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 50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251  
 AUTH.NAME AUTHOR AFFILIATION  
 UHRIG,R.E. Florida Power & Light Co.  
 RECIP.NAME RECIPIENT AFFILIATION  
 GRIMES,B.K. Emergency Preparedness Program Office

SUBJECT: Forwards facility evacuation time estimates in response to  
 NRC 791129 request.

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WASHINGTON, D. C. 20250

MEMORANDUM FOR THE RECORD

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July 17, 1980  
L-80-226

Office of Nuclear Reactor Regulation  
Attention: Mr. Brian K. Grimes, Program Director  
Emergency Preparedness Program Office  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Dear Mr. Grimes:

Re: Turkey Point Units 3 & 4  
Docket Nos. 50-250 & 50-251  
Evacuation Time Estimates

The attached information is being submitted in response to your letter of November 29, 1979. It is based on work performed by our consultant, HMM Associates. The information has been reviewed and found acceptable by appropriate state and local officials.

Very truly yours,

Robert E. Uhrig  
Vice President  
Advanced Systems & Technology

REU/MAS/cph

Attachment

cc: Mr. J. P. O'Reilly, Region II  
Harold F. Reis, Esquire

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8007230442



## ATTACHMENT

Re: Turkey Point Units 3 & 4  
Docket Nos. 50-250 & 50-251  
Evacuation Time Estimates

The estimates contained herein are based on updated population data and on EVAC, a computer-based, real-time, traffic simulation model. A more detailed description of EVAC is contained in Appendix A to this attachment.

Population data were converted to estimated numbers of automobiles evacuating selected sectors of the 10-mile Emergency Planning Zone (EPZ). Two estimates were generated: a conservative estimate (Figure 1) based on an automobile occupancy of 2.6 persons per automobile, and a less conservative estimate (Figure 2) based on 3.2 persons per automobile. The two estimates represent a reasonable range of vehicles departing the EPZ.

An evacuation traffic network, consisting of major streets and intersections within the EPZ, was developed by HMM Associates based on a field survey, Dade County road maps, and USGS maps. Clear time estimates were then made for 7 cases. Normal weather and adverse weather scenarios were examined for each case. The results are shown in Tables 1 and 2.

Six categories of special facilities within the 10-mile EPZ were evaluated: schools, nursing homes, retirement facilities, Department of Health and Rehabilitative Services (DHRS) residences, incarceration facilities, and hospitals. It has been estimated that, by using busses dispatched by the Dade County Bus Transportation Office, it should take no longer than 1-1/2 hours from the time of dispatch to transport students out of the EPZ. Private schools are not considered a special case because the total enrollment is a small fraction of the overall population. All nursing homes have evacuation plans filed with the Dade County Department of Public Health. The retirement facilities, which also represent a small fraction of the overall population, would probably be evacuated by means of carpooling. The single DHRS residence would be evacuated by its van. The incarceration facilities involve a limited number of people who would be transported by police vehicles. Hospitals would be evacuated by a variety of means (e.g., ambulance, private vehicle, local disaster preparedness assistance), with the possibility that some patients and staff may remain sheltered in the hospital, especially if movement would present a greater health hazard than the potential radiological exposure.

The Metropolitan Dade County Civil Defense Agency would be available to assist particular facilities in making transportation arrangements. The Agency has the emergency authority to dispatch Metro Transit Agency Vehicles, Metro Fire-Rescue squads, available school busses, and the local ambulance service.

The islands south and east of Turkey Point that are not served by bridges and highways would be evacuated within several hours by the Florida Marine Patrol and the Public Safety Department Marine Patrol.

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The Civil Defense Agency estimates that the total notification time should be about 30 minutes. It is estimated that visual confirmation of evacuation will take approximately one hour.

Alternatives to evacuation, e.g., taking shelter, controlling access to affected areas, and control of foodstuffs, would be considered in cases where evacuation itself carried a risk comparable to the potential radiological exposure.



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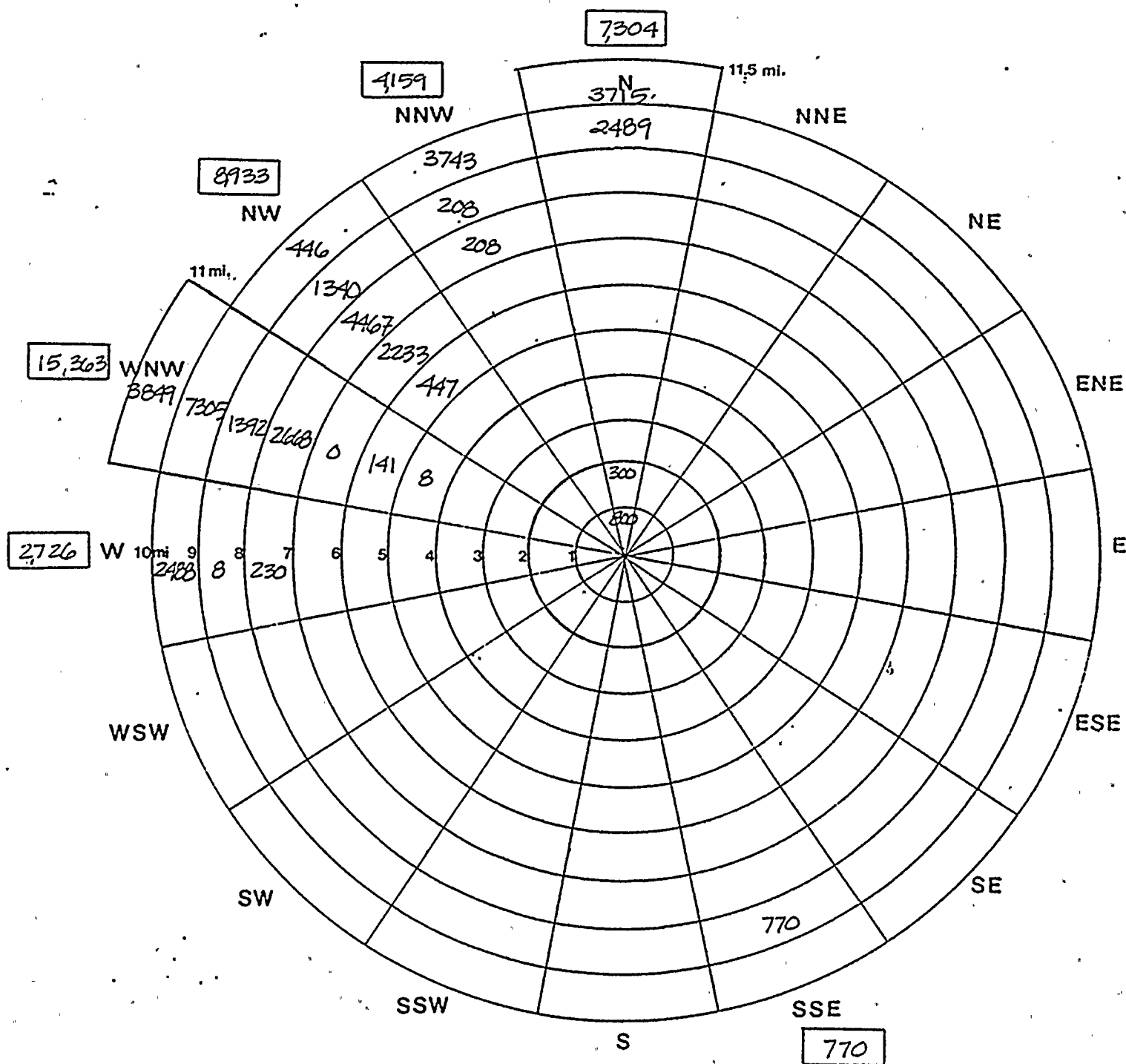


FIGURE 1 NUMBER OF AUTOMOBILES ASSOCIATED WITH PEAK POPULATION - 1980  
(2.6 Persons per auto)  
Total number of autos = 39,255

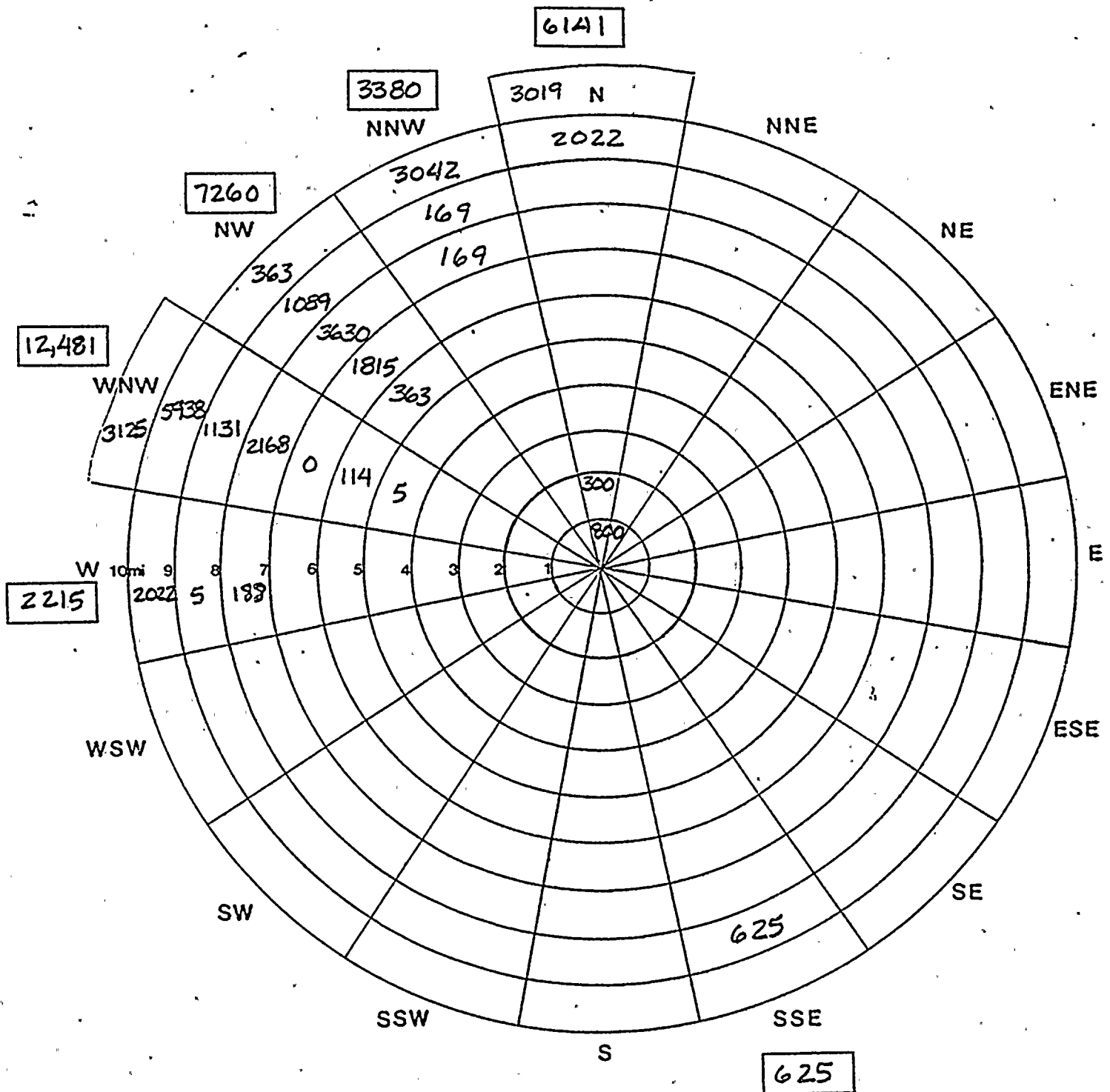


FIGURE 2 NUMBER OF AUTOMOBILES ASSOCIATED WITH PEAK  
POPULATION - 1980  
(3.2 People per Automobile)  
Total number of autos = 32,102



7. 2

TABLE 1

RANGE OF CLEAR TIME ESTIMATES DURING NORMAL WEATHER (minutes)

<u>Evacuation Area</u>	<u>High Estimate</u>	<u>Low Estimate</u>
0-2 miles	60	60
South, 0-5 miles	60	60
West, 0-5 miles	65	65
North, 0-5 miles	70	70
South, 0-10 miles	60	60
West, 0-10 miles	335	185
North, 0-10 miles	225	165

The area to the East was not examined as a general case because it lies over water. The islands to the East were considered as a special case.



TABLE 2

RANGE OF CLEAR TIME ESTIMATES DURING ADVERSE WEATHER \* (MINUTES)

<u>Evacuation Area</u>	<u>High Estimate</u>	<u>Low Estimate</u>
0-2 miles	75	75
South, 0-5 miles	75	75
West, 0-5 miles	80	80
North, 0-5 miles	85	85
South, 0-10 miles	75	75
West, 0-10 miles	350	200
North, 0-10 miles	240	180

The area to the East was not examined as a general case because it lies over water. The islands to the East were considered as a special case.

\*Mixed rain and thunderstorms



### THE EVAC MODEL

The EVAC Model is a traffic network simulation model. It was specifically designed to provide evacuation clear-time estimates, and related information, for use in emergency planning. EVAC was developed by HMM Associates during the Winter and Spring of 1980. Dr. Yosef Sheffi, Warren Powell and Hani Mahmassani are the principal authors of the model.

The EVAC Model applies the principles of the Highway Capacity Manual to estimating traffic conditions during evacuations. Highway geometric data and population (or automobile) density data within the area to be evacuated are input into the Model. Based on these inputs, the Model computes traffic volumes and travel speeds as a function of demand and capacity for each highway link within the evacuation study area.

Given the evacuation highway network data and traffic loading rates and points, the Model calculates evacuation routes, evacuation traffic volumes, and operating speed by link. EVAC simulates the movement of the traffic along the alternative routes and calculates the times required for the simulated movements.

Route choices are dynamically determined at each intersection as a function of predetermined "preference factors" and traffic conditions on the downstream link. The most direct route out of the evacuation area is generally given a higher preference factor; alternate routes are given lower preference factors. When congestion develops and traffic speeds for preferred routes decline, traffic is routed to alternate routes with higher travel speeds.

At each intersection, impedance to traffic flow is calculated. Where traffic signals exist "green time" for each approach is assigned. Where no signals exist, conflicting flows through the intersection are regulated by the model. Total flows in this case are a function of "priority" and traffic demand. Priority is predetermined as priority #1 or priority #2. First priority is given to the dominant or major routes. Second priority is given to the minor or secondary routes, such as those controlled by stop signs.

To keep track of network performance, the Model updates statistics on the full network and on each link at the end of each specified time increment.

EVAC can calculate both current and cumulative statistics for the entire network and for each link at the end of each time step, and/or whenever requested. The statistics reported include capacity, flow, queues, current and total volumes, speeds, network occupancy, and summary of departures. From these data, all significant changes in the network can be traced through the term of the evacuation.



