4 BASELINE ENVIRONMENT

This section comprises a description of the baseline environment appropriate to the Project site and surrounding area. The information is based on the following:

- Desk review of available documents
- Site visits and surveys

4.1 SITE AND PROJECT AREA

4.1.1 The Site

Constance Belle Mare Plage is located at Belle Mare in the District of Flacq.

The resort itself is located on the coast and the technical facilities as well as some commercial facilities are located on the inland side of the coastal road. The desalination plant will be sited next to the technical area inland.

An aerial view of the resort in shown in Figure 4 below.

Figure 4: Aerial Picture of Constance Belle Mare Plage Resort

The desalination plant is to be housed in a plant room built next to the technical yard of the hotel. The hotel facilities are located in the inland side of the coastal road, i.e. on private land belonging to Constance Industries Ltd as per title deed TV No. 3236 No 51.

4.1.2 The Project Area

The Project area for an Environmental Impact Assessment typically comprises land within 1,000m of the site boundaries; the effective project area of influence for such small RO desalination plants with no directly interface with the lagoon/ocean can be effectively reduced to land within 150m of the site boundary.

From the aerial picture shown in Figure 3 above and the Location Plan, attached in the Drawing section of the EIA report, the following features are found within or adjoin the Project area of influence:

- Seawards
    - The high water mark at 185m from BH1 (intake borehole) and 235m from BH2 (rejection borehole)
    - The resort between the coastal road and the coast, with nearest room at 140m from the plant room
    - The technical yard, with nearest workshop at 15m from the plant room
- Landwards
    - The Golf course with brackish water retention ponds

Photographs of site and surroundings of the project area are shown in Appendix E.

4.2 TERRESTRIAL ENVIRONMENT

4.2.1 Site Geology

Mauritius is entirely volcanic except for deposits of beach and dune sands along the coast and a fringe of coral reefs. The volcanic deposits are composed essentially of basaltic lava flows with some inclusions of pyroclastics. Two general series of volcanic rocks has been identified, namely the older and younger volcanic series and dated as illustrated in Table 5.

Series	Age (Million Years)
Younger Volcanic Series	
Late lavas	0.17-0.7
Intermediate lavas	
Early lavas	2.0-3.5
Older Volcanic Series	6.8-7.8

Table 5: Geological Age of Mauritius

The 1:50,000 Geologic Map of Mauritius indicates that the site is located on superficial alluvial and eluvial formations, namely non-volcanic strata underlain by fresh basalt of the Recent Volcanic Series. Nonvolcanic formations are represented by raised coral reefs, beaches and old dune deposits.

In the context of the Feasibility Study for the implementation of a seawater desalination plant at Constance Belle Mare Plage, site investigations were carried out by Water Research Co. Ltd and included drilling of two boreholes, logging, airlift to develop the borewell and pumping and recovery tests.

Despite de fact that the drilling method used (DTH technique) does not produce core samples but rock or soil fragments, the driller's description of the observed material for the two boreholes are provided in Table 6 below.

BOREHOLE 1		BOREHOLE 2	
Depth	**Material**	**Depth**	**Material**
0.0m to 3.0m bgl[1]	Sand	**0.0m to 1.0m blg**	Sand
3.0m to 5.0m bgl	Compact basalt	**1.0m to 3.0m bg**	Weathered basalt
5.0m to 7.0m bgl	Compact and Fractured basalt	**3.0m to 5.0m bgl**	Slightly Compact basalt
7.0m to 10.0m bgl	Weathered Basalt	**5.0m to 11.5m bgl**	Compact Basalt
10.0m to 14.0 m bgl	Sand	**11.5m to 13.0 m bgl**	Coral and Weathered Basalt
14.0m to 16.0 m bgl	Weathered basalt and coral	**13.0 m to 15.0 m bgl**	Coral
16.0 m to 22.0 m bgl	Strong Coral	**15.0 m to 16.0 m bgl**	Strong Coral
22.0 m to 25.0 m bgl	Coral	**16.0 m to 20.0 m bgl**	Weathered Basalt
25.0 m to 26.0 m bgl	Clay	**20.0 m to 28.0 m bgl**	Strong coral
		28.0 m to 34.0 m bgl	Compact Basalt
		34.0 m to 40.0 m bgl	Highly Weathered Basalt

Table 6: Boring Geological Findings

4.2.2 Site Hydrology

The hydrogeology of a site pertains to the underground water features of this site.

Belle Mare is located in the coastal common recharge area, seawards of Nouvelle Decouvertes – Plaines des Roches/Midlands – Trou D'eau Douce. In the coastal areas are typically found the saline interfaces between the freshwater migrating seawards and the seawater migrating inland. There are no boreholes for freshwater supply located in the coastal perimeter.

[1] blg : below ground level

From the geotechnical report, it is noted that water strikes on BH 1 were recorded at 2.0m, 6.0m, 8.0 m and 22.0m bgl with the static water level at 0.72m bgl before the start of the pumping tests.
Water strikes in BH 2 were recorded at 12.0m and 35.0m bgl.

4.2.3 Site Hydrology

The hydrology of a site pertains to the surface water features of this site.

As per the Hydrology Data Book of the Water Resources Unit, Belle Mare is located within the catchment area code CD of an extent of 49.7 km² at sea. There are no rivers in the project area as shown in Figure 5.

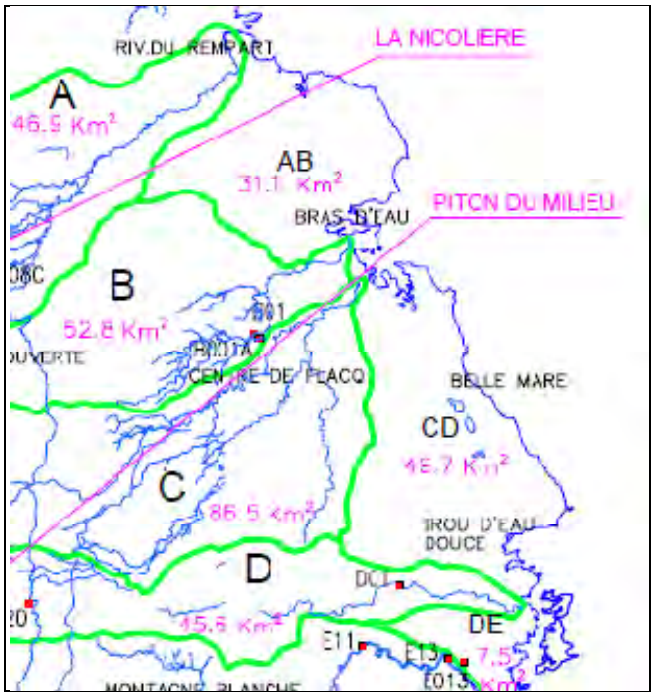

Figure 5: Catchement of River Citronnier

4.2.4 Terrestrial Biodiversity

The site is a developed site and does not fall in any conservation area or reserve zone. The site is not classified as a Ramsar site and no plant or animal species has any conservation value or found in the IUCN red list of endangered animals.

4.3 GENERAL CLIMATIC CONDITIONS

Mauritius has a moderate tropical climate characterized by a hot, humid summer between November and April (average mid-day temperature 25°C on the Central Plateau and 30°c on the coast), followed by cooler and drier winter period (19°c and 24°c respectively). Seasonal rainfall patterns are distinct, with about 50% of the annual rainfall (average 1,200 mm) occurring between January and March, and often little or no rainfall during November to December.

4.3.1 Wind Regime

Mauritius is situated in the equator-ward belt of the southern sub-tropical anticyclone system. Atmospheric pressures at the surface increase southward in this belt, creating a gradient, which maintains a general easterly flow.

The prevailing wind pattern in Mauritius is the South Eastern trade winds, as shown on Figure 6 below, except for short periods in the summer months when tropical storms approach the island. The trade winds are stronger and more persistent in winter when strong anticyclones pass to the South and close to the island.

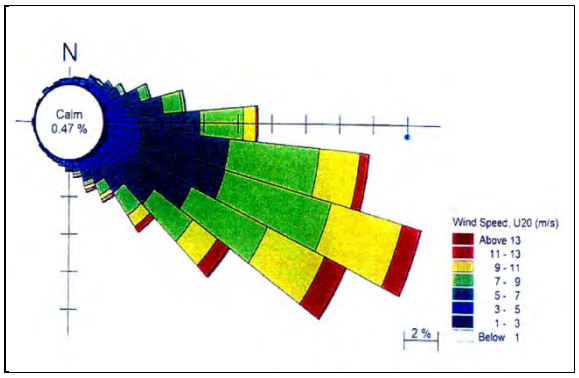

Figure 6: Wind Rose For Mauritius

Belle Mare is directly under the influence of the prevailing winds as located on the eastern coastal plains.

Mean wind speed for the period 1997-2003 for the eastern region, i.e. Palmar meteorological station are reported in Table 7 below (source: Mauritius Meteorological Services).

The wind speed increases in winter with strong south eastern trade winds and anti cyclones.

Wind variations should cause no effect to and from the proposed project due to the type of activity involved.

Month	Mean Wind Speed (km/h)
January	14.3
February	15.6
March	15.0
April	15.4
May	15.9
June	18.7
July	20.0
August	19.8
September	17.0
October	15.9
November	13.9
December	13.0

Table 7: Mean Wind Speed – Palmar

4.3.2 Temperatures

Mean maximum and mean Minimum monthly temperatures for the period 1997-2003 for the eastern region, i.e. Palmar meteorological station are reported in Table 8 below (source: Mauritius Meteorological Services).

Mean minimum temperatures are recorded during the winter season in July, August and September. Mean maximum temperatures are recorded during the summer season from December to March.

Seasonal temperature variations should cause no effect to and from the proposed project due to the type of activity involved.

Month	Mean Max Temp (°c)	Mean Min Temp (°c)
January	28.8	22.0
February	28.7	22.3
March	28.6	22.0
April	27.6	21.2
May	26.2	19.3
June	24.6	17.8
July	23.7	17.3
August	23.8	17.0
September	24.3	17.1
October	25.4	17.9
November	27.1	19.4
December	28.2	21.0

Table 8: Temperatures records - Palmar

4.3.3 Rainfall Regime

The comparative low annual rainfall for Belle Mare and its surroundings arises from the prevailing pattern of the south eastern trade winds.

These winds rise over the island and cause precipitation mainly on the higher Central Plateau and its eastern slopes. When the winds reach the lower regions, and the north western coast, they have already dropped most of their moisture.

Average monthly rainfall for the period 1997-2003 for the eastern region, i.e. Palmar meteorological station are reported in Table 9 below (source: Mauritius Meteorological Services).

September to November are the driest months. December to April are above 200mm monthly rainfall. In the past year March has been a month of heavy rainfall with occasional flooding inland.

Seasonal rain variations should cause no effect to and from the proposed project due to the type of activity and to the small extent of site involved.

Month	Average Rainfall (mm)	No. day with rainfall >5mm
January	261	20
February	334	22
March	231	18
April	240	19
May	168	16
June	104	13
July	103	14
August	105	12
September	70	8
October	62	7
November	83	8
December	203	14
TOTAL	1,964	

Table 9: Mean monthly rainfall - Palmar

4.3.4 Cyclone and Natural Catastrophes

4.3.4.1 Cyclone

Mauritius is subjected to possible seasonal tropical cyclones in the months of December to March/April. Cyclones are characterised by low pressure conditions and high wind systems. From records available at the Mauritius Meteorological Services, over the period 1960-70, 39% of cyclones were classified as Weak", 42% as "Moderate" and 19% as "Strong" with gust speeds over 80km/h.

Since cyclone Dina in 2001, Mauritius has not been subject to strong cyclones.
Elevations in sea levels caused by cyclones do not exceeded 2.00m, however high wind systems over the sea can contribute to formation of occasional waves exceeding this value.

Given that the building have been setback some 200 metres from high water mark there should be no flooding effect due to see level rise due to cyclonic conditions.

4.3.4.2 Natural Catastrophes

Mauritius is not subjected to earthquakes, nor has the island been affected by the Tsunami in December 2004. Elevations in sea levels which have been recorded from North to East of the island have not exceeded 2.00m.

4.4 AIR QUALITY AND NOISE

4.4.1 Air Quality

Existing air quality within the area is expected to reflect its eastern coastal character free from any atmospheric pollutant.

There is little published data on ambient air quality in Mauritius and none in the eastern coastal area. The data available are extracted from the unpublished report "Environmental Investment Programme of Mauritius, Project No7A" prepared for the Government of Mauritius, Ministry of Health by the Norwegian Institute for Air Research and I. Kruger Consult AS-COWI Consult. The 1993 study included an air pollution survey that reported urban related levels of particulate matter (PM) from road traffic taken over a two-month period in August-October 1992.The report found that road traffic emissions (notably from old diesel truck and bus fleet) are the dominant source of PM pollution in Mauritius.

Mauritius having a moderate tropical climate with South East trade winds prevailing through most of the year and the site being located on the eastern coast and with no nearby source of trans-boundary air pollution, the natural background dust level is extremely low. However, burning of sugar cane fields during the harvest season also raises particulate matter of less than 10µm concentrations above 70µg/m3 over a wider area during low wind speeds and poor dispersion.

4.4.2 Noise

Noise is probably the most common form of pollution experienced by the majority of the population, and is unfortunately an inevitable by-product of the whole process of industrialisation and urbanisation.

There is little published data on ambient noise quality in Mauritius and none in the eastern coastal area as it is neither industrialised not urbanised. Noise levels in the area are however

characteristic of the background natural noise due to wind and waves and anthropogenic noise due to traffic and other activities.

4.5 BUILT ENVIRONMENT

4.5.1 Socio-Cultural Conditions

The population of Mauritius, according to the Central Statistics Office of the Ministry of Finance and Economic Development (MFED), was estimated at 1,233,669 in July 2004 based on 2000 Census. Salient features of the Mauritius Demography are:

- according to the medium variant population projections, the population of Mauritius will grow from 1,186,873 in 2000 to around 1,486,000 in 2040, at an average annual rate of 0.56%;
- a sex composition of the population, that, from a slight excess of males over females in 1972, has reversed in 1983, to reach 610,294 males against 623,375 females in 2004, giving a sex ratio of 97.9 in 2040 due to lower mortality prevailing among female;
- the Republic of Mauritius, with a total land area of 2,040 square kilometres, had a population density of around 605 in mid-2004

4.5.1.1 Existing Settlements

Belle Mare is located on the eastern coast of the District of Flacq. This coastal area mainly made up of resorts falls within the Village Council Area of Poste de Flacq, which population as at census 2000 was of 6,606 inhabitants.

The resident population in the Project Area of Influence is limited to a small residential development facing the golf course.

4.5.1.2 Social Infrastructures

The social infrastructure in the project neighbourhood is limited as residential areas are also limited and includes only the common infrastructures of the villages of Poste de Flacq and Trou d'Eau Douce.

Belle Mare hosts one of the longest public beaches in Mauritius, spread over more than 15 kms.

4.5.2 Socio-Economic Conditions

Almost half the employment in the District of Flacq is provided by agriculture and manufacturing; however perhaps the most noticeable feature is the above average proportion of jobs in hotels and restaurants (a proxy for tourism) – around 1 in 8 jobs compared with a national average of 1 in 20 and 1 in 12 in other Districts. Conversely, the proportion employed in manufacturing is significantly lower. In other respects, the employment structure in the District of Flacq differs little from those in other Districts.

4.6 TRANSPORT AND INFRASTRUCTURE

4.6.1 Transport

Constance Belle Mare Plage is serviced by B59 Belle Mare Palmar Trou d'Eau Douce Road which branches onto B52 Poste de Flacq Road.

Traffic on this portion of B59 is directly related to the resorts found on the northern part of B59.

On this part of B59 the level of service is classified "A" which represents free flow conditions. Individual users are virtually unaffected by the presence of others in the traffic stream.

4.6.2 Infrastructure

Water is provided within the area of Belle Mare by the Central Water Authority.

Electricity is provided within the area of Belle Mare by the Central Electricity Baord.

The Mauritius Telecom provides telecommunication facilities to the project area through telephone lines, mostly above ground level and a service of mobile phones with relay stations all over the island. Mobile phone service is also available both through the Mauritius Telecom and through a private company.
The area is also provided with optical fibre cables.

The site is not connected to any sewer system and residents resort to on site disposal systems and all hotels above 50 rooms are connected to private sewer treatment plants.

4.7 CULTURAL AND HISTORICAL HERITAGE

There are no monuments listed in the National Heritage Fund Act in the project area of influence; the closest national heritage is Belle Mare Sugar Factory and further away are the Poste de Flacq limekilns and old cemetery.

4.8 LANDSCAPE AND VISUAL ENVIRONMENT

The principal visual features in the area of the site are as follows:

- The clear blue lagoon
- The Moka Range
- The golf course and water features