



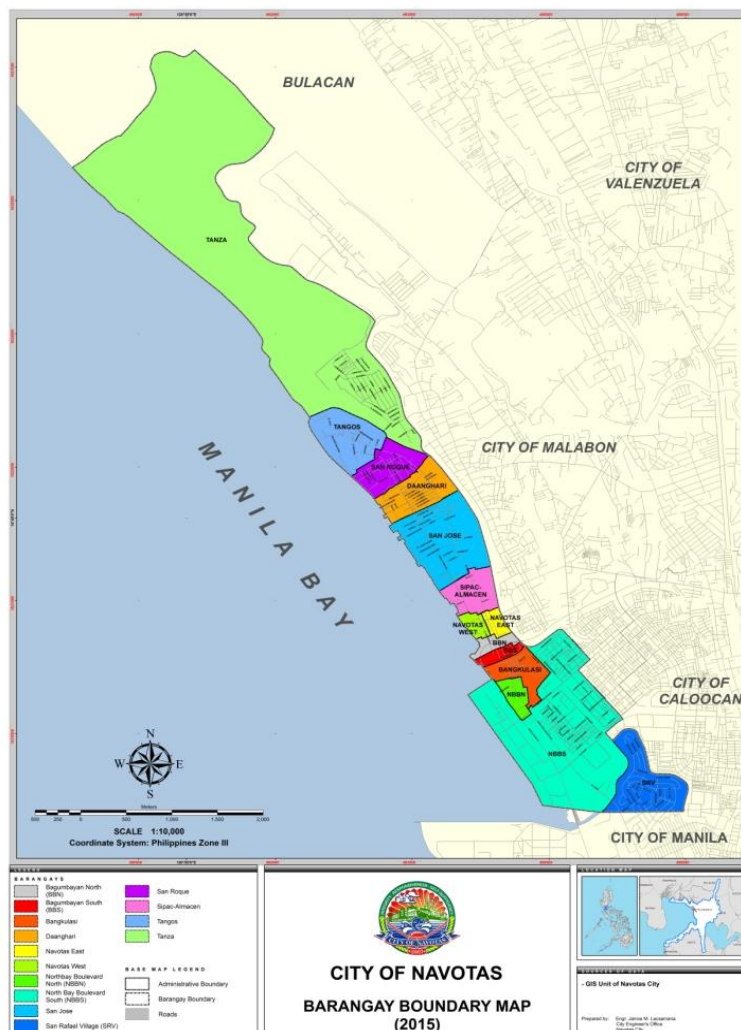
## PART 2: NATURAL AND PHYSICAL PROFILE

### 2.1. PHYSICAL FEATURES

#### 2.1.1. Land Area

Navotas has a total land area of 10.69 square kilometers or 1,069 hectares, inclusive of the reclaimed area currently being utilized by the Philippine Fisheries Development Authority. The city is divided into 2 districts and is composed of 14 barangays, 12 of which are located along the coast. The barangays making up the city of Navotas are Bagumbayan North, Bagumbayan South, Bangkulasi, Daanghari, Navotas East, Navotas West, North Bay Boulevard North, North Bay Boulevard South, San Jose, San Rafael Village, San Roque, Sipac-Almacen, Tangos, and Tanza.

Map 2.1. Navotas Barangay Boundary Map





The areas in hectares of the different barangays in the city are shown in table 2.1 together with their corresponding percent distribution.

**Table 2.1. Land Area and Percentage Distribution of the Fourteen (14) Barangays**

<b>Barangay</b>	<b>Area (Has)</b>	<b>%</b>
<b>District I</b>		
<i>San Rafael Village</i>	39	3.65
<i>North Bay Boulevard South</i>	254	23.76
<i>North Bay Boulevard North</i>	65	6.08
<i>Bangkulasi</i>	15	1.40
<i>Bagumbayan South</i>	5	0.47
<i>Bagumbayan North</i>	4	0.37
<i>Navotas West</i>	6	0.56
<i>Navotas East</i>	7	0.65
<i>Sipac-Almacen</i>	27	2.53
<b>District II</b>		
<i>San Jose</i>	71	6.64
<i>Daanghari</i>	26	2.44
<i>San Roque</i>	27	2.53
<i>Tangos</i>	31	2.90
<i>Tanza</i>	492	46.02
<b>Total</b>	<b>1,069</b>	<b>100</b>

Source: Socio-economic Profile, 2013

### 2.1.2. Topography and Slope

The City of Navotas is a flat and narrow strip of highly urbanized coastal area with an aggregate shoreline of 12.5 kilometers lying along the Manila Bay. It has a slope range of 0-3% with an elevation of 2 meters above sea level (masl).

### 2.1.3. Geology

The geology of Navotas is of quaternary alluvium comprised of detrital deposits, mostly silt, sand and gravel. These soils are of deltaic deposit formed by the Navotas and the Malabon-Tullahan rivers mixed with marine faunas and corals. The thickness of the alluvial deposits range from 15-27 meters below which lies the Pleistocene tuffaceous rock (tuff and pyroclastic rocks) of the Guadalupe Formation, characterized by thin to medium-bedded, fine grained vitric tuffs, and welded volcanic breccias with subordinate amount of tuffaceous, fine to medium-grained sandstone. On the other hand, the landform of Navotas primarily consists of active tidal flats. Landform refers to the physical relief of the area with respect to the different rock types that initially shape up the area that was modified throughout the geologic time into its present configuration. Active tidal flats also can be found in the nearby city of Malabon and the municipalities of Paombong and Hagonoy that are situated north of Navotas. The common land uses for active tidal flats are fishponds, salt ponds, urban areas and sometimes rain fed paddy rice. The soils are composed mainly of tidal mudflats, with mucky and peaty materials and alluvial sediments. The active tidal flat area is submerged



and flushed with sea water during high and low tides. It is very poorly drained and is subject to seasonal flooding varying from slight to severe in magnitude.

### Map 2.2. Navotas City Geological Map





### **2.1.3.1. Soil Type and Suitability**

The soils of Navotas consist of three (3) types of soil: Hydrosols, Obando fine sandy loam and Prensa silty clay loam. Hydrosols are soils which developed from former tidal flats utilized for fishpond and salt beds. This particular type of soil is generally a collection of clay materials and organic matters originating from the decay of marshy growth. Hydrosol is being classified as miscellaneous soil type and has no true profile, has little natural soil and has no agricultural value in its present state. Hydrosols cover about 16.16% or about 172.74 hectares of the total area of Navotas and can be found in the northern portion of Tanza, the entire Barangay San Rafael Village and a portion of Barangay North Bay Boulevard South.

Another type of soil present in Navotas is the Prensa silty clay loam. Prensa series belongs to clayey, montmorillonitic, isohyperthermic, and enticchromusterts. These soils contain common manganese-iron concretions (15-50%). These soils are formed on weakly stratified unconsolidated concretionary fine clayey materials on separated fan terrace landscape and dissected piedmont foot slope landscape position between mountain foot slopes and broad low plains. The parent materials are derived from volcanic ejecta, limestone, metamorphic, greywacke, and conglomerates. This soil type can be found in the western portions of the Barangays Navotas West, Bagumbayan North, Bagumbayan South, Bangkulasi, North Bay Boulevard North, and North Bay Boulevard South, mostly in the reclaimed areas such as the Navotas Fish Port Complex. Prensa comprises 8.20 % of the total land area of the city or 87.62 hectares.

Meanwhile, the Obando fine sandy loam occurs in nearly level, broad landscape position adjacent to and slightly above the active tidal flats with silty clay loam surface texture. It is formed from recent coastal deposits in which the surface soil is colored brown, fine, sandy loam, gritty, loose, and having no structure. It has a depth ranging from 10-30 cm with the subsoil characterized to be gray sand mixed with marine shells. It is mostly found in Barangays Daanghari, San Jose, San Roque, Tangos, and Tanza. A total of 805.13 hectares falls within this particular soil type or about 75.32% of the total area of Navotas.



Map 2.3. Navotas City Soil Map



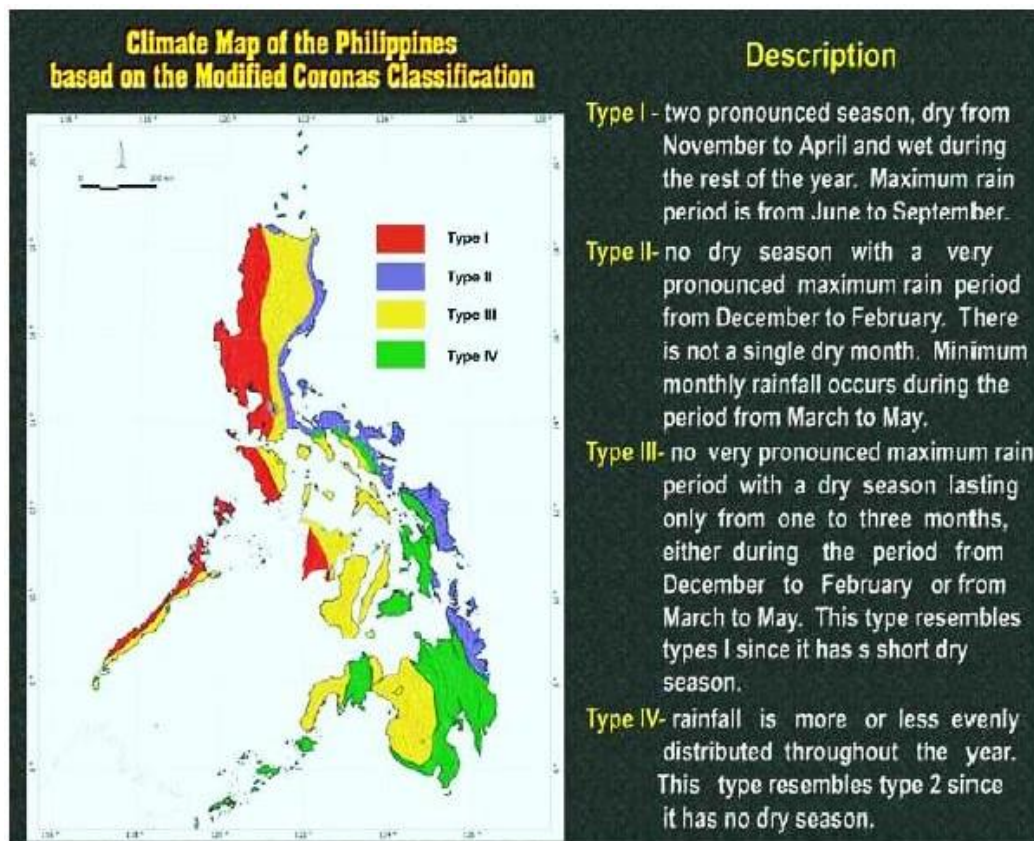


## 2.2. CLIMATOLOGICAL FEATURES

### 2.2.1. Climate

Meteorological conditions in the area surrounding the PAGASA synoptic station at the Port Area are representatives of the meteorological situations for Navotas City. The values of various climatological parameters at this station are given in the climatological normals. Navotas belongs to the Type I climate. It is characterized by two pronounced seasons, dry during the months of November to April and rainy or wet the rest of the year. The maximum rain period is during the months of June-September. The dry season is further subdivided into (a) the cool dry season, from December to February; and (b) the hot dry season, from March to May. The Philippine Climate Map is shown in the figure 2.1 below.

**Figure 2.1. The Climate Map of the Philippines Based on the Modified Coronas Classification**





### **2.2.2 Atmospheric Temperature**

Annual mean temperature in the area is 27.4°C while the mean maximum and mean minimum temperatures are 32.1°C and 22.8°C, respectively. April is the warmest month with a mean temperature of 34.9 °C. The coolest month is January with a mean temperature of 20.4°C. The highest temperature recorded at the Science Garden was 38.1°C, which was observed on May 18, 1969, while the lowest was 14.6°C on February 1, 1962.

### **2.2.3. Relative Humidity**

The City of Navotas is relatively humid. Mean monthly relative humidity in the area varies from 70% to 84%. The months of August and September have the highest relative humidity at 84%. The annual average relative humidity is 77%.

### **2.2.4. Rainfall**

Navotas City experiences rainfall, which is heaviest from June to September, but the month of August is the wettest month with an average monthly rainfall of 526.8 mm. The driest month is February with less than 8.9 mm of mean monthly rainfall. The mean annual total rainfall in the Port area is 2,531.8 mm. The highest 24-hour rainfall recorded since 1961 at the Science Garden station was 472.4 mm, which was observed on July 20, 1972. This rainfall amount is roughly equivalent to a 100-year storm.

### **2.2.5. Air Quality**

Generally, the ambient air quality in Metro Manila is poor, including in Navotas City. The air pollution is brought about by anthropogenic sources due to intensive urbanization and industrialization.

Like most areas under Metro Manila, Navotas exhibits poor ambient air due to air pollution. Anthropogenic sources of air pollution have been increasing with intensive urbanization and industrialization. Air pollution in Navotas largely comes from mobile, stationary, and area sources.

## **2.3 HYDROGEOLOGIC FEATURES**

### **2.3.1. Groundwater Resources**

The alluvial sediments found in the coastal plains of Navotas are considered as its principal groundwater resource. Alluvium, which offers good sources of groundwater, is largely derived from the erosion of the Guadalupe formation. It occurs in three separate areas and one of them is the Manila Bay Deltaic Plain, which includes the Navotas area.

In the absence of specific groundwater resources data for the city, the extent of its groundwater resources can be deduced from the data for the NCR. Thus, considering



the coastal setting of Navotas, its proximity to Manila Bay, its geology, and topography, Navotas can be characterized as having a predominantly shallow to deep well areas.

### **2.3.2. Drainage System**

During the term of the then Mayor now Congressman Tobias M. Tiangco, the city government commissioned the services of a private firm to do a study and formulate a comprehensive drainage system master plan for the City of Navotas. This plan served as a guide for the City in the rehabilitation and maintenance of its existing drainages.

## **2.4. MANGROVE AREA**

Mangroves are important resources because they are of great help in sustaining the Fishing industry of Navotas City. Mangroves serve as breeding and nursery grounds for fish, invertebrates, and other marine organisms. The city of Navotas is one of the two localities in Metro Manila with existing mangrove system. The city's mangroves covers an area of about 29.47 hectares, which serves as a sanctuary for endemic and migratory birds. This mangrove area, which can only be found in Barangay Tanza, is now locally designated as Marine Tree Park by Brgy. Ordinance No. 04 enacted in 2011. The 3.5-kilometer mangrove strip protects the communities in Tanza and adjoining cities and towns from the effects of storm surges and coastline erosion.

Based on the biodiversity monitoring activities conducted by the DENR-NCR in 2011, at least six (6) families of mangroves with 14 associated species were initially identified within the area. The species of *Avicennia marina* (Bungalon) is the most prominent among the species amounting to 1,976 matured trees. This specie has also the highest relative frequency of 94% of the matured trees.

The mangroves also serve as a home for a wide variety of faunas. Wildlife resources present in these areas include insects like aphids, red bug beetles, and giant crab spiders. Shellfishes are also abundantly found in the area which includes river mussels, pen shells, barnacles, and salt water clams. In addition, barangay Tanza has been established as one of the four major bird monitoring sites in Metro Manila since 2004. It was observed last 2012, that there were 12,424 birds that visited the mangrove area. This number is considered huge compared to what was observed in other bird monitoring sites in the metro. Majority of the bird species observed are little terns, common terns and common egret. The chinese egret, which is considered as an endangered species, was sighted in the area.





Map 2.6. Map of the Location of Mangrove Area

