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2.4.7 ICE EFFECTS

PTN COL 2.4-2 The potential impact of ice effects on Units 6 & 7 is analyzed by evaluating historical hydrometeorological data from the USGS and NOAA and by examining the historical occurrences of ice events including a detailed search of the *Ice Jam Database* of the USACE. Results of this evaluation are summarized below.

The climate near Units 6 & 7 is subtropical marine with occasional freezing air temperatures (Reference 201). Freezing events were reported for the years 1977 and 1989 (Reference 202). These freezing events are captured in the historical air temperature data obtained from the National Climate Data Center (NCDC) of NOAA (Reference 201). However, as described below, the corresponding daily average temperatures always stayed above freezing.

Water temperature data are obtained from USGS stations (Reference 203). Due to data quality, data from 13 stations of the available 449 stations within 30 miles (48 kilometers) of the plant area are used. These 13 stations are listed in Table 2.4.7-201 and are shown in Figure 2.4.7-201. Figure 2.4.7-202 plots the water temperature at these stations for 1953–2007. The results indicate that water temperatures remain well above the freezing point with the minimum water temperature of 54.0°F (12.2°C) recorded on April 3, 1959, in the Snapper Creek Canal at Miller Drive near S. Miami Station (USGS No. 02290610) (Reference 203). The station is 20 miles (32 kilometers) northwest of the plant area.

Air temperature data of two meteorological stations are obtained from NCDC of NOAA (Reference 201). These stations are the Homestead Experimental Station (12 miles [19 kilometers] west of the plant area, Cooperative ID 084091, period of record from 1910 to 1988 with a continuous record starting in 1931) and the Miami International Airport Station (24 miles [38 kilometers] north of the plant area, Cooperative ID 085663, period of record from 1948 to 2008). Figure 2.4.7-201 shows the location of the two meteorological stations. Table 2.4.7-202 summarizes subfreezing and corresponding daily average temperatures on record. Although the data at the two stations show below-freezing air temperatures with a minimum of 26°F (–3.3°C), measured on December 13, 1934, March 2, 1941, and February 16, 1943, at the Homestead Experimental Station, the daily average temperatures remained above freezing. The minimum daily average temperature of 38°F (3.3°C) occurred on December 24, 1989, at Miami International Airport Station (Reference 201).

There are no records of ice jams in Florida in the *Ice Jam Database* of USACE ([Reference 204](#)). Ice sheet formation, wind-driven ice ridges, and frazil or anchor ice formation are also precluded because subfreezing water and daily average air temperatures have not occurred based on the available historical data.

The design of the AP1000 reactor employs a passive containment cooling system that functions as the safety-related ultimate heat sink. This system is described in [DCD Subsection 6.2.2](#). The passive containment cooling system does not require an open surface water source to perform its safety-related function and, therefore, is not affected by surface water ice conditions.

2.4.7.1 References

201. U.S. Department of Commerce, NOAA, NCDC Homestead Experimental Station (Cooperative Id 084091) and Miami International Airport (Cooperative Id 085663) Station Data. Available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?WWDI~StnSrch~StnID~10100175> and at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?WWDI~StnSrch~StnID~20004250>, accessed August 6, 2008.
202. U.S. Department of Commerce, NOAA, *Florida's Top 10 Weather Events of the 20th Century*. Available at <http://www.srh.noaa.gov/tlh/topevents/>, accessed September 25, 2008.
203. U.S. Geological Survey, *Water-Quality Samples for the Nation*, Water Temperatures for Biscayne Canal at S-28 Near Miami, Florida (Station #02286340), Little River Canal at S-27 at Miami, Florida (Station #02286380), Miami Canal at NW36 ST, Florida (Station #02288600), Miami Canal at Water Plant at Hialeah, Florida (Station #02288500), Miami Canal East of Levee 30 Near Miami, Florida (Station #02287395), Mowry Canal Near Homestead, Florida (Station #02290725), Snake Creek Ca at S-29 at North Miami Beach, Florida (Station #02286300), Snake Creek Canal at NW67 Ave Nr Hialeah, Florida (Station #02286200), Snake Creek Canal Below S-30 Nr Hialeah, Florida (Station #02286181), Tamiami Canal near Coral Gables, Florida (Station #02289500), Tamiami Canal Outlets L-30 to L-67A Nr Miami, Florida (Station #02289060), West Highway Creek near Homestead, Florida (Station #251433080265000), Snapper Creek C at Miller Drive Nr Smiami, Florida (Station #02290610). Available at <http://nwis.waterdata.usgs.gov/usa/nwis/qwdata>, accessed September 25, 2008.

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204. U.S. Army Corps of Engineers, *Ice Jam Database*, Cold Region Research and Engineering Laboratory. Available at <http://www.crrel.usace.army.mil/ierd/icejam/icejam.htm>, accessed August 13, 2008.
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Table 2.4.7-201
USGS Stations Used to Characterize the Typical Water Temperatures Near
Units 6 & 7

| USGS Station ^(a) | Station No. | Period of Record |
|--|-----------------|------------------|
| BISCAYNE CANAL AT S-28 NEAR MIAMI | 2286340 | 1968–1996 |
| LITTLE RIVER CANAL AT S-27 AT MIAMI | 2286380 | 1958–1996 |
| MIAMI CANAL AT NW36 ST | 2288600 | 1967–1996 |
| MIAMI CANAL AT WATER PLANT AT HIALEAH | 2288500 | 1953–1979 |
| MIAMI CANAL EAST OF LEVEE 30 NEAR MIAMI | 2287395 | 1961–1980 |
| MOWRY CANAL NEAR HOMESTEAD | 2290725 | 1969–1980 |
| SNAKE CREEK CA AT S-29 AT NORTH MIAMI BEACH | 2286300 | 1967–1980 |
| SNAKE CREEK CANAL AT NW67 AVE NR HIALEAH | 2286200 | 1960–1980 |
| SNAKE CREEK CANAL BELOW S-30 NR HIALEAH | 2286181 | 1961–1975 |
| TAMIAMI CANAL NEAR CORAL GABLES | 2289500 | 1963–1980 |
| TAMIAMI CANAL OUTLETS L-30 TO L-67A NR MIAMI | 2289060 | 1953–1982 |
| WEST HIGHWAY CREEK NEAR HOMESTEAD | 251433080265000 | 2003–2007 |
| SNAPPER CREEK C AT MILLER DRIVE NR SMIAMI | 2290610 | 1958–1976 |

(a) Water temperature data from 449 stations were examined. Only 13 stations listed in the table above have periodic measurements useful for analysis. In addition, although the period of records for the stations is from 1939 to 2007, data prior to 1953 are sporadic and were not considered in this evaluation.

Source: [Reference 203](#)

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Table 2.4.7-202 (Sheet 1 of 2)
Subfreezing and Corresponding Daily Average Temperatures at
NCDC Stations Near Units 6 & 7

| Homestead Experimental Station (Period of Record 1910 to 1988) | | | | | |
|--|----------------|---------|------------|----------------|---------|
| Date | Temperature °F | | Date | Temperature °F | |
| | Minimum | Average | | Minimum | Average |
| 12/03/1910 | 31.0 | 46.5 | 01/26/1951 | 30.0 | 48.0 |
| 02/03/1917 | 30.0 | 40.0 | 01/05/1953 | 32.0 | 53.5 |
| 02/06/1917 | 32.0 | 49.5 | 12/17/1953 | 32.0 | 49.0 |
| 01/02/1918 | 30.0 | 51.0 | 12/22/1954 | 30.0 | 49.0 |
| 01/04/1918 | 27.0 | 43.5 | 12/23/1954 | 32.0 | 53.5 |
| 03/02/1920 | 31.0 | 51.5 | 01/06/1956 | 31.0 | 51.5 |
| 12/17/1920 | 32.0 | 51.0 | 01/09/1956 | 29.0 | 46.5 |
| 02/28/1922 | 29.0 | (a) | 01/10/1956 | 31.0 | 50.5 |
| 12/28/1923 | 27.0 | 56.5 | 01/15/1956 | 27.0 | 49.0 |
| 01/02/1927 | 30.0 | 47.5 | 01/10/1958 | 31.0 | 44.5 |
| 01/12/1927 | 30.0 | 49.0 | 02/05/1958 | 27.0 | 48.5 |
| 03/04/1927 | 32.0 | 51.0 | 02/14/1958 | 32.0 | 49.0 |
| 01/29/1928 | 30.0 | 48.5 | 01/22/1960 | 29.0 | 44.0 |
| 12/29/1928 | 32.0 | 52.0 | 01/23/1960 | 30.0 | 44.5 |
| 03/05/1930 | 32.0 | 51.0 | 01/24/1960 | 28.0 | 45.5 |
| 12/12/1934 | 31.0 | 44.5 | 01/21/1961 | 32.0 | 49.5 |
| 12/13/1934 | 26.0 | 40.0 | 12/29/1961 | 32.0 | 47.0 |
| 12/12/1937 | 32.0 | 47.5 | 12/30/1961 | 32.0 | 47.5 |
| 01/28/1938 | 32.0 | 48.5 | 12/10/1962 | 30.0 | 44.0 |
| 01/20/1939 | 32.0 | 46.5 | 12/11/1962 | 29.0 | 48.0 |
| 01/28/1940 | 28.0 | 39.5 | 12/14/1962 | 30.0 | 44.5 |
| 01/29/1940 | 30.0 | 44.0 | 12/15/1962 | 31.0 | 48.5 |
| 01/30/1940 | 30.0 | 46.0 | 01/14/1964 | 32.0 | 41.5 |
| 01/11/1941 | 31.0 | 49.0 | 01/15/1964 | 30.0 | 46.5 |
| 03/02/1941 | 26.0 | 46.0 | 01/18/1965 | 30.0 | 45.0 |
| 02/03/1942 | 30.0 | 49.0 | 01/31/1966 | 31.0 | 48.0 |
| 03/04/1942 | 32.0 | 50.5 | 01/20/1971 | 30.0 | 41.5 |
| 02/16/1943 | 26.0 | 47.0 | 01/19/1977 | 31.0 | 39.5 |
| 12/20/1943 | 30.0 | 49.0 | 01/20/1977 | 27.0 | 44.0 |
| 02/09/1945 | 32.0 | 55.0 | 01/13/1981 | 31.0 | 46.0 |
| 02/06/1947 | 29.0 | 48.5 | 01/19/1981 | 32.0 | 50.0 |
| 01/02/1949 | 30.0 | 51.5 | 12/26/1983 | 31.0 | 39.5 |
| 11/27/1949 | 31.0 | 53.0 | 01/22/1985 | 30.0 | 41.0 |
| 11/29/1950 | 30.0 | 49.0 | 01/23/1985 | 32.0 | 43.0 |
| 12/19/1950 | 30.0 | 47.0 | 03/02/1986 | 32.0 | 48.0 |

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Table 2.4.7-202 (Sheet 2 of 2)
Subfreezing and Corresponding Daily Average Temperatures at
NCDC Stations Near Units 6 & 7

| Homestead Experimental Station (Period of Record 1910 to 1988) | | | | | |
|--|----------------|---------|------------|----------------|---------|
| Date | Temperature °F | | Date | Temperature °F | |
| | Minimum | Average | | Minimum | Average |
| 12/20/1950 | 32.0 | 49.5 | — | — | — |
| Miami International Airport (Period of Record 1948 to 2008) | | | | | |
| Date | Temperature °F | | Date | Temperature °F | |
| | Minimum | Average | | Minimum | Average |
| 01/20/1977 | 31.0 | 45.0 | 01/22/1985 | 30.0 | 41.5 |
| 03/03/1980 | 32.0 | 42.5 | 12/24/1989 | 31.0 | 38.0 |
| 01/13/1981 | 32.0 | 46.5 | 12/25/1989 | 30.0 | 42.5 |

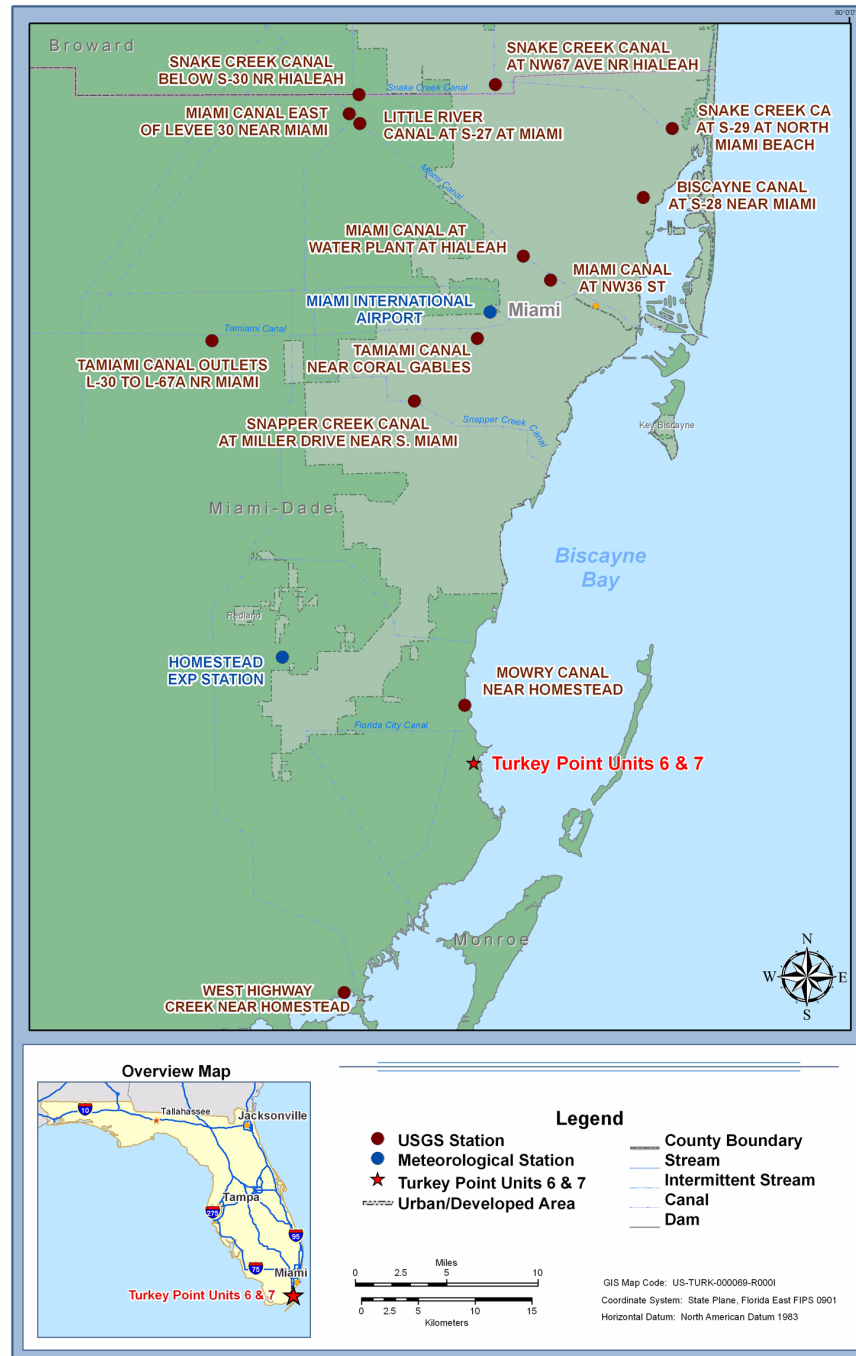
(a) This data point is not available. However, based on all the data available, the daily average temperature is not expected to fall below freezing.

Source: [Reference 201](#)

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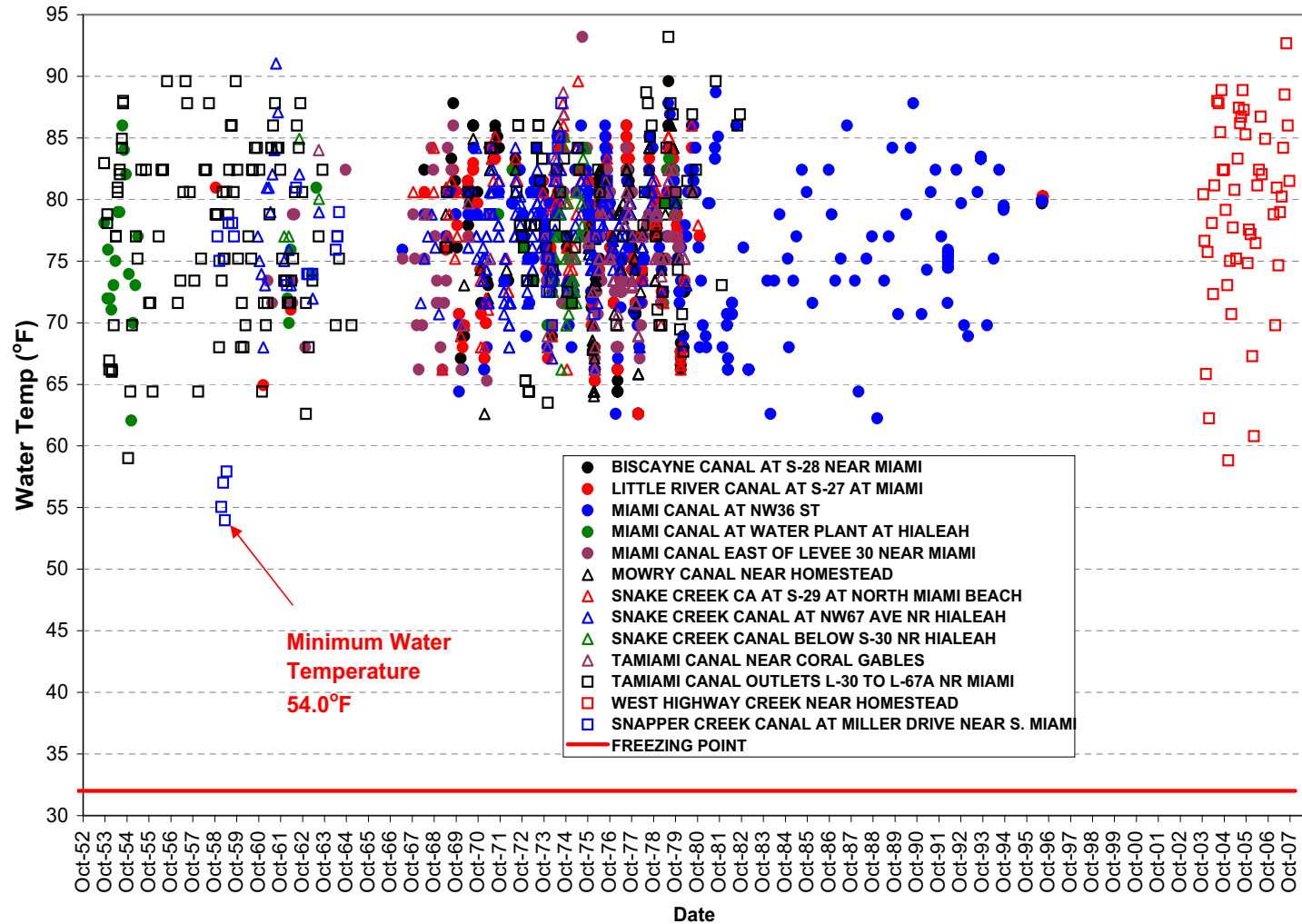
**Figure 2.4.7-201 Meteorological and USGS Stations Near Units 6 & 7
Where Historical Air Temperature and Water Temperature Data Were
Collected**



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Figure 2.4.7-202 Water Temperatures at the USGS Stations Near Units 6 & 7



Reference 203