

### 5.3.3. Schedule of Works

The schedule of works of the project are expected to be as follows:

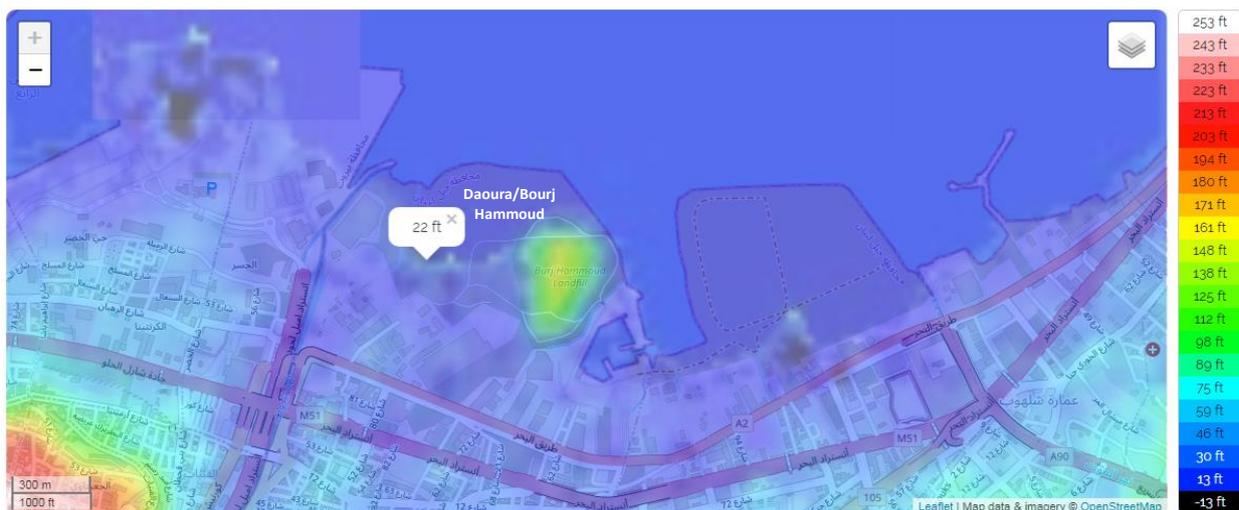
- Planning and Design Period: March 2020 (delayed by Covid-19 lockdown) – December 2021
- Construction Period: June 2022 – June 2024
- Operation Period to commence on July 2024

## 5.4. Description of the Surrounding Environment of the Project

To properly assess the potential impacts of the construction and operation of the Bourj Hammoud/Daoura WWTP, an environmental and socioeconomic baseline needs to be developed. The baseline will also play a prominent role in developing and implementing mitigation and monitoring plans. This section presents a preliminary overview of the baseline information and issues that will be analysed and addressed at the next stage of the ESIA process. The preliminary description of the baseline conditions was based on several studies conducted within the study area (including the EIA conducted prior to commencement of Phase 1 of this WWTP and EIA of the Coral Composting Facility nearby) and the site visit that the ESIA team conducted on the 27<sup>th</sup> of February, 2020.

### 5.4.1. Topography, Geology and Soil

The project is located on Lebanon’s Mediterranean coast and situated at the municipality of Bourj Hammoud, a north-eastern suburb of Greater Beirut and separated from Beirut Municipality by Beirut River. The site is located on a reclaimed flat land at around 6.7 meters above sea level. Figure 5-16 shows the topographic map of the area.



**Figure 5-16: Topographic Map of Project Area in Daoura/Bourj Hammoud Sea Side<sup>2</sup>**

<sup>2</sup> Topographic-map Website. (2020). Beirut topographic map. Available at <https://en-us.topographic-map.com/maps/tlyt/Beirut/>. Accessed on 6/3/2020.

The land where the WWTP will be constructed is a reclaimed land on the Lebanese coast. The geological formation of the proposed study area is presented in Figure 5-17. The plots of land are not shown in the map since it was not updated to include reclaimed lands. According to the EIA of the Coral Composting facility, which is located on a reclaimed land 300 m away from the WWTP proposed site, the natural material at the site area is characterized by heterogeneous and variable sequences of alluvial outfall deposits of different composition, mainly Sandy Clays to Clayey Sands with Silts. In addition, non-engineered fills including building waste, reject of domestic waste and soil waste were deposited on this land in the process of reclamation. Furthermore, a geotechnical study was conducted at the stage of developing the Coral Composting facility EIA. Seven boreholes with different depth (ranging from 15 to 21.5 m) were taken in order to analyse the geological stratigraphy and structural condition of the area. The study showed that the site is mainly composed of the following units<sup>3</sup>:

- Unit 1: Surface fill – roughly 1 – 2 m in thickness. It consists predominately of Clayey Sands and Sandy Clay with Gravels and Cobbles.
- Unit 2: Uncontrolled reclamation fill – Extending to roughly 10 – 12 m below existing grades. It consists of a highly heterogeneous mix of Sandy Clays, Clayey Sands, Gravels and Cobbles and containing miscellaneous debris, plastic bags, steel rebar, etc. (Suggesting a waste/rubble nature/source).
- Unit 3: Natural seabed stratum. This layer is distinctive and consists of dark brown/grey sand silt to silty sand. All boreholes executed on site terminated in this layer

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<sup>3</sup> Geoflint. (2017). Environmental Impact Assessment. Coral Composting Facility. Reviewed and Approved by MOE.

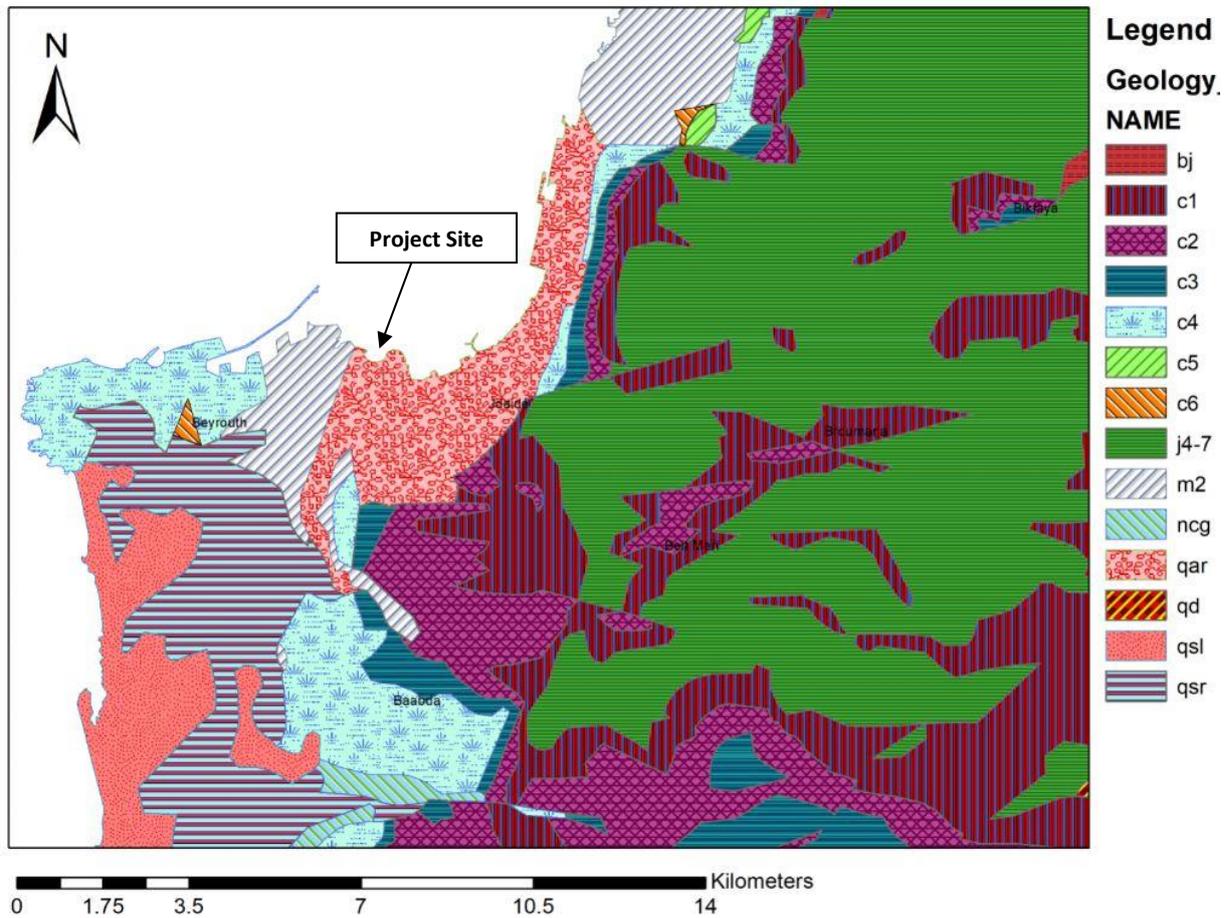


Figure 5-17: Geology map of the study area

The main geological formation within the WWTP catchment area belong to the following:

- Sannine Limestone of Cenemonain age unit (C4); this unit is divided into three subunits namely:
  - Dolomitic Limestone (C4a): this formation is characterized by geodes of different sizes filled or voided and a thickness of about 300 meter. Within this unit Ammonites and fish fossils were found.
  - Bluish marl and shale (C4b): this formation contains crystals of quartz, chert nodules and bands form. The thickness of this unit is in the range of 80-100 meter
  - Limestone and dolomitic limestone (C4c): The Limestone of this unit is highly karstified. The colour of this formation is white to brown and its thickness is about 300 meter.
- Pleistocene (Q): this formation belongs to the quaternary geological unit. It is composed of loose Eolian and cemented sands. Residual soil including Terra Rosa are also found in this formation. In addition, this geological unit is composed of loose alluvium, unconsolidated soil and sediments
- Chouf Sandstone (C1): It is an often ferruginous brown to white sandstone with associated clays, shales and lignites. Some of the darker layers contain woody or coaly fragments, often with pyrite, marcasite and amber. Locally, the Chouf Sandstone contains basaltic volcanics and

reddish clayey beds which appear to be weathered volcanic tuffs. The Chouf Sandstone is very variable in thickness, ranging from a few metres to 300 m thick and in places showing rapid lateral changes.

- Hammana Formation (C2b-C3): It is a variable unit which can be most easily defined as the beds between the top of the Mdairej Limestone cliff and the base of the massive carbonates of the Sannine Formation. It is a varied sequence of generally thin bedded carbonates, marls and terrigenous sands that is generally brown in colour with a good marine bivalve fauna. The general trend is for carbonates to replace terrigenous clastics upwards and westwards. The entire Hammana Formation is around 140 m thick at the type section.
- Jurassic (J4-J7): it consists of the kesrouan limestone J4, Bhannes Volcanics or Equivalent J5, Bikfaya Limestone J6 and Salima Limestone J7.

#### 5.4.2. Climate

The climate of the project site is typically Mediterranean characterized by hot and dry summers and cool and rainy winters. The climate in Beirut which represents the climate of the study area is warm and temperate. The average annual temperature in Beirut is 20.5°C. The lowest annual average temperature is 13 °C which is recorded in the month of January while the highest annual average temperature occurs in the warmest month that is August is 27.5 °C. The driest month is July with 0 mm of precipitation. Most of the precipitation falls in January, averaging 196 mm. However, the average annual precipitation is 845 mm<sup>4</sup>. The climate graph of Beirut city is represented in Figure 5-18.

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<sup>4</sup> Climate Data Website, 2020. Beirut Climate. Available at: <https://en.climate-data.org/asia/lebanon/beirut/beirut-3572/>. Accessed on 17/4/2020