# 5. CLIMATE

The climate in the region is marked by a 3-4° seasonal latitudinal movement of the high pressure belt, which intensifies in winter over the subcontinent. As a result, there is a corresponding increase in the number of low pressure cells bringing cool wet weather to the region during winter. The high pressure cells are usually accompanied by easterly winds and the low pressure cells by westerlies. According to Louw (1976), the "*weather in the Port Elizabeth area is dominated by eastward migrating high pressure systems, alternated by coastal lows and [cold] frontal disturbances*". In Algoa Bay and its hinterland, climatic conditions are strongly influenced by oceanographic conditions, particularly the presence of the warm Agulhas current and upwelling driven by south-easterly winds. Local climatic conditions further inland are affected by topographic conditions, such as proximity to the Great Escarpment and the Zuurberg mountain range. In general, Port Elizabeth and the coastal area receives most of its rainfall in winter, whereas the hinterland receives most of its rain during the eqinoxes or in the summer months. Extreme rainfall events are typically associated with the passage of cut-off lows.

## 5.1. Meteorological Record

Climatic data was primarily obtained from the South African Weather Bureau in Pretoria, and supplemented by published papers, reports and other data sources, referred to within the references list (Chapter 16).

### *5.1.1. Temperature*

Mean annual air temperatures in the study area are highest in Addo (18,35°C) and lowest in Somerset East (17,2°C). Mean monthly maxima range from a high of 29,3°C in February at Addo to a low of 19,2°C in June at Somerset East. In contrast, mean monthly minima range from a high of 17,9°C in January and February at Port Elizabeth to a low of 5,2°C in July at Addo. The highest temperature (45,5°C) was recorded on the 8 February 1987 at Addo and the lowest (-3,8°C) on the 15 June 1970 at Somerset East.

### *5.1.2. Rainfall*

Mean annual rainfall is highest in Port Elizabeth (624 mm) and lowest in Pearston (318,2 mm). The wettest and driest years on record were 1068 mm (Port Elizabeth, 1968) and

248 mm (Addo, 1990) respectively. Mean monthly rainfall in the study area ranges from 84 mm (March, Somerset East) to 12,1 mm (June, Cookhouse). The highest rainfall in 24 hours (429 mm) was recorded on the 1 September 1968 in Port Elizabeth. The mean number of rain days per annum ranges from 112 in Port Elizabeth, to 73 at Addo. The maximum number of rain days occurred at Somerset East (140 days) and the least at Addo (59 days).

### *5.1.3. Relative Humidity*

The mean annual Relative Humidity at 14h00 is highest in Port Elizabeth (60%) and lowest in Somerset East (39%). Relative Humidity is normally highest in summer and lowest in winter. The most humid months are February and March (64%, Port Elizabeth) and the least humid in July (33%, Somerset East). Similarly cloud cover reaches a maximum (4,3/8 at 14h00, Addo) in summer and a minimum in winter (2,5/8 at 14h00, Somerset East).

### *5.1.4. Evaporation*

Mean monthly evaporation has a strong impact on the moisture deficit, which in turn plays an important part in determining vegetation distribution patterns and plant-animal interactions. Mean annual evaporation ranges from 2 041,8 mm at Somerset East to 1 664,3 mm at Addo. Somerset East also has the greatest annual moisture deficit (-1 471,8 mm), while Port Elizabeth has the lowest (-1 122,3 mm). Mean monthly evaporation is highest in summer (257,6 mm, January, Somerset East) and lowest in winter (66,0 mm, June, Addo).

### *5.1.5. Wind*

The predominant wind directions in Port Elizabeth are from the south-west and south-east, with most winds offshore in winter and onshore in summer (Anon., 1965). Summer is characteristically more windy than winter, with October to February regarded as the “windy season” (Louw, 1976). The maximum reported wind speed at Port Elizabeth for the period 1943-1973 was 21,0 m/s, with a maximum gust up to 38,4 m/s (Anon, 1974). The highest corresponding values for a return period of 100 years are 23,0 m/s for maximum wind speed and 42,7 m/s for a maximum gust (Anon, 1974). In the Port Elizabeth-Uitenhage area approximately 55% of wind greater than 3,3 m/s comes from a south-south-westerly to west-north-westerly direction and a further 30% from the south-east to east-north-east sector (Louw, 1976).

### *5.1.6. Extreme Weather Conditions*

Somerset East experiences the most thunderstorms per annum (approximately 23) and Port Elizabeth the least (approximately 14). Thunderstorms are the most common in late summer, particularly March, at Somerset East (approximately 4,0), Addo (approximately 2,5) and Port Elizabeth (approximately 2,5) and least common in mid-winter (approximately 0,2; June, Somerset East). Although uncommon, hail may occur at any time of the year, but with a greater tendency to occur more often in the summer months. Snow is a very rare occurrence, but has been reported at Somerset East on 3 September 1853 and 9-10 July 1988. Fog is most prevalent at Somerset East (71 times per annum) and least at Addo (22 times per annum). At Somerset East, fog is most common in summer, while at Addo and Port Elizabeth it is most common in winter.

## 5.2. Potential Impacts and Mitigation Measures

The severity of the potential impacts of the various climatic variables are listed in Table 5.1. The climate is expected to have very little impact on the conductors or tower structures, but may cause small variations in the transmission of electricity. An increase in temperature has been associated with a drop in capacity in Transmission lines (Skea, 1997). Oxidation and subsequent corrosion of metallic components may occur with time, but is only likely to be of importance within 50 km of the coast where onshore winds may blow salt-laden air inland. High wind speeds may also cause some stress to the Transmission lines, and it is necessary to ensure that the sideways movement or swing of the conductors caused by the maximum gust which can be expected in the next 100 years does not exceed the required 3,2 m clearance, or the breaking strain of the conductors or tower structures.

**Table 5.1:** Potential impact of climate on towers/conductors between Poseidon and Grassridge Substations

| Climatic Variable | Extent of Impact | Duration of Impact | Intensity / Magnitude | Probability | Significance |
|---|---|---|---|---|---|
| Temperature | Local | long-term | negligible | definite | low |
| Rainfall | Local | long-term | negligible | definite | low |
| Relative Humidity | Local | long-term | negligible | definite | low |
| Evaporation | Local | long-term | negligible | definite | low |
| Wind | Local | long-term | low | definite | low |
| Lightning | Local | long-term | low[1] | probable | high[2] |

Note: the "significance" of impacts makes reference to the impact of climate on the Transmission line hardware and *not* the environment

1. assumes lightning protection is installed

2. high as protective measures always need to be installed

## 5.3. Conclusions

The study area traverses both the Mediterranean-like climate of the Port Elizabeth area, as well as the summer rainfall region in the hinterland, subject to some modification induced by the Zuurberg mountain range. Extreme weather phenomena are unlikely to pose a threat to the Transmission line, although secondary effects, such as flood conditions associated with high rainfall may present problems to the structural stability of the line. Localised impacts on towers within 50 km of the coast will require mitigation measures to be implemented. This will be particularly important within corridor 2 where a longer portion of the proposed Transmission line will be located in close proximity to the coast. With the adoption of mitigating measures to alleviate the threat posed by lightning to the transmission of electricity, no negative impacts are anticipated from this phenomenon.