5877





DATE: March 15, 1988

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

| | |
|---|---|
| In the Matter of | |
| LONG ISLAND LIGHTING COMPANY | Docket No. 50-322-OL-3 (Emergency Planning) |
| (Shoreham Nuclear Power Station, Unit 1) | |

RESPONSE OF THE STATE OF NEW YORK TO LILCO'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS REGARDING HOSPITAL EVACUATION TIME ESTIMATES

This is the State of New York's response to "LILCO's First Set of Interrogatories and Requests for Production of Documents Regarding Hospital Evacuation Time Estimates to Suffolk County and New York State," dated February 25, 1988 ("LILCO's First Set of Interrogatories and Requests").[1]

To the extent that LILCO's First Set of Interrogatories and Requests seeks information and documents of any sort that are not within the possession, custody or control of the State of New

[1]The Board's "Memorandum and Order (Ruling on LILCO's Motion for Summary Disposition of the Hospital Evacuation Issue)," dated February 24, 1988 and received by the State of New York on March 1, 1988, established a discovery period of fifteen days commencing upon receipt of the Order. In accordance with the time frames established in 10 CFR 2.740b and the Order, this response is being served within fourteen days of receipt by the State of New York of the Order.



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York, but, rather within the possession, custody or control of county governments (including Suffolk County), the State of New York objects. County governments are autonomous from the State of New York and are not within the State of New York's control. Accordingly, the burden of obtaining such information is the same for LILCO as it is for the State of New York.

To the extent that LILCO's First Set of Interrogatories and Requests seeks information and documents of any sort that are protected against disclosure, for example, by attorney work product doctrine, the State of New York objects.

LILCO Interrogatories Nos. 1-13

1. Please identify each witness Intervenors expect to call to testify on the issue of the bases and accuracy of LILCO's hospital evacuation time estimates, as defined in the Board's February 25 Memorandum and Order. For each witness, other than experts, that Intervenors expect to call, state the subject matter on which he is expected to testify and the substance of the facts to which he is expected to testify. For each witness that Intervenors expect to call as an expert witness, state the subject matter on which he is expected to testify, the substance of the facts and opinions to which he is expected to testify, and the summary of the grounds for each such opinion.

Response: On March 9, 1988, the State of New York identified David T. Hartgen, Ph.D., as an expert witness it expects to call to testify on hospital evacuation time estimates. Dr. Hartgen will likely offer testimony concerning the bases and accuracy of LILCO's hospital evacuation time estimates. Although Dr. Hartgen's review of the calculations underlying the time estimates has not been completed yet, Dr. Hartgen's testimony will probably concern questionable methodological assumptions

and procedures regarding travel speeds, reception hospital assignments and capacities, vehicle allocations, route designations and other assumptions and procedures.

It is possible that further discovery, investigation and analysis could have an effect on the substance of Dr. Hartgen's testimony. For example, Mr. Sobotka stated in his deposition on March 7, 1988 that there were several "assumptions" or "clarifications of assumptions" not set forth in Appendix A that he and his associates relied upon in the process of calculating hospital evacuation time estimates. Mr. Sobotka was unable, during the deposition, to identify the "assumptions" or "clarifications of assumptions," with one exception. This information, which was just provided to the State of New York by LILCO on March 10, 1988, could have a bearing on the substance of Dr. Hartgen's testimony.

2. For each witness, please provide a copy of his most current curriculum vitae, resume, or statement or professional qualifications.

Response: The State of New York provided LILCO with a copy of Dr. Hartgen's most current resume under cover of a letter dated March 9, 1988.

3. Please list any NRC, legislative, or other legal proceeding in which each witness has testified on any matter concerning evacuation time estimates for general population evacuees, special facilities or hospitals.

Response: As LILCO is aware, Dr. Hartgen testified in the 1984

emergency planning hearings and 1987 reception center hearings concerning Shoreham evacuation time estimates.

4. Please provide a copy of any prefiled testimony listed in response to Interrogatory 3 above.

Response: The State of New York objects to this interrogatory on the grounds that it is unduly burdensome. Dr. Hartgen's prefiled testimony was provided to LILCO when it was filed in the proceedings listed in response to Interrogatory No. 3.

5. Please identify all articles, papers, and other documents authored or coauthored by each witness on the subject of evacuation time estimates for general population evacuees, special facilities, or hospitals.

Response: Other than the prefiled testimony listed in response to Interrogatory No. 3 and Dr. Hartgen's February 1, 1988 affidavit submitted in this hospital evacuation time estimate proceeding, Dr. Hartgen has not authored or coauthored such materials.

6. Please state whether each witness has prepared, or has had prepared, any written studies, reports, analyses, or other documents with respect to any of the following:

(a) Evacuation time estimates for hospitals or special facilities in the 10-mile EPZ around any nuclear power plant in New York or elsewhere in the United States; and

(b) The assumptions used in calculating such evacuation time estimates.

Response: Other than with respect to Shoreham, for which LILCO

already possesses responsive information, Dr. Hartgen has not prepared such studies, reports, etc.

7. Unless the answer to Interrogatory 6 above is a simple negative, please identify and provide a copy of each document.

Response: See response to Interrogatory No. 6.

8. Have any of the witnesses Intervenors expect to call on this issue calculated evacuation time estimates for the hospitals in the Shoreham EPZ? If so, please state the assumptions used in calculating them and provide a copy of every document relied upon in the calculation.

Response: At this time, Dr. Hartgen has not calculated evacuation time estimates for the hospitals in the Shoreham EPZ, except insofar as has been necessary to reproduce LILCO's hospital evacuation time estimate calculations.

9. Please list each and every reason why Intervenors believe that LILCO's hospital evacuation time estimate calculations are flawed (see Intervenors' Response to LILCO's Motion for Summary Disposition of the Hospital Evacuation Issue (Jan. 25 [sic], 1988), at 25 n.11). Please identify and produce a copy of every document that Intervenors think supports this opinion.

Response: LILCO mischaracterizes the Intervenors' statement in our January 15, 1988 pleading at 25, n.11. The actual statement says, "based upon the little information that has been provided by LILCO, it would appear that LILCO's time estimate calculations are flawed." Similarly, the State of New York's position at this time is that, subject to further discovery, investigation and analysis, LILCO's methodological assumptions and procedures regarding travel speeds, reception hospital assignments and

capacities, vehcile allocations, route designations and other assumptions and procedures appear to be questionable.

10. Please list each and every reason why Intervenors believe that the assumptions used in calculating the hospital evacuation time estimates (listed in the Dec. 18 Lieberman affidavit at pages 2-3, and in Rev. 9 of the LILCO Plan at Appendix A) are inaccurate, inadequate, insufficient, or incomplete. For each assumption that Intervenors believe to be incorrect, state what is in Intervenors' view the correct assumption.

Response: See response to Interrogatory No. 9. Further discovery, investigation and analysis are required.

11. State every reason, if there are any, that LILCO's hospital evacuation time estimates fail to conform with 10 C.F.R. Part 50, App.E and NUREG-0654.

Response: At this time, it appears for the reasons stated in response to Interrogatories Nos. 9 and 10 that LILCO's hospital evacuation time estimates appear to be based on questionable assumptions and procedures, and, therefore, subject to further discovery, investigation and analysis, may be inaccurate, unreliable and unverifiable.

12. Please list the specific hospital evacuation time estimates that have been calculated and submitted in the emergency plans for every other nuclear power plant in New York, and list all of the assumptions used in calculating each set of time estimates. Please identify and produce a copy of every document concerning such time estimates and assumptions.

Response: Without agreeing to the relevancy of this interrogatory, the State of New York submits the following response. The answers to this interrogatory are set forth in the individual radiological emergency preparedness plans for the counties of Monroe, Wayne, Oswego, Putnam, Rockland, Westchester and Orange. This information is as readily available to LILCO as it is to the State of New York. Since LILCO possesses these plans, and since the burden of determining the content of these plans is the same for LILCO as it is for the State of New York, the county plans require no explanation from the State of New York.

In addition, it appears that the attached "Analysis of Evacuation Travel Times" from "Evacuation Travel Time Estimates for the James A. Fitzpatrick/Nine Mile Point Emergency Planning Zone," dated May 1984 and prepared by Parsons, Brinckerhoff, Quade & Douglas, Inc., may be responsive. Since the "Analysis of Evacuation Travel Times" is not contained in the Oswego County Plan, it is being provided at this time.

13. Please identify and provide a copy of any document not already identifed in response to Interrogatories 1-12 above on which Intervenors intend to rely in support of their position on the accuracy and bases of the hospital evacuation times estimates contained in Rev. 9 of the LILCO Plan.

Response: At this time, the State of New York has not identified any such documents. If any such documents are identified as a result of further discovery, investigation and analysis, they will be provided as appropriate.

## Objections Stated by Counsel

Counsel states all objections, assertions of privilege, and answers not requiring verification.

Fabian G. Palomino
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Special Counsel to the Governor

Attorneys for Mario M. Cuomo,
Governor, and the State of New York

# VERIFICATION

STATE OF NEW YORK) SS:
COUNTY OF ALBANY )

David T. Hartgen, Ph.D., being duly sworn, deposes and says: that he has read the answers to Interrogatories Nos. 1-11 and that based upon such information of which he has personal knowledge and with which he has been provided, he is informed and believes the matters stated therein to be true to the best of his knowledge and belief, and on these grounds, alleges that the matters stated therein are true and therefore verifies the foregoing on behalf of the State of New York.

David T. Hartgen

David T. Hartgen, Ph.D.

Sworn to before me this 14TH day
of March 1988 _____

Notary Public

RICHARD J. ZARI[illegible]
Notary Public, State of New York
Qualified in ~~Albany County~~ Saratoga County
No. 4766948
Commission Expires ~~March~~ Nov 30, 19[illegible]

DATE: March 15, 1988

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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|---|---|
| In the Matter of<br><br>LONG ISLAND LIGHTING COMPANY<br><br>(Shoreham Nuclear Power Station<br><br>Unit 1) | Docket No. 50-322-OL-3<br>(Emergency Planning) |

CERTIFICATE OF SERVICE

I hereby certify that copies of the "Response of the State of New York to LILCO's First Set of Interrogatories and Request for Production of Documents Regarding Hospital Evacuation Time Estimates" have been served on the following this 15th day of March 1988 by U.S. Mail, first class, except as noted by asterisks.

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# IV. ANALYSIS OF EVACUATION TRAVEL TIMES

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### A. Scenarios

Evacuation travel time estimates are prepared to serve as a guide for local emergency coordinators in refining their emergency response plans, and as an aid to local officials in selecting protective actions during an emergency. Evacuation travel time estimates were prepared by ERPA for six distinct time-based scenarios and two distinct weather conditions for inclusion in the Oswego County REPP; these estimates assumed a simultaneous evacuation of the entire EPZ. The six scenarios included in the emergency preparedness plan are listed below in order of increasing evacuation travel time:

- Nighttime
- Weekend/Holiday winter, daytime
- Weekend/Holiday summer, daytime
- Evening
- Weekday, school not in session
- Weekday, school in session.

These time-based scenarios were chosen and analyzed for the emergency preparedness plan because they cover all significantly different patterns of population distribution and transportation availability. Hence, the decision maker is provided with an effective tool for deciding the travel time required to simultaneously evacuate the entire EPZ under varying weather conditions and at different times of the day. These evacuation travel times are shown by ERPA in Appendix F.

Because these evacuation travel times assume a simultaneous evacuation of the entire EPZ, they do not provide specific information for an evacuation of a sub-portion of the EPZ. The travel time estimates presented in this section of the report are for the specific 90° Sectors required in NUREG-0654, as well as for the entire EPZ (Sector M). In this report, travel time estimates are provided for the scenarios on both ends of the range of travel times; i.e., the nighttime scenario and the weekday, school-in-session scenario. These two scenarios are also the most frequent in terms of the number of hours they occur during the year. By knowing the shortest and longest evacuation travel times for a given Sector, the decision maker can extrapolate between these endpoints to estimate travel times by Sector for the other four scenarios, if necessary. The nighttime and weekday, school-in-session scenarios are described below. A detailed description of the other four scenarios is included in Appendix A of the Oswego County REPP.

Nighttime Scenario - The baseline scenario is nighttime, when most people in the general population are in their residences, institutions have minimal staff on duty, and relatively few businesses are functioning. This scenario is considered to be representative of the resident population distribution. Nighttime differences among days of the week and seasons are not regarded as large enough to warrant a separate designation.

Weekday, School-in-Session Scenario - Weekdays are characterized by "normal" activity patterns. Most households have at least one member at work.

Institutions are usually at their maximum staffing levels; businesses are usually open and active; and children are in school. This scenario, as opposed to a weekday, school-not-in-session scenario, most significantly affects bus transportation needs and usage, and reception/congregate care procedures because of the greater potential need to reunite families who have been evacuated by different means.

B. Weather Conditions

NUREG-0654 stipulates that two weather conditions -- normal and adverse -- be considered in the evacuation travel time analysis. Therefore, both the nighttime and school-in-session scenarios were analyzed assuming the following weather conditions:

- For normal weather, clear sky and dry roadway pavement;
- For adverse weather, reduced visibility (e.g., due to fog or heavy rain) and/or a slippery roadway surface (e.g., due to plowed snow or ice).

The effects of these weather conditions on the roadway capacities, and hence the evacuation travel time estimates, have been discussed earlier in Section III.A.1. Evacuation Capacity Analysis.

C. Trip Generation

For each traffic zone included in a given $90^{\circ}$ Sector, the number of evacuation trips generated by that zone was estimated by trip type. The number of trips varied significantly by scenario. For example, for the weekday school-in-session scenario, large numbers of evacuation trips were attributable to transient employees working in the EPZ. However, for the nighttime scenario, this same trip type (employees) was much less significant because most businesses would be closed.

The number of trips from a given traffic zone was based on population and vehicle occupancy data. For example, if a zone has a nursing home with 120 ambulatory and 15 wheelchair-bound residents, and if the facility owns one 10-passenger wheelchair van, then five vehicle trips would be generated by the nursing home (three buses provided by a bus company with 40 passengers each, one facility-owned van, and one other 5-passenger wheelchair van provided by a bus company).

Vehicle trips generated by each zone were then converted to passenger car equivalents (PCEs) for traffic assignment purposes. Buses were weighted as the equivalent of two cars, since their primary impact would be one of increased roadway space during a slow, congested evacuation condition.

D. Traffic Assignment

The assignment of the evacuation vehicles generated by each traffic zone over the designated evacuation routes was performed by a computer model developed specifically for evacuation planning studies. The model loaded the network and computed the travel and delay times for all zones being analyzed

in any given Sector. A static traffic assignment procedure which assumed instantaneous loading of the evacuation network and concurrent vehicular demand on all roadway segments was incorporated in the computer model. Obviously, this procedure is not an exact simulation of vehicle movement during an evacuation or any other travel situation. However, the static traffic assignment results were compared to those obtained from a complex, state-of-the-art dynamic traffic simulation model for a sample number of routes in the heavily populated Indian Point EPZ (located in parts of Westchester, Rockland, Orange, and Putnam Counties in the State of New York), and were found to be very similar. A detailed description of the static traffic assignment algorithm, and the results of the comparison between the static and dynamic assignments, is presented in Appendix G.

E. Notification Time

The JAF/NMP EPZ is served by a siren notification system that meets the minimum acceptable design objectives specified in Appendix 3 of NUREG-0654. The siren system is designed to notify 100% of the population within 5 miles of the site within 15 minutes. Many sirens are also located in the 5-mile to 10-mile radius. Tonealert radios are provided to private residences within the EPZ located in areas out of the sirens' range. In addition, all schools, special facilities, and major industries in the EPZ have been provided with tonealert radios. The Oswego County REPP contains backup notification procedures such as route alert in the event of a siren/tonealert system malfunction.

F. Components of the Evacuation Travel Time

The estimates of evacuation travel time include the following components:

Public Preparation Time - Twenty minutes are assumed to be required for the public to prepare for evacuation after official notification to leave their homes.

Terminal Time - The terminal time for vehicles departing from home represents the time to drive via local feeder streets in a traffic zone to the first link of the predesignated primary evacuation route. The terminal time for buses and special vehicles is defined as the time to travel from the first pickup point to the first link of the ultimate evacuation route, and is comprised of both traveling time between, and loading time at, pickup points.

Roadway Travel Time - The roadway travel time is the amount of time required for all vehicles to traverse the entire length of their evacuation route to the edge of the evacuated area. This time depends on both normal operating speeds on the road and on delays due to congestion (where the vehicle volumes approach or exceed the capacity of the roadway at a particular location). Hence, the roadway travel time is the amount of time beginning when the first vehicle enters the evacuation route, assuming normal operating speeds, until the last vehicle leaves the Sector, taking account of reduced speeds attributable to congestion and including delay time.

Round Trip Time - For vehicles required to make multiple trips from the evacuating area, round trip time represents the time to travel beyond the EPZ

to a predesignated host facility or reception center, return to the evacuating area for a second assignment, leave the EPZ, and load and unload passengers at terminal points. This round trip time is particularly important for the school-in-session scenario because all schoolchildren would be evacuated first by buses to the New York State Fairgrounds in Syracuse. Some buses would then return to the EPZ for the remaining transit-dependent ambulatory general population. In addition, wheelchair-bound residents at several nursing homes in the City of Oswego would be required to wait for wheelchair-equipped vehicles to complete initial assignments during a school-in-session evacuation.

When school is in session, there are not enough buses available to evacuate all transit-dependent individuals (i.e., schoolchildren, resident population and transients without automobiles, and special facility residents) in one trip. This determination is based on a worst-case assumption of a simultaneous full-EPZ evacuation when schools are open. The Oswego County REPP contains procedures intended to minimize the likelihood of such an occurrence, such as go-home plans and sheltering options. However, for planning purposes, the following steps were followed in the calculation of evacuation travel time estimates (including round-trip time) for a school-in-session scenario:

1. School districts use their full-sized buses to evacuate schools in their districts as a first priority.

2. All elementary schools, middle schools, private schools, nursery schools, and day care centers are evacuated with district-owned or contracted vehicles.

3. Golden Sun Bus Company evacuates schools in Minetto and the City of Oswego because enough district-owned vehicles are not available.

4. Mexico HS, Oswego HS, and the State University are evacuated entirely with Centro of Syracuse buses. Centro also evacuates all ambulatory residents of special facilities.

5. BOCES self-evacuates with its own vehicles and vehicles at the facility belonging to other school districts.

6. School district-owned vans are used to run general population bus routes in the first wave of evacuation in ERPAs near JAF/NMP. With the exception of one bus route in Mexico, full-size district-owned buses are used for the general public only after all schoolchildren have been evacuated.

7. Centro of Oswego vehicles are also used to run general population bus routes in the first wave of evacuation.

8. Enough vans and other buses exist to evacuate all ERPAs in the five-mile radius (ERPAs 1-11) on the first evacuation wave.

9. All remaining ERPAs (ERPAs 12-22) must wait to evacuate on the second wave after schoolchildren have been evacuated. These remaining ERPAs are all at least 5 miles from the site.

G. Evacuation Travel Time Estimates

The results of the evacuation travel time analysis described in this report are presented by Sector in Tables 13, 14, 15, and 16 for the nighttime normal weather, nighttime adverse weather, school-in-session normal weather, and school-in-session adverse weather scenarios, respectively. The travel time estimates are presented for the following population subgroups (as defined earlier):

- Permanent resident population with automobiles;
- Permanent resident population without automobiles;
- Transient population; and
- Special facilities population.

The evacuation travel time estimates calculated for the JAF/NMP EPZ are in accord with the implementation procedures in the REPP. The implementation procedures include provisions such as predesignated evacuation routes for all ERPAs, prioritized traffic control locations, and bus routes with pickup points for the public. Thus, the evacuation travel time estimates are based on these and other operational strategies indicated in the Oswego County REPP.

As mentioned earlier, travel times were calculated as a range under normal weather conditions. When deciding which end of the range to use to estimate evacuation travel time, a decision maker would consider factors including the degree of mobilization, the degree of public cooperation, and the exent of capacity restrictions on key highway links.

Lower-bound evacuation travel times (shorter times) can be anticipated when:

(a) Unexpected long-term capacity restrictions on key highway links owing to incidents such as accidents, vehicle breakdowns and highway construction do not occur;

(b) A high state of operational readiness (traffic control officers mobilized, traffic control devices operational, all buses stationed to begin their initial runs, etc.) is attained;

(c) An informed and cooperative public follow directions as instructed. (In other words, the public has been sufficiently educated as to their responsibility in an evacuation, and has been given adequate notice of the possibility they may have to evacuate.)

Upper-bound evacuation travel times (longer times) for normal weather conditions are representative of a situation where:

(a) Capacity restrictions adversely affect traffic flow, but not to the point where a breakdown in traffic flow would result;

## Table 13

## EVACUATION TRAVEL TIME ESTIMATES BY SECTOR
## NIGHTTIME SCENARIO
## NORMAL WEATHER

| Sector | Quadrant | Resident Population | | Special Facilities | Transients |
|---|---|---|---|---|---|
| | | With Autos | Without Autos | | |
| | | From – To | From – To | From – To | From – To |
| **2-Mile Radius** | | | | | |
| A | NE | 0:30 – 0:40 | 0:40 – 0:50 | – | 0:40 – 0:50 |
| B | SE | 0:30 – 0:40 | 0:40 – 0:50 | – | 0:40 – 0:50 |
| C | SW | 0:30 – 0:40 | 0:50 – 1:00 | – | 0:40 – 0:50 |
| D | NW | 0:30 – 0:40 | 0:40 – 0:50 | – | 0:40 – 0:50 |
| **5-Mile Radius** | | | | | |
| E | NE | 0:40 – 0:50 | 1:00 – 1:10 | – | 0:50 – 1:00 |
| F | SE | 0:40 – 0:50 | 1:10 – 1:20 | 1:10 – 1:20 | 0:50 – 1:00 |
| G | SW | 0:50 – 1:00 | 1:20 – 1:30 | – | 0:50 – 1:00 |
| H | NW | 0:40 – 0:50 | 1:00 – 1:10 | – | 0:50 – 1:00 |
| **10-Mile Radius** | | | | | |
| I | NE | 1:00 – 1:10 | 1:20 – 1:30 | – | 1:10 – 1:20 |
| J | SE | 1:10 – 2:10 | 1:30 – 2:40 | 1:30 – 1:40 | 1:20 – 2:20 |
| K | SW | 2:20 – 3:50 | 2:50 – 4:10 | 2:50 – 4:00 | 2:20 – 3:50 |
| L | NW | 1:00 – 1:10 | 1:20 – 1:30 | – | 1:10 – 1:20 |
| **360° EPZ** | | | | | |
| M | All | 2:20 – 3:50 | 2:50 – 4:10 | 2:50 – 4:00 | 2:20 – 3:50 |

Notes:

(1) The evacuation travel time ranges presented in this Table are based on operational strategies indicated in the evacuation implementation procedures. Lower bound evacuation travel times (shorter times) can be anticipated when:
   (a) Unexpected long-term capacity restrictions on key highway links owing to incidents such as accidents, vehicle breakdowns, and highway construction, do not occur;
   (b) A high state of operational readiness (traffic control officers mobilized, traffic control devices operational, all buses stationed to begin their initial runs, etc.) is attained;
   (c) An informed and cooperative public follow directions as instructed.

   Upper bound evacuation travel times (longer times) are representative of a situation where:
   (a) Capacity restrictions adversely affect traffic flow, but not to the point where a breakdown in traffic flow would result;
   (b) A low state of operational readiness results from minimal mobilization of the emergency workforce;
   (c) A low degree of cooperation from the public occurs.

(2) The evacuation travel time ranges are indicated as hours:minutes, and include 20 minutes of public preparation time.

(3) Normal weather conditions are considered to be clear sky and dry roadway pavement for the above scenario.

(4) The population subgroups indicated in this Table are:
   (a) resident population (with and without automobiles);
   (b) special facilities (schools, colleges, nursing homes, hospitals, other health care facilities, residential facilities such as group homes, convents, and monasteries);
   (c) transients (employees, visitors to parks, resident and day camps, hotels, and motels).

(5) Gaps in this Table indicates that there is no special facility in the given Sector.

Table 14

## EVACUATION TRAVEL TIME ESTIMATES BY SECTOR
## NIGHTTIME SCENARIO
## ADVERSE WEATHER

| Sector | Quadrant | Resident Population | | Special Facilities | Transients |
|---|---|---|---|---|---|
| | | With Autos | Without Autos | | |
| 2-Mile Radius | | | | | |
| A | NE | 0:50 | 1:00 | – | 1:00 |
| B | SE | 0:50 | 1:00 | – | 1:00 |
| C | SW | 0:50 | 1:10 | – | 1:00 |
| D | NW | 0:50 | 1:00 | – | 1:00 |
| 5-Mile Radius | | | | | |
| E | NE | 1:00 | 1:20 | – | 1:10 |
| F | SE | 1:00 | 1:30 | 1:30 | 1:10 |
| G | SW | 1:50 | 2:10 | – | 1:50 |
| H | NW | 1:00 | 1:20 | – | 1:10 |
| 10-Mile Radius | | | | | |
| I | NE | 1:20 | 1:40 | – | 1:30 |
| J | SE | 2:30 | 3:00 | 2:20 | 2:40 |
| K | SW | 4:40 | 5:00 | 4:50 | 4:40 |
| L | NW | 1:20 | 1:40 | – | 1:30 |
| 360° EPZ | | | | | |
| M | All | 4:40 | 5:00 | 4:50 | 4:40 |

Notes:

(1) The evacuation travel time estimates presented in this Table are based on operational strategies indicated in the evacuation implementation procedures.

(2) The evacuation travel times are indicated as hours:minutes, and include 20 minutes of public preparation time.

(3) Adverse weather conditions are considered to be a slippery roadway surface (e.g., due to snow or ice), and/or reduced visibility (e.g., due to fog or heavy rain) for the above scenario.

(4) The population subgroups indicated in this Table are:

(a) resident population (with and without automobiles);

(b) special facilities (schools, colleges, nursing homes, hospitals, other health care facilities, residential facilities such as group homes, convents, and monasteries);

(c) transients (employees, visitors to parks, resident and day camps, hotels, and motels).

(5) Gaps in this Table indicate that there is no special facility in the given Sector.

Table 15

## EVACUATION TRAVEL TIME ESTIMATES BY SECTOR
## SCHOOL-IN-SESSION SCENARIO
## NORMAL WEATHER

| Sector | Quadrant | Resident Population | | Special Facilities | Transients |
|---|---|---|---|---|---|
| | | With Autos | Without Autos | | |
| | | From – To | From – To | From – To | From – To |
| 2-Mile Radius | | | | | |
| A | NE | 0:30 – 0:40 | 0:40 – 0:50 | – | 0:30 – 0:40 |
| B | SE | 0:40 – 1:40 | 0:50 – 1:50 | – | 0:40 – 1:40 |
| C | SW | 0:30 – 0:40 | 0:50 – 1:00 | – | 0:30 – 0:40 |
| D | NW | 0:30 – 0:40 | 0:40 – 0:50 | – | 0:30 – 0:40 |
| 5-Mile Radius | | | | | |
| E | NE | 0:40 – 0:50 | 1:00 – 1:10 | – | 0:40 – 0:50 |
| F | SE | 0:50 – 1:50 | 1:20 – 2:10 | 1:10 – 1:20 | 0:50 – 1:50 |
| G | SW | 0:50 – 2:00 | 1:20 – 2:10 | – | 0:50 – 2:00 |
| H | NW | 0:40 – 0:50 | 1:00 – 1:10 | – | 0:40 – 0:50 |
| 10-Mile Radius | | | | | |
| I | NE | 1:00 – 1:10 | 1:20 – 1:30 | – | 1:00 – 1:10 |
| J | SE | 1:10 – 2:20 | 3:50 – 5:40 | 1:30 – 2:30 | 1:10 – 2:20 |
| K | SW | 4:40 – 7:50 | 6:40 – 9:00 | 5:00 – 8:00 | 4:40 – 7:50 |
| L | NW | 1:00 – 1:10 | 1:20 – 1:30 | – | 1:00 – 1:10 |
| 360° EPZ | | | | | |
| M | All | 4:40 – 7:50 | 6:40 – 9:00 | 5:00 – 8:00 | 4:40 – 7:50 |

Notes:

(1) The evacuation travel time ranges presented in this Table are based on operational strategies indicated in the evacuation implementation procedures. Lower bound evacuation travel times (shorter times) can be anticipated when:
   (a) Unexpected long-term capacity restrictions on key highway links owing to incidents such as accidents, vehicle breakdowns, and highway construction, do not occur;
   (b) A high state of operational readiness (traffic control officers mobilized, traffic control devices operational, all buses stationed to begin their initial runs, etc.) is attained;
   (c) An informed and cooperative public follow directions as instructed.

   Upper bound evacuation travel times (longer times) are representative of a situation where:
   (a) Capacity restrictions adversely affect traffic flow, but not to the point where a breakdown in traffic flow would result;
   (b) A low state of operational readiness results from minimal mobilization of the emergency workforce;
   (c) A low degree of cooperation from the public occurs.

(2) The evacuation travel time ranges are indicated as hours:minutes, and include 20 minutes of public preparation time.

(3) Normal weather conditions are considered to be clear sky and dry roadway pavement for the above scenario.

(4) The population subgroups indicated in this Table are:
   (a) resident population (with and without automobiles);
   (b) special facilities (schools, colleges, nursing homes, hospitals, other health care facilities, residential facilities such as group homes, convents, and monasteries);
   (c) transients (employees, visitors to parks, resident and day camps, hotels, and motels).

(5) Gaps in this Table indicates that there is no special facility in the given Sector.

Table 16

## EVACUATION TRAVEL TIME ESTIMATES BY SECTOR
## SCHOOL-IN-SESSION SCENARIO
## ADVERSE WEATHER

| Sector | Quadrant | Resident Population | | Special Facilities | Transients |
|---|---|---|---|---|---|
| | | With Autos | Without Autos | | |
| 2-Mile Radius | | | | | |
| A | NE | 0:50 | 1:00 | – | 0:50 |
| B | SE | 1:50 | 2:00 | – | 1:50 |
| C | SW | 0:50 | 1:10 | – | 0:50 |
| D | NW | 0:50 | 1:00 | – | 0:50 |
| 5-Mile Radius | | | | | |
| E | NE | 1:00 | 1:20 | – | 1:00 |
| F | SE | 2:10 | 2:20 | 1:30 | 2:10 |
| G | SW | 2:20 | 2:30 | – | 2:20 |
| H | NW | 1:00 | 1:20 | – | 1:00 |
| 10-Mile Radius | | | | | |
| I | NE | 1:20 | 1:40 | – | 1:20 |
| J | SE | 2:50 | 6:30 | 2:40 | 2:50 |
| K | SW | 9:40 | 10:40 | 9:50 | 9:40 |
| L | NW | 1:20 | 1:40 | – | 1:20 |
| 360° EPZ | | | | | |
| M | All | 9:40 | 10:40 | 9:50 | 9:40 |

Notes:

(1) The evacuation travel time estimates presented in this Table are based on operational strategies indicated in the evacuation implementation procedures.

(2) The evacuation travel times are indicated as hours:minutes, and include 20 minutes of public preparation time.

(3) Adverse weather conditions are considered to be a slippery roadway surface (e.g., due to snow or ice), and/or reduced visibility (e.g., due to fog or heavy rain) for the above scenario.

(4) The population subgroups indicated in this Table are:

(a) resident population (with and without automobiles);

(b) special facilities (schools, colleges, nursing homes, hospitals, other health care facilities, residential facilities such as group homes, convents, and monasteries);

(c) transients (employees, visitors to parks, resident and day camps, hotels, and motels).

(5) Gaps in this Table indicate that there is no special facility in the given Sector.

(b) A low state of operational readiness results from minimal mobilization of the emergency workforce;

(c) A low degree of cooperation from the public occurs. (In other words, the public is believed to be unsure as to what is expected of them.)

The evacuation travel times represent the time for the last vehicle in a Sector to clear the Sector boundary.

H. Confirmation Time

Confirmation of evacuation will be provided, to the extent possible, by law enforcement and other emergency workers concurrent with their patrolling of the EPZ during evacuation.

I. Distribution of the Evacuated Population by Time

The time required to evacuate the last individual from a Sector is an important piece of information for an emergency planner and decision maker. Obviously, everyone else will already have been evacuated when the last person leaves; thus, it is also important to obtain an estimate of the percent of the population evacuated as a function of time.

An output of the model used to estimate travel times was a prediction of the temporal distribution of the population as they leave the evacuating area. To produce this output, an approximation was made of the total population evacuated by Sector for each scenario by applying average vehicle occupancy rates to the number of vehicle trips generated by each traffic zone within the Sector. When a traffic zone had evacuated entirely at a given point in time, the estimated population for that zone was added to the Sector population already evacuated at that time; the resulting total was then divided by the total Sector population to determine the percent of the total population evacuated as a function of time.

Typical population distribution curves for the entire 10-mile EPZ (Sector M) are presented in Figures 24 through 27 for the nighttime and school-in-session scenarios under normal and adverse weather conditions. Inspection of these curves indicates that significant portions of the total population would be evacuated well before the last person leaves the EPZ.

J. Critical Locations

The Oswego County REPP calls for the stationing of traffic control personnel at key locations throughout the evacuation network. The REPP also identifies backup evacuation routes for roadway segments likely to become very congested. One of the factors which determined where to place the personnel and where to specify backup routes was based on an output from the computer assignment model that identified critical bottleneck links along each route in the network. These critical links represent the locations of potential maximum delays for evacuees traversing that route. Figures 28 and 29 indicate the critical links for the nighttime and school-in-session scenarios, respectively. Both figures are a composite representation of the critical links identified for an evacuation of all 13 sectors described earlier in this report.

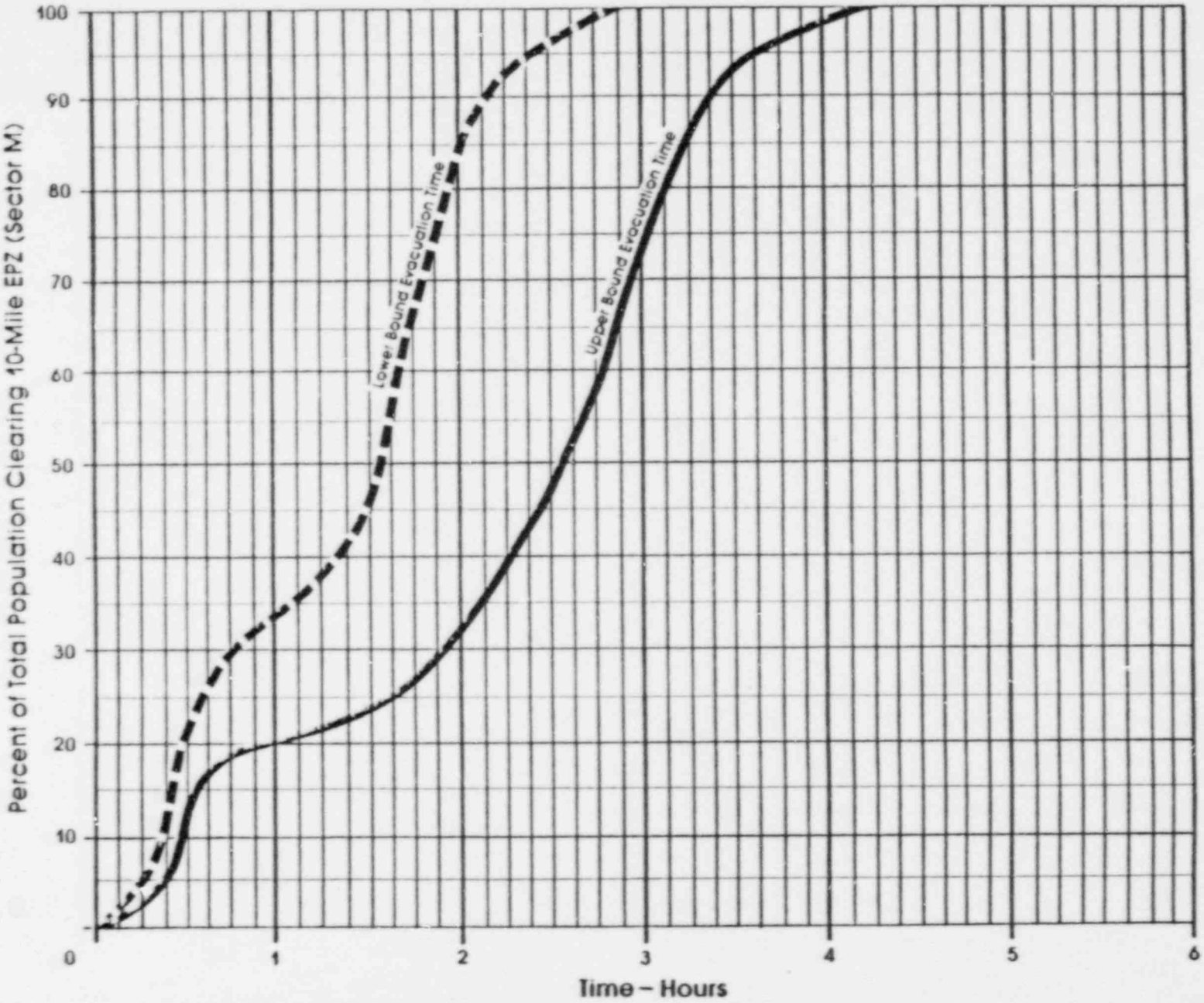


Fig. 24 Population Clearing 10-Mile EPZ Under Nighttime Scenario, Normal Weather

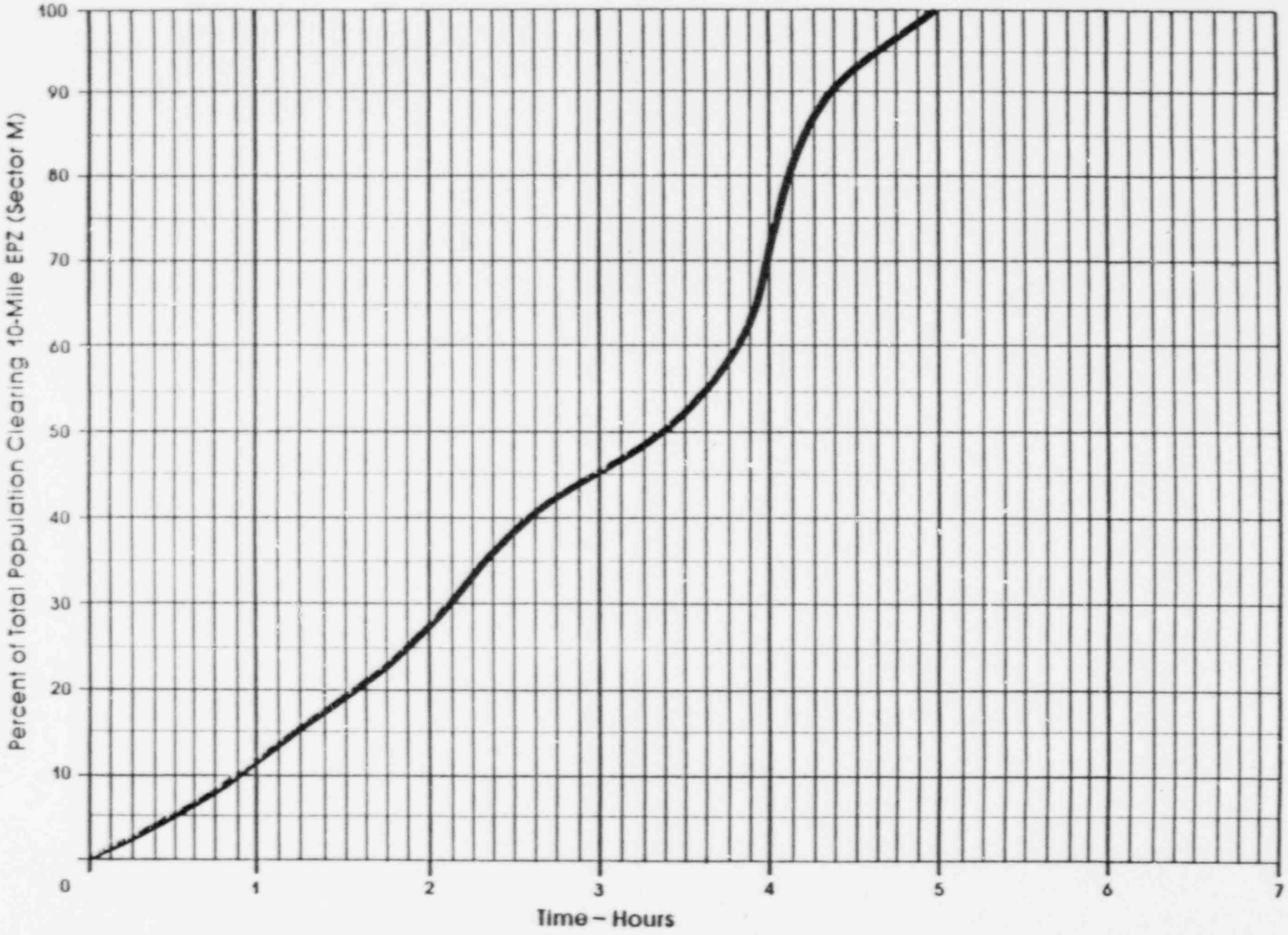


Fig. 25 Population Clearing 10-Mile EPZ Under Nighttime Scenario, Adverse Weather

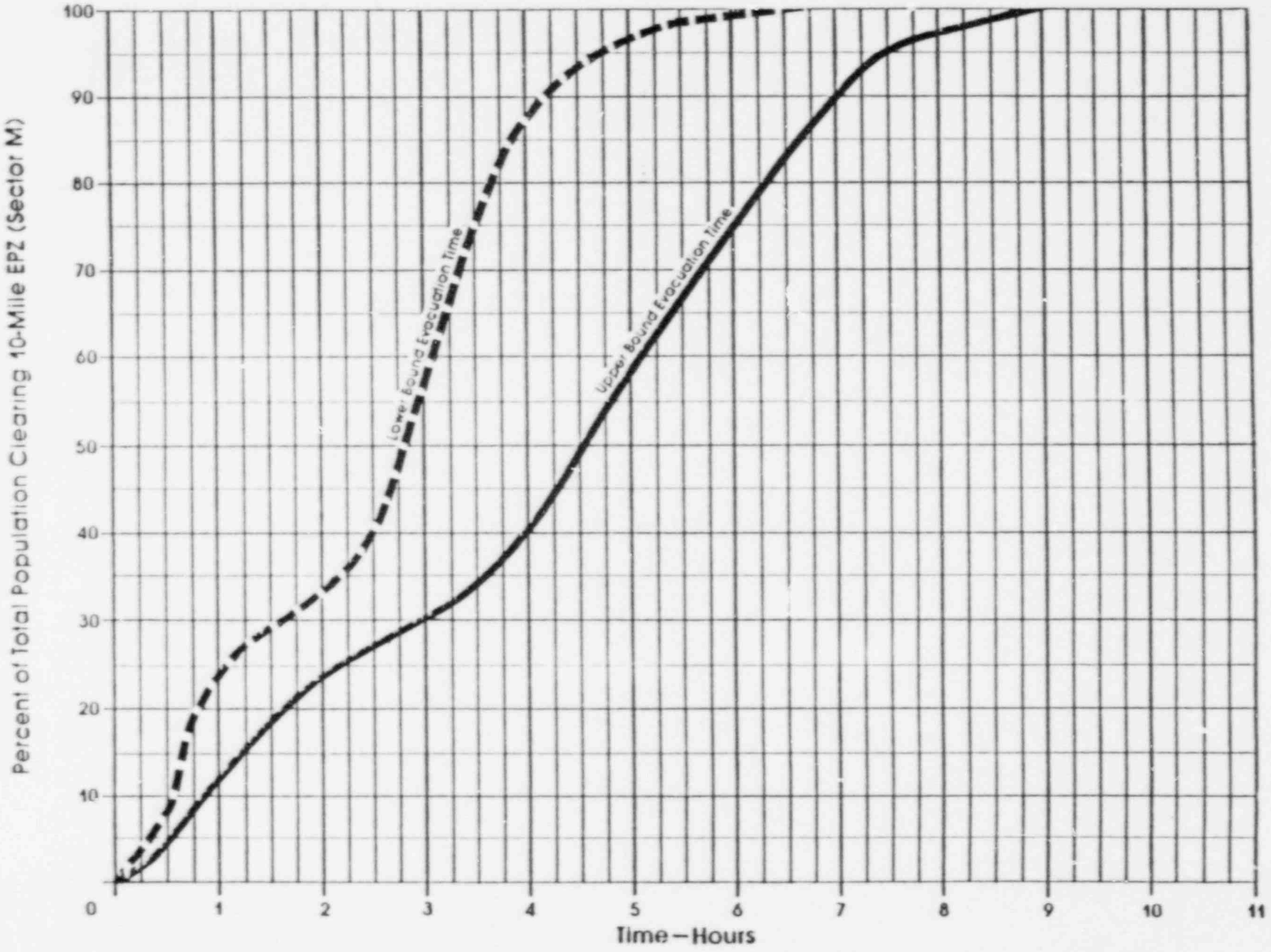


Fig. 26 Population Clearing 10-Mile EPZ Under School-in-Session Scenario, Normal Weather

**J.A. FitzPatrick/ Nine Mile Point Nuclear Power Stations**

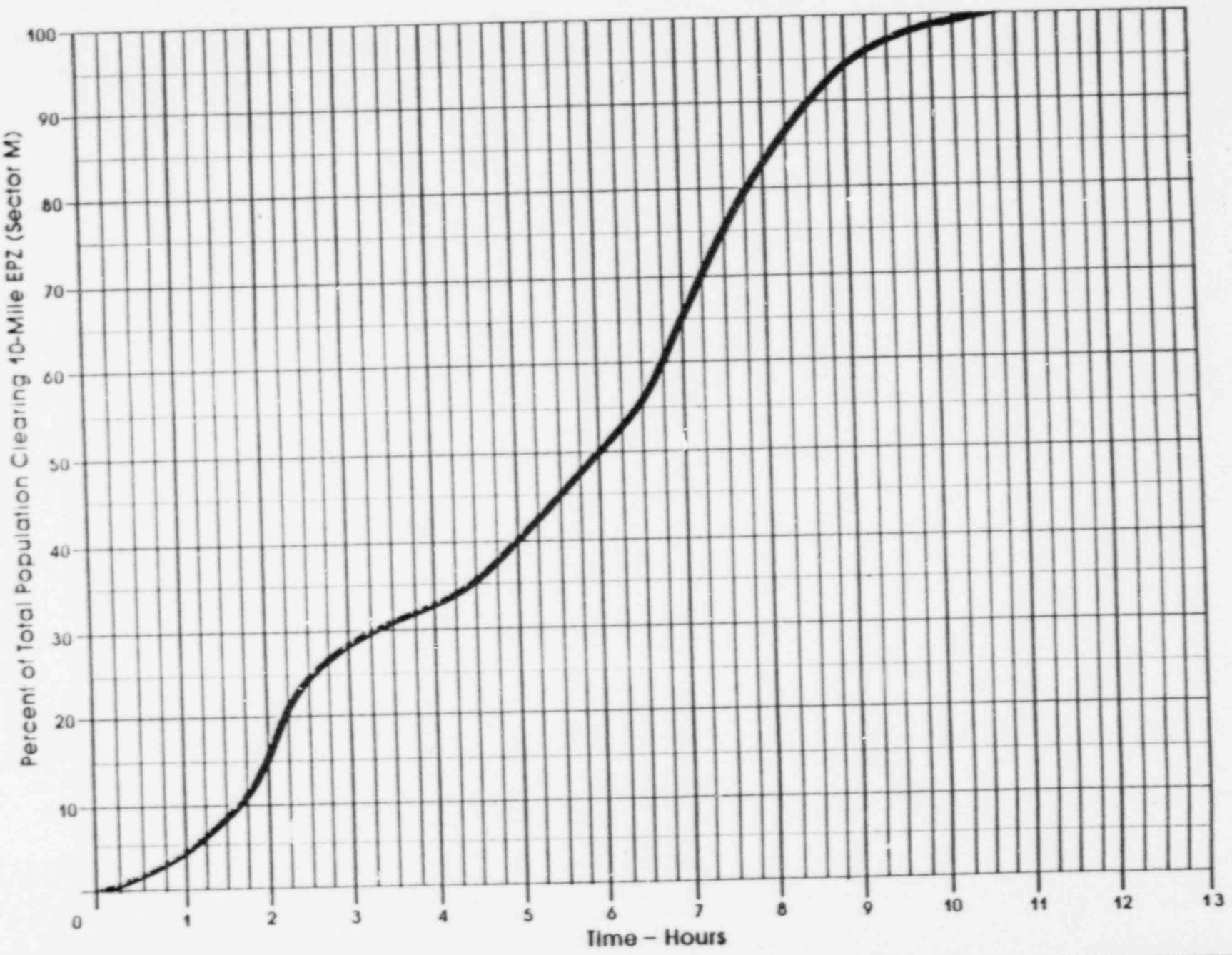


Fig. 27 Population Clearing 10-Mile EPZ Under School-In-Session Scenario, Adverse Weather

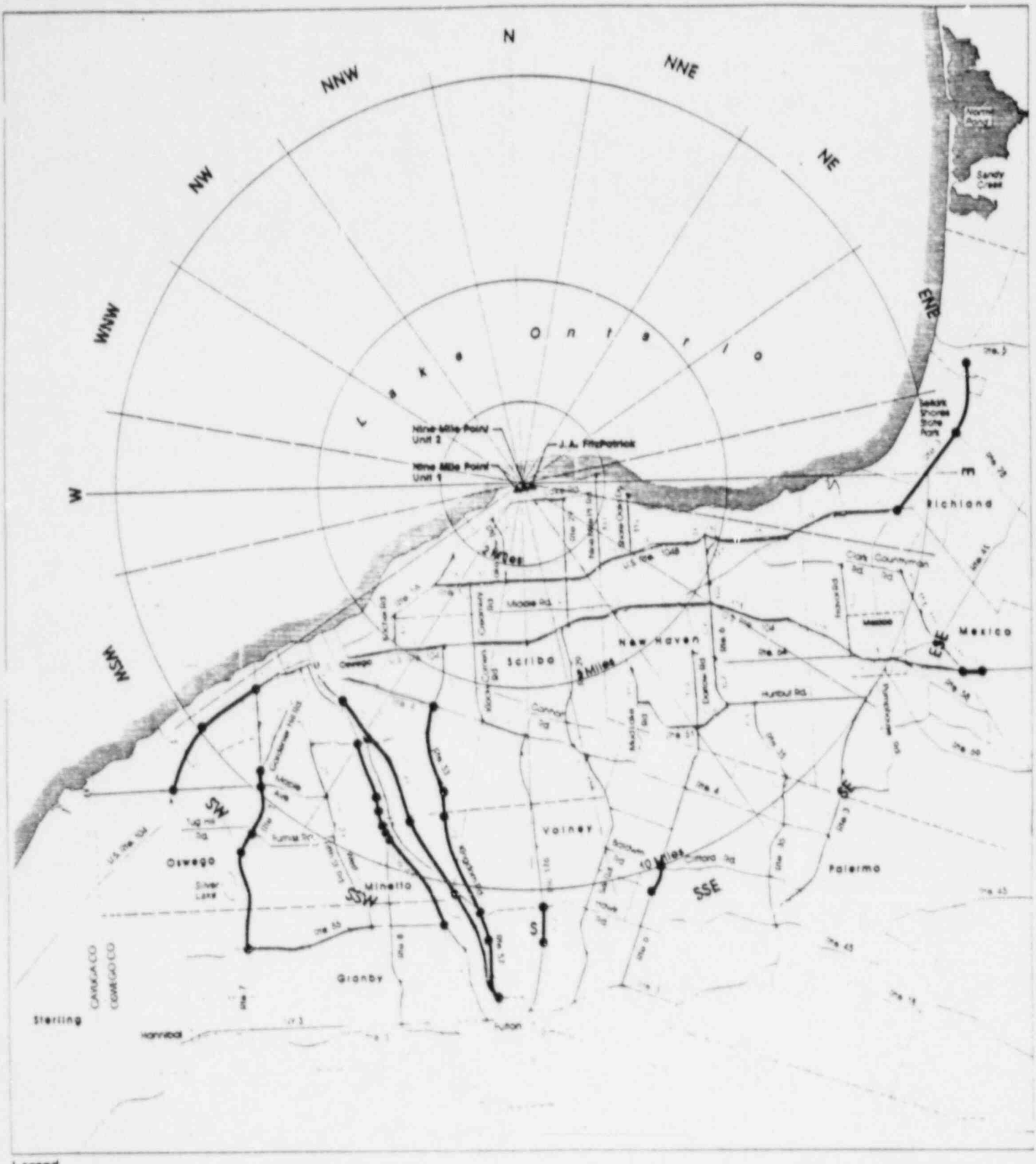


Fig. 28 Critical Bottleneck Links, Nighttime Scenario

J.A. FitzPatrick/
Nine Mile Point
Nuclear Power Stations

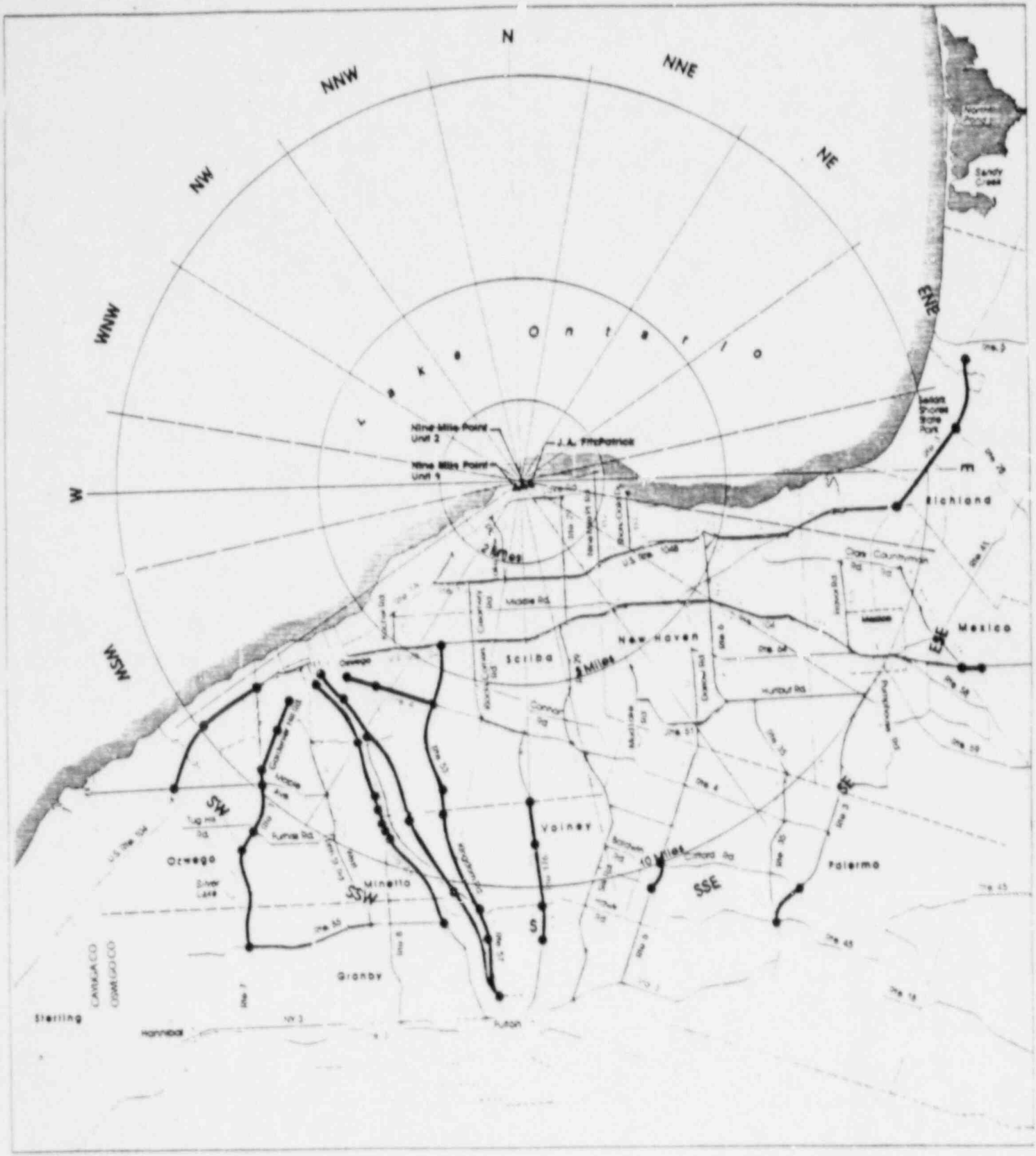


Fig. 29 Critical Bottleneck Links, School-in-Session Scenario

J.A. FitzPatrick/ Nine Mile Point Nuclear Power Stations

## F. Temporary Construction Workforce Effect on Evacuation Travel Time

The evacuation travel time analysis described earlier for the school-in-session scenario was modified, in a separate analysis, to include the Nine Mile Point Unit 2 temporary construction workforce of approximately 6,000 people. In some cases, temporary construction workforce members relocated their families to the nearby area for the duration of the project. As such, the inclusion of both workers and their families into the analysis was necessary. The school-in-session scenario was selected because it represents a worst-case condition. The largest shift of construction workers would be on-site, and their families would be at home, in school, or at work.

This section summarizes the methodology that was used to determine the impact of the workforce on evacuation travel time estimates. An employee (and mailing address) listing of construction personnel for the new plant was compiled by the Niagara Mohawk Power Corporation. From this employee address listing, it was determined that (for the purpose of estimating evacuation times) there are four categories of people associated with the temporary construction of Nine Mile Point Unit 2. These are as follows:

1. People whose addresses indicate that they now live in the EPZ, but were assumed to have moved from out of the EPZ to a location within the 10-mile radius (e.g., residents in motels and trailer parks).

2. People whose addresses indicate that they live beyond the EPZ but within reasonable driving distance. These workers were assumed to enter and leave the EPZ daily.

3. People whose addresses indicate that they now live beyond a reasonable driving distance (e.g., mailing addresses in other states). These people were assumed to have temporarily relocated in the EPZ.

4. People who have maintained permanent residence within the EPZ and work at the site.

These categories of construction-related people were counted from the employee mailing address listing and, where appropriate, assigned to geographic areas of concentration by their zip code. ERPAs 2, 7, 12, 13, 16, and 21 were found to be the primary EPZ locations hosting workers and families associated with the temporary plant construction. These people were then included in a separate analysis to determine their impact upon the evacuation time estimates.

The results of this special scenario indicated that as much as 3 hours would be added onto the school-in-session scenario evacuation travel time for ERPA 1. This result assumes that construction workers and the general public would simultaneously be instructed to evacuate. To the extent that workers are given a "head start", this time could be reduced. However, in general, the average impact to the evacuation travel time estimates would be to

increase these times by an hour. The ERPAs primarily affected by this new bulk of evacuating population would be those surrounding the plant area and sharing evacuation routes with the construction workforce. The temporary workforce was assigned to evacuate on four different routes leaving the site, as described in Appendix C for traffic zone 1B. These routes were selected based on several factors:

1. observed discharge patterns, gate locations, parking lot configurations, and parking lot clearing times on the site;

2. avoidance of heavily congested routes serving the City of Oswego and its environs;

3. general radial dispersion.

It is noted that the overall (i.e., longest) evacuation travel times were not significantly affected by the temporary workforce because different routes were utilized. Tables F-15 and F-16 in Appendix F provide evacuation travel time estimates by ERPA for the workforce scenario, under both normal and adverse weather conditions. These tables may be compared to Tables F-3 and F-4, respectively, to assess the increase in travel time assuming significant construction activity on-site.

L. Comparison to Earlier Evacuation Time Estimates

The evacuation travel time estimates prepared for this report were compared to the time estimates included in the earlier May 1982 study. For the nighttime scenario, the current total (i.e., longest) evacuation travel times (for sector M) are nearly identical to those previously calculated for the various population groups. Although the total travel time did not change significantly in the updated study for the nighttime scenario, variations were noted for individual ERPAs within the EPZ. These variations are attributable to the precise block-level population data available from the 1980 Census and used in the current report. The block-level data permits a much more accurate analysis of where people live within the EPZ.

In addition, the revised time estimate tables specifically include 20 minutes for public preparation time that was not included in the earlier study. If the original time estimates are increased by this 20 minute period to be consistent with the revised time estimates, it is noted that the revised evacuation times are slightly lower than the earlier estimates for many ERPAs. This finding is explained by the fact that the total permanent resident population in the EPZ analyzed in the current study is approximately 5400 people lower than the total included in the May 1982 analysis. The earlier analysis was based on 1976 Census projections of 1980 population; the revised study is based on actual 1980 Census data, which is more current and accurate.

Both evacuation time studies were based on the provisions of the Oswego County REPP in effect at the time of the analysis. The latest version of the REPP contains numerous changes in evacuation procedures that are reflected in the updated time estimates. In terms of evacuation time, the most significant change was made to the bus operations procedure. The current REPP provides for all available buses to first transport schoolchildren to the New York

State Fairgrounds in Syracuse, and then return to the EPZ for the transit-dependent general public. Earlier versions of the REPP designated facilities in Jefferson County as school reception centers, in addition to the New York State Fairgrounds. The modified REPP bus procedure is less complicated and more efficient in terms of bus utilization and operations. Hence, evacuation travel times for the resident population without autos are shorter for many ERPAs in the current study. The travel time savings to residents without autos may range from five minutes to nearly three hours under the revised Oswego County REPP procedures for a school in session scenario.