SAFETY EVALUATION REPORT INPUT
DAVIS-BESSE-UNIT 1
DOCKET NO. 50-346
METEOROLOGY

2.3 Information concerning atmospheric diffusion characteristics of a nuclear power plant site are required for a determination that postulated accidental, as well as routine operational, releases are within USNRC guidelines. Regional and local climatological information, including extremes of climate and severe weather occurrences which may affect safe design and siting of a nuclear plant, are required to ensure that safety-related plant design and operating bases are within USNRC guidelines. Meteorological characteristics of a site are determined by our evaluation of meteorological information in accordance with the procedures presented in Sections 2.3.1 through 2.3.5 of the USNRC Regulatory Standard Review Plan (November 1974).

2.3.1 Regional Climatology

The climate of the site can be described as continental, moderated somewhat by the presence of Lake Erie. During the winter the area is frequently affected by southward movements of continental polar air from Canada that is modified by crossing the relatively warm waters of the lake, resulting in slightly warmer temperatures, excessive winter cloudiness, and frequent snows. In the summer, Lake Erie also has a moderating effect on temperature extremes, and a "lake breeze" circulation is established along and near the shoreline, further cooling the area.

Severe weather is not uncommon because the site lies near the principal track of winter and spring storms that move northeast and east through the region.

Thunderstorms can be expected to occur on about 40 days per year, being most frequent in June, July, and August. Between 1955 and 1967, the one-degree latitude-longitude square containing the site had 1[illegible] occurrences of hail greater than 3/4 of an inch in diameter.

Also during the period 1955-1967, 14 tornadoes were reported in the one-degree latitude-longitude square containing the site, giving a mean annual frequency of 1.1. The computed recurrence interval for a tornado at the plant site is about 1200 years. April is the month with the highest frequency of tornado occurrences. Four waterspouts have been reported on Lake Erie within 50 miles of the site between 1951 and 1973. The design bases tornado characteristics (360 mph maximum wind speed) for this plant were

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established by USAEC Reactor Technology Memorandum No. 1, "Tornado Considerations," dated April 10, 1968. The acceptability of the applicant's design capability for tornadoes of this magnitude is discussed in Section 3.3 of this report.

The "fastest mile" wind speed reported at Toledo (about 20 miles west-northwest of the site) was 87 mph (March 1948). The operating basis wind speed (defined as the "fastest mile" wind speed at a height of 30 feet above the ground with a return period of 100 years) of 90 mph selected by the applicant is adequate for the si

In the period 1936-1970, there were about 28 atmospheric stagnation cases totalling about 115 days reported in the site area.

2.3.2 Local Meteorology

Climatological data from Toledo, Sandusky (about 20 miles east-southeast of the site), and available onsite data have been used to assess local meteorological characteristics.

Mean monthly temperatures at the site may be expected to range from about 28°F in January to about 74°F in July. Extreme temperatures of 105°F and -15°F have been reported at Sandusky.

Annual average precipitation in the site area is about 34 inches, with about 60% occurring in the period April through September. The maximum 24-hour rainfall reported at Sandusky was about 5.6 inches. Annual average snowfall is about 29 inches. The maximum 24-hour snowfall at Sandusky was 12.3 inches.

Wind data from the 20-ft level of the original 300-foot onsite meteorological tower for the period December 1969 through November 1970 indicate prevailing winds from the west-southwest, southwest, and south-southwest occcurred about 38% of the time. Winds from the southeast and south-southeast occurred least frequently at less than 3% for each direction. Calms occurred about 2.5% of the time.

2.3.3 Onsite Meteorological Measurements Program

The current onsite meteorological measurements program, operational since August 1974, consists of two meteorological towers, 340-foot and 35-foot, located about 2000 feet southwest of the Unit 1 containment building. A temporary 35-ft tower was in operation from December 1973 to August 1974. On the 340-ft tower, wind speed and direction are measured at the 250-ft and 340-ft levels, vertical temperature difference measurements are made between the

35-ft and 250-ft levels and between the 35-ft and 340-ft levels, and ambient dry bulb temperatures are measured at 35-ft and 340-ft. Precipitation is measured at ground level. The 35-ft tower is used for 35-ft wind speed and direction measurements. This meteorological measurements program meets the recommendations and intent of Regulatory Guide 1.23.

A meteorological program using a 300-ft tower was initiated in October 1968. Wind speed and direction were measured at the 20-, 100-, and 300-ft levels; vertical temperature gradient was measured between 5 feet and 145 feet and between 145 feet and 297 feet, and dewpoint temperature was measured at 5 feet. This tower was instrumented prior to issuance of Regulatory Guide 1.23. The construction of the Unit 1 structures and a change in grade elevation caused wind speed and direction data from this tower to be erroneous. However, data collected during the period December 1969 through November 1970 do not exhibit any interference problems. The applicant will perform a correlation study of one year of temperature lapse rate data between the 300-foot and 340-foot towers.

One full year of onsite data from the new meteorological program will not be available to us until late 1975. The applicant has provided data from the 300-foot tower for the period December 1969 through November 1970. These data were in the form of joint frequency distributions of wind speed and direction data from the 20-ft level at atmospheric stability (defined by the vertical temperature gradient between 145 feet and 5 feet). Data recovery for this period was 82%. These are the only data available at this time. We have performed an interim evaluation of relative concentration (X/Q) values using these data. We will use the one year of onsite data from the new program, and the correlation study of Delta-T as measured on the 300-foot and 340-foot towers, to verify the relative concentration values presented herein.

In Revision 11, the applicant has described the control room monitoring program for pertinent meteorological parameters. It includes digital displays of 15-minute averages updated every 15 minutes. The parameters to be included in the displays are: wind speed and direction at the 35-ft and 250-ft levels; vertical temperature gradient between 35 feet and 250 feet; ambient dry bulb and dew point temperatures at 35 feet; and standard deviations of wind direction at the 35-ft and 250-ft levels. In addition, there will be an instantaneous meter display of wind speed and direction at 35 feet, vertical temperature gradient between 35 feet adn 250 feet, and ambient dry bulb temperature at 35 feet. The proposed control room monitoring program is acceptable.

2.3.4 Short-Term (Accident) Diffusion Estimates

In the evaluation of short-term (0-2 hours at the exclusion distance and 0-8 hours at the LPZ distance) accidental releases from buildings and vents, we assumed a ground-level release with a building wake factor, cA, of $1300m^2$. Relative concentration (X/Q) values for the various time period following an accidental release were calculated using the diffusion model described in Regulatory Guide 1.4 (Revision 2, June 1974).

The relative concentration value for the 0-2 hour time period for onshore flow conditions (defined as winds blowing from the west-northwest clockwise through southwest) which is exceeded 5% of the time is 5.4×10^{-4} sec/m^3 at the exclusion distance of 730m. This relative concentration is equivalent to that calculated assuming Pasquill Type F stability with a wind speed of 0.8 meters/second.

The relative concentration values for various time periods at the outer boundary of the Low Population Zone (3200m) for onshore flow conditions (defined as winds blowing from the west-northwest clockwise through the southeast) are:

Time Periods	X/Q sec/m^3
0-8 hours	1.8×10^{-5}
8-24 hours	1.3×10^{-5}
1-4 days	5.8×10^{-6}
4-30 days	1.9×10^{-6}

The applicant has presented more conservative values at the LPZ distance because all directions were considered. We consider our analysis to be consistent with our approach to evaluating coastal and shoreline sites.

2.3.5 Long-Term (Routine) Diffusion Estimates

Using the model described in Regulatory Guide 1.42 (Revision 1, March 1974), we calculated the highest offsite overland annual average relative concentration for vent releases, assuming a ground-level release, to be 1.1×10^{-5} sec/m^3 at the site boundary (760m) north-northwest of the reactor complex.

2.3.6 Conclusions

Although we have some reservations about the quality of the onsite meteorological data collected during the period December 1969 through November 1970, the joint frequency distributions of wind speed and direction at the 20-ft level by atmospheric stability (defined by the vertical temperature gradient between 5-ft and 145-feet) for this period appear reasonable. Therefore, we have used these data, without adjustments, for an interim evaluation of accident and annual average relative concentration values. We have compared our interim relative concentration values for the Davis-Besse site with those calculated for the Perry site and preliminary calculations for the Fermi site, considering only onshore flow conditions at each site. These sites are also along the shoreline of Lake Erie, and should have similar atmospheric dispersion characteristics. The relative concentration values for the 0-2 hour time period at the various exclusion distances are comparable, although the values for the longer time periods at the various LPZ distances indicate that the interim atmospheric diffusion estimates for the Davis-Besse site at the LPZ distance are somewhat better than other sites. Our final evaluation will be based on examination of one full year of acceptable data from the new onsite meteorological measurements program (commensurate with the recommendations of Regulatory Guide 1.23), the results of the correlation study of one year of temperature lapse rate data between the 300-foot and 340-foot towers, and a discussion by the applicant concerning the representativeness of the onsite data with respect to expected long-term conditions at the site. We expect the final evaluation to be completed in late 1975, depending upon the schedule developed for the submittal of the additional information. We will report our final evaluation in a supplement to this report.

We also have some concerns with the selection of the design basis meteorological conditions for the Ultimate Heat Sink (UHS). Regulatory Guide 1.27 (Revision 1, March 1974) recommends that analyses determining maximum evaporation from the UHS be based on the worst 30-day average meteorological conditions of record to assure the availability of a 30-day cooling supply, and that analyses determining minimum water cooling be based on worst 1-day and worst 30-day average meteorological conditions of record. The applicant has utilized a statistical approach (Reponse to Item 9.2.8, Revision 11, February 1975) to construct "worst" 30-day average meteorological conditions as input to the analyses determining the adequacy of the UHS. While we do not endorse this approach for the selection of design basis meteorological conditions for the UHS, the selected design basis 30-day average meteorological conditions appear to be conservative, although especially qualitative with respect to wind speeds. This approach does not appear feasible for the identification of worst 1-day average meteorological conditions. Therefore, to allow us to complete our evaluation of the meteorological design bases for the UHS, the applicant should identify the selected worst 1-day average design basis meteorological conditions for minimum water cooling, and should also clarify discrepancies in the selected value (76% or 89%) of 30-day average relative humidity (and corresponding dew point temperature) for the minimum water cooling analysis presented on page 9.2.8.16. We will report our final evaluation in a supplement to this report.

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