NELSON MANDELA BAY MUNICIPALITY

CONTRACT NO: SCM/18-7/S

DEVELOPMENT OF A WATER SERVICES DEVELOPMENT PLAN

(2019 – 2022)

INTERPRETATION REPORT

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INTERPRETATION REPORT

1. PREAMBLE

The Nelson Mandela Bay Municipality (NMBM) has compiled an updated Water Services Development Plan (WSDP) in accordance with the requirements of the Water Services Act. The WSDP Report consists of eight (8) topics, the information is captured via an Integrated Regulatory Information System via the Department of Water and Sanitation.

The purpose of the WSDP lies in the need to plan for water services whereby key targets of the NMBM are set for a 5-year period. Furthermore, it is a mechanism used to identify and address water service priorities, in terms of Basic Water Services, High Level of Services, Water Resources, Environmental Impacts, Effective Management, and Transfers within the NMBM's area of jurisdiction. Finally, the WSDP forms the basis on which the Water and Sanitation Master Plans are based that in turn provides more detail for planning purposes.

The NMBM is required to compile new WSDP every five (5) years. Whilst the last time that council approved the document was the WSDP 2003 (Council resolution 55 of 18 August 2003), the NMBM has submitted updated version to DWS with the last being WSDP 2012. This latest WSDP will ensure that it is Council approved.

The purpose of the accompanying Interpretation Report is essentially two-fold:

- An executive summary of the WSDP Report, providing an overview of the information captured in the WSDP Report.
- An explanatory document providing the source information/references, expanding details of the data as presented in the WSDP Report.

The information presented in this Interpretation Report is as captured on **30 June 2019**.

2. SOURCE REFERENCES

The source references list for the compilation of the WSDP is as listed in the Table 1 below.

Table 1: WSDP Source Reference List

NMBM Water Service Development Plan – References List WSDP Source Reference List		
No.	**Description**	**Date**
1	NMBM Water Services Development Plan	Aug-03
2	NMBM Water Services Development Plan Update	May-12
3	NMBM Pails Investigation	Nov-18
3	NMBM Water Master Plan Review 2011-2035	Nov-12
4	EDAMS Water Shapefiles	May-18
5	NMBM Maintenance Backlog Assessment 2010: Sanitation Infrastructure: Pump Stations, Wastewater Treatment Works, Pipelines (Revision 2)	Mar-11
6	NMBM Maintenance Backlog Assessment 2011: Water Infrastructure: Pump Stations, Reservoirs, Break Pressure Tanks, Water Treatment Works, Dams & Pipelines (Revision 2)	Jan-11
7	Algoa Water Supply System Reconciliation Strategy: Status Report 5	Apr-18
8	NMBM Sewerage Master Plan: Phase 2 Stage 2	Oct-09
9	NMBM: GIS Infrastructure Data Base	May-18
10	Census 2011: StatsSA	Oct-12
11	NMBM Operating Expenditure Module (2016/17 to 2018/19)	Jun-19
12	NMBM Capital Expenditure Module (2016/17 to 2018/19)	Jun-19
13	NMBM Maintenance Backlog Report on Sewage Pump Stations in the Nelson Mandela Metropolitan Area – Mechanical and Electrical Items	Sep-17
14	DWA Eastern Cape Groundwater Plan	Feb-10
15	NMBM Integrated Water Resource Management Strategy Review	Jun-18
16	NMBM WC / WDM 10 Year Business Plan November – Version 3	Nov-16
17	NMBM IDP 2017/18 – 2021/22 (Third Edition)	Jun-19
18	EDAMS Bulk Supply Process Flow	Aug-17
19	Strategic Framework for Water Services	Nov-03
20	DWAF Framework for a National Sanitation Strategy	Feb-02
21	Guidelines for Infrastructure Asset Management in Local Government (2006 - 2009)	Mar-06
22	Infrastructure Maintenance Budgeting Guideline: CIDB	Jan-09
23	EMIS: Department of Education	Apr-19
24	NMBM Wastewater Resource Plan, Anderson Mancotywa	Feb-19
25	Algoa Water Supply System: Operational Analysis: 2019- 20: January 2020 Monthly Progress Report	Jan-20
26	NMBM: Non- Revenue Water: 10 Year Business Plan	Feb-17
27	IWA Water Balance	Jan-20
28	Stats SA: General Household Survey 2018	May-19
29	NMBM EDAMS Sewer Shapefiles	May-18
30	NMBM Water Treatment Works Output 2018/19	Mar-20

NOTE: Comments on the status of infrastructure is based on the information supplied by the Water & Sanitation Sub-Directorate's technical staff.

3. TOPIC 1: SETTLEMENT DEMOGRAPHICS & PUBLIC AMENITIES

Nelson Mandela Bay is located on the southern coast of South Africa, on the shores of Algoa Bay. The Nelson Mandela Bay Municipality is one of two metropolitan municipalities in the Eastern Cape Province. It incorporates Port Elizabeth, Uitenhage and Despatch, with their surrounding agricultural areas, and has a gross area of 1,959.02km².

The current population is **1,263,051**, the total number of households is **355,381**, with an average household size of approximately **3.6** people per household. The population is in line with the Integrated Development Plan 2017/18 – 2021/22 (Third Edition).

The basis for the population (or settlement data) was obtained from the Community Survey of 2016, with an annual growth of 1.54% to calculate the current population. Based on the Community Survey of 2016, the estimated current population and number of households as at 30 June 2019 is as follows:

- Total Population: **1,263,051**
- Total Number of Households: **355,381**
- Average Household Size: **3.6**

Settlements are as defined in the Census 2011: Small Area Layer. The Small Area layer is the second smallest area available under the Census 2011 data, the next level up is the “Sub-Place” and the level down is the Enumeration Area (EA). The Sub-Place coincides to ward boundaries, while the EA is the area covered by one enumerator.

According to Stats SA, households are defined as all individuals who live together under the same roof or in the same yard, and who share resources such as food or money to keep the household functioning. The definition is much more restrictive than the concept of a family which usually refer to individuals who are related by blood and who may live very far apart.

Taking the above definitions into consideration, the NMBM comprises of **250** settlements, all of which are located within the Metropolitan Municipal Boundary, consisting of **355,381** households with a population of **1,263,051** at average household size of approximately **3.6** people per household. All the settlements located within the Metropolitan Municipal boundary area are classified as urban settlements for the purpose of the WSDP.

There are a total of **438** Public Amenities Facilities with Water and Sanitation requirements, made up as follows:

- Educational: **367**
    - Primary School: **226**
    - Secondary School: **92**
    - Combined School: **26**
    - Tertiary Institution: **14**
    - Special School: **9**
- Health: **73**
    - Public Hospital: **11**
    - Private Hospital: **4**
    - Clinics: **58**
    - Mobile Clinic: **16** (Excluded for purposes of WSDP)
- Total: **440**

A detailed breakdown of the Public Amenity Facilities is indicated in **Table 41: NMBM Service Level Profile for Public Amenities**.

The WSDP Report excludes police stations, prisons, public libraries, pools, parks, community halls, ward offices, home affairs, stadiums, churches etc. as the DWS WSDP template does not allow the capturing of these facilities.

All of the 440 public amenity facilities have adequate water and sanitation facilities, with the exception of **3** educational facilities, namely Amanzi Primary, Sindawonnye Primary and Rocklands Intermediate School.

4. TOPIC 2: SERVICE LEVEL PROFILE

The service level profile relates to the access and type of access the consumers have to water and sewerage services, which has a direct implication on water demand and sewage produced. The NMBM is required to provide basic access to water and sanitation infrastructure.

NMBM as a local authority strives to conduct business as governed by the Constitution of the Republic of South Africa No 108 of 1996.

The main principles from the constitution can be defined as follow:

- Ensure sustainable provision of services to communities;
- Promote a safe and healthy environment; and
- Encourage involvement of communities and community organisations.

The Constitution ensures the right of each citizen in the country to a basic form of water and sanitation service.

The following is the minimum requirements for basic water and sanitation:

Basic Water:

The Strategic Framework for Water Services (2003) guides Local Government in the basic service standards for the provision of water and sanitation and defines National Norms and Standards. The NMBM complies with the National Norms and Standards as stipulated in the Strategic Framework and provides additional service standards over and above the Norms and Standards. According to the Framework, Basic Water Supply is defined as follows:

- A minimum quantity of 25 litres per day per person;
- A minimum flow rate of 10 litres per minute;
- Access to water within 200m of a household; and
- Not more than 7 days of interrupted water supply per year.

Basic Sanitation:

Furthermore, one of the objectives of the Strategic Framework for Sanitation Services (2002) is to provide a toilet which is safe, reliable, environmentally sound, easy to clean, provides privacy and protection against the weather, is well ventilated, keeps smells to a minimum and prevents the entry and exit of flies and other disease-carrying pests.

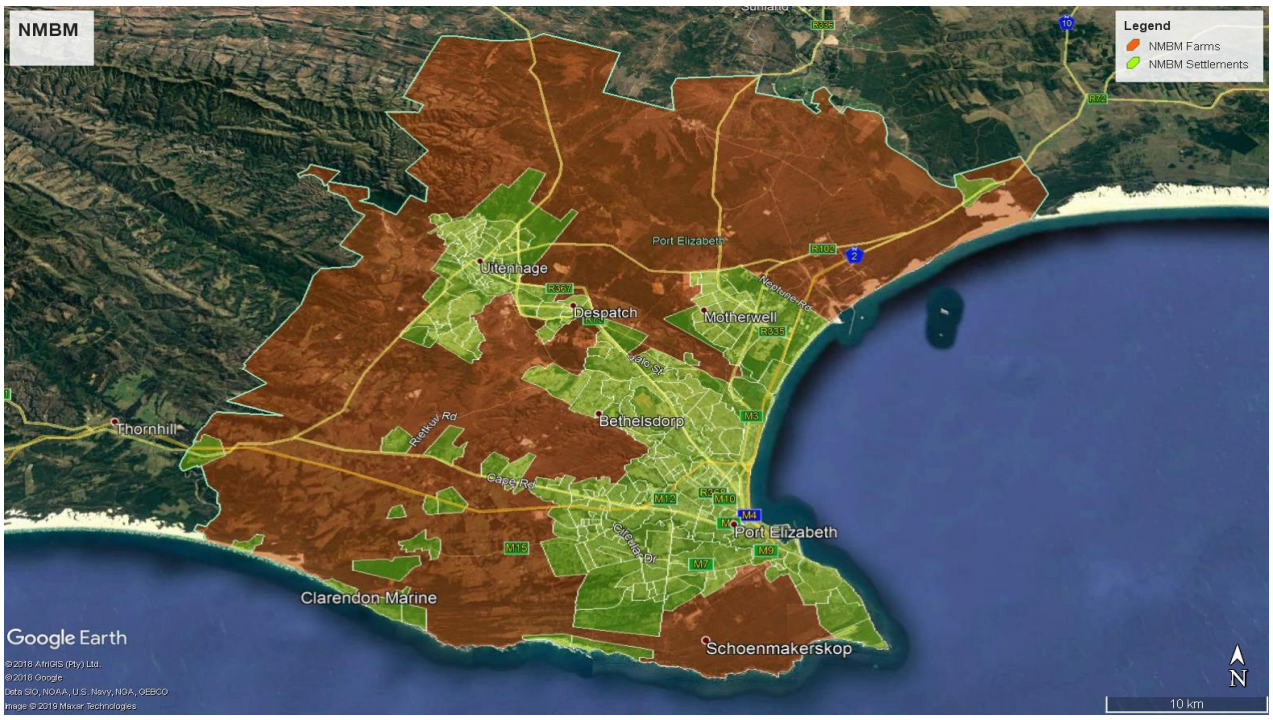
NMBM is responsible for the overall planning and coordination of service delivery within the Despatch, Uitenhage and Port Elizabeth region. The key focus of infrastructure delivery within the Municipality is provision to all households of a viable and appropriate sanitation system.

NMBM provides four (4) types of sanitation services:

- Bucket Sanitation (currently being eradicated);
- Chemical Toilets;
- VIP; and
- Waterborne Sanitation including:
    i. Individual sewer erf connections
    ii. Communal Ablution Facilities
    iii. Stand Alone Toilets
    iv. Communal Toilet Banks

Figure 1 below shows the extents of the NMBM with the areas considered to be within the Urban Fringe shown in green and those outside the urban fringe in brown.

Figure 1: NMBM Boundary showing Settlements and Farm Areas



NMBM currently has **355,381** households distributed among **250** settlements, located within the Metropolitan Municipal boundary area and all classified as urban settlements. Of the **355,381** households, **3,219** households with an estimated population of **12,682** have a water need (irrespective of the type of need), and **7,615** households or population of **27,493** which has a sanitation need (irrespective of the type of need). List of settlements and households with a service level profile for water and sanitation is provided in **Table 42: NMBM Service Level Profile for Water and Sanitation**.

The water services infrastructure supply level and reliability profile of the total **355,381** households are provided in **Table 42: NMBM Service Level Profile for Water and Sanitation**.

All households located within the urban fringe, including formal redistributed erven, have water that meets the RDP standard (<200m from Standpipe).

The total number of households that do not have a reliable water supply is **3,219**, consisting of households with Piped water >200m, Rain-water tank in yard, Water vendor-carrier / tanker, Stagnant water – dam / pool as well as Flowing water / spring / stream / river.

The sanitation service infrastructure supply level and reliability profile of the total **355,381** households is provided in **Table 42: NMBM Service Level Profile for Water and Sanitation**.

Based on the service level profiles, the total number of households that do not have basic sanitation is **7,615** households consisting of **6,010** households with buckets, **762** households that have no sanitation, **36** households that have chemical toilets, and **807** households that have pit toilets.

The bucket eradication programme consists currently of the eradication of buckets in 31 formal settlements consisting of **6,010** households as listed in **Table 42: NMBM Service Level Profile for Water and Sanitation**. In addition to the formal settlements, the Water and Sanitation Division identified **132** informal settlements (as at 19 August 2019) **34,174** households requiring chemical toilets as temporary sanitation solution.

The Water and Sanitation Service Level Profile for all public amenities is adequate, with the exception of 4 education facilities that do not have adequate water and sanitation, namely Amanzi Primary, Sindawonye Primary, Rocklands Intermediate and Ankervas Primary Schools.

Table 2 summarises the total number of informal settlements and households requiring chemical toilets as an immediate solution, and estimated costs, as estimated by the NMBM Wastewater Conveyance Division.

Table 2: Chemical Toilets Requirements

Chemical Toilets Requirement				
No.	**Total No. of Settlements**	**Estimated No. of Households**	**Chemical Toilets Needed**	**Estimated Cost of Chemical Toilets × 12 months**
1	132	34,174	3,432	R63,835,200.00

5. TOPIC 3: WATER SERVICES ASSET MANAGEMENT

The NMBM is the custodian of all water and sanitation systems within its municipal boundary. Infrastructure assets are stationary systems (or networks) that serve settlements to a specified level of service by either refurbishment or replacement of components.

Water services asset management with respect to the WSDP consist of the following:

- Groundwater;
- Water Abstraction;
- Water Treatment Works;
- Water Pumps;
- Sewerage Pumps;
- Water Lines (Pipelines) i.e. bulk lines (gravity / pump), from the Water Master Plan Bulk Pipelines GIS file received from NMBM;
- Sewerage Lines (Pipelines) i.e. bulk lines (gravity / pump), 200mm diameter and over, as received from EDAMS, and as agreed with NMBM project meetings;
- Reservoirs; and
- Wastewater Treatment Works.

5.1 GROUNDWATER

5.1.1 Existing Groundwater

There is one (1) existing groundwater / wellfield scheme, details per **Table 3** as follows:

Table 3: Existing Wellfields

No.	Description	Recommended Yield	Abstraction Rate	Current Abstraction		Licensed Abstraction		Capacity
		l/s	l/s	Mm^3/A	Ml/d	Mm^3/A	Ml/d	Ml/d
1	Uitenhage Springs	68.53	68.53	1.99	5.44	2.16	5.92	6

5.1.2 Future Groundwater

The total future groundwater water supply is approximately **40.9Ml/day**, as detailed per **Table 4**:

Table 4: Future Groundwater Schemes

No.	Description	Estimated Yield		Capacity	Status
		Mm³/A	l/s	Ml/d	
1	Coegakop	6.31	200.23	17.30	Under construction
2	St Georges Park	1.10	34.72	3.00	Not developed yet
3	Springs	0.18	5.79	0.50	
4	Malabar	0.51	16.20	1.40	
5	Fairview	0.26	8.10	0.70	
6	Glendinning	0.58	18.52	1.60	
7	Fort Nottingham	0.26	8.10	0.70	
8	Churchill	1.10	34.72	3.00	
9	Bushy Park	3.65	115.74	10.00	
TOTAL		**14.94**	**473.37**	**40.90**	

It must be noted that the aforementioned groundwater schemes are in the initial stages of development.

5.2 SURFACE WATER ABSTRACTION

5.2.1 Existing Surface Water Abstraction

There are nine (9) existing surface water abstraction points, as listed in **Table 5** below:

Table 5: Existing Surface Water Abstraction

No.	Sub-system	Dam	Owner	Current Abstraction		Licensed Abstraction		Full Capacity
				Mm³/A	Ml/d	Mm³/A	Ml/d	Mm³
1	Kromme	Churchill	NMBM	12.73	34.89	18.00	49.32	35.2
2		Impofu	DWS	22.42	61.43	20.08	55.00	105.8
3	Kouga	Kouga	DWS	14.59	39.97	23.00	63.01	125.9
		Loerie	DWS					3
4	Groendal	Groendal	NMBM	3.68	10.07	3.08	8.44	11.6
5	Older Dams	Bulk River	NMBM	0.58	1.59	0.91	2.49	0.66
6		Sand River	NMBM	1.3	3.57	2.56	7.00	2.88
7		Upper Van Stadens	NMBM	0.03	0.07	0.37	1.00	0.143
8		Van Stadens Gorge	NMBM	0.27	0.73	0.73	2.00	0.318
9	Sundays River	Scheepersvlakte	DWS	49.26	134.97	58.30	159.73	0.806
TOTAL				**104.86**	**287.29**	**127.03**	**347.99**	**286.307**

The registered dam capacities and abstraction values are as per Department of Water and Sanitation Water Use Licenses.

As of 30 June 2019, the Department of Water & Sanitation imposed the equivalent of a 15% restriction on abstractions from NMBM's local surface water sources due to the local drought disaster.

NMBM can only abstract a raw water volume of **58.42Mm³/annum** or **163.58Ml/day** from the local resources namely Kromme, Kouga, Groendal and Older dams subsystem. The restricted volume of from Kromme sub-system includes for the allocation to Humansdorp. To make up the deficit amount of water needed within the Metro, a minimum of **50Mm³/annum (140Ml/day)** should be supplied to the NMBM from the Sundays River subsystem through the Nooigedacht WTW to reach a net supply of **108.42Mm³/annum** or **303.58Ml/day**. Abstraction volumes for June 2019 is **287.29Ml/day** which is within the restricted allocation limits.

5.2.2 Future Surface Water Abstraction

According to the NMBM IWRM Strategic Review (June 2018), the long-term growth of the NMBM's water demand has been estimated to approximately 2.4%. In the NMBM Water Master Plan Review (November 2012), feasibility studies for the following water abstraction projects are under investigation:

- Desalination of Sea Water*:
    i. Schoenmakerskop: Possible **60Ml/day**;
    ii. Coega IDZ: Possible **60Ml/day**; and
    iii. Lower Sundays River Return Flows: Possible **50Ml/day**
- New larger dam below Kouga Dam, or a new dam upstream of Kouga at Guernakop

* It must be noted that while Sea Water is a type of Surface Water, the NMBM defines Surface Water as a source of supply from riverine catchments only i.e. Perennial Rivers, Streams, Lakes, Ponds and Dams. However, for the context of the WSDP, Sea Water has been included in this category.

5.3 WATER TREATMENT WORKS

5.3.1 Existing Water Treatment Works

There are eight (8) existing water treatment works, with a combined total treatment capacity of **506.18 Ml/day** per **Table 6** below:

Table 6: Existing Water Treatment Works

No.	Description	Class	Status	Commission Date	Current Peak Capacity (Ml/d)
1	Churchill	Regional	Existing	1947	100
2	Elandsjagt	Regional	Existing	1984	105
3	Groendal	Internal	Existing	1986	20
4	Linton	Internal	Existing	1937	15
5	Loerie	Internal	Existing	1968	100
6	Nooitgedagt	Internal	Existing	1993	160*
7	Rocklands	Internal	Existing	2008	0.18
8	Uitenhage Springs	Internal	Existing	1867	6
Total					**506.18**

* Nooitgedagt is currently undergoing extensions that will increase peak capacity from **160Ml/day** to **210Ml/day** by March 2021.

5.3.2 Future Water Treatment Works

There is one (1) planned water treatment works, namely Coegakop WTW with an estimated peak capacity of **20Ml/day**.

Other possible water treatment initiatives under investigation or planning stages:

- Desalination of Sea Water:
    i. Schoenmakerskop: Possible **60Ml/day**
    ii. Coega IDZ: Possible **60Ml/day**
    iii. Lower Sundays River Return Flows: Possible **50Ml/day**
- Direct and / or Indirect Re-use of waste water
- Reclaimed effluent at Fishwater Flats WWTW for Coega IDZ
- Reclaimed effluent at Fishwater Flats WWTW for Loerie Dam

5.4 WATER PUMP STATIONS

There are thirty-five (35) existing water pump stations, and one (1) future pump station, namely Chatty as listed in **Table 43: NMBM Water Pump Stations**.

5.5 SEWER PUMP STATIONS

There are ninety-two (92) existing sewerage pump stations, and two (2) future pump stations, namely Fitzpatrick and Missionvale 3 as listed in **Table 44: NMBM Sewer Pump Stations**.

5.6 BULK WATER PIPELINES

There are **560km** of bulk water lines (per Water Mater Plan_Bulk Pipelines shape file).

5.7 BULK SEWER PIPELINES

There are **516km** bulk sewerage lines (per Pipes 200mm dia. and larger, Sewer Master Plan_Bulk Pipelines shape file).

5.8 RESERVOIRS

There are seventy-three (73) existing reservoirs with a total capacity of **1,338Ml**, and ten (10) planned reservoirs with total capacity of **53.77Ml** as follows:

- Amanzi: 20Ml
- Amanzi Tower: 0.5Ml
- Balmoral: 9Ml
- Greenbushes (Elevated): 0.06Ml
- Greenbushes: 14Ml
- Lakefarm: 1Ml
- Rocklands 2: 0.36Ml
- Seaview Upper: 2.5Ml
- St Albans: 6Ml
- State Forest: 0.35Ml

- **Total:** **53.77Ml**

Furthermore, there are four (4) planned reservoirs to store recycled water from various WWTW's and industrial areas, namely Fishwater Flats, Despatch, Industrial Dam and Strelitsia Dam. The capacities of these reservoirs are to be confirmed by the Water & Sanitation Sub-directorate.

A complete List of Existing and Planned Reservoirs are listed in **Table 45: NMBM Reservoirs**. The reservoirs are in operational condition, with medium refurbishment requirements.

5.9 WASTEWATER TREATMENT WORKS

5.9.1 Existing Wastewater Treatment Works

There are eight (8) existing wastewater treatment works with a total capacity of **205.04Ml/day**, the pre-treatment facility at Brickfields is not classified as a treatment works, as listed in **Table 7** below:

Table 7: Existing Wastewater Treatment Works

No.	Description	Type	Status	Commission Date	Last Upgrade	Current Peak Capacity (Ml/d)
1	Cape Receife	Activated Sludge	Existing	1971	2013	9
2	Despatch	Activated Sludge	Existing	1969	2005	8.86
3	Driftsands	Activated Sludge	Existing	1985	2018	22
4	Fishwater Flats	Activated Sludge	Existing	1976	2018	132
5	Kelvin Jones	Activated Sludge	Existing	1936	2018	24
6	Kwanobuhle	Activated Sludge	Existing	1985	1999	9
7	Rocklands SBR	Activated Sludge	Existing	2006	-	0.18
8	Brickfield	Pre-treatment	Existing	-	-	-
TOTAL						**205.04**

The treatment works are all in operation condition, and allowance has been made for refurbishment of existing and/or replacement of components or internal refurbishment/upgrading of the works in terms of technology or capacity, but no replacement of the works.

The volume of re-used treated effluent at the four (4) existing wastewater treatment works is currently **7.6Ml/day** as listed in **Table 8**.

Table 8: Wastewater Treatment Works with re-use of treated effluent

No.	Description	Current Peak Capacity (Ml/day)	Volume Billed (Ml/day)
1	Fishwater Flats	132	2
2	Kelvin Jones	24	0.7
3	Despatch	8.88	1.9
4	Cape Receife	9	3
TOTAL		**173.88**	**7.6**

The Fishwater Flats RE is abstracted from the on-site 9ML reservoir at the WWTW. The average daily usage of RE from the scheme is approximately 2ML.

RE is pumped from Kelvin Jones WWTW to Strelitzia and Industrial open dams near Kelvin Jones WWTW. The capacity of the filtration plant is 1ML/day, and the average daily usage is approximately 0.7ML.

Despatch RE is abstracted from the final effluent at the chlorine contact tank. The average daily usage based on pumping capacity is 1.9ML. Reservoirs are located off site and the Water Distribution Division operates the distribution scheme.

The Cape Receife RE is abstracted from the final effluent after the chlorine contact tank before it gets to the first of the two maturation ponds. The average daily usage based on pumping capacity is currently 3ML.

The above is based on information supplied by the NMBM Wastewater Treatment Division.

5.9.2 Future Wastewater Treatment Works

There are five (5) future wastewater treatment works under investigation and planning, with a combined total treatment capacity of **196.5Ml/day** to, as listed in **Table 9** below:

Table 9: Future Wastewater Treatment Works

No.	Description	Capacity (Ml/d)
1	Bushy Park	60
2	Greenbushes	53
3	Draaifontein	39
4	St. Albans	22
5	Coega	22.5
TOTAL		**196.5**

5.9.3 Sanitation Schemes

There are fourteen (14) existing sanitation schemes, with five (5) planned for future, namely Motherwell North - Coega, Bushy Park, Greenbushes and Draaifontein. These sanitation schemes are listed in **Table 10**, and each scheme is characterised by the catchment areas to the wastewater treatment works.

Table 10: Sanitation Schemes

No.	Scheme	Wastewater Treatment Works	Class (Bulk)	Status	Owner	Green Drop Status
1	Chatty	Fishwater Flats	Internal	Existing	NMBM	62.16
2	City	Fishwater Flats	Internal	Existing	NMBM	62.16
3	Despatch	Despatch	Internal	Existing	NMBM	71.44
4	Driftsands	Driftsands	Internal	Existing	NMBM	87.67
5	Jagtvlakte	Kelvin Jones	Internal	Existing	NMBM	62.67
6	Kwanobuhle	Kwanobuhle	Internal	Existing	NMBM	66.60
7	Lower Baakens	Cape Receife	Internal	Existing	NMBM	70.94
8	Motherwell	Fishwater Flats	Internal	Existing	NMBM	62.16
9	Paapenkuils	Fishwater Flats	Internal	Existing	NMBM	62.16
10	Swartkops	Fishwater Flats	Internal	Existing	NMBM	62.16
11	Uitenhage	Kelvin Jones	Internal	Existing	NMBM	62.67
12	Upper Baakens	Driftsands	Internal	Existing	NMBM	87.67
13	Wells Estate	Fishwater Flats	Internal	Existing	NMBM	62.16
14	Kwanobuhle	Rocklands	Internal	Existing	NMBM	59.64
15	Bushy Park	Bushy Park	Internal	Future	NMBM	-
16	Draaifontein	Draaifontein	Internal	Future	NMBM	-
17	Greenbushes	St Albans	Internal	Future	NMBM	-
18	Motherwell North - Coega	Coega	Internal	Future	NMBM	-

5.10 WATER SERVICES ASSETS FUNCTIONALITY / REFURBISHMENT AND REPLACEMENT STATUS

5.10.1 Status Summary

Table 11 is a summary of the water services assets functionality and refurbishment/replacement status:

Table 11: Functionality / Refurbishment / Replacement of Infrastructure

GENERAL INFORMATION			GENERAL PHYSICAL CONDITION				COST NEEDS		
No.	**ASSET**	**NO. OFF**	**VANDALIS-ED**	**DYSFUNCT-IONAL**	**OPERATIO-NAL**	**PRIME CONDITION**	**ASSET VALUE (RM)**	**REFURBISHMENT NEEDS COST (RM)**	**REPLACEMENT NEEDS COST (RM)**
1	Boreholes	1	0	0	1	0	6.58	0.225	0.075
2	Abstraction Points	9	0	0	9	0	1,421.77	6.939	2.329
3	Water Treatment Works	8	0	0	8	0	1,215.29	34.400	126.700
4	Water Pump Stations	35	0	0	35	0	235.77	46.260	68.080
5	Sewer Pump Stations	92	0	0	92	0	223.45	41.230	116.240
6	Bulk Water Pipelines	560km	560km Bulk Water Pipes; All operational, Refurbishment 251 km, Replacement 0 km				9,378.27	1,541.820	3,119.140
7	Water Reticulation	4,822km	4,822km of water reticulation				2,575.25	Excluded*	Excluded*
8	Bulk Sewer Pipelines	516km	516km Bulk Sewers; All operational, refurbishment 295.1 km, replacement 71.42 km				2,721.23	796.100	136.740
9	Sewer Reticulation	3,116km	3,116km of sewer reticulation (< 200mm dia.), incl. 67 602 manholes				1,185.78	Excluded*	Excluded*
10	Reservoirs	73	0	0	73	0	2,233.20	123.49	2,072.95
11	Wastewater Treatment Works	8	0	0	8	0	3,664.11	308.195	4,273.826
TOTAL							**24,860.75**	**2,898.659**	**9,916.080**

(*Costs quantification applicable to bulk infrastructure only, not applicable for internal infrastructure)

5.10.2 Refurbishment & Replacement Needs

i. Groundwater

The existing Uitenhage Springs is in a fully functional and operational condition, with medium refurbishment needs required. Therefore, it is estimated that **30%** refurbishment needs and **10%** replacement needs for all infrastructure components are required. Using a base value of **R372,000** as per the Maintenance Backlog Report (2010), the following refurbishment and replacement needs costs were determined:

Table 12: NMBM Groundwater Refurbishment & Replacement Needs Costs

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Costs (RM)
1	Uitenhage Springs	Existing	Operational	Medium	0.225	0.075

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 13: NMBM Groundwater Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Uitenhage Springs	0.331	0.486	0.714

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 14: NMBM Groundwater Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Uitenhage Springs	0.11	0.162	0.238

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be 10% of the Asset Value (R750,000) which resulted to **R75,000**.

ii. Abstraction Points

Based on the Maintenance Backlog Report 2010, all the dams are in good condition. There are minimal replacement needs of major components for the dams, and the refurbishment needs (of components of the dam / abstraction) were quantified based on the Backlog Report, and rounded off as follows:

Table 15: NMBM Surface Water Refurbishment & Replacement Needs Costs

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Costs (RM)
1	Churchill	Existing	Operational	Low	0.559	0.279
2	Impofu	Existing	Operational	Low	-	0.001
3	Kouga	Existing	Operational	Low	0.042	0.002
4	Loerie	Existing	Operational	Low	0.762	0.040
5	Groendal	Existing	Operational	Low	1.207	0.483
6	Bulk River	Existing	Operational	Low	1.504	0.602
7	Sand River	Existing	Operational	Low	0.651	0.012
8	Upper Van Stadens	Existing	Operational	Low	0.575	0.056
9	Van Stadens Gorge	Existing	Operational	Low	1.181	0.152
10	Scheepersvlakte	Existing	Operational	Low	0.500	0.200

It must be noted that the low refurbishment cost for Impofu Dam is due to the dam wall and spillway is being in very good condition, resulting in almost bare minimal refurbishments required for the infrastructure.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 16: NMBM Surface Water Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Churchill	0.821	1.207	1.773
2	Impofu	-	-	-
3	Kouga	0.062	0.091	0.133
4	Loerie	1.12	1.645	2.417
5	Groendal	1.773	2.606	3.829
6	Bulk River	2.21	3.247	4.771
7	Sand River	0.957	1.405	2.065
8	Upper Van Stadens	0.845	1.241	1.824
9	Van Stadens Gorge	1.735	2.550	3.746
10	Scheepersvlakte	0.735	1.079	1.586

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 17: NMBM Surface Water Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Churchill	0.410	0.602	0.885
2	Impofu	0.001	0.002	0.003
3	Kouga	0.003	0.004	0.006
4	Loerie	0.059	0.086	0.127
5	Groendal	0.710	1.043	1.532
6	Bulk River	0.885	1.300	1.910
7	Sand River	0.018	0.026	0.038
8	Upper Van Stadens	0.082	0.121	0.178
9	Van Stadens Gorge	0.223	0.328	0.482
10	Scheepersvlakte	0.294	0.432	0.634

It must be noted that the low replacement cost for Impofu Dam is due to the recent maintenance done at the intake tower, as well as the lighting.

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R182.7-million**. This cost is due to the water purchased from the Scheepersvlakte Dam to service the Nooitgedagt Water Treatment Works.

iii. Water Treatment Works

All existing water treatment works are operational, but require some refurbishments and / or replacements needs (of components of the works). Based on the Maintenance Backlog report of 2010, the water treatment works have the following estimated costs:

Table 18: NMBM Water Treatment Works Refurbishment & Replacement Needs Cost

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Cost (RM)
1	Churchill	Existing	Operational	Low	1.251	24.287
2	Elandsjagt	Existing	Operational	Low	5.490	34.142
3	Groendal	Existing	Prime	Low	3.235	8.074
4	Linton	Existing	Operational	Low	0.403	16.888
5	Loerie	Existing	Operational	Low	3.321	38.116
6	Nooitgedagt	Existing	Operational	Low	20.649	0.181
7	Rocklands	Existing	Operational	Low	0.049	3.000
8	Uitenhage Springs	Existing	Operational	Low	0.004	2.009

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 19: NMBM Water Treatment Works Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Churchill	1.838	2.701	3.968
2	Elandsjagt	8.067	11.852	17.415
3	Groendal	4.753	6.984	10.262
4	Linton	0.592	0.870	1.278
5	Loerie	4.880	7.170	10.535
6	Nooitgedagt	30.340	44.580	65.502
7	Rocklands	0.072	0.106	0.155
8	Uitenhage Springs	0.006	0.009	0.013

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 20: NMBM Water Treatment Works Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Churchill	35.686	52.434	77.042
2	Elandsjagt	50.166	73.710	108.304
3	Groendal	11.863	17.431	25.612
4	Linton	24.814	36.460	53.572
5	Loerie	56.005	82.290	120.91
6	Nooitgedagt	0.266	0.391	0.574
7	Rocklands	4.408	6.477	9.517
8	Uitenhage Springs	2.952	4.337	6.373

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R210.53-million**.

iv. Water Pump Stations

All 35 existing water pump stations are operational, with refurbishments / replacement requirements as listed in **Table 46: NMBM Water Pump Stations Refurbishment & Replacement Needs Cost** and **Table 47: NMBM Water Pump Stations Infrastructure Problems**. Based on the backlog report of 2010, as well as discussions with the Water Division with respect to the refurbishment needs, the estimated costs for refurbishments / replacement / upgrading requirements (of components) has been quantified per pump station.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 21: NMBM Water Pump Stations Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Water Pump Stations	66.780	98.110	144.160

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 22: NMBM Water Pump Station Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Water Pump Stations	75.270	110.600	162.510

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R70.6-million**.

v. Sewer Pump Stations

All 92 sewer pump stations are operational, with refurbishments / replacement requirements. Based on the backlog report of 2010 as well as discussions with the Waste Water Division with respect to the refurbishment needs as listed in **Table 48: NMBM Sewer Pump Stations Refurbishment & Replacement Needs Cost** and **Table 49: NMBM Sewer Pump Station Problems**, the estimated costs for refurbishments / replacement / upgrading requirements (of components) has been quantified per pump station.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 23: NMBM Sewer Pump Stations Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Sewer Pump Stations	60.580	89.010	130.790

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 24: NMBM Sewer Pump Station Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Sewer Pump Stations	170.790	250.950	368.730

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R167.96-million**.

vi. Bulk Water Pipelines

All 560km of bulk water pipe are operational with medium refurbishment needs, except for the Churchill-Socoman pipeline which has high refurbishment needs. No bulk water pipes require replacement as a result of poor working conditions. Refurbishment / replacement and O&M costs are indicated in **Table 53: Pipe Refurbishments & Replacements Costings Criteria** and **Table 54: O&M Costings Criteria**.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 25: NMBM Bulk Water Pipelines Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Bulk Water Pipelines	2,266.480	3,331.720	4,897.640

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 53: Pipe Refurbishments & Replacements Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 26: NMBM Bulk Water Pipelines Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Bulk Water Pipelines	4,585.140	6,640.150	9,908.020

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R126.46-million**.

vii. Bulk Sewer Pipelines

All 516km of bulk sewer lines are operational, with replacement needs due to numerous breakages / condition of the pipeline. Refurbishment, replacement and O & M criteria and costs are indicated in **Table 53: Pipe Refurbishments & Replacements Costings Criteria** and **Table 54: O&M Costings Criteria**.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 27: NMBM Bulk Sewer Pipelines Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Bulk Sewer Pipelines	1,170.270	1,720.300	2,528.840

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 53: Pipe Refurbishments & Replacements Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 28: NMBM Bulk Sewer Pipelines Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Bulk Sewer Pipelines	1,970.490	2,896.620	4,258.040

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R110.47-million**.

viii. Reservoirs

There are 73 reservoirs all with various refurbishment / replacement needs based on the Reservoir Condition Assessment Reports of 2015, as listed in **Table 51: NMBM Reservoirs Refurbishment & Replacement Needs Cost** and **Table 52: NMBM Reservoirs Infrastructure Problems** , with refurbishment costings based on the Reservoir Condition Report of 2015. Costs are escalated by 8% per annum.

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 29: NMBM Reservoir Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Reservoir	181.450	266.610	391.74

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 53: Pipe Refurbishments & Replacements Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 30: NMBM Reservoir Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Reservoir	3,045.840	4,475.340	6,575.750

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R120.3-million**.

ix. Wastewater Treatment Works

There are seven (7) existing wastewater treatment works requiring various refurbishments needs and / or upgrading. Current upgrading / refurbishment needs as per the NMBM Project List were taken into account in the costings.

Table 31: NMBM Wastewater Treatment Works Refurbishment & Replacement Needs Cost

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Costs (RM)	Replacement Needs Costs (RM)
1	Cape Receife	Existing	Operational	High	13.649	77.947
2	Despatch	Existing	Operational	Medium	34.148	114.074
3	Driftsands	Existing	Operational	Medium	12.388	534.657
4	Fishwater Flats	Existing	Operational	High	184.789	2,972.850
5	Kelvin Jones	Existing	Operational	High	28.997	300.257
6	Kwanobuhle	Existing	Operational	Medium	16.080	243.697
7	Rocklands SBR	Existing	Operational	Medium	18.144	30.344

Furthermore, the refurbishment costs were escalated at approximately 8% per annum to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 32: NMBM Wastewater Treatment Works Future Refurbishment Costs

No.	Description	5-year Refurbishment Cost (RM)	10-year Refurbishment Cost (RM)	15-year Refurbishment Cost (RM)
1	Cape Receife	20.056	29.469	43.300
2	Despatch	50.178	73.727	108.330
3	Driftsands	18.205	26.749	39.303
4	Fishwater Flats	271.517	398.948	586.153
5	Kelvin Jones	42.606	62.602	91.983
6	Kwanobuhle	23.627	34.716	51.008
7	Rocklands SBR	26.659	39.172	57.556

Similar to the refurbishment needs costs, the replacement needs costs were escalated as per **Table 55: Infrastructure Replacement Costings Criteria** to determine future costs on a 5, 10 and 15-year basis as illustrated below:

Table 33: NMBM Wastewater Treatment Works Future Replacement Costs

No.	Description	5-year Replacement Cost (RM)	10-year Replacement Cost (RM)	15-year Replacement Cost (RM)
1	Cape Receife	114.530	168.282	247.261
2	Despatch	167.612	246.277	361.862
3	Driftsands	785.587	1,154.284	1,696.022
4	Fishwater Flats	4,368.092	6,418.160	9,430.383
5	Kelvin Jones	441.176	648.232	952.466
6	Kwanobuhle	358.071	526.124	773.048
7	Rocklands SBR	44.585	65.510	96.256

With reference to **Table 54: O&M Costings Criteria** the annual O&M costs have been estimated to be **R109.247-million**.

6. TOPIC 4: WATER SERVICES OPERATION & MAINTENANCE

The Operation & Maintenance is based on the following:

1. Resources

a) Staffing

b) External Resources

c) Spare parts

d) Tools & Equipment

e) Budget

2. Information

a) Manuals Available

b) Asset Register

c) As Built Info

d) Tools & Equipment

e) Contingency & Safety Plan

3. Activity Control & Management

a) Procedures

b) Record keeping in place

c) Quality Control procedures established

d) Risk Management

e) Reporting (data analysis & report generation est.)

Whilst the operations and maintenance of various components of infrastructure are in place, the development of an overall Operations and Maintenance Strategy for all Water and Sanitation Infrastructure needs to be put in place. This will include the filling of key vacancies and continuous training of key staff, increased storage, space and availability of key space, parts, tools and equipment, and aligned budgeting. However, it must be noted that the information captured is continuously developed on an asset register database recording and uploading as-built information into EDAMS, which is used as a record-keeping database. With regards to Activity Control & Management, procedures and record keeping are in place, with the system in place whereby incidents / condition assessments / refurbishments / replacement needs are logged with EDAMS electronic database, with reports generated for follow up procedures to address infrastructure upgrades.

7. TOPIC 5: CONSERVATION & DEMAND MANAGEMENT

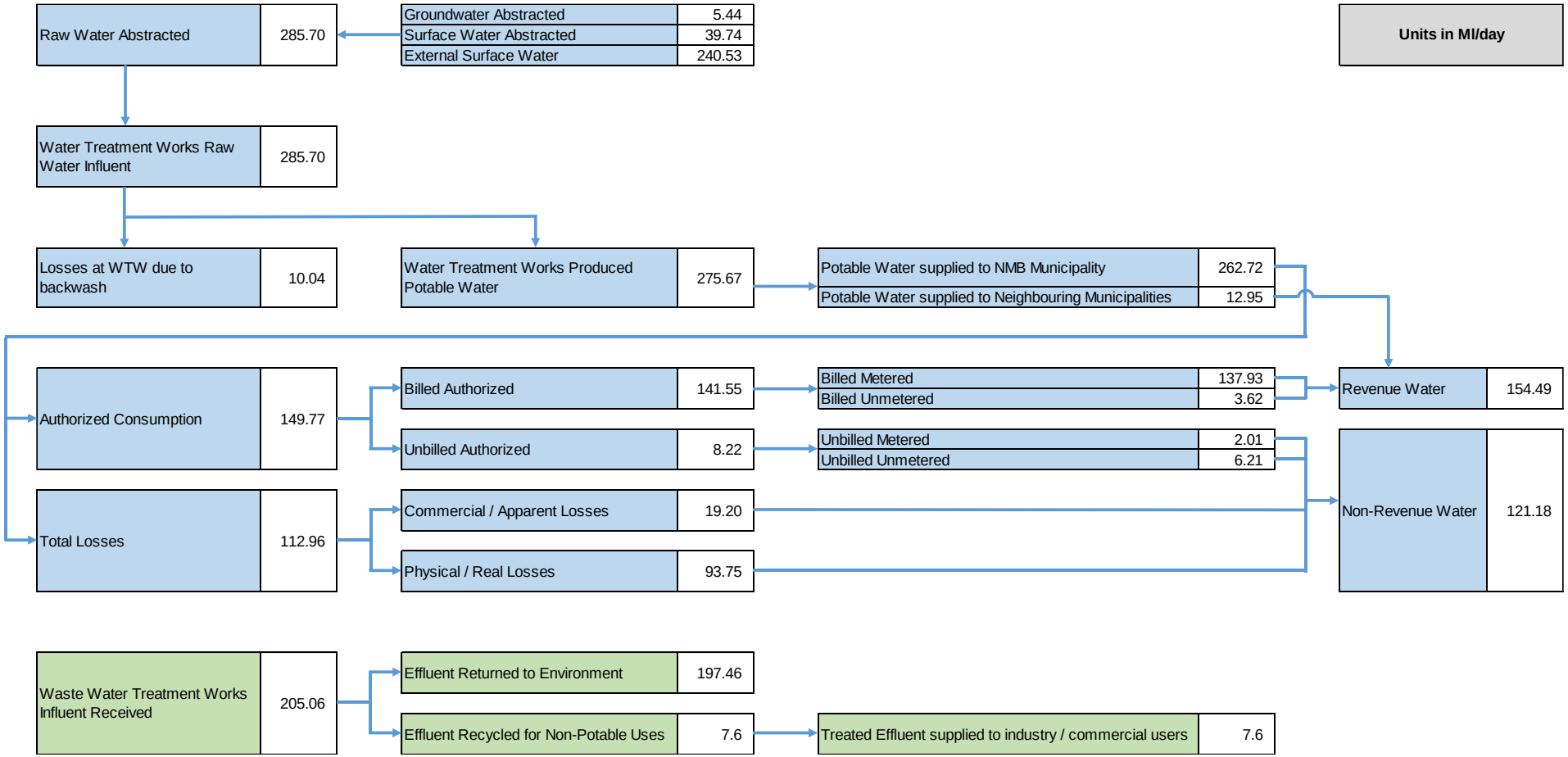
Based on the Non-Revenue Water: Ten Year Business Plan of February 2017, the workstream currently (30 June 2019) being implemented by NMBM to address Water Conservation and Demand Management are summarised as follows:

1. Bulk Water Supply & Bulk Water Meters;
2. Greater Meter Area (GMA) & District Meter Area (DMA) Meters;
3. Remote Reading;
4. Non-Revenue Water (NRW) Monitoring;
5. Pressure Management;
6. Industrial, Commercial and Institutional (ICI) Users and Billing Management;
7. Water and Sanitation Tariffs;
8. Leak Repairs;
9. Leak Repair Contractor;
10. Domestic Meter Audit;
11. Valve & Hydrant Audit;
12. Meter Replacement Programme;
13. Pipe Replacement Programme;
14. Reservoir Rehabilitation; and
15. Publicity Awareness Programme.

7.1 TOPIC 5.2: WATER BALANCE

The water balance as at 30 June 2019 is reflected in Figure 2 below, and is based on the following:

Figure 2: NMBM IWA Water Balance Cycle



8. TOPIC 6: WATER RESOURCES

Topic 6 provides a summary of existing and additional water resources.

8.1 EXISTING WATER RESOURCES

The total existing water resources available is **292.35Ml/day** as summarised in **Table 34** below:

Table 34: NMBM Water Sources

No.	Current Water Sources	No. Sources	Current Abstraction (Mm^3/A)	Current Abstraction (Ml/day)	Components Abstraction Recorded	Licensed Abstraction (Mm^3/A)
1	Groundwater	1	1.99	5.44	1	2.16
2	Surface Water Abstraction	6	18.59	50.92	6	25.65
3	External Sources	4	86.27	236.37	4	101.38
TOTAL		**11**	**106.85**	**292.35**	**11**	**129.19**

The existing sources are illustrated in more detail in **Table 3: Existing Wellfields** and **Table 5: Existing Surface Water Abstraction**. Surface Water Abstraction refer to NMBM owned dams and External Sources refers to DWS owned dams.

8.2 ADDITIONAL AVAILABLE RESOURCES

8.2.1 Groundwater

The NMBM is currently investigating and planning nine (9) potential groundwater resources as listed in **Section 5.1.2 Future Groundwater**, **Table 4: Future Groundwater Schemes**. The potential groundwater sources have been envisaged to bring in an additional **40.9Ml/day** to the Algoa Water Supply System.

8.2.2 Surface Water

The potential additional surface water sources that are currently under investigation by the NMBM are mentioned in **Section 5.2.2 Future Surface Water Abstraction**.

8.2.3 External Sources (Licenced External Abstraction)

The Scheepersvlakte Scheme is currently undergoing extensions that will increase Nooitgedagt WTW's peak capacity from **160Ml/day** to **210Ml/day** by March 2021 and supply additional water into the Algoa Water Supply Scheme.

8.2.4 Re-use of Existing Sources

Water must be recognised as a valuable resource, a finite resource, a renewable resource and a shared resource. It must be noted that water conservation should be both an objective in water resource management and water services management as well as a strategy. To increase the volume of recycled water supplied to consumers in the NMBM, the following projects are proposed:

- Direct and / or Indirect re-use of waste water;
- Reclaimed effluent at Fishwater Flats WWTW for Coega IDZ; and
- Reclaimed effluent at Fishwater Flats WWTW for Loerie Dam.

The main future use of recycled water will be focused towards the Coega IDZ from the proposed Coega WWTW with an anticipated peak demand of **110Ml/day**.

Note: Recycled water will be used for non-potable applications such as:

1. Irrigation use; and
2. Industrial use.

9. TOPIC 7: FINANCE

Topic 7 covers municipality's expenditure and revenue. The expenditure and revenue information has been extracted from the NMBM operating expenditure and budgeting system using the voting codes for the water and sanitation departments.

9.1 Topic 7.1: Expenditure

Table 35 is a summary extract of the expenditure cost standards and ratios.

Table 35: Expenditure Cost Standards & Ratios (2018/19)

No.	Indicators	Value
1	Sanitation service O&M [and repair] as a % of total / capital budget	13.2%
2	Sanitation service O&M [and repair] as a % Asset value [PPE]	7.6%
3	Water service O&M [and repair] Cost as % of total / capital budget	37.6%
4	Water service O&M [and repair] Cost as % of Asset value [PPE]	8.2%
5	Untreated waste water units released	-
6	Cost to purify water	R669.20-mil
7	Cost to deliver water to consumer	R461.60-mil
8	Cost to treat waste water	R197.80-mil
9	Cost to deliver waste water to treatment facility	R670.20-mil
10	Blue Drop Cost	R0.60-mil
11	Green Drop Cost	R0.52-mil

The costs to purify water, deliver water to consumers, treat wastewater and deliver wastewater to the treatment facilities were extracted from the NMBM operational expenditure. The extracted totals excluded line items under the category of balance sheet, costing charge, control expense account and control suspense account as items under these categories do not contribute to the actual cost of water and waste water operational expenditure.

The percentage of asset value and budget was determined by dividing the relevant service by the total budget as summed in **Topic 7.2: Revenue and Capex**, and by dividing the relevant services by the replacement value of the assets respectively.

Table 36 is a summary of the water balance cost i.e. revenue of metered water produced or purchased versus metered / unmetered / billed consumption and losses.

Table 36: NMBM Expenditure Cost Standards & Ratios (2018/19)

No.	Water Balance Element	2018/19 Income (R)	2018/19 Units (m^3)	R/m^3
1	System Input Volume	R1,358,146,030.80	100,615,000	R13.50
2	Billed Authorised Consumption		56,000,000	R24.08

The information was obtained from the NMBM Integrated Water Asset water balance spreadsheet.

The average rand value per cubic meter of water was calculated by dividing the income generated from water by the system input volume. The table also calculates the average cost of water that billed authorised consumers are charged to be R24.08/m^3. If all consumers paid this average rate for water, the NMBM's income could be increased by 79.1%.

Table 37 below shows the average cost to consumer per service.

Table 37: Summary of Financial Year (2018/19)

No.	Service	Total Income (R-mill)	Total Expenditure (R-mill)	Volume (kl)	R/kl
1	Water	1,358.1	1,131.4	56,400,000	24.08
2	Sanitation	1,212.5	942.8	74,846,900	16.20
Combined		**2,570.6**	**2.074.2**		

The average rand value per cubic meter of wastewater was calculated by dividing the income generated from wastewater by the volume of sewage received at the WWTW.

The combined income exceeds expenditure by approximately R496.4-million.

The provision of Water & Sanitation requires extensive support services whose operational budgets are partially funded by this surplus, including but not limited to:

Council; City Manager; Internal Audit & Risk Management; Chief Operating Officer; Integrated Development Plan; Communications; Legal Services; Chief Financial Officer; Budget & Treasury; Customer Care Centre; Supply Chain Management; Corporate Services; Human Resource Services; Labour Relations; Payroll; Information Technology; Asset Management; Facilities Management; Printing; Archives; Scientific Services; Laboratory; Fleet Management; Environmental Management; Occupational Safety Management; Occupational Health; Disaster Management; Security Services; Metro Police; and the Expanded Public Works Programme.

A summary of non-revenue water past nine (9) years is summarised in **Table 38**.

Table 38: Non-revenue water

No.	Financial Year	2010 / 11	2011 / 12	2012 / 13	2013 / 14	2014 / 15	2015 / 16	2016 / 17	2017 / 18	2018 / 19
1	Volume Treated (Ml)	87,755	91,700	99,752	107,655	109,258	109,875	101,298	100,028	100,620
2	Revenue Volume (Ml)	52,501	58,656	57,817	62,110	58,843	62,139	63,262	56,163	56,400
3	NRW (%)	**40.2**	**36.0**	**41.7**	**42.3**	**46.1**	**43.4**	**37.5**	**43.9**	**43.9**
4	Real Losses (Ml)	22,961	19,272	30,079	39,042	43,406	40,985	29,807	41,189	34,212
5	Real Losses (%)	26.2	21.0	33.7	40.3	39.7	37.3	29.4	41.2	34.0

Although there was a gradual decrease in Real Losses in 2010/11 and 2011/12 due to WC / WDM interventions such as the water loss programme and the ATTP programme, this was short-lived as the Real Losses increased from 2012/13 due to the decline in billing volumes. Unfortunately, the Budget and Treasury Directorate is unable to provide an explanation for this.

It must be noted that the high increase in demand in production volumes of approximately 7.4% is a concern. The natural growth rate in population is 1.54%. Possible reasons for this can be:

- Production volumes are measured at the outlet of each WTW and there are long bulk supply mains that convey the water to the city. Additional bulk meters need to be installed at the edge of the city so that water balance of the bulk system can be established;
- The accuracy of billing volumes is suspect. The I & E and the B & T directorates need to liaise closely on this;
- Many communal standpipes have been installed in informal areas without meters before the elections. The installation is undertaken as an urgent intervention without detailed planning;
- The water loss contract, repairs and maintenance contract and ATTP programme were dormant for large parts of 2013/14 financial year;
- High number of unmetered connections (approximately 10 000) in low cost housing due to SCM processes; and
- Increase in industrial demand.

The operational resource costs (cost to operate and deliver service) are summarised in **Table 39**:

Table 39: Operational Resource Costs

#	MTEF	2018/19	2019/20	2020/21	2021/22
1	Staff	R381,013,130	R429,626,420	R471,010,200	R517,105,460
2	Vehicles / transport	R8,750,920	R9,867,446	R10,817,928	R11,876,621
3	Chemicals	R48,343,480	R54,511,602	R59,762,434	R65,611,065
4	Materials	R27,982,910	R31,553,237	R34,592,604	R37,977,998
5	Equipment	R80,446,570	R90,710,711	R99,448,423	R109,180,911
6	Tools	R100,000	R112,759	R123,621	R135,719
7	Operation	R30,959,880	R34,910,037	R38,272,748	R42,018,298
8	Administration	R638,115,790	R719,532,690	R788,841,702	R866,041,439
9	Maintenance (corrective; adaptive; preventative)	R242,886,630	R287,473,480	R307,434,260	R328,360,770
10	Billing	R490,158,383	R552,697,466	R605,936,069	R665,235,805
11	Revenue collection	R0	R0	R0	R0
12	Management	R125,419,490	R141,421,705	R155,044,156	R170,217,502
TOTAL		**R2,074,177,183**	**R2,352,417,553**	**R2,571,284,145**	**R2,813,761,588**

The above shows an anticipated average increase in operational resource costs of 10.7% per annum, which is far above the council approved 2019/20 water and sanitation tariff increase of 7.5%.

An extract of the MTEF Expenditure per Asset as summarised in **Table 40** was extracted from the NMBM projects list MTEF for four (4) financial years, based on the budgeting forecasts.

Table 40: NMBM MTEF Expenditure (R-million)

No.	MTEF	2018/19	2019/20	2020/21	2021/22
1	Property	35.1	15	15	15
2	Boreholes	-	-	-	-
3	Reservoirs	24.41	14	37	38
4	Water Treatment Works	7.76	51.18	83.51	116
5	Water Pump Stations	47	25	1	1
6	Water Bulk Reticulation	-	1.5	7	16
7	Wastewater Treatment Works	38.34	72.51	116	107
8	Internal Sanitation Reticulation	4	10	10	10
9	Bulk Sanitation Reticulation	52.4	129.1	151.5	139

9.2 Topic 7.2: Revenue and Capex

The funding sources for the 2018/19 financial year totalled R3,068.4-million made up as follows:

- Urban Settlement Development Grant: R905-million
- Municipal Disaster Relief Grant: R233.4-million
- Municipal Disaster Grant: R97-million
- Service Charges: R1,683-million
- Interest earned outstanding debtors: R150-million

10. TOPIC 8: WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER SERVICES

Topic 8 provides the answers of the Municipal Strategic Self-Assessment (MuSSA) which is used to determine the business health of the municipality in terms its water and sanitation services.

It comprises of the following sub-sections:

- Introduction;
- Water and Sanitation Services Planning;
- Management Skill Level (Technical);
- Staff Skill Levels (Technical);
- Technical Staff Capacity (Numbers);
- Water Resources Management (WRM);
- Water Conservation & Demand Management (WC/WDM);
- Drinking Water Safety & Regulatory Compliance;
- Basic Sanitation;
- Wastewater / Environmental Safety & Regulatory Compliance;
- Infrastructure Asset Management (IAM);
- Operation & Maintenance of Assets;
- Financial Management;
- Revenue Collection;
- Financial Asset Management;
- Information Management (IT);
- Organisation Performance Monitoring;
- Water and Sanitation Service Quality; and
- Customer Care (CRM).

ANNEXURE 1

LIST OF TABLES

Table 41: NMBM Service Level Profile for Public Amenities

No.	ASSOCIATED SERVICES FACILITY	NUMBER OF FACILITIES	WATER		SANITATION	
			ADEQUATE	INADEQUATE	ADEQUATE	INADEQUATE
EDUCATION PLAN						
1	Schools	353	350	3	350	3
2	Tertiary	14	14	0	14	0
TOTAL		**367**	**364**	**3**	**364**	**3**
HEALTH PLAN						
3	Hospitals	15	15	0	15	0
4	Clinics	58	58	0	58	0
TOTAL		**73**	**73**	**0**	**73**	**0**
PUBLIC AMENITIES						
TOTAL		**440**	**437**	**3**	**437**	**3**

Table 42: NMBM Service Level Profile for Water and Sanitation

WATER SERVICES INFRASTRUCTURE SUPPLY LEVEL PROFILE			
No.	**CLASSIFICATION / DEFINITION**	**HOUSEHOLDS**	**POPULATION**
1.1	Piped Water inside Dwelling / House	264,634	923,403
1.2	Piped Water inside Yard	52,748	201,015
1.3	Piped Water Distance <200m	34,780	125,951
1.4	Piped Water Distance >200m	681	2,683
1.5	Borehole in the Yard	870	3,428
1.6	Rain-Water tank in Yard	336	1,324
1.7	Water Vendor-Carrier / Tanker	630	2,482
1.8	Stagnant Water – Dam / Pool	165	650
1.9	Flowing water / Springs / Streams / Rivers	60	236
1.10	Water Other	477	1,879
WATER RELIABILITY PROFILE			
No.	**CLASSIFICATION / DEFINITION**		**TOTALS**
2.1	Water Supply System (Scheme Based)		1
2.2	Total Number of Households Having Reliable Service		353,428
2.3	Total Number of Households NOT having Reliable Service		1,953
SANITATION SERVICES INFRASTRUCTURE SUPPLY LEVEL PROFILE			
No.	**CLASSIFICATION / DEFINITION**	**HOUSEHOLDS**	**POPULATION**
3.1	Flush Toilet – Connected to Sewerage System	341,259	1,211,250
3.2	Flush Toilet – with Septic Tank	6,507	23,419
3.3	Bucket Toilet	6,010	22,059
3.4	None	762	3,002
3.5	Chemical Toilet	36	142
3.6	Pit Toilet with/without Ventilation (VIP)	807	3,179
SANITATION RELIABILITY PROFILE			
No.	**CLASSIFICATION / DEFINITION**		**TOTALS**
4.1	Infrastructure to be upgraded: Buckets to Waterborne (households)		6,010
4.2	Infrastructure to be upgraded: None/Pit/VIP/Chemical to Waterborne (households)		1,605

Table 43: NMBM Water Pump Stations

No.	Description	Status	Bulk Class	Standby Pumps	Capacity (Ml/day)
1	Airport (Schoenmakerskop)	Existing	Internal	Yes	289.40
2	Bethelsdorp B	Existing	Internal	Yes	TBC
3	Blue Horizon Bay	Existing	Internal	Yes	10.00
4	Buffelsfontein (Emerald Hill)	Existing	Internal	Yes	60.00
5	Chelsea	Existing	Internal	Yes	138.90
6	Chelsea Upgrade	Existing	Internal	Yes	0
7	Churchill Booster (Elandsjaght)	Existing	Regional	Yes	405.10
8	Churchill Raw Water	Existing	Regional	Yes	578.70
9	Colleen Glen	Existing	Internal	Yes	1.60
10	Elandsjagt Raw Water	Existing	Regional	Yes	463.00
11	Gamtoos Booster	Existing	Regional	Yes	1 678.20
12	Groendal	Existing	Internal	Yes	243.10
13	Heatherbank	Existing	Internal	Yes	34.70
14	Loerie Final	Existing	Regional	Yes	532.40
15	Loerie Raw	Existing	Regional	Yes	266.20
16	Lovemore Heights	Existing	Internal	Yes	46.30
17	Matanzima	Existing	Internal	Yes	13.50
18	Motherwell Booster	Existing	Internal	Yes	10.00
19	Nooitgedagt High Level	Existing	Regional	Yes	130.00
20	Nooitgedagt Low Level	Existing	Regional	Yes	60.00
21	Reservoir 2 - Reservoir 1	Existing	Internal	Yes	13.50
22	Reservoir 3 into Zone	Existing	Internal	Yes	13.50
23	Rosedale	Existing	Internal	Yes	94.70
24	Schoemakerskop (Emerald Hill)	Existing	Internal	Yes	810.20
25	Seaview	Existing	Internal	Yes	155.10
26	Seaview 2	Existing	Internal	Yes	TBC
27	Standford Road	Existing	Internal	Yes	10.00
28	Struandale	Existing	Internal	Yes	53.20
29	Summit Transfer	Existing	Regional	Yes	10.00
30	Theescombe	Existing	Internal	Yes	10.00
31	Van Riebeeck Hoogte	Existing	Internal	Yes	21.10
32	Van Stadens Gorge	Existing	Internal	Yes	56.00
33	Van Stadens Village Booster	Existing	Internal	Yes	10.00
34	Verwoerd 1	Existing	Internal	Yes	13.50
35	Verwoerd 2	Existing	Internal	Yes	0
36	Chatty	Future	Internal	N/A	N/A

Table 44: NMBM Sewer Pump Stations

No.	Description	Drainage Area	Status	Standby Pump	Capacity (l/s)
1	Aloes	Markman	Existing	Yes	165
2	Baldwin 1	Swartkops	Existing	Yes	5
3	Baldwin 2	Swartkops	Existing	Yes	5
4	Bishops Way	Paapenkuils	Existing	Yes	10
5	Bluewater Bay	Markman	Existing	Yes	9.5
6	Bluewater Drive	Markman	Existing	Yes	56
7	Boardwalk	City	Existing	Yes	15
8	Boundary Lane	Driftsands	Existing	Yes	10
9	Brighton Beach	Swartkops	Existing	Yes	14
10	Chris Hani (Jachtvlakte)	Kwanobuhle	Existing	Yes	18
11	Creek (Domestic)	City	Existing	Yes	350
12	Creek Extension	City	Existing	Yes	335
13	Creek (Industrial)	City	Existing	Yes	198
14	Deal Party	Paapenkuils	Existing	Yes	5
15	Despatch 1	Despatch	Existing	Yes	5
16	Despatch 2	Despatch	Existing	Yes	5
17	Despatch 3	Despatch	Existing	Yes	5
18	Despatch 4	Despatch	Existing	Yes	35
19	Despatch 5	Despatch	Existing	Yes	10
20	Despatch 7	Despatch	Existing	Yes	10
21	Despatch 8	Despatch	Existing	Yes	40
22	Despatch 9	Despatch	Existing	Yes	39
23	Downing Street	City	Existing	Yes	32.9
24	Edgar Lane	City	Existing	Yes	8.82
25	Edinburgh Drive	Markman	Existing	Yes	27
26	Essexvale	Lower Baakens	Existing	Yes	22.5
27	Fleming Street	City	Existing	Yes	5.68
28	Fordyce Road	Lower Baakens	Existing	Yes	38
29	Hallack Road	City	Existing	Yes	56
30	Hella	Uitenhage	Existing	Yes	3.8
31	Industria Road	Swartkops	Existing	Yes	10
32	Internal	Upper Baakens	Existing	Yes	15.15
33	Johnson Road (Korsten Lake)	City	Existing	Yes	5.93
34	Kabega Park	Upper Baakens (pumps to Paapenkuils)	Existing	Yes	15.15
35	Kelvin Jones (Road)	Uitenhage	Existing	Yes	15
36	Kelvin	Uitenhage	Existing	Yes	28.4
37	Kings Beach	City	Existing	Yes	78
38	Kuyga	Upper Baakens	Existing	Yes	10
39	Kwaford	Paapenkuils	Existing	Yes	46
40	Kwazakhele No. 5	Swartkops	Existing (Bypassed)	Yes	38
41	Kwazakhele Stage 7	Swartkops	Existing	Yes	25
42	Leslie Street	Swartkops	Existing	Yes	15
43	Logistics	Uitenhage	Existing	Yes	11.02
44	Lovemore Heights	Driftsands	Existing	Yes	145
45	Lower Magennis	Uitenhage	Existing	Yes	17
46	Malabar	Paapenkuils	Existing	Yes	3

47	Mangold Park	Lower Baakens (pumps to Driftsands)	Existing	Yes	3
48	Matanzima	Kwanobuhle	Existing	Yes	29.5
49	Matlock Bridge	City	Existing	Yes	9.5
50	Mc Arthur Baths	City	Existing	Yes	26
51	Mill Park	City	Existing	Yes	26
52	Missionvale 1	Swartkops	Existing	Yes	25
53	Missionvale 2	Swartkops	Existing	Yes	11
54	Missionvale 4	Chatty	Existing	Yes	20
55	Motherwell 1	Motherwell	Existing	Yes	32
56	Motherwell 2	Motherwell	Existing	Yes	13
57	Motherwell 3	Motherwell	Existing	Yes	64.1
58	Motherwell 4	Motherwell	Existing	Yes	140
59	Motherwell 5	Motherwell	Existing	Yes	3
60	Motherwell 6	Motherwell	Existing	Yes	130
61	Motherwell 7	Motherwell	Existing	Yes	14
62	Octagon	City	Existing	Yes	15.6
63	Paapenkuils	Paapenkuils	Existing	Yes	3
64	Parsonsvlei	Paapenkuils	Existing	Yes	3.5
65	Peter Searl	Uitenhage	Existing	Yes	10
66	Power Station	Swartkops	Existing	Yes	2.25
67	Prospect Rd	Lower Baakens	Existing	Yes	132
68	PSTN	City	Existing	Yes	62
69	Red Windmill	City	Existing	Yes	10
70	Redhouse	Swartkops	Existing	Yes	133
71	Rudolph Street	City	Existing	Yes	29
72	Saddlewoods	Driftsands	Existing	Yes	4.5
73	Schooner Crescent	Swartkops	Existing	Yes	161.7
74	Soweto On Sea	Swartkops	Existing	Yes	58
75	St Albans	Witteklip	Existing	Yes	1,000
76	Strand Street	City	Existing	Yes	29.17
77	Strang Street	City	Existing	Yes	37.88
78	Studebaker	Markman	Existing	Yes	10
79	Summerstrand	Lower Baakens	Existing	Yes	10
80	Swartkops Screw	Swartkops	Existing	Yes	26
81	Swartkops Station 4	Swartkops	Existing	Yes	7
82	Swartkops Street	City	Existing	Yes	29
83	Temporary	Paapenkuils	Existing	Yes	15
84	Theescombe	Driftsands	Existing	Yes	16.67
85	Valley Road	City	Existing	No	130
86	Veeplaas	Swartkops	Existing	No	0
87	Voyle Street	City	Existing	No	0
88	Walmer Q	Driftsands	Existing	No	0
89	Waterford Road	Paapenkuils	Existing	No	0
90	Woodlands	Upper Baakens (pumps to Driftsands)	Existing	No	0
91	Zwide No. 1	Swartkops	Existing (Bypassed)	No	0
92	Zwide No. 2	Swartkops	Existing (Bypassed)	No	0
93	Fitzpatrick	City	Future	-	42
94	Missionvale 3	Swartkops	Future	-	-

Table 45: NMBM Reservoirs

No.	Description	Bulk Class	Commission Date	Status	Capacity (m^3)
1	Airport	Internal	1967/01/01	Existing	21,080
2	Aspen Heights Tank	Internal	1971/11/17	Existing	20.18
3	Azalia	Internal	1985/01/01	Existing	11,092.44
4	Beachview Caravan Park	Internal	1960/01/01	Existing	42
5	Beachview Township	Internal	1960/01/01	Existing	750
6	Bethelsdorp	Internal	1971/10/24	Existing	23,000
7	Bloemendal	Internal	1986/01/01	Existing	23,000
8	Blue Horizon Bay Lower	Internal	1981/01/01	Existing	860
9	Blue Horizon Bay Upper	Internal	1982/05/18	Existing	700
10	Chatty	Internal	2011/09/02	Existing	25,000
11	Chelsea	Internal	1964/01/01	Existing	90,840
12	Churchill (Tunnel)	Internal	1947/01/01	Existing	0
13	Churchill Booster	Internal	2009/12/15	Existing	0
14	Coegakop BPT	Internal	2001/01/01	Existing	17,000
15	Colchester	Internal	1992/01/01	Existing	2,125
16	Colleen Glen O/H Tank	Internal	1970/01/01	Existing	10
17	Daleview	Internal	1949/01/01	Existing	150
18	Despatch Water Tower	Internal	1988/01/01	Existing	1,000
19	Driftsands	Internal	1967/10/20	Existing	23,930
20	Elandsjagt	Regional	1964/01/01	Existing	27,000
21	Emerald Hill East	Internal	1964/01/01	Existing	90,830
22	Emerald Hill West	Internal	1960/01/01	Existing	90,830
23	End Street 1 & 2	Internal	1972/01/01	Existing	11,400
24	Fairbridge Heights	Internal	1967/01/01	Existing	9,600
25	Fairview	Internal	1940/10/20	Existing	16,930
26	Fort Nottingham	Internal	1881/03/08	Existing	6,420
27	Gamtoos (New)	Internal	1970/01/01	Existing	1,805.06
28	Gamtoos (Old)	Internal	1970/01/01	Existing	149.02
29	Gelvandale	Internal	1962/10/20	Existing	29,020
30	Glendinning	Internal	1949/10/20	Existing	44,930
31	Grassridge	Internal	1990/01/01	Existing	23,000
32	Greenbushes	Internal	1953/01/01	Existing	25,000
33	Heatherbank	Internal	1962/05/31	Existing	7,500
34	Kabah 1 (OLD)	Internal	1955/01/01	Existing	18,000
35	Kabah 2 (NEW)	Internal	1985/01/01	Existing	5,000
36	Kamesh	Internal	1988/01/01	Existing	15,000
37	Kini Bay	Internal	1985/01/01	Existing	58.72
38	Kwanobuhle 1 (Old 10Ml / Gunguluza)	Internal	1990/01/01	Existing	10,000
39	Kwanobuhle 2 (Peace Village 8Ml)	Internal	2006/03/28	Existing	6,300
40	Kwanobuhle 3 (New 10Ml)	Internal	2004/08/24	Existing	10,000
41	Kwanobuhle 4 (New)	Internal	2011/01/01	Existing	12,000
42	Linton	Internal	1924/01/01	Existing	22,500
43	Loerie BPT	Internal	1968/01/01	Existing	0
44	Lovemore Heights	Internal	1973/10/24	Existing	10,970
45	Lovemore Heights Upper (High) Level	Internal	1996/10/21	Existing	500
46	Malabar	Internal	1996/10/20	Existing	6,030
47	Masonary Seaview	Internal	TBC	Existing	700
48	McNaughton	Internal	1955/01/01	Existing	1,000
49	Motherwell 1	Internal	1986/07/19	Existing	23,250
50	Motherwell 2	Internal	2003/01/01	Existing	23,300

51	Nooitgedagt	Regional	1993/01/01	Existing	TBC
52	Olifantskop Reservoir*	Internal	2016/04/04	Existing	10,000
53	Rocklands 1	Internal	2004/01/01	Existing	1,200
54	Rocklands Tower	Internal	2004/01/01	Existing	14
55	Rosedale	Internal	1977/01/01	Existing	9,300
56	Scheepershoogte	Internal	1983/09/26	Existing	15,000
57	Schoenmakerskop BPT	Internal	1992/01/01	Existing	4,590
58	Schoenmakerskop Village Tank	Internal	1955/11/17	Existing	300
59	Seaview Lower Tank	Internal	1975/08/13	Existing	2,500
60	Seaview Pumpstations Balancing Tank	Internal	2012/08/22	Existing	1,400
61	Seaview Upper Tank	Internal	1996/08/13	Existing	120
62	St Georges	Internal	1907/01/01	Existing	8,810
63	Struandale	Internal	1956/11/17	Existing	27,320
64	Summit	Regional	1967/01/01	Existing	3,070
65	Summit / Confluence BPT	Internal	1967/01/01	Existing	TBC
66	Theescombe Reservoir	Internal	2011/11/17	Existing	6,000
67	Theesecomb Tank	Internal	2009/11/17	Existing	40
68	Tulbach Street	Internal	1955/01/01	Existing	2,300
69	van Riebeeck Hoogte	Internal	1955/01/01	Existing	9,080
70	Van Stadens Mouth	Internal	TBC	Existing	120
71	Van Stadens Village	Internal	2013/02/01	Existing	400
72	Voortrekker Street 1	Internal	1949/01/01	Existing	1,040
73	Voortrekker Street 2	Internal	1957/05/26	Existing	1,000
74	Amanzi	Internal	-	Future	20,000
75	Amanzi Tower	Internal	-	Future	500.00
76	Balmoral	Internal	-	Future	9,000
77	Greenbushes (Elevated Reservoir)	Internal	-	Future	55
78	Greenbushes (New)	Internal	-	Future	14,000
79	Lakefarm	Internal	-	Future	1,000
80	Rocklands 2	Internal	-	Future	360
81	Seaview Upper (New)	Internal	-	Future	2,500
82	St Albans	Internal	-	Future	6,000
83	State Forest	Internal	-	Future	350
84	Fishwater Flats (Reclaimed Effluent)	Internal	-	Future	0
85	Despatch (Reclaimed Effluent)	Internal	-	Future	0
86	Industrial Dam (Reclaimed Effluent)	Internal	-	Future	0
87	Strelitsia Dam (Reclaimed Effluent)	Internal	-	Future	0

* Olifantskop Reservoir capacity is currently being upgraded via an additional 45Ml storage reservoir, bringing the total capacity to 55Ml after construction.

Table 46: NMBM Water Pump Stations Refurbishment & Replacement Needs Cost

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Cost (RM)
1	Airport (Schoenmakeskop)[1]	Existing	Operational	Medium	13.15	13.91
2	Bethelsdorp	Existing	Operational	Low	0.12	0.17
3	Blue Horizon Bay	Existing	Operational	Medium	0.36	0.37
4	Buffelsfontein[2]	Existing	Operational	Low	0.27	0.35
5	Chelsea[3]	Existing	Operational	Low	0.49	0.49
6	Chelsea Upgrade	Existing	Prime	None	0.00	0.00
7	Churchill Booster[4]	Existing	Operational	Low	0.03	0.25
8	Churchill Raw Water	Existing	Prime	Low	5.00	0.25
9	Colleen Glen	Existing	Operational	Medium	0.01	0.09
10	Elandsjagt Raw Water[5]	Existing	Prime	Low	0.00	0.07
11	Gamtoos Booster	Existing	Operational	Low	2.11	2.19
12	Groendal	Existing	Operational	Low	0.12	0.18
13	Heatherbank	Existing	Operational	Low	0.19	0.89
14	Loerie[6]	Existing	Operational (Upgrade)	Low	0.00	0.08
15	Loerie Raw	Existing	Operational	Low	0.01	0.05
16	Lovemore Heights	Existing	Operational	Low	0.07	0.22
17	Matanzima[8]	Existing	Operational (Upgrade)	Low	0.18	0.27
18	Motherwell Booster[7]	Existing	Prime	Low	0.05	1.00
19	Nooitgedagt High Level	Existing	Operational	Low	3.98	3.99
20	Nooitgedagt Low Level	Existing	Prime	Low	3.46	4.51
21	Reservoir 2 – Reservoir 1[9]	Existing	Operational (Upgrade)	Medium	0.13	0.60
22	Reservoir 3 into Zone	Existing	Operational	High	1.22	1.24
23	Rosedale[10]	Existing	Operational	Low	0.77	0.88
24	Schoenies – Emerald Hill	Existing	Operational	Low	3.51	3.51
25	Seaview[11]	Existing	Operational (upgrade)	Low	0.16	0.75
26	Seaview 2	Existing	Operational	High	2.05	0.11
27	Stanford Road	Existing	Operational	Low	0.05	1.00
28	Struandale[12]	Existing	Operational (Upgrade)	Low	1.49	1.79
29	Summit Transfer[13]	Existing	Operational	Low	0.17	3.30
30	Theescombe	Existing	Prime	Low	2.87	2.99

31	Van Riebeeck Hoogte[14]	Existing	Operational	Medium	1.09	1.14
32	Van Stadens Gorge	Existing	Operational	Medium	0.60	1.51
33	Van Stadens Village Booster	Existing	Operational	Low	0.05	1.00
34	Verwoerd 1	Existing	Operational	Medium	0.45	0.62
35	Verwoerd 2	Existing	Operational	None	2.05	18.31

Refurbishment Notes:

1. Airport Pump Station's equipment is outdated.
2. Buffelsfontein Pump Station's roof is falling in.
3. Motherwell Booster Pump Station requires fencing and backfill (see reservoir comments).
4. Matanzima Pump Station and pipeline requires refurbishment.
5. Reservoir 2 and 1 Pump Station has had a wall constructed but the pump station has not been refurbished in a while and has been damaged from vandalism.
6. Rosedale Reservoir was recently refurbished but the pump requires work.
7. Seaview Pump Station is currently being refurbished.
8. Struandale Pump Station requires replacement as the pumps were constructed too high and fail to self-prime when the reservoir level falls below a certain level. The building requires attention.
9. Summit Transfer Pump Station requires attention on the pump stations control.
10. Van Riebeek Hoogte Pump Station was refurbished a couple of years ago but was badly vandalised and then repaired however a fire has destroyed some equipment and cables.

Table 47: NMBM Water Pump Stations Infrastructure Problems

No.	Description	General Physical Condition	Refurbishment Needs	Problems
1	Airport (Schoenmakerskop)	Operational	Medium	Equipment is outdated
2	Buffelsfontein	Operational	Low	Roof is falling / caving in
3	Chelsea	Operational	Low	Building requires replacement
4	Churchill Booster	Operational	Low	System trips due to incorrect electrical reticulation installation
5	Elandsjagt Raw Water	Prime	Low	Currently under construction
6	Loerie	Operational (Upgrade)	Low	Currently undergoing upgrade
7	Matanzima	Operational (Upgrade)	Low	Pump station and pipeline requires refurbishment
8	Motherwell Booster	Prime	Low	Requires fencing and backfill (see reservoir comments)
9	Reservoir 2- Reservoir 1	Operational (Upgrade)	Medium	Lack of refurbishment has led to damage from vandalism
10	Rosedale	Operational	Low	Pump requires work
11	Seaview	Operational (Upgrade)	Low	Currently undergoing refurbishment
12	Straundale	Operational (Upgrade)	Low	Requires replacement as the pumps were constructed too high and fail to self-prime when the reservoir level falls below a certain level. The building requires attention
13	Summit Transfer	Operational	Low	Controls require attention
14	Van Riebeeck Hoogte	Operational	Medium	Badly vandalised and fire has destroyed some equipment and cables

Table 48: NMBM Sewer Pump Stations Refurbishment & Replacement Needs Cost

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Cost (RM)
1	Aloes	Existing	Operational (Upgrade)	Low	2.79	3.02
2	Baldwin 1	Existing	Prime	Low	0.00	0.51
3	Baldwin 2	Existing	Operational (Upgrade)	Low	0.10	1.27
4	Bishops Way	Existing	Operational (Upgrade)	Medium	0.07	0.43
5	Bluewater Bay	Existing	Operational (Upgrade)	Low	0.15	0.28
6	Bluewater Drive	Existing	Operational (Upgrade)	Low	0.01	0.94
7	Boardwalk	Existing	Operational (Upgrade)	Medium	0.79	0.81
8	Boundary Lane	Existing	Operational (Upgrade)	High	1.41	1.62
9	Brighton Beach	Existing	Operational (Upgrade)	Low	0.51	0.85
10	Chris Hani (Jachtvlakte)	Existing	Operational	Low	0.09	0.31
11	Creek (Domestic)	Existing	Operational	Low	1.77	5.95
12	Creek (Industrial)	Existing	Operational	Low	1.69	5.70
13	Creek Extension	Existing	Operational	Medium	0.57	1.63
14	Deal Party	Existing	Operational (Upgrade)	Low	0.00	2.36
15	Despatch 1	Existing	Operational (Upgrade)	Low	0.00	0.09
16	Despatch 2	Existing	Operational	Low	0.30	0.61
17	Despatch 3	Existing	Operational	Low	0.00	1.68
18	Despatch 4	Existing	Operational	Medium	0.04	1.42
19	Despatch 5	Existing	Prime	Low	0.02	0.19
20	Despatch 7	Existing	Operational (Upgrade)	Low	0.02	0.14
21	Despatch 8	Existing	Operational (Upgrade)	Low	0.22	0.33
22	Despatch 9	Existing	Operational	Low	0.94	1.19
23	Downing Street	Existing	Operational (Upgrade)	Low	0.05	1.29
24	Edgar Lane	Existing	Operational (Upgrade)	Low	0.39	0.59
25	Edinburgh Drive	Existing	Operational (Upgrade)	Low	0.13	1.39
26	Essexvale	Existing	Operational	Medium	0.81	0.95
27	Fleming Street	Existing	Operational (Upgrade)	Low	0.08	0.27
28	Fordyce Road	Existing	Operational (Upgrade)	Low	0.07	0.19
29	Hallack Road	Existing	Operational (Upgrade)	Low	0.35	0.48
30	Hella	Existing	Operational	Low	0.10	0.23
31	Industria Road	Existing	Operational	Low	0.05	0.17

32	Internal	Existing	Operational	Low	0.16	0.25
33	Johnson Road (Korsten Lake)	Existing	Operational (Upgrade)	Low	0.35	0.82
34	Kabega Park (Standby)	Existing	Operational (Upgrade)	Low	0.75	0.90
35	Kelvin Jones (Road)	Existing	Operational (Upgrade)	Low	0.08	0.26
36	Kelvin	Existing	Operational	Medium	0.81	1.15
37	Kings Beach	Existing	Operational (Upgrade)	Low	0.28	0.39
38	Kuyga	Existing	Operational	Medium	0.49	0.63
39	Kwaford	Existing	Operational (Upgrade)	Low	0.13	0.29
40	Kwazakhele No. 5	Existing	Operational	Low	0.40	0.53
41	Kwazakhele Stage 7	Existing	Operational (Upgrade)	Low	0.13	0.43
42	Leslie Street	Existing	Operational	Medium	0.48	0.66
43	Logistics	Existing	Operational	Low	0.00	0.76
44	Lovemore Heights	Existing	Operational	Low	0.34	0.54
45	Lower Magennis	Existing	Operational (Upgrade)	Low	0.09	0.29
46	Malabar	Existing	Operational (Upgrade)	Medium	0.19	0.27
47	Mangold Park (Standby)	Existing	Operational	Medium	0.55	0.57
48	Matanzima	Existing	Operational	Low	0.38	0.44
49	Matlock Bridge	Existing	Operational (Upgrade)	Low	0.47	0.57
50	Mc Arthur Baths	Existing	Operational (Upgrade)	Low	0.36	0.41
51	Mill Park	Existing	Prime	Low	0.13	0.44
52	Missionvale 1	Existing	Operational (Upgrade)	Low	0.07	0.19
53	Missionvale 2 (3 for Finance) (Standby)	Existing	Operational (Upgrade)	Low	0.02	0.11
54	Missionvale 4	Existing	Operational (Upgrade)	Low	0.05	0.13
55	Motherwell 1	Existing	Operational (Upgrade)	Medium	1.12	1.94
56	Motherwell 2	Existing	Operational (Upgrade)	Low	0.39	0.49
57	Motherwell 3	Existing	Operational (Upgrade)	Low	0.56	0.88
58	Motherwell 4	Existing	Operational (Upgrade)	Low	0.13	2.00
59	Motherwell 5	Existing	Operational (Upgrade)	High	0.51	0.56
60	Motherwell 6 (Standby Pump Station)	Existing	Operational (Upgrade)	Low	0.66	2.21
61	Motherwell 7	Existing	Operational	Low	0.07	0.24
62	Octagon	Existing	Operational (Upgrade)	Medium	0.48	0.70
63	Paapenkuils	Existing	Operational	Low	0.33	0.70
64	Parsonsvlei	Existing	Operational (Upgrade)	Medium	0.65	0.75
65	Peter Searl	Existing	Operational (Upgrade)	Low	0.05	0.17

66	Power Station	Existing	Operational	Low	0.00	0.64
67	Prospect Road	Existing	Operational (Upgrade)	Low	0.13	0.56
68	PSTN	Existing	Operational	Low	0.08	0.39
69	Red Windmill	Existing	Operational (Upgrade)	Low	0.15	0.26
70	Redhouse	Existing	Operational (Upgrade)	Low	0.01	0.01
71	Rudolph Street	Existing	Operational (Upgrade)	Low	0.07	1.03
72	Saddlewoods	Existing	Operational	Medium	0.47	0.79
73	Schooner Crescent	Existing	Operational (Upgrade)	Low	0.03	0.59
74	Soweto on Sea (Standby)	Existing	Operational	Low	0.31	0.47
75	St Albans	Existing	Operational	Low	5.05	17.00
76	Strand Street	Existing	Operational (Upgrade)	Medium	0.08	0.76
77	Strang Street	Existing	Operational (Upgrade)	Low	0.02	0.31
78	Studebaker	Existing	Operational (Upgrade)	Low	0.05	0.17
79	Summerstrand	Existing	Operational (Upgrade)	Medium	0.05	1.00
80	Swartkops Screw	Existing	Operational	Medium	0.27	0.96
81	Swartkops 4	Existing	Operational	Low	0.00	6.24
82	Swartkops Street	Existing	Operational (Upgrade)	Low	0.20	0.92
83	Temporary	Existing	Operational	Low	0.08	0.26
84	Theescombe PSTN	Existing	Operational	Low	0.13	0.26
85	Valley Road	Existing	Operational (Upgrade)	Low	0.40	1.17
86	Veeplaas	Existing	Operational (Upgrade)	Low	1.82	5.14
87	Voyle Street	Existing	Prime	Low	0.21	0.58
88	Walmer Q (Standby)	Existing	Operational	Low	0.79	2.22
89	Waterford Road	Existing	Operational (Upgrade)	Low	0.02	0.07
90	Woodlands	Existing	Prime	Low	5.44	15.34
91	Zwide No. 1	Existing	Operational	Low	0.11	0.31
92	Zwide No. 2	Existing	Operational	Low	0.08	0.23

Table 49: NMBM Sewer Pump Station Problems

No.	Description	Refurbishment Needs	Refurbishment requirements
1	Aloes	Low	Diesel generator not operational as battery is removed Drywell cramped and requires to be cleaned out
2	Baldwin 1 & 2	Low	Motor, valves and pipes are rusting Pump fault Drywell requires to be cleaned out
3	Bluewater Drive	Low	Diesel driven pump set is not operational Dilapidated electrical supply and metering Valves and pipes are rusting Untidy cabling in pump station General lights and plugs in pump station rusted
4	Brighton Beach	Low	Drywell to be cleaned New perimeter gate showing signs of rust as it can be opened while locked Valves and pipes are rusting Lock box to building gate badly rusted Some valves and NRV's are badly rusted and might require refurbishment or replacement No e-stops installed for pumps
5	Deal Party	Low	Structure, mechanical components and electrical installation in poor condition
6	Despatch 5	Low	Diesel driven pump not operational Dosing equipment not operational Cabling not according to regulation
7	Despatch 7	Low	Both submersible pumps are not operational Pump station is regularly flooded Outlet Valve chamber under water Valve and NRV's are rusted Sump is to be cleaned
8	Despatch 8	Low	Sump to be cleaned Vegetation growth from the distribution cubicle Telemetry not functional Fence Stolen
9	Despatch 9	Low	One of the two pumps are not operational Sump is to be cleaned Dosing equipment and diesel generator is not operational
10	Downing Street	Low	One of the two pumps in the drywell are operational General lights and plugs are not fully functional Pump chamber is flooded Pumps and valves are rusted
11	Edgar	Low	Requires conversion from 500v to 400v electrical supply
12	Edinburgh Drive	Low	Incomer cubicle requires replacing
13	Fleming Street	Low	Mechanical and electrical equipment requires upgrading
14	Hella	Low	Diesel pump set's suction piping is not formalised Holes around suction piping in walls is exposed
15	Kelvin	Medium	Faulty flow meter Telemetry is switch off No emergency stop is installed at the pump set

			Diesel generator is not operational Dosing equipment is not operational No protective barrier installed around the sump opening No cover installed over the drive opening
16	Kings Beach	Low	Water is apparent in the drywell Sump pump is not installed No telemetry is installed General installation is dilapidating Mechanical equipment has not been treated against rust and has not been painted yet
17	Kwazakhele Stg 7	Low	Overall pump station requires cleaning One of the two pump covers has not been installed
18	Malabar	Medium	Grating to the delivery valve chamber is lying in the chamber Chamber requires cleaning Delivery valves are rusted Sump requires cleaning Telemetry is not installed
19	Mc Arthur Baths	Low	Control cubicle is dilapidating No telemetry is installed Drywell requires cleaning Mechanical equipment and electrical plugs are rusted
20	Mill Park	Low	Controller of the diesel pump set is off Flow meter installation incomplete
21	Missionvale 4	Low	One of the two electrical pump sets is operational Motor and engine to the other pump sets have been removed Drywell requires cleaning No lighting installed in drywell Ventilation fan is removed from site Drywell has been flooded for a prolonged period of time
22	Motherwell 2	Low	Overall Pump Station
23	Motherwell 4	Low	Two of three pumps not operational Drywell is flooded
24	Motherwell 5	High	Two of three pumps not operational Drywell is flooded
25	Motherwell 6 (Standby)	Low	One of three electrical pump sets operational Motor and rotating element to the other pump set has been removed Drywell inlet is flooded and requires cleaning Lights to be reinstated in the drywell Cover to v-belts to be installed Mechanical equipment in the drywell is rusting and requires treatment Compressor has been removed from site
26	Octagon	Medium	No telemetry is installed Drywell to be cleaned out Mechanical equipment is rusted
27	Parsonsvlei	Medium	One of the two electrical pump sets are not operational Motor and rotating element of one of the two pumps has been removed from site Drywell was recently flooded and requires cleaning Cover to v-belts to be installed

			Mechanical equipment in the drywell is starting to rust and requires treatment Connection boxes in the drywell are open, exposing conductors that could be live
28	Peter Searl	Low	Piping in the sump is rusted
29	Strand Street	Medium	Both electrical pumps are not available on the HMI
30	Strang Street	Low	Control cubicle is dilapidating Telemetry HMI is removed Drywell to be cleaned out Mechanical equipment is rusted Electrical supply and distribution board is dilapidated Building structure is dilapidating Security light has been stolen
31	Studebaker	Low	One of the two electrical pump stets is not operational Blocked air valve caused spillage in the pump station
32	Summerstrand	Medium	Equipment has been stripped out of the telemetry cubicle Concerns over workmanship of piping installation of new pump sets and setting out of pumps No covers protecting suction pumps in sump Ventilation fans have been stripped out of the pump station
33	Swartkops Screw	Medium	Overhaul Pump Station
34	Swartkops Station 4	Low	VSD is removed from one of the cubicles Connection to the electrical motor is poorly made Mechanical equipment in the pump station is badly rusted
35	Swartkops Street	Low	One of the two electrical driven pump sets in the pump station is not installed Electrical supply to the pump station has been vandalized, resulting in a dangerous connection with open terminals Operational pump is leaking
36	Valley Road	Low	Submersible pump set is not operational Step-down transformer is stolen Insulation of the windings are exposed to high temperatures Cable was terminated without lugs Motor will have a short life expectancy running at 500V, 100V over the capacity of the motor MCC is in poor condition Covers are not installed, exposing the operators to an electrical shock hazard
37	Veeplaas	Low	Overhaul Pump Station

Table 50: NMBM Bulk Water Pipelines Refurbishment & Replacement Needs Cost

No.	Description	Length of Pipeline (m)	Refurbishment Needs	Refurbishment Needs Costs (RM)	Replacement Needs Costs (RM)
1	Bloemendal - Chelsea - Motherwell	2,705.67	Low	1.527	0.34
2	Linton - Chelsea - Motherwell	7,277.36	High	34.28	0.92
3	Chelsea - Motherwell	8,369.58	Low	1.886	1.06
4	Bethelsdorp - Chelsea - Motherwell	1,646.68	Medium	3.891	0.21
5	Churchill - Schoenmakerskop	867.26	High	4.442	0.11
6	Despatch 2 - Chelsea - Motherwell	5,133.23	None	0.049	0.65
7	Despatch 1 - Chelsea - Motherwell	5,556.64	Low	1.178	0.70
8	Driftsands - Marine Drive	4,720.47	Medium	16.19	0.60
9	Nooitgedagt - Scheepersvalkte	8,723.07	None	0.326	1.11
10	Kwanobuhle - Chelsea	12,294.58	None	0.701	1.56
11	Motherwell - Markman	7,387	None	0.841	0.94
12	Schoenmakerskop - Airport	4,294.36	None	0.134	0.54
13	Schoenmakerskop - Emarald Hill	3,075.64	None	0.171	0.39
14	Sand - Bulk River	26,806.5	None	1.054	3.40
15	Sand - Bulk River	36,935.81	None	1.481	4.68
16	Greenbushes - Chelsea	4,297.16	None	0.856	0.54
17	Chelsea - Motherwell	22,154.91	None	3.887	2.81
18	Summit - Chelsea Steel	40,119.71	None	0.341	5.08
19	Van Stadens	23,375.39	None	0.477	2.96
20	Grassridge - Motherwell	18,461.74	None	6.368	2.34
21	Chelsea - Motherwell	23,413.25	Low	0.147	2.97
22	Grassridge - Coega	5,672.5	None	0.22	0.72
23	Churchill - Socoman	108,483.7	High	927	13.75
24	Summit - Churchill	4,840.53	Medium	29.51	0.61
25	Summit - Loerie	4,671.67	None	0.426	0.59
26	Nooitgedagt - Grassridge	13,973.27	None	1.826	1.77
27	Seaview - Greenbushes	4,148.7	None	0.139	0.53
28	Seaview - Greenbushes	4,254.2	None	0.096	0.54
29	Churchill Steel	509.55	None	0.042	0.06
30	Churchill Steel	116,337.23	High	501.2	14.74
31	Churchil - Seaview	659.27	None	0.025	0.08
32	Churchil - Seaview	630.46	None	0.013	0.08
33	Van Stadens	23,381.55	None	0.274	2.96
34	Greenbushes - Chelsea	3,482.43	None	0.095	0.44
35	Greenbushes - Chelsea	622.73	None	0.021	0.08
36	Greenbushes - Chelsea	645.44	None	0.02	0.08

Table 51: NMBM Reservoirs Refurbishment & Replacement Needs Cost

No.	Description	Status	General Physical Condition	Refurbishment Needs	Refurbishment Needs Cost (RM)	Replacement Needs Cost (RM)
1	Airport	Existing	Operational	Low	0.64	58.29
2	Aspin Heights Tank	Existing	Operational	Low	0.002	28.40
3	Azalia	Existing	Operational	High	1.05	0.00
4	Beachview Caravan Park	Existing	Operational	Low	0.01	0.09
5	Beachview Township	Existing	Operational	Low	0.21	3.89
6	Bethelsdorp[1]	Existing	Operational	Low	2.49	60.45
7	Bloemendal[5]	Existing	Operational	Low	0.21	61.53
8	Blue Horizon Bay Lower[2]	Existing	Operational	Low	0.07	2.591
9	Blue Horizon Bay Upper[3]	Existing	Operational	Low	0.11	3.670
10	Chatty	Existing	Operational	Low	4.00	4.00
11	Chelsea[4]	Existing	Operational	Low	3.11	151.13
12	Churchill (Tunnel)	Existing	Operational	Low	0.05	18.89
13	Churchill Booster	Existing	Operational	Low	0.04	17.27
14	Coegakop BPT	Existing	Prime	Low	0.72	9.72
15	Colchester	Existing	Prime	Low	0.22	10.36
16	Colleen Glen O/H Tank	Existing	Operational	Low	0.00	4.10
17	Daleview	Existing	Operational	High	0.01	2.16
18	Despatch Water Tower	Existing	Operational	Low	0.08	8.64
19	Driftsands	Existing	Operational	Low	0.44	61.53
20	Elandsjagt	Existing	Prime	Low	1.20	63.69
21	Emerald Hill East	Existing	Operational	Low	2.58	75.56
22	Emerald Hill West	Existing	Operational	Low	14.53	75.56
23	End Street 1 & 2	Existing	Operational	Low	1.91	39.94
24	Fairbridge Heights	Existing	Operational	Low	0.31	36.70
25	Fairbridge Heights	Existing	Operational	Low	0.57	50.73
26	Fort Nottingham[5]	Existing	Operational	Low	1.71	26.99
27	Gamtoos (New)	Existing	Operational	Medium	0.17	9.72
28	Gamtoos (Old)	Existing	Operational	High	0.01	1.30
29	Gelvandale[6]	Existing	Operational	Low	0.85	70.17
30	Glendinning	Existing	Operational	Low	5.70	88.52
31	Grassridge	Existing	Operational	Low	3.10	59.37

32	Greenbushes	Existing	Operational	Medium	0.07	66.92
33	Heatherbank	Existing	Operational	Low	0.93	32.38
34	Kabah 1 (OLD)	Existing	Operational	Low	2.45	42.10
35	Kabah 2 (NEW)	Existing	Operational	Low	2.20	21.59
36	Kamesh	Existing	Operational	Low	1.36	14.60
37	Kini Bay	Existing	Operational	Medium	0.01	3.89
38	Kwanobuhle 1 (Old 10ML / Gunguluza)[7]	Existing	Operational	Low	0.97	37.78
39	Kwanobuhle 2 (Peace Village 8ML)[8]	Existing	Operational	Low	2.48	33.46
40	Kwanobuhle 3 (New 10ML)	Existing	Operational	Low	0.16	37.78
41	Kwanobuhle 4 (New)	Existing	Prime	Low	1.92	1.92
42	Linton	Existing	Operational	Low	8.72	58.29
43	Loerie BPT	Existing	Operational	Low	1.63	0.16
44	Lovemore Heights[9]	Existing	Operational	Low	0.34	38.86
45	Lovemore Heights Upper (High) Level[10]	Existing	Operational	Low	0.06	4.10
46	Malabar	Existing	Prime	Low	0.15	25.91
47	Masonary Seaview	Existing	Operational	Low	0.11	0.15
48	McNaughton[12]	Existing	Operational	Medium	2.07	5.40
49	Motherwell 1[11]	Existing	Operational	Low	0.56	95.00
50	Motherwell 2	Existing	Prime	Low	7.04	95.00
51	Nooitgedagt	Existing	Operational	Low	1.63	0.86
52	Olifantskop Reservoir	Existing	Prime	Low	8.80	8.80
53	Rocklands 1	Existing	Operational	Low	0.19	0.19
54	Rocklands Tower	Existing	Operational	Low	0.00	0.002
55	Rosedale	Existing	Operational	Low	1.17	35.62
56	Scheepershoogte	Existing	Operational	Low	0.45	47.50
57	Schoenmakerskop BPT	Existing	Operational	Low	0.44	0.18
58	Schoenmakerskop Village Tank	Existing	Operational	Low	0.19	2.59
59	Seaview Lower Tank[13]	Existing	Operational	Medium	0.13	4.32
60	Seaview Pumpstations Balancing Tank	Existing	Operational	Low	0.22	0.22
61	Seaview Upper Tank	Existing	Prime	Low	0.07	1.62
62	St Georges	Existing	Operational	High	23.99	36.70
63	Struandale	Existing	Operational	Low	0.66	63.69

64	Summit	Existing	Operational	Low	0.11	0.11
65	Summit / Confluence BPT	Existing	Operational	Low	1.625	90.68
66	Theescombe Reservoir	Existing	Prime	Low	0.06	0.86
67	Theesecomb Tank	Existing	Operational	Low	0.06	0.06
68	Tulbach Street[14]	Existing	Operational	Low	1.13	10.80
69	van Riebeeck Hoogte	Existing	Prime	Low	1.77	36.70
70	Van Stadens Mouth	Existing	Operational	Low	0.06	0.86
71	Van Stadens Village	Existing	Prime	Low	0.06	0.86
72	Voortrekker Street 1	Existing	Operational	Low	0.49	4.10
73	Voortrekker Street 2	Existing	Operational	Low	0.86	5.40

Table 52: NMBM Reservoirs Infrastructure Problems

No.	Description	General Physical Condition	Refurbishment Needs	Refurbishment requirements
1	Bethelsdorp	Operational	Low	Notable concrete spalling
2	Blue Horizon Bay Lower	Operational	Low	Shows evidence of leakage
3	Blue Horizon Bay Upper	Operational	Low	Shows evidence of leakage
4	Chelsea	Operational	Low	Requires internal work and for the roof to be secured
5	Fort Nottingham	Operational	Low	Requires structural attention as the building is crumbling and the inlet and outlet works requires attention.
6	Gelvandale	Operational	Low	Inlet building roof requires replacement
7	Kwanobuhle 1 (Old 10ML / Gunguluza)	Operational	Low	Construction of security wall and control works are being replaced
8	Kwanobuhle 2 (Peace Village 8 ML)	Operational	Low	Requires backfill around the reservoir and a security fence due to high security incidents
9	Lovemore Heights	Operational	Low	Requires work at the inlet and outlet controls to be done.
10	Lovemore Heights Upper (High) Level	Operational	Low	Fence requires replacing
11	Motherwell 1	Operational	Low	Requires security fence due to high security incidents
12	McNaughton	Operational	Medium	Requires upgrade control works and pipes and for both inlet and outlet works
13	Seaview Lower Tank	Operational	Medium	Outlet controls requires attention and the outside concrete structure
14	Tulbach Street	Operational	Low	Requires a fence

Table 53: Pipe Refurbishments & Replacements Costings Criteria

No.	Criteria	Assumption
1	Refurbishment Needs	High > 60 years; Medium > 30 years; Low > 10 years; None
2	Total refurbishment needs %	60 years or older = 0% (100% Replacement) > 60 years = 100 - (100/1+e^(-k(x-xo))); k = 0.25 (estimate); xo = 30 (half lifespan); x = age (Infrastructure Maintenance Budgeting Guideline: CIDB = 4-8%)
3	Total refurbishment needs cost (RM)	Total refurbishment needs % x Replacement Costs
4	Refurbishment Cost 5 year	Total refurbishment needs cost escalated to 30 June 2019
5	Refurbishment Cost 10 year	5-year Refurbishment Cost + 5 year Cost Price Adjustment
6	Refurbishment Cost 15 year	10-year Refurbishment Cost + 5 year Cost Price Adjustment

Table 54: O&M Costings Criteria

No.	Criteria	Assumption
1	O&M Occurrence	Regular > 50 years; Periodic > 30 years; Sporadic > 10 years; None < 10 years
2	Annual operating cost (RM)	0.1% Replacement Costs (Guidelines for Infrastructure Asset Management in Local Government 2006 – 2009)
3	Annual maintenance cost (RM)	= 8 - (7.5/1+e^(-k(x-xo))); k = 0.25 (estimate); xo = 25 (half lifespan); x = age; 8% (Infrastructure Maintenance Budgeting Guideline: CIDB = 4-8%)

Table 55: Infrastructure Replacement Costings Criteria

No.	Criteria	Assumption
1	Total replacement needs %	Older than 60 = 100%
2	Total replacement needs cost (RM)	Total replacement needs % x Replacement Costs
3	Replacement Cost 5 year	Replacement Costs cost escalated to 30 June 2019
4	Replacement Cost 10 year	5-year Replacement Cost + 5 year Cost Price Adjustment
5	Replacement Cost 15 year	10-year Replacement Cost + 5 year Cost Price Adjustment