2.4.7 Ice Effects

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 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.

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.

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

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)					
	Temperature °F			Temperature °F	
Date	Minimum	Average	Date	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

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

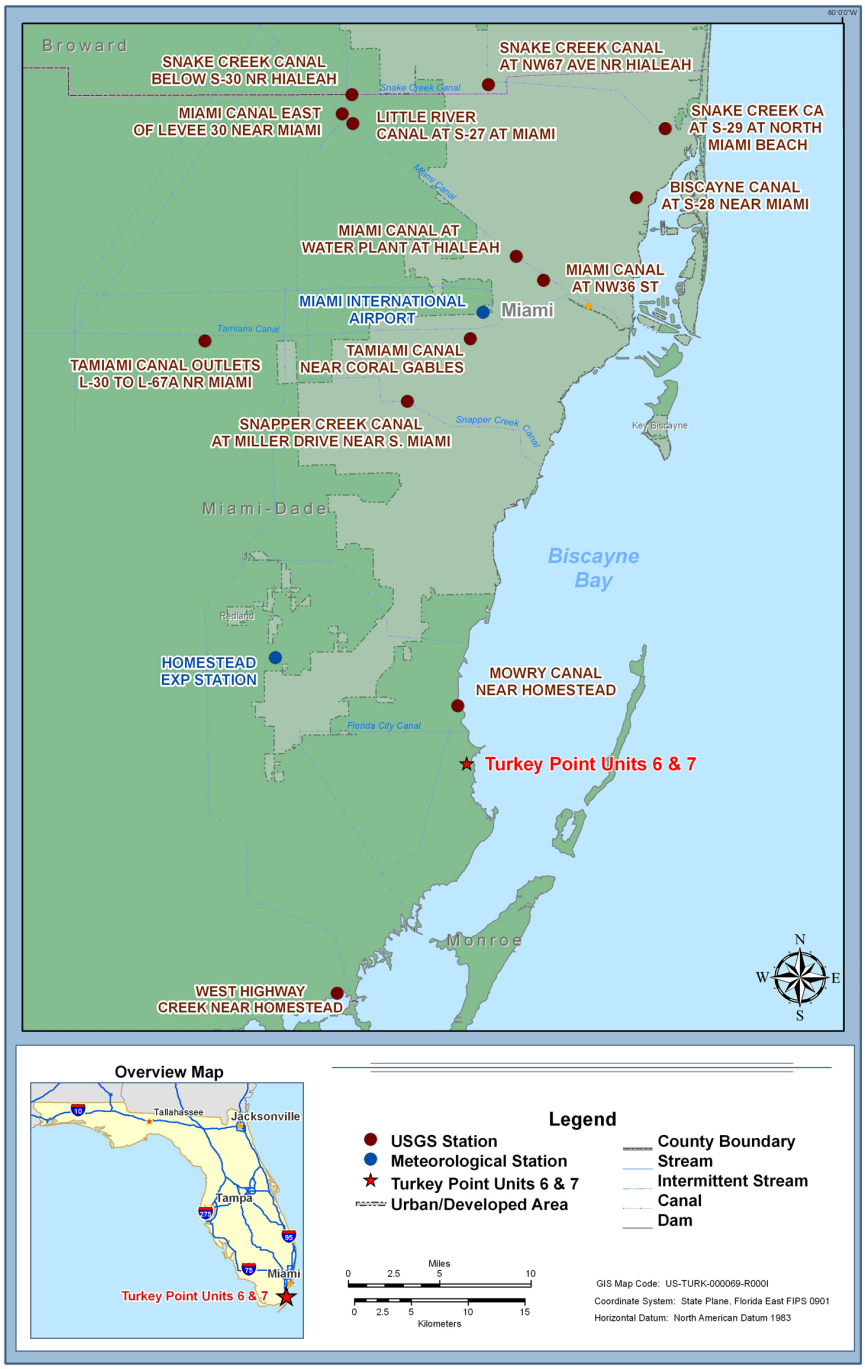
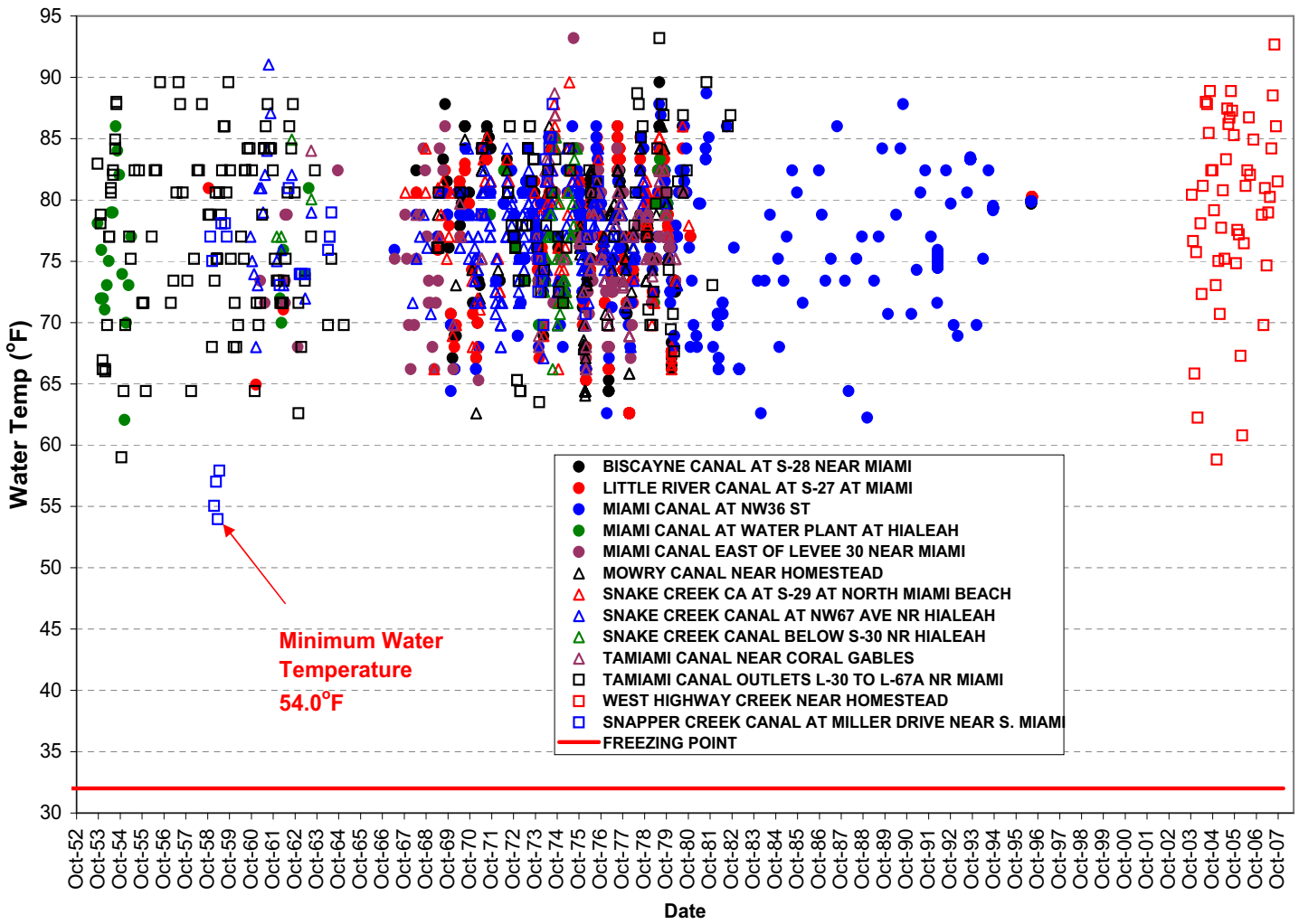


Figure 2.4.7-201 Meteorological and USGS Stations Near Units 6 & 7 Where Historical Air Temperature and Water Temperature Data Were Collected



Reference 203

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