

Muscat Wastewater Scheme

Haya Water

(Oman Wastewater Services Company)

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- Introduction
- Planned capital expenditure
- Technology Applied
- Reuse Potential

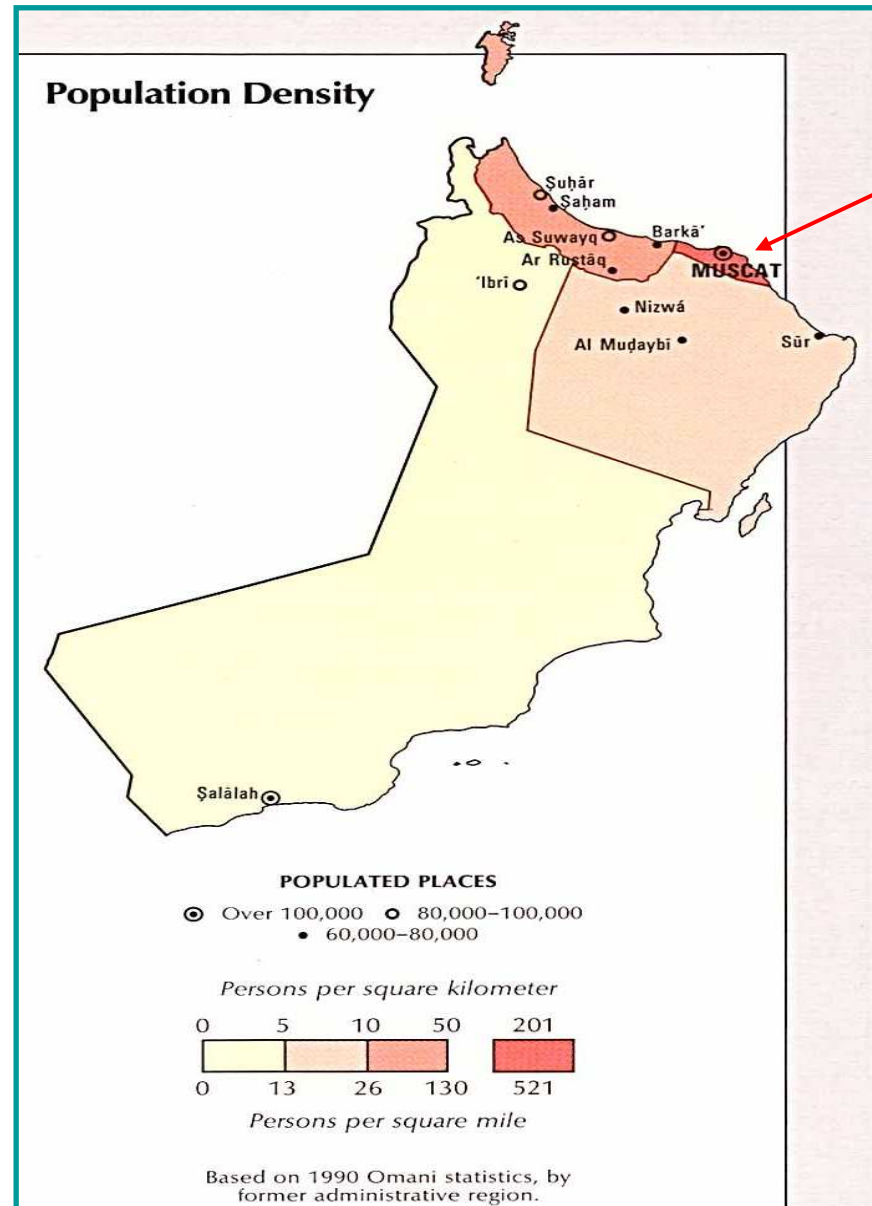


About HAYA Water

- Established in Dec 2002 by the Government of Oman to build and operate the Muscat Wastewater Project.
- The Company signed a concession agreement with the Government for 30 years ends by 2036.
- Its key objective is to connect **80%** of Muscat Governorate population by **2014** and **90%** by **2017**.



Responsibilities and Concession Areas

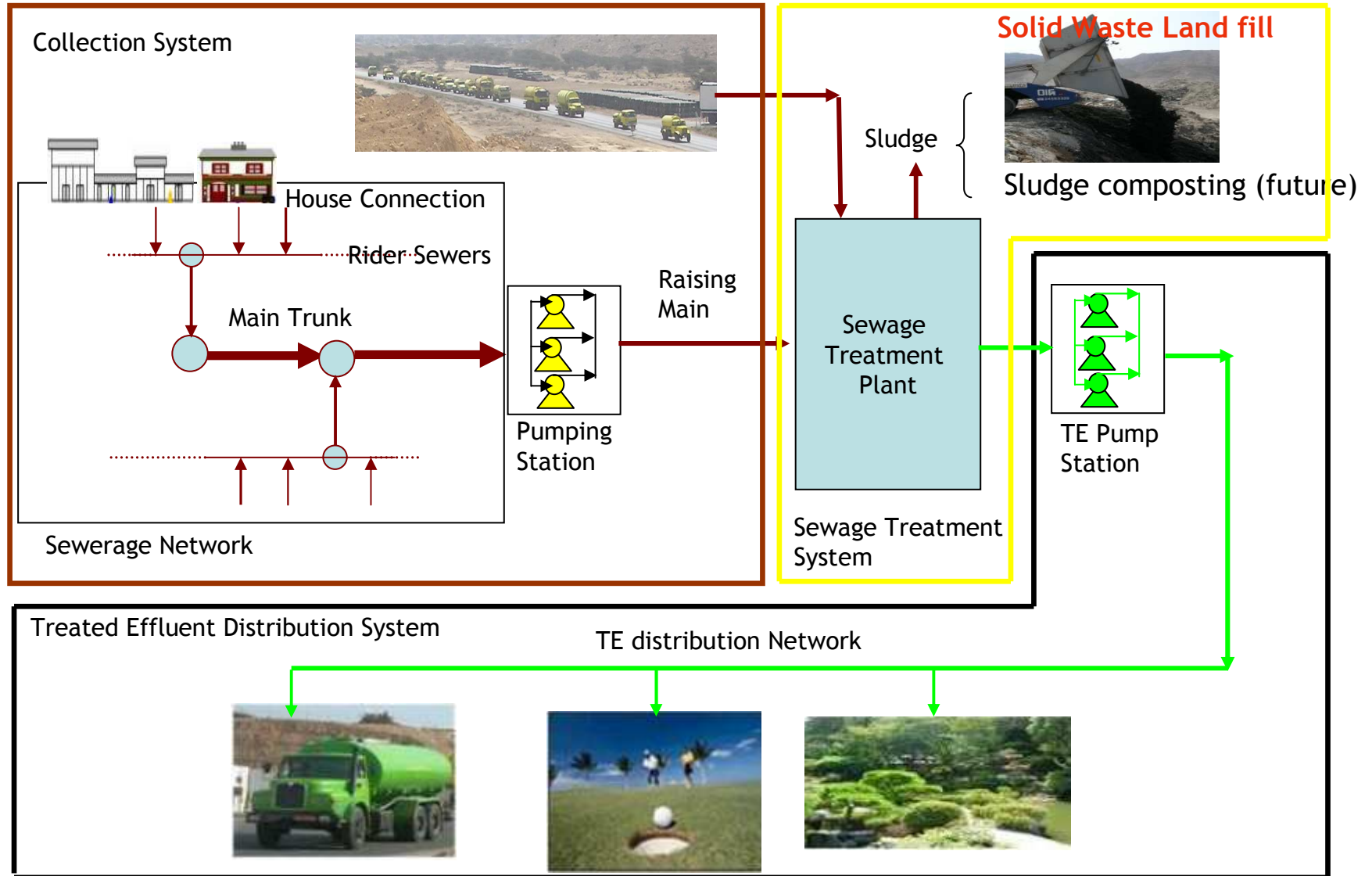


Muscat Governorate

Population
in 2003: 632,000
Projected to Reach
1 million by 2035

Project Area 3900km²

Wastewater System Components



Muscat Wastewater Project

The map illustrates the Muscat Wastewater Project, showing the city of Muscat and surrounding areas. The project is divided into four main categories:

- Area Under Design/Tendering:** Shaded in light green.
- Area Under Construction:** Shaded in light blue.
- Area Not Yet Started:** Shaded in light orange.
- Existing Sewer Line:** Shaded in dark orange.

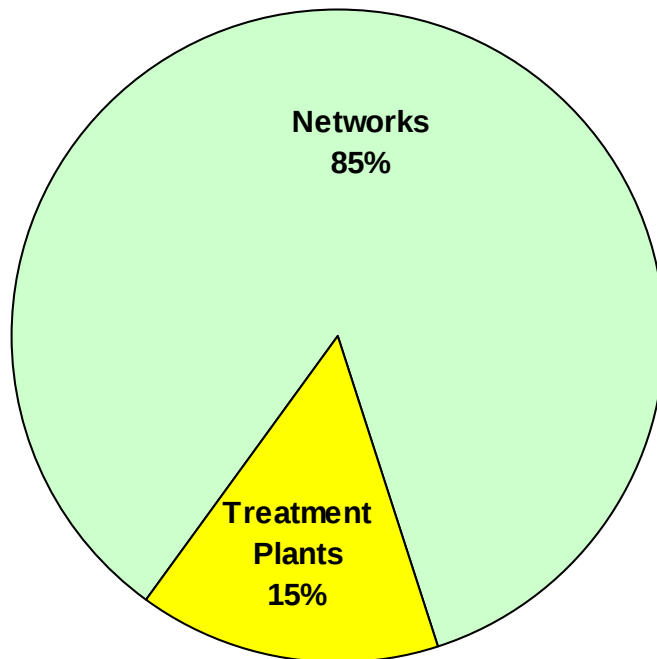
The map also shows the **Gulf Of Oman** to the east. Key locations labeled include Manama, Mabbela, Al Khoud, Al Hail, The Wave, Airport Area, Al Aziba, Al Ghubara, Al Khawar, Al Wallyah, Darait, Muttrah, Muscat, Wadi Audai, Al Hattirya, Wadi Al Kaber, Al Bustan, Al Rusayl, Al Ansab, Ghala, Bolshier, Al Amerat, Al Hajar, Quriyat Center, and Daghmer.

Major areas identified are A' Seeb, Bousher, Al Amerat, Muttrah & Muscat, and Quriyat.

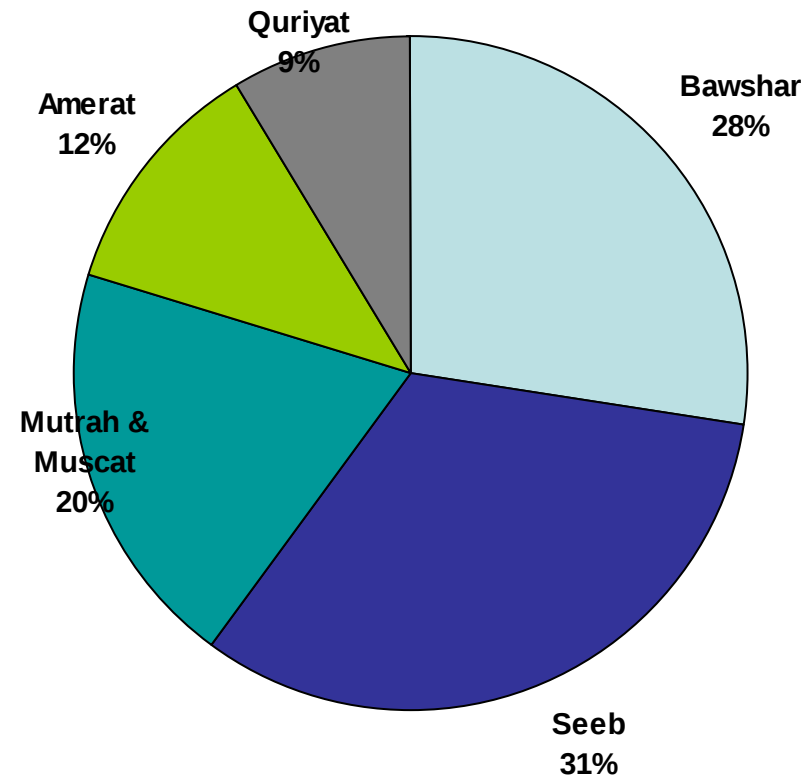


An Omani Rial 1.64 Billion Project (US\$4.26 Billion)

Projects By Type

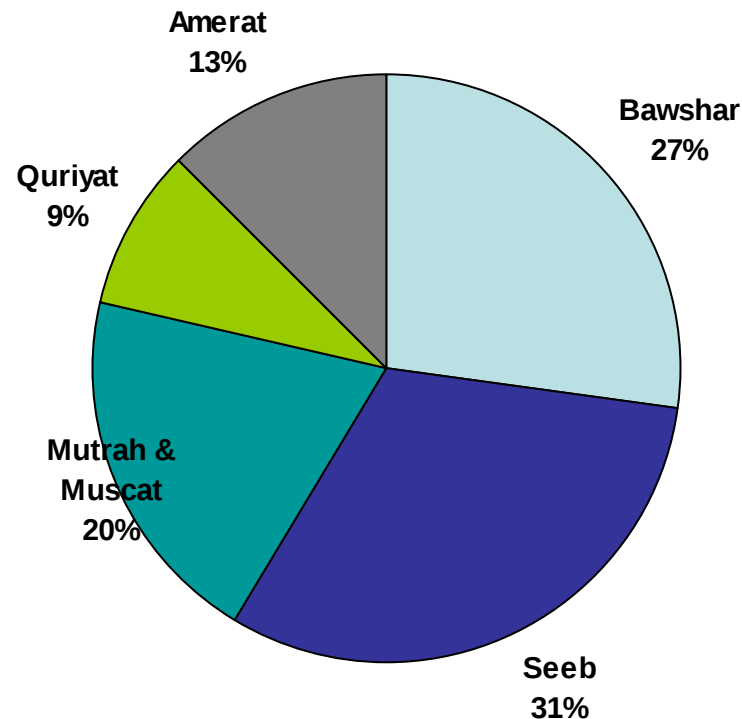


Projects By Wilayat

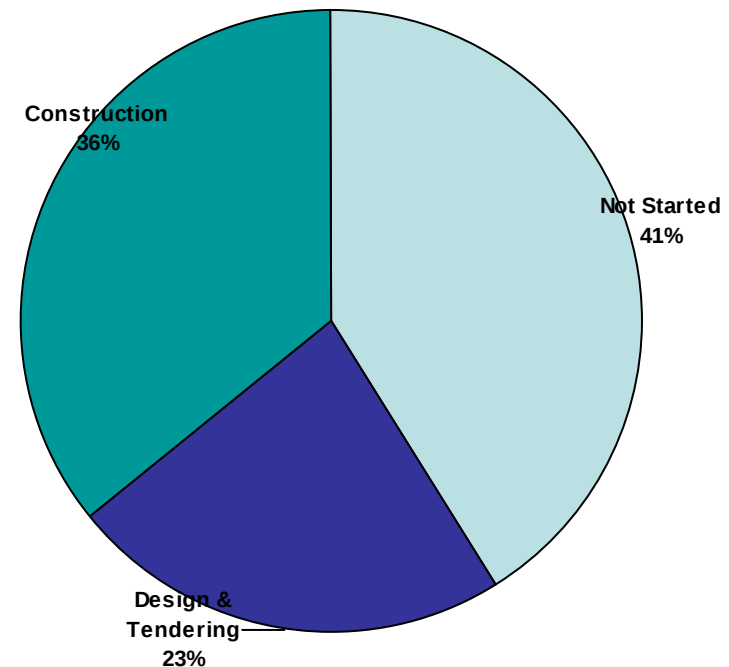


Network Projects R.O. 1.4 Billion (US\$3.64 Billion)

By Wilayat



By Progress



Network Projects R.O. 1.4 Billion (US\$3.64 Billion)

PROGRESS BY CATCHMENT

- A. Seeb:
 - 5 NW construction packages.
 - Largest vacuum sewer(11VS, 3000VV).
 - Microtunneling 24km long (2000mm)
- B. Bawshar:
 - 3 NW construction packages
- C. Mutrah & Muscat:
 - 1 NW construction package.

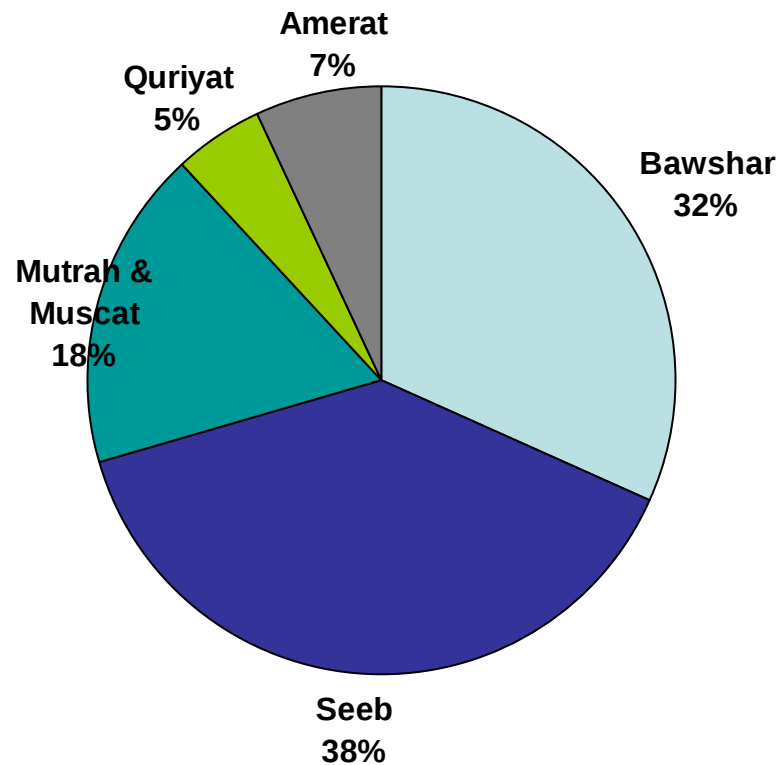
FUTURE BY CATCHMENT

- A. Bawshar:
 - 2 NW construction packages.
- B. Mutrah & Muscat:
 - 3 NW construction packages.
- C. Amerat:
 - 3 NW construction packages.
- D. Quriyat:
 - 3 NW construction packages.

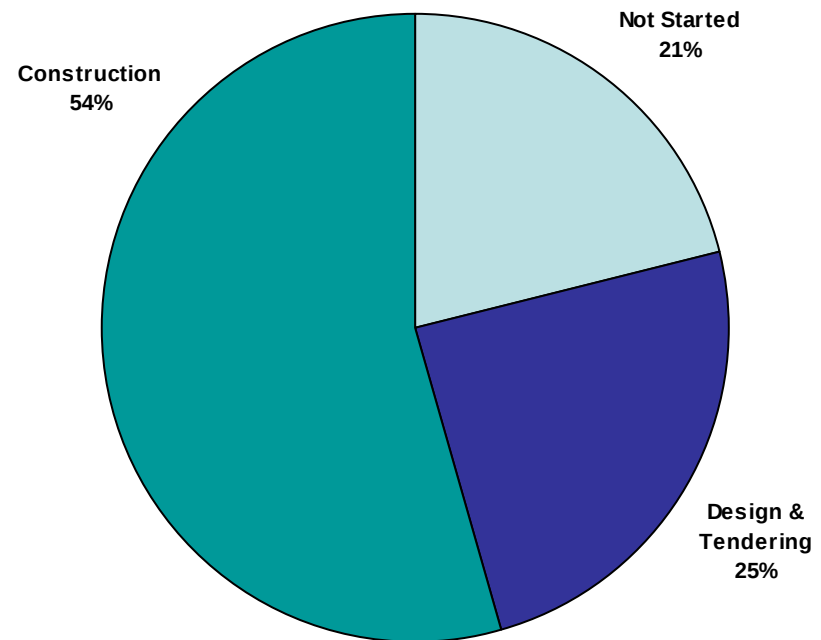


Treatment Plant Projects R.O. 244 million (US\$634 million)

By Wilayat



Progress



Treatment Plant Projects R.O. 244 million (US\$634 million)

PROGRESS BY CATCHMENT

A. Seeb:

- 1 STP construction package.
- SBR Plant with ultra-filtration.
- 60,000m³/day- Phase 1.

B. Bawshar:

- 1 STP construction package (Al Ansab STP).
- MBR Plant.
- 55,000 m³/day- Phase 1.

C. Mutrah & Muscat:

- 1 STP construction package (Darsait STP).
- MBR Plant.
- 50,000 m³/day.

FUTURE BY CATCHMENT

A. Seeb:

- 20,000m³/day expansion- Phase 2.

B. Amerat:

- 1 STP construction package.
- MBR Plant.
- 18,000 m³/day.

C. Quriyat and Small Villages:

- 5 STP construction packages.



Challenges of a Brown Field Implementation

- Availability of accurate data covering existing services.
- Multiple NOC bodies.
- Availability of service corridors.
- Public safety and inconvenience.
- Availability of contractors with state-of-the-art experience.
- Managing the public and the press.



Micro Tunneling Activities



Construction Activities



Sewage Treatment Plant



Issues considered in the evaluation of the process options

- a. Reliability/robustness
- b. Footprint
- c. Energy minimization
- d. Whole Life Cost
- e. Minimum Environmental impact
- f. Shock load resilience
- g. Modularity/phasing
- h. Operational complexity
- i. Maintenance redundancy
- j. Sludge production and type
- k. Public acceptance & Sustainability
- l. Adaptability for aquifer recharge/potable standard



Typical Wastewater Quality

BOD ₅	350	-	400	mg/L
TSS	400	-	500	mg/L
Total Nitrogen, N	50	-	70	mg/L
Ammonia	35	-	50	mg/L
Total Phosphorous	10	-	15	mg/L



Water Re-use & TE Standards Drives the Use of Membrane Technology

- Government Policy drives the company towards water reuse.
- Public health and safety is a primary concern

	Units	Land Reuse Standards	Target Quality
BOD	mg/l	15	5
SS	mg/l	15	5
NH ₃ - N	mg/l	5	1
Total N	mg/l	15	15
P - P	mg/l	30	12
Nematode Ova	eggs/l	1	1

- Proximity to the public means strict odor control requirements



PROCESS & TREATMENT TECHNOLOGY APPLIED

- Membrane Bio Reactor (MBR) based on MLE process with Immersed Flat Sheet and HF membranes
- Sequential Batch Reactor process with U/F

Pretreatment

- Coarse & Fine Screens
- Aerated FOG & Grit Removal

Post Treatment

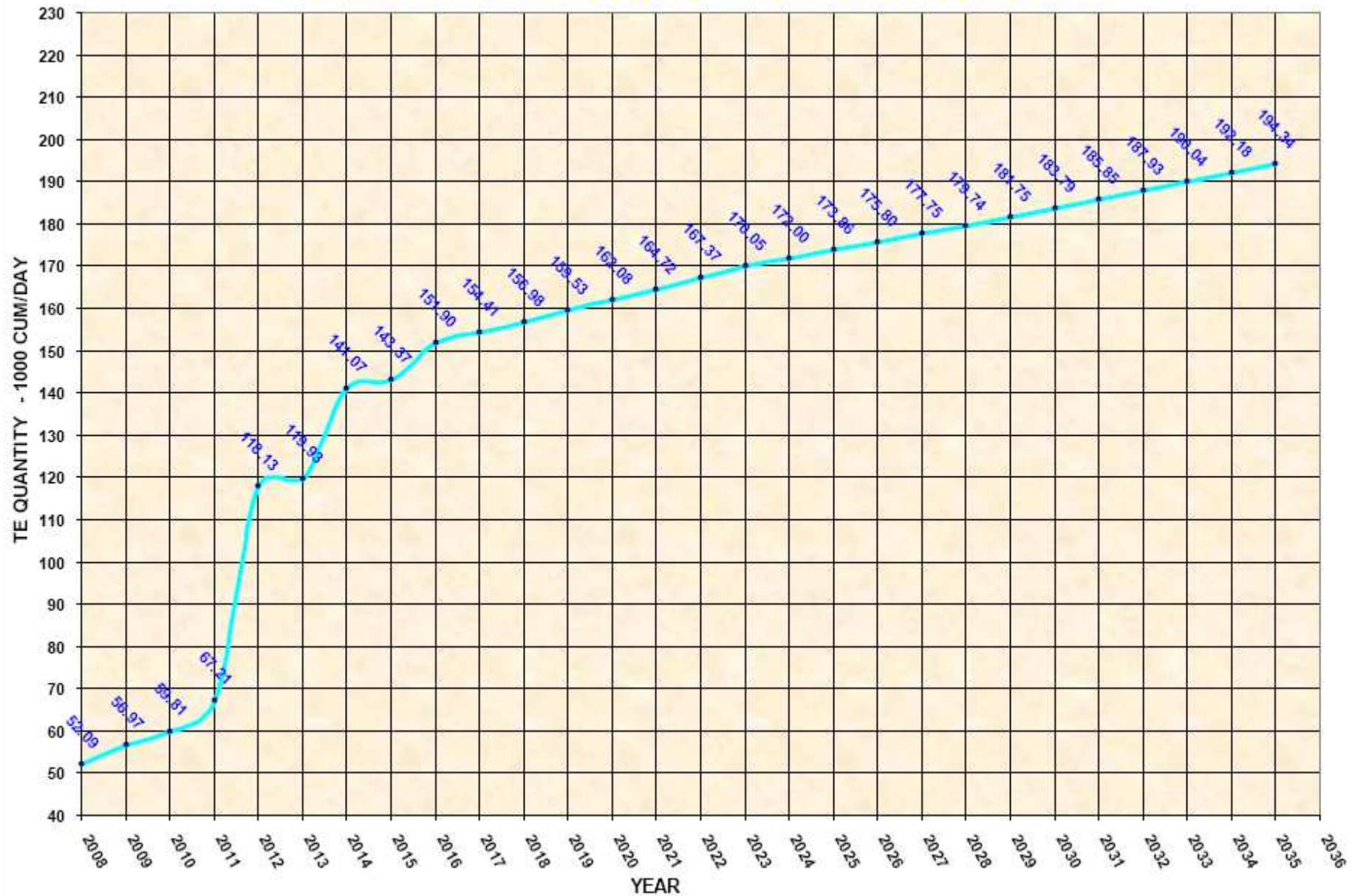
- Chlorine dosing to maintain residual chlorine(0.30-1.0 mg/L)

Sludge Treatment

- Belt Filter Press / Centrifuge & Final Composting



TREATED EFFLUENT PRODUCTION FROM MUSCAT GOVERNATE



Driving Treated Water Reuse in Muscat

- Total average volume of treated water at the 11 Haya Water STPs is currently around 50,000 m³/day.
- All the existing treated water is sold to Muscat Municipality for landscaping and beautification irrigation.
- There are currently approx. 100 kms of pipelines that distribute treated water.
- Treated water available for reuse will reach 145,000 m³/day by 2015.
- All new network projects include treated water reuse networks.



Treated water Re-Use options

Supply to public landscaping and beautification
(roads, parks etc.)



Treated water Re-Use options

- Supply to large private developments (golf courses, tourist projects, institutions).



Treated water Re-Use Options

- Agriculture for raising of crops (maize and cattle fodder)



Treated water Re-Use Options

- Integrated management of wetland; create new environment for birds and plants.



Treated water Re-Use Options

- Education programs on wastewater and water reuse.
- Tourism; birds watchers.



The Last Resort Sea Outfalls

Five outfalls will be built for emergency and excess TE disposal.



Bio-Solids Composting Project

- Technology: Open Agitated Windrow
- Materials: Bio-Solids and Green Waste
- Capacity: 40,000 dt/year (end product)
- Cost: US\$ 6.2m
- Standards Applied:
 - Ministry of Environment and Climate Affairs (Oman)
 - USEPA
- Commissioning Date: June 2010
- Present status: construction tender under evaluation.



Thank you!

