

ENVIRONMENTAL GUIDANCE NOTES:
ENVIRONMENTAL STANDARDS AND LIMITS



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1 PURPOSE

This guide document has been developed for PDC’s prospective tenants to assist and inform the national environmental standards and limits applicable to operate within PDC concession at SEZAD. It is to be noted that this guide is not meant to be comprehensive or exhaustible but provides the key standards and limits to be used as base reference to establish coherent compliance with legislative framework.

2 APPLICABILITY

This document is applicable to all of PDC’s Assets and Facilities and where PDC has operational control.

3 STANDARDS AND LIMITS

3.1 MD 145/93 and RD 115/2001 Water Resource and Wastewater

The Omani standards for wastewater discharge and re-use on land are issued under MD 145/93 and RD 115/2001. There are two types of standards, based on the crops grown on the land where the wastewater is applied which are shown in Table 1 and Table 2.

Table 1 Uses of wastewater discharge Standards A-1 and A-2

Specification	Standard A-1	Standard A-2
Crops	Vegetables and fruits likely to be eaten raw within two weeks of irrigation	Vegetables to be cooked or processed. Fruits if not irrigated within 2 weeks of cropping. Fodder, cereal and seed crops
Grass and ornamental areas	Public parks, hotel lawns, recreational areas. Areas and lakes accessed by public	Pastures and areas with no public access
Aquifer recharge	All aquifer recharge controlled and monitored by the Ministry	
Methods of irrigation	Spray or any other method of aerial irrigation is not permitted in areas with public access unless with timing control	
Any other re-use applications	Subject to the approval of the ministry	

Table 2 Allowable pollutant levels for wastewater standards A-1 and A-2

Parameter	Units	Standard A-1	Standard A-2
Aluminum (as Al)	mg/L	5	5
Arsenic (as As)	mg/L	0.10	0.10
Barium (as Ba)	mg/L	1	2
Beryllium (as Be)	mg/L	0.10	0.30
Biochemical oxygen demand (BOD) - 5 days @ 20° C	mg/L	15	20
Boron (as B)	mg/L	0.50	1.00
Cadmium (as Ca)	mg/L	0.01	0.01
Chemical oxygen demand (COD)	mg/L	150	200
Chloride (as Cl)	mg/L	650	650
Chromium (Total as Cr)	mg/L	0.05	0.05
Cobalt (as Co)	mg/L	0.05	0.05
Copper (as Cu)	mg/L	0.50	1.00
Cyanide (Total as CN)	mg/L	0.05	0.10
Electrical conductivity (EC)	µs/cm	2000	2700
Faecal coliform bacteria	Number per 100 mL	200	1000
Fluoride (as F)	mg/L	1	2
Iron (Total as Fe)	mg/L	1	5
Lead (as Pb)	mg/L	0.10	0.20
Lithium (as Li)	mg/L	0.07	0.07

Parameter	Units	Standard A-1	Standard A-2
Magnesium (as Mg)	mg/L	150	150
Manganese (as Mn)	mg/L	0.10	0.50
Mercury (as Hg)	mg/L	0.001	0.001
Molybdenum (as Mo)	mg/L	0.01	0.05
Nickel (as Ni)	mg/L	0.10	0.10
Nitrogen: Ammoniacal (as N)	mg/L	5	10
:Nitrate (as NO ₃)		50	50
: Organic (Kjeldahl as N)		5	10
Oil and grease (Total extractable)	mg/L	0.50	0.50
pH	-	6-9	6-9
Phenols (Total)	mg/L	0.001	0.002
Phosphorus (Total as P)	mg/L	30	30
Selenium (as Se)	mg/L	0.02	0.02
Silver (as Ag)	mg/L	0.01	0.01
Sodium (as Na)	mg/L	200	300
Sodium absorption ratio (SAR)	-	10	10
Sulphate (as SO ₄)	mg/L	400	400
Sulphide (Total as S)	mg/L	0.10	0.10
Suspended solids (SS)	mg/L	15	30
Total dissolved solids (TDS)	mg/L	1500	2000
Vanadium (as V)	mg/L	0.10	0.10
Viable nematode ova	Number per L	<1	<1
Zinc (as Zn)	mg/L	5	5

Source: Adapted from MECA 2001 - RD 115/2001 and MD145/93

The following are Omani standards for re-use or disposal of sludge resulting from wastewater treatment. The sludge generated from the wastewater treatment may be applied on land for agricultural use (after obtaining permit from SEZAD for the same), subject to the conditions given in Table 3.

Table 3 Wastewater Treatment Sludge Re-use Standards

Metal	Maximum concentration (mg/kg of dry solids)	Maximum Applicable rate (kg/ha)	Maximum permitted concentration in soil (mg/kg of dry solids)
Cadmium	20	0.15	3
Chromium	1000	10.00	400
Copper	1000	10.00	150
Lead	1000	15.00	150
Mercury	10	0.10	1
Molybdenum	20	0.10	3
Nickel	300	3.00	75
Selenium	50	0.15	5
Zinc	3000	15.00	300

3.2 MD 169/2005 Marine Discharge Standards

Table 4 presents the maximum guideline limits for the discharge of liquid waste to the marine environment.

Table 4 Maximum guideline limits for the discharge of liquid waste. All concentration in mg/l unless stated otherwise.

Parameter	Standard
Temperature	Not greater than 10 °C above ambient receiving seawater temperature
Biochemical oxygen demand (BOD)	20.0
Chemical oxygen demand (COD)	200.0
Total Suspended Solids	30.0

Parameter	Standard
Aluminium	5.0
Arsenic	0.1
Barium	2.0
Beryllium	0.3
Boron	1.0
Cadmium	0.01
Chromium	0.05
Cobalt	0.05
Copper	0.2
Cyanide	0.1
Fluoride	2.0
Iron	1.5
Lead	0.08
Lithium	0.07
Mercury	0.001
Molybdenum	0.05
Nickel	0.1
Nitrogen: Ammonia cal	1.0
Nitrogen : Nitrate	15.0
Nitrogen : Organic (Kjeldahl)	5.0
Total - Nitrogen	15.0
Oil & Grease	10.0
Phenols (total)	0.002
Phosphorus	2.0
Selenium	0.02
Silver	0.01
Sophie	0.10
Total chlorine	0.4
Vanadium	0.1
Zinc	1.0
Faecal Coliform Bacteria (per litre)	1,000
Viable Nematode Ova (per litre)	< 1
Organo halogens	< 0.001
Pesticides or their by - products	< 0.001
Organosilicon compounds	< 0.001
Organocopper compounds	< 0.001
Organotin compounds	0.00002

3.3 MD 118/2004 Air Quality Emission Standards

Omani standards for air emissions from stationary sources are specified under MD 118/2004 and are provided in Table 5

Table 5 Air Emission from stationary sources Standards

Pollutants	Maximum permissible limits
General	
Grit and dust Dark smoke products of combustion shall not emits smoke as dark as or darker than shade one on the Rigelmann scale (20% opacity)	0.050 g/m ³
Power Plants - Natural Gas Fired	
Nitrogen dioxide	0.150 g/m ³
Particulates	0.050 g/m ³
Unburnt hydrocarbons	0.010 g/m ³
Carbon dioxide	5 g/m ³
Power Plants - Diesel oil fired (less than 0.5% Sulphur)	
Sulphur dioxide	0.035 g/m ³
Carbon monoxide	0.050 g/m ³
Nitrogen dioxide	0.150 g/m ³
Particulates	0.100 g/m ³
Unburnt hydrocarbons	0.010 g/m ³

Pollutants	Maximum permissible limits
Combustion Sources - Diesel oil fired (Industrial boilers, furnaces, ovens)	
Carbon monoxide	0.050 g/m ³
Sulphur dioxide	0.035 g/m ³
Nitrogen dioxide	0.150 g/m ³
Particulates	0.100 g/m ³
Unburnt hydrocarbons	0.010 g/m ³
Combustion Sources - Natural Gas fired (Industrial boilers, furnaces, industrial ovens)	
Nitrogen dioxide	0.150 g/m ³
Particulates	0.050 g/m ³
Unburnt hydrocarbons	0.010 g/m ³
Carbon dioxide	5 g/m ³

The Ministry of Environment and Climate Affairs (MECA) has developed Ambient Air Quality Standards in Oman. The standards are detailed in Table 6.

Table 6 Omani Standards for concentrations of pollutants in ambient air

Pollutants	The maximum level of contaminants concentrations	Averaging Period
Sulphur Dioxide	350 µg.m ⁻³	One hour
	150 µg.m ⁻³	24 hours
Hydrogen Sulphide	30 µg.m ⁻³	One hour
Nitrogen Dioxide	250 µg.m ⁻³	One hour
	130 µg.m ⁻³	24 hours
Ozone	120 µg.m ⁻³	8 hours
PM10	150 µg.m ⁻³	24 hours
Carbon Monoxide	30 mg.m ⁻³	One hour
	10 mg.m ⁻³	8 hours
Non-Methane Hydrocarbons	160 µg.m ⁻³	3 hours

MECA also recommends the use of the United States Environmental Protection Agency (US EPA) National Ambient Air Quality Standards (NAAQS), which are detailed in Table 7.

Table 7 US EPA National Ambient Air Quality Standards

Pollutant	Primary/Secondary*	Averaging Time	Level	Form	
Carbon Monoxide	Primary	8 hour	9 ppm (10 mg.m ⁻³)	Not to be exceeded more than once per year	
		1 hour	35 ppm (40 mg.m ⁻³)		
Lead	Primary and Secondary	Rolling 3 month average	0.15 µg.m ⁻³	Not to be exceeded	
Nitrogen Dioxide	Primary	1 hour	100 ppb (188 µg.m ⁻³)	98 th percentile, averaged over 3 years	
	Primary and Secondary	Annual	53ppb (100 µg.m ⁻³)	Annual Mean	
Ozone	Primary and Secondary	8 hour	0.075 ppb (147 µg.m ⁻³)	Annual fourth highest daily maximum 8 hour concentration, averaged over 3 years	
Particle Pollution	PM _{2.5}	Primary	Annual	12 µg.m ⁻³	Particulate Matter
		Secondary	Annual	15 µg.m ⁻³	
		Primary and Secondary	24 hour	35 µg.m ⁻³	
	PM ₁₀	Primary and Secondary	24 hour	150 µg.m ⁻³	
Sulphur Dioxide	Primary	1 hour	75 ppb (196 µg.m ⁻³)	99 th percentile of 1 hour daily maximum concentrations, averaged over 3	

Pollutant	Primary/Secondary*	Averaging Time	Level	Form
				years
	Secondary	3 hour	0.5 ppm (1300 µg.m ⁻³)	Not to be exceeded more than once per year

*Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

3.4 MD 79/94 Noise

The regulations for noise control are applicable to workplace noise levels and ambient noise levels. The ambient noise standards are issued under MD 79/94 and the limits for ambient noise levels from industrial sources are summarized in Table 8

Table 8 Ambient Noise Standards

Type of District	Maximum Permissible Noise Level [as L _{eq} in dB (A)]		
	Day Time (7 AM- 6 PM) workdays	Evening Time (6PM- 11PM) workdays	Night Time (11PM- 7AM) on workdays and all times on holidays
Rural residential and recreational	45	40	35
Sub-urban residential	50	45	40
Urban residential	55	50	45
Urban residential with some workshops or business city hub	60	55	50
Industrial and commercial	70	70	70

4 ABBREVIATIONS

Term	Definition
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
dB	Decibel
g/m ³	Gram per cubic meter
MECA	Ministry of Environment and Climate Affairs
MD	Ministerial Decision
µg.m ⁻³	Microgram per cubic meter
µs/cm	Microsecond per centimeter
mL	Milliliter
mg.m ⁻³	Milligram per cubic meter
mg/L	Milligram per Liter
mg/kg	Milligram per Kilogram
mg/ha	Milligram per hectare
NAAQS	National Ambient Air Quality Standards
PDC	Port of Duqm Company SAOC
PoD	Port of Duqm
PM	Particulate Matter
ppm	Parts per million
ppb	Parts per billion
RD	Royal Decree

Term	Definition
SEZAD	Special Economic Zone Authority at Duqm
TDS	Total Dissolved Solids
US EPA	United States Environmental Protection Agency