempunyai kitaran lengkap air dan pembetungan
i. The Water And Sewerage Sectors Currently Work In Silo/*Sektor Air dan Pembetungan bekerja berasingan*		
ii. Non Revenue Water (NRW)/ *Air Tidak Berhasil*		
iii. Catchment Development Impacts On Water Security / *Impak pembangunan kawasan tadahan keatas keselamatan air*		
iv. Competing for same water resource /*Persaingan sumber air yang sama*		
v. No provision for water security /Tiada peruntukan mencukupi bagi keselamatan air		
vi. Low water and sewerage tariff rates /Kadar Tarif air dan pembetungan yang rendah		
vii. Effect of climate change on water resources		
viii. River pollution		
Please state other challenges that you feel are present (If not stated above)/Sila nyatakan cabaran lain y*ang anda rasakan wujud dalam industri (Jika tidak dinyatakan diatas)*		

7. Please fill in the following for the job area relevant to you or that you have knowledge of./ *Sila isi ruang berikut untuk kerja yang berkaitan dengan anda atau anda mempunyai pengetahuan mengenainya.*

(a) **Job Areas /** ***Bidang Kerja***	(b) **Technical Skills Required (example: Planning, Operation)/** ***Kemahiran Teknikal Diperlukan (Contoh: Perancangan, Operasi)***	(c) **Skills Gaps (Please state skills that are in shortage) /*Jurang Kemahiran (Sila nyatakan kekurangan kemahiran)***	(d) **Emerging Skills (Skills that are core but required in the near future, if any) /*Kemahiran Baru (Kemahiran yang tidak teras tetapi diperlukan pada masa akan datang, jika ada)***
SAMPLE ANSWER / CONTOH JAWAPAN: Water Resource	Planning , Operation /Perancangan, Operasi	Planning /Perancangan	Ground Water Exploration, Sea water Dessalination /Eksplorasi Air tanah, / Penyahgaraman Air Laut
Water Resource			
Water Treatment			
Water Distribution			
Non Revenue Water			
Water Infrastructure Development			
Consumer / Customer Service			
Sewerage Network			
Treatment & Pumping Station			
Desludging			
Customer Service			
Facilities M&E			
Water Quality/Laboratory			

SECTION 2 : INDUSTRY BACKGROUND
/ SEKSYEN 2 : LATAR BELAKANG INDUSTRI

8. Please list down the main regulatory bodies in your field of work/ *Sila senaraikan badan-badan kawal selia utama dalam bidang kerja anda.*
(Sample Answer/Contoh Jawapan: Suruhanjaya Perkhidmatan Air Negara)

9. Please list down the related acts in your field of work/ *Sila senaraikan undang-undang yang berkaitan dengan bidang kerja anda*
(Sample Answer/Contoh Jawapan: Water Services Industry Act 2006)

10. What is the major government and industry based programs, if any, to support development in the industry? / *Apakah program yang dijalankan oleh kerajaan dan industri sekiranya ada, untuk menyokong pembangunan dalam industri?*
(Sample Answer/Contoh Jawapan: Economic Transformation Program, Rancangan Malaysia Ke-11)

End of Questionnaire. /*Kaji selidik tamat*

Thank you for your cooperation. /*Terima kasih diatas kerjasama anda.*

ANNEX 4

OCCUPATIONAL STRUCTURE (OS)

Table 1: Water Services Industry – Water Supply Sub-sector

Sector	**Water Services Industry** MSIC Section E : Water Supply; Sewerage, Waste Management												
Sub-Sector	**Water Supply** (MSIC Division 36 : Water Collection, Treatment And Supply)												
Area	Water Resource	Water Treatment		Water Distribution		Non Revenue Water (NRW)			Consumer / Customer Service			Water Infrastructure Development		
Sub-Area/ Level	Catchment, Rivers and Dams	Production		Distribution Installation	Network	District Meter Zone Development	Leak Detection	Monitoring	User Account Administration	Meter Reading and Billing	Customer Relations	Planning and Design	Asset Manage-ment	Project Manage-ment
8	No Level	No Level		No Level	No Level	No Level			No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	No Level		No Level	No Level	No Level			No Level	No Level	No Level	No Level	No Level	No Level
6	Senior Technical Manager			Senior Technical Manager		Senior Technical Manager			Senior Manager			Senior Manager		Senior Manager
5	Engineer /Technical Manager/Plant Manager */Senior Water Treatment Manager*			Engineer /Technical Manager/Operation Manager /Senior Distribution Manager		Engineer /Technical Manager/ Section Head*			Manager			Engineer / Manager		Engineer / Manager
4	Technical Assistant / Senior Technician*	Technical Assistant / Senior Technician/Plant Superintendent		Technical Assistant / Senior Technician/ Distribution Installation Superintendent	Technical Assistant / Senior Technician/ Network Superintendent	Technical Assistant / Senior Technician/ Executive *			Executive	Executive	Executive	Technical Assistant/Executive		Technical Assistant/ Executive
3	Technician*	Technician*	Lab Assistant*	Technician*	Technician*	Technician*			Senior Clerk*	Supervisor/ Senior Meter Reader*	Supervisor*	Senior Technician*		Senior Technician*
2	Senior Operator*	Senior Operator*		Senior Pump Operator*	Senior Fitter*	Fitter*			Clerk*	Meter Reader*	Customer Service Rep/ Call Centre Rep/ Front Desk Rep*	Technician*	Technician*	Technician*
1	Operator *	Operator*		Pump Operator*	Pipe Fitter/ Handyman *	No Level			No Level	No Level	No Level	No Level	No Level	No Level

*Critical job title

Table 2: Water Services Industry – Sewerage Sub-sector

Sector	**Water Services Industry** MSIC Section E : Water Supply; Sewerage, Waste Management								
Sub-Sector	**Sewerage** (MSIC Division 37 : Sewerage)								
Area	Sewerage Network	Sewerage Treatment	Desludging	Customer Service			Sewerage Infrastructure Development		
Sub-Area/ Level				Accounts Administration	Billing	Customer Relations	Planning and Design	Asset Management	Project Management
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
6	Senior Technical Manager			Senior Manager			Senior Manager		Senior Manager
5	Technical Manager/Engineer *			Manager			Engineer / Manager		Engineer / Manager
4	Technical Assistant / Senior Technician	Technical Assistant / Senior Technician	Technical Assistant / Senior Technician*	Executive	Executive	Executive	Technical Assistant/ Executive		Technical Assistant/ Executive
3	Technician/Supervisor *	Technician/Supervisor *	Technician/Supervisor *	Senior Clerk	Supervisor	Supervisor	Senior Technician*		Senior Technician*
2	Senior Operator*	Senior Operator*	Senior Operator*	Clerk	Clerk	Call Centre Rep/ Front Desk Rep	Technician*	Technician*	Technician*
1	Operator *	Operator *	Operator *	No level	No level	No level	No Level	No Level	No Level

*Critical job title

Table 3: Water Services Industry – Support Services Sub-sector

Sector	**Water Services Industry** MSIC Section C :Manufacturing and Section M : Professional, Scientific and Technical Activities		
Sub-Sector	**Support Services** MSIC Section C: Division 33: Repair And Installation Of Machinery And Equipment and Section M: Division 71: Architectural And Engineering Activities; Technical Testing And Analysis		
Area/Level	Mechanical & Electrical (M&E)		Water Quality /Laboratory
8	No Level	No Level	No Level
7	No Level	No Level	No Level
6	Senior Manager		Senior Manager
5	Manager		Lab Manager/Chemist
4	Technical Assistant	Chargeman*	Senior Lab Technician /Assistant Chemist
3	Electrician/ Technician		Lab Technician *
2	Fitter	No Level	Water Sampler
1	No Level	No Level	No Level

*Critical job title

Table 3: Water Services Industry – Support Services Sub-sector (continued)

Sector	**Water Services Industry** MSIC Section C: Manufacturing, Section H: Transportation and Storage andSection M: Professional , Scientific and Technical Activities			
Sub-Sector	**Support Services** MSIC Section C: Division 33: Repair And Installation Of Machinery And Equipment, Section F: Division 49 and Division 52: Warehousing and Support activities for Transportation and Section M: Division 71: Architectural And Engineering Activities; Technical Testing And Analysis			
Area Sub-Area/Level	Instrumentation	Fleet Management	Geographical Information System (GIS) and Network Modelling	Store
8	No Level	No Level	No Level	No Level
7	No Level	No Level	No Level	No Level
6	Senior Manager	Senior Manager	Senior Manager	Senior Manager
5	Manager	Manager	Manager	Manager
4	Instrumentation Technician *	Executive	Executive*	Executive
3	No Level	Mechanical Fitter	No Level	Store Assistant*
2	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level

*Critical job title

Note:
NOSS under the Support Services areas for Fleet management, GIS, Store and Laboratory will be developed under the respective Sections F and Section M of the MSIC.

NOSS for areas of M & E and Instrumentation will be further deliberated to be specific for the Water Services Industry by experts from the Water Services Industry

ANNEX 5

OCCUPATIONAL DESCRIPTIONS (OD)

LIST OF OCCUPATIONAL DESCRIPTIONS ACCORDING TO CRITICAL JOB TITLES

Item	Critical Job Title	Sub-Sector/Job Area	Level
1.	Water Resource Operator	Water Resource	1
2.	Water Resource Senior Operator	Water Resource	2
3.	Water Resource Technician	Water Resource	3
4.	Technical Assistant / Senior Technician	Water Resource	4
5.	Engineer /Technical Manager/Plant Manager	Water Resource / Water Treatment	5
6.	Water Treatment Operator	Water Treatment	1
7.	Water Treatment Senior Operator	Water Treatment	2
8.	Water Treatment Technician	Water Treatment	3
9.	Pipe Fitter	Water Distribution/Network	1
10.	Senior Fitter	Water Distribution/Network	2
11.	Technician	Water Distribution/Network	3
12.	Pump Operator	Water Distribution /Distribution Installation	1
13.	Senior Pump Operator	Water Distribution /Distribution Installation	2
14.	Technician	Water Distribution /Distribution Installation	3
15.	NRW Fitter	Non Revenue Water (NRW)	2
16.	NRW Technician	Non Revenue Water (NRW)	3
17.	Technical Assistant / Senior Technician/ Executive	Non Revenue Water (NRW)	4
18.	Engineer /Technical Manager/ Section Head	Non Revenue Water (NRW)	5
19.	Clerk	User Accounts Administration	2
20.	Senior Clerk	User Accounts Administration	3
21.	Meter Reader	Meter Reading and Billing	2
22.	Supervisor/ Senior Meter Reader	Meter Reading and Billing	3

23.	Customer Service Rep / Call Centre Rep/ Front Desk Rep	Customer Relations	2
24.	Supervisor	Customer Relations	3
25.	Technician	Water Infrastructure Development/Planning and Design	2
26.	Technician	Water Infrastructure Development/ Asset Management	2
27.	Senior Technician	Water Infrastructure Development/ Planning and Design , Asset Management	3
28.	Technician	Water Infrastructure Development/ Project Management	2
29.	Senior Technician	Water Infrastructure Development/ Project Management	3
30.	Operator	Sewerage Network	1
31.	Senior Operator	Sewerage Network	2
32.	Technician/Supervisor	Sewerage Network	3
33.	Operator	Sewerage Treatment	1
34.	Senior Operator	Sewerage Treatment	2
35.	Technician/ Supervisor	Sewerage Treatment	3
36.	Operator	Desludging	1
37.	Senior Operator	Desludging	2
38.	Supervisor / Technician	Desludging	3
39.	Technical Assistant / Senior Technician	Desludging	4
40.	Technical Manager/Engineer	Sewerage /Network, Desludging, Treatment	5
41.	Technician	Sewerage Infrastructure Development/ Planning and Design	2
42.	Technician	Sewerage Infrastructure Development/ Asset Management	2
43.	Senior Technician	Sewerage Infrastructure Development/ Planning and Design, Asset Management	3
44.	Technician	Sewerage Infrastructure Development/Project Management	2

45.	Senior Technician	Sewerage Infrastructure Development/Project Management	3
46.	Chargeman *	Support Services/ Mechanical & Electrical (M&E)	4
47.	Lab Technician *	Support Services/ (Water Quality /Laboratory)	3
48.	Instrumentation Technician*	Support Services/ Instrumentation	4
49.	Executive*	Support Services/ Geographical Information System (GIS) and Network Modelling	4
50.	Store Assistant*	Support Services/ Store	3

Note: *The occupational descriptions for the job titles marked with * can be referred in the respective Industry/Sector's Occupational Analysis or NOSS documents

SUB-SECTOR: WATER SUPPLY

JOB AREA : WATER RESOURCE

Water Resource Operator (Level 1)

A Water Resource Operator is responsible to assist in operating valves, water sampling, , read water and pump meters, record water quality monitoring, identify water resource parameters (rain fall), water rate and flow rate level. The personnel also has to assist in repairing minor defects.

Responsibilities may include:

- Assist in operating valves
- Assist in water sampling
- Identify dam safety parameters
- Identify water resource parameters (rain fall)
- Identify water rate level and flow rate
- Assist in repairing minor defects
- Read water and pump meters
- Record water quality monitoring

Knowledge, Skills, Attitude

A Water Resource Operator needs:

- Knowledge on types of water resources and water works
- Knowledge on water quality standard
- Knowledge on safe water, raw water and treated water
- The ability to operate a variety of power tools and equipment
- The ability to work as part of a team
- To follow Occupational Health and Safety regulations

JOB AREA : WATER RESOURCE

Water Resource Senior Operator (Level 2)

A Water Resource Senior Operator is responsible in operating valves, assisting water sampling, record dam safety parameters, water resource parameters (rain fall), water and flow rate level. The personnel is also responsible for performing water quality monitoring, repair minor defects, inform superior of pollution issues and assist agencies in identifying pollutant point.

Responsibilities may include:

- Operate valves
- Record dam safety parameters
- Record water resource parameters (rain fall)
- Record water rate level and flow rate
- Perform water quality monitoring
- Repair minor defects
- Inform superior of pollution issues
- Assist in water sampling
- Assist agencies in identifying pollutant point

Knowledge, Skills, Attitude

A Water Resource Senior Operator needs:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution
- Knowledge on types of water resources and water works
- Knowledge on water quality standard
- Knowledge on safe water, raw water and treated water
- The ability to operate a variety of power tools and equipment
- The ability to work as part of a team
- To follow Occupational Health and Safety regulations

JOB AREA : WATER RESOURCE

Water Resource Technician (Level 3)

A Water Resource Technician is responsible to supervise valve operation. The personnel have to check water sampling records, dam safety parameters records and water resource parameters records (water fall). He/she is designated to supervise repair work, prepare work schedule and am safety and water resource monitoring reports. The personnel also has to report pollution issues with related agencies such as Department of Environment.

Responsibilities may include:

- Supervise valve operation
- Check water sampling records
- Check dam safety parameters records
- Check water resource parameters records (water fall)
- Supervise repair work
- Communicate with other team members
- Prepare work schedule
- Prepare dam safety and water resource monitoring reports
- Report pollution issues with related agencies such as Department of Environment

Knowledge, Skills, Attitude

A Water Resource Technician needs:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution
- Knowledge on types of water resources and water works
- Knowledge on water quality standard
- Knowledge on safe water, raw water and treated water
- The ability to operate a variety of power tools and equipment
- The ability to work as part of a team
- To follow Occupational Health and Safety regulations.

JOB AREA : WATER RESOURCE

Water Resource Technical Assistant (Level 4)

This role may also be called: Senior Technician

A Water Resource Technical Assistant is responsible to monitor valve operation and analyse dam safety and water resource monitoring reports. The personnel has to implement actions based on dam safety and water resource monitoring reports. He/ she also has to monitor repair work, and plan work schedule.

Responsibilities may include:

- Monitor valve operation
- Analyse dam safety and water resource monitoring reports
- Implement actions based on dam safety and water resource monitoring reports
- Monitor repair work
- Communicate with other subordinates and management
- Plan work schedule

Knowledge, Skills, Attitude

A Water Resource Technical Assistant needs:

- Knowledge of dynamics of rivers, lakes, coastal areas and the impact of pollution
- Skills and knowledge of water conservation methods and best practices
- Skills and knowledge of water demand forecasting
- Skills and knowledge of soil erosion and sediment control
- Skills and knowledge of environmental and sustainability considerations (i.e. recycling and water saving technology, carbon footprint, reuse of water resources)
- Skills and knowledge of access to water
- To ensure Occupational Health and Safety and Environmental Quality Act adherence
- To possess effective communication skills
- To possess analytical skills

JOB AREA: WATER RESOURCE / WATER TREATMENT
Water Resource Technical Manager (Level 5)

This role may also be called: Water Resource Engineer /Plant Manager

A Water Resource Technical Manager is responsible to ensure security of water and prepare dam safety and water resource monitoring reports. The personnel is designated to monitor repair work, valve operation, contamination of water from dam and water level of the river.

Responsibilities may include:

- Ensure security of water
- Monitor valve operation and repair work
- Monitor availability of chemical stock
- Monitor contamination of water from the dam
- Prepare dam safety and water resource monitoring reports
- Implement actions based on dam safety and water resource monitoring reports
- Assist in planning work schedule
- Verify influx of dirty water into surface water
- Verify disruption and damage reports and records of water level of the river / reservoir

Knowledge, Skills, Attitude

A Water Resource Technical Manager needs:

- Knowledge of river modelling, water resources, water conservation, hydrology for catchment strategy and sustainable and compatible land use planning
- Knowledge of regulated water accounting and water pricing including environmental cost
- Knowledge of water carbon foot-printing and water statistical analysis
- Knowledge of water scarcity, economic scarcity and town planning
- Skills and knowledge of water demand forecasting , soil erosion and sediment control
- Skills and knowledge of environmental and sustainability considerations
- To ensure OSHA and Environmental Quality Act adherence
- To apply effective communication skills and analytical skills

JOB AREA : WATER TREATMENT

Water Treatment Operator (Level 1)

A Water Treatment Operator is responsible to identify chemical stock and identify data to be recorded. The personnel has to assist in carry out cleaning and running pumps Main / auxiliary pumps water / raw water. He/ she also has to report and record any power outages, report any contamination of water from the dam and record influx of dirty water into surface water.

Responsibilities may include:

- Identify chemical stock
- Identify data to be recorded.
- Assist in carry out cleaning and running pumps / auxiliary pumps water / raw water.
- Report and record any power outages.
- Report any contamination of water from the dam.
- Report and record influx of dirty water into surface water

Knowledge, Skills, Attitude

A Water Treatment Operator needs:

- Skills and knowledge of quality and quantity of water sources
- Skills and knowledge in Early Warning System
- Skills and knowledge of Water Treatment Plant operation process
- Skills and knowledge on water works
- Skills and knowledge on water quality standard
- Knowledge on raw water and treated water
- Knowledge of access to water
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : WATER TREATMENT

Water Treatment Senior Operator (Level 2)

A Water Treatment Senior Operator is responsible to determine the quantity to supply chemical stock and assist in checking data. The personnel has to carry out cleaning and running of pumps/auxiliary pumps water/raw water and report any power outages. He/she is designated to assist in checking contamination of water from the dam, checking influx of dirty water into surface water and assist in Water Treatment Plant maintenance activities.

Responsibilities may include:

- Determine quantity of chemical stock preparation
- Assist in checking data
- Carry out cleaning and running pumps / auxiliary pumps water / raw water.
- Report any power outages.
- Assist in checking contamination of water from the dam.
- Assist in checking influx of dirty water into surface water
- Assist in Water Treatment Plant maintenance activities

Knowledge, Skills, Attitude

A Water Treatment Senior Operator needs:

- Skills and knowledge of quality and quantity of water sources
- Skills and knowledge in Early Warning System
- Skills and knowledge of Water Treatment Plant operation process
- Skills and knowledge on water works
- Skills and knowledge on water quality standard
- Knowledge on raw water and treated water
- Knowledge of access to water
- The ability to work as part of a team
- To follow Occupational Health and Safety regulations
- To communicate with other team members/supervisor

JOB AREA : WATER TREATMENT

Water Treatment Technician (Level 3)

A Water Treatment Technician is responsible to check the availability of chemical stock, analyse recorded data and to supervise inventory. The personnel has to check contamination of water from the dam, check influx of dirty water into surface water and water level of the river. He/ she also has to record water levels of reservoirs suction and perform Water Treatment Plant maintenance activities.

Responsibilities may include:

- Check the availability of chemical stock
- Check contamination of water from the dam
- Check influx of dirty water into surface water
- Check and record the water level of the river / reservoir
- Perform Water Treatment Plant maintenance activities
- Supervise inventory
- Report any disruption, damage and a lot of noise on the pump and any electrical equipment.
- Record water levels of reservoirs suction (suction sump)

Knowledge, Skills, Attitude

A Water Treatment Technician needs:

- Skills and knowledge of quality and quantity of water sources
- Skills and knowledge in Early Warning System
- Skills and knowledge of Water Treatment Plant operation process
- Skills and knowledge of standard parameters in sewage/industrial effluent in river discharge in the interest of Drinking Water Standard
- Skills and knowledge in maximum operable limit for Water Treatment Plant operation
- Skills and knowledge of optimised energy usage
- The ability to work as part of a team
- To adhere to Occupational Health and Safety regulations
- To communicate with other team members/supervisor.

JOB AREA: WATER DISTRIBUTION

SUB – AREA: NETWORK

Water Distribution Pipe Fitter (Level 1)

This role may also be called: Handyman/General Worker

A Water Distribution Pipe Fitter is responsible to identify pipe sizes, specification, pipe threaders, benders and related equipment. The personnel are designated to assist in pipe measurement, excavation process and testing installed systems and pipe lines.

Responsibilities may include:

- Identify pipe sizes and pipe specification
- Identify pipe threaders, benders and related equipment
- Identify other utilities location
- Assist in taking the measurement of pipes for cutting and threading
- Assist in excavation process
- Assist in testing installed systems and pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods

Knowledge, Skills, Attitude

A Water Distribution Pipe Fitter needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of water supply system
- Knowledge of product specification requirements
- Knowledge and skills of pressure management tools and equipment
- The ability to work as part of a team
- To adhere to Occupational Health and Safety regulations
- Apply green technology and sustainability

JOB AREA : WATER DISTRIBUTION

SUB – AREA: NETWORK

Water Distribution Senior Fitter (Level 2)

A Water Distribution Senior Fitter is responsible to determine the pipe sizes and specification. The personnel are designated to determine pipe threaders and benders and determine the measurement of pipes for cutting and threading. He/she also have to assist in testing installed systems and pipe lines, excavation process and measurement of pipes.

Responsibilities may include:

- Determine pipe sizes and pipe specification
- Determine pipe threaders and benders
- Perform measurement of pipes for cutting and threading
- Perform excavation process
- Assist in testing installed systems and pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods

Knowledge, Skills, Attitude

A Water Distribution Senior Fitter needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of water supply system
- Knowledge of product specification requirements
- Knowledge and skills of pressure management tools and equipment
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair
- To apply Non Revenue Water practices
- To apply green technology and sustainability
- To possess critical thinking skills
- The ability to work as part of a team
- To adhere to Occupational Safety and Health regulations

JOB AREA : WATER DISTRIBUTION

SUB – AREA: NETWORK

Water Distribution Technician (Level 3)

A Water Distribution Technician is responsible to execute selection of pipe sizes, assemble and secure pipes, tubes, fittings, and related equipment, according to specifications. He/she also has to supervise installed systems and pipe lines, supervise work sites for obstructions and ensure that holes will not cause structural weakness. The personnel is also designated to execute measurement and mark pipes for cutting and threading.

Responsibilities may include:

- Execute selection of pipe sizes and types and related materials, such as supports, hangers, and hydraulic cylinders, according to specifications
- Execute measurement and mark pipes for cutting and threading
- Assemble and secure pipes, tubes, fittings, and related equipment, according to specifications
- Supervise installed systems and pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods.
- Supervise work sites for obstructions and to ensure that holes will not cause structural weakness.

Knowledge, Skills, Attitude

A Water Distribution Technician needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of water supply system and network management system
- Knowledge of SCADA and telemetry system
- Knowledge of product specification and technology requirements
- Knowledge and skills of pressure management tools and equipment
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair
- To apply Non Revenue Water practices
- To apply green technology and sustainability
- The ability to work as part of a team
- To adhere to Occupational Safety and Health regulations

JOB AREA: WATER DISTRIBUTION

SUB – AREA: DISTRIBUTION INSTALLATION

Water Distribution Pump Operator (Level 1)

A Water Distribution Pump Operator is responsible to operate water distribution equipment, controls and/or valves on equipment to provide power, regulate and set operations of systems, record readings on gauges, meters, and charts, record daily logs of operation, maintenance and safety activities, activate valves to maintain required amounts of water, clean and lubricate equipment, assist in ensuring site security and assist in valve maintenance and pump maintenance activities.

Responsibilities may include:

- Operate water distribution equipment
- Operate controls and/or valves on equipment to provide power, to regulate and set operations of system
- Record readings on gauges, meters, and charts
- Record daily logs of operation, maintenance, and safety activities
- Activate valves to maintain required amounts of water
- Clean and lubricate equipment
- Provide assistance in daily maintenance activities
- Assist in ensuring site security
- Assist in valve maintenance and pump maintenance activities

Knowledge, Skills, Attitude

A Water Distribution Pump Operator needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of water supply system
- Knowledge of product specification requirements
- Knowledge and skills of pressure management tools and equipment
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair
- To apply Non Revenue Water practices
- To apply green technology and sustainability
- To adhere to Occupational Safety and Health regulations

JOB AREA : WATER DISTRIBUTION

SUB – AREA: DISTRIBUTION INSTALLATION

Water Distribution Senior Pump Operator (Level 2)

A Water Distribution Senior Pump Operator is responsible to operate water distribution installation equipment, adjust controls and/or valves on equipment to provide power, regulate operations of system , observe readings , record daily logs, activate valves to maintain required amounts of water , perform preventive and corrective maintenance.

Responsibilities may include:

- Operate water distribution installation equipment
- Ensure water distribution installation equipment is operating efficiently and safely
- Adjust controls and/or valves on equipment to provide power, and to regulate and set operations of system
- Observe readings on gauges, meters, and charts
- Record daily logs of operation, maintenance, and safety activities
- Activate valves to maintain required amounts of water
- Perform service and maintenance activities
- Report on-site accidents
- Ensure water distribution site security

Knowledge, Skills, Attitude

A Water Distribution Senior Pump Operator needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of water supply system
- Knowledge of product specification requirements
- Knowledge and skills of pressure management tools and equipment
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair
- To apply Non Revenue Water practices, green technology and sustainability
- To adhere to Occupational Safety and Health regulations

JOB AREA : WATER DISTRIBUTION

SUB – AREA: DISTRIBUTION INSTALLATION

Water Distribution Technician (Level 3)

A Water Distribution Technician is responsible to supervise water distribution installation equipment operation , ensure water distribution equipment is operating efficiently and safely, supervise adjustment of controls and/or valves on equipment to provide power, regulate and set operations of system , check readings on gauges, meters, and charts, verify daily logs of operation, maintenance, supervise activation of valves to maintain required amounts of water, arrange for repairs and daily maintenance activities, They are also required to verify report on-site accidents and ensure water distribution site security.

Responsibilities may include:

- Supervise water distribution installation equipment operation
- Ensure water distribution installation equipment is operating efficiently and safely
- Supervise adjustment of controls and/or valves on equipment and to regulate and set operations of system
- Supervise activation of valves to maintain required amounts of water
- Check readings on gauges, meters, and charts to detect operations and detect malfunctions
- Verify on-site accidents report, daily logs of operation, maintenance, and safety activities
- Arrange for repairs and daily maintenance activities and arrange with equipment manufacturers when necessary to resolve equipment problems
- Coordinate water distribution site security

Knowledge, Skills, Attitude

A Water Distribution Technician needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of pressure management tools and equipment
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair
- To apply Non Revenue Water practices
- To apply green technology and sustainability
- To adhere to Occupational Safety and Health regulations

JOB AREA : NON REVENUE WATER

Non Revenue Water Fitter (Level 2)

A Non Revenue Water (NRW) Fitter is responsible to assist in controlling the loss of water due to Non Revenue Water, assist team leader in carrying out cleaning work on site and assist in performing Visual Inspection & Sounding (VIS). The personnel have to ensure that the equipment to work at the site is in good condition. He/she also has to perform keying in of leaking complaints into Smart Water Systems system.

Responsibilities may include:

- Assist in controlling the loss of water due to Non Revenue Water
- Assist in performing Visual Inspection & Sounding (VIS)
- Assist in performing Step Test activities
- Monitor leaking complaints in Smart Water Systems and Active Leakage Control team
- Assist in performing the process of mapping
- Assist in performing 'proving' work to identify the areas involved
- Assist affairs of the District Monitoring Area (DMA).Unit
- Perform cleaning work on site
- Observe the repair work by contractors
- Ensure NRW and other related tools and equipment on-site are in good condition
- Ensure log book is updated

Knowledge, Skills, Attitude

A Non Revenue Water Fitter needs:

- Knowledge and skills of Non Revenue Water implementation
- To apply Non Revenue Water practices
- Knowledge and skills in the usage and application of NRW equipment and tools
- Knowledge and skills of Step Test
- To apply green technology and sustainability practices
- To be proactive and responsive
- The ability to work as part of a team and receive instructions from superior
- To adhere to Occupational Safety and Health regulations

JOB AREA : NON REVENUE WATER

Non Revenue Water Technician (Level 3)

A Non Revenue Water Technician is responsible to control and monitor control the loss of water due to Non Revenue Water, execute Job Management System (JMS) control,

Responsibilities may include:

- Ensure the loss of water due to Non Revenue Water is lessened and controlled
- Perform key in of leaking complaints into Smart Water Systems system
- Perform the process of mapping
- Perform 'proving' work to identify the areas involved
- Assist in performing Visual Inspection & Sounding (VIS)
- Conduct and supervise cleaning work on site
- Carry out Step Test activities
- Verify updated log book information
- Monitor and coordinate the maintenance /repair work by contractors
- Check that NRW and other related tools and equipment on-site are in good condition
- Supervise affairs related to the District Monitoring Area (DMA)Unit

Knowledge, Skills, Attitude

A Non Revenue Water Technician needs:

- Knowledge and skills of Non Revenue Water implementation
- To apply Non Revenue Water practices
- To apply green technology and sustainability
- To be proactive and responsive
- To pay close attention to details and always be alert
- The ability to work as part of a team
- To adhere to Occupational Safety and Health regulations

JOB AREA : NON REVENUE WATER

Non Revenue Water Technical Assistant (Level 4)

This role may also be called: Senior Technician, Executive

A Non Revenue Water Technical Assistant is responsible to monitor DMA Zone, PAV (Pressure, Altitude Valve & Valve) work activities, analyse Step Test, supervise and control the budget for the NRW unit and assist in providing monthly performance reports for each team member.

Responsibilities may include:

- Monitor PAV (Pressure, Altitude Valve & Valve)work activities
- Create a new DMA zone and provide reports for the new zone
- Ensure that the DMA zone contributing to leakage is lessened, DMA region have minimum pressure and DMA is below the set baseline
- Solve problems and issues within stipulated response time (i.e. solve main burst in zone)
- Proficient use of all NRW fittings
- Analyse the Step Test which the team had performed
- Verify that leak complaints are keyed into the SMART system.
- Verify that the team carries out the work of Visual Inspection and Sounding (VIS)
- Supervise mapping activities and 'proving' work to identify affected zones
- Supervise the budget for the NRW unit
- Arrange purchasing of spare parts
- Assist in providing monthly performance reports for each team member
- Prepare leakage and maintenance related reports

Knowledge, Skills, Attitude

A Non Revenue Water Technical Assistant needs:

- Knowledge and skills of Non Revenue Water implementation
- To apply Non Revenue Water, green technology and sustainability practices
- Must be proficient in terms of the whole piping system and within the DMA
- To have analytical skills, leadership skills, documentation skills and communication skills
- To adhere to Occupational Safety and Health regulations

JOB AREA : NON REVENUE WATER

Non Revenue Water Technical Manager (Level 5)

This role may also be called: Non Revenue Water Engineer, Section Head

A Non Revenue Water Technical Manager is responsible to manage NRW effectively and develop ways to lower the NRW level for the state, manage the annual budget for the NRW unit, manage the purchasing of tools and equipment for NRW unit and PAV (Pressure, Altitude Valve & Valve) work activities. He/ she has to check monthly report, verify all data and information for auditing purposes and has to attend meetings with other departments and management.

Responsibilities may include:

- Manage NRW effectively and develop ways to lower the NRW level for the state
- Manage the contractor's work activities
- Manage and control the annual budget for the NRW unit
- Manage PAV (Pressure, Altitude Valve & Valve) work activities
- Prepare NRW Unit monthly report
- Calculate the percentage of NRW and certified by management
- Monitor the Job Management System (JMS) for repair work
- Plan activities in the NRW unit
- Provide all data and information for internal audit, SPAN and SIRIM
- Verify/review monthly report for each section and activities related to the District Monitoring Area (DMA) Unit
- Assist in planning the purchasing of tools and equipment for NRW unit
- Attend meetings with other departments and management and chair the monthly meetings with all staff

Knowledge, Skills, Attitude

A Non Revenue Water Technical Manager needs:

- Knowledge and skills of Non Revenue Water planning and management
- To apply Non Revenue Water, green technology and sustainability practices
- To have analytical skills, leadership skills, documentation skills and communication skills
- To adhere to Occupational Safety and Health regulations

JOB AREA : CONSUMER/CUSTOMER SERVICES

SUB - AREA : USER ACCOUNTS ADMINISTRATION

User Accounts Clerk (Level 2)

This role may also be called: Customer Accounts Clerk, Data Processing Clerk, OMPD

A User Accounts Clerk is responsible to perform data entry for accounts creation, billing, payment receipts, miscellaneous debit and credit notes, special bills and customer data maintenance. Other roles include process interfacing between billing system and handheld computers for meter reading and billing, print suspended accounts for resolution and informing supervisor on data entry error. He/she needs to adhere to Occupational Health and Safety procedures as well as communicating with team members and his supervisor.

Responsibilities may include:

- Perform data entry for accounts creation, billing, payment receipts, miscellaneous debit and credit notes, special bills including disconnection bills, customer data maintenance
- Maintain meter reading daily scheduling
- Download billing data for meter reading in handheld computers
- Upload billing data from handheld computers after meter reading
- Upload consolidated payment data from payment centres
- Inform superior of data entry errors.

Knowledge, Skills, Attitude

A User Accounts Clerk needs:

- Knowledge in Computerised Information and Billing System
- Knowledge in handheld computer functions
- Basic knowledge in accounting
- Good hand-eye coordination
- Ability to key-in data at reasonable speed
- Ability to follow verbal instructions
- Ability to complete daily tasks to avoid backlog
- Ability to work as part of a team
- To adhere Occupational Health and Safety procedures

JOB AREA : CONSUMER / CUSTOMER SERVICES
SUB - AREA : USER ACCOUNTS ADMINISTRATION

User Accounts Senior Clerk (Level 3)

This role may also be called: **Customer Accounts Supervisor**

A User Accounts Senior Clerk is responsible for supervising data entry for accounts creation, billing, payment receipts, miscellaneous debit and credit notes, special bills, and customer data maintenance. Other roles include supervising process interfacing between billing system and handheld computers for meter reading and billing, resolve suspended accounts and clearing data entry error. A User Accounts Senior Clerk needs to adhere to Occupational Health and Safety procedures as well as communicating with team members.

Responsibilities may include:

- Supervise data entry for accounts creation, billing, payment receipts, miscellaneous debit & credit notes, customer data maintenance
- Supervise meter reading daily scheduling
- Supervise downloading of billing data for meter reading in handheld computers
- Supervise uploading of billing data from handheld computers after meter reading
- Supervise uploading of consolidated payment data from payment centres
- Check suspended accounts listing
- Coordinate clearance of suspense accounts listing with senior meter readers
- Resolve data entry errors by Customer Accounts Clerk
- Inform Customer Accounts Executive for job sheet request on new item/item changes/item removal in water billing software application
- Communicate with User Accounts Clerk, Executive and other related units

Knowledge, Skills, Attitude

A User Accounts Clerk needs:

- Knowledge in Computerised Information and Billing System
- Thorough knowledge in data entry and handheld computer functions
- Knowledge in accounting
- Ability to supervise subordinates and coordinate tasks with other related units

JOB AREA : CONSUMER/CUSTOMER SERVICES
SUB - AREA : METER READING AND BILLING

Meter Reader (Level 2)

A Meter Reader is responsible to read utility meters and record consumption of water by consumer according to organisation SOP, to enter data in hand-held computers/equipment, record cases where consumption appears to be abnormal, inspect meters for unauthorized connections, defects, and damage, connect and disconnect utility services at specific locations and report to service departments of any problems such as meter irregularities, damaged equipment, maintenance or equipment problems.

Responsibilities may include:

- Perform reading of water consumption meters
- Enter data in hand-held computers/equipment
- Record cases where consumption appears to be abnormal
- Inspect meters for unauthorized connections, defects, and damage
- Connect and disconnect utility services at specific locations
- Report to service departments of any problems such as meter irregularities, damaged equipment, maintenance or equipment problems

Knowledge, Skills, Attitude

A Meter Reader needs:

- Knowledge and skills in controlling machines and processes
- Knowledge in handheld computer functions
- Good hand-eye coordination
- To adhere occupational health and safety procedures
- Knowledge and skills operating vehicles, mechanized devices, or equipment

JOB AREA : CONSUMER / CUSTOMER SERVICES
SUB - AREA : METER READING AND BILLING

Senior Meter Reader (Level 3)

This role may also be called: **Supervisor**

A Senior Meter Reader is responsible to supervise and carry out reading of utility meters and recording consumption of water by consumer according to organisation SOP, to check data in hand-held computers/equipment, verify readings where consumption appears to be abnormal. He/she is also responsible to supervise inspection of meters for unauthorized connections, defects, and damage, connect and disconnect utility services at specific locations and report to service departments of any problems such as meter irregularities, damaged equipment, maintenance or equipment problems

Responsibilities may include:

- Perform and supervise reading of water consumption meters
- Check data in hand-held computers/equipment
- Verify readings in cases where consumption appears to be abnormal, and record possible reasons for fluctuations.
- Supervise inspection of meters for unauthorized connections, defects, and damage
- Supervise and conduct connection and disconnection of utility services at specific locations
- Report to service departments of any problems such as meter irregularities, damaged equipment, maintenance or equipment problems

Knowledge, Skills, Attitude

A Meter Reader needs:

- Knowledge and skills in controlling machines and processes
- Knowledge in handheld computer functions
- Good hand-eye coordination
- To adhere occupational health and safety procedures
- Knowledge and skills operating vehicles, mechanized devices, or equipment
- Ability to supervise subordinates and coordinate tasks with other related units

JOB AREA : CONSUMER/CUSTOMER SERVICES
SUB - AREA : CUSTOMER RELATIONS

Customer Service Representative (Level 2)

This role may also be called: Call Centre Representative, Front Desk Representative

A Customer Service Representative is responsible to provide a comprehensive solution for the complaint / report regarding the Company's services, adhere to policies and procedures and customer service, liaise with other departments / divisions / units, attend to all complaints / reports and provide the customer with information regarding the Company's services.

Responsibilities may include:

- Provide a comprehensive solution for the complaint / report regarding the Company's services.
- Adhere to policies and procedures regarding customer service.
- Liaise with other departments / divisions / units.
- Attend to all complaints / reports.
- Involve in Consumer Education programs / activities.
- Provide the customer with information regarding the Company's services.
- Perform company's communication handling tasks via phone, email, etc.

Knowledge, Skills, Attitude

A Customer Service Representative needs:

- Knowledge and skills in utilising communication equipment
- Knowledge and skills in Customer Service
- To posses excellent and effective communication skills
- To adhere occupational health and safety procedures

JOB AREA : CONSUMER / CUSTOMER SERVICES
SUB - AREA : CUSTOMER RELATIONS

Customer Service Supervisor (Level 3)

A Customer Service Supervisor is responsible to coordinate a comprehensive solution for the complaint / report regarding the Company's services, adhere to policies and procedures and customer service, communicate with other departments / divisions / units, arrange customer service representative to assist all complaints / reports, coordinate Consumer Education programs / activities, provide customer information regarding the Company's services and coordinate the Company's communication handling tasks.

Responsibilities may include:

- Coordinate a comprehensive solution for the complaint / report regarding the Company's services.
- Adhere to policies and procedures and customer service.
- Communicate with other departments / divisions / units.
- Arrange customer service representative to assist all complaints / reports.
- Coordinate Consumer Education programs / activities.
- Provide customer information regarding the Company's services.
- Coordinate the Company's communication handling tasks.

Knowledge, Skills, Attitude

A Customer Service Supervisor needs:

- Knowledge and skills in utilising communication equipment
- Knowledge and skills in Customer Service
- To posses excellent and effective communication skills
- To adhere occupational health and safety procedures
- Ability to supervise subordinates and coordinate tasks with other related units

JOB AREA : WATER INFRASTRUCTURE DEVELOPMENT
SUB-AREA : PLANNING AND DESIGN

Water Infrastructure Planning and Design Technician (Level 2)

A Water Infrastructure Development Planning and Design Technician is responsible to assist in preparation and documentation of source yield study, water supply systems planning, water demand study, water supply systems design and design compliance and parameters.

Responsibilities may include:

- Assisting in source yield study preparation and documentation
- Assisting in water supply systems planning preparation and documentation
- Assisting in water demand study preparation and documentation
- Assisting in water supply systems design preparation and documentation
- Assisting in approval of new water supplies preparation and documentation
- Assisting in design compliance and parameters preparation and documentation

Knowledge, Skills, Attitude

A Water Infrastructure Development Planning and Design Technician needs:

- Possess analytical skills, documentation skills and communication skills
- Knowledge of relevant regulatory requirements
- Knowledge of technical and design specification requirements
- Knowledge of material and equipment selection criteria

JOB AREA : WATER INFRASTRUCTURE DEVELOPMENT

SUB-AREA : ASSET MANAGEMENT

Water Infrastructure Asset Management Technician (Level 2)

A Water Infrastructure Development Asset Management Technician is responsible to assist in asset inventory, asset economics, life costing, asset replacement program, asset condition monitoring and asset updating

Responsibilities may include:

- Assisting in asset inventory
- Assisting in asset economics, life costing
- Assisting in asset replacement program
- Assisting in asset condition monitoring
- Assisting in asset updating
- Assisting in land ownership & legislative requirements documentation

Knowledge, Skills, Attitude

A Water Infrastructure Development Asset Management Technician needs:

- Knowledge in Geographic Information System (GIS) and Information Technology (IT) applications
- Knowledge in land ownership & legislative requirements

JOB AREA : WATER INFRASTRUCTURE DEVELOPMENT

SUB-AREA : PLANNING AND DESIGN

Water Infrastructure Planning and Design &Asset Management Senior Technician (Level 3)

A Water Infrastructure Development Planning and Design &Asset Management **Senior** Technician is responsible to perform preparation and documentation of source yield study, water supply systems planning, water demand study, water supply systems design and design compliance and parameters. He/she is also responsible for to perform asset inventory, asset economics, life costing, asset replacement program, asset condition monitoring, asset updating, GIS and IT applications and prepare land ownership & legislative requirements documentation.

Responsibilities may include:

- Perform source yield study preparation and documentation
- Perform water supply systems planning preparation and documentation
- Perform water demand study preparation and documentation
- Perform water supply systems design preparation and documentation
- Perform approval of new water supplies preparation and documentation
- Perform design compliance and parameters preparation and documentation
- Perform asset inventory , asset economics, life costing, asset replacement , asset condition monitoring and asset updating
- Utilise GIS and IT applications
- Prepare land ownership & legislative requirements documentation.

Knowledge, Skills, Attitude

A Water Infrastructure Development Planning and Design& Asset Management Senior Technician needs:

- Possess analytical skills, documentation skills and communication skills
- Knowledge of relevant regulatory requirements
- Knowledge of technical and design specification requirements
- Knowledge of material and equipment selection criteria
- Knowledge of hydrological and climate change study
- Knowledge of assessment of land use in a catchment area, ground water reservoir/aquifer
- Knowledge of Erosion Sediment Control Plan
- Knowledge of water demand projection
- Knowledge of long term development plan
- Possess analytical skills, documentation skills and communication skills
- Knowledge in GIS and IT applications
- Knowledge in Land ownership & legislative requirements

JOB AREA : WATER INFRASTRUCTURE DEVELOPMENT

SUB-AREA :PROJECT MANAGEMENT

Water Infrastructure Development Project Management Technician (Level 2)

A Water Infrastructure Development Project Management Technician is responsible to assist in construction project management, quality awareness for construction, quality awareness for construction and assist in inspection, testing and commissioning.

Responsibilities may include:

- Assist Construction Project Management
- Assist Quality awareness for construction
- Assist quality awareness for construction
- Assist in inspection, Testing and Commissioning

Knowledge, Skills, Attitude

A Water Infrastructure Development Project Management Technician needs:

- Knowledge in construction skills
- Comply to Safety, Health and Environment requirements
- Comply to organisation rules and regulation
- Aware of technology and innovation relevant to water infrastructure project development

JOB AREA : WATER INFRASTRUCTURE DEVELOPMENT

SUB-AREA: PROJECT MANAGEMENT

Water Infrastructure Development Project Management Senior Technician (Level 3)

A Water Infrastructure Development Project Management Senior Technician is responsible to perform construction project management, quality awareness for construction, quality awareness for construction and assist in inspection, testing and commissioning.

Responsibilities may include:

- Perform construction project management
- Perform quality awareness for construction
- Perform quality awareness for construction
- Perform inspection, testing and commissioning

Knowledge, Skills, Attitude

A Water Infrastructure Development Project Management Technician needs::

- Knowledge in Construction skills
- Comply to Safety, Health and Environment requirements
- Comply to organisation rules and regulation
- Aware of technology and innovation relevant to water infrastructure project development

SUB-SECTOR: SEWERAGE

JOB AREA: SEWERAGE NETWORK

Sewerage Network Operator (Level 1)

A Sewerage Network Operator is responsible to identify sewerage pipe sizes, specification, pipe threaders, benders and related equipment. The personnel have to assist in sewerage pipe measurement, and testing installed systems and pipe lines.

Responsibilities may include:

- Identify sewerage pipe sizes and pipe specification
- Identify sewerage pipe threaders, benders and related equipment
- Identify other utilities location
- Assist in taking the measurement of sewerage pipes for cutting and threading
- Assist in testing installed systems and pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods

Knowledge, Skills, Attitude

A Sewerage Network Operator needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of sewerage network system
- Knowledge and skills of sewerage network tools and equipment
- The ability to work as part of a team
- To adhere to Occupational Health and Safety regulations
- Apply green technology and sustainability

JOB AREA: SEWERAGE NETWORK

Sewerage Network Senior Operator (Level 2)

A Sewerage Network Senior Operator is responsible to determine the sewerage pipe sizes and specification. The personnel are designated to determine sewerage pipe threaders and benders and determine the measurement of pipes for cutting and threading. He/she also have to assist in testing installed sewerage systems and pipe lines and measurement of sewerage pipes.

Responsibilities may include:

- Determine sewerage pipe sizes and pipe specification
- Determine sewerage pipe threaders and benders
- Perform measurement of sewerage pipes for cutting and threading
- Assist in testing installed systems and sewerage pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods

Knowledge, Skills, Attitude

A Sewerage Network Senior Operator needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of sewerage system
- Knowledge and skills of sewerage network tools and equipment
- The ability to work as part of a team
- To adhere to Occupational Health and Safety regulations
- Apply green technology and sustainability

JOB AREA: SEWERAGE NETWORK

Sewerage Network Technician (Level 3)

A Sewerage Network Technician is responsible to execute selection of sewerage pipe sizes, assemble and secure sewerage pipes, tubes, fittings, and related equipment, according to specifications. He/ she also has to supervise installed sewerage systems and pipe lines, supervise work sites for obstructions and ensure that holes will not cause structural weakness. The personnel is also designated to execute measurement and mark sewerage pipes for cutting and threading.

Responsibilities may include:

- Execute selection of sewerage pipe sizes and types and related materials, such as supports, hangers, and hydraulic cylinders, according to specifications
- Assemble and secure sewerage pipes, tubes, fittings, and related equipment, according to specifications
- Supervise installed systems and pipe lines, using pressure gauge, hydrostatic testing, observation, or other methods.
- Execute measurement and mark sewerage pipes for cutting and threading
- Supervise work sites for obstructions and to ensure that holes will not cause structural weakness.

Knowledge, Skills, Attitude

A Sewerage Network Technician needs:

- Knowledge and skills on pipe installation method and procedures
- Knowledge and skills of sewerage network system
- Knowledge of product specification and technology requirements
- Knowledge and skills of basic welding methods and procedures
- Knowledge and skills of minor repair

JOB AREA : SEWERAGE TREATMENT

Sewerage Treatment Operator (Level 1)

A Sewerage Treatment Operator is responsible to operate, and assist in maintaining the wastewater treatment facility, carry out chemicals handling, housekeeping, cleaning of screens and assist in carry out cleaning and running pumps. He/ she also has to record wastewater treatment facility activities data and any power outages.

Responsibilities may include:

- Identify chemical stock
- Carry out chemicals handling
- Carry out housekeeping
- Carry out cleaning of screens
- Assist in carry out cleaning and running pumps
- Record wastewater treatment facility activities data
- Report and record any power outages.

Knowledge, Skills, Attitude

A Sewerage Treatment Operator needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of chemical dosing
- Knowledge and skills of grease trap function , maintenance schedule and inspection requirements
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : SEWERAGE TREATMENT

Sewerage Treatment Senior Operator (Level 2)

A Sewerage Treatment Senior Operator is responsible to operate and maintain the wastewater treatment facility, determine the quantity to supply chemical stock and assist in checking data. The personnel has to carry out cleaning and running of pumps/auxiliary pumps, housekeeping and report any power outages.

Responsibilities may include:

- Operate and maintain the wastewater treatment facility
- Determine quantity of chemical stock preparation
- Assist in checking data
- Carry out report and record any power outages
- Carry out chemicals dosing
- Carry out housekeeping
- Carry out cleaning and running of pumps

Knowledge, Skills, Attitude

A Sewerage Treatment Senior Operator needs:

- Knowledge and skills of chemical dosing
- Knowledge and skills of grease trap function , maintenance schedule and inspection requirements
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : SEWERAGE TREATMENT

Sewerage Treatment Technician (Level 3)

A Sewerage Treatment Senior Technician is responsible to supervise wastewater treatment facility activities such as cleaning and running of pumps / auxiliary pumps water, supervise chemicals dosing and plant operation, verify reports and records of any power outages and check housekeeping, cleaning and running of pumps.

Responsibilities may include:

- Supervise cleaning and running of pumps / auxiliary pumps water.
- Supervise chemicals dosing
- Supervise plant operation
- Verify reports and records of any power outages.
- Check housekeeping, cleaning and running of pumps

Knowledge, Skills, Attitude

A Sewerage Treatment Senior technician needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of chemical dosing
- Knowledge and skills of grease trap function , maintenance schedule and inspection requirements
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : DESLUDGING

Sewerage Desludging Operator (Level 1)

A Sewerage Desludging Operator is responsible to identify tools, equipment and safety apparatus and obtain signature and consent from premise occupier for responsive services. The personnel is designated to assist in performing desludging services, checking septic tank for any defect and clean the desludging tanker. He/she has to assist in providing all necessary information and feedback to supervisor after attending to the services.

Responsibilities may include:

- Identify tools equipment and safety apparatus.
- Assist in performing desludging services
- Operate desludging tanker
- Obtain signature and consent from premise occupier for responsive services
- Assist in checking septic tank for any defect
- Assist in cleaning the desludging tanker
- Assist in provide all necessary information and feedback to supervisor
- Maintain desludging tanker cleanliness

Knowledge, Skills, Attitude

A Sewerage Desludging Operator needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of disposal requirement
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : DESLUDGING

Sewerage Desludging Senior Operator (Level 2)

A Sewerage Desludging Senior Operator is designated to perform desludging services, checking septic tank for any defect and clean the desludging tanker. He/she has to provide all necessary information and feedback to supervisor after attending to the services.

Responsibilities may include:

- Determine tools equipment and safety apparatus
- Perform desludging services
- Obtain signature and consent from premise occupier for responsive services
- Check septic tank for any defect
- Carry out cleaning of the desludging tanker
- Provide all necessary information and feedback to supervisor regarding desludging services

Knowledge, Skills, Attitude

A Sewerage Desludging Senior Operator needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of disposal requirement
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : DESLUDGING

This role may also be called: Technician

Sewerage Desludging Supervisor (Level 3)

A Sewerage Desludging Supervisor is responsible to execute workable and efficient working method, equipment and tools to minimize manpower and increase efficiency. He/she is designated to supervise employee output and ensure that sludge from desludging exercise is transported out, treated and disposed of safely according to OSHA regulations and DOE regulations.

Responsibilities may include:

- Supervise employee annual leave programme to maximize output
- Execute workable and efficient working method, equipment and tools to minimize manpower and increase efficiency
- Supervise and ensure that sludge from desludging exercise has been transported out, treated and disposed of safely, in-line with OSHA regulations and DOE regulations

Knowledge, Skills, Attitude

A Sewerage Desludging Supervisor needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of disposal requirement
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to OSHA regulations
- Possess leadership skills, communication skills and documentation skills

JOB AREA : DESLUDGING

Sewerage Desludging Technical Assistant (Level 4)

A Sewerage Desludging Technical Assistant is responsible to coordinate desludging service to ensure it is within agreed level of service, organise the desludging services within budgeted allocation according to Safety and health policies and guidelines.

Responsibilities may include:

- Coordinate desludging service to ensure it is within agreed level of service
- Organise the desludging services within budgeted allocation according to Safety and Health Policies and guidelines
- Execute staff development training and activities to improve teamwork and achieve Company's objective
- Attend meetings with other departments and management

Knowledge, Skills, Attitude

A Sewerage Desludging Technical Assistant needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of technical and regulatory disposal requirements
- Knowledge and skills of reuse technologies (3R)
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations
- Possess leadership skills, communication skills and documentation skills

JOB AREA : NETWORK/TREATMENT/DESLUDGING

Sewerage Technical Manager (Level 5)

A Sewerage Technical Manager is responsible to plan and manage sewerage activities within designated areas to ensure optimum productivity and customer satisfaction, conduct staff development training and activities to improve teamwork and achieve company's objectives, ensure contractors perform according to obligations in the contract agreement and timely submission of payment claim. They are also required to conduct and attend meetings with other departments and management.

Responsibilities may include:

- Plan and manage sewerage activities within designated areas to ensure optimum productivity and customer satisfaction
- Conduct staff development training and activities to improve teamwork and achieve Company's objective
- Ensure contractors perform according to obligations in the contract agreement and timely submission of payment claim
- Attend meetings with other departments and management

Knowledge, Skills, Attitude

A Sewerage Technical Manager needs:

- Knowledge and skills of sewerage works
- Knowledge and skills of technical and regulatory disposal requirements
- Knowledge and skills of reuse technologies (3R)
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations
- Possess leadership skills, communication skills and documentation skills

JOB AREA :SEWERAGE INFRASTRUCTURE DEVELOPMENT

SUB-AREA : PLANNING AND DESIGN

Sewerage Infrastructure Planning and Design Technician (Level 2)

A Sewerage Infrastructure Development Planning and Design Technician is responsible to assist in sewerage planning policy, sewerage and sludge catchment strategy and sewerage planning guidelines/SOP preparation and documentation

Responsibilities may include:

- Assisting in sewerage planning policy preparation and documentation
- Assisting in sewerage and sludge catchment strategy preparation and documentation
- Assisting in sewerage planning guidelines / SOP preparation and documentation
- Compile utilities mapping data
- Retrieve and compile GIS data

Knowledge, Skills, Attitude

A Sewerage Infrastructure Development Planning and Design Technician needs:

- Knowledge of sewerage planning policy
- Knowledge of sewerage and sludge catchment strategy such as land use planning, routing, use of GIS
- Knowledge and skills of design, process and system standardisation
- Knowledge and skills of reuse technologies (3R)
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA :SEWERAGE INFRASTRUCTURE DEVELOPMENT

SUB-AREA : ASSET MANAGEMENT

Sewerage Infrastructure Asset Management Technician (Level 2)

A Sewerage Infrastructure Development Asset Management Technician is responsible to assist in asset inventory, asset economics, life costing, asset replacement program, asset condition monitoring, asset updating, GIS and IT applications and prepare land ownership & legislative requirements documentation.

Responsibilities may include:

- Assisting in asset inventory
- Assisting in asset economics, life costing
- Assisting in asset replacement program
- Assisting in asset condition monitoring
- Assisting in asset updating
- Utilise GIS and IT applications
- Assisting in preparing land ownership & legislative requirements documentation

Knowledge, Skills, Attitude

A Sewerage Infrastructure Development Asset Management Technician needs:

- Knowledge in GIS and IT applications
- Knowledge in Land ownership & legislative requirements

JOB AREA :SEWERAGE INFRASTRUCTURE DEVELOPMENT

SUB-AREA : PLANNING AND DESIGN , ASSET MANAGEMENT

Sewerage Infrastructure Planning and Design &Asset Management Senior Technician (Level 3)

A Sewerage Infrastructure Development Planning and Design &Asset Management Senior Technician is responsible to perform sewerage planning policy preparation and documentation, sewerage and sludge catchment strategy preparation and documentation and sewerage planning guidelines / SOP preparation and documentation. He/she is also responsible for to perform asset inventory, asset economics, life costing, asset replacement program, asset condition monitoring, asset updating, GIS and IT applications and prepare land ownership & legislative requirements documentation.

Responsibilities may include:

- Perform sewerage planning policy preparation and documentation
- Perform sewerage and sludge catchment strategy preparation and documentation
- Perform sewerage planning guidelines / SOP preparation and documentation
- Interpret utilities mapping data
- Update and apply GIS data
- Perform sewerage asset inventory, asset economics, life costing, asset replacement program, asset condition monitoring and asset updating
- Prepare land ownership & legislative requirements documentation

Knowledge, Skills, Attitude

A Sewerage Infrastructure Development Planning and Design Senior Technician needs:

- Knowledge of sewerage planning policy
- Knowledge of sewerage and sludge catchment strategy such as land use planning, routing, use of GIS and IT applications
- Knowledge in Land ownership & legislative requirements
- Knowledge and skills of design, process and system standardisation
- Knowledge and skills of reuse technologies (3R)
- The ability to work as part of a team
- To communicate with other team members/supervisor
- To adhere to Occupational Health and Safety regulations

JOB AREA : SEWERAGE INFRASTRUCTURE DEVELOPMENT

SUB-AREA :PROJECT MANAGEMENT

Sewerage Infrastructure Development Project Management Technician (Level 2)

A Sewerage Infrastructure Development Project Management technician is responsible to assist in construction project management , quality awareness for construction, quality awareness for construction and assist in inspection, testing and commissioning.

Responsibilities may include:

- Assist Construction Project Management
- Assist Quality awareness for construction
- Assist quality awareness for construction
- Assist in inspection, Testing and Commissioning

Knowledge, Skills, Attitude

A Sewerage Infrastructure Development Project Management Technician needs:

- Knowledge in construction project management such as land acquisition, planning and risk management
- Knowledge and skills of construction skills such as construction of treatment plant, distribution/conveyance , consumer connection and infrastructure rehabilitation
- Comply to Safety, Health and Environment requirements
- Aware of technology and innovation relevant to sewerage infrastructure project development

JOB AREA : SEWERAGE INFRASTRUCTURE DEVELOPMENT

SUB-AREA :PROJECT MANAGEMENT

Sewerage Infrastructure Development Project Management Senior Technician (Level 3)

A Sewerage Infrastructure Development Project Management Senior Technician is responsible to perform construction project management, quality awareness for construction, quality awareness for construction and assist in inspection, testing and commissioning.

Responsibilities may include:

- Perform construction project management
- Perform quality awareness for construction
- Perform quality awareness for construction
- Perform inspection, testing and commissioning

Knowledge, Skills, Attitude

A Sewerage Infrastructure Development Project Management Senior Technician needs:

- Knowledge in construction project management such as land acquisition, planning and risk management
- Knowledge and skills of construction skills such as construction of treatment plant, distribution/conveyance , consumer connection and infrastructure rehabilitation
- Comply to Safety, Health and Environment requirements
- Aware of technology and innovation relevant to sewerage infrastructure project development