2.7 Meteorology, Air Quality, and Noise

This section describes the regional and local climatological, meteorological, and air quality characteristics applicable to the STP site. This section also provides site-specific meteorological information for use in evaluating construction and operational impacts. This section concludes with a brief discussion of existing noise generating sources at the site and predicted noise levels relative to estimated background conditions.

2.7.1 Regional Climatology

This section identifies sources of climatological data used to characterize various aspects of the climate representative of the region around the STP site, describes large-scale general climatic features and their relationship to conditions at the site (Subsection 2.7.1.2), and summarizes normals, means, and extremes of several standard weather elements (Subsection 2.7.1.3).

2.7.1.1 Data Sources

Several sources of data are used to characterize local and regional climatological conditions pertinent to the STP site. This includes data acquired by the National Weather Service (NWS) at its Victoria, Texas first-order station and for 14 other nearby stations. These stations are located within approximately 50 miles of the STP site and are associated with its network of cooperative weather-observer stations, as compiled and summarized by the National Climatic Data Center (NCDC). In addition, historical data is available from measurements made at the onsite meteorological monitoring program in support of STP 1 & 2.

These climatological observing stations are located in Matagorda, Wharton, Jackson, Calhoun, Brazoria, Victoria, Fort Bend, and Aransas counties, all located in Texas. Table 2.7-1 identifies the specific stations and lists their approximate distance and direction from the mid point between the STP 3 & 4 reactors at the site. Figure 2.7-1 illustrates these station locations relative to the STP site.

The objective of selecting nearby, offsite climatological monitoring stations is to determine mean and extreme values, as measured at those locations, that are reasonably representative of conditions that might be expected to be observed at the STP site. A 50-km (approximately 31 miles) grid spacing is considered to be a reasonable fine mesh grid in current regional climate modeling, so this distance was used as a nominal radius for the station selection process (Reference 2.7-1). The identification of stations to be included was based on the following general considerations:

- Proximity to the site (i.e., within the nominal 50-kilometer radius indicated above, to the extent possible).
- Coverage in all directions surrounding the site (to the extent possible).
- Where more than one station exists for a given direction relative to the site, a station was chosen if it contributed one or more extreme conditions (e.g., rainfall,

snowfall, maximum and/or minimum temperatures) for that general direction. Nevertheless, if an overall extreme precipitation or temperature condition was identified for a station located within a reasonable distance beyond the nominal 50-kilometer radius and that event was considered to be reasonably representative for the site area, such stations were also included, regardless of directional coverage.

First-order NWS stations also record measurements, typically on an hourly basis, of other weather elements, including winds, several indicators of atmospheric moisture content (i.e., relative humidity, dew point, and wet-bulb temperatures), and barometric pressure, as well as other observations when those conditions occur (e.g., fog, thunderstorms). Although the Victoria weather station is located 53 miles to the west of the STP site, the terrain between the STP site and the Victoria station is relatively flat. Additionally, the Victoria station is located at almost the same latitude as the STP site. Therefore, the long-term (30 years) data from the Victoria station was used to describe the general climatic conditions at the STP site. Table 2.7-2, excerpted from the 2005 local climatological data (LCD) summary for the Victoria, Texas NWS station, presents the long-term characteristics of these parameters.

Data sources have been used to describe climatological characteristics of the site area and region in terms of normals (i.e., 30-year averages), period-of-record means and extremes of temperature, rainfall, and snowfall, as well as air flow, severe weather phenomena, and air quality conditions.

2.7.1.2 General Climate Description

The STP site is located within the Coastal Prairie region, situated along the Coastal Plain that runs parallel to the Gulf of Mexico and extends from south central Texas to southwestern Louisiana (see Figure 2.1-2). The STP site area is relatively flat; elevation of the STP site is approximately 25 feet above mean sea level (MSL).

The state of Texas is divided into ten climate divisions. The STP site is located within the Upper Coastal division, which is situated south of East Texas, bordered by the State of Louisiana on the east, the Gulf of Mexico to the south, and Victoria and Calhoun Counties to the west (Reference 2.7-2).

The general climate in this region is classified as maritime subtropical (or humid subtropical) and is characterized by mild, short winters; long periods of mild sunny weather in the autumn; somewhat more windy, but mild weather in spring; and long, hot summers (Reference 2.7-3).

The regional climate is predominantly influenced by the Azores high-pressure system (also known as the Azores High). Because of the clockwise circulation around the western extent of the Azores High, maritime tropical air mass characteristics prevail much of the year, especially during the summer with the establishment of the Bermuda High and the Gulf High. Together, these systems govern late spring and summer temperature and precipitation patterns. This macro-circulation feature also has an effect on the frequency of high air pollution potential in the site region. These characteristics, and their relationship to the Bermuda High, especially during the summer and early autumn, are addressed in Subsection 2.7.2.3.

The influence of this macro-scale circulation feature continues during the transitional seasons (spring and autumn) and winter months; however, it is occasionally disrupted by the passage of synoptic- and meso-scale weather systems. During winter, cold air masses may briefly intrude into the region with the cyclonic (i.e., counter-clockwise) northerly flow that follows the passage of low-pressure systems. These systems frequently originate in the continental interior around Colorado or Canada, pick up moisture-laden air due to southwesterly through southeasterly airflow in advance of the system, and result in a variety of precipitation events that include rain, sleet, freezing rain, or mixtures, depending on the temperature characteristics of the weather system itself and the temperature of the underlying air (see Subsection 2.7.3.4).

Larger, persistent outbreaks of very cold, dry air associated with massive high-pressure systems that move southward out of Canada also occasionally affect the site region (Reference 2.7-3). However, these weather conditions are moderated significantly by the Gulf of Mexico immediately to the south and by heating as it passes over the land.

Monthly precipitation exhibits a cyclical pattern, with the predominant maximum occurring from late spring into early summer, and a secondary maximum period from early to mid- autumn (see Table 2.7-2). The late summer/early autumn maximum is associated with both tropical cyclones (as discussed in Subsection 2.7.3.5) and thunderstorm activity; the early to mid-autumn secondary maximum is primarily due to thunderstorms. The STP site is located close enough to the Gulf of Mexico (the distance, midpoint between STP 3 & 4 reactor building, is 14.67 miles) that the strong winds associated with tropical cyclones can have a significant effect on the site area.

2.7.1.3 Normal, Mean, and Extreme Climatological Conditions

This section discusses normals and period-of-record means and extremes for several standard weather elements (i.e., temperature, atmospheric water vapor, precipitation, and wind conditions) representative of this climate setting. All references to seasonal periods in this section pertain to the following months: winter (December, January, February); spring (March, April, May); summer (June, July, August); and autumn (September, October, November).

As indicated previously, Table 2.7-2 presents normals, means, and extremes of an extensive set of meteorological measurements and observations made at the Victoria, Texas NWS Station, located approximately 53 miles west of the STP site. For comparison, Table 2.7-3 summarizes the annual normal daily maximum, minimum, range, and mean temperatures, as well as the normal annual rainfall and snowfall totals for Victoria, Texas and the 14 other nearby cooperative weather-observing stations.

With the exception of daily temperature measurements at Wharton and Edna Highway 59 Bridge and snowfall measurements at Edna Highway 59 Bridge, long-term periods of record for temperature and precipitation for the climatological observing stations, as well as summaries of the latest 30-year station normals from 1971 through 2000, are readily available from the NCDC.

2.7.1.3.1 Temperature

Daily mean temperatures are based on the average of the daily mean maximum and minimum temperature values. Annual daily normal temperatures are similar over the site area, ranging from 68.8°F at the Danevang 1W weather observing station to 71.1°F at the Point Comfort weather observing station (see Table 2.7-3), which are separated by a distance of approximately 33 miles. Diurnal (day-to-night) temperature ranges, as indicated by the differences between the daily mean maximum and minimum temperatures, however, are more variable, ranging from 11.4°F at Port O'Connor weather observing station to 21.7°F at the Pierce 1E weather observing station (Reference 2.7-4). In general, diurnal temperature ranges among the one NWS and the 14 nearby cooperative weather-observer stations are greater at those stations farther from the Gulf of Mexico and adjacent bays, and are less for those stations closer to those waters (see Figure 2.7-1).

As Table 2.7-4 indicates, extreme maximum temperatures recorded in the vicinity of the STP site have ranged from 102°F to 112°F, with the highest reading observed at the Pierce 1E cooperative weather station on September 5, 2000. The record high temperatures for the Bay City Waterworks (109°F), Danevang 1W (109°F), Freeport 2NW (105°F), and Aransas Wildlife Refuge (102°F) weather observing stations have been reached on two or three occasions. Extreme minimum temperatures in the vicinity of the STP site have ranged from 4°F to 13°F, with the lowest reading on record observed at the Pierce 1E weather observing station on January 31, 1949 (References 2.7-5, 2.7-6, and 2.7-7).

The extreme maximum and minimum temperature data, and the historical station records on which they are based, indicate that synoptic-scale conditions responsible for periods of record-setting excessive heat as well as significant cold air outbreaks tend to affect the overall STP site area. The general similarity of the respective extremes suggests that these statistics are representative of the STP site area (References 2.7-3, 2.7-5, and 2.7-7). However, as with the variation in the weather observing station diurnal temperature ranges noted above, proximity to the water has a moderating influence on extreme maximum and minimum temperatures as well. Therefore, extreme temperature characteristics at STP 3 & 4 will likely be within the range of maximum and minimum records reported in Table 2.7-4 for the climatological observing stations located farther inland.

2.7.1.3.2 Atmospheric Water Vapor

Based on a 20-year period of record, the LCD summary for the Victoria, Texas NWS station (see Table 2.7-2) indicates that the mean annual wet-bulb temperature is 64.5°F, with a seasonal maximum during the summer months (June through August) and a seasonal minimum during the winter months (December through February). The highest monthly mean wet-bulb temperature is 76.2°F in July (and virtually the same during August); the lowest monthly mean value (50.0°F) occurs during January (Reference 2.7-3).

Based on a 20-year period of record, the LCD summary shows a mean annual dew point temperature of 60.9°F, also reaching its seasonal maximum and minimum during the summer and winter, respectively. The highest monthly mean dew point temperature is 73.1°F, reaching its peak in July and August. The lowest monthly mean dew point temperature (46.0°F) occurs during January (Reference 2.7 3).

The 30-year period of record normal daily relative humidity averages 76% annually, typically reaching its diurnal maximum in the early morning (around 0600 hours) and its diurnal minimum during the midday (around 1200 hours). There is less variability in this daily pattern with the passage of weather systems, persistent cloud cover, and precipitation. Nevertheless, this daily pattern is evident throughout the year. The LCD summary shows that average early morning relative humidity levels are greater than or equal to 90% from May through November and are not much lower during the remaining months of the year (Reference 2.7 3).

2.7.1.3.3 Precipitation

Because precipitation is a point measurement, mean and extreme statistics, such as individual storm totals, or daily totals or cumulative monthly totals typically vary from station to station. Assessing the variability of precipitation means and extremes over the STP site area, in an effort to evaluate whether the available long-term data are representative of conditions at the site, is largely dependent on station coverage.

Monthly and daily historical precipitation extremes for rainfall and snowfall are presented in Table 2.7-4 for the one NWS and 14 cooperative weather-observing stations representative of conditions at STP 3 & 4 that are listed in Table 2.7-1.

As Table 2.7-3 indicates, normal annual rainfall totals vary substantially over the site area ranging from 34.78 inches at Port O'Connor weather observing station to 57.24 inches at the Angleton 2W weather observing station (Reference 2.7-4). This data, in conjunction with Figure 2.7-1, also indicate that total annual rainfall for the region tends to decrease more from east to west, than as a function of distance inland from the Gulf of Mexico and adjacent bay waters.

However, the four climatological observing stations (i.e., Matagorda 2, Palacios Municipal Airport, Bay City Waterworks, and Danevang 1W) closest to and surrounding the STP site within 20 miles have normal annual rainfall totals that are quite similar, ranging from 43.75 inches at Matagorda 2 to 48.03 inches at Bay City Waterworks (Reference 2.7-4). Therefore, long-term average annual total rainfall at the STP site could be expected to be within this range.

As indicated in Subsection 2.7.3.5, nearly one-third of the individual weather station 24-hour rainfall records and nearly two-thirds of the monthly record totals were established as a result of precipitation associated with tropical cyclones that passed within a 100-nautical-mile radius of the STP site.

However, the overall highest 24-hour rainfall total in the site area, 17.58 inches on October 18, 1994, at the Edna Highway 59 Bridge cooperative weather observing station (Reference 2.7-6), approximately 40 miles west-northwest of the STP site, was not associated with a tropical cyclone originating in or passing through the Gulf of Mexico. Rather, this extreme rainfall event was one of many over southeast Texas caused by a synoptic situation that included a steady stream of tropical moisture into the region in the wake of former Pacific Hurricane Rosa (which had crossed into Mexico, moved through Texas, and slowed after entering the Mississippi Valley), and a quasi-stationary frontal boundary along the Texas Coast that provided a source of instability and supported widespread and continual thunderstorm development (Reference 2.7-27).

Similarly, the overall highest monthly rainfall total for the site area is 34.44 inches during July 2006 and was recorded at the Port O'Connor cooperative weather-observing station, located approximately, 34 miles southwest of the STP site. This total represents the accumulation of 15 days of measurable precipitation during that month, with less than 20% being recorded from July 1 to 7, and the period from July 22 to 29 accounting for about 80% of the total, with over 24 inches falling in a period of only four days between July 23 and July 26 (Reference 2.7-7).

In general, when monthly rainfall records were established at a given weather observing station, regardless of their cause(s), significant amounts of precipitation were usually measured at most of the other stations in the site area. This is usually not the case with respect to the maximum 24-hour rainfall records because of the intense nature of these storm events in this coastal area. However, there does not appear to be any clear relationship between the amount of rainfall recorded during such extreme events, whether on a 24-hour or monthly basis, and distance inland within the area considered around the STP site (see Figure 2.7-1). Therefore, based on the range of the maximum recorded 24-hour and monthly rainfall totals among these stations, the areal distribution of these climatological observing stations around the site, and their proximity to the site, the data suggest that rainfall extremes close to the upper limits of the respective maxima might reasonably be expected to occur at the STP site.

Measurable snowfall occurs only rarely in the STP site area, as discussed in Subsection 2.7.3.3, with normal annual totals at all observing stations averaging 0.2 inches or less (see Table 2.7-3, Reference 2.7-3). Although the disruptive effects of any winter storm accompanied by frozen precipitation can be significant in South Texas, storms that produce large measurable amounts of snow are rare. As Table 2.7-4 indicates, 24-hour and monthly total station records have been established over a number of years based on the available periods of record. The most recent event, however, the Christmas Storm of 2004, was responsible for the overall highest 24-hour and monthly totals recorded for the site area-10.5 inches-in both cases measured at the Danevang 1W observing station, approximately 20 miles north-northwest of the STP site (see Table 2.7-4).

Snow depth measurements were not available for December 25, 2004 or through the end of the month although it is noted that the daytime high temperature for December 25 and 26 was above the freezing mark (i.e., in the mid to-upper 30s) and by December 27 had reached 50°F (10.0°C), increasing to the 70s a few days later. The reported water equivalent for this event was 1.05 inches (Reference 2.7-28). It is reasonable to assume, therefore, that the snow did not remain for more than a few days. Similar characteristics have been observed for other snowfall events in the site area (References 2.7-5 and 2.7-29).

2.7.1.3.4 Wind Conditions

Based on a 25-year period of record, the LCD summary for the Victoria, Texas NWS station (see Table 2.7-2) indicates that the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 160° (i.e., south-southeast). Monthly average prevailing wind directions are from the south (180°) to south-southeast during March through August. As shown in Table 2.7-2, during the period October, November, December, January and February, winds prevail from the north due to cyclonic northerly flow associated with the passage of low-pressure systems as described in Subsection 2.7.1.2 (Reference 2.7-3).

Based on a 28-year period of record, the LCD summary shows an annual mean wind speed of 9.7 mph. On a seasonal basis, the highest average wind speeds occur during November through May (averaging about 10.4 mph), are slightly less during June, July, and October (averaging about 8.9 mph), and are lowest during August and September (averaging about 8.1 mph). On average, the LCD indicates that the highest monthly wind speed (11.2 mph) occurs in April (Reference 2.7-3).

Characteristics of extreme wind conditions for design basis purposes are discussed in Subsection 2.7.3.2. Wind data summaries, based on measurements from the onsite meteorological monitoring program of STP 1 & 2, for the purpose of climatological characterization related to the dispersion of radioactive and non-radioactive effluents released into the atmosphere, are discussed in Subsections 2.7.4.2 and 2.7.4.3.

2.7.2 Air Quality

This section addresses current ambient air quality conditions in the site area and region (e.g., the compliance status of various air pollutants), projected air quality conditions resulting from the operation of STP 3 & 4, and the climatology of restrictive dispersion conditions in the region. The pollutants that are currently monitored in the region are non-radiological and include parameters such as particulate matter and select gaseous pollutants (Subsection 2.7.2.1). Based on plant design, construction, and operating basis considerations, Subsection 2.7.2.2 discusses projected air quality conditions during the operation of STP 3 & 4 and what sources will contribute to non-radiological emissions. Subsection 2.7.2.3 characterizes climatological conditions in the site area and region that may be restrictive to atmospheric dispersion.

2.7.2.1 Regional Air Quality Conditions

The STP site is located within the Metropolitan Houston-Galveston Intrastate Air Quality Control Region. This region includes Matagorda, Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Montgomery, Walker, Waller, and Wharton Counties (Reference 2.7-8). The STP site is located in central Matagorda County. Attainment areas are areas where the ambient levels of criteria air pollutants are designated as being "better than," "unclassifiable/attainment," or "cannot be classified or better than" the Environmental Protection Agency (EPA)-promulgated National Ambient Air Quality Standards (NAAQS) (Reference 2.7-9). Criteria pollutants are those for which NAAQS have been established: sulfur dioxide; particulate matter (i.e., PM_{10} and $PM_{2.5}$, which are particles with nominal aerodynamic diameters less than or equal to 10.0 and 2.5 microns, respectively); carbon monoxide; nitrogen dioxide; ozone; and lead (Reference 2.7-9).

The Metropolitan Houston-Galveston Intrastate Air Quality Control Region is in attainment for all criteria pollutants with the exception of the 8-hour ozone standard in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties. All of these counties are classified as "moderate" non-attainment. These counties are located either northeast or north-northeast of Matagorda County, with the closest being Brazoria County directly northeast (Reference 2.7-10).

Since 1988, the EPA, states, and federal land management agencies (e.g., National Park Service, U.S. Forest Service, and Bureau of Land Management) have conducted monitoring of visibility impairment at a number of national parks and wilderness areas across the United States. These national parks and wilderness areas are referred to as "Mandatory Class I Federal Areas" where visibility is an important value. The national parks and wilderness areas closest to the STP site include the Big Bend and Guadalupe Mountains National Parks in Texas (Reference 2.7-11) and the Breton Wilderness Area in Louisiana (Reference 2.7-12). The Big Bend National Park is the closest of these Class I areas-approximately 432 miles west of the STP site. The Breton Wilderness Area and Guadalupe Mountains National Parks are located approximately 442 miles east-northeast and 564 miles west-northwest, respectively, from the STP site.

2.7.2.2 Projected Air Quality Conditions

The new nuclear steam supply system and other related radiological systems are not sources of either criteria pollutants or other air toxics emissions. Air toxic pollutants are also known as hazardous air pollutants (40 CFR Part 63). Non-radiological supporting equipment (e.g., diesel generators, fire pump engines), and other non-radiological emission-generating sources (e.g., storage tanks) or activities are not expected to be a significant source of criteria pollutant emissions. This is especially true with respect to ozone-precursor emissions (e.g., carbon monoxide, nitrogen oxides and volatile organic compounds) in light of the non-attainment status for the 8-hour average ozone NAAQS in nearby Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties.

Supporting equipment will only be operated on an intermittent test or emergency-use basis. Therefore, these emission sources are not be expected to significantly impact ambient air quality levels either in the vicinity of the STP site, or within the 8-hour average ozone moderate non-attainment area in nearby Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. Likewise, because of the relatively long distance from the STP site, visibility at any of the identified Class I Federal Areas is not expected to be significantly impacted by project construction or facility operations.

Nevertheless, these non-radiological emission sources will be regulated by the Texas Commission on Environmental Quality (TCEQ) in accordance with Texas Administrative Code (TAC) Title 30, Part 1, Chapters 101 through 122, depending on the source type, source emissions, and permitting requirements for construction and operation. Currently, STP 1 & 2 non-radiological air pollution sources are covered by a federal (Title V) operating permit issued by the TCEQ. The Title V permit was renewed on January 25, 2006 and is valid until January 25, 2011. In addition, a permit-by-rule authorizes the operation of backup emergency generators. Under the TAC permit-by-rule regulation (Title 30, Section 106.511), the maximum annual operating hours for the emergency diesel generators for STP 1 & 2 and for STP 3 and 4 shall not exceed 10 percent of the normal annual operating schedule for the primary equipment (Reference 2.7-13).

2.7.2.3 Restrictive Dispersion Conditions

Atmospheric dispersion can be described as the horizontal and vertical transport and diffusion of pollutants released into the atmosphere. Horizontal and along-wind dispersion is controlled primarily by wind direction variation, wind speed, and atmospheric stability. Subsection 2.7.4.2 addresses wind direction characteristics for the STP site based on measurements from the existing meteorological monitoring program at the site. The persistence of wind conditions at STP 1 & 2 are discussed in Subsection 2.7.4.3. The seasonal and annual atmospheric stability conditions representative of conditions at the STP site are discussed in Subsection 2.7.4.4.

In general, lower wind speeds represent less turbulent air flow, which restricts horizontal and vertical dispersion. Although wind direction tends to be more variable under lower wind speed conditions, which increases horizontal transport, air parcels containing pollutants often recirculate within a limited area, thereby increasing cumulative exposure.

Major air pollution episodes are usually related to the presence of stagnating high-pressure weather systems (or anti-cyclones) that influence a region with light and variable winds conditions for four or more consecutive days. An updated air stagnation climatology report entitled *Air Stagnation Climatology for the United States* (1948-1998) (Reference 2.7-14) has been published with data for the continental United States based on greater than 50 years of observations. In this study, stagnation conditions were defined as four consecutive days or more when meteorological conditions were conducive to poor dispersion. Although inter-annual frequency varies, the data in Figures 1 and 2 of that report indicate that, on average, the site can expect approximately 30 days each year with stagnation conditions, or about six cases per year, with the mean duration of each case lasting about five days (Reference 2.7 14).

Air stagnation conditions primarily occur during an "extended" summer season that runs from May through October (Reference 2.7-14). This is a result of the weaker pressure and temperature gradients, and therefore weaker wind circulations, during this season. These meteorological conditions are discussed further as of the description of regional, synoptic-scale circulation characteristics and wind speed conditions for the site area in Subsection 2.7.1.2.

Based on Figures 17 to 67 in Wang and Angell (Reference 2.7-14), the highest incidence of stagnation conditions has been recorded between July and September, typically reaching its peak in August, when the Bermuda High pressure system has become established. As the LCD summary for Victoria, Texas (Reference 2.7-3) in

Table 2.7-2 indicates, this 3-month period coincides with the lowest monthly mean wind speeds during the year.

The dispersion of air pollutants is also a function of the mixing height. The mixing height (or depth) is defined as the height above the surface through which relatively vigorous vertical mixing takes place. Lower mixing heights (and wind speeds), therefore, are a relative indicator of more restrictive dispersion conditions. USDA Forest Service Ventilation Climate Information System (Reference 2.7-15) reports statistical data for mean monthly morning and afternoon mixing heights and wind speeds for locations in the contiguous United States, Alaska, and Hawaii. The data used to compute the statistics is based on observations over the periods 1961-1990 for mixing heights and 1959-1998 for wind speed. Monthly statistics for these parameters include minimum, maximum, and mean values, as well as average wind direction, and most frequent wind direction based on the longitude and latitude of the site location.

Table 2.7-5 summarizes the mean monthly, seasonal, and annual morning and afternoon mixing heights and wind speeds for the STP site. From a climatological perspective, the lowest morning mixing heights occur in the autumn and the highest during spring. As might be expected, the afternoon mixing heights are lowest in the winter and highest in the summer, due to more intense summertime heating.

The wind speeds listed in Table 2.7-5 for the STP site are consistent with the mean seasonal wind speeds summarized in the LCD for Victoria, Texas (see Table 2.7-2) and the STP onsite data (see Table 2.7-6) in that the lowest mean wind speeds are shown to occur during the summer and autumn. This period of minimum wind speeds also coincides with the "extended" summer season described by Wang and Angell (Reference 2.7-14) that is characterized by relatively higher stagnation conditions.

2.7.3 Severe Weather

This section addresses severe weather phenomena that affect the STP site area and region and that are considered in the design and operating bases for STP 3 & 4. These include

- The frequencies of thunderstorms and lightning (Subsection 2.7.3.1)
- Observed and probabilistic extreme wind conditions (Subsection 2.7.3.2)
- Tornadoes and related wind and pressure characteristics (Subsection 2.7.3.3)
- The frequency and magnitude of hail, snowstorms, and ice storms (Subsection 2.7.3.4)
- Tropical cyclones and related effects (Subsection 2.7.3.5).

2.7.3.1 Thunderstorms and Lightning

Thunderstorms can occur in the site area at any time during the year. Based on a 43-year period of record, Victoria, Texas averages approximately 56 thunderstorm-days (i.e., days on which thunder is heard at an observing station) per year (see Table 2.7-2). On average, August has the highest monthly frequency of occurrence-approximately 9.7 days. Annually, 45% of thunderstorm-days are recorded during July, August, and September. From November through February, a thunderstorm might be expected to occur approximately one to two days per month (Reference 2.7-3).

The mean frequency of lightning strokes to earth can be estimated using a method attributed to the Electric Power Research Institute, as reported by the U.S. Department of Agriculture Rural Utilities Service in the 1998 publication titled "Summary of Items of Engineering Interest" (Reference 2.7-16). This methodology assumes a relationship between the average number of thunderstorm-days per year (T) and the number of lightning strokes to earth per square mile per year (N), where:

$$N = 0.31T$$

Based on the average number of 56 thunderstorm-days per year at Victoria (see Table 2.7-2), the frequency of lightning strokes to earth per square mile is approximately 17 per year for the site area. This frequency is similar to the mean of the 10 year (1989 to 1999) cloud-to-ground flash density of approximately 7 flashes/km^2/year or 18 flashes/mi^2/year reported by the NWS for the area that includes the STP site (Reference 2.7-17).

2.7.3.2 Tornadoes

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes are categorized as "weak," "strong," and "violent." Approximately 7 in 10 tornadoes are weak, with rotating wind speeds no greater than about 110 mph. (Reference 2.7-19). The typical strong tornado often has what is popularly considered a more "classic" funnel-shaped cloud associated with the whirling updraft. Rotating wind speeds vary from 110 to 200 mph. Violent tornadoes can have rotating wind speeds in excess of 300 mph. Strong and violent tornadoes usually form in association with mesocyclones, which tend to occur with the most intense events in the thunderstorm spectrum. (Reference 2.7-19). The intensity of tornadoes is rated on a scale (based on damage) from F0 (least intense) to F5 (most intense). F0 tornadoes are the most common, but the relatively rare F3 or stronger tornados are responsible for most property damage (Reference 2.7-20).

Tornadoes can occur in any part of Texas (Reference 2.7-20). Historically, tornadoes in Matagorda County have been most prevalent in September and April. During the period January 1, 1950 to March 31, 2007, 43 tornadoes were recorded in Matagorda County and all were in the categories F0 to F3. Twenty-four of these tornadoes were classified as F0. Eighteen of the remaining tornadoes have been classified as either F1 (14), F2 (2), and F3 (2). One tornado was not classified. The two F3 tornadoes occurred on September 20, 1967 and April 11, 1969 (Reference 2.7-21).

The plant design to withstand tornadoes is discussed in FSAR Section 2.3S.1.3.2.

2.7.3.3 Hail, Snowstorms, and Ice Storms

Frozen precipitation in the STP site area typically occurs in the form of hail, snow, sleet, and freezing rain. The frequency of occurrence of these types of weather events is based on the latest version of "The Climate Atlas of the United States" (Reference 2.7-23), which was developed from observations made over the 30-year period of record from 1961 to 1990 and from observations of Texas storm events for the period January 1950 to March 007 (Reference 2.7-24).

Though hail can occur at any time of the year and is associated with well-developed thunderstorms, it is observed primarily during the spring and early summer months and least often during the late summer and autumn months. "The Climate Atlas of the United States" (Reference 2.7-23) indicates that Matagorda County, Texas can expect, on average, hail with diameter 0.75 inch or greater one day per year. The adjacent counties of Calhoun, Jackson, Wharton, and Brazoria, Texas can also expect hail with diameter 0.75 inch or greater approximately one day per year on average. The occurrence of hailstorms with hail greater than or equal to approximately 1.0 inch in diameter averages less than one day per year in Matagorda County and also in the adjacent counties (Reference 2.7-23).

NCDC cautions that hailstorm events are point observations and somewhat dependent on population density. Hailstorm events within Matagorda and surrounding counties have generally resulted in maximum hail stone diameters between 2.0 and 4.5 in. The maximum diameter of hail observed in Matagorda County, approximately nine miles south-southeast of the STP site, was approximately 2 in. Hailstones having a diameter of approximately 2.5 in have been reported in Pearland, Texas (Brazoria County), approximately 61 miles northeast of the STP site. Three nearby counties have reported hail measuring about 2.75 inches in diameter. These locations include Granado, (Jackson County), Arcola, (Fort Bend County), and Victoria, (Victoria County), which are respectively 33 miles west, 61 miles northeast, and 52 miles west of the STP site. In terms of extreme hailstorm events, grapefruit size hail (approximately 4.5 inches in diameter) was observed on two occasions at two different locations in the general STP site area on April 11, 1995 in Calhoun, Calhoun County, approximately 67 miles north-northwest of the STP site, and June 20, 1996 in Egypt, Wharton County, approximately 43 miles north-northwest of the STP site (Reference 2.7-24).

From central Texas southward, most winters bring no accumulation of snowfall. Freak snowstorms occur only once every few decades, but no corner of the state is immune (Reference 2.7-20). Snow forms if the air temperature in a cloud is below freezing. The water vapor in the cloud turns to ice and tiny ice crystals stick together until they form snowflakes. As the snowflake falls through the cloud, the crystal continues to grow by picking up more water vapor. When they get heavy enough to fall, they drop out of the clouds. If the air temperature on the way down to the ground remains below freezing, then the snowflakes will fall without melting and so fall as snow (Reference 2.7-25). Any accumulation of snow is a rare occurrence on the Upper Coastal division within the Coastal Prairie region where the STP site is located, with normal annual totals at all observing stations averaging less than 0.5 inch (see Table 2.7-3). Historical records for the area (see Table 2.7 4) indicate that maximum 24-hour and monthly snowfalls have occurred during November, December, January and February. The greatest snowfall on record in the STP area was measured at the Danevang 1W weather observing station located 20 miles north-northwest of the STP site. A twenty-four-hour and monthly total weather observing station record of 10.5 inches were recorded during the Christmas Storm of 2004 (Reference 2.7-24). Additional details on the maximum 24-hour and cumulative monthly record snowfall totals are given in Subsection 2.7.4.1.3 and in Table 2.7-3.

Depending on the temperature characteristics of the air mass, snow events are often accompanied by or alternate between sleet and freezing rain (ice). In most cases, freezing rain results from the process of warm moist air "overrunning" colder air. Freezing rain is caused by rain falling into a relatively shallow layer of cold air with temperatures either at or just below the freezing point (Reference 2.7-25). Arctic air masses that reach the Upper Coastal division in the winter season are typically very shallow and have been known to produce devastating ice storms. According to the Climatic Atlas (Reference 2.7-23), freezing precipitation occurs only approximately 2.5 to 5.4 days per year at the STP site.

An ice storm occurred on January 12 and 13, 1997 and impacted the Texas counties of Matagorda, Brazoria, Fort Bend, Jackson, and Wharton. Trees, power lines, and roadways were all affected. The weight of the ice caused trees and power lines to fall. Estimated damage was set at $800,000. Another reported winter weather event with sleet, snow, and rain mix impacted the counties of Victoria and Calhoun on December 8, 2006. Light ice accumulations were reported on roadways. Widespread ice accumulation on roads, bridges, and the roofing of general structures was reported on January 16 and 17, 2007 in nearby Fort Bend and Wharton counties. Property damage was reported to be estimated at $51,000 (Reference 2.7.24).

Dust and sand storms are short-term meteorological conditions and there have been no reported records of probable annual frequency of dust storms at the STP site area (Reference 2.7-24).

2.7.3.4 Tropical Cyclones

Tropical cyclones include not only hurricanes and tropical storms, but systems classified as tropical depressions, subtropical storms, subtropical depressions, and extra-tropical storms, among others (Reference 2.7-26). This characterization considers all tropical cyclones (rather than systems classified only as hurricanes and tropical storms), because storm classifications are generally downgraded once landfall occurs and the system weakens, although they may still result in significant rainfall events as they travel inland.

The National Oceanic and Atmospheric A (NOAA) Coastal Services Center (Reference 2.7-26) maintains a comprehensive historical database, extending from 1851 through 2006, of tropical cyclone tracks based on information compiled by the National Hurricane Center. This database indicates that 142 tropical cyclone centers or storm tracks have passed within a 100-nautical-mile radius of the STP site during this historical period (Reference 2.7-26). Storm classifications and respective frequencies of occurrence over this 155-year period of record are:

- Hurricanes - Category 5 (1), Category 4 (7), Category 3 (9), Category 2 (12), Category 1 (31)
- Tropical storms - 62
- Tropical depressions - 18
- Subtropical storms - 0
- Subtropical depressions - 1
- Extra-tropical storms - 1

Tropical cyclones within this 100-nautical-mile radius have occurred as early as June and as late as October, with the highest frequency (45 out of 142 events) recorded during September. August accounts for 41 events, indicating that almost 61% of the tropical cyclones that affect the site area occur from late summer to early autumn. Frequencies during the months of June and July are approximately equal but about 45% lower than during the peak months of August and September; intensity levels are lower as well. The compiled database for this area indicates that tropical cyclones are designated as hurricanes as are storms of less intense classifications (in this case, primarily tropical storms) (Reference 2.7-26).

Hurricanes of all categories have passed within 100 nautical miles of the site during the month of September; 10 of these 19 occurrences were classified as Category 1 storms. The only Category 5 storm track within this radial distance was Hurricane Carla in September 1961 (Reference 2.7-26). Twenty-two hurricanes have been recorded within 100 nautical miles of the site during August. While none of these hurricanes reached Category 5 status, the distribution of other hurricane classifications indicates August as having higher intensities on a long-term climatological basis, that is, Category 4 (4), Category 3 (5), Category 2 (5), and Category 1 (8).

Nearly one-third of the individual NWS weather observing station 24-hour rainfall records and nearly two-thirds of the monthly record totals were established as a result of precipitation associated with tropical cyclones that passed within a 100-nautical-mile radius of the STP site. For example, as shown in Table 2.7-4, the maximum 24-hour rainfall event for Bay City Waterworks (8.95 in) occurred on September 12, 1961 as a result of Hurricane Carla (References 2.7-5 and 2.7-6). Greater than 16 in of rain was reported from Bay City, Texas northeast to Galveston, Texas for the same hurricane (References 2.7-5 and 2.7-6). Also, tropical depression Claudette in July, 1979 set 24-hour rainfall records at Freeport 2NW (16.72 in) and Angleton 2W (14.36 in) cooperative weather stations (Reference 2.7-5).

2.7.4 Local Meteorology and Topography

In addition to using data from nearby climatological observing stations, measurements from the STP onsite meteorological monitoring system (see Section 6.4) are also used to characterize local meteorological conditions. The meteorological monitoring system includes a 60-meter guyed meteorological tower that serves as the primary system.

On the primary tower, wind speed and wind direction are measured at 10 meters (33 feet) and 60 meters (197 feet) above ground level. Ambient temperature is measured at the 10- and 60-meter levels. Vertical differential temperature (ΔT) is calculated as the difference between the temperatures measured at the 10-meter and 60-meter levels. Dew point temperature is measured at the 3 meter level. Additional relative humidity/dew point temperature are measured at the 10- and 60-meter levels. Precipitation is measured at ground level near the base of the primary tower, while solar radiation is measured at 2.5 meters above ground (see Table 6.4-3).

The backup onsite meteorological monitoring system is a completely independent system installed and maintained for the purpose of providing redundant site-specific meteorological information (10-meter wind speed, direction, temperature, and sigma theta) representative of the site environment. The primary tower is located approximately 2.1 kilometers (1.3 miles) east of STP 3 & 4, while the backup tower is approximately 670.5 meters (2200 feet) due south of the primary tower. Both locations are clear of man-made and natural obstructions that could influence the collection of meteorological data. Detailed information regarding the meteorological monitoring program for STP 1 & 2 is provided in Section 6.4.

2.7.4.1 Fog

The closest first-order NWS station to the STP site at which observations of fog are made and routinely recorded is the Victoria, Texas NWS station approximately 53 miles to the west. The NWS defines heavy fog as fog that reduces visibility to 1/4 miles or less. The LCD summary for this station (Table 2.7-2) indicates an average of 41.7 days per year of heavy fog conditions, based on a 43-year period of record (Reference 2.7-3).

On average, the occurrence of heavy fog conditions follows a cyclical pattern over the course of the year, being recorded most often from November through March when normal daily minimum temperatures are relatively lower. The peak frequency is reached during January, averaging approximately 7 days per month. Heavy fog occurs least often during the summer (June, July and August), averaging less than one day per month in each of those months.

The potential for ground level fog from the operation of the Main Cooling Reservoir (MCR) was assessed during a fog monitoring program prior to the operation of STP 1 & 2 (Reference 2.7-29). The monitoring was conducted in two phases. Phase I (preoperation) was conducted for one year before the commercial operation of STP 1. Phase II (post-operation) was also conducted for one year and began after commercial operation of STP 2. The results of the fog monitoring program do not indicate that the presence of the MCR significantly increases fog occurrence over naturally occurring fog. Because fogging from the operation of MCR for STP 1 & 2 did not increase over naturally occurring fog, it is not likely to increase as a result of the addition of STP 3 & 4.

The mechanical draft cooling towers associated with STP 3 & 4 were also evaluated for the potential to produce ground-level fog. Seasonal and annual modeling results indicate that fogging will not occur from the operation of the STP 3 & 4 cooling towers. Further information regarding the impact of plant operation is discussed in Section 5.

2.7.4.2 Average Wind Direction and Wind Speed Conditions

The distribution of wind direction and wind speed is an important consideration when characterizing the dispersion climatology of a site. Long-term average wind motions at the macro- and synoptic scales (i.e., on the order of several thousand down to several hundred kilometers) are influenced by the general circulation patterns of the atmosphere at the macro-scale and by large-scale topographic features (e.g., land-water interfaces such as coastal areas). These characteristics are addressed in Subsection 2.7.1.2.

Site-specific or micro-scale (i.e., 2 km or less) wind conditions, while they may reflect these larger-scale circulation effects, are influenced primarily by local and, to a lesser extent, meso- or regional-scale (i.e., up to approximately 200 km) topographic features. Wind measurements at these smaller scales are currently available from the onsite meteorological monitoring program operated in support of STP 1 & 2 and may be compared to data recorded at the Victoria, Texas NWS station.

Subsection 2.7.4 presents a summary description of this onsite monitoring program. A detailed discussion of the onsite meteorological monitoring program is provided in Section 6.4. In its current configuration, wind direction and wind speed measurements are made at two levels on an instrumented 60-meter tower (i.e., the lower level at 10 meters and the upper level at 60 meters).

Figures 2.7-2 through 2.7-6 present annual and seasonal wind rose plots (i.e., graphical distributions of the direction from which the wind is blowing and wind speeds for each of 16, 22.5° compass sectors centered on north, north-northeast, northeast, etc.) for the 10-meter level based on measurements over the composite 3-year period of record that includes calendar years 1997, 1999, and 2000. The 3-year dataset was identified to be the most defendable (using validated data with the least data substitution), representative (tower siting and sensor location in accordance with RG 1.23[Reference 2.7-30]), and complete (with annual data recovery rate greater than 90%), but not older than 10 years from the date of the application.

The wind direction distribution at the 10-meter level generally follows a southeast orientation on an annual basis (see Figure 2.7-2). The prevailing wind (i.e., defined as the direction from which the wind blows most often) is from the south-southeast, with nearly 40% of the winds blowing from the southeast through south sectors.

During the winter months (i.e., December through February), north winds prevail, although a bimodal directional distribution is exhibited. Northerly winds (i.e., from the north-northwest through the north-northeast sectors) occur with about the same frequency as winds from the southeast through the south sectors- about 28% of the time for each group of sectors (see Figure 2.7-3). The prevalence of northerly winds during the winter is attributed to increased cold frontal passages as continental, polar air masses intrude the region. Winds from the southeast quadrant predominate during the spring and summer with prevailing seasonal directions shifting from the southeast to the south, respectively (see Figures 2.7-4 and 2.7-5). The autumn months (i.e., September through November) represent a transitional period that is predominated by winds from the southeast and northeast quadrants. Wind directions with a westerly component are relatively infrequent until late in the autumn and early in the winter. Plots of individual monthly wind roses at the 10-meter measurement levels are presented in (Figure 2.7-7).

Wind rose plots based on measurements at the 60-meter measurement level are shown in Figures 2.7-8 through 2.7-13. The wind direction distributions for the 60 meter level are fairly similar to the 10-meter level wind roses on a composite annual (see Figure 2.7-8) and seasonal basis (see Figures 2.7-9 through 2.7-12). Plots of individual monthly wind roses at the 60-meter measurement level are presented in Figure 2.7-13.

Wind information summarized in the LCD for the Victoria, Texas NWS station (see Table 2.7-2) indicates a prevailing south-southeasterly wind direction (Reference 2.7-3) that appears to be similar to the 10-meter level wind flow at the STP site, at least on an annual basis (see Figure 2.7 2). The monthly variation of prevailing wind directions for the Victoria, Texas NWS station follows a similar pattern from March through August and during November and December, but differs during September, October, January, and February. However, the variations for September, October, January, and February are most likely due to the much shorter period of record for the STP meteorological data, as compared to Victoria station (Reference 2.7-2).

Table 2.7-6 summarizes seasonal and annual mean wind speeds based on measurements from the upper and lower levels of the meteorological tower operated in support of STP 1 & 2, over the composite 3-year period, and from wind instrumentation at the Victoria, Texas NWS station (28-year mean) (Reference 2.7-3). The elevation of the wind instruments at the Victoria NWS station is nominally 20 feet (approximately 6.1 meters) (Reference 2.7-3), and are comparable to the lower (10-meter) level measurements at the STP site.

On an annual basis, mean wind speeds at the 10- and 60-meter levels are 4.1 m/sec and 6.0 m/sec, respectively, at the STP site. The annual mean wind speed at Victoria (i.e., 4.3 m/sec) is similar to the 10-meter level at the STP site, differing by only 0.2 m/sec; seasonal average wind speeds at Victoria are likewise slightly higher. Seasonal mean wind speeds for both measurement levels at the STP site follow the same pattern discussed in Subsection 2.7.2.3 with respect to the seasonal variation of relatively higher air stagnation and restrictive dispersion conditions in the site region.

There were no occurrences of calm wind (less than 0.27 m/sec) conditions at the STP site over the 3-year period of record that includes calendar years 1997, 1999, and 2000 at either the 10- or 60-meter levels. This is likely due to the fact that the STP site is a relatively high wind site with annual mean wind speeds of 4.1 and 6.0 m/sec at the lower and upper measurement levels, respectively (see Table 2.7-6), and because of a starting threshold wind speed of 0.27 m/sec for the cup-type anemometers in place at the time (see Table 6.4-4).

2.7.4.3 Wind Direction Persistence

Wind direction persistence is a relative indicator of the duration of atmospheric transport from a specific sector-width to a corresponding downwind sector-width that is 180° opposite. Atmospheric dilution is directly proportional to the wind speed, with other factors remaining constant. When combined with wind speed, a wind direction persistence/wind speed distribution further indicates the downwind sectors with relatively more or less dilution potential (i.e., at higher or lower wind speeds, respectively) associated with a given transport wind direction.

Tables 2.7-7 and 2.7-8 present wind direction persistence/wind speed distributions based on measurements at the STP site for the 3-year period of record that includes calendar years 1997, 1999, and 2000. The distributions account for durations ranging from 1 to 48 consecutive hours for wind directions from 22.5° upwind sectors centered on each of the 16 standard compass radials (i.e., north, north-northeast, northeast, etc.), and for wind speed groups greater than or equal to 5, 10, 15, 20, 25, and 30 mph. Distributions are provided for wind measurements made at the lower (10-meter) and the upper (60-meter) tower levels, respectively.

At the 10-meter level, the longest persistence period is 30 hours for winds from the southeast sector. This duration appears only in the lowest two wind speed groups (i.e., for wind speeds greater than or equal to 5 mph and 10 mph). Persistence periods of 24 hours are indicated for several direction sectors, including winds from the east, southeast, south-southeast, south, west-southwest, and north-northwest. For wind speeds greater than or equal to 20 mph, maximum persistence periods are limited to 8 hours.

At the 60-meter level, the longest persistence period is also 30 hours, but occurred for two different sectors (i.e., winds from the north and east-northeast). This duration appears only in the lowest two wind speed groups for the north sector and for the lowest three wind speed groups for the east-northeast sector (i.e., for wind speeds greater than or equal to 5, 10, and 15 mph). Persistence periods of 24 hours are indicated for multiple direction sectors for the lowest three wind speed groups. For wind speeds greater than or equal to 25 mph, maximum persistence periods are limited to 8 hours with the exception of one 12-hour duration from the south sector.

2.7.4.4 Atmospheric Stability

Atmospheric stability is a relative indicator of the potential diffusion of pollutants released into the ambient air. Atmospheric stability is based on the delta temperature (ΔT) method defined in Table 1 of RG 1.23, "Meteorological Monitoring Programs for Nuclear Power Plants," (Reference 2.7-30).

The method classifies stability based on the temperature change with height (i.e., the difference in °C/100 m). Stability classifications are assigned according to the following criteria:

- Extremely Unstable (Class A): $\Delta T \leq -1.9$ °C
- Moderately Unstable (Class B): -1.9 °C $< \Delta T \leq -1.7$ °C
- Slightly Unstable (Class C): -1.7 °C $< \Delta T \leq -1.5$ °C
- Neutral Stability (Class D): -1.5 °C $< \Delta T \leq -0.5$ °C
- Slightly Stable (Class E): -0.5 °C $< \Delta T \leq +1.5$ °C
- Moderately Stable (Class F): $+1.5$ °C $< \Delta T \leq +4.0$ °C
- Extremely Stable (Class G): $+4.0$ °C $< \Delta T$

The diffusion capacity is greatest for extremely unstable conditions and decreases progressively through the remaining unstable, neutral stability, and stable classifications.

During the 3-year period of record that includes calendar years 1997, 1999, and 2000 at the STP site, ΔT was determined from the difference between temperature measurements made at the 60- and 10-meter tower levels. Seasonal and annual frequencies of atmospheric stability class and associated 10-meter level mean wind speeds for this period of record are presented in Table 2.7-9.

The data indicate a predominance of neutral stability (Class D) and slightly stable (Class E) conditions throughout the year, ranging from about 45% of the time during the autumn to about 63% of the time during the winter and spring. Extremely unstable conditions (Class A) occur approximately 14% of the time annually, are most frequent during the summer, and occur least often during the winter months owing to greater and lesser insolation, respectively, and relatively lower and higher mean wind speeds, respectively. Extremely and moderately stable conditions (Classes G and F, respectively) are most frequent during autumn (about 30% of the time) and winter (about 20% of the time), owing to increased radiational cooling at night. The relatively lower percent occurrences of stability classes B and C are believed to be due to the narrow ΔT ranges associated with those classifications.

Joint frequency distributions of wind speed and wind direction by atmospheric stability class and for all stability classes combined for the 10-meter and 60-meter wind measurement levels at the STP site are presented in Table 2.7-10 and Table 2.7-11 respectively, for the 3-year period of record that includes calendar years 1997, 1999, and 2000. The 10-meter level joint frequency distributions are used to evaluate short-term dispersion estimates for accidental atmospheric releases (see Subsection 2.7.5) and the 60-meter level joint frequency distributions are used to evaluate long-term diffusion estimates of routine releases to the atmosphere (see Subsection 2.7.6).

2.7.4.5 Topographic Description

The STP site is located in Matagorda County, Texas, approximately 12 miles south-southwest the city limits of Bay City, Texas, and, 10 miles north of Matagorda and East Matagorda Bays, and approximately 15 miles north of the Gulf of Mexico. As shown in Figure 6.4-4, STP 3 & 4 are located approximately one-half mile north of the ~~Main Cooling Reservoir (MCR)~~ MCR. The terrain elevation at the site is approximately 25 feet (7.6 meters) above MSL.

Topographic features within a 50-mile (80-kilometer) radius of the STP site, based on digital map elevations, are shown in Figure 2.7-14. The terrain in the site area is basically flat to the northeast and southwest of the site, decreases to sea level to the south and southeast as the Gulf of Mexico and adjacent bay waters are reached, and increases gradually in the northwest quadrant relative to the site to a maximum elevation of about 165 feet (approximately 50 meters) above MSL within this radial area.

More detailed topographic features within a 5-mile (8-kilometer) radius of the STP site, also based on digital map elevations, are shown in Figure 2.7-15, including elevation characteristics in the immediate vicinity of STP 3 & 4. Further information regarding potential modifications to the site area during and after construction are discussed in Subsection 4.1.1.

Terrain elevation profiles along each of the 16 standard 22.5° compass radials out to a distance of 50 miles (80 kilometers) from the site are illustrated in (Figure 2.7-16). Because STP 3 & 4 are located relatively close to one another, and because of the distance covered by these profiles, the locus of these radial lines is the center point between the STP 3 & 4 reactor buildings.

2.7.5 Short-Term Diffusion Estimates

2.7.5.1 Basis

To evaluate potential health effects of design basis accidents at STP 3 & 4, a hypothetical accident is postulated to predict upper-limit concentrations and doses that might occur in the event of a containment release to the atmosphere. Site-specific meteorological data covering the 3-year period of record from 1997, 1999, and 2000 was used to quantitatively evaluate such a hypothetical accident at the site. Onsite data provides representative measurements of local dispersion conditions appropriate to the STP site and a 3-year period of record is considered to be reasonably representative of long-term conditions as discussed in Subsections 6.4.2.2 and 6.4.2.3.

According to 10 CFR Part 100 (Reference 2.7-31), it is necessary to consider the doses for various time periods immediately following the onset of a postulated containment release at the exclusion area boundary (EAB) and for the duration of exposure for the low population zone (LPZ) and population center distances.

Meteorological data has been used to determine various postulated accident conditions as specified in "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants" RG 1.145 (1982) (Reference 2.7-32). Compared to an elevated release, a ground-level release usually results in higher ground-level concentrations at downwind receptors because of less dilution from shorter traveling distances. Since the ground-level release scenario provides a bounding case, elevated releases are not considered unless they can be clearly identified.

The PAVAN computer program as described in PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations NUREG/CR-2858 (1992) (Reference 2.7-33), is used to estimate ground-level relative air concentrations (χ/Qs) at the EAB and LPZ for potential accidental releases of radioactive material to the atmosphere. The χ/Qs are estimated for various time periods ranging from 2 hours to 30 days This assessment is required by 10 CFR Part 100 (Reference 2.7-31) and 10 CFR Part 50, Appendix E (Reference 2.7-34).

The EAB for STP 3 & 4 is shown in Figure 2.1-1, which is an oval centered at a point (305 feet) directly west of the center of the STP 2 Reactor Building. Since the EAB is centered on the existing STP 1 & 2, the distance to the EAB from the center of STP 3 & 4 is different for each directional sector. These distances are specified in Table 2.7-12. To be conservative, the shortest distances in each direction to the EAB were determined as presented in Table 2.7-13.

The LPZ is a 3-mile radius circle centered at the same point as the EAB (see Figure 2.1-1). The distances from the STP 3 & 4 to the LPZ are specified in Table 2.7-12. Similarly, the shortest distances in each direction to the LPZ were determined as presented in Table 2.7 13.

The PAVAN program implements the guidance provided in RG 1.145 (Reference 2.7-31). Mainly, the code computes χ/Qs at the EAB and LPZ for each combination of wind speed and atmospheric stability class for each of 16 downwind direction sectors (i.e., north, north-northeast, northeast, etc.). The χ/Q values calculated for each direction sector are then ranked in descending order, and an associated cumulative frequency distribution is derived based on the frequency distribution of wind speeds and stabilities for the complementary upwind direction sector. The χ/Q value that is equaled or exceeded 0.5% of the total time becomes the maximum sector-dependent χ/Q value.

The calculated χ/Q values are also ranked independently of wind direction into a cumulative frequency distribution for the entire site. The PAVAN program then selects the χ/Qs that are equaled or exceeded 5% of the total time.

The larger of the two values (i.e., the maximum sector-dependent 0.5% χ/Q or the overall site 5% χ/Q value) is used to represent the χ/Q value for a 0-2-hour time period. To determine χ/Qs for longer time periods, the program calculates an annual average χ/Q value using the procedure described in "Methods for Estimating Atmospheric

Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," RG 1.111 (1977) (Reference 2.7-35). The program then uses logarithmic interpolation between the 0-2 hour χ/Qs for each sector and the corresponding annual average χ/Qs to calculate the values for intermediate time periods (i.e., 0-8 hours, 8-24 hours, 1-4 days, and 4-30 days).

The PAVAN model has been configured to calculate offsite χ/Q values assuming both wake-credit allowed and wake-credit not allowed. The EAB is located beyond the wake influence zone induced by the Reactor Building, so the "wake credit not allowed" scenario was used. And, because the LPZ is located farther away from the plant site than the EAB, the "wake-credit not allowed" scenario of the PAVAN results has been used for the χ/Q analyses at both the EAB and the LPZ.

The PAVAN model input data are presented below:

- Meteorological data: 3-year (1997, 1999, and 2000) composite onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability
- Type of release: Ground-level
- Wind sensor height: 10 meters
- Vertical temperature difference: (between 10 meters to 60 meters)
- Number of wind speed categories: 11
- Release height: 10 meters (default height)
- Distances from release point to EAB for all downwind sectors
- Distances from release point to LPZ for all downwind sectors

The PAVAN model uses building cross-sectional area and containment height to estimate wake-related χ/Q values. If the EAB and the LPZ are both located beyond the building wake influence zone, these two input parameters have no effect in calculating the non-wake χ/Q values.

To be conservative, the shortest distance from the STP 3 reactor buildings to the EAB or the STP 4 reactor building to the EAB was entered as input for each downwind sector to calculate the χ/Q values at the EAB. Similarly, the shortest distance from STP 3 & 4 reactor buildings to the LPZ is entered as input to calculate the χ/Q values at the LPZ.

2.7.5.2 PAVAN Modeling Results

The PAVAN modeling results for the 50th percentile overall site χ/Q values at the EAB and the LPZ relative to the 0- to 2-hour time period, the annual average time period, and other intermediate time intervals evaluated by the PAVAN model are presented below.

Receptor Location	0-2 hours	0-8 hours	8-24 hours	1-4 days	4-30 days	Annual Average
EAB	4.20E-05	3.65E-05	3.40E-05	2.92E-05	2.35E-05	1.80E-05
LPZ	4.95E-06	3.54E-06	3.00E-06	2.08E-06	1.24E-06	6.54E-07

The PAVAN-predicted maximum 0-2 hours EAB χ/Q (4.20E-05) is lower than the corresponding DCD EAB χ/Q value (1.37E-03). Similarly, the PAVAN-predicted maximum 0-2 hours LPZ χ/Q value (4.95E-06) is lower than the corresponding DCD LPZ χ/Q value (4.11E-04).

2.7.6 Long-Term (Routine) Diffusion Estimates

2.7.6.1 Basis

The NRC-sponsored XOQDOQ computer program, as described in, XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations NUREG/CR-2919 (Reference 2.7-36), is used to estimate χ/Q values due to routine releases of gaseous effluents to the atmosphere. The XOQDOQ computer code has the primary function of calculating annual average χ/Q values and annual average relative deposition (D/Q) values at receptors of interest (e.g., at the EAB and LPZ boundaries and at the nearest milk cow, residence, vegetable garden, and meat animal). The χ/Q and D/Q values due to intermittent releases, which occur during routine operation, may also be evaluated using the XOQDOQ model.

The XOQDOQ dispersion model implements the assumptions outlined in RG 1.111 (Reference 2.7-35). The program assumes that the material released to the atmosphere follows a Gaussian distribution around the plume centerline. In estimating concentrations for longer time periods, the Gaussian distribution is assumed to be evenly distributed within a given directional sector. A straight-line trajectory is assumed between the release point and all receptors.

The following input data and assumptions have been used in the XOQDOQ modeling analysis:

- Meteorological Data: 3-year (1997, 1999, and 2000) composite onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability
- Type of release: Ground-level
- Wind sensor height: 10 meters

- Vertical temperature difference: (between 10 meters to 60 meters)
- Number of wind speed categories: 11
- Release height: 10 meters (default height)
- Minimum building cross-sectional area: 2,134 square meters
- Containment structure height: 37.7 meters above grade
- Distances from the release point to the nearest residence, nearest EAB boundary, vegetable garden, and meat animal
- No residential milk cows have been identified within 5 miles of the STP site and no dairies have been identified within 50 miles. It is conservatively assumed that all residents have a vegetable garden and are fattening a calf for residential consumption.

The ABWR reactor design has been used to calculate the minimum building cross-sectional area for evaluating building downwash as discussed in NUREG/CR-2919 (Reference 2.7-36). The reactor building is a rectangular structure. Therefore, based on the width (56.6 meters) and height (37.7 meters) of the reactor building, the cross-sectional area of the reactor structure is calculated to be 2,134 meters squared.

Distances from the STP 1 & 2 reactors to various receptors of interest (i.e., nearest residence, meat animal, site boundary, and vegetable garden) for each directional sector are provided in Offsite Dose Calculation Manual (Reference 2.7-37). A milk receptor does not exist within 5 miles of the STP site. The shortest distances from the STP 3 & 4 reactor buildings to these same receptors of interest are recalculated for each directional sector. The results are presented in Table 2.7-14.

Ground-level releases were also considered for routine releases. Therefore, the lower level (10-meter) 3-year (1997, 1999, and 2000) joint frequency distributions were used as input in XQODOQ modeling analysis.

2.7.6.2 XOQDOQ Modeling Results

Table 2.7-15 summarizes the maximum relative concentration and relative deposition (i.e., χ/Q and D/Q) values predicted by the XOQDOQ model for identified sensitive receptors in the STP site area due to routine releases of gaseous effluents. The listed maximum χ/Q values reflect several plume depletion scenarios that account for radioactive decay (i.e., no decay, and the default half-life decay periods of 2.26 and 8 days).

The overall maximum annual average χ/Q value (with no decay) is 8.3E-05 sec/m^3 and occurs at the STP 4 reactor due to the releases from the STP 3 reactor. The maximum annual average χ/Q values (along with the direction and distance of the receptor locations relative to the STP site) for the other sensitive receptor types are:

- 6.2E-07 sec/m^3 for the nearest residence occurring in the WSW sector at a distance of 2.19 miles.
- Because the same shortest distance (2.19 miles) was used to estimate χ/Q values for the nearest vegetable garden and meat animal, the same χ/Q value (6.2E-07 sec/m^3) was obtained at these receptors.
- 1.3 E-05 sec/m^3 for the nearest EAB occurring in the NW sector at a distance of 0.58 miles.

Finally, Table 2.7-16 summarizes annual average χ/Q values (for no decay) and D/Q values at the XOQDOQ model's 22 standard radial distances between 0.25 and 50 miles and for the model's 10 distance-segment boundaries between 0.5 and 50 miles downwind along each of the 16 standard direction radials (i.e., separated by 22.5°).

2.7.7 Noise

STP is located on approximately 12,200-acres surrounded by farmland on all sides except for the portion of the property that borders the Colorado River (see Figure 2.2-2). The only sources of man-made noise at the STP site are those associated with STP 1 & 2 operations. STPNOC does not have noise measurements for the STP site. Sources of noise from STP 1 & 2 include transformers and other electrical equipment, circulating water pumps, and the public address system. However, the effect of noises generated by STP 1 & 2 operations are mitigated by the undeveloped land surrounding the plant. Also, most equipment is located within various plant buildings, which further serves to dampen noises. The center of STP 1 & 2 lies approximately 1 mile south from the nearest site boundary (see Figure 2.1-1). The proposed units would lie closer with their center being approximately 0.7 miles south from the nearest site boundary (see Figure 2.1-1). The nearest full-time residence is approximately 2.4 miles west-southwest from the STP 1 & 2 and STP 3 & 4 reactor containment buildings.

In addition to noise related to operation of STP 1 & 2, there is the noise from an occasional train. A Union Pacific rail line is located to the north of the STP site has a rail spur from this line to the plant. Also, to the east of STP site is a Burlington Northern Santa Fe branch line (Reference 2.7-38). Railroad operations are subject to federal noise regulations. The Noise Control Act of 1972 (P.L. 92-574) requires the federal government to set and enforce uniform noise control for railroads. Moving locomotives are required to operate at less than 90 decibels and rail cars noise should not exceed 93 decibels (Reference 2.7-39).

In the absence of onsite noise data, STP reviewed the noise determinations made by NRC with regard to similar nuclear power plants. In the Generic Environmental Impact Statement (GEIS) for License Renewal (NUREG-1437) (Reference 2.7-40) the NRC evaluated the impacts of noise at all operating nuclear reactors and concluded:

"Because noise impacts have been found to be small and generally not noticed by the public, noise impacts are expected to be of small significance at all sites. Because noise reduction methods would be costly, and given that there have been few complaints, no additional mitigation measures are warranted for license renewal."

The noise from STP 1 & 2, along with the addition of STP 3 & 4, is not greater than the normal operational noise occurring at other nuclear power plants. STPNOC believes that background or ambient sound levels at the STP site, with its rural setting, would likely compare to the ambient sound level of a farm, 44 decibels or to that of a small town or quiet suburban area, 46 to 52 decibels (Reference 2.7-41). The exception would be when the public address system is used and warning sirens are tested, which are both very short-lived occurrences.

2.7.8 References

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Table 2.7-1 NWS and Cooperative Observing Stations Near the STP Site

Station [1]	County	Approximate Distance (miles)	Direction Relative to Site	Elevation (feet)
Matagorda 2	Matagorda	10	SE	10
Palacios Municipal Airport	Matagorda	13	WSW	12
Bay City Waterworks	Matagorda	13	NNE	52
Danevang 1W	Wharton	20	NNW	70
Maurbro	Jackson	26	WNW	30
Pierce 1E	Wharton	31	NNW	105
Point Comfort	Calhoun	32	WSW	20
Port O'Connor	Calhoun	34	SW	5
Wharton	Wharton	36	N	111
Edna Highway 59 Bridge	Jackson	40	WNW	68
Freeport 2NW	Brazoria	43	ENE	8
Angleton 2W	Brazoria	44	NE	27
Victoria Regional Airport [2]	Victoria	53	W	115
Thompsons 3WSW	Fort Bend	54	NNE	72
Aransas Wildlife Refuge	Aransas	56	SW	15

[1] Numeric and letter designators following a station name (e.g., Pierce 1E) indicate the station's approximate distance in miles (e.g., 1) and direction (e.g., east) relative to the place name (e.g., Pierce).

[2] National Weather Service First-Order-Station.

Reference: 2.7-4

Table 2.7-2 2005 Local Climatological Data (LCD) Summary for Victoria, Texas

Reference: 2.7.3

NORMALS, MEANS, AND EXTREMES

VICTORIA, TX (VCT)

LATITUDE: 28° 51' 45" N LONGITUDE: 96° 55' 47" W ELEVATION (FT): GRND: 103 BARO: 106 TIME ZONE: CENTRAL (UTC + 6) WBAN: 12912

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	62.8	66.6	73.4	79.2	85.1	90.3	93.4	93.7	89.9	83.0	73.0	65.2	79.6
	MEAN DAILY MAXIMUM	48	63.8	67.5	73.8	80.5	85.7	91.0	93.7	94.1	89.5	83.1	73.4	66.3	80.2
	HIGHEST DAILY MAXIMUM	44	88	95	97	98	101	106	104	107	111	99	93	88	111
	YEAR OF OCCURRENCE		1971	1986	1989	1963	1964	1998	1964	1962	2000	1991	1988	1964	SEP 2000
	MEAN OF EXTREME MAXS.	48	79.3	82.0	85.9	89.6	92.7	96.1	98.3	99.4	96.3	92.1	86.2	81.0	89.9
	NORMAL DAILY MINIMUM	30	43.6	46.7	53.9	60.1	68.1	73.3	75.0	74.6	70.3	61.6	52.3	45.2	60.4
	MEAN DAILY MINIMUM	48	43.6	46.6	53.3	61.4	68.2	73.4	75.1	74.7	70.6	61.6	52.3	45.5	60.5
	LOWEST DAILY MINIMUM	44	14	19	21	33	49	59	62	62	48	31	24	9	9
	YEAR OF OCCURRENCE		1982	1985	2002	1987	1978	1984	1967	2004	2000	1993	1976	1989	DEC 1989
	MEAN OF EXTREME MINS.	48	26.0	29.9	35.1	44.6	56.1	65.4	70.3	69.7	57.5	45.3	35.3	28.3	47.0
	NORMAL DRY BULB	30	53.2	56.7	63.7	69.7	76.6	81.8	84.2	84.2	80.1	72.3	62.7	55.2	70.0
	MEAN DRY BULB	48	53.8	57.0	63.6	70.9	77.0	82.2	84.4	84.3	80.2	72.3	62.8	56.1	70.4
	MEAN WET BULB	20	50.0	53.2	58.2	64.6	71.3	75.3	76.2	76.1	72.8	66.2	58.3	51.7	64.5
	MEAN DEW POINT	20	46.0	49.1	53.9	60.5	68.4	72.7	73.1	73.1	69.5	62.8	54.6	47.7	60.9
	NORMAL NO. DAYS WITH:														
	MAXIMUM ≥ 90°	30	0.0	0.1	0.4	0.8	6.3	20.2	28.0	27.9	18.5	4.9	0.1	0.0	107.2
	MAXIMUM ≤ 32°	30	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4
	MINIMUM ≤ 32°	30	4.1	2.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	*	0.6	3.1	10.5
	MINIMUM ≤ 0°	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H/C	NORMAL HEATING DEG. DAYS	30	372	249	113	28	1	0	0	0	1	22	145	317	1248
	NORMAL COOLING DEG. DAYS	30	18	26	84	181	368	514	601	597	454	248	83	29	3203
RH	NORMAL (PERCENT)	30	77	76	75	74	78	77	74	75	76	76	77	77	76
	HOUR 00 LST	30	84	84	84	85	89	90	89	88	88	88	87	85	87
	HOUR 06 LST	30	88	88	88	89	92	93	93	94	93	91	90	88	91
	HOUR 12 LST	30	65	63	60	59	62	60	55	56	59	58	61	64	60
	HOUR 18 LST	30	69	64	62	62	67	66	60	62	65	67	71	71	66
S	PERCENT POSSIBLE SUNSHINE														
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY≤1/4 MI)	43	7.1	5.1	5.2	3.9	2.3	0.6	0.3	0.3	1.3	3.5	6.0	6.1	41.7
	THUNDERSTORMS	43	1.5	1.9	2.9	3.4	6.3	7.0	7.3	9.7	8.0	3.8	2.2	1.5	55.5
CLOUDINESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	1			6.4			4.0							
	MIDNIGHT-MIDNIGHT (OKTAS)														
	MEAN NO. DAYS WITH:														
	CLEAR	1	3.0	5.0	8.0		5.0	3.0							
	PARTLY CLOUDY	1		1.0	3.0		9.0	6.0							
	CLOUDY	1	1.0	3.0	10.0		3.0	5.0							
PR	MEAN STATION PRESSURE(IN)	31	30.01	29.97	29.87	29.84	29.79	29.82	29.88	29.87	29.85	29.92	29.96	30.01	29.90
	MEAN SEA-LEVEL PRES. (IN)	20	30.15	30.10	30.02	29.96	29.93	29.94	30.01	29.99	29.98	30.04	30.09	30.14	30.03
WINDS	MEAN SPEED (MPH)	28	10.3	10.8	10.9	11.2	10.4	9.4	8.6	8.2	8.0	8.7	9.6	9.8	9.7
	PREVAIL.DIR(TENS OF DEGS)	25	36	36	16	16	16	16	18	18	04	36	36	36	16
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	9	43	43	39	47	41	39	62	43	41	43	40	40	62
	DIR. (TENS OF DEGS)		17	15	36	11	07	29	05	26	04	35	29	33	05
	YEAR OF OCCURRENCE		1996	2001	1996	2004	1999	2003	2003	1996	1998	1998	2003	1997	JUL 2003
	MAXIMUM 5-SECOND:														
	SPEED (MPH)	9	52	52	47	64	59	48	83	45	53	52	51	47	83
	DIR. (TENS OF DEGS)		30	15	35	11	22	30	04	27	12	35	30	33	04
	YEAR OF OCCURRENCE		1998	2001	1996	2004	2004	2003	2003	1996	2001	1998	2003	1997	JUL 2003
PRECIPITATION	NORMAL (IN)	30	2.44	2.04	2.25	2.97	5.12	4.96	2.90	3.05	5.00	4.26	2.64	2.47	40.10
	MAXIMUM MONTHLY (IN)	44	7.76	9.08	11.61	11.70	14.66	13.50	13.59	8.97	19.05	12.44	16.14	6.97	19.05
	YEAR OF OCCURRENCE		1991	1992	1997	1997	1993	2004	1990	2001	1978	1997	2004	1975	SEP 1978
	MINIMUM MONTHLY (IN)	44	0.02	0.23	0.18	T	0.01	T	0.05	0.34	1.11	0.34	0.02	0.36	T
	YEAR OF OCCURRENCE		1971	1988	1971	1987	1998	1980	1997	1965	1982	1987	1981	1972	APR 1987
	MAXIMUM IN 24 HOURS (IN)	44	4.70	3.21	5.04	9.87	8.45	9.30	8.41	6.14	8.51	6.15	9.20	6.12	9.87
	YEAR OF OCCURRENCE		1991	1992	1997	1991	1972	1977	1990	1964	1967	1994	2004	1975	APR 1991
	NORMAL NO. DAYS WITH:														
	PRECIPITATION ≥ 0.01	30	8.8	7.3	6.9	6.4	7.4	8.4	7.2	8.8	9.9	7.3	7.5	8.1	94.0
	PRECIPITATION ≥ 1.00	30	0.6	0.6	0.7	0.8	1.7	1.7	0.9	0.9	1.5	1.3	0.6	0.6	11.9
SNOWFALL	NORMAL (IN)	30	0.1	0.*	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.*	0.*	0.1
	MAXIMUM MONTHLY (IN)	36	2.1	1.0	T	0.0	T	0.0	0.0	T	0.0	0.0	0.2	T	2.1
	YEAR OF OCCURRENCE		1985	1973	1990		1993			1994			1976	1990	JAN 1985
	MAXIMUM IN 24 HOURS (IN)	36	2.1	1.0	T	0.0	T	0.0	0.0	T	0.0	0.0	0.2	T	2.1
	YEAR OF OCCURRENCE		1985	1973	1990		1993			1994			1976	1990	JAN 1985
	MAXIMUM SNOW DEPTH (IN)	39	2	3	0	0	0	0	0	0	0	0	0	0	3
	YEAR OF OCCURRENCE		1985	1958											FEB 1958
	NORMAL NO. DAYS WITH:														
	SNOWFALL ≥ 1.0	30	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

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Table 2.7-3 Climatological Normals at Selected NWS and Cooperative Observing Stations in the STP Site Area

	Normal Annual Temperatures (°F) [1,2]				Normal Annual Precipitation	
Station	Daily Maximum	Daily Minimum	Daily Range	Daily Mean	Rainfall [1,2] (inches)	Snowfall [1,2] (inches)
Matagorda [2]	77.5	61.8	15.7	69.7	43.75	0.1
Palacios Muni Airport	77.2	61.1	19.4	69.2	45.40	0.1
Bay City Waterworks	80.6	61.2	16.1	70.9	48.03	0.0
Danevang 1W	79.0	58.5	20.5	68.8	45.37	0.2
Maurbro [3]	NA [4]	NA [4]	NA [4]	NA [4]	NA [4]	NA [4]
Pierce 1E	79.7	58.0	21.7	68.9	45.92	Trace
Point Comfort	79.7	62.4	17.3	71.1	43.87	Trace
Port O'Connor	76.4	65.0	11.4	70.7	34.78	0.1
Wharton	NA [4]	NA [4]	NA [4]	NA [4]	45.62	NA [4]
Edna Hwy 59 Bridge	NA [4]	NA [4]	NA [4]	NA [4]	42.17	NA [4]
Freeport 2NW	77.6	62.1	15.5	69.8	50.66	Trace
Angleton 2W	78.5	59.9	18.6	69.2	57.24	0.1
Victoria Regional Airport	79.6	60.4	19.2	70.0	40.10	0.1
Thompsons 3WSW	79.6	59.3	20.3	69.5	45.81	0.1
Aransas Wildlife Refuge	77.5	62.9	14.6	70.2	40.83	Trace

[1] Reference 2.7-3
[2] Reference 2.7-4
[3] Station decommissioned in 1966
[4] NA = Measurements not made at this station

Table 2.7-4 Climatological Extremes at Selected NWS and Cooperative Observing Stations in the STP Site Area

Station	Maximum Temperature (°F)	Minimum Temperature (°F)	Max 24-Hr Rainfall (inches)	Max Monthly Rainfall (inches)	Max 24-Hr Snowfall (inches)	Max Monthly Snowfall (inches)
Matagorda 2	104 [1] (09/06/00)	9 [1] (12/23/89)	15.71 [1] (05/01/11)	20.75 [1] (10/86)	5.0[3] (12/25/04)	5.0 [3] (12/04)
Palacios Muni Airport	107 [1] (09/05/00)	9 [1] (12/23/89)	9.65 [1] (05/07/51)	24.30 [2,4] (10/49)	4.0 [2,4] (02/12/58)	4.0 [2,4] (02/58)
Bay City Waterworks	109 [1,2] (09/06/00) [7]	7 [1,2] (12/24/89) [8]	8.95 [1] (09/12/61)	23.73 [1] (10/84)	3.8 [2,4] (02/12/58)	3.8 [2,4] (02/58)
Danevang 1W	109 [1,2] (09/06/00) [8]	7 [1] (01/23/40)	12.96 [1] (06/26/60)	24.01 [2,4] (08/45)	10.5 [3] (12/23/04)	10.5 [3] (12/04)
Maurbro	107 [2,4] (07/27/54)	8 [2,4] (01/31/49)	14.80 [2,4] (06/26/60)	22.47 [2,4] (06/60)	4.0 [2,4] (02/13/60)	4.0 [2,4] (02/60)
Pierce 1E	112 [1] (09/05/00)	4 [1] (01/31/49)	8.85 [1] (11/02/43)	17.22 [2,4] (10/49) [9]	8.0 [2,4] (02/13/60)	8.0 [2,4] (02/60)
Point Comfort	107 [1] (09/06/00)	9 [1] (12/23/89)	14.65 [1] (06/26/60)	25.24 [2,4] (06/60)	Trace [1] (11/28/76)	Trace [1] (11/76)
Port O'Connor	105 [1] (09/06/00)	10 [1] (12/23/89)	12.50 [1] (07/10/76)	34.44 [4,5] (07/06)	1.3 [1] (02/09/73)	1.3 [1] (02/73)
Wharton	NA [5]	NA [5]	NA [5]	NA [5]	7.0 [2,4] (02/13/60)	7.0 [2,4] (02/60)
Edna Hwy 59 Bridge	NA [5]	NA [5]	17.58 [2,4] (10/18/94)	20.97 [2,4] (10/94)	NA [5]	NA [5]
Freeport 2NW	105 [1,2] (09/06/00) [6]	13 [1] (12/26/83)	16.72 [1] (07/26/79)	31.61 [1] (09/79)	2.0 [2,4] (02/12/58)	3.0 [2,4] (01/40)
Angleton 2W	107 [1] (09/05/00)	7 [1,2] (12/24/89) [7]	14.36 [1] (07/26/79)	22.13 [1] (07/79)	3.0 [2,4] (01/22/40)	3.0 [2,4] (01/40)
Victoria Regional Airport	111 [1] (09/05/00)	9 [1] (12/23/89)	9.87 [1] (04/05/91)	19.05 [1] (09/78)	2.1 [1] (01/12/85)	2.1 [1] (01/85)
Thompsons 3WSW	106 [3] (07/07/05)	8 [1] (12/23/89)	9.53 [1] (09/19/83)	18.15 [2,4] (06/60)	1.5 [1,2,4] (02/09/73) [10]	1.5 [1,2,4] (02/73) [10]
Aransas Wildlife Refuge	102 [1,2] (09/06/00) [11]	9 [1] (12/23/89)	14.25 [1] (11/01/74)	19.08 [1] (09/79)	5.5 [3] (12/25/04)	5.5 [3] (12/04)

[1] Reference 2.7-5
[2] Reference 2.7-6
[3] Reference 2.7-24
[4] Reference 2.7-7
[5] NA = Measurements not made at this station
[6] Occurs on multiple dates: 09/04/00; 09/06/00 (most recent date shown in table)
[7] Occurs on multiple dates: 12/23/89; 12/24/89 (most recent date shown in table)
[8] Occurs on multiple dates: 09/05/00; 09/06/00 (most recent date shown in table)
[9] Incomplete total of 23.37 inches of rain reported for month of November 2004 (up to six days of observations missing)
[10] Occurs on multiple dates: 02/13/60; 02/09/73 (most recent date and/or month shown in table)
[11] Occurs on multiple dates: 05/03/84; 05/04/84; 09/06/00 (most recent date shown in table)

Table 2.7-5 Mean Monthly, Seasonal, and Annual Morning and Afternoon Mixing Heights and Wind Speed for the STP Site

Period	Statistic [1]	Mixing Height (m, AGL) [2]		Wind Speed – (m/sec)	
		AM	PM	AM	PM
January	Min	267	554	3.2	2.9
	Max	550	1,004	4.9	4.2
	Mean	416	843	4.2	3.7
February	Min	294	717	3.1	2.9
	Max	582	1,227	5	4.3
	Mean	429	979	4.2	3.7
March	Min	283	872	3.7	3.1
	Max	773	1,478	5.1	4.7
	Mean	521	1,127	4.5	4.0
April	Min	302	836	4.0	3.4
	Max	892	1,577	5.3	4.7
	Mean	615	1,147	4.7	4.1
May	Min	378	859	3.6	2.6
	Max	909	1,574	5.8	4.7
	Mean	608	1,224	4.7	3.9
June	Min	209	1,056	3.7	2.7
	Max	1,036	1,850	5.5	4.1
	Mean	469	1,418	4.4	3.6
July	Min	191	1,095	3.4	2.9
	Max	602	1,904	5.2	4.2
	Mean	351	1,518	4.1	3.5
August	Min	193	1,181	2.8	2.7
	Max	606	2,005	4.8	4.2
	Mean	340	1,570	3.9	3.5
September	Min	174	1,122	3.1	2.8
	Max	614	1,737	5.0	4.4
	Mean	346	1,390	3.8	3.5
October	Min	197	972	2.9	2.6
	Max	530	1,724	5.0	4.2
	Mean	333	1,282	3.9	3.5
November	Min	278	741	3.3	2.9
	Max	582	1,342	4.9	4.4
	Mean	399	1,051	4.2	3.7
December	Min	267	577	3.5	2.6
	Max	593	1,102	5.1	4.2
	Mean	392	853	4.2	3.7
Winter	Mean	412	892	4.2	3.7
Spring	Mean	581	1,166	4.6	4.0
Summer	Mean	387	1,502	4.1	3.5
Autumn	Mean	359	1,241	4.0	3.6
Annual	Mean	435	1,200	4.2	3.7

Source: Reference 2.7-15

Notes:

[1] Monthly minimum, maximum and mean values are based directly on summaries available from USDA - Forest Service Ventilation Climate Information System (VCIS) (Reference 2.7-15). Seasonal and annual mean values represent weighted averages based on the number of days in the appropriate months.

[2 AGL = above ground level

Table 2.7-6 Seasonal and Annual Mean Wind Speeds for the STP Site (1997, 1999, and 2000) and the Victoria, Texas NWS Station (1971–2000, Normals)

Primary Tower Elevation	Location	Winter	Spring	Summer	Autumn	Annual
Upper Level (60 m) (m/sec)	STP Site [2]	6.5	6.5	5.4	5.6	6.0
Lower Level (10 m) (m/sec)	STP Site [2]	4.5	4.7	3.7	3.6	4.1
Single Level (6.1 m) (m/sec)	Victoria Regional Airport [1]	4.6	4.8	3.9	3.9	4.3

Winter = December, January, February
Spring = March, April, May
Summer = June, July, August
Autumn = September, October, November
[1] Reference: 2.7-3
[2] Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, and 2000.

Table 2.7-7 Wind Direction Persistence/Wind Speed Distributions for the STP Site – 10-Meter Level

Site Name: STP **Period of Record: 1/1/1997 00:00 to 12/31/1997 23:00 and 1/1/1999 00:00 to 12/31/2000 23:00**
Number of Sectors Included: 1 **Width in Degrees: 22.5**
Measurement Height, m: 10 **Speed Sensor: 1** **Direction Sensor: 1**

Speed Greater than or Equal to: 5.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	1532	1342	996	835	1123	1607	2951	3368	3182	1195	499	172	170	243	529	1110
2	1007	828	523	412	601	932	1931	2274	2313	709	248	62	66	109	311	723
4	534	354	162	144	261	419	999	1228	1329	282	63	13	15	39	138	362
8	158	85	14	34	76	126	320	405	418	62	5	1	1	6	37	115
12	55	29	0	10	30	48	126	137	142	22	0	0	0	0	6	37
18	3	5	0	3	9	7	33	23	24	9	0	0	0	0	0	10
24	0	0	0	0	1	0	8	5	3	3	0	0	0	0	0	2
30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 10.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	849	455	275	295	475	823	1563	1744	1685	455	188	47	24	59	244	655
2	575	259	137	163	302	534	1075	1188	1200	286	96	10	5	29	157	440
4	303	110	33	68	156	267	578	629	637	122	23	0	1	10	82	221
8	89	33	0	26	57	85	191	199	175	33	0	0	0	1	23	70
12	25	9	0	10	29	27	74	77	45	18	0	0	0	0	4	20
18	0	0	0	3	9	0	25	19	3	8	0	0	0	0	0	1
24	0	0	0	0	1	0	8	5	0	2	0	0	0	0	0	0
30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to:15.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	313	93	28	57	170	285	402	396	200	57	33	7	7	12	96	254
2	197	44	8	31	116	193	252	240	127	38	13	1	3	5	62	155
4	84	18	0	15	63	99	119	113	55	21	1	0	1	0	30	68
8	9	3	0	5	22	31	23	20	8	4	0	0	0	0	7	16
12	0	0	0	1	10	6	1	5	1	0	0	0	0	0	0	4
18	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.7-7 Wind Direction Persistence/Wind Speed Distributions for the STP Site – 10-Meter Level (Continued)

Speed Greater than or Equal to: 20.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	45	1	1	0	14	43	51	39	13	1	4	1	2	0	14	55
2	22	0	0	0	9	23	26	16	7	0	1	0	1	0	5	31
4	5	0	0	0	5	8	6	2	4	0	0	0	0	0	0	10
8	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to:25.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	3	0	0	0	2	4	7	4	0	0	0	0	0	0	0	6
2	1	0	0	0	1	2	5	2	0	0	0	0	0	0	0	2
4	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 30.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, and 2000.

Table 2.7-8 Wind Direction Persistence/Wind Speed Distributions for the STP Site – 60-Meter Level

Site Name: STP **Period of Record: 1/1/1997 00:00 to 12/31/1997 23:00 and 1/1/1999 00:00 to 12/31/2000 23:00**
Number of Sectors Included: 1 **Width in Degrees: 22.5**
Measurement Height, m: 60 **Speed Sensor: 1** **Direction Sensor: 1**

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	1658	1347	1120	1038	1353	1835	3170	4159	3600	1372	529	222	225	304	568	1173
2	1140	818	620	547	791	1147	2235	3087	2695	855	270	81	86	158	345	784
4	648	356	237	213	346	524	1238	1855	1571	366	88	17	18	52	167	409
8	254	78	39	53	77	150	438	674	539	77	14	1	1	6	46	132
12	113	18	5	28	19	53	187	245	202	13	0	0	0	0	10	34
18	40	0	0	16	7	10	51	55	36	0	0	0	0	0	0	3
24	10	0	0	10	1	0	16	8	6	0	0	0	0	0	0	0
30	3	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 10.00 mph
Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	1363	1009	783	714	982	1429	2588	3520	2936	1033	346	118	99	84	354	950
2	971	633	460	419	630	919	1814	2611	2207	672	184	47	43	43	217	657
4	573	276	185	170	296	446	969	1546	1282	308	62	8	13	15	108	349
8	229	64	31	44	70	142	309	553	442	70	10	0	1	1	37	118
12	101	16	3	25	19	53	121	206	164	11	0	0	0	0	7	31
18	37	0	0	16	7	10	43	53	28	0	0	0	0	0	0	1
24	10	0	0	10	1	0	16	8	4	0	0	0	0	0	0	0
30	3	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.7-8 Wind Direction Persistence/Wind Speed Distributions for the STP Site – 60-Meter Level (Continued)

Speed Greater than or Equal to: 15.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	768	432	275	233	367	597	986	1471	1387	471	132	26	37	20	165	576
2	517	251	143	132	213	384	676	1045	988	299	65	3	14	6	97	383
4	283	99	48	60	97	208	382	593	534	130	12	0	3	1	46	195
8	97	20	3	35	27	74	128	221	172	16	0	0	0	0	12	67
12	36	3	0	24	4	24	51	97	63	4	0	0	0	0	0	14
18	11	0	0	15	0	3	12	22	12	0	0	0	0	0	0	0
24	3	0	0	9	0	0	5	5	2	0	0	0	0	0	0	0
30	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 20.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	241	60	20	37	80	191	233	410	335	139	25	3	16	4	60	234
2	148	21	5	19	45	123	147	254	212	75	8	0	7	0	34	149
4	69	6	0	8	19	60	75	115	101	32	1	0	2	0	14	67
8	8	0	0	0	3	14	15	25	23	6	0	0	0	0	1	19
12	0	0	0	0	0	3	0	6	4	0	0	0	0	0	0	2
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.7-8 Wind Direction Persistence/Wind Speed Distributions for the STP Site – 60-Meter Level (Continued)

Speed Greater than or Equal to: 25.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	45	3	1	0	1	22	27	75	51	20	8	0	5	0	7	65
2	25	0	0	0	0	9	10	33	29	9	3	0	2	0	3	31
4	8	0	0	0	0	2	0	5	16	1	0	0	0	0	1	13
8	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	3
12	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 30.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	WSW	SW	WSW	W	WNW	NW	NNW
1	5	0	0	0	0	3	5	13	10	1	2	0	2	0	0	11
2	1	0	0	0	0	1	2	5	5	0	1	0	0	0	0	7
4	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	3
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, and 2000.

Table 2.7-9 Seasonal and Annual Vertical Stability Class and Mean 10-Meter Level Wind Speed Distributions for the STP Site (1997, 1999, and 2000)

	Vertical Stability Categories [1]						
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Winter							
Frequency (%)	9.25	3.85	5.07	33.13	28.52	9.65	10.52
Wind Speed (m/sec)	5.9	5.5	5.4	5.4	4.2	2.8	2.0
Spring							
Frequency (%)	11.63	6.43	7.27	39.27	24.12	6.70	4.57
Wind Speed (m/sec)	6.1	5.5	5.6	5.4	3.7	2.3	1.9
Summer							
Frequency (%)	19.74	5.62	6.44	20.02	32.27	13.05	2.87
Wind Speed (m/sec)	4.8	4.3	4.3	4.2	3.4	1.8	1.5
Fall							
Frequency (%)	14.33	5.32	4.57	22.04	23.35	13.28	17.10
Wind Speed (m/sec)	4.5	4.6	4.9	4.8	3.4	2.3	1.9
Annual							
Frequency (%)	13.73	5.31	5.85	28.67	27.07	10.65	8.72
Wind Speed (m/sec)	5.2	5.0	5.1	5.1	3.7	2.3	1.9

[1] Vertical stability based on temperature difference (ΔT) between 60-meter and 10-meter measurement levels.

Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, 2000.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: Speed: PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: A ΔT Extremely Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	1	6	15	40	29	19	0	0	0	110
NNE	0	0	0	1	4	20	39	27	4	0	0	0	95
NE	0	0	0	2	3	25	58	19	3	0	0	0	110
ENE	0	0	0	1	4	12	38	9	3	0	0	0	67
E	0	0	0	0	2	11	27	14	11	0	0	0	65
ESE	0	0	0	0	5	9	36	38	37	0	0	0	125
SE	0	0	0	0	3	11	114	144	63	2	0	0	337
SSE	0	0	0	0	1	13	119	186	86	1	0	0	406
S	0	0	0	0	4	46	450	588	79	2	0	0	1169
SSW	0	0	0	0	7	39	206	140	37	0	0	0	429
SW	0	0	0	1	2	34	72	43	18	0	0	0	170
WSW	0	0	0	0	6	10	13	6	5	0	0	0	40
W	0	0	0	0	4	11	16	4	3	0	0	0	38
WNW	0	0	0	2	3	31	26	16	3	0	0	0	81
NW	0	0	0	2	5	15	25	32	17	0	0	0	96
NNW	0	0	0	1	1	22	52	45	32	1	0	0	154
Totals	0	0	0	11	60	324	1331	1340	420	6	0	0	3492

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	3492
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: B ΔT Moderately Unstable

Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	2	4	8	21	9	9	0	0	0	53
NNE	0	0	0	0	2	8	29	10	4	0	0	0	53
NE	0	0	0	0	2	14	26	9	1	0	0	0	52
ENE	0	0	0	2	2	8	24	9	1	0	0	0	46
E	0	0	0	1	2	6	15	7	5	1	0	0	37
ESE	0	0	0	0	4	4	29	45	23	2	0	0	107
SE	0	0	0	0	1	14	73	100	48	0	0	0	236
SSE	0	0	0	1	6	18	86	90	27	0	0	0	228
S	0	0	0	1	3	20	140	80	19	0	0	0	263
SSW	0	0	0	0	0	18	37	11	4	0	0	0	70
SW	0	0	0	0	3	7	12	11	2	0	0	0	35
WSW	0	0	0	0	2	10	9	1	0	0	0	0	22
W	0	0	0	0	2	6	3	2	1	1	0	0	15
WNW	0	0	1	0	2	15	6	1	3	0	0	0	28
NW	0	0	0	2	1	6	11	13	8	0	0	0	41
NNW	0	0	0	2	1	10	17	24	10	1	0	0	65
Totals	0	0	1	11	37	172	538	422	165	5	0	0	1351

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	1351
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: C ΔT Slightly Unstable

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	1	1	4	8	23	23	21	0	0	0	81
NNE	0	0	0	1	3	12	43	10	2	0	0	0	71
NE	0	0	0	2	2	11	44	14	1	0	0	0	74
ENE	0	0	0	6	2	12	33	7	6	0	0	0	66
E	0	0	0	0	3	16	23	21	16	3	0	0	82
ESE	0	0	0	1	3	9	17	45	39	5	0	0	119
SE	0	0	0	0	5	8	81	123	52	2	0	0	271
SSE	0	0	0	1	0	11	86	107	24	1	0	0	230
S	0	0	0	0	2	17	94	51	3	0	0	0	167
SSW	0	0	0	0	2	19	44	11	3	0	0	0	79
SW	0	0	0	0	3	11	21	5	0	0	0	0	40
WSW	0	0	0	0	1	4	2	4	0	0	0	0	11
W	0	0	0	1	4	10	4	0	0	0	0	0	19
WNW	0	0	0	2	5	13	8	4	1	0	0	0	33
NW	0	0	2	2	7	7	12	14	7	2	0	0	53
NNW	0	0	0	1	3	12	25	23	25	2	0	0	91
Totals	0	0	3	18	49	180	560	462	200	15	0	0	1487

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	1487
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: D ΔT Neutral

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	1	9	18	67	251	307	157	10	0	0	820
NNE	0	0	1	9	17	67	290	159	48	0	0	0	591
NE	0	0	1	10	19	64	180	75	12	0	0	0	361
ENE	0	0	0	10	11	56	167	111	31	0	0	0	386
E	0	0	1	8	14	46	155	183	88	3	0	0	498
ESE	0	0	0	9	13	41	219	223	131	3	0	0	639
SE	0	0	0	10	14	65	371	450	124	6	2	0	1042
SSE	0	0	0	3	11	60	413	391	103	8	0	0	989
S	0	0	0	3	13	60	381	198	21	1	0	0	677
SSW	0	0	0	0	3	36	130	76	3	0	0	0	248
SW	0	0	0	2	3	10	54	23	3	0	0	0	95
WSW	0	0	1	1	3	9	23	6	1	0	0	0	44
W	0	0	0	3	7	16	17	4	2	0	0	0	49
WNW	0	0	0	10	12	22	28	11	1	0	0	0	84
NW	0	0	0	9	17	42	58	49	43	0	0	0	218
NNW	0	0	1	12	16	46	158	182	117	16	0	0	548
Totals	0	0	6	108	191	707	2895	2448	885	47	2	0	7289

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	7289
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: E ΔT Slightly Stable

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	3	24	30	78	162	68	30	0	0	0	395
NNE	0	1	4	14	37	115	232	30	0	0	0	0	433
NE	0	1	3	27	48	122	128	21	1	0	0	0	351
ENE	0	0	6	24	44	89	105	24	0	0	0	0	292
E	0	1	5	22	37	130	162	25	9	0	0	0	391
ESE	0	0	5	33	59	192	246	47	2	0	0	0	584
SE	0	0	6	21	62	379	409	120	13	0	1	0	1011
SSE	0	0	3	13	34	403	663	228	37	0	0	0	1381
S	0	0	2	6	20	172	567	93	9	0	0	0	869
SSW	0	1	0	4	8	98	249	27	0	0	0	0	387
SW	0	0	2	2	2	24	107	18	1	0	0	0	156
WSW	1	0	1	7	9	16	37	5	1	0	0	0	77
W	0	0	3	8	8	31	15	0	0	0	0	0	65
WNW	0	0	2	9	19	21	12	3	2	0	0	0	68
NW	0	0	1	15	18	39	50	22	4	0	0	0	149
NNW	0	1	3	18	31	48	119	43	9	1	0	0	273
Totals	1	5	49	247	466	1957	3263	774	118	1	1	0	6882

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	6882
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: F ΔT Moderately Stable

Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	1	6	28	29	54	41	2	0	0	0	0	161
NNE	0	2	14	43	49	67	52	0	0	0	0	0	227
NE	0	3	16	59	83	80	29	0	0	0	0	0	270
ENE	0	3	9	58	61	83	16	0	1	0	0	0	231
E	0	0	8	71	69	98	28	0	0	0	0	0	274
ESE	0	0	5	91	109	119	20	1	1	0	0	0	346
SE	0	1	3	45	153	205	28	0	0	0	0	0	435
SSE	0	0	0	17	41	167	32	1	3	0	0	0	261
S	0	0	0	5	15	26	36	2	0	0	0	0	84
SSW	0	0	0	4	4	6	12	0	0	0	0	0	26
SW	0	0	0	0	4	6	11	0	0	0	0	0	21
WSW	0	0	0	1	3	5	8	2	0	0	0	0	19
W	0	1	1	4	17	17	4	0	0	0	0	0	44
WNW	0	3	8	22	29	17	4	1	0	0	0	0	84
NW	0	0	7	24	38	32	13	0	0	0	0	0	114
NNW	0	0	2	23	28	40	16	1	0	0	0	0	110
Totals	0	14	79	495	732	1022	350	10	5	0	0	0	2707

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	2707
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: Speed: PT SPD10 Direction: PT DIR10 Lapse: PT DT60-10

Stability Class: G ΔT Extremely Stable

Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
	Wind Speed (m/s)												
N	1	3	18	50	41	46	15	0	0	0	0	0	174
NNE	0	2	12	85	125	69	27	0	0	0	0	0	320
NE	1	5	15	108	120	102	18	0	0	0	0	0	369
ENE	1	2	19	100	112	52	3	0	0	0	0	0	289
E	0	6	10	73	89	65	13	0	0	0	0	0	256
ESE	0	4	9	57	81	68	5	1	0	0	0	0	225
SE	1	2	5	26	66	47	0	0	0	0	0	0	147
SSE	0	1	3	6	12	26	2	0	0	0	0	0	50
S	0	1	3	3	1	5	0	0	0	0	0	0	13
SSW	0	0	1	2	0	3	0	0	0	0	0	0	6
SW	0	3	2	0	1	0	0	0	0	0	0	0	6
WSW	1	0	1	1	0	0	3	0	0	0	0	0	6
W	0	4	3	8	6	19	3	0	0	0	0	0	43
WNW	0	6	9	29	29	28	0	0	0	0	0	0	101
NW	0	2	10	22	35	25	4	0	0	0	0	0	98
NNW	0	3	13	33	29	28	8	0	0	0	0	0	114
Totals	5	44	133	603	747	583	101	1	0	0	0	0	2217

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	2217
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-10 Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Summary of All Stability Classes ΔT

	Wind Speed (m/s)												
Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	1	4	29	115	132	276	553	438	236	10	0	0	1794
NNE	0	5	31	153	237	358	712	236	58	0	0	0	1790
NE	1	9	35	208	277	418	483	138	18	0	0	0	1587
ENE	1	5	34	201	236	312	386	160	42	0	0	0	1377
E	0	7	24	175	216	372	423	250	129	7	0	0	1603
ESE	0	4	19	191	274	442	572	400	233	10	0	0	2145
SE	1	3	14	102	304	729	1076	937	300	10	3	0	3479
SSE	0	1	6	41	105	698	1401	1003	280	10	0	0	3545
S	0	1	5	18	58	346	1668	1012	131	3	0	0	3242
SSW	0	1	1	10	24	219	678	265	47	0	0	0	1245
SW	0	3	4	5	18	92	277	100	24	0	0	0	523
WSW	2	0	3	10	24	54	95	24	7	0	0	0	219
W	0	5	7	24	48	110	62	10	6	1	0	0	273
WNW	0	9	20	74	99	147	84	36	10	0	0	0	479
NW	0	2	20	76	121	166	173	130	79	2	0	0	769
NNW	0	4	19	90	109	206	395	318	193	21	0	0	1355
Totals	6	63	271	1493	2282	4945	9038	5457	1793	74	3	0	25425

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	879
Number of Valid Hours for this Table	25425
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, and 2000.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: A ΔT Extremely Unstable

	Wind Speed (m/s)												
Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	0	1	10	26	38	24	4	0	0	103
NNE	0	0	0	2	3	8	31	38	19	0	0	0	101
NE	0	0	0	0	3	10	49	32	9	0	0	0	103
ENE	0	0	0	1	1	10	29	15	3	0	0	0	59
E	0	0	0	0	1	8	22	19	12	0	0	0	62
ESE	0	0	0	0	3	3	21	42	48	8	0	0	125
SE	0	0	0	0	1	4	61	173	70	21	0	0	330
SSE	0	0	0	0	0	4	57	146	152	42	0	0	401
S	0	0	0	0	1	15	160	547	363	53	7	0	1146
SSW	0	0	0	0	1	24	115	125	114	37	0	0	416
SW	0	0	0	0	2	15	55	39	22	5	0	0	138
WSW	0	0	0	0	2	3	14	10	2	1	0	0	32
W	0	0	0	0	2	9	17	8	5	2	0	0	43
WNW	0	0	0	0	4	22	23	15	3	0	0	0	67
NW	0	0	0	2	4	8	27	23	19	6	0	0	89
NNW	0	0	0	2	1	16	39	34	42	19	1	0	154
Totals	0	0	0	7	30	169	746	1304	907	198	8	0	3369

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	3369
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: Speed: PT SPD10 Direction: PT DIR10 Lapse: PT DT60-10

Stability Class: B ΔT Moderately Unstable

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	1	0	1	2	5	16	7	15	1	0	0	48
NNE	0	0	0	0	0	11	16	20	7	0	0	0	54
NE	0	0	0	0	1	8	22	19	4	0	0	0	54
ENE	0	0	0	2	1	7	13	10	5	0	0	0	38
E	0	0	0	1	1	5	14	14	4	1	0	0	40
ESE	0	0	0	0	1	8	15	41	35	5	1	0	106
SE	0	0	0	0	1	6	42	92	67	11	0	0	219
SSE	0	0	0	0	1	13	43	97	67	9	1	0	231
S	0	0	0	0	1	11	57	94	60	19	1	0	243
SSW	0	0	0	0	0	16	26	16	16	3	0	0	77
SW	0	0	0	0	2	3	15	4	7	0	0	0	31
WSW	0	0	0	0	2	3	9	5	0	0	0	0	19
W	0	0	0	1	0	6	5	0	2	1	1	0	16
WNW	0	0	0	0	2	11	6	1	3	0	0	0	23
NW	0	0	0	2	2	7	10	12	6	3	0	0	42
NNW	0	0	0	0	2	4	10	18	17	11	1	0	63
Totals	0	1	0	7	19	124	319	450	315	64	5	0	1304

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	1304
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: C ΔT Slightly Unstable

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	1	2	8	16	14	29	6	0	0	76
NNE	0	0	0	2	1	11	37	17	6	0	0	0	74
NE	0	0	0	1	0	6	30	21	6	0	0	0	64
ENE	0	0	0	4	2	11	30	16	9	1	0	0	73
E	0	0	0	1	2	8	18	21	21	4	0	0	75
ESE	0	0	0	0	3	6	13	34	53	14	1	0	124
SE	0	0	0	0	2	3	38	103	75	20	0	0	241
SSE	0	0	0	0	2	7	35	92	87	9	2	0	234
S	0	0	0	0	0	8	36	56	42	6	1	0	149
SSW	0	0	0	0	1	8	25	17	13	4	0	0	68
SW	0	0	0	0	2	6	10	6	6	0	0	0	30
WSW	0	0	1	0	0	3	5	2	1	0	0	0	12
W	0	0	0	0	3	6	6	0	0	0	0	0	15
WNW	0	0	0	0	4	16	5	6	2	0	0	0	33
NW	0	0	0	2	6	3	10	10	5	2	2	0	40
NNW	0	0	0	0	2	5	20	17	25	18	1	0	88
Totals	0	0	1	11	32	115	334	432	380	84	7	0	1396

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	1396
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: D ΔT Neutral

Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	4	8	23	138	224	347	73	7	0	824
NNE	0	0	0	0	12	28	155	176	157	10	0	0	538
NE	0	0	0	4	5	30	117	139	54	5	0	0	354
ENE	0	0	0	9	6	32	77	140	105	7	0	0	376
E	0	0	0	4	5	15	81	151	171	16	0	0	443
ESE	0	0	0	1	6	36	90	234	217	42	2	0	628
SE	0	0	0	3	4	30	153	352	383	40	6	0	971
SSE	0	0	0	2	8	24	139	340	431	78	10	0	1032
S	0	0	0	1	3	14	91	244	233	32	5	0	623
SSW	0	0	0	1	2	11	44	89	79	11	1	0	238
SW	0	0	0	1	1	2	21	35	23	1	1	0	85
WSW	0	0	0	0	4	5	17	13	4	0	0	0	43
W	0	0	0	2	3	8	16	12	7	1	0	0	49
WNW	0	0	1	4	11	16	29	6	4	0	0	0	71
NW	0	0	1	3	7	28	44	48	60	9	1	0	201
NNW	0	0	0	5	9	29	66	154	172	76	12	0	523
Totals	0	0	2	44	94	331	1278	2357	2447	401	45	0	6999

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	6999
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: E ΔT Slightly Stable

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	0	0	3	15	68	179	108	15	0	0	388
NNE	0	0	0	3	6	15	71	168	89	0	0	0	352
NE	0	0	1	1	7	14	90	130	56	1	0	0	300
ENE	0	0	1	3	2	27	89	132	29	1	0	0	284
E	0	0	0	0	11	24	110	173	34	2	0	0	354
ESE	0	0	0	1	5	19	149	231	53	0	0	0	458
SE	0	0	0	3	4	27	294	381	132	5	0	0	846
SSE	0	0	0	2	9	24	326	764	336	28	2	1	1492
S	0	0	0	0	4	14	212	414	295	17	2	0	958
SSW	0	0	0	2	3	6	116	240	102	5	0	0	474
SW	0	0	0	2	3	6	49	80	32	1	0	0	173
WSW	0	0	0	2	3	3	31	19	6	0	0	0	64
W	0	0	0	2	0	9	13	7	9	0	1	0	41
WNW	0	0	0	2	5	17	28	4	3	0	0	0	59
NW	0	0	0	2	4	12	41	43	15	0	0	0	117
NNW	0	0	0	3	2	13	49	69	74	15	1	0	226
Totals	0	0	2	28	71	245	1736	3034	1373	90	6	1	6586

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	6586
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: F ΔT Moderately Stable

	Wind Speed (m/s)												
Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	1	1	2	11	37	60	22	1	0	0	135
NNE	0	0	0	4	4	15	35	52	36	0	0	0	146
NE	0	0	1	2	6	11	37	31	37	0	0	0	125
ENE	0	0	0	2	7	12	61	32	6	1	0	0	121
E	0	0	1	4	9	16	77	108	12	0	0	0	227
ESE	0	0	1	4	8	17	101	70	9	0	0	0	210
SE	0	0	0	3	6	26	158	132	3	0	0	0	328
SSE	0	0	0	2	7	31	271	224	10	2	0	0	547
S	0	0	1	0	4	20	183	63	34	0	0	0	305
SSW	0	0	0	1	4	12	34	14	8	0	0	0	73
SW	0	0	0	4	0	3	30	8	5	0	0	0	50
WSW	0	0	1	4	0	10	13	9	4	0	0	0	41
W	0	0	0	3	2	10	15	10	2	0	0	0	42
WNW	0	0	2	5	3	24	31	3	1	0	0	0	69
NW	0	0	0	3	3	8	36	19	6	0	0	0	75
NNW	0	0	0	2	2	9	18	29	12	1	0	0	73
Totals	0	0	8	44	67	235	1137	864	207	5	0	0	2567

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	2567
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Hours at Each Wind Speed and Direction

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Stability Class: G ΔT Extremely Stable

	Wind Speed (m/s)												
Wind Direction (from)	0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	0	2	0	2	17	31	27	16	0	0	0	95
NNE	0	0	1	6	6	16	37	48	23	1	0	0	138
NE	0	1	1	1	3	18	43	47	44	0	0	0	158
ENE	0	1	4	7	7	17	53	51	15	0	0	0	155
E	0	2	1	5	8	21	101	62	12	0	0	0	212
ESE	0	0	0	10	9	27	92	86	14	0	0	0	238
SE	0	0	2	5	13	35	126	104	5	0	0	0	290
SSE	0	0	1	6	9	34	119	90	15	0	0	0	274
S	0	0	1	5	7	21	122	27	5	0	0	0	188
SSW	0	0	0	2	5	7	27	4	0	0	0	0	45
SW	0	0	2	1	4	9	19	3	1	0	0	0	39
WSW	0	0	1	3	3	8	11	13	1	0	0	0	40
W	0	0	1	1	7	9	10	10	2	3	0	0	43
WNW	0	0	0	4	3	10	27	3	3	0	0	0	50
NW	0	0	2	5	2	8	22	10	3	0	0	0	52
NNW	0	0	1	5	4	16	24	29	12	0	0	0	91
Totals	0	4	20	66	92	273	864	614	171	4	0	0	2108

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	2108
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.

Table 2.7-11 Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the STP Site (1997, 1999, and 2000) (Continued)

Period of Record: 1997, 1999, 2000 Total Period

Elevation: **Speed:** PT SPD10 **Direction:** PT DIR10 **Lapse:** PT DT60-10

Summary of All Stability Classes ΔT

Wind Direction (from)	Wind Speed (m/s) 0.23-0.50	0.51-0.75	0.76-1.00	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	> 18.0	Total
N	0	1	3	7	20	89	332	549	561	100	7	0	1669
NNE	0	0	1	17	32	104	382	519	337	11	0	0	1403
NE	0	1	3	9	25	97	388	419	210	6	0	0	1158
ENE	0	1	5	28	26	116	352	396	172	10	0	0	1106
E	0	2	2	15	37	97	423	548	266	23	0	0	1413
ESE	0	0	1	16	35	116	481	738	429	69	4	0	1889
SE	0	0	2	14	31	131	872	1337	735	97	6	0	3225
SSE	0	0	1	12	36	137	990	1753	1098	168	15	1	4211
S	0	0	2	6	20	103	861	1445	1032	127	16	0	3612
SSW	0	0	0	6	16	84	387	505	332	60	1	0	1391
SW	0	0	2	8	14	44	199	175	96	7	1	0	546
WSW	0	0	3	9	14	35	100	71	18	1	0	0	251
W	0	0	1	9	17	57	82	47	27	7	2	0	249
WNW	0	0	3	15	32	116	149	38	19	0	0	0	372
NW	0	0	3	19	28	74	190	165	114	20	3	0	616
NNW	0	0	1	17	22	92	226	350	354	140	16	0	1218
Totals	0	5	33	207	405	1492	6414	9055	5800	846	71	1	24329

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	1975
Number of Valid Hours for this Table	24329
Total Hours for the Period	26304

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-Meter and 10-Meter measurement levels.
Reference: STP Meteorological Onsite Monitoring Program 1997, 1999, and 2000.

Table 2.7-12 EAB and LPZ Distances from STP Units 3 & 4

Distance from STP Unit 3				
Directional Sector	To EAB (feet)	To EAB (meters)	To LPZ (feet)	To LPZ (meters)
N	3,431	1,046	14,180	4,323
NNE	3,831	1,168	14,761	4,500
NE	4,731	1,443	15,416	4,699
ENE	5,870	1,790	16,157	4,925
E	6,745	2,056	16,855	5,138
ESE	7,356	2,243	17,408	5,306
SE	7,381	2,250	17,697	5,395
SSE	6,567	2,002	17,672	5,387
S	6,112	1,863	17,337	5,285
SSW	5,973	1,821	16,759	5,109
SW	5,421	1,653	16,154	4,924
WSW	4,534	1,382	15,309	4,667
W	4,173	1,272	14,675	4,473
WNW	3,945	1,203	14,210	4,332
NW	3,638	1,109	13,978	4,261
NNW	3,497	1,066	13,996	4,267

Table 2.7-12 EAB and LPZ Distances from STP Units 3 & 4 (Continued)

Distance from STP 4				
Directional Sector	To EAB (feet)	To EAB (meters)	To LPZ (feet)	To LPZ (meters)
N	3,326	1,014	14,180	4,323
NNE	3,746	1,142	14,998	4,572
NE	4,943	1,507	15,970	4,868
ENE	6,519	1,987	16,945	5,165
E	7,648	2,332	17,760	5,414
ESE	8,208	2,502	18,257	5,565
SE	7,881	2,403	18,333	5,588
SSE	6,584	2,007	17,973	5,479
S	6,036	1,840	17,250	5,258
SSW	5,413	1,650	16,307	4,971
SW	4,499	1,372	15,320	4,670
WSW	3,558	1,085	14,433	4,400
W	3,273	998	13,770	4,198
WNW	3,201	976	13,396	4,084
NW	3,050	930	13,340	4,067
NNW	3,122	952	13,610	4,149

Table 2.7-13 Shortest Distances from STP 3 & 4 to EAB and LPZ

Directional Sector	Unit	To EAB (feet)	To EAB (meters)	Unit	To LPZ (feet)	To LPZ (meters)
N	4	3,326	1,014	3 & 4	14,180	4,323
NNE	4	3,746	1,142	3	14,761	4,500
NE	3	4,731	1,443	3	15,416	4,699
ENE	3	5,870	1,790	3	16,157	4,925
E	3	6,745	2,056	3	16,855	5,138
ESE	3	7,356	2,243	3	17,408	5,306
SE	3	7,381	2,250	3	17,697	5,395
SSE	3	6,567	2,002	3	17,672	5,387
S	4	6,036	1,840	4	17,250	5,258
SSW	4	5,413	1,650	4	16,307	4,971
SW	4	4,499	1,372	4	15,320	4,670
WSW	4	3,558	1,085	4	14,433	4,400
W	4	3,273	998	4	13,770	4,198
WNW	4	3,201	976	4	13,396	4,084
NW	4	3,050	930	4	13,340	4,067
NNW	4	3,122	952	4	13,610	4,149

Table 2.7-14 Distances to Sensitive Receptors

	Distance to Nearest Milk Cow, Residence, Vegetable Garden, and Meat Animal (meters) from		Distance to Nearest Milk Cow, Residence, Vegetable Garden, and Meat Animal (meters) from		Closest of two (meters)
Direction	Center of 1 & 2	Center of 3 & 4	Unit 4	Unit 3	Unit 3 or 4
N	5,600	5,174	5,193	5,158	5,158
NNE	8,000	7,858	7,924	7,794	7,794
NE	8,000	8,000	8,278	8,066	8,000
ENE	8,000	8,000	8,585	8,324	8,000
E	8,000	8,000	8,805	8,531	8,000
ESE	5,600	6,387	8,585	6,262	6,262
SE	5,600	6,396	6,495	6,297	6,297
SSE	8,000	8,000	8,794	8,658	8,000
S	0	0	0	0	0
SSW	8,000	8,000	8,180	8,260	8,000
SW	7,200	7,112	7,027	7,198	7,027
WSW	4,000	3,632	3,517	3,748	3,517
W	7,200	6,561	6,425	6,698	6,425
WNW	6,400	5,619	5,490	5,747	5,490
NW	7,200	6,407	6,313	6,503	6,313
NNW	5,600	4,936	4,896	4,979	4,896

Notes: If distance is greater than 8,000 the distance is taken as 8,000
If a pathway is not applicable, the receptor destance is 0

Table 2.7-15 XOQDOQ-Predicted Maximum χ/Q and D/Q Values at Receptors of Interest

	Type of Location	Direction from Site	Distance (miles)	X/Q (sec/m³)
No Decay	EAB	NW	0.58	1.30E-05
	Residence	WSW	2.19	6.20E-07
	Meat Animal	WSW	2.19	6.20E-07
	Vegetable Garden	WSW	2.19	6.20E-07
	Unit 4 Reactor	WNW	0.17	8.30E-05
2.26-Day Decay	EAB	NW	0.58	1.30E-05
	Residence	WSW	2.19	6.20E-07
	Meat Animal	WSW	2.19	6.20E-07
	Vegetable Garden	WSW	2.19	6.20E-07
	Unit 4 Reactor	WNW	0.17	8.30E-05
8-Day Decay	EAB	NW	0.58	1.20E-05
	Residence	WSW	2.19	5.10E-07
	Meat Animal	WSW	2.19	5.10E-07
	Vegetable Garden	WSW	2.19	5.10E-07
	Unit 4 Reactor	WNW	0.17	8.00E-05
	Type of Location	**Direction from Site**	**Distance (miles)**	**D/Q (1/m²)**
	EAB	NW	0.58	8.50E-08
	Residence	NNW	3.04	1.80E-09
	Meat Animal	NNW	3.04	1.80E-09
	Vegetable Garden	NNW	3.04	1.80E-09
	Unit 4 Reactor	WNW	0.17	3.40E-07

Table 2.7-16 XOQDOQ-Predicted Annual Average χ/Q Values at the Standard Radial Distances and Distance-Segment Boundaries

No Decay χ/Qs at Various Segments

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	.250	.500	.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	7.560E-06	2.445E-06	1.270E-06	8.399E-07	4.716E-07	3.144E-07	2.302E-07	1.788E-07	1.445E-07	1.204E-07	1.025E-0
SSW	1.023E-05	3.238E-06	1.672E-06	1.118E-06	6.363E-07	4.281E-07	3.156E-07	2.464E-07	2.001E-07	1.673E-07	1.430E-0
SW	1.132E-05	3.527E-06	1.819E-06	1.223E-06	7.015E-07	4.744E-07	3.510E-07	2.749E-07	2.238E-07	1.875E-07	1.605E-0
WSW	9.714E-06	3.034E-06	1.565E-06	1.051E-06	6.022E-07	4.068E-07	3.008E-07	2.354E-07	1.916E-07	1.604E-07	1.373E-0
W	9.498E-06	3.019E-06	1.578E-06	1.054E-06	5.998E-07	4.033E-07	2.972E-07	2.320E-07	1.883E-07	1.574E-07	1.344E-0
WNW	1.066E-05	3.458E-06	1.832E-06	1.216E-06	6.856E-07	4.582E-07	3.361E-07	2.614E-07	2.116E-07	1.764E-07	1.504E-0
NW	1.229E-05	4.107E-06	2.200E-06	1.441E-06	7.980E-07	5.272E-07	3.834E-07	2.961E-07	2.383E-07	1.977E-07	1.678E-0
NNW	9.566E-06	3.343E-06	1.799E-06	1.163E-06	6.330E-07	4.134E-07	2.980E-07	2.285E-07	1.829E-07	1.509E-07	1.275E-0
N	6.030E-06	2.030E-06	1.066E-06	6.793E-07	3.662E-07	2.376E-07	1.705E-07	1.303E-07	1.040E-07	8.562E-08	7.220E-0
NNE	2.538E-06	8.642E-07	4.547E-07	2.899E-07	1.562E-07	1.014E-07	7.273E-08	5.558E-08	4.435E-08	3.652E-08	3.079E-0
NE	1.251E-06	4.120E-07	2.143E-07	1.379E-07	7.526E-08	4.926E-08	3.559E-08	2.736E-08	2.194E-08	1.814E-08	1.535E-0
ENE	8.038E-07	2.720E-07	1.437E-07	9.316E-08	5.110E-08	3.355E-08	2.430E-08	1.870E-08	1.502E-08	1.243E-08	1.053E-0
E	1.718E-06	5.446E-07	2.828E-07	1.882E-07	1.066E-07	7.151E-08	5.261E-08	4.102E-08	3.328E-08	2.779E-08	2.372E-0
ESE	3.626E-06	1.113E-06	5.726E-07	3.845E-07	2.205E-07	1.491E-07	1.103E-07	8.639E-08	7.034E-08	5.892E-08	5.044E-0
SE	4.113E-06	1.300E-06	6.779E-07	4.507E-07	2.550E-07	1.709E-07	1.256E-07	9.782E-08	7.931E-08	6.619E-08	5.648E-0
SSE	5.363E-06	1.732E-06	8.995E-07	5.934E-07	3.323E-07	2.212E-07	1.617E-07	1.255E-07	1.014E-07	8.438E-08	7.182E-0

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	8.884E-08	5.152E-08	3.517E-08	2.067E-08	1.424E-08	1.070E-08	8.477E-09	6.970E-09	5.887E-09	5.075E-09	4.446E-0
SSW	1.243E-07	7.283E-08	5.008E-08	2.973E-08	2.062E-08	1.556E-08	1.238E-08	1.021E-08	8.650E-09	7.475E-09	6.562E-0
SW	1.397E-07	8.235E-08	5.684E-08	3.391E-08	2.361E-08	1.786E-08	1.424E-08	1.176E-08	9.976E-09	8.631E-09	7.585E-0
WSW	1.195E-07	7.035E-08	4.852E-08	2.892E-08	2.012E-08	1.522E-08	1.213E-08	1.002E-08	8.494E-09	7.348E-09	6.456E-0
W	1.168E-07	6.840E-08	4.700E-08	2.786E-08	1.931E-08	1.456E-08	1.157E-08	9.541E-09	8.076E-09	6.976E-09	6.121E-0
WNW	1.304E-07	7.585E-08	5.186E-08	3.054E-08	2.107E-08	1.583E-08	1.255E-08	1.032E-08	8.716E-09	7.514E-09	6.583E-0
NW	1.450E-07	8.319E-08	5.634E-08	3.276E-08	2.241E-08	1.673E-08	1.319E-08	1.080E-08	9.088E-09	7.808E-09	6.820E-0
NNW	1.098E-07	6.205E-08	4.159E-08	2.382E-08	1.613E-08	1.194E-08	9.353E-09	7.615E-09	6.376E-09	5.455E-09	4.746E-0
N	6.207E-08	3.495E-08	2.338E-08	1.337E-08	9.046E-09	6.700E-09	5.250E-09	4.277E-09	3.583E-09	3.067E-09	2.670E-0
NNE	2.647E-08	1.488E-08	9.945E-09	5.680E-09	3.843E-09	2.845E-09	2.229E-09	1.815E-09	1.521E-09	1.301E-09	1.133E-0
NE	1.324E-08	7.546E-09	5.092E-09	2.949E-09	2.016E-09	1.505E-09	1.187E-09	9.720E-10	8.182E-10	7.033E-10	6.145E-1
ENE	9.089E-09	5.194E-09	3.509E-09	2.034E-09	1.388E-09	1.035E-09	8.149E-10	6.666E-10	5.605E-10	4.813E-10	4.202E-1
E	2.061E-08	1.206E-08	8.280E-09	4.908E-09	3.403E-09	2.567E-09	2.042E-09	1.684E-09	1.426E-09	1.232E-09	1.081E-0
ESE	4.392E-08	2.592E-08	1.790E-08	1.069E-08	7.454E-09	5.644E-09	4.503E-09	3.723E-09	3.160E-09	2.735E-09	2.405E-0
SE	4.904E-08	2.863E-08	1.963E-08	1.161E-08	8.042E-09	6.060E-09	4.816E-09	3.969E-09	3.359E-09	2.900E-09	2.545E-0
SSE	6.222E-08	3.604E-08	2.458E-08	1.444E-08	9.947E-09	7.468E-09	5.917E-09	4.865E-09	4.109E-09	3.542E-09	3.103E-0

Table 2.7-16 XOQDOQ-Predicted Annual Average χ/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

No Decay at Various Segments

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-
S	1.340E-06	4.836E-07	2.321E-07	1.451E-07	1.027E-07	5.254E-08	2.104E-08	1.075E-08	6.98
SSW	1.774E-06	6.507E-07	3.179E-07	2.009E-07	1.432E-07	7.415E-08	3.020E-08	1.564E-08	1.02
SW	1.933E-06	7.164E-07	3.535E-07	2.246E-07	1.608E-07	8.376E-08	3.443E-08	1.794E-08	1.17
WSW	1.663E-06	6.151E-07	3.029E-07	1.922E-07	1.375E-07	7.156E-08	2.937E-08	1.529E-08	1.00
W	1.665E-06	6.135E-07	2.994E-07	1.890E-07	1.347E-07	6.965E-08	2.831E-08	1.463E-08	9.56
WNW	1.920E-06	7.024E-07	3.388E-07	2.125E-07	1.507E-07	7.732E-08	3.107E-08	1.591E-08	1.03
NW	2.286E-06	8.205E-07	3.868E-07	2.394E-07	1.682E-07	8.500E-08	3.340E-08	1.683E-08	1.08
NNW	1.859E-06	6.531E-07	3.010E-07	1.838E-07	1.279E-07	6.356E-08	2.435E-08	1.202E-08	7.64
N	1.108E-06	3.786E-07	1.723E-07	1.045E-07	7.242E-08	3.583E-08	1.367E-08	6.746E-09	4.29
NNE	4.724E-07	1.616E-07	7.351E-08	4.458E-08	3.089E-08	1.526E-08	5.812E-09	2.865E-09	1.82
NE	2.243E-07	7.763E-08	3.594E-08	2.204E-08	1.540E-08	7.721E-09	3.011E-09	1.514E-09	9.74
ENE	1.498E-07	5.265E-08	2.453E-08	1.509E-08	1.056E-08	5.311E-09	2.075E-09	1.041E-09	6.68
E	2.989E-07	1.091E-07	5.301E-08	3.340E-08	2.378E-08	1.228E-08	4.988E-09	2.580E-09	1.68
ESE	6.091E-07	2.252E-07	1.111E-07	7.058E-08	5.054E-08	2.635E-08	1.086E-08	5.670E-09	3.73
SE	7.152E-07	2.611E-07	1.266E-07	7.960E-08	5.660E-08	2.917E-08	1.181E-08	6.091E-09	3.97
SSE	9.485E-07	3.409E-07	1.631E-07	1.018E-07	7.199E-08	3.677E-08	1.470E-08	7.509E-09	4.87

Table 2.7-16 XOQDOQ-Predicted Annual Average χ/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

χ /Qs at Various Distances

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES

********************* RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS ********************

DIRECTION FROM SITE	DISTANCES IN MILES .25	.50	.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	4.086E-08	1.382E-08	7.094E-09	4.356E-09	2.171E-09	1.317E-09	8.904E-10	6.453E-10	4.906E-10	3.865E-10	3.129E-10
SSW	4.076E-08	1.378E-08	7.078E-09	4.346E-09	2.167E-09	1.314E-09	8.885E-10	6.438E-10	4.895E-10	3.857E-10	3.122E-10
SW	3.614E-08	1.222E-08	6.275E-09	3.853E-09	1.921E-09	1.165E-09	7.877E-10	5.708E-10	4.340E-10	3.419E-10	2.768E-10
WSW	3.136E-08	1.060E-08	5.445E-09	3.343E-09	1.667E-09	1.011E-09	6.835E-10	4.953E-10	3.766E-10	2.967E-10	2.402E-10
W	3.651E-08	1.234E-08	6.338E-09	3.892E-09	1.940E-09	1.177E-09	7.956E-10	5.766E-10	4.384E-10	3.454E-10	2.796E-10
WNW	4.885E-08	1.652E-08	8.481E-09	5.208E-09	2.596E-09	1.575E-09	1.065E-09	7.715E-10	5.866E-10	4.622E-10	3.742E-10
NW	7.923E-08	2.679E-08	1.376E-08	8.447E-09	4.211E-09	2.554E-09	1.727E-09	1.251E-09	9.515E-10	7.496E-10	6.068E-10
NNW	8.073E-08	2.730E-08	1.402E-08	8.607E-09	4.291E-09	2.602E-09	1.760E-09	1.275E-09	9.695E-10	7.638E-10	6.184E-10
N	7.383E-08	2.497E-08	1.282E-08	7.871E-09	3.924E-09	2.380E-09	1.609E-09	1.166E-09	8.867E-10	6.985E-10	5.655E-10
NNE	2.835E-08	9.588E-09	4.923E-09	3.023E-09	1.507E-09	9.140E-10	6.180E-10	4.478E-10	3.405E-10	2.683E-10	2.172E-10
NE	1.191E-08	4.028E-09	2.068E-09	1.270E-09	6.331E-10	3.839E-10	2.596E-10	1.881E-10	1.430E-10	1.127E-10	9.123E-11
ENE	4.987E-09	1.687E-09	8.659E-10	5.317E-10	2.651E-10	1.608E-10	1.087E-10	7.877E-11	5.989E-11	4.719E-11	3.820E-11
E	6.217E-09	2.102E-09	1.079E-09	6.628E-10	3.304E-10	2.004E-10	1.355E-10	9.819E-11	7.466E-11	5.882E-11	4.762E-11
ESE	1.091E-08	3.689E-09	1.894E-09	1.163E-09	5.798E-10	3.516E-10	2.378E-10	1.723E-10	1.310E-10	1.032E-10	8.355E-11
SE	1.751E-08	5.922E-09	3.041E-09	1.867E-09	9.308E-10	5.645E-10	3.817E-10	2.766E-10	2.103E-10	1.657E-10	1.341E-10
SSE	3.086E-08	1.043E-08	5.358E-09	3.290E-09	1.640E-09	9.947E-10	6.726E-10	4.874E-10	3.706E-10	2.920E-10	2.364E-10

DIRECTION FROM SITE	DISTANCES IN MILES 5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.589E-10	1.269E-10	7.959E-11	4.023E-11	2.435E-11	1.633E-11	1.170E-11	8.784E-12	6.830E-12	5.456E-12	4.453E-12
SSW	2.583E-10	1.266E-10	7.941E-11	4.014E-11	2.429E-11	1.629E-11	1.167E-11	8.764E-12	6.815E-12	5.443E-12	4.443E-12
SW	2.290E-10	1.122E-10	7.041E-11	3.559E-11	2.154E-11	1.444E-11	1.035E-11	7.770E-12	6.042E-12	4.826E-12	3.939E-12
WSW	1.987E-10	9.737E-11	6.109E-11	3.088E-11	1.869E-11	1.253E-11	8.979E-12	6.742E-12	5.242E-12	4.188E-12	3.418E-12
W	2.313E-10	1.133E-10	7.112E-11	3.595E-11	2.176E-11	1.459E-11	1.045E-11	7.849E-12	6.103E-12	4.875E-12	3.979E-12
WNW	3.095E-10	1.517E-10	9.516E-11	4.810E-11	2.911E-11	1.952E-11	1.399E-11	1.050E-11	8.166E-12	6.523E-12	5.324E-12
NW	5.020E-10	2.460E-10	1.543E-10	7.802E-11	4.722E-11	3.166E-11	2.269E-11	1.703E-11	1.324E-11	1.058E-11	8.636E-12
NNW	5.115E-10	2.507E-10	1.573E-10	7.950E-11	4.811E-11	3.226E-11	2.312E-11	1.736E-11	1.350E-11	1.078E-11	8.799E-12
N	4.678E-10	2.292E-10	1.438E-10	7.270E-11	4.400E-11	2.950E-11	2.114E-11	1.587E-11	1.234E-11	9.859E-12	8.047E-12
NNE	1.796E-10	8.803E-11	5.524E-11	2.792E-11	1.690E-11	1.133E-11	8.118E-12	6.096E-12	4.740E-12	3.786E-12	3.090E-12
NE	7.546E-11	3.698E-11	2.320E-11	1.173E-11	7.098E-12	4.759E-12	3.410E-12	2.561E-12	1.991E-12	1.590E-12	1.298E-12
ENE	3.160E-11	1.549E-11	9.716E-12	4.911E-12	2.972E-12	1.993E-12	1.428E-12	1.072E-12	8.337E-13	6.660E-13	5.436E-13
E	3.939E-11	1.930E-11	1.211E-11	6.122E-12	3.705E-12	2.484E-12	1.780E-12	1.337E-12	1.039E-12	8.302E-13	6.776E-13
ESE	6.911E-11	3.387E-11	2.125E-11	1.074E-11	6.501E-12	4.359E-12	3.123E-12	2.345E-12	1.824E-12	1.457E-12	1.189E-12
SE	1.110E-10	5.437E-11	3.412E-11	1.724E-11	1.044E-11	6.998E-12	5.014E-12	3.765E-12	2.928E-12	2.339E-12	1.909E-12
SSE	1.955E-10	9.581E-11	6.012E-11	3.039E-11	1.839E-11	1.233E-11	8.835E-12	6.634E-12	5.158E-12	4.121E-12	3.363E-12

Table 2.7-16 XOQDOQ-Predicted Annual Average χ/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

χ /Qs at Various Segments

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES

0************************ RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS ************************

SEGMENT BOUNDARIES IN MILES

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	7.370E-09	2.277E-09	9.061E-10	4.952E-10	3.147E-10	1.352E-10	4.192E-11	1.661E-11	8.872E-12	5.491E-12
SSW	7.354E-09	2.272E-09	9.041E-10	4.941E-10	3.140E-10	1.349E-10	4.183E-11	1.658E-11	8.852E-12	5.479E-12
SW	6.520E-09	2.014E-09	8.016E-10	4.380E-10	2.784E-10	1.196E-10	3.708E-11	1.470E-11	7.848E-12	4.858E-12
WSW	5.657E-09	1.748E-09	6.955E-10	3.801E-10	2.416E-10	1.038E-10	3.218E-11	1.275E-11	6.810E-12	4.215E-12
W	6.586E-09	2.035E-09	8.096E-10	4.424E-10	2.812E-10	1.208E-10	3.746E-11	1.485E-11	7.928E-12	4.907E-12
WNW	8.813E-09	2.723E-09	1.083E-09	5.920E-10	3.763E-10	1.616E-10	5.012E-11	1.986E-11	1.061E-11	6.566E-12
NW	1.429E-08	4.416E-09	1.757E-09	9.602E-10	6.103E-10	2.621E-10	8.129E-11	3.222E-11	1.721E-11	1.065E-11
NNW	1.456E-08	4.500E-09	1.791E-09	9.784E-10	6.219E-10	2.671E-10	8.283E-11	3.283E-11	1.753E-11	1.085E-11
N	1.332E-08	4.115E-09	1.637E-09	8.948E-10	5.687E-10	2.443E-10	7.575E-11	3.002E-11	1.603E-11	9.924E-12
NNE	5.115E-09	1.580E-09	6.288E-10	3.436E-10	2.184E-10	9.381E-11	2.909E-11	1.153E-11	6.157E-12	3.811E-12
NE	2.149E-09	6.638E-10	2.642E-10	1.444E-10	9.175E-11	3.941E-11	1.222E-11	4.843E-12	2.586E-12	1.601E-12
ENE	8.997E-10	2.780E-10	1.106E-10	6.045E-11	3.842E-11	1.650E-11	5.117E-12	2.028E-12	1.083E-12	6.704E-13
E	1.122E-09	3.465E-10	1.379E-10	7.535E-11	4.789E-11	2.057E-11	6.379E-12	2.528E-12	1.350E-12	8.357E-13
ESE	1.968E-09	6.080E-10	2.419E-10	1.322E-10	8.403E-11	3.609E-11	1.119E-11	4.436E-12	2.369E-12	1.466E-12
SE	3.159E-09	9.761E-10	3.884E-10	2.122E-10	1.349E-10	5.795E-11	1.797E-11	7.122E-12	3.803E-12	2.354E-12
SSE	5.567E-09	1.720E-09	6.844E-10	3.740E-10	2.377E-10	1.021E-10	3.166E-11	1.255E-11	6.701E-12	4.148E-12

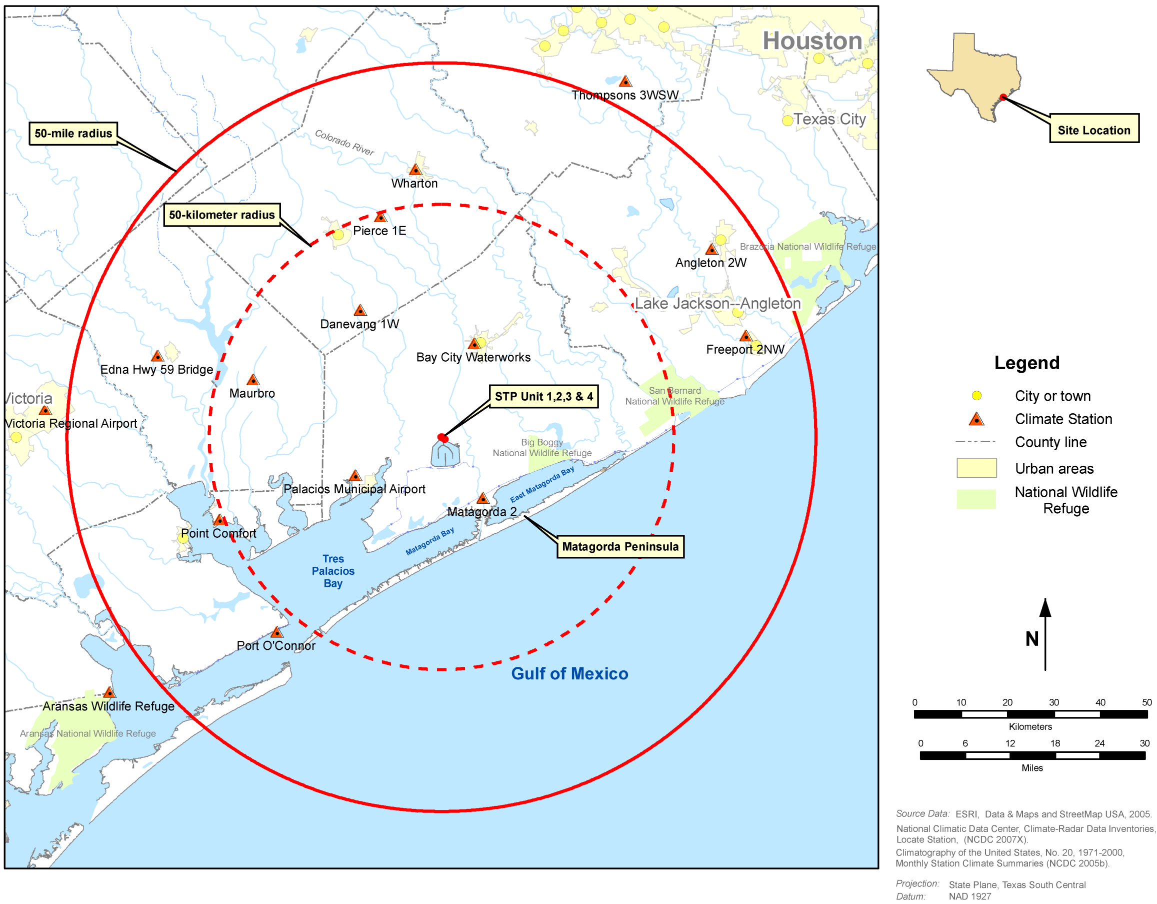


Figure 2.7-1 Climatological Observing Stations Near STP Site

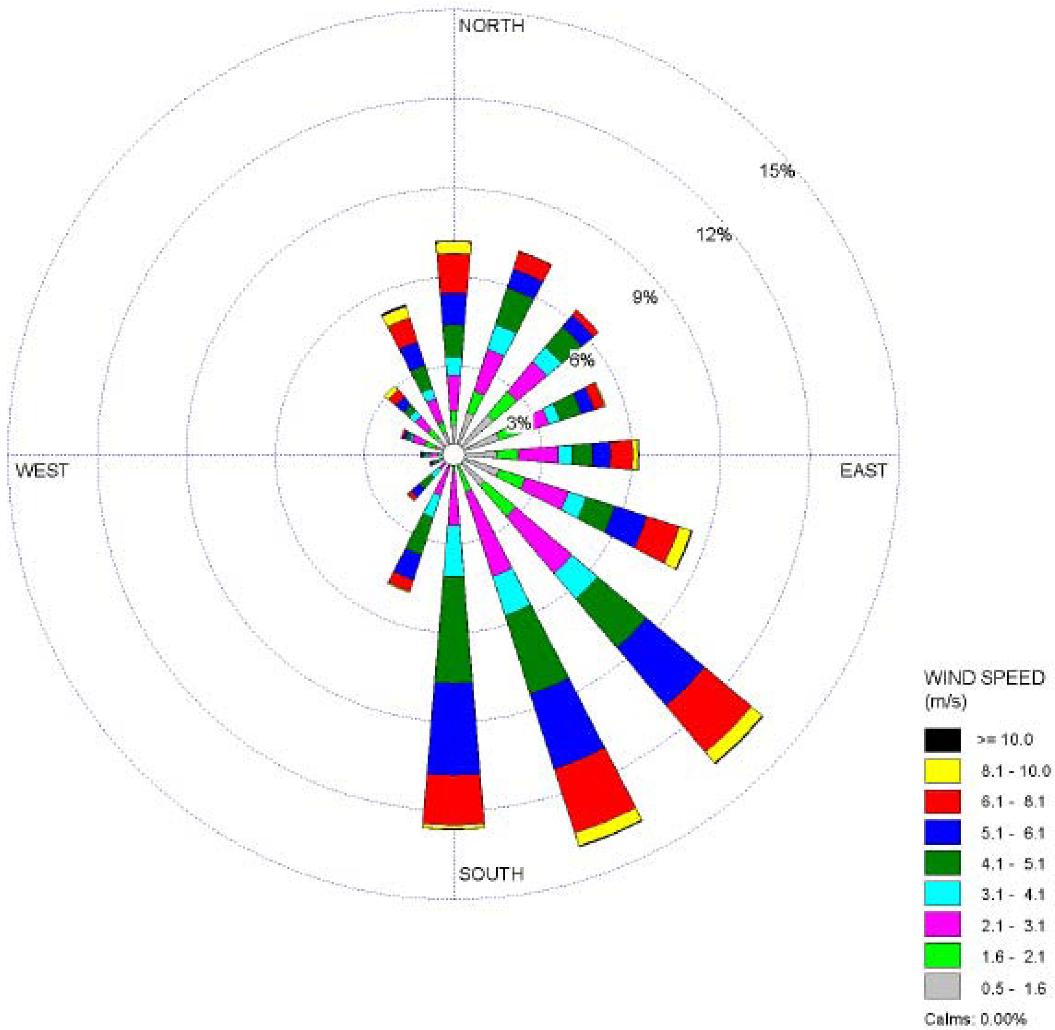


Figure 2.7-2 STP 10-Meter Level 3-year Composite Wind Rose - Annual (1997, 1999, and 2000)

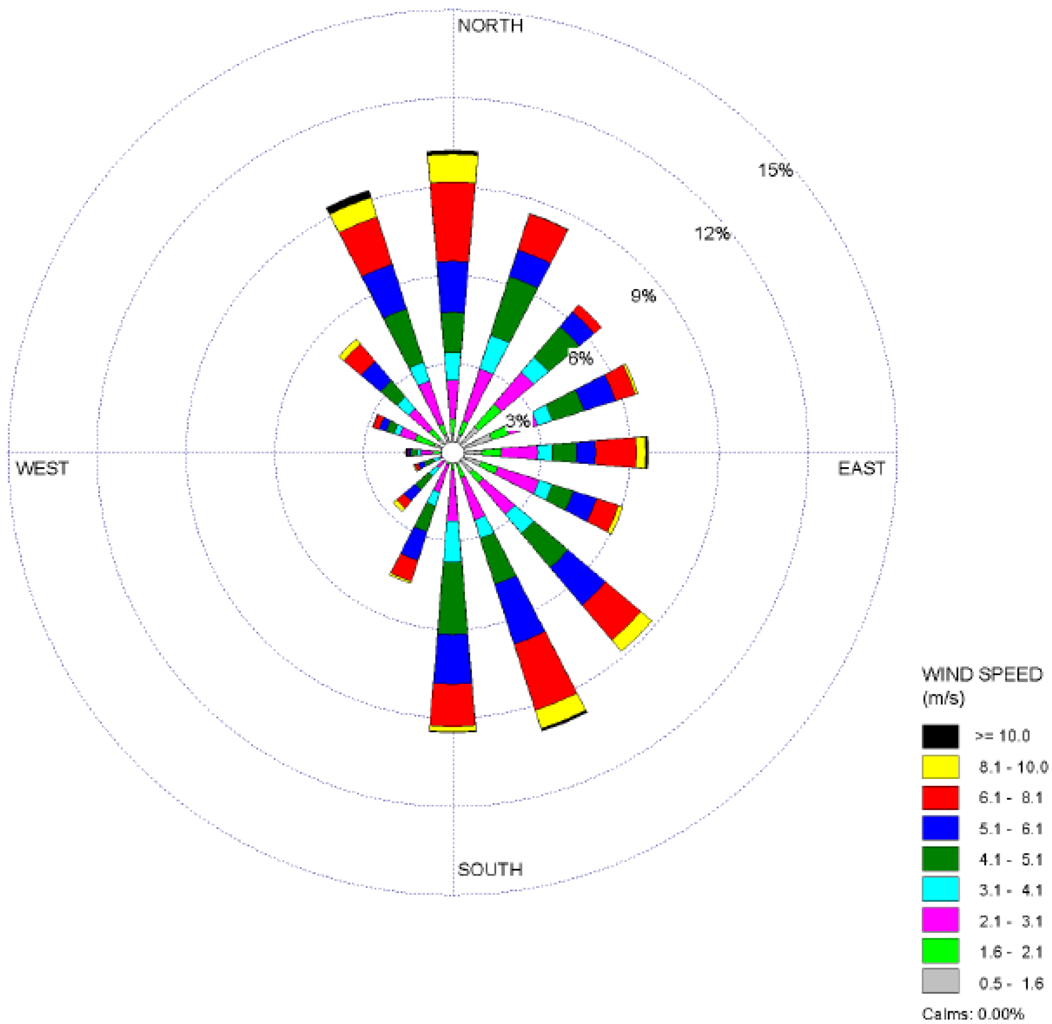


Figure 2.7-3 STP 10-Meter Level 3-Year Composite Wind Rose - Winter (1997, 1999, and 2000)

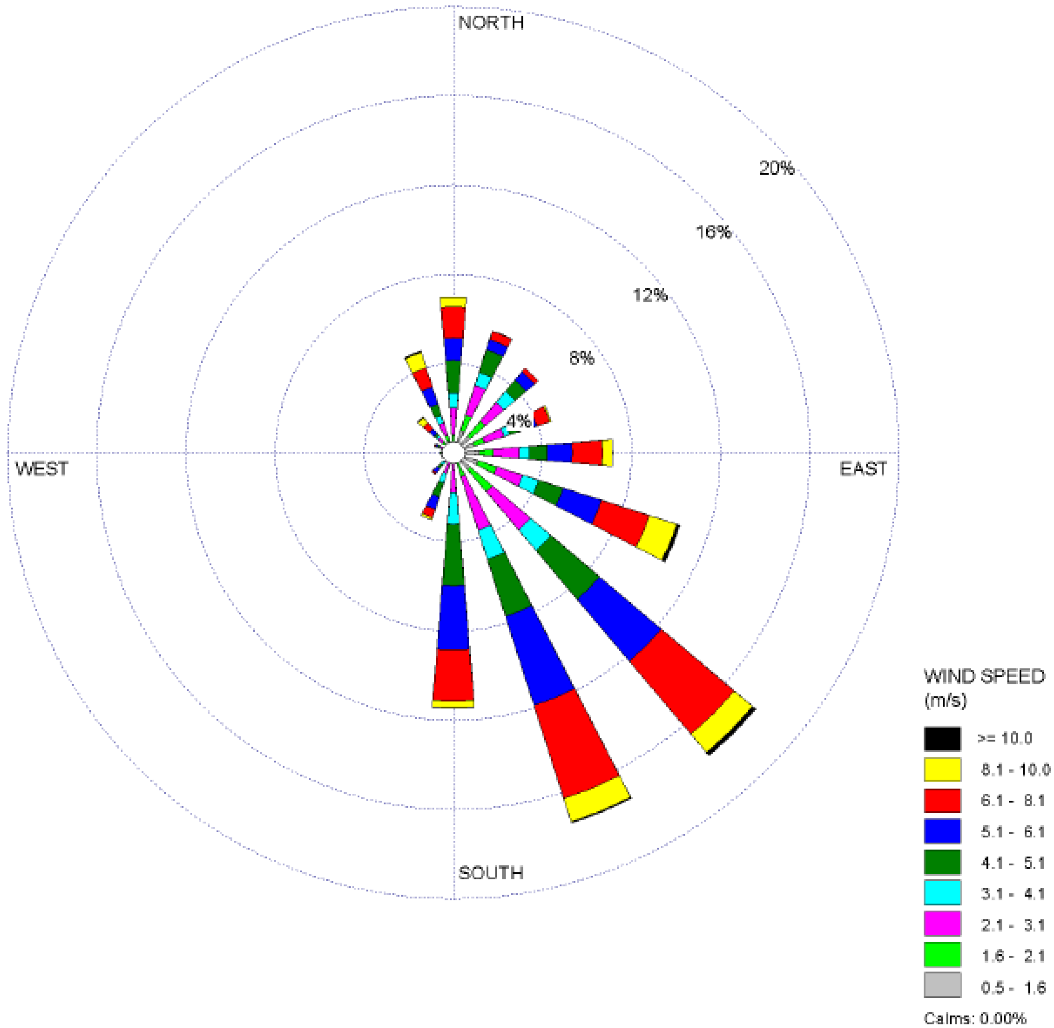


Figure 2.7-4 STP 10-Meter Level 3-Year Composite Wind Rose - Spring (1997, 1999, and 2000)

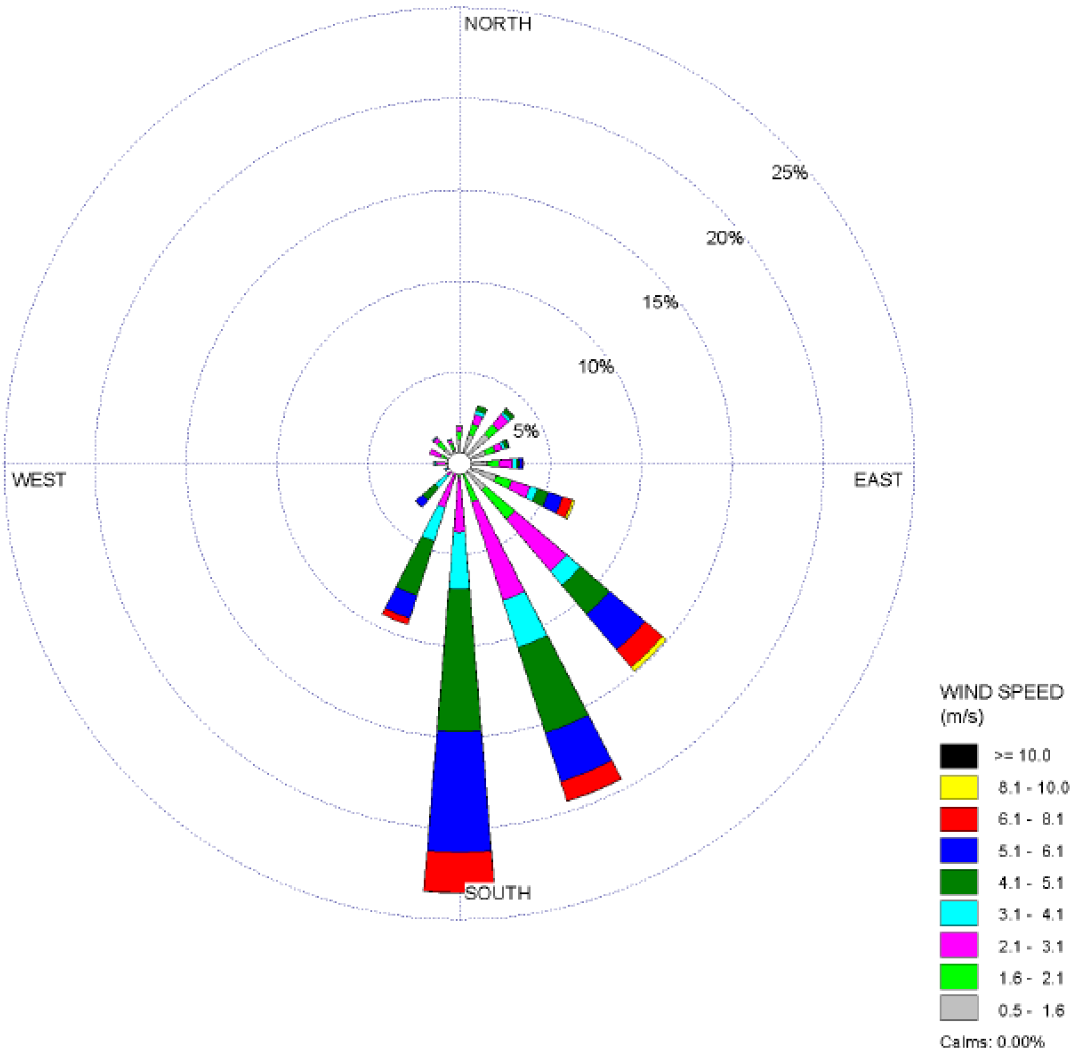


Figure 2.7-5 STP 10-Meter Level 3-Year Composite Wind Rose - Summer (1997, 1999, and 2000)

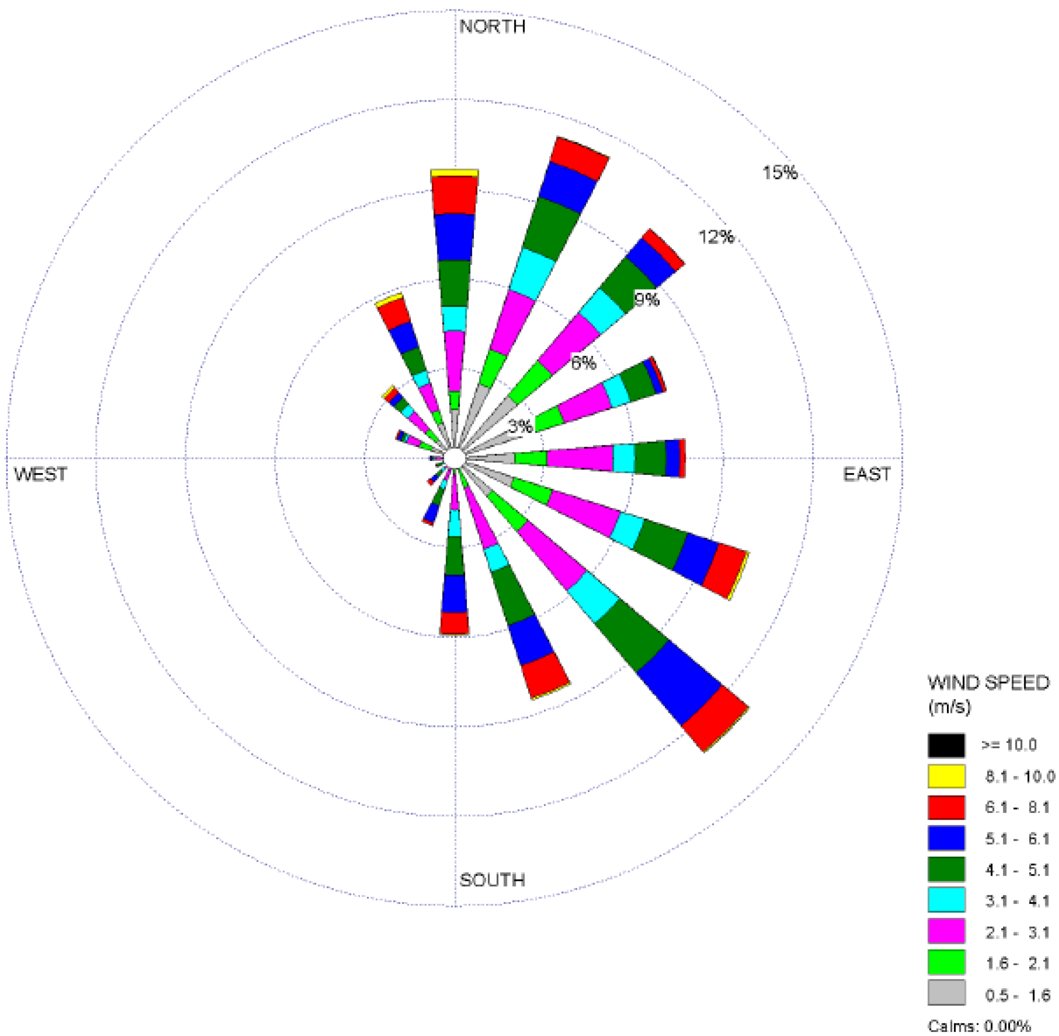


Figure 2.7-6 STP 10-Meter Level 3-Year Composite Wind Rose - Autumn (1997, 1999, and 2000)

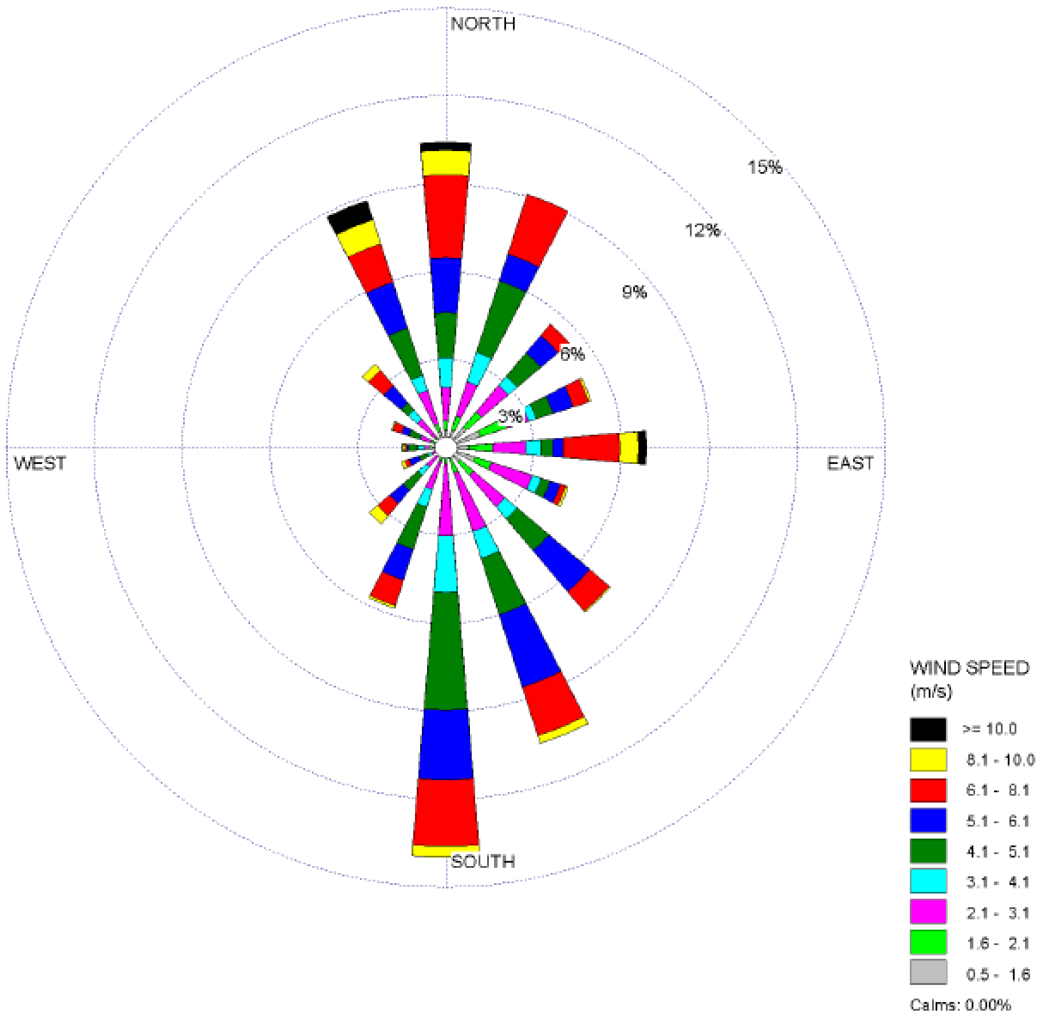


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - January (1997, 1999, and 2000) - Page 1 of 12

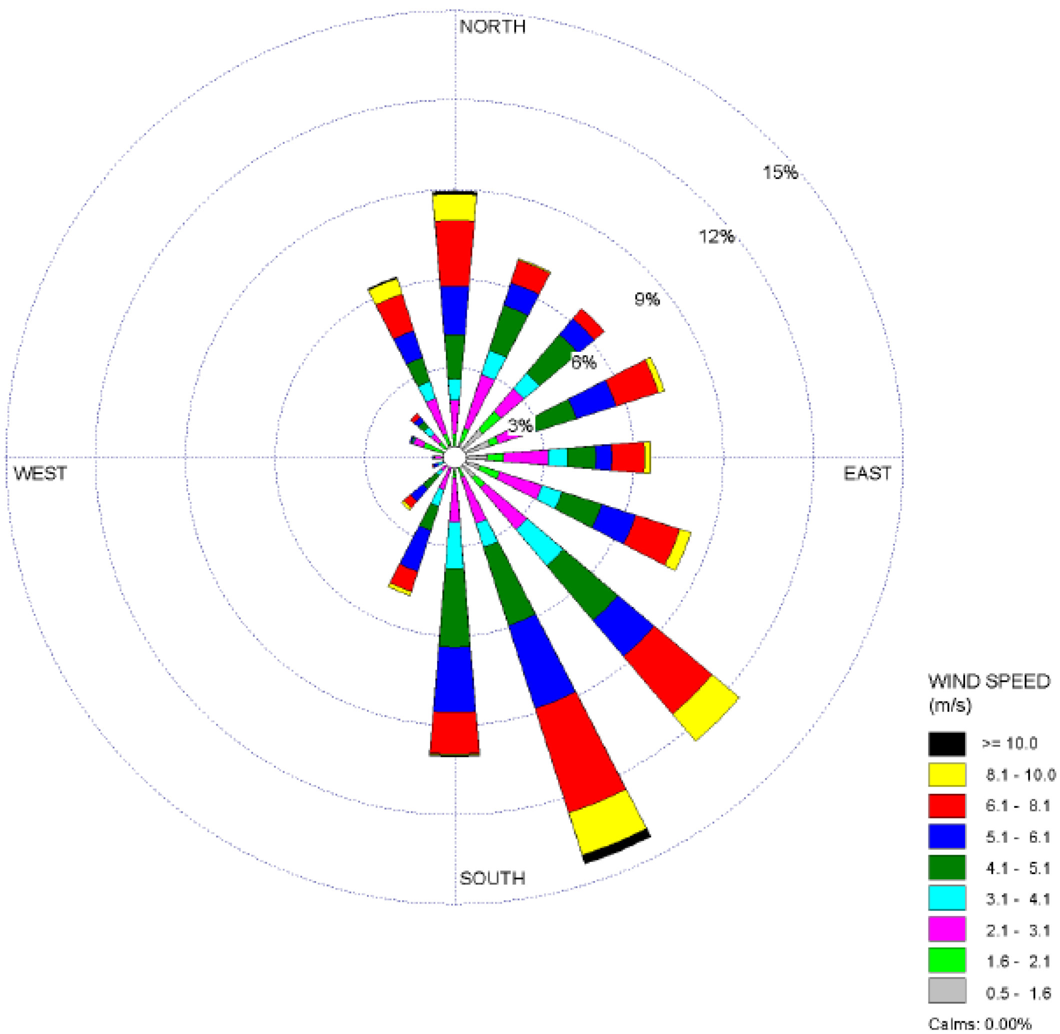


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - February (1997, 1999, and 2000) - Page 2 of 12

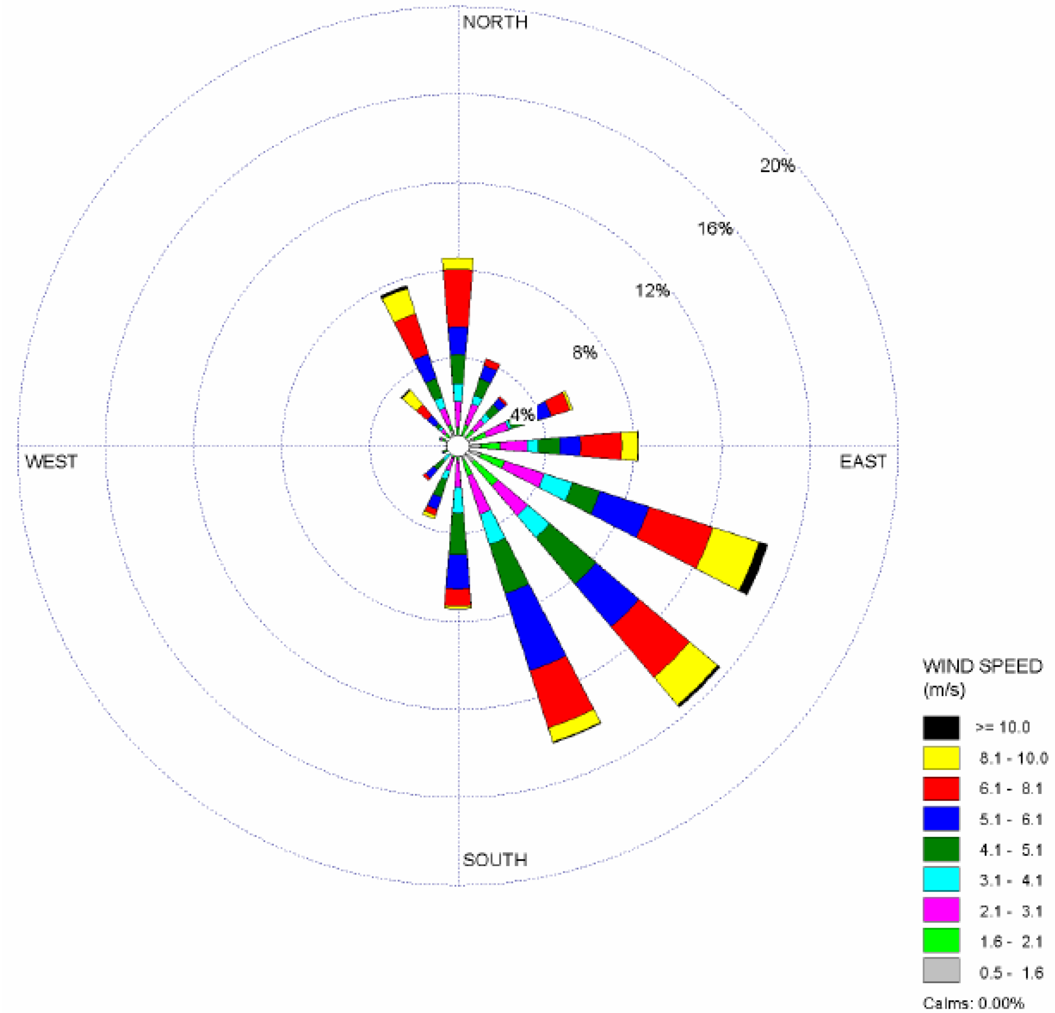


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - March (1997, 1999, and 2000) - Page 3 of 12

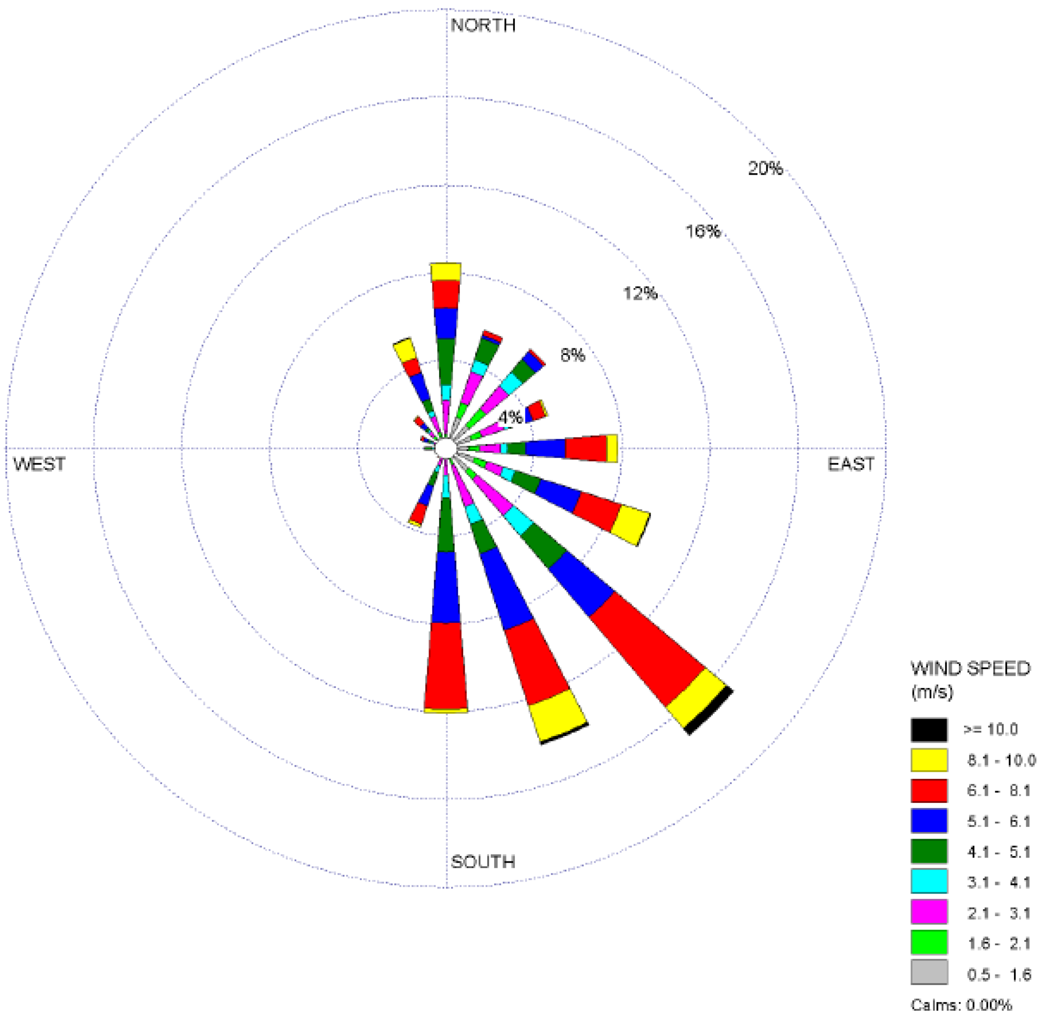


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - April (1997, 1999, and 2000) - Page 4 of 12

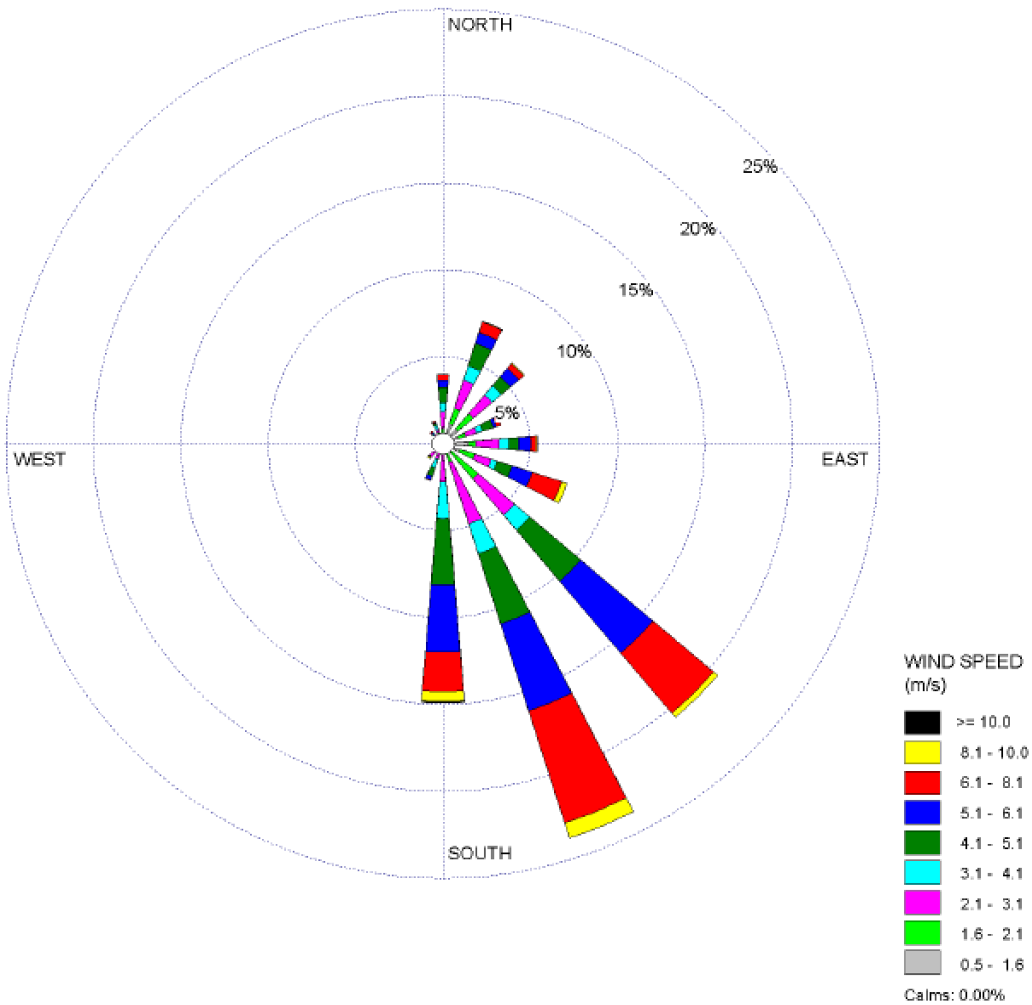


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - May (1997, 1999, and 2000) - Page 5 of 12

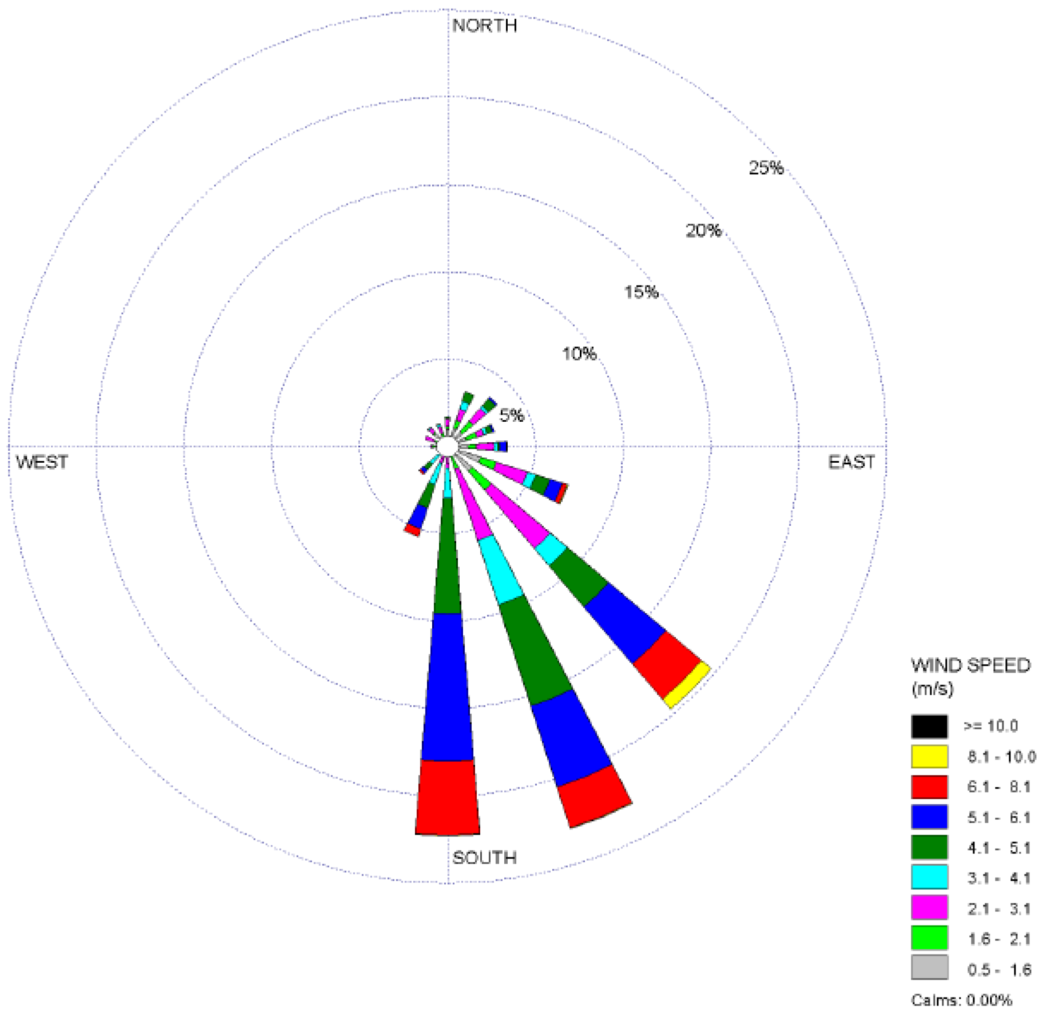


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - June (1997, 1999, and 2000) - Page 6 of 12

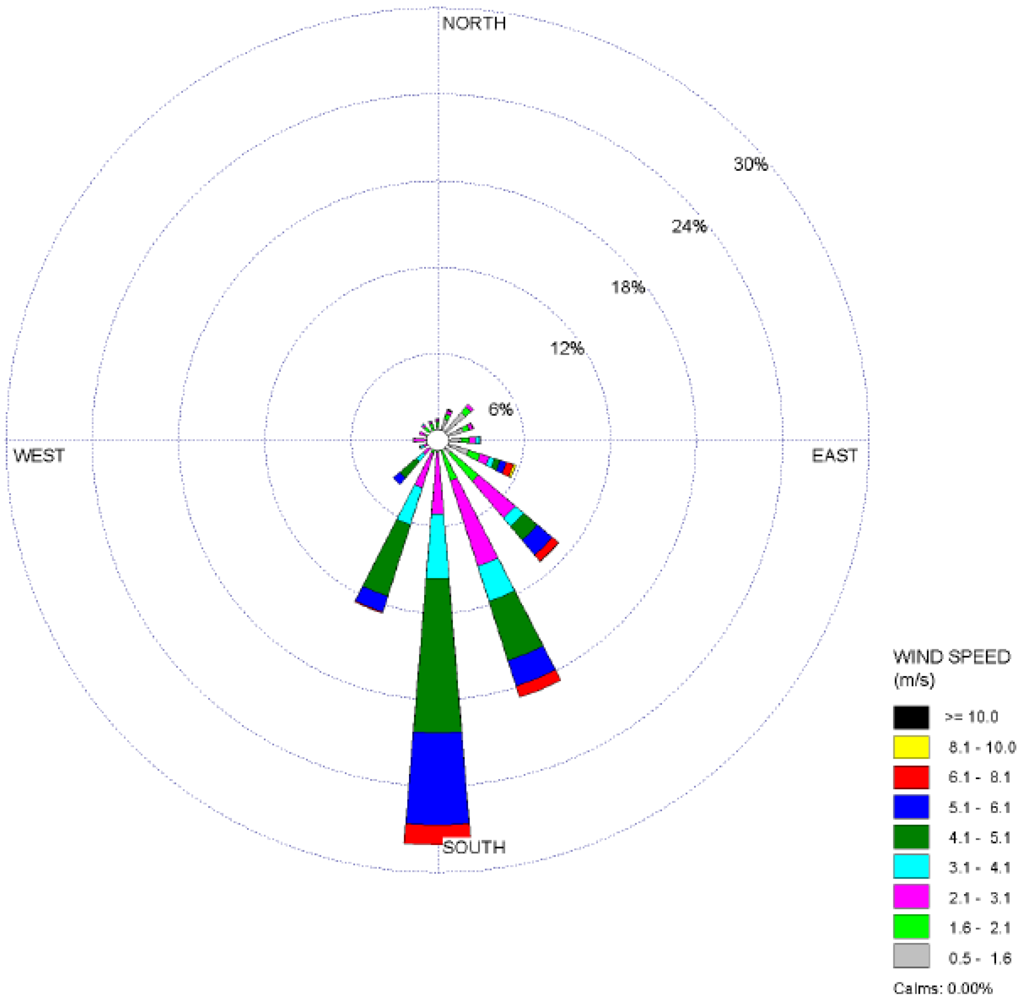


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - July (1997, 1999, and 2000) - Page 7 of 12

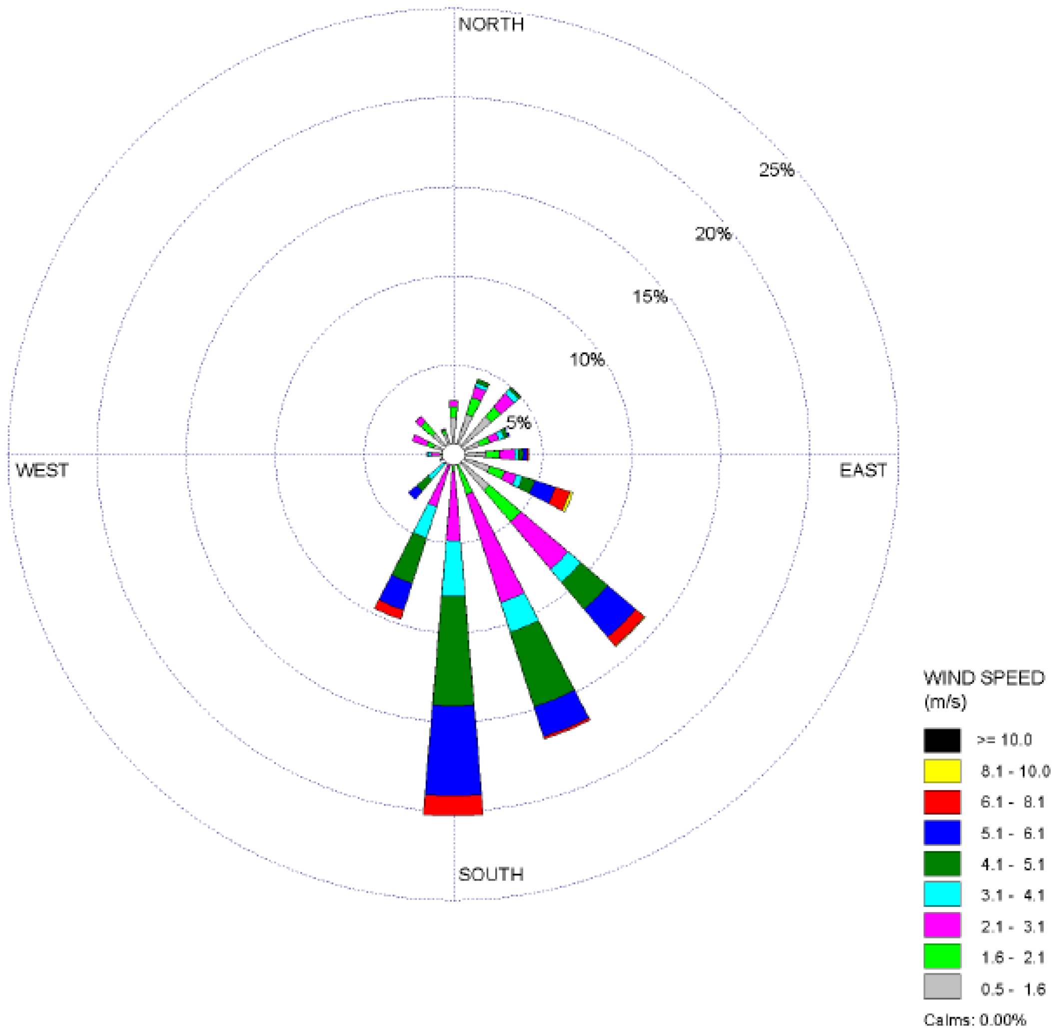


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - August (1997, 1999, and 2000) - Page 8 of 12

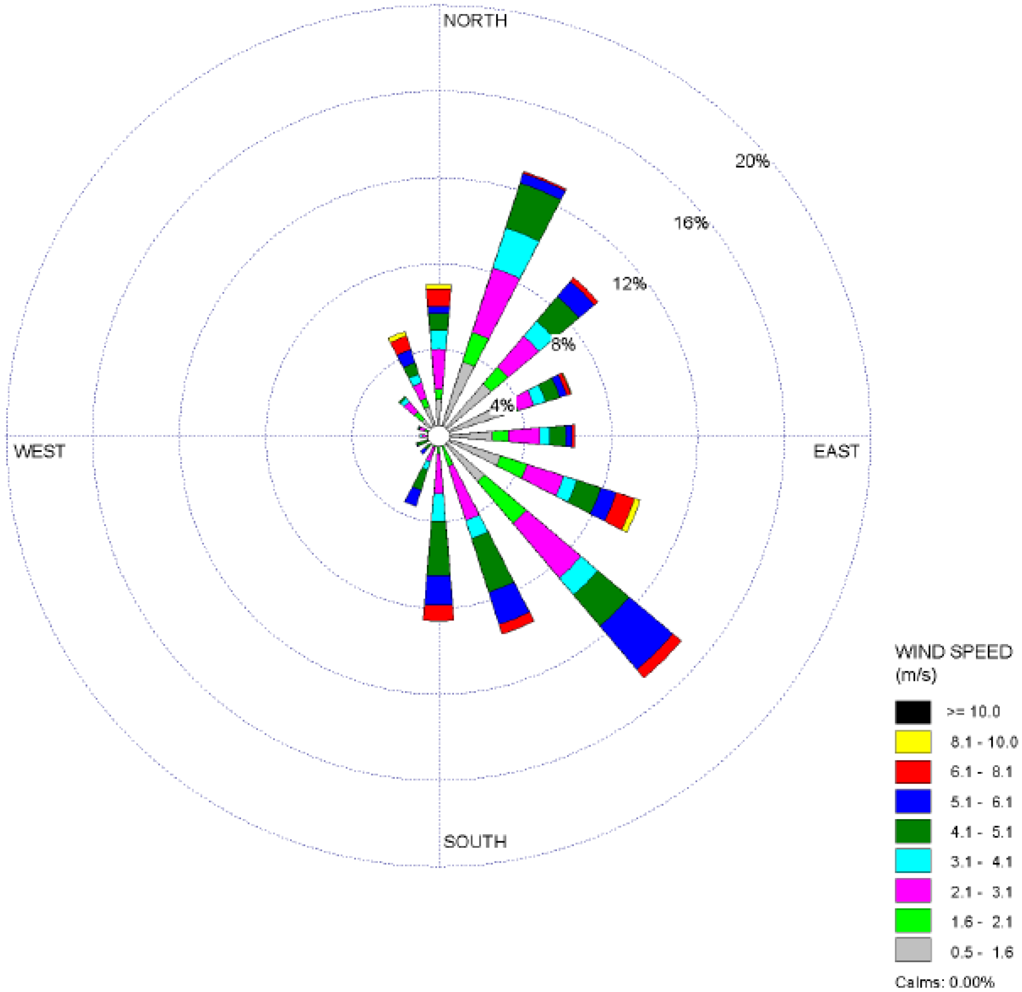


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - September (1997, 1999, and 2000) - Page 9 of 12

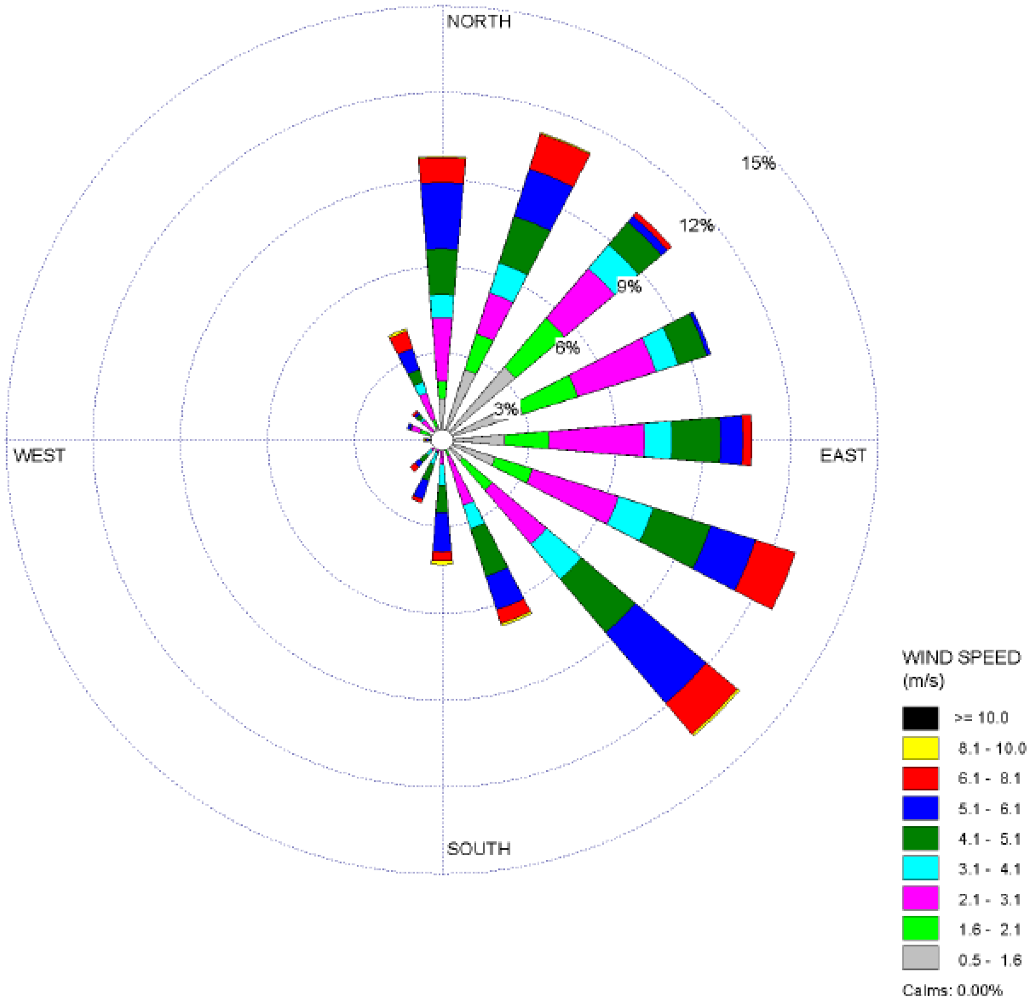


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - October (1997, 1999, and 2000) - Page 10 of 12

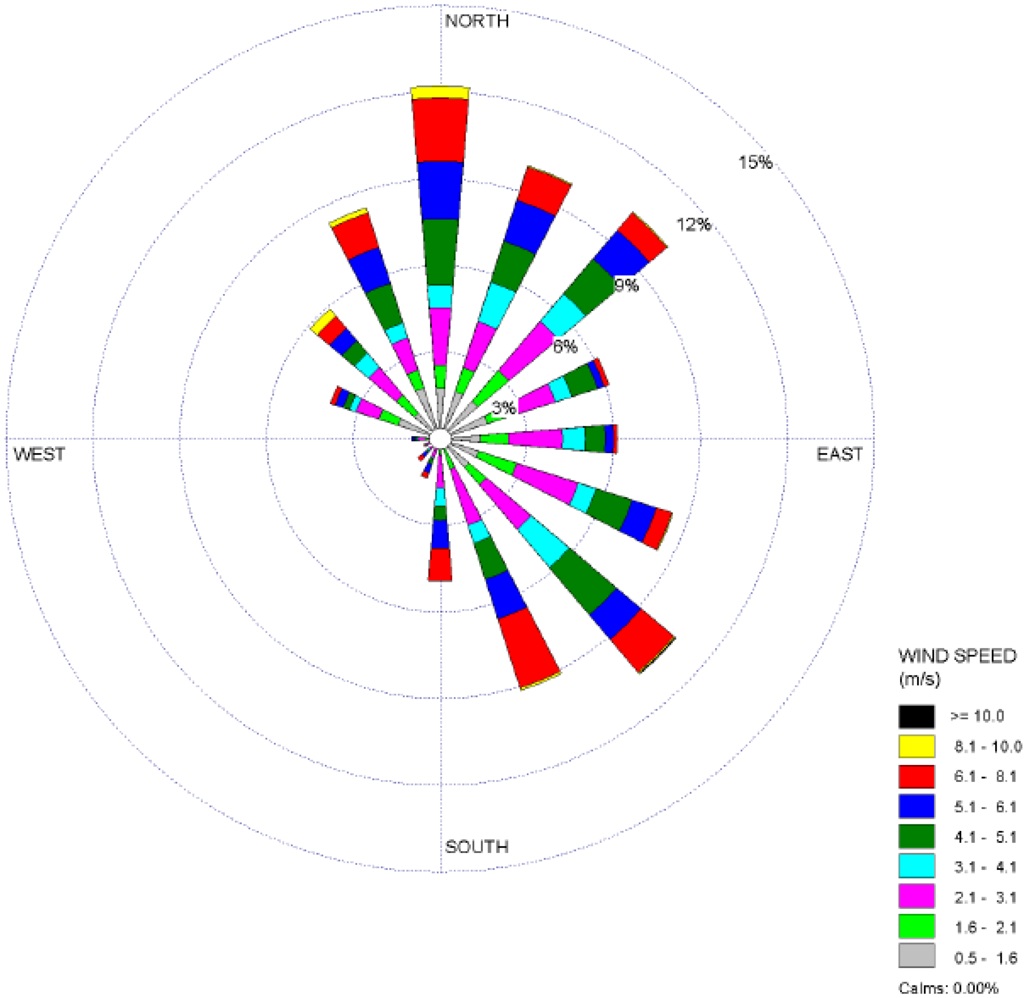


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - November (1997, 1999, and 2000) - Page 11 of 12

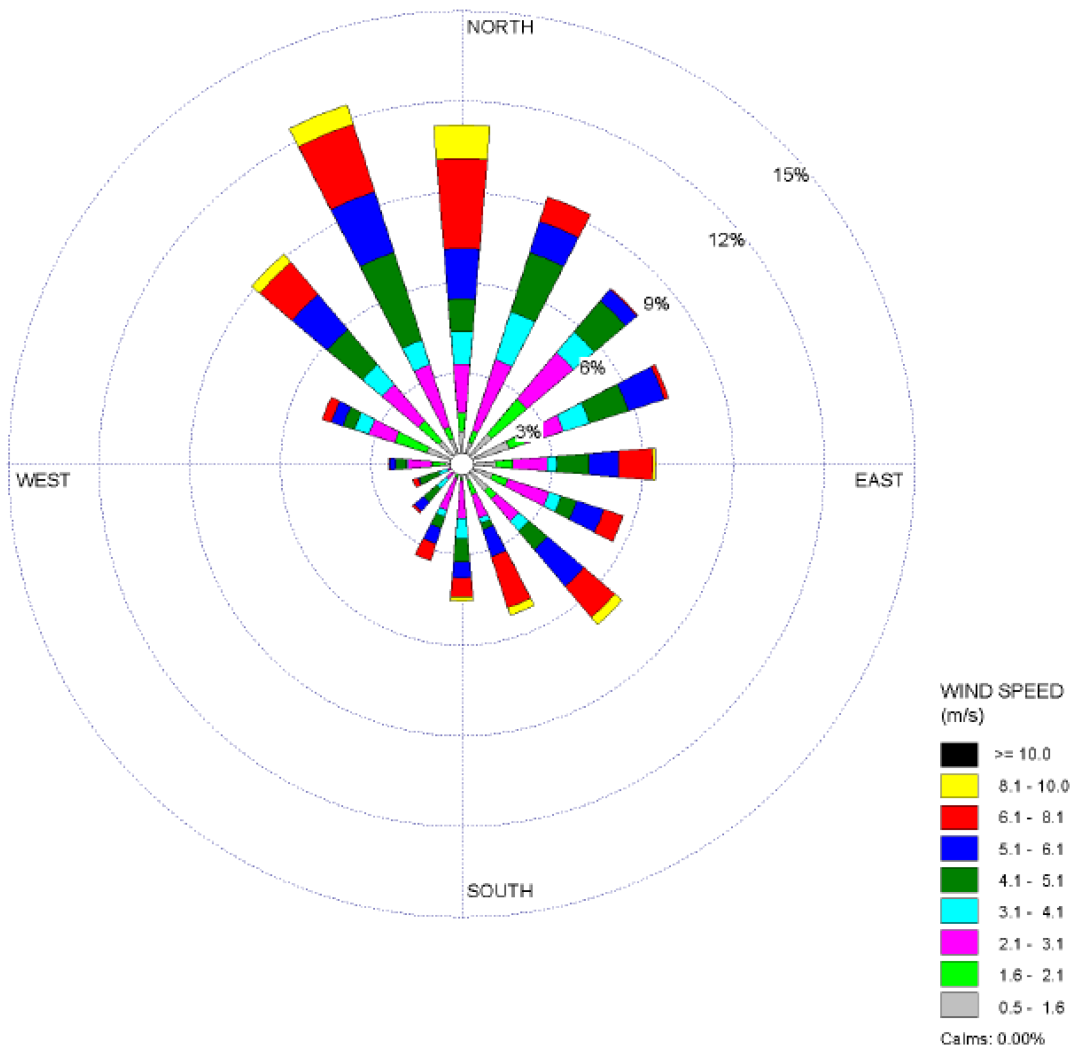


Figure 2.7-7 STP 10-Meter Level 3-Year Composite Wind Rose - December (1997, 1999, and 2000) - Page 12 of 12

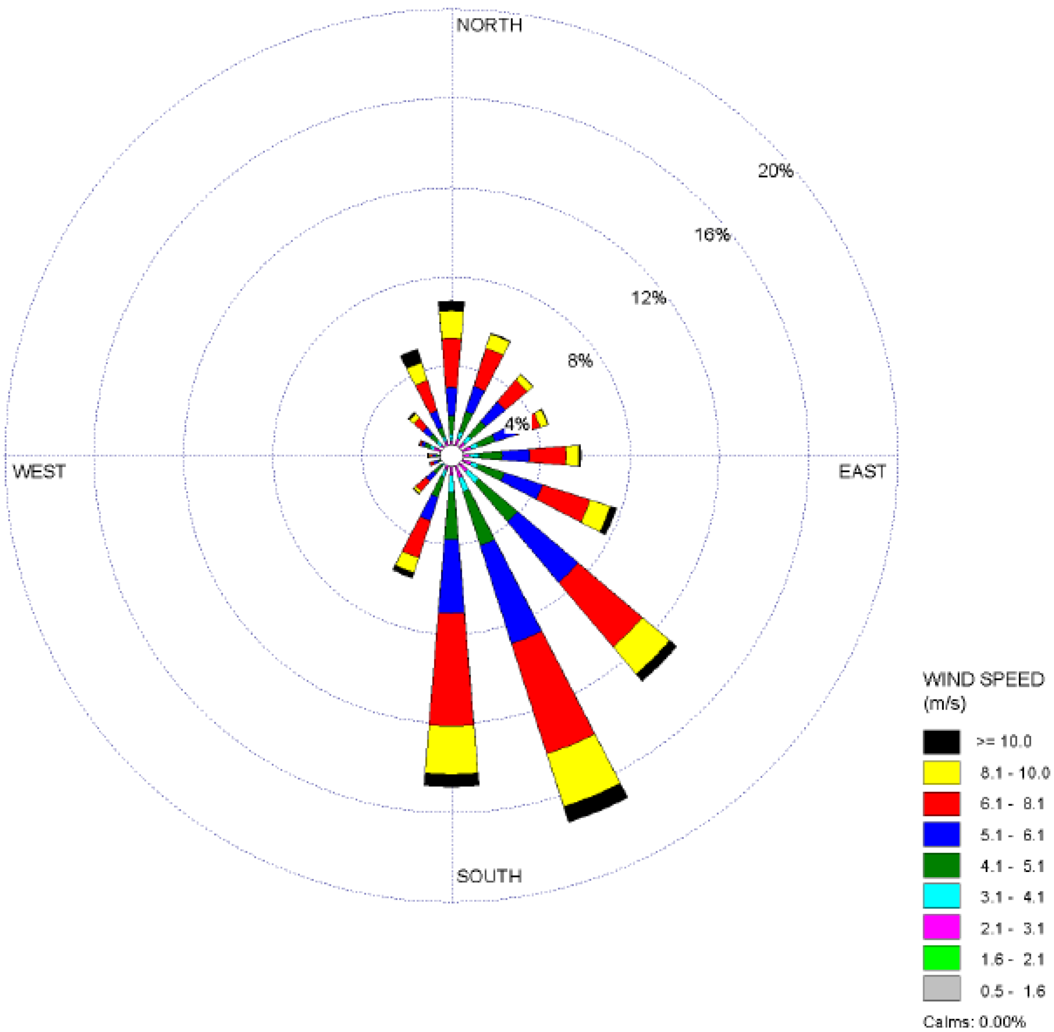


Figure 2.7-8 STP 60-Meter Level 3-Year Composite Wind Rose - Annual (1997, 1999, and 2000)

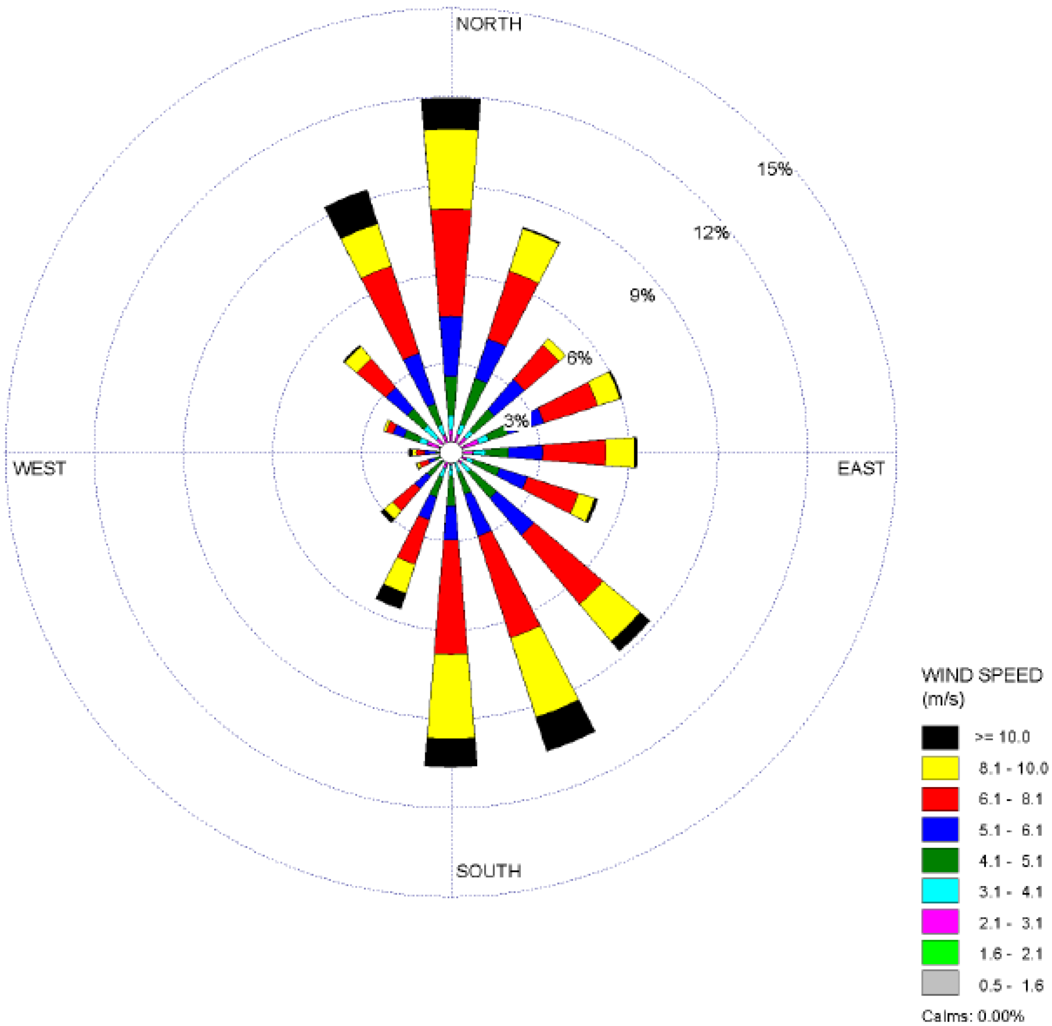


Figure 2.7-9 STP 60-Meter Level 3-Year Composite Wind Rose - Winter (1997, 1999, and 2000)

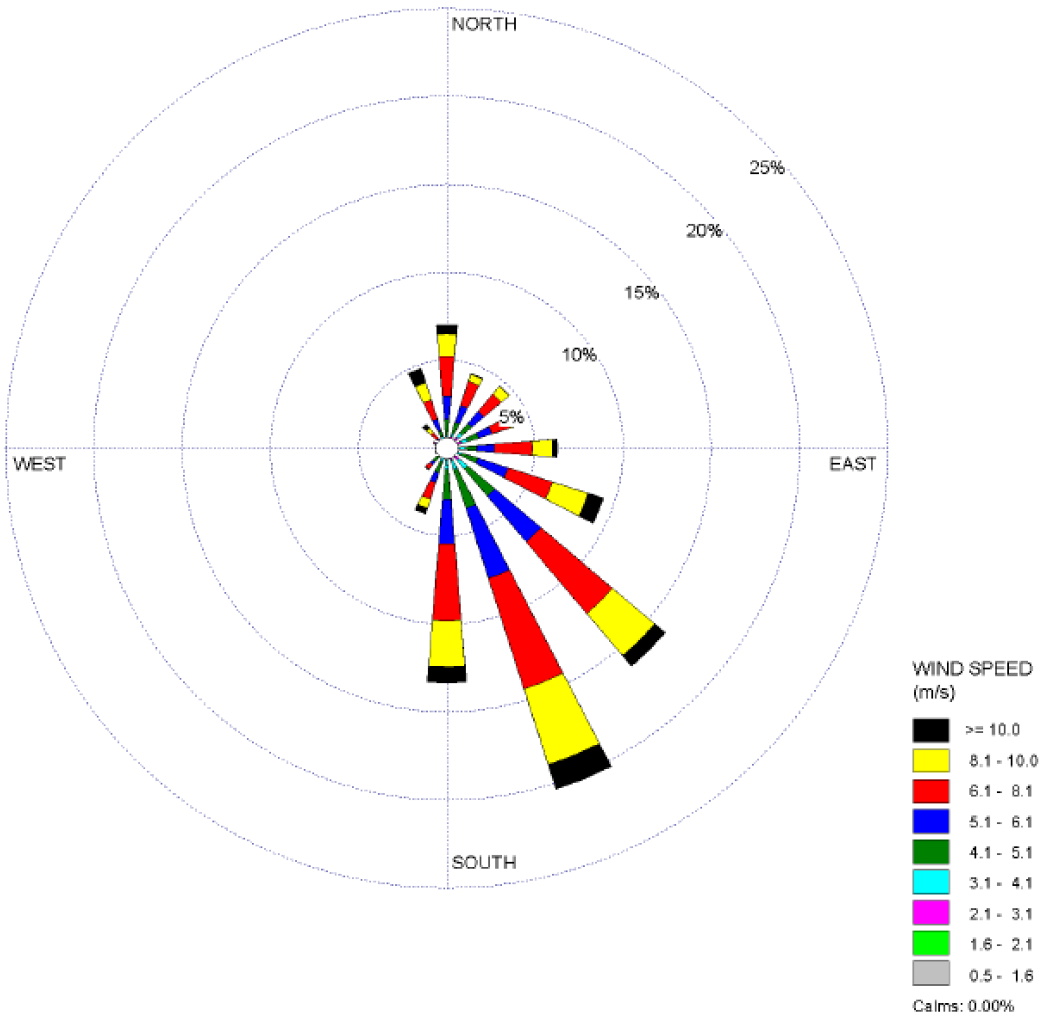


Figure 2.7-10 STP 60-Meter Level 3-Year Composite Wind Rose - Spring (1997, 1999, and 2000)

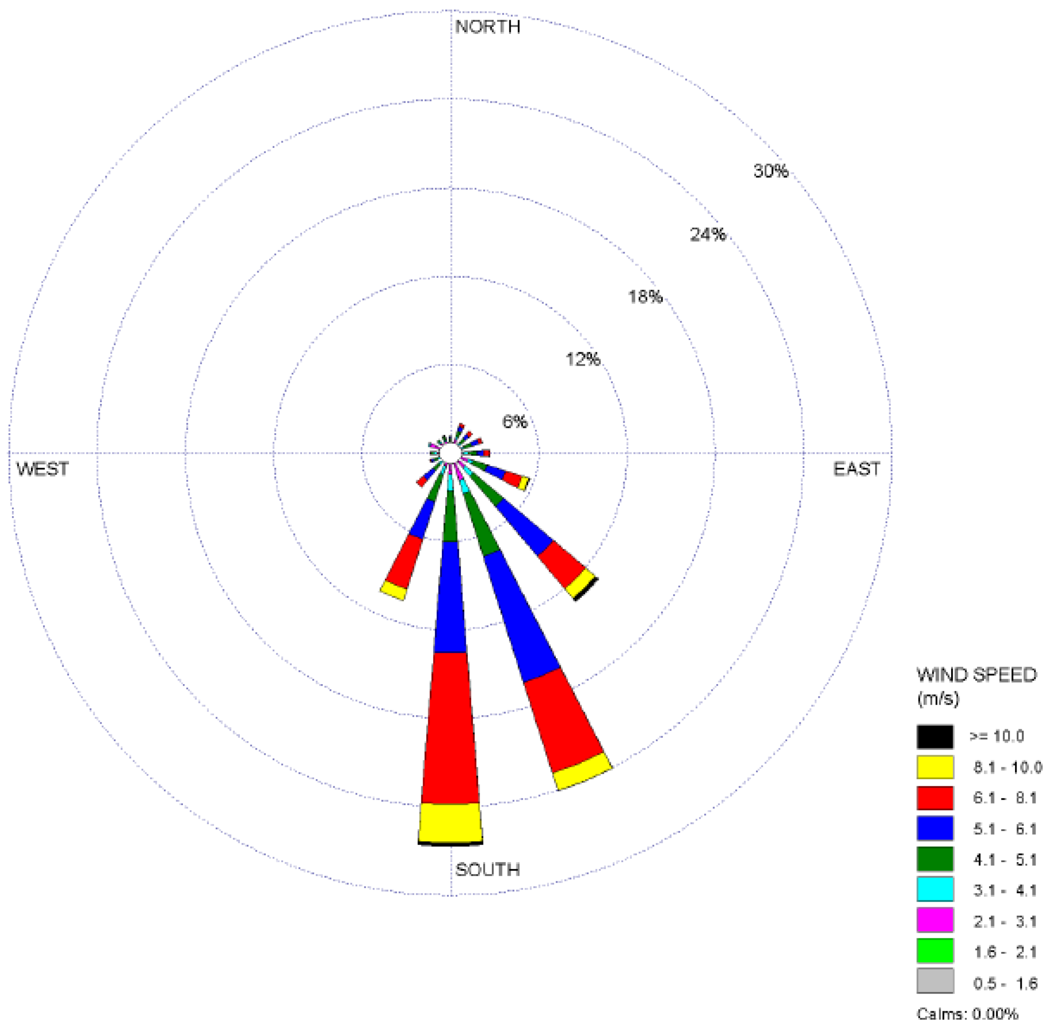


Figure 2.7-11 STP 60-Meter Level 3-Year Composite Wind Rose - Summer (1997, 1999, and 2000)

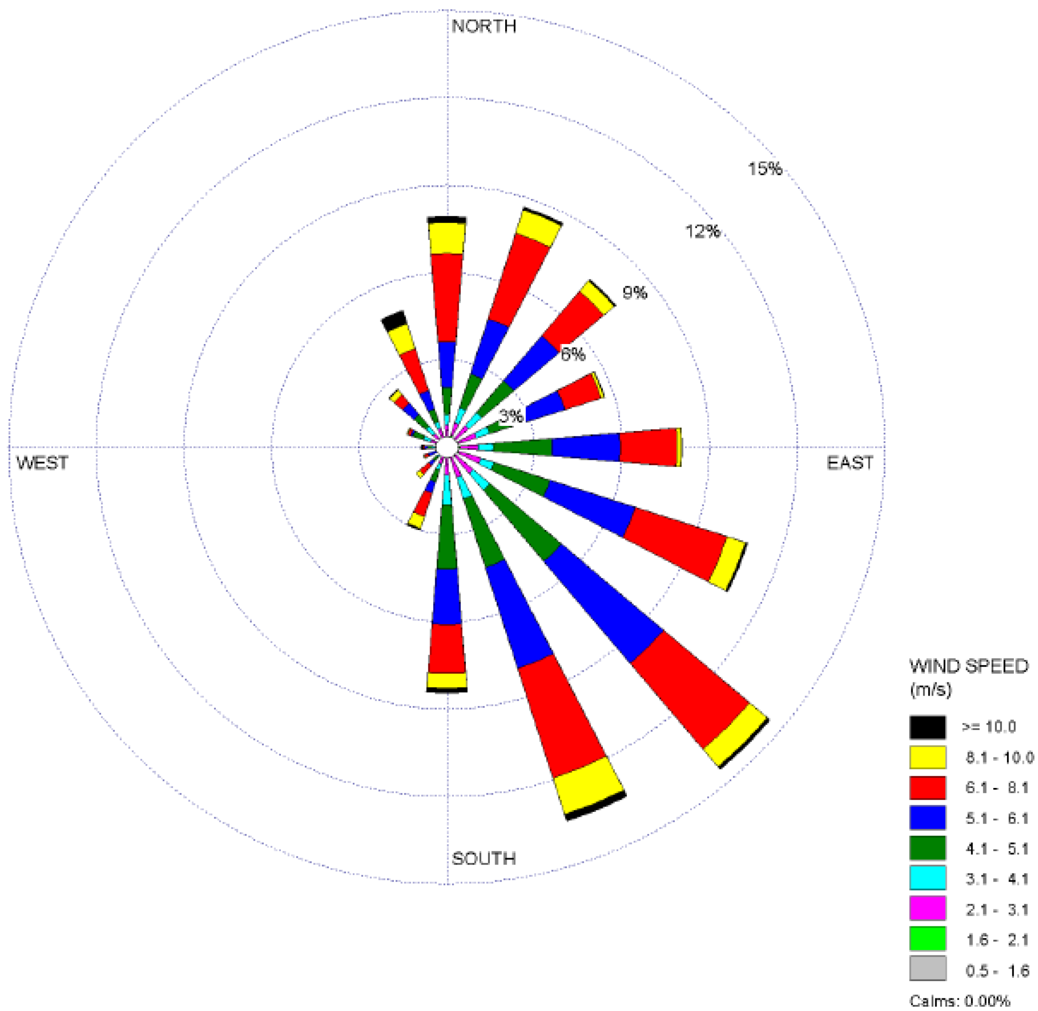


Figure 2.7-12 STP 60-Meter Level 3-Year Composite Wind Rose - Autumn (1997, 1999, and 2000)

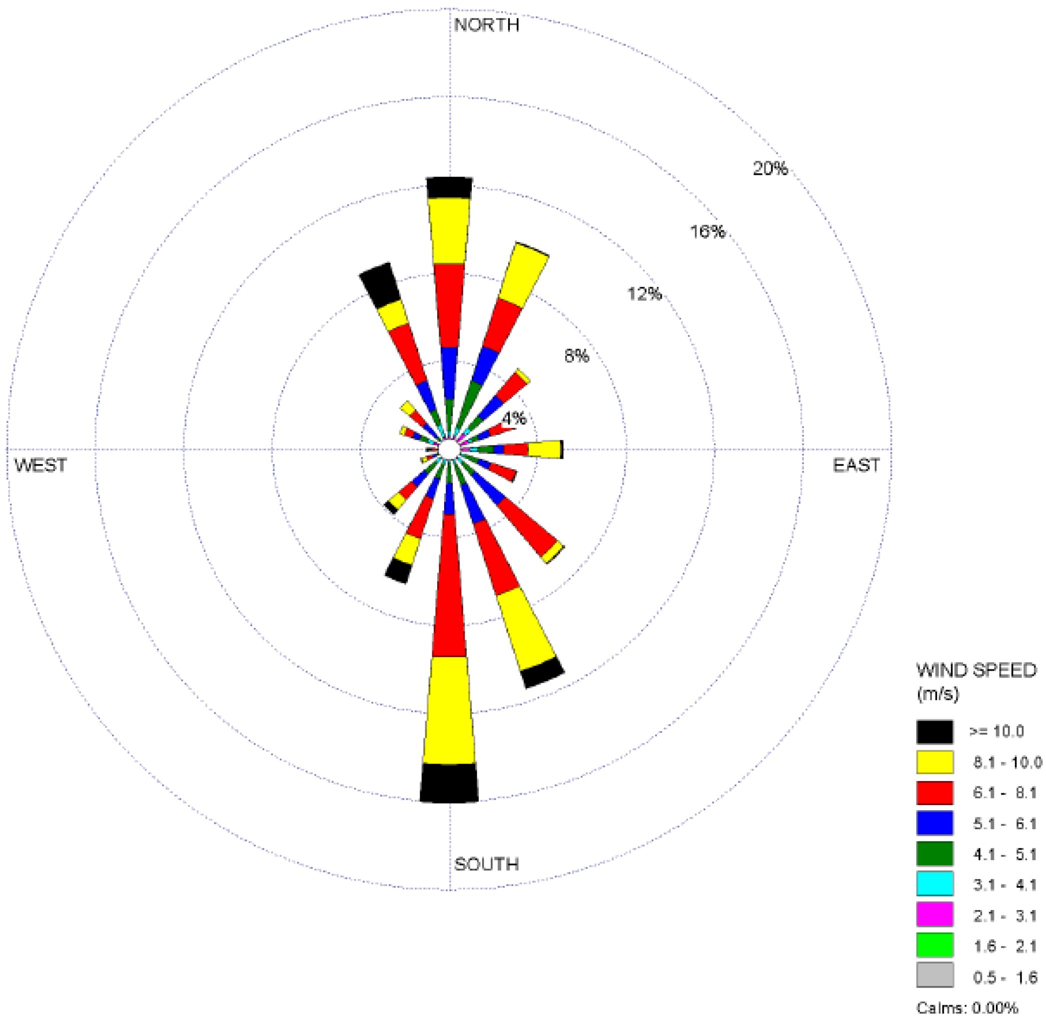


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - January (1997, 1999, and 2000) - Page 1 of 12

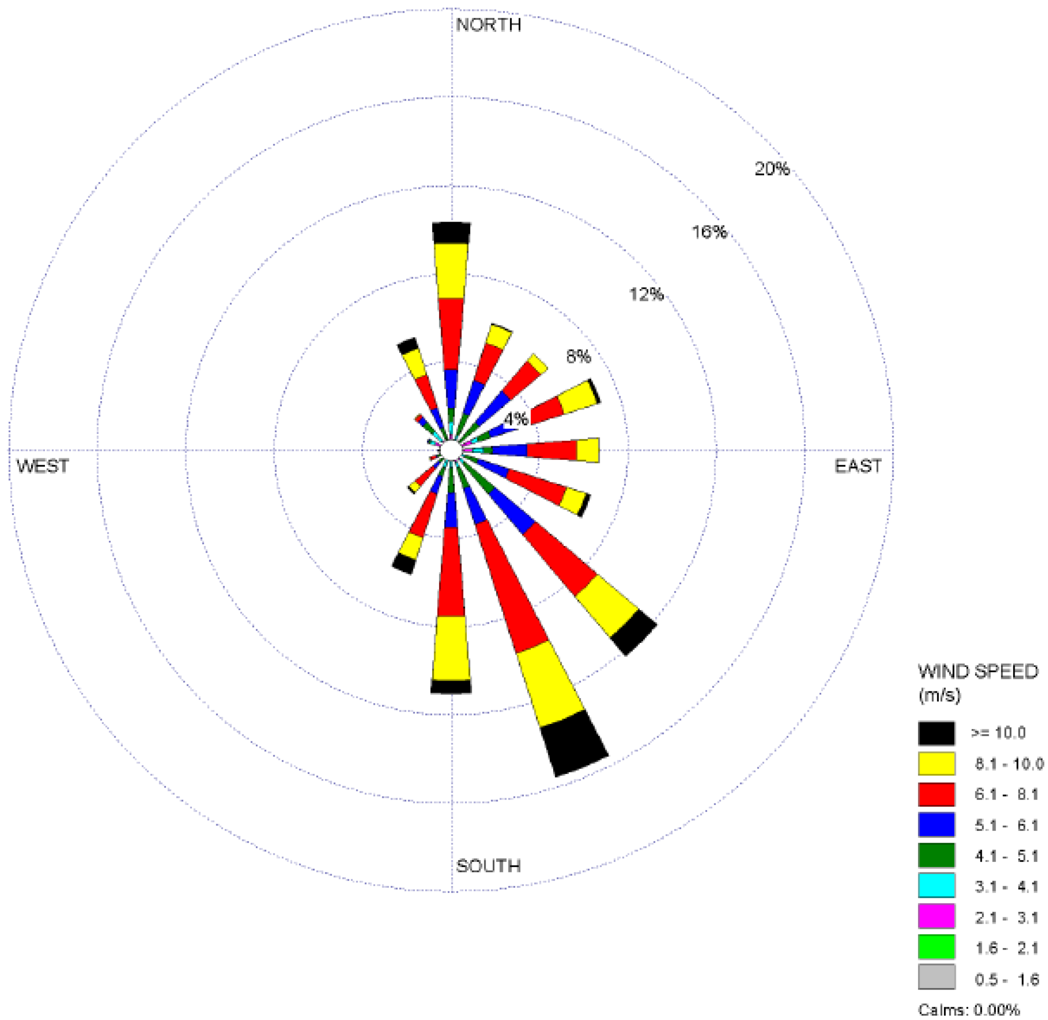


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - February (1997, 1999, and 2000) - Page 2 of 12

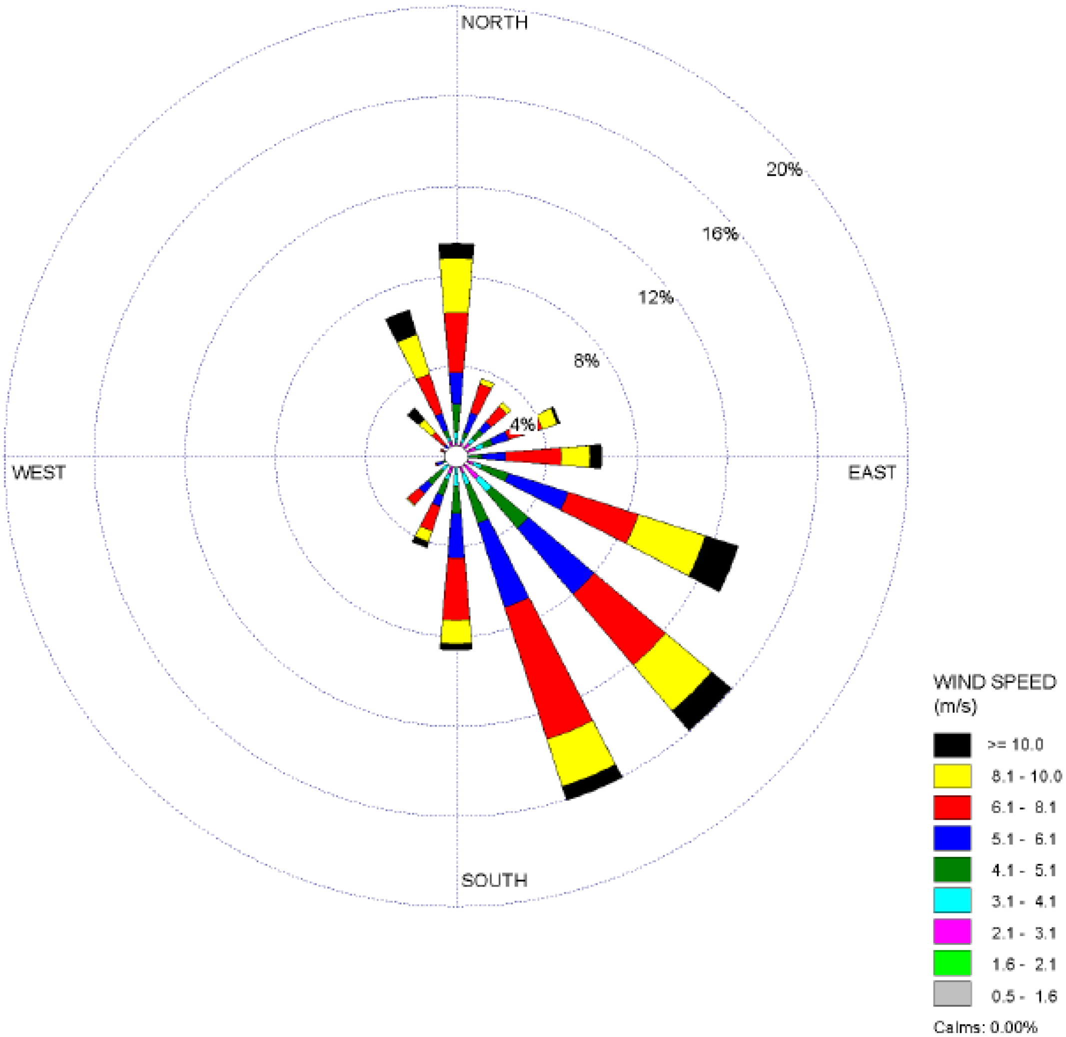


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - March (1997, 1999, and 2000) - Page 3 of 12

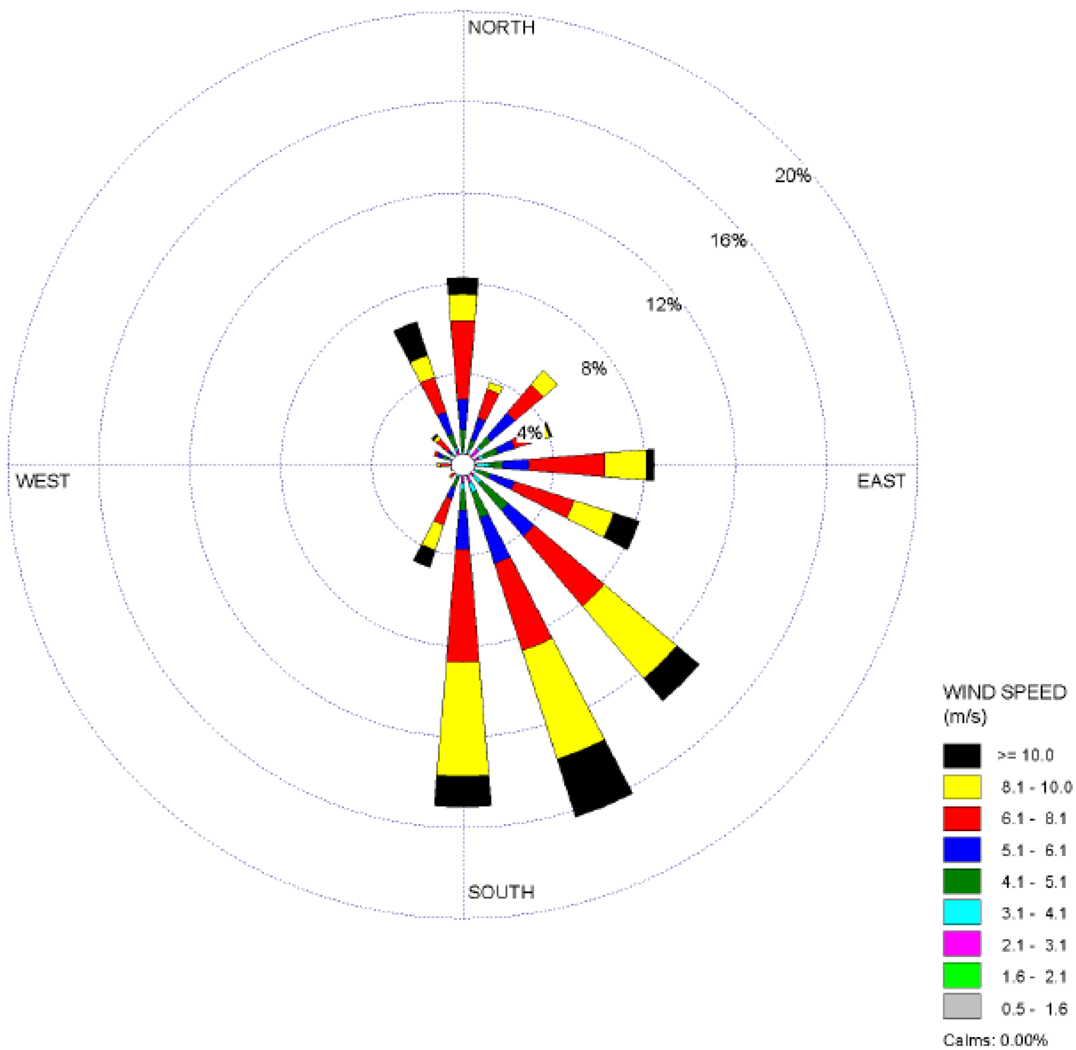


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - April (1997, 1999, and 2000) - Page 4 of 12

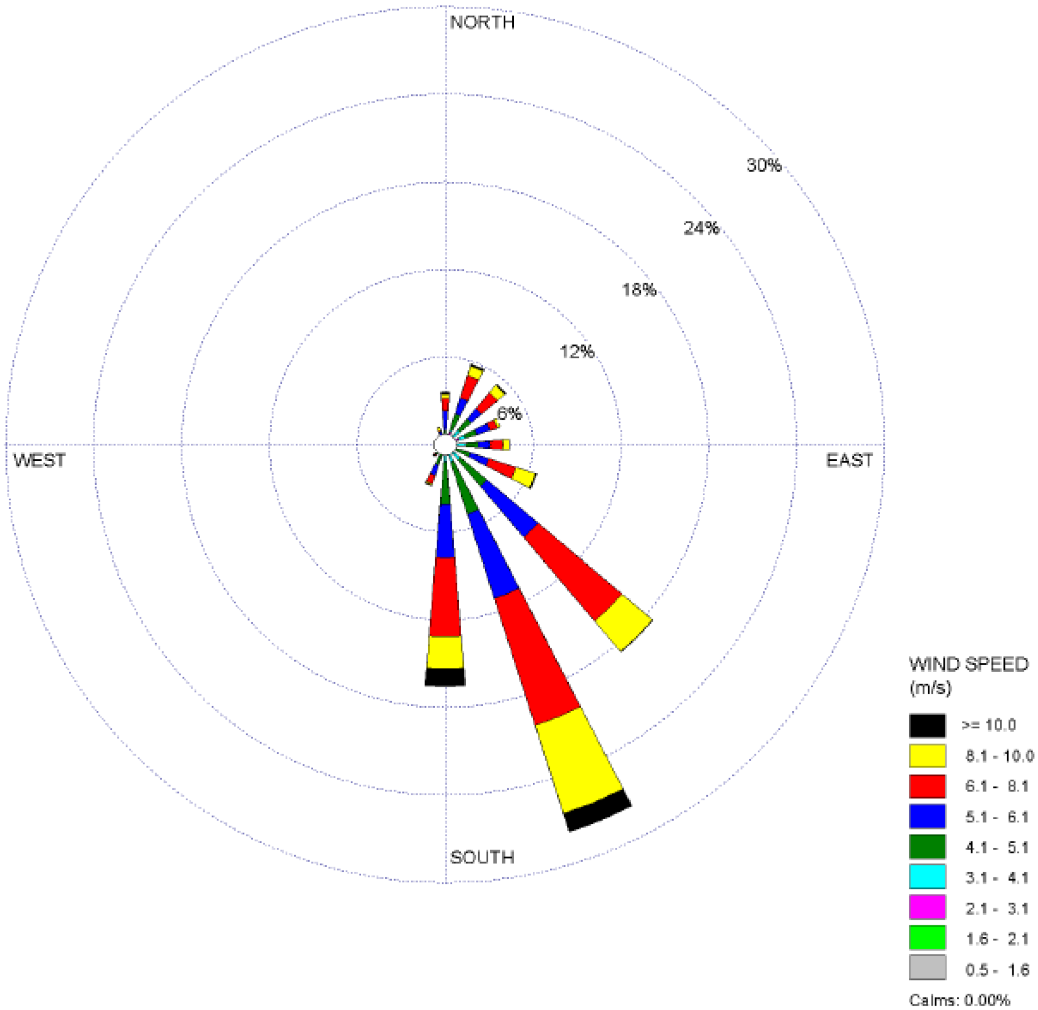


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - May (1997, 1999, and 2000) - Page 5 of 12

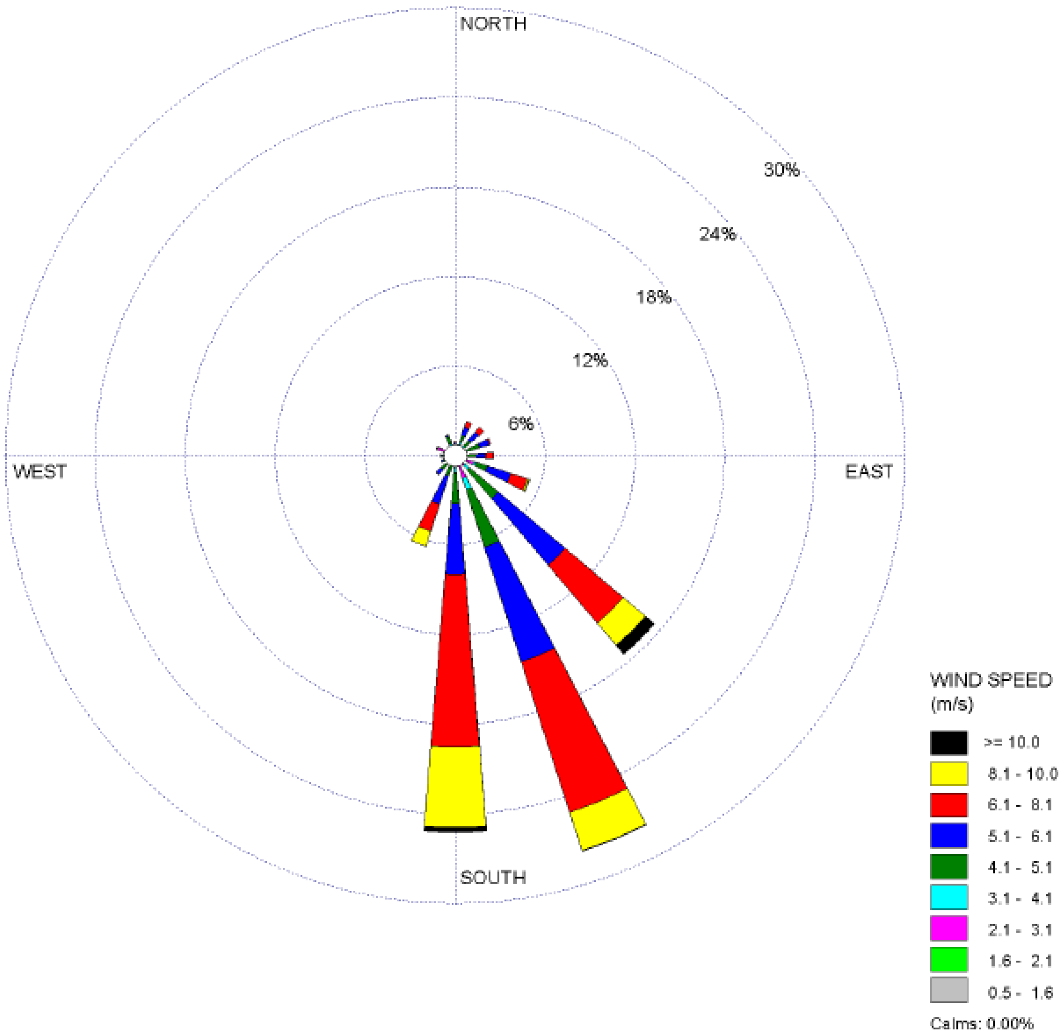


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - June (1997, 1999, and 2000) - Page 6 of 12

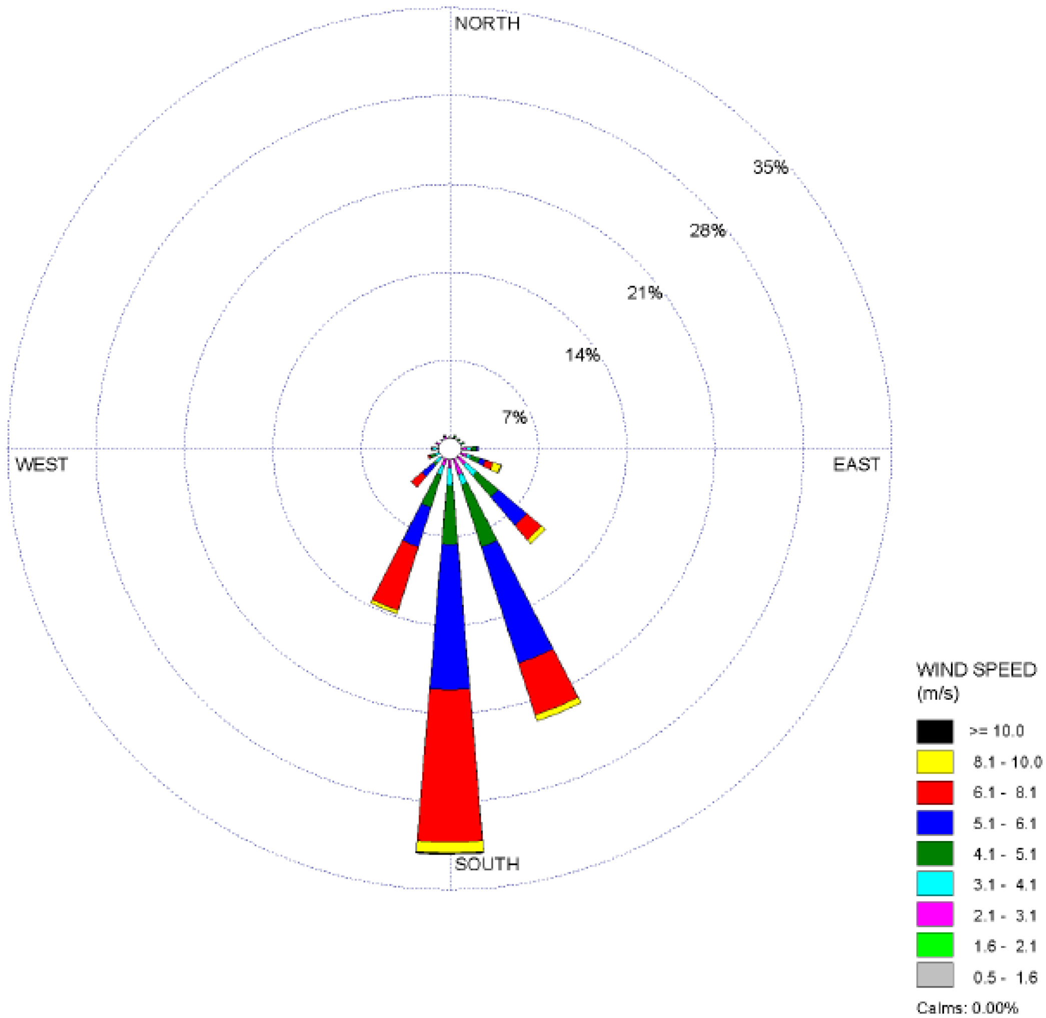


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - July (1997, 1999, and 2000) - Page 7 of 12

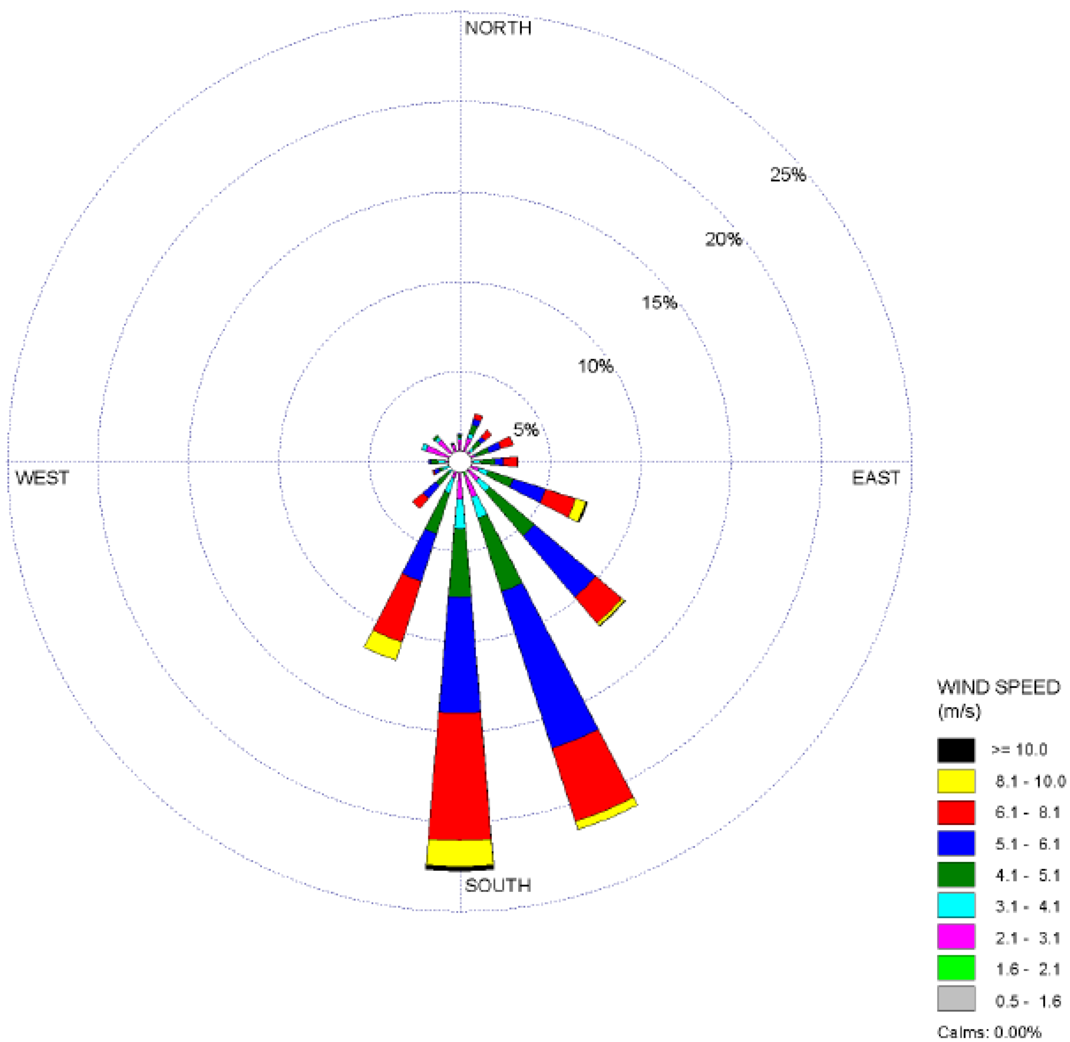


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - August (1997, 1999, and 2000) - Page 8 of 12

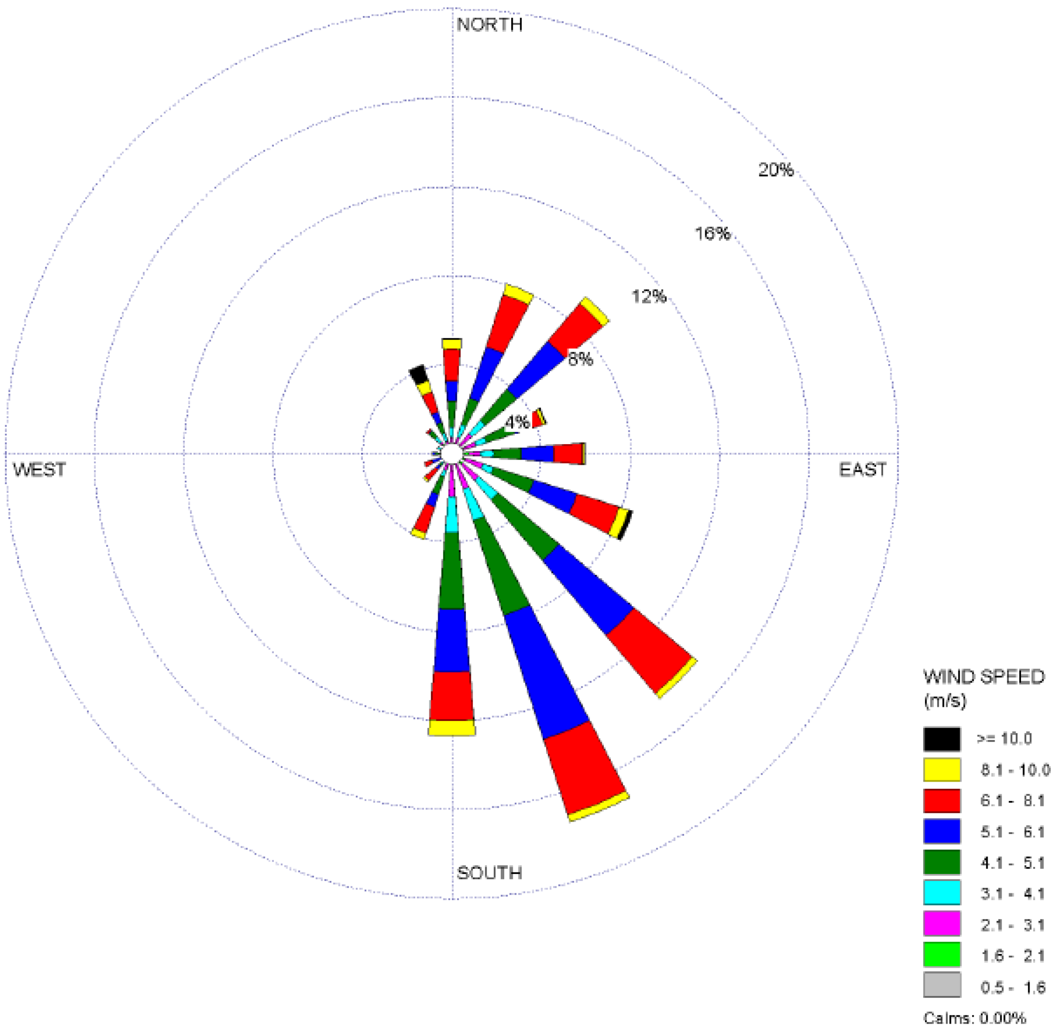


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - September (1997, 1999, and 2000) - Page 9 of 12

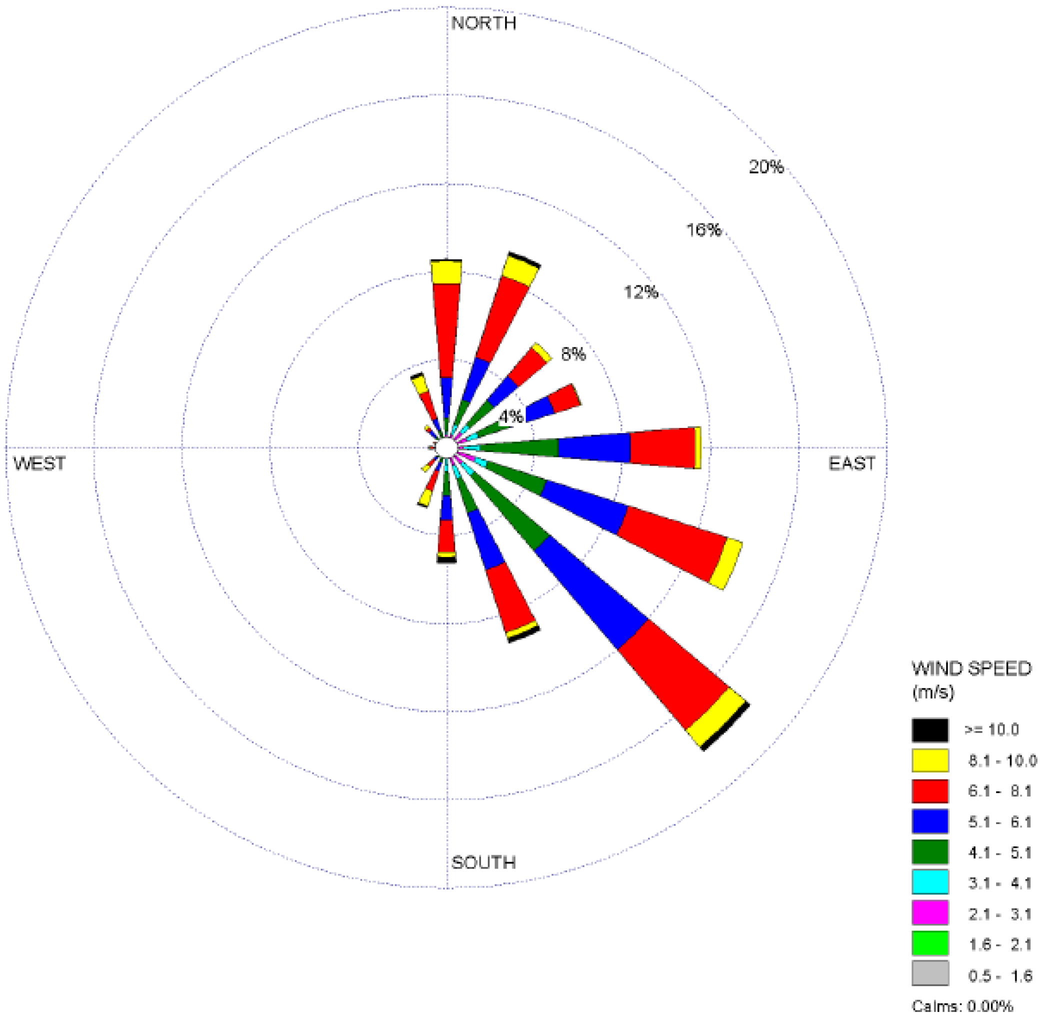


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - October (1997, 1999, and 2000) - Page 10 of 12

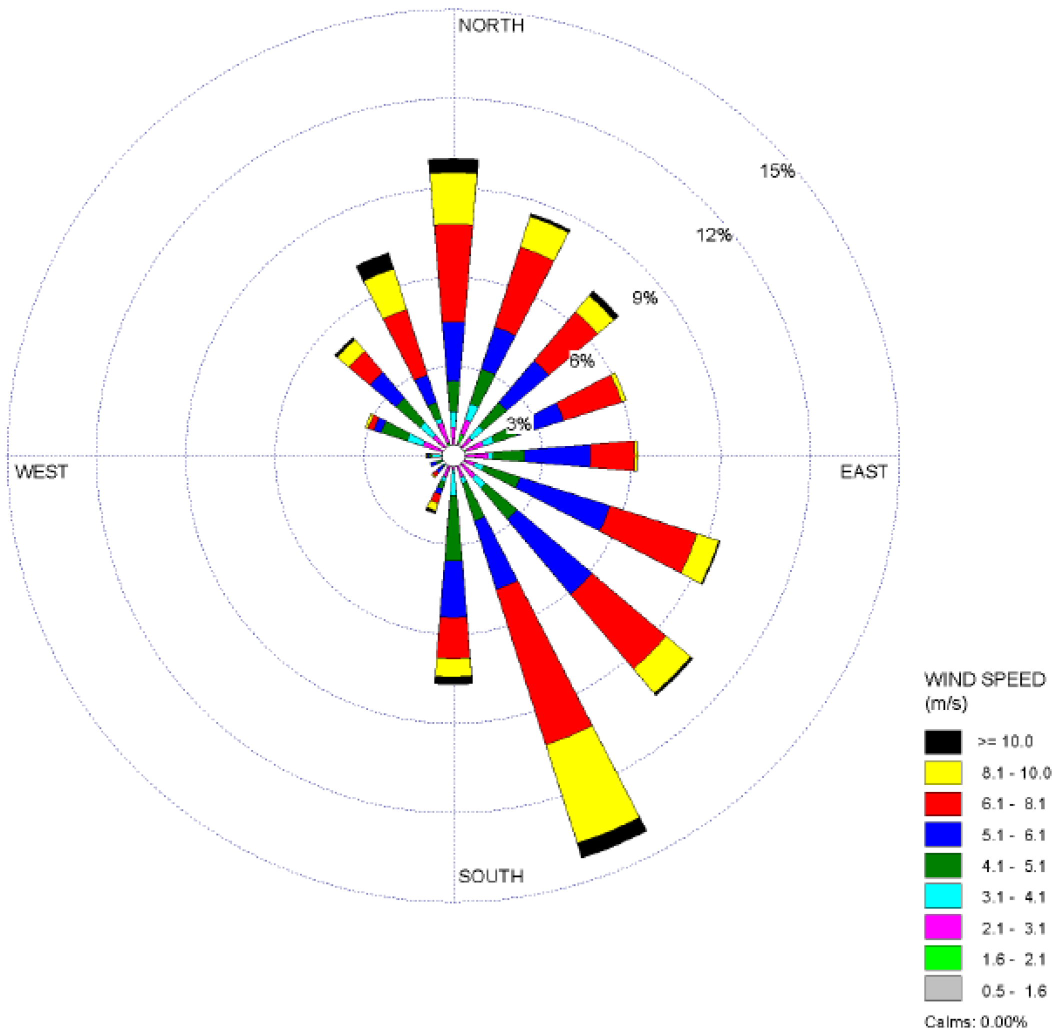


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - November (1997, 1999, and 2000) - Page 11 of 12

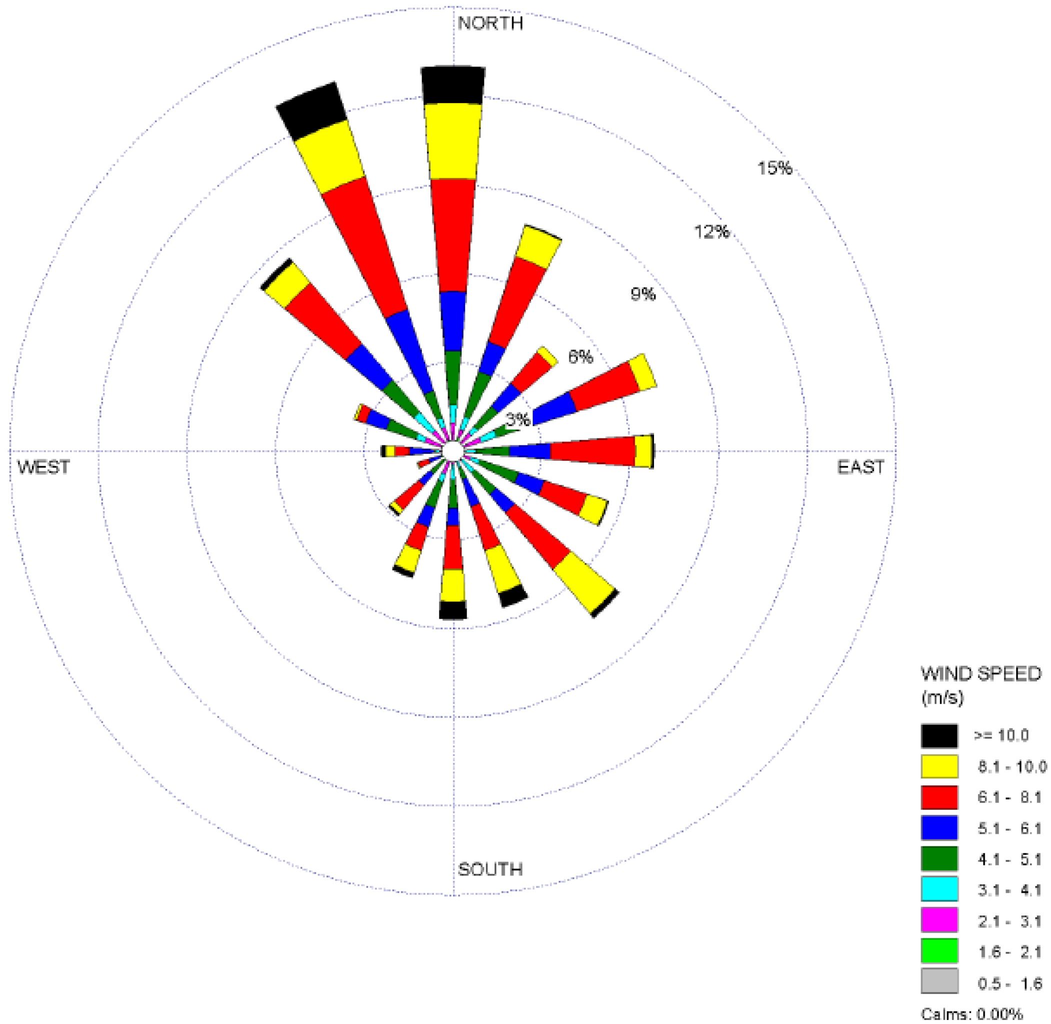


Figure 2.7-13 STP 60-Meter Level 3-Year Composite Wind Rose - December (1997, 1999, and 2000) - Page 12 of 12

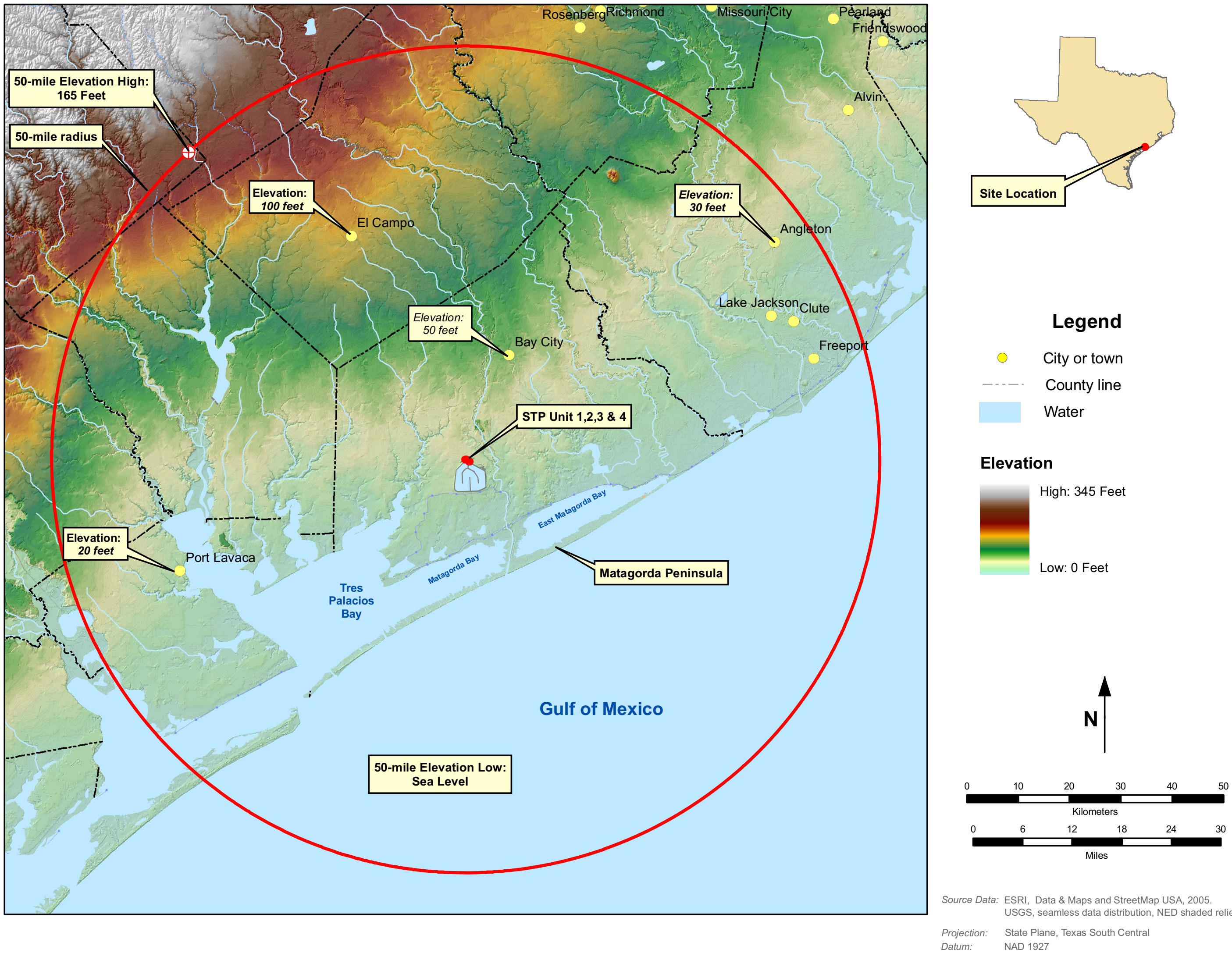
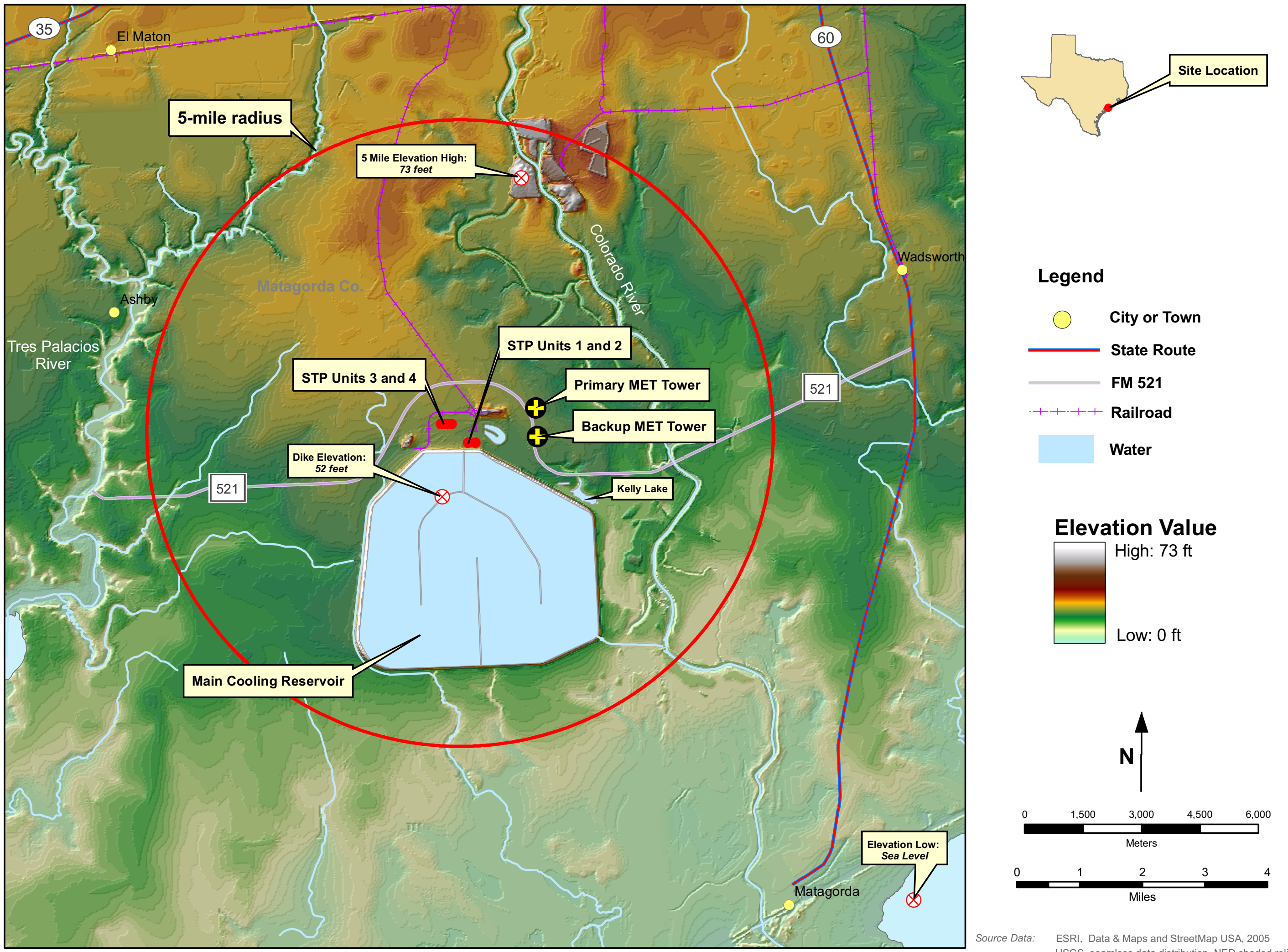


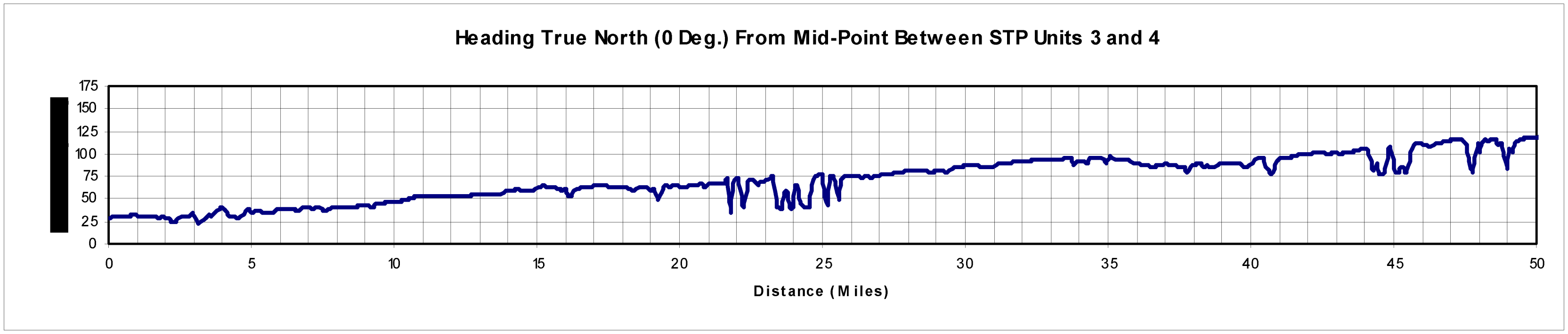
Figure 2.7-14 Site Area Map - 50-Mile Radius



Source Data: ESRI, Data & Maps and StreetMap USA, 2005
USGS, seamless data distribution, NED shaded relief
Houston Lighting & Power Company, Drawing No. 9-Y-51-0-H-1151 Rev. 9

Projection: State Plane, Texas South Central
Datum: NAD 1927

Figure 2.7-15 Site and Vicinity Map (5-Mile Radius)



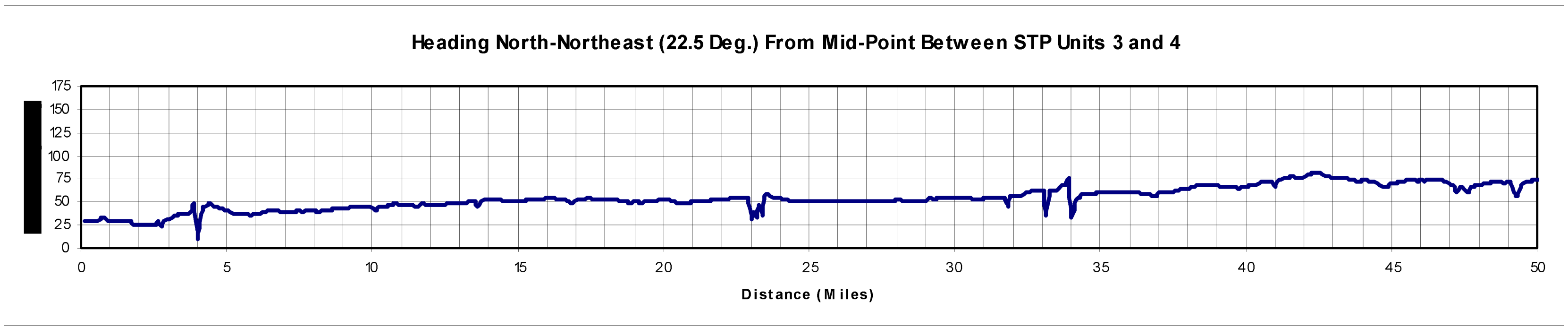
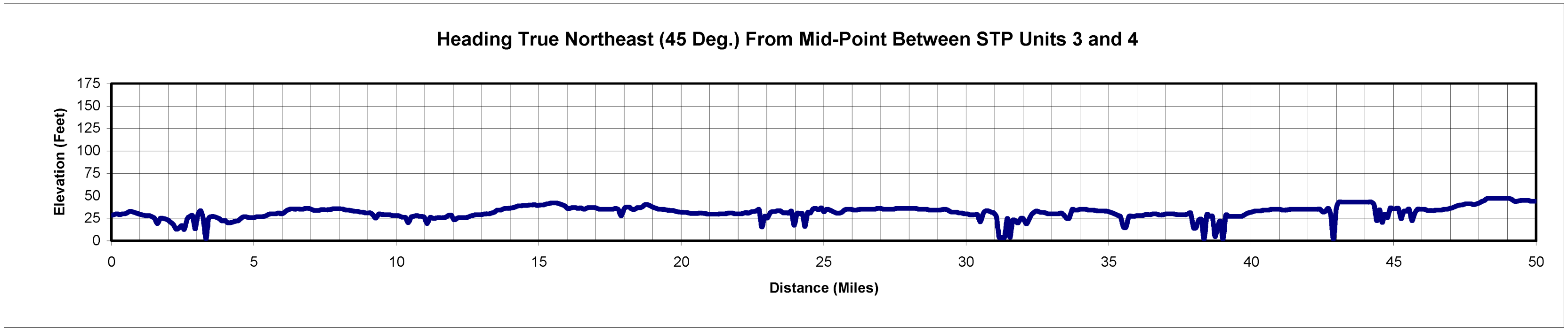


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 1 of 8)



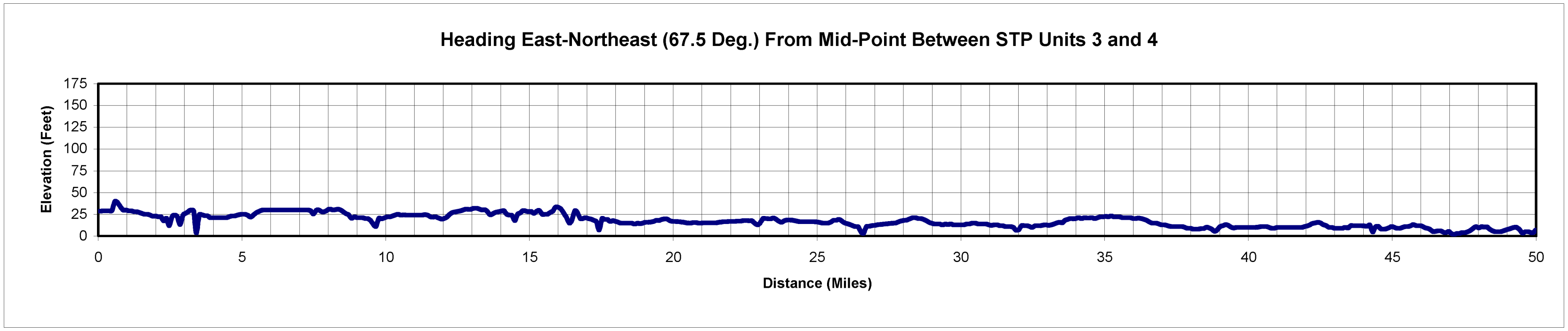
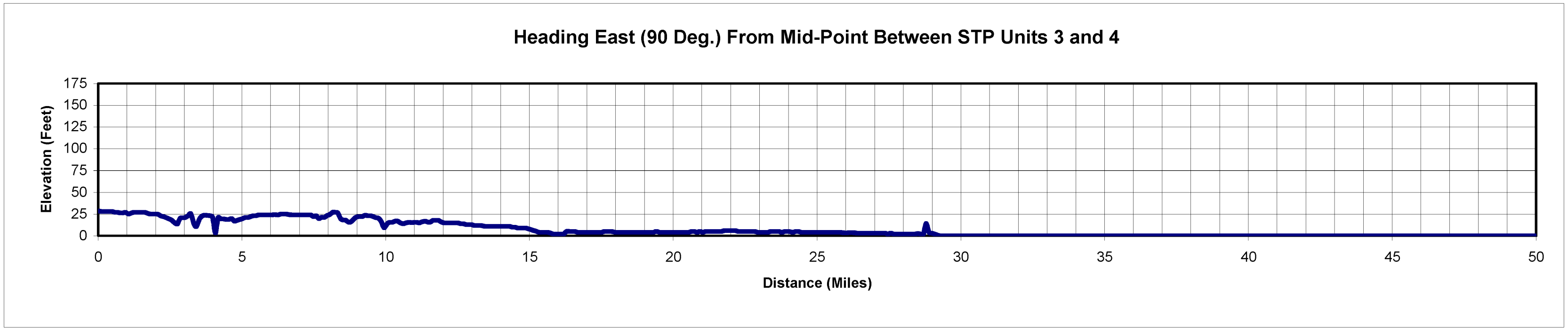


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 2 of 8)



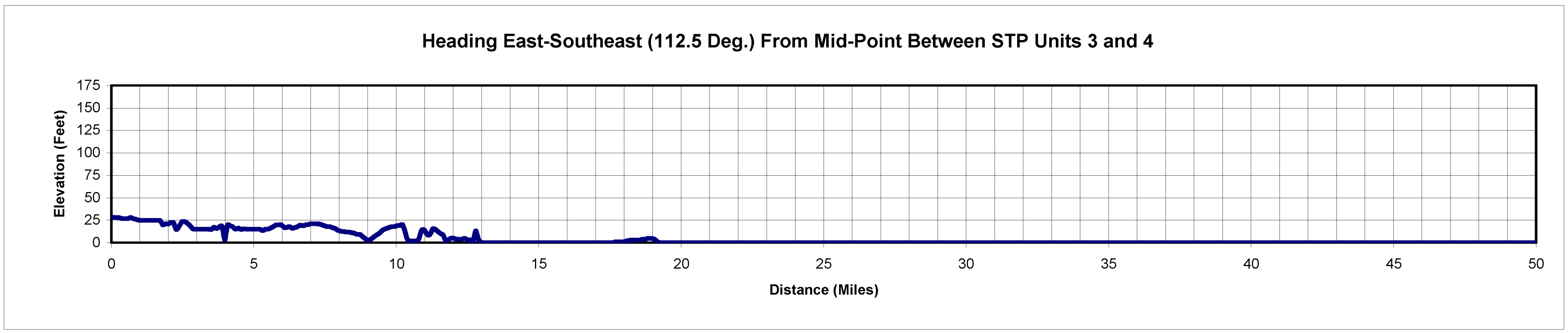
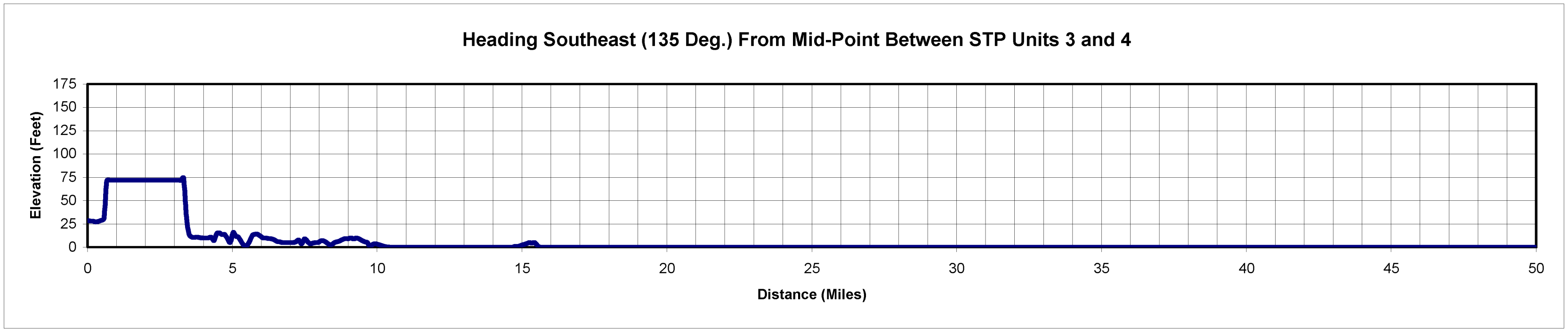


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 3 of 8)



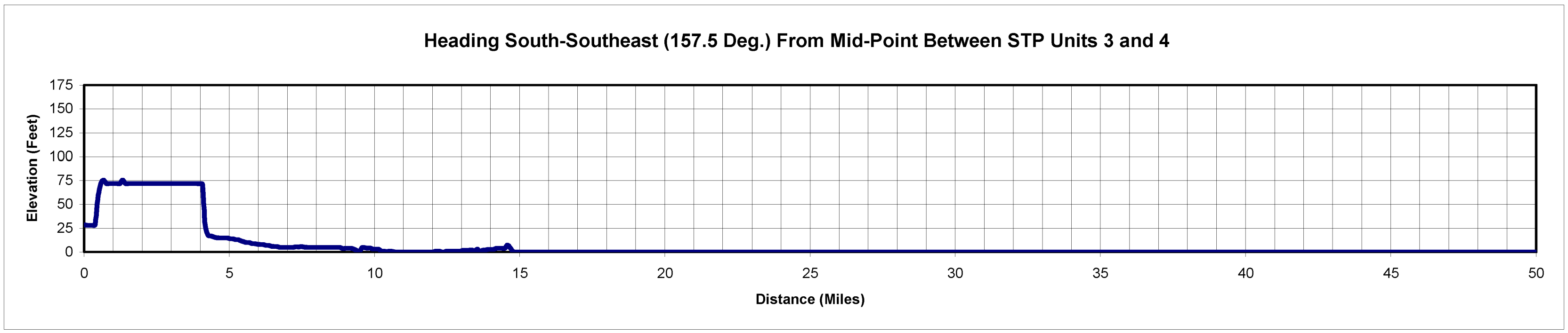
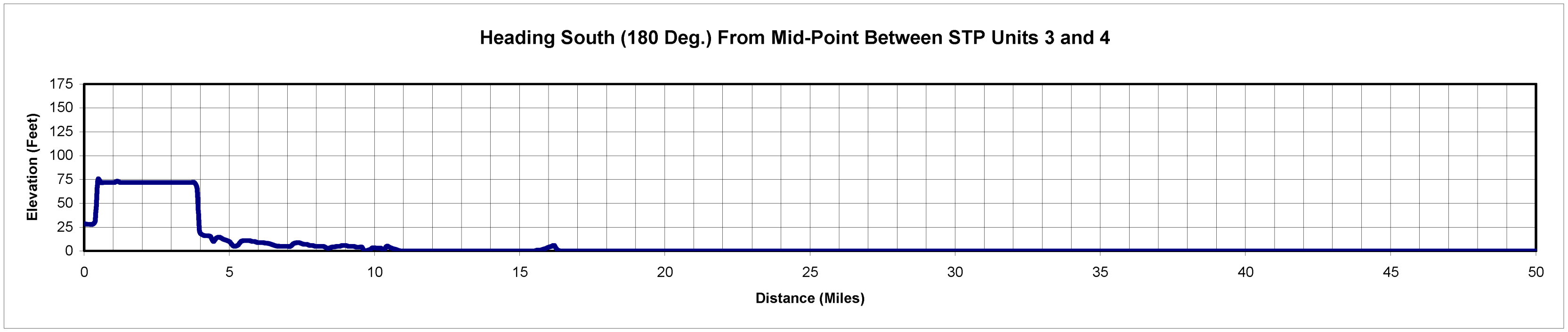


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 4 of 8)



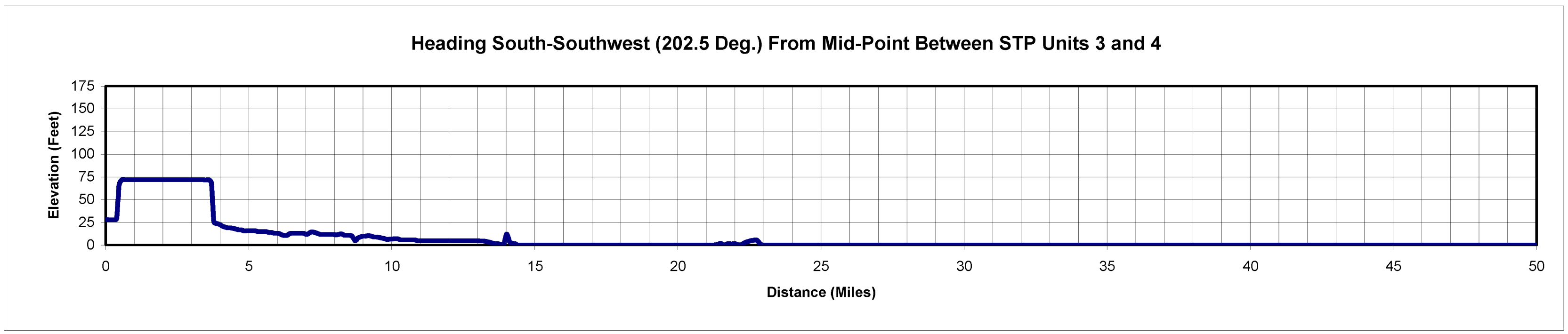
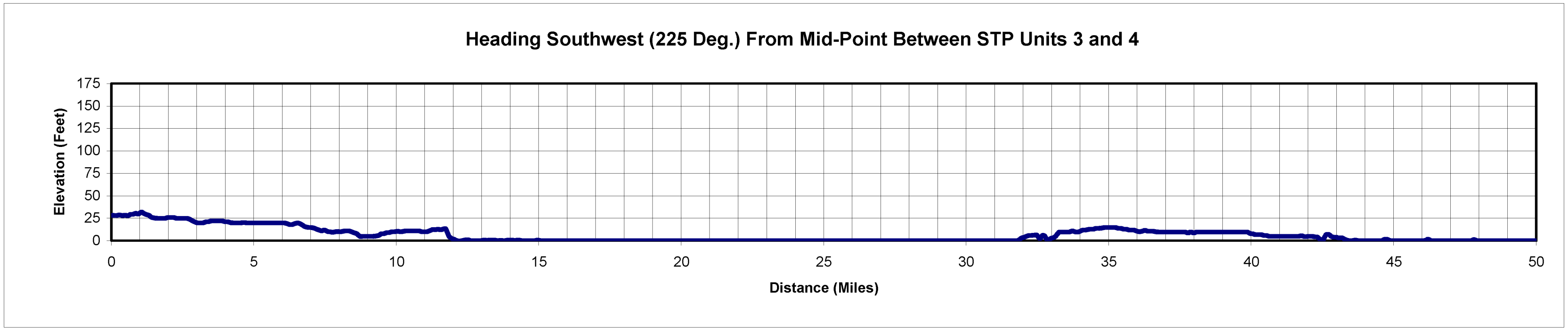


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 5 of 8)



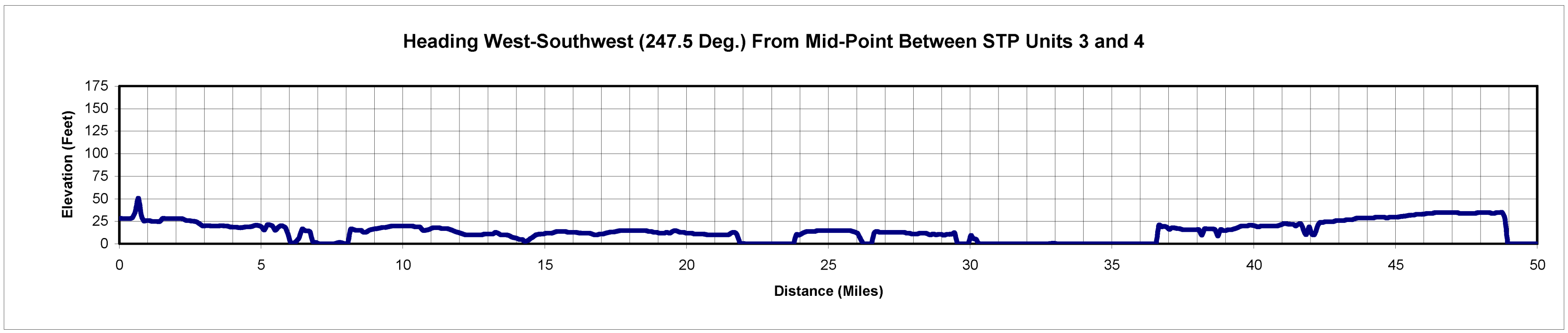
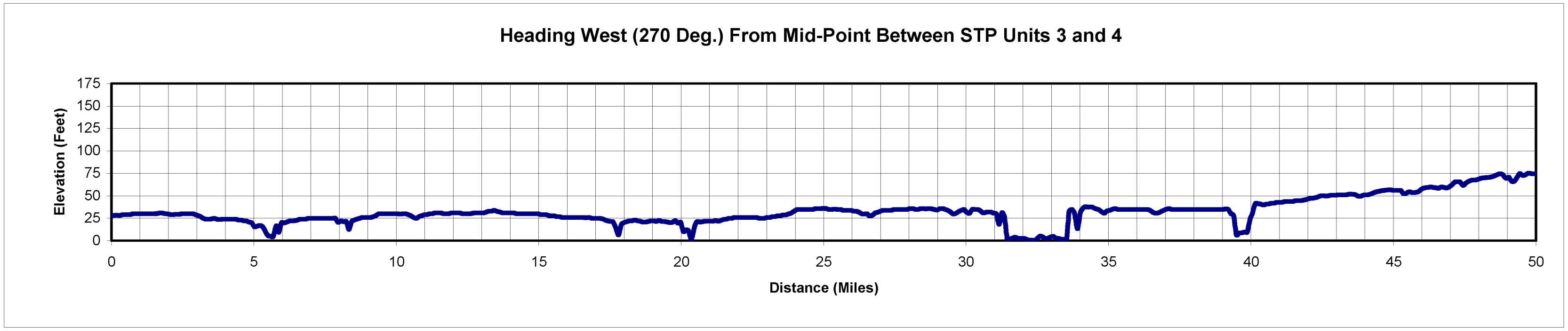


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 6 of 8)



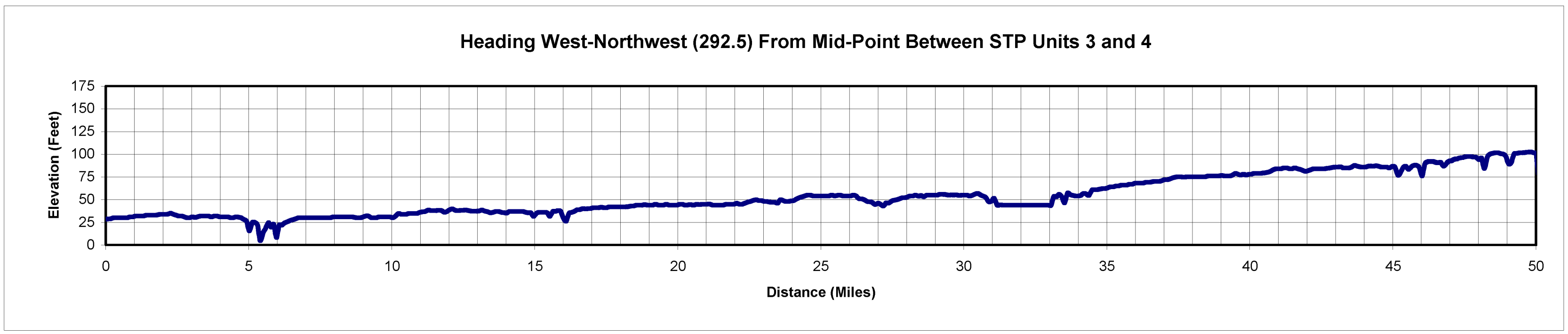
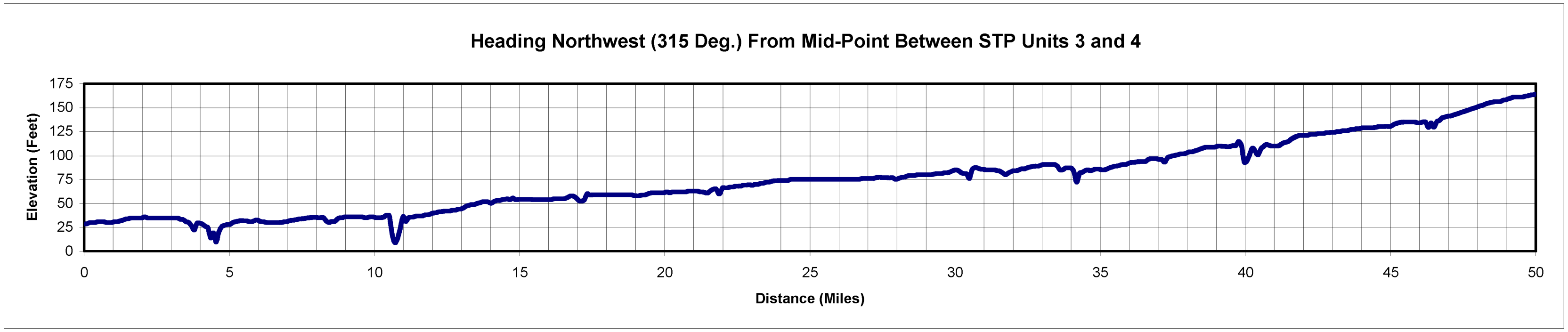


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 7 of 8)



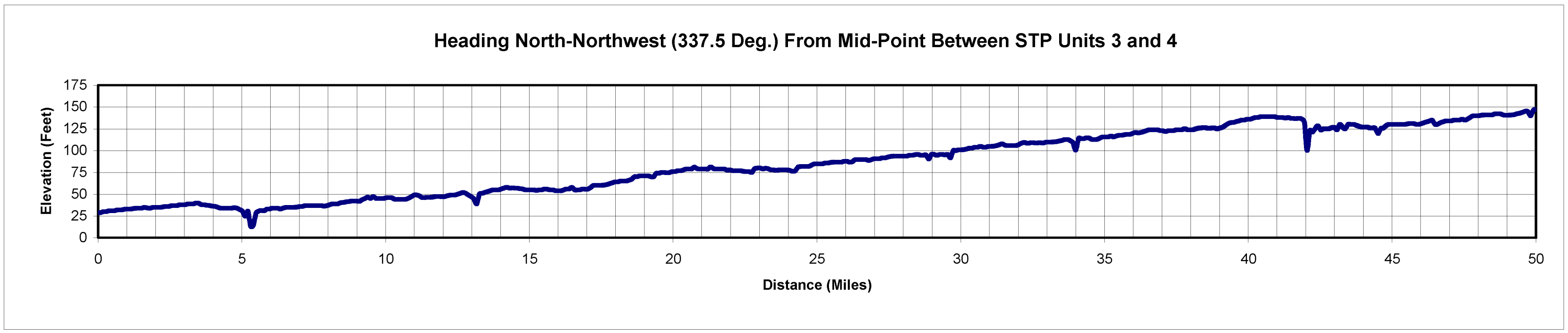


Figure 2.7-16 Terrain Elevation Profiles Within 50 Miles of the STP Site (Sheet 8 of 8)

Reference: ESRI Data and Maps and Streetmap USA, 2005, USGS Seamless Data Distribution