7. GENERAL POPULATION EVACUATION TIME ESTIMATES (ETE)

This section presents the current results of the computer analyses using the IDYNEV System described in Appendices B, C and D. These results cover 25 regions within the HNP EPZ and the 12 Evacuation Scenarios discussed in Section 6.

The ETE for all Evacuation Cases are presented in Tables 7-1A through 7-1D. **These tables present the estimated times to clear the indicated population percentages from the Evacuation Regions for all Evacuation Scenarios.** The tabulated values of ETE are obtained from the PC-DYNEV simulation model outputs of vehicles exiting the specified evacuation areas. These data are generated at 10-minute intervals, then interpolated to the nearest 5 minutes.

7.1 Voluntary Evacuation and Shadow Evacuation

We define "voluntary evacuees" as people who are within the EPZ in sub-zones located outside the Evacuation Region, for which an Advisory to Evacuate *has not* been issued, yet who nevertheless elect to evacuate. We define "shadow evacuation" as the movement of people from areas *outside* the EPZ for whom no protective action recommendation has been issued. Both voluntary and shadow evacuation are assumed to take place over the same time frame as the evacuation from within the impacted Evacuation Region.

The ETE for the HNP addresses the issue of voluntary evacuees as discussed in Section 2.2 and displayed in Figure 7-1 (same as Figure 2-1). Figure 7-2 presents the area identified as the Shadow Evacuation Region. This region extends radially from the boundary of the EPZ to a distance of 15 miles from HNP.

Traffic generated within this Shadow Evacuation Region, traveling away from the HNP location, has a potential for impeding evacuating vehicles from within the Evacuation Region. We assume that the traffic volumes emitted within the Shadow Evacuation Region correspond to 30 percent of the residents there plus a proportionate number of employees in that region. **All ETE calculations include this shadow traffic movement.**

7.2 Patterns of Traffic Congestion During Evacuation

Figures 7-3 through 7-6 illustrate the patterns of traffic congestion that arise for the case when the entire EPZ (Region R03) is advised to evacuate during the summer, midweek, midday period under good weather conditions.

Traffic congestion, as the term is used here, is defined as Level of Service (LOS) F. LOS F is defined as follows (2000 HCM):

> Level of Service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point

> exceeds the amount that can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level of Service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow, which causes the queue to form, and Level of Service F is an appropriate designation for such points.

This definition is general and conceptual in nature, and applies primarily to uninterrupted flow. Levels of Service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them.

All highway "links" which experience LOS F at the indicated times are delineated in these Figures by a red line; all others are lightly indicated. Congestion develops in areas with concentrations of population and at traffic bottlenecks. Congestion develops southbound on US Highway 401 and on the approaches to US Highway 1, especially along North Carolina Highway 55 by 1 Hour (Figure 7-3) after the evacuation advisory.

Figure 7-4 presents the congestion pattern 2 hours after the Advisory to Evacuate. This represents the peak congestion period. The majority of the congestion is in the shadow area within Wake County; however, considerable congestion exists within Fuquay Varina, southbound on US Highway 401, and on the NC Highway 55 approach to US Highway 1. By 3 hours after the Advisory to Evacuate (Figure 7-5), congestion within the EPZ has dissipated, while congestion still persists in the shadow area.

By 3 hours and 15 minutes (Figure 7-6), congestion only persists on the approaches to US Highway 1 and Interstate 40 in the Cary area. The absence of congestion on network links (white colored links) implies that traffic demand there has decreased below the roadway capacity for a period of time sufficient to dissipate any traffic queues. It does not necessarily imply that traffic has completely cleared from these roadway sections.

7.3 Evacuation Rates

Evacuation is a continuous process, as implied by Figures 7-3 through 7-6. Another format for displaying the dynamics of evacuation is depicted in Figure 7-7. This plot indicates the rate at which traffic flows out of the indicated areas for the case of an evacuation of the entire EPZ (Region R03) under the indicated conditions. Appendix J presents these plots for all Evacuation Scenarios for Region R03.

As indicated in Figure 7-7, there is typically a long "tail" to these distributions. Vehicles

evacuate an area slowly at the beginning, as people respond to the Advisory to Evacuate at different rates. Then traffic demand builds rapidly (slopes of curves increase). When the system becomes congested, traffic exits the EPZ at rates somewhat below capacity until some evacuation routes have cleared. As more routes clear, the aggregate rate of egress slows since many vehicles have already left the EPZ. Towards the end of the process, relatively few evacuation routes service the remaining demand. It is reasonable to expect that some evacuees may delay or lengthen their mobilization activities and evacuate at a later time as a result; these ETE estimates do not (and should not) be distorted to account for these relatively few stragglers.

This decline in aggregate flow rate, towards the end of the process, is characterized by these curves flattening and gradually becoming horizontal. Ideally, it would be desirable to fully saturate all evacuation routes equally so that all will service traffic near capacity levels and all will clear at the same time. For this ideal situation, all curves would retain the same slope until the end -- thus minimizing evacuation time. In the real world, this ideal is generally unattainable reflecting the variation in population density and in highway capacity over the EPZ.

7.4 Guidance on Using ETE Tables

Tables 7-1A through 7-1D present the ETE values for all 25 Evacuation Regions and all 12 Evacuation Scenarios. They are organized as follows:

Table	Contents
7-1A	ETE represents the elapsed time required for 50 percent of the population within a Region, to evacuate from that Region.
7-1B	ETE represents the elapsed time required for 90 percent of the population within a Region, to evacuate from that Region.
7-1C	ETE represents the elapsed time required for 95 percent of the population within a Region, to evacuate from that Region.
7-1D	ETE represents the elapsed time required for 100 percent of the population within a Region, to evacuate from that Region.

The user first determines the percentile of population for which the ETE is sought. The applicable value of ETE within the chosen Table may then be identified using the following procedure:

1. Identify the applicable **Scenario**:
    - The Season
        - Summer (schools not in session)
        - Winter (also Autumn and Spring)
    - The Day of Week
        - Midweek (work-day)
        - Weekend, Holiday
    - The Time of Day
        - Midday (work and commuting hours)
        - Evening
    - Weather Condition
        - Good Weather
        - Rain
        - Ice
    - Special Event (if any)
        - New Plant Construction

While these Scenarios are designed, in aggregate, to represent conditions throughout the year, some further clarification is warranted:

- The conditions of a summer evening (either midweek or weekend) and rain are not explicitly identified in Tables 7-1A through 7-1D. For these

conditions, Scenario (4) applies.

- The conditions of a winter evening (either midweek or weekend) and rain are not explicitly identified in Tables 7-1A through 7-1D. For these conditions, Scenario (10) applies.
- The seasons are defined as follows:
  - Summer implies that public schools are *not* in session.
  - Winter, Spring and Autumn imply that public schools *are* in session.
- Time of Day: Midday implies the time over which most commuters are at work.

2. With the Scenario (and column in the Table) identified, now identify the **Evacuation Region**:
   - Determine the projected azimuth direction of the plume (coincident with the wind direction). This direction is expressed in terms of compass orientation: *towards* N, NNE, NE, …
   - Determine the distance that the Evacuation Region will extend from the Harris Nuclear Plant. The applicable distances and their associated candidate Regions are given below:
     - 2 Miles (Region R01)
     - 5 Miles (Regions R02 and R04 through R12)
     - to EPZ Boundary (Regions R03 and R13 through R25)
   - Enter Table 7-2 and identify the applicable group of candidate Regions based on the wind direction and on the distance that the selected Region extends from HNP. Select the Evacuation Region identifier in that row from the first column of the Table.

3. Determine the **ETE for the Scenario** identified in Step 1 and the Region identified in Step 2, as follows:
   - The columns of Table 7-1 are labeled with the Scenario numbers. Identify the proper column in the selected Table using the Scenario number determined in Step 1.
   - Identify the row in this table that provides ETE values for the Region identified in Step 2.
   - The unique data cell defined by the column and row so determined contains the desired value of ETE expressed in Hours:Minutes.

Example

It is desired to identify the ETE for the following conditions:

- Sunday, August 10th at 4:00 AM.
- It is raining.
- Wind direction is *to* the northeast (NE).
- Wind speed is such that the distance to be evacuated is judged to be 10 miles (to EPZ boundary).
- The desired ETE is that value needed to evacuate 95 percent of the population from within the impacted Region.

Table 7-1C is applicable because the 95-percentile population is desired. Proceed as follows:

1. Identify the Scenario as summer, weekend, evening and raining. Entering Table 7-1C, it is seen that there is no match for these descriptors. However, the clarification given above assigns this combination of circumstances to Scenario 4.

2. Enter Table 7-2 and locate the group entitled “Evacuate 5-Mile Ring and Downwind to EPZ Boundary”. Under “Wind Direction”, identify the NE (northeast) azimuth and read REGION R14 in the first column of that row.

3. Enter Table 7-1C to locate the data cell containing the value of ETE for Scenario 4 and Region R14. This data cell is in column (4) and in the row for Region R14; it contains the ETE value of **2:45**.

Table 7-1A. Time to Clear the Indicated Area of 50 Percent of The Affected Population

	Summer		Summer		Summer		Winter			Winter		Winter		Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend		Midweek Weekend		Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	Scenario:	(12)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday		Evening	Region Wind Toward:	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Ice	Good Weather	Rain	Good Weather		New Plant Construction
Entire 2-Mile Region, 5-Mile Region, and EPZ														
R01 2-mile ring	0:45	0:45	0:45	0:45	0:45	R01 2-mile ring	0:45	0:50	0:50	0:45	0:45	0:50	R01 2-mile ring	1:20
R02 5-mile ring	1:05	1:05	1:05	1:05	0:55	R02 5-mile ring	1:05	1:05	1:05	0:55	0:55	0:55	R02 5-mile ring	1:20
R03 Entire EPZ	1:25	1:30	1:10	1:15	1:05	R03 Entire EPZ	1:30	1:30	1:35	1:10	1:15	1:10	R03 Entire EPZ	1:55
2-Mile Ring and Downwind to 5 Miles														
R04 N, NW, NNW	1:00	1:05	1:05	1:05	0:55	R04 N, NW, NNW	1:05	1:05	1:05	0:55	0:55	0:55	R04 N, NW, NNW	1:20
R05 NNE	1:00	1:05	0:55	0:55	0:55	R05 NNE	1:05	1:05	1:05	0:55	0:55	0:55	R05 NNE	1:20
R06 NE, ENE	1:05	1:05	0:55	0:55	0:55	R06 NE, ENE	1:05	1:05	1:05	0:55	0:55	0:55	R06 NE, ENE	1:20
R07 E	1:05	1:05	0:55	0:55	0:55	R07 E	1:05	1:05	1:10	0:55	0:55	0:55	R07 E	1:20
R08 ESE	0:55	0:55	0:50	0:50	0:50	R08 ESE	0:55	0:55	1:00	0:50	0:50	0:50	R08 ESE	1:20
R09 SE	0:55	0:55	0:50	0:50	0:50	R09 SE	0:55	0:55	1:00	0:50	0:50	0:50	R09 SE	1:20
R10 SSE, S	0:50	0:50	0:45	0:45	0:50	R10 SSE, S	0:55	0:55	0:55	0:45	0:50	0:50	R10 SSE, S	1:15
R11 SSW, SW	0:50	0:50	0:45	0:45	0:50	R11 SSW, SW	0:50	0:50	0:50	0:45	0:45	0:50	R11 SSW, SW	1:15
R12 WSW, W, WNW	0:55	0:55	1:00	1:00	0:50	R12 WSW, W, WNW	0:55	0:55	0:55	0:50	0:50	0:50	R12 WSW, W, WNW	1:15
5-Mile Ring and Downwind to EPZ Boundary														
R13 N, NNE	1:20	1:25	1:05	1:05	1:05	R13 N, NNE	1:25	1:25	1:30	1:05	1:05	1:05	R13 N, NNE	1:40
R14 NE	1:25	1:30	1:10	1:15	1:05	R14 NE	1:30	1:30	1:35	1:10	1:15	1:05	R14 NE	1:55
R15 ENE, E	1:25	1:30	1:15	1:15	1:05	R15 ENE, E	1:30	1:30	1:35	1:10	1:15	1:10	R15 ENE, E	1:55
R16 ESE	1:20	1:25	1:10	1:10	1:05	R16 ESE	1:20	1:25	1:30	1:05	1:10	1:05	R16 ESE	1:45
R17 SE	1:20	1:20	1:05	1:10	1:05	R17 SE	1:20	1:20	1:25	1:05	1:05	1:05	R17 SE	1:40
R18 SSE	1:20	1:20	1:05	1:10	1:05	R18 SSE	1:20	1:20	1:25	1:05	1:05	1:05	R18 SSE	1:40
R19 S	1:10	1:10	0:55	1:00	0:55	R19 S	1:10	1:10	1:10	0:55	0:55	0:55	R19 S	1:20
R20 SSW	1:10	1:15	0:55	1:00	0:55	R20 SSW	1:10	1:15	1:15	0:55	0:55	0:55	R20 SSW	1:20
R21 SW	1:05	1:05	0:55	1:00	0:55	R21 SW	1:05	1:05	1:10	0:55	0:55	0:55	R21 SW	1:20
R22 WSW	1:05	1:05	0:55	1:00	0:55	R22 WSW	1:05	1:05	1:10	0:55	0:55	0:55	R22 WSW	1:20
R23 W, WNW	1:05	1:05	0:55	1:00	0:55	R23 W, WNW	1:05	1:05	1:05	0:50	0:55	0:55	R23 W, WNW	1:15
R24 NW	1:00	1:00	0:55	0:55	0:50	R24 NW	1:00	1:05	1:05	0:50	0:50	0:55	R24 NW	1:15
R25 NNW	1:20	1:25	1:05	1:05	1:00	R25 NNW	1:25	1:25	1:30	1:05	1:05	1:05	R25 NNW	1:40

Table 7-1B. Time to Clear the Indicated Area of 90 Percent of The Affected Population

	Summer		Summer		Summer		Winter			Winter		Winter		Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend		Midweek Weekend		Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	Scenario:	(12)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday		Evening	Region Wind Toward:	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Ice	Good Weather	Rain	Good Weather		New Plant Construction
Entire 2-Mile Region, 5-Mile Region, and EPZ														
R01 2-mile ring	1:40	1:40	1:20	1:20	1:40	R01 2-mile ring	1:40	1:40	1:40	1:25	1:30	1:50	R01 2-mile ring	2:25
R02 5-mile ring	1:55	1:55	2:20	2:30	1:40	R02 5-mile ring	2:00	2:00	2:00	1:35	1:40	1:40	R02 5-mile ring	2:50
R03 Entire EPZ	2:35	2:45	2:20	2:30	2:10	R03 Entire EPZ	2:40	2:50	3:00	2:15	2:25	2:10	R03 Entire EPZ	3:40
2-Mile Ring and Downwind to 5 Miles														
R04 N, NW, NNW	1:50	1:50	2:30	2:30	1:40	R04 N, NW, NNW	2:00	2:00	2:00	1:35	1:40	1:40	R04 N, NW, NNW	3:00
R05 NNE	1:50	1:50	1:40	1:40	1:40	R05 NNE	1:50	1:55	1:55	1:35	1:40	1:40	R05 NNE	2:50
R06 NE, ENE	1:55	1:55	1:40	1:40	1:40	R06 NE, ENE	1:55	2:00	2:00	1:40	1:40	1:45	R06 NE, ENE	2:50
R07 E	2:00	2:00	1:40	1:40	1:45	R07 E	2:00	2:00	2:00	1:40	1:40	1:45	R07 E	2:50
R08 ESE	2:00	2:00	1:30	1:30	1:45	R08 ESE	2:00	2:00	2:00	1:30	1:30	1:45	R08 ESE	2:25
R09 SE	2:00	2:00	1:30	1:30	1:50	R09 SE	2:00	2:00	2:00	1:30	1:30	1:50	R09 SE	2:25
R10 SSE, S	1:50	1:50	1:25	1:25	1:40	R10 SSE, S	2:00	2:00	2:00	1:30	1:30	1:50	R10 SSE, S	2:25
R11 SSW, SW	1:50	1:50	1:25	1:25	1:40	R11 SSW, SW	1:50	1:50	1:50	1:30	1:30	1:40	R11 SSW, SW	2:20
R12 WSW, W, WNW	1:50	1:50	2:30	2:30	1:40	R12 WSW, W, WNW	2:00	2:00	2:00	1:30	1:30	1:40	R12 WSW, W, WNW	2:40
5-Mile Ring and Downwind to EPZ Boundary														
R13 N, NNE	2:25	2:35	2:10	2:25	2:00	R13 N, NNE	2:30	2:35	2:50	2:05	2:15	2:00	R13 N, NNE	3:25
R14 NE	2:35	2:45	2:20	2:30	2:05	R14 NE	2:35	2:50	3:00	2:15	2:25	2:05	R14 NE	3:40
R15 ENE, E	2:35	2:45	2:20	2:30	2:10	R15 ENE, E	2:35	2:50	3:00	2:15	2:25	2:10	R15 ENE, E	3:40
R16 ESE	2:30	2:35	2:15	2:30	2:05	R16 ESE	2:30	2:40	2:50	2:05	2:20	2:05	R16 ESE	3:35
R17 SE	2:25	2:35	2:15	2:30	2:05	R17 SE	2:30	2:40	2:50	2:05	2:20	2:05	R17 SE	3:30
R18 SSE	2:25	2:35	2:15	2:30	2:05	R18 SSE	2:30	2:40	2:50	2:05	2:20	2:05	R18 SSE	3:30
R19 S	2:10	2:10	2:10	2:20	1:50	R19 S	2:20	2:20	2:20	1:40	1:40	1:50	R19 S	2:50
R20 SSW	2:20	2:20	2:10	2:20	1:50	R20 SSW	2:20	2:20	2:20	1:40	1:40	1:50	R20 SSW	2:50
R21 SW	2:00	2:00	2:10	2:20	1:40	R21 SW	2:10	2:10	2:10	1:40	1:40	1:40	R21 SW	2:50
R22 WSW	2:00	2:00	2:10	2:20	1:40	R22 WSW	2:10	2:10	2:10	1:40	1:40	1:40	R22 WSW	2:50
R23 W, WNW	2:00	2:00	2:10	2:20	1:40	R23 W, WNW	2:10	2:10	2:10	1:40	1:40	1:40	R23 W, WNW	2:50
R24 NW	2:00	2:00	2:10	2:20	1:40	R24 NW	2:10	2:10	2:10	1:40	1:40	1:40	R24 NW	2:50
R25 NNW	2:25	2:35	2:10	2:20	2:00	R25 NNW	2:30	2:40	2:50	2:05	2:15	2:00	R25 NNW	3:20

Table 7-1C. Time to Clear the Indicated Area of 95 Percent of The Affected Population

	Summer		Summer		Summer		Winter			Winter		Winter		Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend		Midweek Weekend		Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	Scenario:	(12)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday		Evening	Region Wind Toward:	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Ice	Good Weather	Rain	Good Weather		New Plant Construction
Entire 2-Mile Region, 5-Mile Region, and EPZ														
R01 2-mile ring	2:10	2:20	1:50	1:50	2:10	R01 2-mile ring	2:10	2:10	2:10	1:50	1:50	2:20	R01 2-mile ring	2:35
R02 5-mile ring	2:20	2:20	2:40	2:50	2:10	R02 5-mile ring	2:30	2:30	2:30	2:00	2:00	2:10	R02 5-mile ring	3:30
R03 Entire EPZ	2:55	3:00	2:40	2:50	2:30	R03 Entire EPZ	3:00	3:05	3:20	2:30	2:40	2:30	R03 Entire EPZ	4:00
2-Mile Ring and Downwind to 5 Miles														
R04 N, NW, NNW	2:20	2:20	2:40	2:50	2:10	R04 N, NW, NNW	2:30	2:30	2:30	1:50	1:50	2:10	R04 N, NW, NNW	3:40
R05 NNE	2:20	2:20	1:50	1:50	2:10	R05 NNE	2:20	2:20	2:20	1:50	1:50	2:10	R05 NNE	3:10
R06 NE, ENE	2:20	2:20	2:00	2:00	2:10	R06 NE, ENE	2:20	2:20	2:30	2:00	2:00	2:10	R06 NE, ENE	3:10
R07 E	2:30	2:30	2:00	2:00	2:10	R07 E	2:30	2:30	2:30	2:00	2:00	2:10	R07 E	3:10
R08 ESE	2:30	2:30	2:00	2:00	2:10	R08 ESE	2:30	2:30	2:30	2:00	2:00	2:10	R08 ESE	2:40
R09 SE	2:30	2:30	2:10	2:10	2:20	R09 SE	2:40	2:40	2:40	2:10	2:10	2:20	R09 SE	2:40
R10 SSE, S	2:30	2:30	2:00	2:00	2:20	R10 SSE, S	2:30	2:30	2:30	2:00	2:00	2:20	R10 SSE, S	2:35
R11 SSW, SW	2:20	2:20	2:00	2:00	2:20	R11 SSW, SW	2:20	2:20	2:20	2:00	2:00	2:20	R11 SSW, SW	2:30
R12 WSW, W, WNW	2:20	2:20	2:40	2:50	2:20	R12 WSW, W, WNW	2:30	2:30	2:30	2:00	2:00	2:20	R12 WSW, W, WNW	3:10
5-Mile Ring and Downwind to EPZ Boundary														
R13 N, NNE	2:50	2:50	2:30	2:40	2:30	R13 N, NNE	2:50	2:50	3:05	2:30	2:30	2:30	R13 N, NNE	3:40
R14 NE	2:55	3:00	2:30	2:45	2:30	R14 NE	2:55	3:05	3:20	2:30	2:40	2:30	R14 NE	4:00
R15 ENE, E	2:55	3:00	2:30	2:45	2:30	R15 ENE, E	2:55	3:05	3:20	2:30	2:40	2:30	R15 ENE, E	4:00
R16 ESE	2:50	2:55	2:40	2:40	2:30	R16 ESE	2:50	3:00	3:10	2:30	2:30	2:30	R16 ESE	3:50
R17 SE	2:50	2:50	2:40	2:40	2:30	R17 SE	2:50	3:00	3:10	2:20	2:30	2:30	R17 SE	3:45
R18 SSE	2:50	2:50	2:40	2:40	2:30	R18 SSE	2:50	3:00	3:10	2:20	2:30	2:30	R18 SSE	3:45
R19 S	2:40	2:40	2:40	2:40	2:20	R19 S	2:50	2:50	2:50	2:10	2:10	2:20	R19 S	3:20
R20 SSW	2:50	2:50	2:40	2:50	2:20	R20 SSW	2:50	2:50	2:50	2:20	2:20	2:20	R20 SSW	3:30
R21 SW	2:40	2:40	2:40	2:50	2:20	R21 SW	2:40	2:40	2:40	2:10	2:10	2:20	R21 SW	3:30
R22 WSW	2:40	2:40	2:40	2:50	2:20	R22 WSW	2:40	2:40	2:40	2:10	2:10	2:20	R22 WSW	3:30
R23 W, WNW	2:30	2:30	2:40	2:50	2:20	R23 W, WNW	2:40	2:40	2:40	2:00	2:00	2:20	R23 W, WNW	3:30
R24 NW	2:30	2:30	2:40	2:40	2:20	R24 NW	2:40	2:40	2:40	2:00	2:00	2:20	R24 NW	3:30
R25 NNW	2:50	2:50	2:40	2:40	2:30	R25 NNW	2:50	2:50	3:05	2:30	2:30	2:30	R25 NNW	3:40

Table 7-1D. Time to Clear the Indicated Area of 100 Percent of The Affected Population

	Summer		Summer		Summer		Winter			Winter		Winter		Summer
	Midweek		Weekend		Midweek Weekend		Midweek			Weekend		Midweek Weekend		Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	Scenario:	(6)	(7)	(8)	(9)	(10)	(11)	Scenario:	(12)
Region Wind Toward:	Midday		Midday		Evening	Region Wind Toward:	Midday			Midday		Evening	Region Wind Toward:	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather		Good Weather	Rain	Ice	Good Weather	Rain	Good Weather		New Plant Construction
Entire 2-Mile Region, 5-Mile Region, and EPZ														
R01 2-mile ring	4:00	4:00	3:00	3:00	3:00	R01 2-mile ring	4:00	4:00	4:00	3:00	3:00	3:00	R01 2-mile ring	4:00
R02 5-mile ring	4:05	4:05	3:10	3:20	3:10	R02 5-mile ring	4:05	4:05	4:05	3:05	3:10	3:10	R02 5-mile ring	4:10
R03 Entire EPZ	4:10	4:10	4:00	4:00	4:00	R03 Entire EPZ	4:10	4:10	4:10	4:00	4:00	4:00	R03 Entire EPZ	4:40
2-Mile Ring and Downwind to 5 Miles														
R04 N, NW, NNW	4:00	4:05	3:10	3:20	3:10	R04 N, NW, NNW	4:05	4:05	4:05	3:00	3:10	3:10	R04 N, NW, NNW	4:10
R05 NNE	4:00	4:00	3:00	3:00	3:00	R05 NNE	4:00	4:00	4:00	3:00	3:00	3:00	R05 NNE	4:00
R06 NE, ENE	4:00	4:00	3:00	3:00	3:00	R06 NE, ENE	4:00	4:00	4:00	3:00	3:00	3:00	R06 NE, ENE	4:00
R07 E	4:00	4:00	3:00	3:00	3:00	R07 E	4:00	4:00	4:00	3:00	3:00	3:00	R07 E	4:00
R08 ESE	4:00	4:00	3:00	3:00	3:00	R08 ESE	4:00	4:00	4:00	3:00	3:00	3:00	R08 ESE	4:00
R09 SE	4:00	4:00	3:00	3:00	3:00	R09 SE	4:00	4:00	4:00	3:00	3:00	3:00	R09 SE	4:00
R10 SSE, S	4:00	4:00	3:00	3:00	3:00	R10 SSE, S	4:00	4:00	4:00	3:00	3:00	3:00	R10 SSE, S	4:00
R11 SSW, SW	4:00	4:00	3:00	3:00	3:00	R11 SSW, SW	4:00	4:00	4:00	3:00	3:00	3:00	R11 SSW, SW	4:00
R12 WSW, W, WNW	4:00	4:00	3:10	3:20	3:10	R12 WSW, W, WNW	4:05	4:00	4:05	3:00	3:10	3:00	R12 WSW, W, WNW	4:00
5-Mile Ring and Downwind to EPZ Boundary														
R13 N, NNE	4:05	4:10	4:00	4:00	4:00	R13 N, NNE	4:05	4:05	4:10	4:00	4:00	4:00	R13 N, NNE	4:30
R14 NE	4:05	4:05	3:50	4:00	4:00	R14 NE	4:05	4:05	4:10	3:50	4:00	4:00	R14 NE	4:40
R15 ENE, E	4:05	4:05	4:00	4:00	4:00	R15 ENE, E	4:05	4:10	4:10	4:00	4:00	4:00	R15 ENE, E	4:40
R16 ESE	4:10	4:10	4:00	4:00	4:00	R16 ESE	4:05	4:10	4:10	4:00	4:00	4:00	R16 ESE	4:20
R17 SE	4:10	4:10	4:00	4:00	4:00	R17 SE	4:05	4:10	4:10	4:00	4:00	4:00	R17 SE	4:20
R18 SSE	4:10	4:10	4:00	4:00	4:00	R18 SSE	4:05	4:10	4:10	4:00	4:00	4:00	R18 SSE	4:20
R19 S	4:10	4:10	3:50	3:50	3:50	R19 S	4:05	4:10	4:10	3:50	3:50	3:50	R19 S	4:10
R20 SSW	4:10	4:10	3:50	3:50	3:50	R20 SSW	4:05	4:10	4:10	3:50	3:50	3:50	R20 SSW	4:10
R21 SW	4:05	4:05	3:15	3:25	3:15	R21 SW	4:05	4:05	4:10	3:05	3:10	3:10	R21 SW	4:10
R22 WSW	4:05	4:10	3:40	3:40	3:15	R22 WSW	4:05	4:10	4:10	3:40	3:40	3:10	R22 WSW	4:20
R23 W, WNW	4:05	4:10	3:40	3:40	3:15	R23 W, WNW	4:05	4:10	4:10	3:40	3:40	3:10	R23 W, WNW	4:20
R24 NW	4:05	4:05	3:50	3:50	3:40	R24 NW	4:05	4:10	4:10	3:40	3:50	3:40	R24 NW	4:20
R25 NNW	4:05	4:05	3:50	3:50	4:00	R25 NNW	4:05	4:10	4:10	3:50	3:50	4:00	R25 NNW	4:30

Table 7-2. Description of Evacuation Regions															
		Sub-Zone													
Region	Description	A	B	C	D	E	F	G	H	I	J	K	L	M	N
R01	2 mile ring	■													
R02	5-mile ring	■	■	■	■							■	■		
R03	Full EPZ	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Evacuate 2-mile ring and 5 miles downwind															
		Sub-Zone													
Region	Wind Direction	A	B	C	D	E	F	G	H	I	J	K	L	M	N
R04	N,NW,NNW	■	■										■		
R05	NNE	■	■												
R06	NE,ENE	■	■	■											
R07	E	■	■	■	■										
R08	ESE	■		■	■										
R09	SE	■		■	■							■			
R10	SSE,S	■			■							■			
R11	SSW, SW	■										■			
R12	WSW,W,WNW	■										■	■		
Evacuate 5-mile ring and downwind to EPZ boundary															
		Sub-Zone													
Region	Wind Direction	A	B	C	D	E	F	G	H	I	J	K	L	M	N
R13	N,NNE	■	■	■	■	■						■	■		■
R14	NE	■	■	■	■	■	■					■	■		
R15	ENE, E	■	■	■	■	■	■	■				■	■		
R16	ESE	■	■	■	■		■	■	■			■	■		
R17	SE	■	■	■	■			■	■			■	■		
R18	SSE	■	■	■	■			■	■	■		■	■		
R19	S	■	■	■	■				■	■		■	■		
R20	SSW	■	■	■	■				■	■	■	■	■		
R21	SW	■	■	■	■					■	■	■	■		
R22	WSW	■	■	■	■					■	■	■	■	■	
R23	W,WNW	■	■	■	■						■	■	■	■	
R24	NW	■	■	■	■							■	■	■	■
R25	NNW	■	■	■	■	■						■	■	■	■

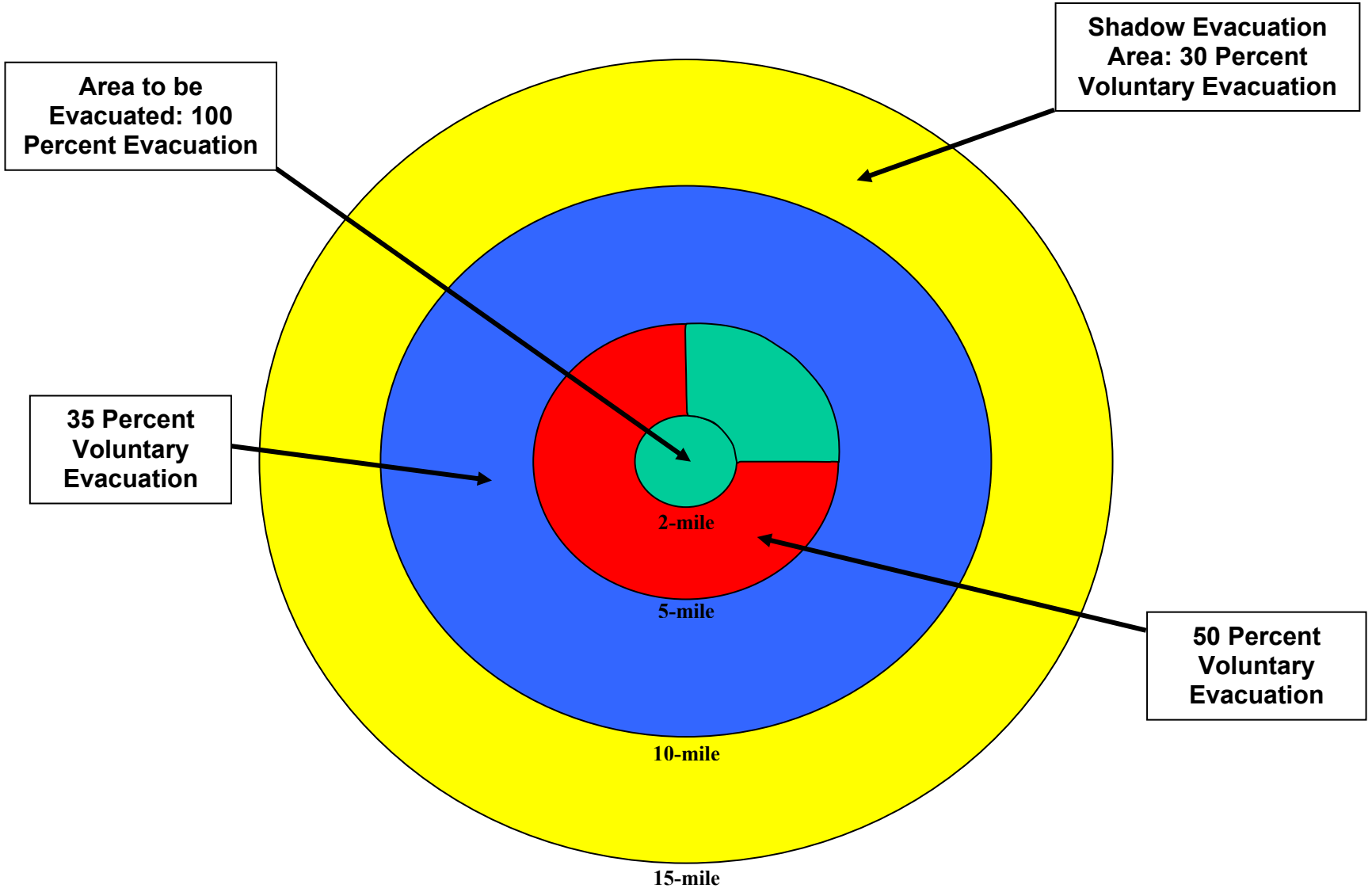


Figure 7-1. Assumed Evacuation Response

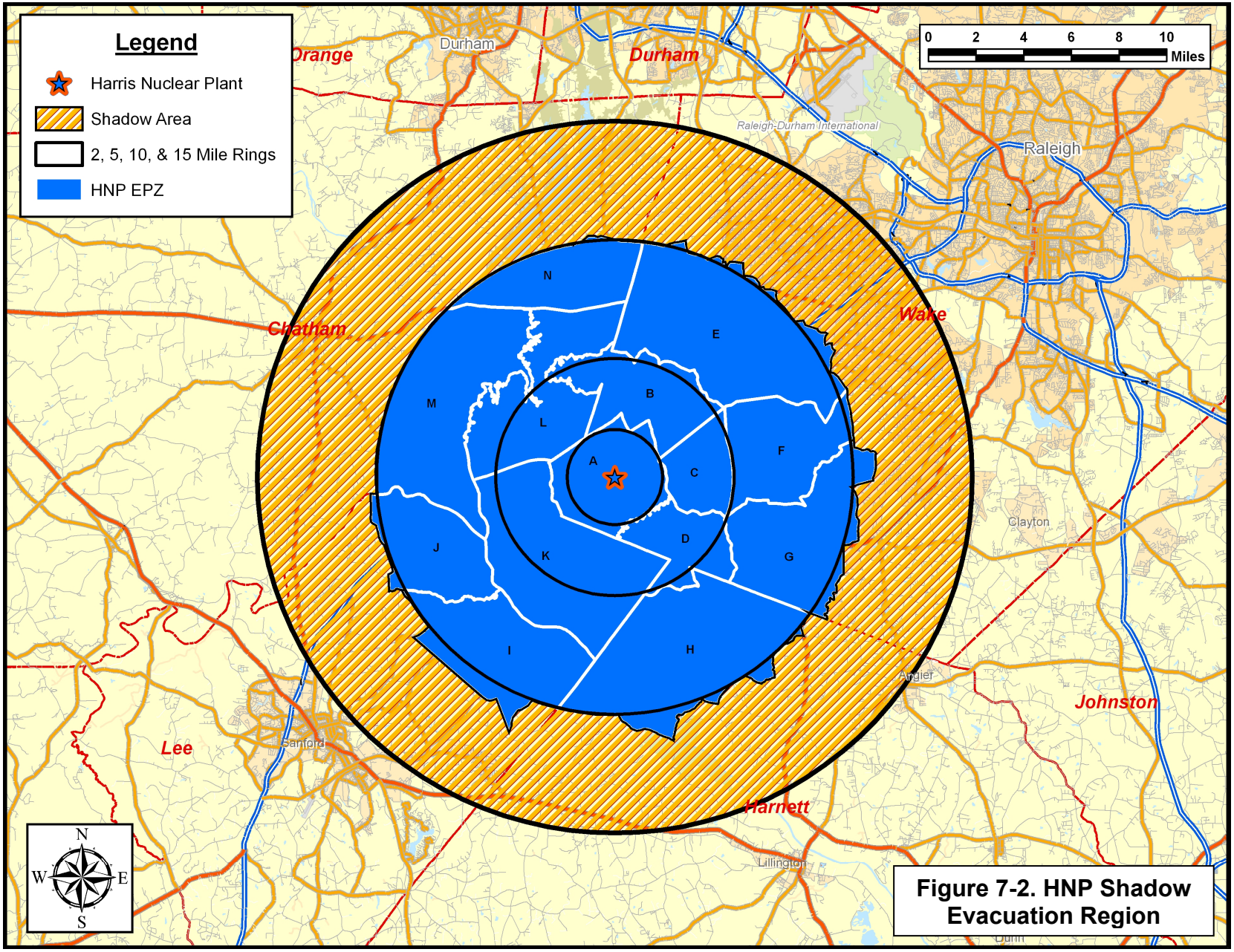


Figure 7-2. HNP Shadow Evacuation Region

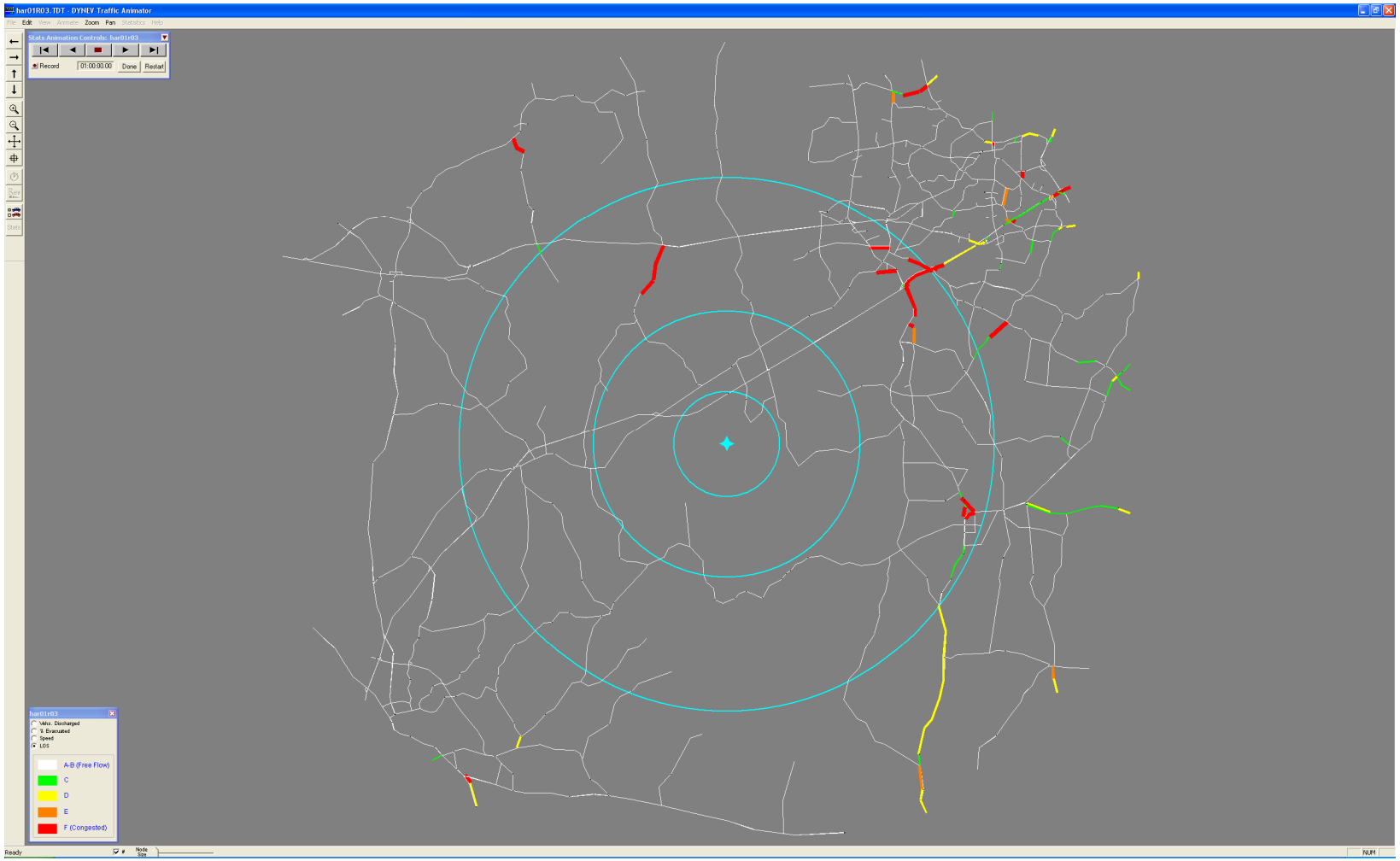


Figure 7-3. Congestion Patterns at 1 Hour after the Evacuation Advisory

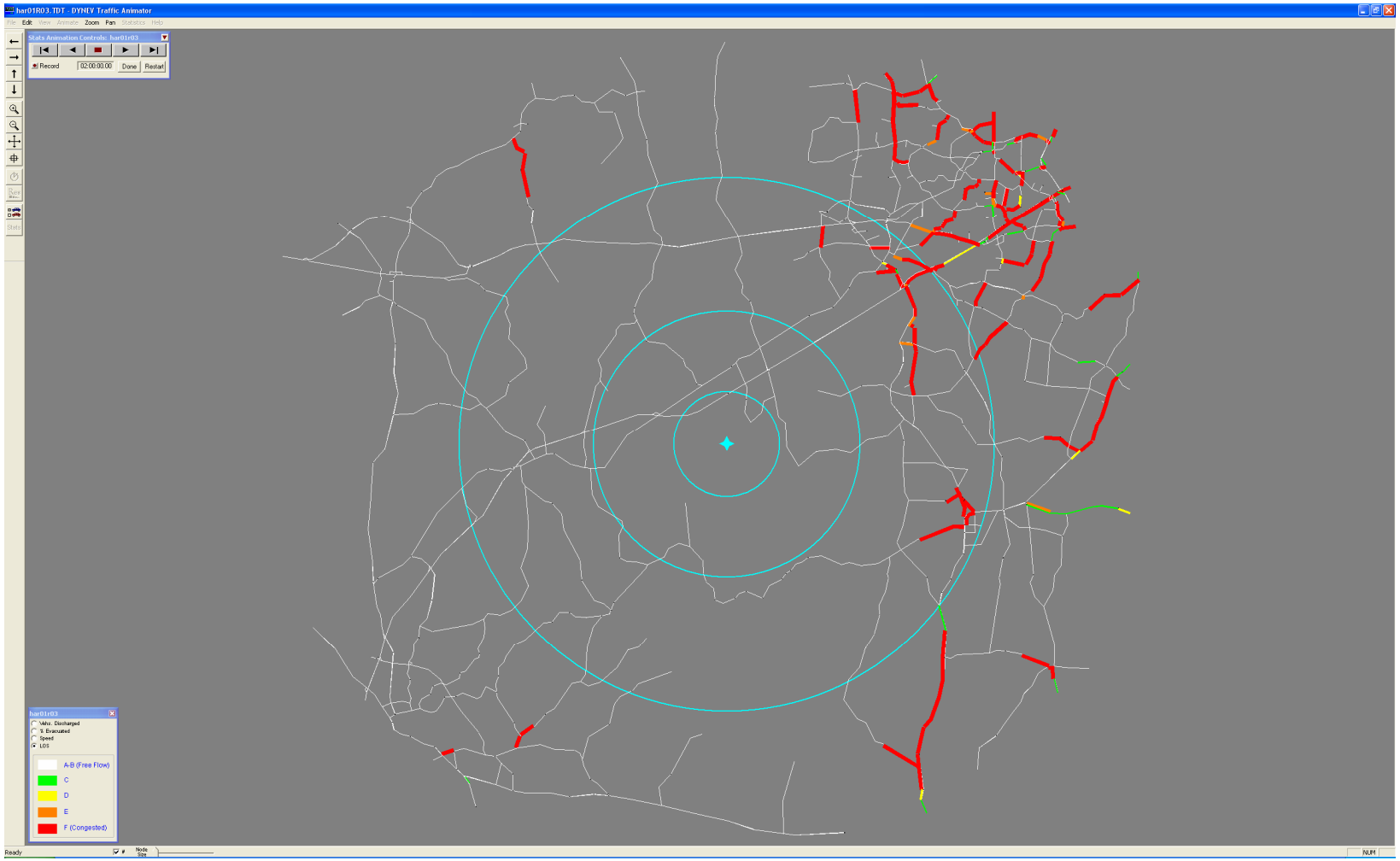


Figure 7-4 Congestion Patterns at 2 Hours after the Evacuation Advisory

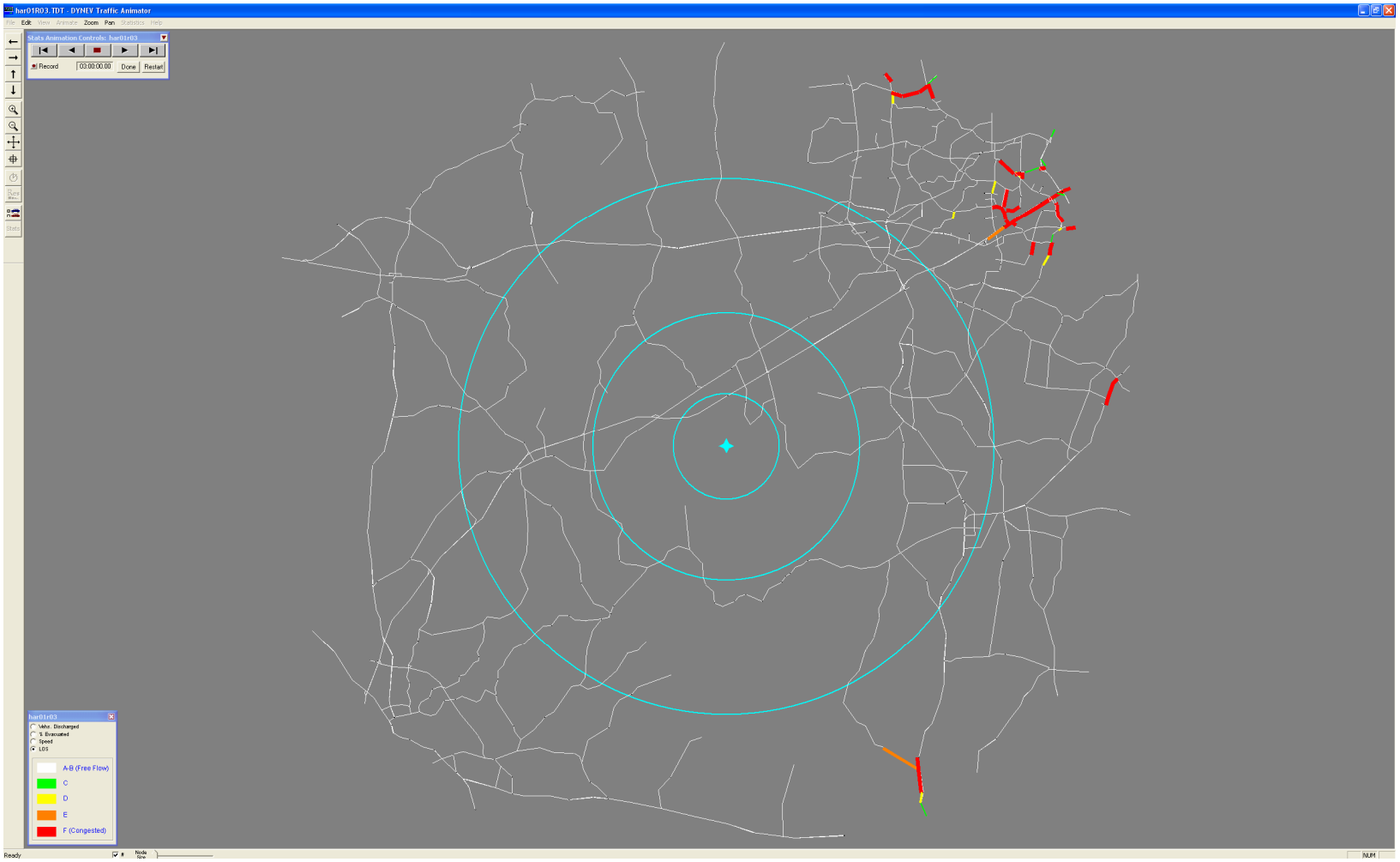


Figure 7-5 Congestion Patterns at 3 Hours after the Evacuation Advisory

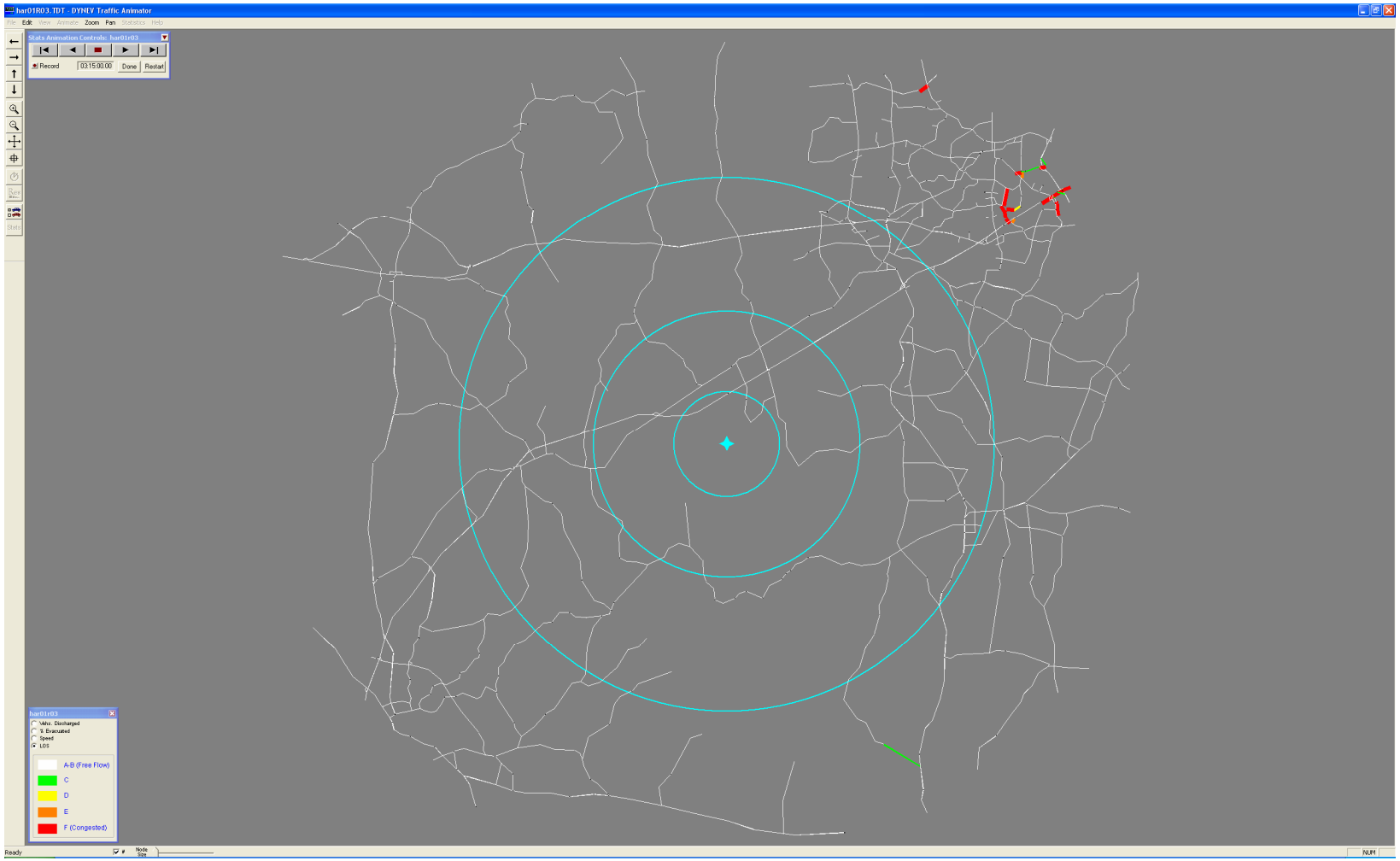


Figure 7-6 Congestion Patterns at 3 Hours:15 Minutes after the Evacuation Advisory

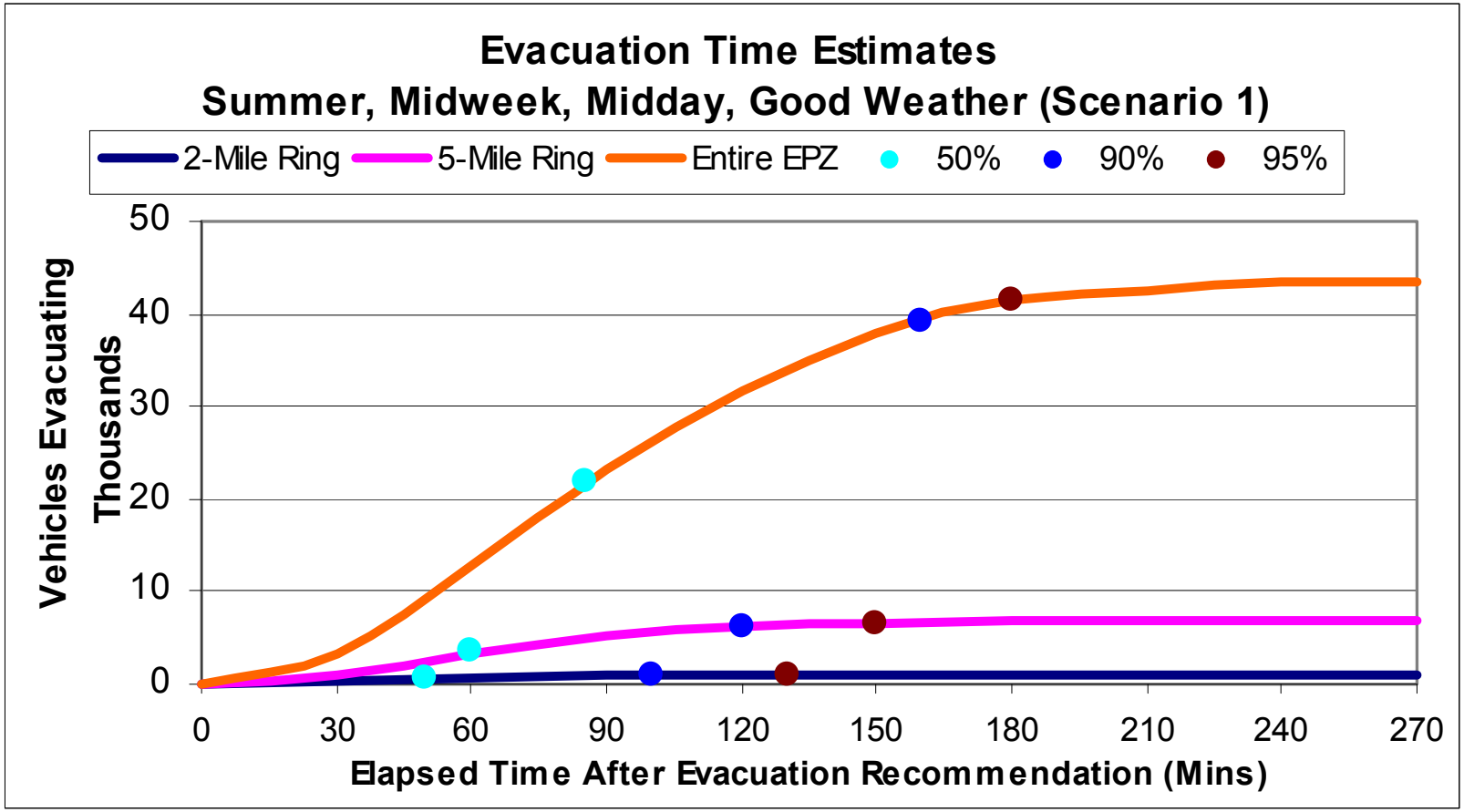


Figure 7-7. Evacuation Time Estimates for HNP Summer, Midweek, Midday, Good Weather Evacuation of Region R03 (Entire EPZ)

8. TRANSIT-DEPENDENT AND SPECIAL FACILITY EVACUATION TIME ESTIMATES

This section details the analyses applied and the results obtained in the form of evacuation time estimates for transit vehicles (buses). The demand for transit service reflects the needs of two population groups: (1) residents, employees and transients with no vehicles available; and (2) residents of special facilities such as schools, health-support facilities, institutions and child-care facilities.

These transit vehicles merge into and become a part of the general evacuation traffic environment that is comprised mostly of "passenger cars" (pc's). The presence of each transit vehicle in the evacuating traffic stream is represented within the modeling paradigm described in Appendix D as equivalent to two pc's. This equivalence factor represents the longer size and more sluggish operating characteristics of a transit vehicle relative to those of a pc.

Transit vehicles must be mobilized in preparation for their respective evacuation missions. Specifically:

- Bus drivers must be alerted
- They must travel to the bus depot
- They must be briefed there and assigned to a route or facility

These activities consume time. Based on experience at other suburban plants, it is estimated that bus mobilization time will average approximately 90 minutes extending from the Advisory to Evacuate to the time when buses arrive at their respective assignments.

During this mobilization period, other mobilization activities are taking place. One of these is the action taken by parents, neighbors, relatives and friends to pick up children from school prior to the arrival of buses, so that they may join their families. Virtually all studies of evacuations have concluded that this "bonding" process of uniting family members is universally prevalent during emergencies and should be anticipated in the planning process. Many emergency plans, however, call for parents to pick up children at host schools or reception centers to speed the evacuation of the school children in the event that buses need to return to the EPZ and evacuate transit dependents. We provide estimates of buses under the assumption that no children will be picked up at school by their parents as an upper bound estimate of the transit vehicles needed.

The procedure is:

- Estimate demand for transit service
- Estimate time to perform all transit functions
- Estimate route travel times to the EPZ boundary and to the school reception centers

8.1 Transit-Dependent People - Demand Estimate

The telephone survey (see Appendix F) results were used to estimate the portion of the population requiring transit service:

- Those persons in households that do not have a vehicle available.
- Those persons in households that do have vehicle(s) that would not be available at the time the evacuation is ordered.

In the latter group, the vehicle(s) may be used by a commuter(s) who does not return (or is not expected to return) home to evacuate the household.

Table 8-1 presents estimates of transit-dependent people. Note:

- Estimates of persons requiring transit vehicles include school children. For those evacuation scenarios where children are at school when an evacuation is ordered, separate transportation is provided for the school children. The actual need for transit vehicles by residents is thereby less than the given estimates. However, we will not reduce our estimates of transit vehicles since it would add to the complexity of the implementation procedures.
- It is reasonable and appropriate to consider that many transit-dependent persons will evacuate by ride-sharing with neighbors, friends or family. For example, nearly 80 percent of those who evacuated from Mississauga, Ontario who did not use their own cars, shared a ride with neighbors or friends. Other documents report that approximately 70 percent of transit-dependent persons were evacuated via ride-sharing. **We will adopt a conservative estimate that 50 percent of transit-dependent persons will ride-share.**

The estimated number of bus trips needed to service transit-dependent persons is based on an estimate of average bus occupancy of 30 persons at the conclusion of the bus run. Transit vehicle seating capacities typically equal or exceed 60 children (equivalent to 40 adults). If transit vehicle evacuees are two-thirds adults and one-third children, then the number of “adult seats” taken by 30 persons is 20 + (2/3 x10) = 27. On this basis, the average load factor anticipated is (27/40) x 100 = 68 percent. Thus, if the actual demand for service exceeds the estimates of Table 8-1 by 50 percent, the demand for service can still be accommodated by the available bus seating capacity.

Table 8-1 indicates that transportation must be provided for 1,645 people. Therefore, a total of 55 bus runs are required to transport this population to reception centers.

To illustrate this estimation procedure, we calculate the number of persons, P, requiring public transit or ride-share, and the number of buses, B, required for the Harris EPZ:

$$P = 23{,}750 \times (0.017 \times 1.90 + 0.134 \times (1.95 - 1) \times 0.74 \times 0.42 + 0.580 \times (3.19 - 2) \times (0.74 \times 0.42)^2)$$
$$P = 23{,}750 * (0.1386) = 3{,}290$$
$$B = (0.5 \times P) \div 30 = 55$$

These calculations are explained as follows:

- All members (1.9 avg.) of households (HH) with no vehicles (1.7%) will evacuate by public transit or ride-share. The term 23,750 (number of households) x 0.017 x 1.90, accounts for these people.
- The members of HH with 1 vehicle away, who are at home, equal (1.95-1). The number of HH where the commuter will not return home is equal to (23,750 x 0.134 x 0.74 x 0.42), as 74% of EPZ households have a commuter, 42% of which would not return home in the event of an emergency. The number of persons who will evacuate by public transit or ride-share is equal to the product of these two terms.
- The members of HH with 2 vehicles that are away, who are at home, equal (3.19 – 2). The number of HH where neither commuter will return home is equal to 23,750 x 0.580 x $(0.74 \times 0.42)^2$. The number of persons who will evacuate by public transit or ride-share is equal to the product of these two terms.
- Households with 3 or more vehicles are assumed to have no need for transit vehicles.
- The total number of persons requiring public transit is the sum of such people in HH with no vehicles, or with 1 or 2 vehicles that are away from home.

8.2 School Population – Transit Demand

Table 8-2 presents the school population and transportation requirements for the direct evacuation of all schools within the EPZ. The column in Table 8-2 entitled “Bus Runs Required” specifies the number of buses required for each school under the following set of assumptions and estimates:

- No students will be picked up by their parents prior to the arrival of the buses.
- Bus capacity, expressed in students per bus, is set to 70 for primary schools and 50 for middle and high schools.
- Those staff members who do not accompany the students will evacuate in their private vehicles.

- No allowance is made for student absenteeism which is in the neighborhood of 3 percent, daily.

We recommend that the Counties introduce procedures whereby the schools are contacted prior to the dispatch of buses from the depot (approximately one hour after the Advisory to Evacuate), to ascertain the current estimate of students to be evacuated. In this way, the number of buses dispatched to the schools will reflect the actual number needed. Some parents will likely pick up their children at school, although they are asked to pick children up at the relocation schools. Those buses originally allocated to evacuate school children that are not needed due to children being picked up by their parents, can be gainfully assigned to service other facilities or those persons who do not have access to private vehicles or to ride-sharing.

Table 8-3 presents a list of the relocation schools for each school in the EPZ. Those students not picked up by their parents prior to the arrival of the buses, will be transported to these centers where they will be subsequently retrieved by their respective families.

8.3 Special Facility Demand

Table 8-4 presents the census of special facilities in the EPZ as of the June, 2007. Approximately 597 people have been identified as living in, or being treated in, these facilities. This census also indicates the number of wheelchair-bound people and the number of bed-ridden people. The transportation requirements for this group are also presented. The number of bus runs estimated assumes 30 ambulatory patients per trip. Wheelchair buses can transport 15 patients while vans can transport 4 patients.

8.4 Evacuation Time Estimates for Transit-Dependent People

County bus resources are assigned to evacuating school children as the first priority in the event of an emergency. In the event that the allocation of buses dispatched from the depots to the various facilities and to the bus routes is somewhat “inefficient”, or if there is a shortfall of available drivers, then there may be a need for some buses to return to the EPZ from the reception center after completing their first evacuation trip, to complete a “second wave” of providing transport service to evacuees. For this reason, the ETE will be calculated for both a one wave transit evacuation and for two waves (Table 8-6). Of course, if the impacted Evacuation Region is other than R3 (the entire EPZ), then there will likely be ample transit resources relative to demand in the impacted Region and this discussion of a second wave would likely not apply.

When school evacuation needs are satisfied, subsequent assignments of buses to service the transit-dependent should be sensitive to their mobilization time. Clearly, the buses should be dispatched after people have completed their mobilization activities and are in a position to board the buses when they arrive at the pick-up points.

Evacuation Time Estimates for Transit Trips were developed using both good weather and adverse weather conditions. Figure 8-1 presents the chronology of events relevant to transit operations. The elapsed time for each activity will now be discussed with reference to Figure 8-1.

Activity: Mobilize Drivers (A→B→C)

Mobilization is the elapsed time from the Advisory to Evacuate until the time the buses are dispatched from their respective depots. It is assumed that for a rapidly escalating radiological emergency with no observable indication before the fact, drivers would likely require 90 minutes to be contacted, to travel to the depot, be briefed, and to travel to the transit-dependent facilities. Mobilization time is slightly longer – 100 minutes – when raining.

Activity: Board Passengers (C→D)

Studies have shown that passengers can board a bus at headways of 2-4 seconds (Ref. HCM2000 Page 27-27). Therefore, the total dwell time to service passengers boarding a bus to capacity at a single stop (e.g., at a school) is about 5 minutes. A loading time of 10 minutes will be used for rain scenarios. For multiple stops along a pick-up route we must allow for the additional delay associated with stopping and starting at each pick-up point. This additional delay to service passengers expands this estimate of boarding time to 15 minutes in good weather, and 20 minutes in rain.

Activity: Travel to EPZ Boundary (D→E)

School Evacuation

The distance from a school to the EPZ boundary is measured using Geographical Information Systems (GIS) software along the most likely route out of the EPZ. The travel times to the EPZ boundary are based on evacuation speeds computed by the model. The average speed for an evacuation of the full EPZ under Scenario 1 (good weather) conditions at 90 minutes (mobilization time) is 22.9 mph, while the average speed for an evacuation of the full EPZ under Scenario 2 conditions (Rain) is 19.1 mph. The travel time from the EPZ boundary to the Reception Center was computed assuming an average speed of 40 mph and 35 mph for good weather and rain, respectively. Based on discussions with Chatham and Wake Counties, there are adequate buses to evacuate the school children in a single wave.

Tables 8-5A (good weather) and 8-5B (rain) present the following evacuation time estimates (rounded up to the nearest 5 minutes) for schools in the EPZ: (1) The elapsed time from the Advisory to Evacuate until the bus exits the EPZ; and (2) The elapsed time until the bus reaches the School Reception Center. The evacuation time out of the EPZ can be computed as the sum of travel times associated with Activities A→B, B→C, C→D, and D→E (For example: 90 min. + 5 + 19 = 1:55 for Holly Springs High School, with good weather). The evacuation time to the School Reception Center is determined by adding the time associated with Activity E→F (discussed below), to this EPZ evacuation time.

Evacuation of Transit-Dependent Population

The buses dispatched from the depots to service the transit-dependent evacuees will be scheduled so that they arrive at their respective routes after their passengers have completed their mobilization. As indicated in Section 5, about 90 percent of the evacuees will complete their mobilization when the first buses will begin their routes, 90 minutes after the Advisory to Evacuate.

Those buses servicing the transit-dependent evacuees will first travel along their pick-up routes, then proceed out of the EPZ. Table 8-6 details the proposed bus routes to service the transit dependent people in the Harris EPZ, while Figure 8-2 maps the proposed bus pick-up routes.

Table 8-7 presents the transit-dependent population evacuation time estimates for each route obtained using the above procedures.

Activity: Travel to School Reception Centers (E→F)

The distances from the EPZ boundary to the relocation schools are measured using Geographical Information Systems (GIS) software along the most likely route from the EPZ to the relocation school. For a one-wave evacuation, this travel time outside the EPZ does not contribute to the ETE. For a two-wave evacuation, the ETE for buses must be considered separately, since it could exceed the ETE for the general public.

Activity: Passengers Leave Bus (F→G)

Passengers can de-board within 5 minutes.

Activity: Bus Returns to Route for Second Wave Evacuation (G→C)

The buses assigned to return to the EPZ to perform a "second wave" evacuation of transit-dependent evacuees will be those that evacuated the first wave since the bus drivers will be familiar with the pick-up routes. The travel time back to the EPZ is calculated using distances estimated from GIS and the free-flow inbound travel speeds. The bus then travels its route and picks up transit-dependent evacuees along the route.

Analysis of Bus Route Operations

Route 1

Buses on this route will pick up evacuees living in less populated areas in the southern part of the EPZ. The first of 5 buses assigned to this route will begin its trip 90 minutes after the Advisory to Evacuate (ATE); 4 buses will follow at headways of 10, 15, 20 and 30 minutes. The route travel time is 45 minutes, 15 minutes longer than the other routes due to the winding nature of State Route 42. Pickup time is 10 minutes. The last bus trip will begin 2:45 after the ATE and exit the EPZ at 3:40.

Route 2

Buses on this route will pick up evacuees living in the eastern part of the EPZ. The first of 6 buses assigned to this route will begin its trip 90 minutes after the ATE; 5 buses will follow at headways of 10, 15, 15, 20 and 20 minutes. The route travel time is 30 minutes, with 10 additional minutes needed for pickups. The last bus trip will begin at 2:50 after the ATE and exit the EPZ at 3:30.

Route 3

Buses on this route will pick up evacuees living in less populated areas in the northern part of the ETE. These 6 buses will follow the same schedule as those of Route 2, with the last bus exiting the EPZ at 3:30.

Route 4

Buses on this route will circulate through Apex, transport the evacuees to Reception Centers to the east of the EPZ, then return to Apex to repeat the process. The first of 8 buses will begin its trip 90 minutes after the ATE; 7 buses will follow at 5-minute headways. It is estimated that each trip within Apex will take 25 minutes plus 10 minutes allowed for pick-up time and 5 minutes to exit the EPZ. Thus, the first bus will exit the EPZ at 2:10 after the ATE. Travel to the Reception Center is 25 minutes plus 5 minutes to unload passengers, 10-minute rest time for the driver and 20 minutes to

return to Apex at 3:10. This bus will repeat the first trip and exit the EPZ at 3:50; the 8th bus will exit the EPZ 35 minutes later at 4:25.

Route 5

Buses on this route will circulate through Holly Springs, transport the evacuees to Reception Centers to the northeast outside the EPZ, then return to Holly Springs to repeat the process. The schedule is similar to that of Route 4, except that travel times to/from the Reception Centers are each 5 minutes longer. Thus, the first bus will exit the EPZ at 2:10 after the ATE for the first trip, return to Holly Springs at 3:20 and then exit the EPZ at 4:00. The 5th bus will exit the EPZ at 4:20.

Route 6

Buses on this route will circulate through Fuquay-Varina, transport the evacuees south to the Reception Center outside the EPZ, then return to Fuquay-Varina to repeat the process. The schedule is the same as for Route 4. The first bus will exit the EPZ at 3:50; the 6th bus, 25 minutes later at 4:15.

The ETE for good weather for all routes and buses are given in Table 8-7A. Table 8-7B provides the ETE for rain; travel times are 10% longer for rain.

Evacuation of Ambulatory Persons from Special Facilities

The bus operations for this group are similar to those for school evacuation except:

- Several buses will pick up evacuees at more than one facility.
- Buses are assigned on the basis of 25-30 patients to allow for staff to accompany the patients.
- The passenger loading time will be longer at approximately one minute per patient to account for the time to move patients from inside the facility to the vehicles.

As is done for the schools, it is estimated that mobilization time averages 90 minutes. In the event there is a shortfall of transit vehicles for a “first-wave” evacuation, then buses used to evacuate schools will have to return to evacuate the special facilities. The school ETE to the Reception Centers is approximately 2:15 on average, and about 15 minutes of additional inbound travel time to the special facility from the reception area would be required. It follows, therefore, that about one hour would have to be added to the calculated ETE for special facilities, in the event they are evacuated as a “second wave.”

Nearly all of the medical facilities are located in Wake County near the EPZ boundary. It is estimated that buses will have to travel 5 miles, on average, to leave the EPZ. The

average speed output by the model at 90 minutes for Region 3, Scenario 1 is 22.9 mph; thus, travel time out of the EPZ is 13 minutes.

Those buses assigned to pick up at multiple facilities have these facilities clustered within a mile or two of one another. We allocate 5 minutes travel time between facilities. For example, the calculation of ETE for bus "A" servicing 3 facilities, each with 6 residents (and 6 minutes loading time) is:

ETE: 90 + 3 x 6 + 13 = 121 min. or 2:05 rounded up. 3:05 for "second wave".

Table 8-4 indicates that 14 wheelchair bus runs and 8 wheelchair van runs are needed for the entire EPZ. Wheelchair buses and vans are often scarce; however, regular buses can be used to transport wheelchair bound patients. Patients would occupy the front portion of the bus and their wheelchairs would be folded and stacked in the back of the bus. Loading times are estimated at 5 minutes per wheelchair bound person as staff will have to assist them on the bus. For example, the ETE for the wheelchair bound at Spring Arbor of Apex is:

ETE: 90 + 15 x 5 + 13 = 3:00 (rounded up to the nearest 5 minutes).

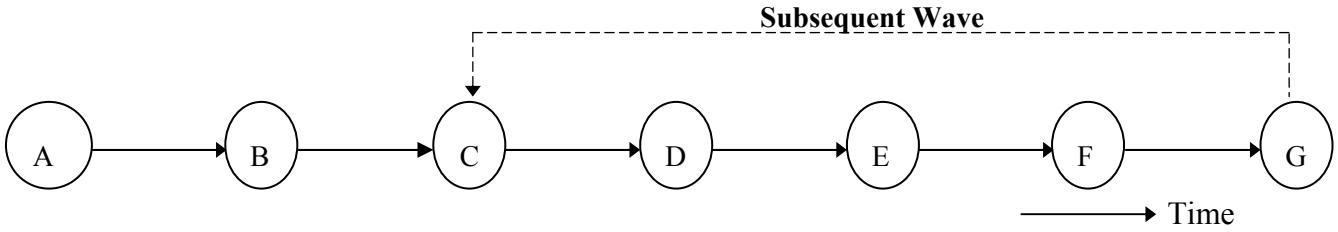
Thus, the ETE for special facilities do not exceed the general population ETE.

Emergency Medical Services (EMS) Vehicles

The previous discussion focused on transit operations for ambulatory persons residing at medical facilities within the Evacuation Region. It is also necessary to provide transit services to non-ambulatory persons who do not -- or cannot -- have access to private vehicles. Based on the data provided in Table 8-4, a total of 23 ambulance runs are needed to evacuate all of the bed ridden patients in the EPZ, assuming 2 people per ambulance. These ambulances will be provided by EMS providers within the EPZ. Additional ambulances will be provided by Raleigh-Durham and other neighboring cities.

It is estimated that 30 minutes will be needed to mobilize ambulances and travel to the medical facilities. Loading times are conservatively estimated as 30 minutes. As with the buses transporting ambulatory patients, ambulances will have to travel 5 miles, on average, to leave the EPZ. The average speed output by the model at 1 hour for Region 3, Scenario 1 is 41.0 mph; thus, travel time out of the EPZ is 7 minutes.

The ETE for ambulances is: 30 + 30 + 7 = 1:10 (rounded to the nearest 5 minutes)



Event

A	Advisory to Evacuate
B	Bus Dispatched from Depot
C	Bus Arrives at Facility/Pick-up Route
D	Bus Departs for Reception Center
E	Bus Exits Region
F	Bus Arrives at School Reception Center
G	Bus Available for “Second Wave” Evacuation Service

Activity

A→B	Driver Mobilization
B→C	Travel to Facility or to Pick-up Route
C→D	Passengers Board the Bus
D→E	Bus Travels Towards Region Boundary
E→F	Bus Travels Towards School Reception Center Outside the EPZ.
F→G	Passengers Leave Bus; Driver Takes a Break

Figure 8-1. Chronology of Transit Evacuation Operations

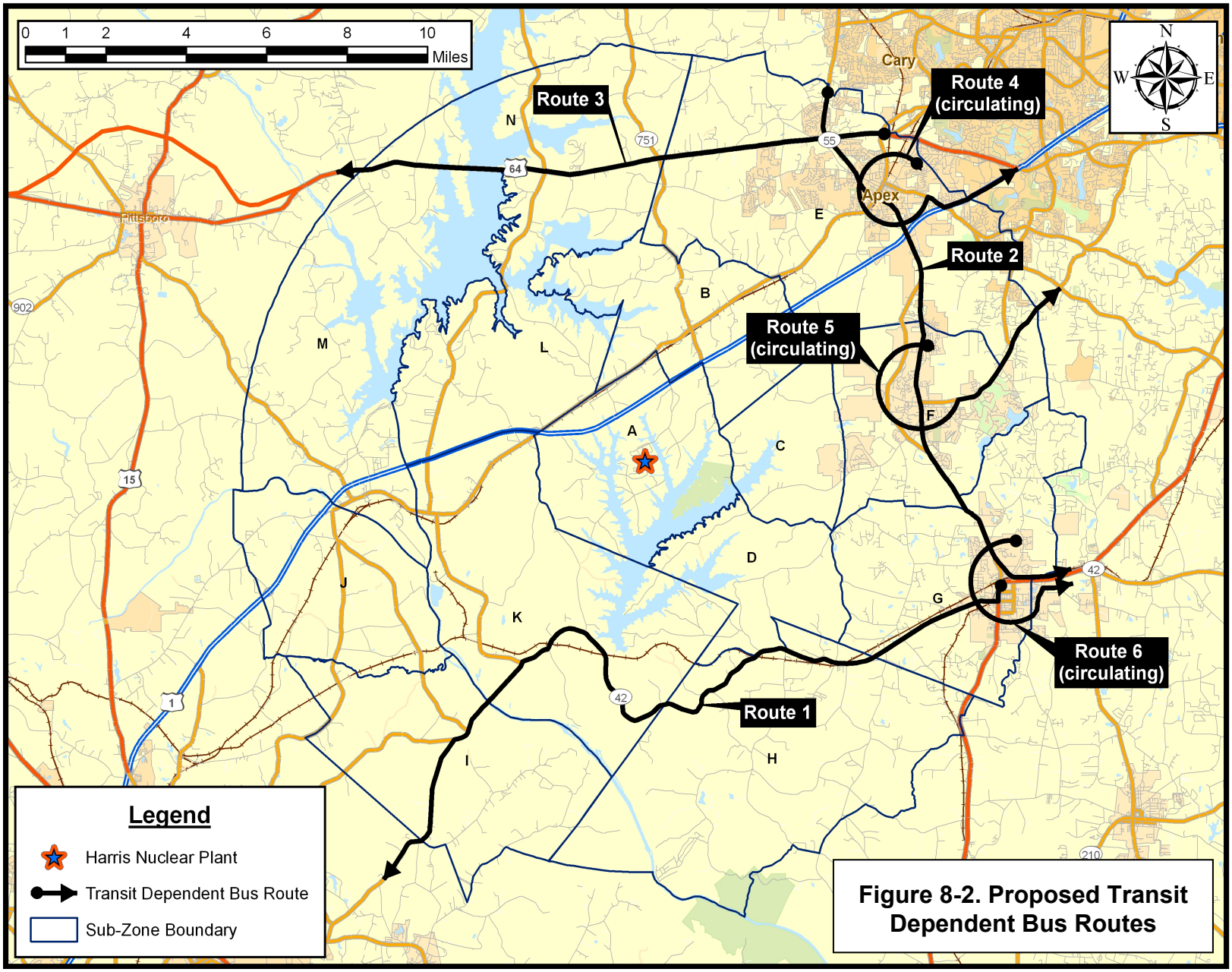


Figure 8-2. Proposed Transit Dependent Bus Routes

Table 8-1. Transit Dependent Population Estimates

Facility Name	2007 EPZ Population	Survey Average Household Size With Indicated No. of Vehicles			Estimated Number of Households	Survey Percent Households With			Survey Percent Households With Commuters	Survey Percent Households With Non-Returning Commuters	Total People Requiring Transport	Estimated Ridesharing Percentage	People Requiring Public Transit	Percent of Population Requiring Public Transit
		0	1	2		0 Veh-icle	1 Veh-icle	2 Veh-icle						
Harris Nuclear Plant	74,097	1.90	1.95	3.19	23,750	1.7%	13.4%	58.0%	74%	42%	3,290*	50%	1,645	2.2%

*See Section 8.1 for detailed calculation.

Table 8-2. School Population Demand Estimates							
Sub-Zone	**Distance (miles)**	**Direction**	**School Name**	**Municipality**	**Enroll-ment**	**Staff**	**Bus Runs Req'd**
Wake County Schools							
E	8.3	NE	Apex Elementary School	Apex	639	42	9
E	8.8	NE	Apex High School	Apex	2215	115	44
E	10.1	NE	Apex Middle School	Apex	1166	63	23
E	9.1	NE	Baucom Elementary School	Apex	904	52	13
E	10.3	NE	Hope Montessori	Apex	44	4	1
E	9.3	NE	Lufkin Rd Middle School	Apex	1066	65	21
E	7.8	NE	Olive Chapel Elementary School	Apex	925	62	13
E	10.3	NE	Salem Elementary School	Apex	757	45	11
E	10.3	NE	Salem Middle School	Apex	656	87	13
E	7.7	NE	St. Mary Magdalene Catholic School	Apex	510	45	10
F	7	E	Community Partners Charter High School	Holly Springs	115	12	2
F	6	E	Holly Grove Elementary School	Holly Springs	462	82	7
F	8	E	Holly Ridge Elementary School	Holly Springs	714	38	10
F	8	E	Holly Ridge Middle School	Holly Springs	1285	110	26
F	7.4	E	Holly Springs Elementary School	Holly Springs	818	85	12
F	6	E	Holly Springs High School	Holly Springs	805	82	16
F	7.2	E	Southern Wake Montessori School	Holly Springs	100	N/A	2
F	9.6	E	The New School Montessori Center	Holly Springs	117	13	2
G	9.2	E	Fuquay-Varina High School	Fuquay-Varina	1730	97	35
G	9.7	SE	Fuquay-Varina Middle School	Fuquay-Varina	989	51	20
G	8.8	SE	Lincoln Heights Elementary School	Fuquay-Varina	630	50	9
				Wake County Totals:	16,647	1,200	299
Chatham County Schools							
M	6.9	W	Moncure Elementary School	Moncure	203	42	3
				Chatham County Totals:	203	42	3
				EPZ Totals:	**16,850**	**1,242**	**302**

* N/A – Not Available

Table 8-3. School Relocation Schools		
Facility	**Sub-zone**	**Relocation School**
High Schools		
Apex Senior High School	E	Sanderson High School
Community Partner's Charter High School	F	Southeast Raleigh High School
Fuquay-Varina Senior High School	G	Garner Senior High School
Holly Springs High School	E	Knightdale High School
Middle Schools		
Apex Middle School	E	Leesville High School
Fuquay-Varina Middle School	G	Millbrook High School
Holly Ridge Middle School	F	Knightdale High School
Lufkin Road Middle School	E	Leesville High School
St. Mary Magdalene Catholic School	E	Cardinal Gibbons High School
Salem Middle School	E	Leesville High School
Southern Wake Montessori School	E	Southeast Raleigh High School
Elementary Schools		
Apex Elementary School	E	Sanderson High School
Baucom Elementary School	E	Leesville High School
Holly Ridge Elementary School	F	Knightdale High School
Holly Springs Elementary School	F	Knightdale High School
Holly Grove Elementary School	E	Knightdale High School
Hope Montessori School	E	Sanderson High School
Lincoln Heights Elementary School	G	Millbrook High School
Moncure Elementary School	M	Northwood Senior High School
The New School, Inc. Montessori	G	Southeast Raleigh High School
Olive Chapel Elementary School	E	Leesville High School
Salem Elementary School	E	Leesville High School

Table 8-4. Special Facility Transit Demand											
ERPA	Facility Name	Municipality	Cap-acity	Current Census	Ambu-latory	Wheel-chair Bound	Bed-ridden	Ambu-lance Runs	Wheel-chair Bus Runs	Wheel-chair Van Runs	Bus Runs
WAKE COUNTY											
A	Brown's Family Care Home	New Hill	6	5	5	0	0	0	0	0	1
A	James Rest Home	New Hill	40	39	32	7	0	0	0	2	2
E	Buck Jones Road Home	Apex	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A
E	Mason Street Home	Apex	6	6	6	0	0	0	0	0	A
E	Rex Rehab & Nursing Care	Apex	107	100	38	50	12	6	3	2	2
E	Seagroves Family Home	Apex	6	6	6	0	0	0	0	0	A
E	Spring Arbor of Apex	Apex	76	74	59	15	0	0	1	0	2
E	Atwater Rest Home	Apex	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
F	Adams Care Home	Apex	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B
F	Harrison Home	Apex	2	2	2	0	0	0	0	0	B
F	Autumn Green Adult Care Home	Holly Springs	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D
F	Avent Ferry House	Holly Springs	6	6	6	0	0	0	0	0	D
F	Country Lane Group Home	Holly Springs	6	6	6	0	0	0	0	0	D
F	Herbert Reid Home	Holly Springs	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D
F	Hickory Street Group Home	Holly Springs	6	6	5	1	0	0	0	1	E
F	Murchison Adult Family Living	Holly Springs	2	2	2	0	0	0	0	0	E
F	St. Mark's Manor	Holly Springs	9	9	9	0	0	0	0	0	F
F	Trotter's Bluff	Holly Springs	6	6	6	0	0	0	0	0	F
G	VOCA Olive Home	Apex	6	6	6	0	0	0	0	0	B
G	Brighton Manor	Fuquay-Varina	80	59	10	43	6	3	3	0	1
G	Evans-Walston Home	Fuquay-Varina	3	3	3	0	0	0	0	0	C
G	Fuquay-Varina Home for the Elderly	Fuquay-Varina	60	59	59	0	0	0	0	0	2
G	Kinton Sunset Ret. Cmty	Fuquay-Varina	28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
G	VOCA Creekway	Fuquay-Varina	6	6	6	0	0	0	0	0	C
G	Wake Med Fuquay-Varina Outpatient and Skilled Nursing Facility	Fuquay-Varina	36	31	2	22	7	4	1	2	1
G	Windsor Point	Fuquay-Varina	100	71	47	11	13	7	1	0	2
G	Mims Family Care Home	Holly Springs	6	1	1	0	0	0	0	0	F
LEE COUNTY											
J	Sanford Health and Rehabilitation	Sanford	97	94	12	77	5	3	5	1	1
		Total:	**775**	**597**	**328**	**226**	**43**	**23**	**14**	**8**	**23**

N/A = Not Available
Buses A, B, C, D, E, and F will make multiple stops as indicated.

Table 8-5A. School Evacuation Time Estimates - Good Weather								
School	**Driver Mobilization Time(min)**	**Loading Time (min)**	**Dist. to EPZ Boundary (mi.)**	**Travel Time to EPZ Bdry (min)**	**ETE (hr:min)**	**Dist. EPZ Bndry to R.C. (mi.)**	**Travel Time EPZ Bdry to RC (min)**	**ETE to R.C. (hr:min)**
Wake County Schools								
Apex Elementary School	90	5	3.2	9	**1:45**	15.1	23	**2:10**
Apex High School	90	5	0.2	1	**1:40**	16.4	25	**2:05**
Apex Middle School	90	5	3	8	**1:45**	18.3	28	**2:15**
Baucom Elementary School	90	5	2.2	6	**1:45**	19.6	30	**2:15**
Community Partners Charter High School	90	5	4.4	12	**1:50**	13.7	21	**2:10**
Fuquay-Varina High School	90	5	1	3	**1:40**	5.9	9	**1:50**
Fuquay-Varina Middle School	90	5	0.9	3	**1:40**	28.6	43	**2:25**
Holly Grove Elementary School	90	5	7.2	19	**1:55**	25.1	38	**2:35**
Holly Ridge Elementary School	90	5	3.2	9	**1:45**	25.1	38	**2:25**
Holly Ridge Middle School	90	5	3.2	9	**1:45**	25.1	38	**2:25**
Holly Springs Elementary School	90	5	3.8	10	**1:45**	25.1	38	**2:25**
Holly Springs High School	90	5	7.2	19	**1:55**	25.1	38	**2:35**
Hope Montessori	90	5	1.3	4	**1:40**	16.4	25	**2:05**
Lincoln Heights Elementary School	90	5	2	6	**1:45**	28.6	43	**2:25**
Lufkin Rd Middle School	90	5	1.2	4	**1:40**	18.3	28	**2:10**
Olive Chapel Elementary School	90	5	4.3	12	**1:50**	19.6	30	**2:20**
Salem Elementary School	90	5	1.3	4	**1:40**	19.6	30	**2:10**
Salem Middle School	90	5	1.4	4	**1:40**	19.6	30	**2:10**
Southern Wake Montessori School	90	5	5	14	**1:50**	25.1	38	**2:30**
St. Mary Magdalene Catholic School	90	5	4.4	12	**1:50**	10.6	16	**2:05**
The New School Montessori Center	90	5	2.8	8	**1:45**	13.7	21	**2:05**
Chatham County Schools								
Moncure Elementary School	90	5	4.3	12	**1:50**	14.3	22	**2:10**
				Average for EPZ:	**1:45**		**Average:**	**2:15**

Table 8-5B. School Evacuation Time Estimates - Rain								
School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Boundary (mi.)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bndry to R.C. (mi.)	Travel Time EPZ Bdry to RC (min)	ETE to R.C. (hr:min)
Wake County Schools								
Apex Elementary School	100	10	3.2	11	**2:05**	15.1	26	**2:30**
Apex High School	100	10	0.2	1	**1:55**	16.4	29	**2:20**
Apex Middle School	100	10	3	10	**2:00**	18.3	32	**2:35**
Baucom Elementary School	100	10	2.2	7	**2:00**	19.6	34	**2:35**
Community Partners Charter High School	100	10	4.4	14	**2:05**	13.7	24	**2:30**
Fuquay-Varina High School	100	10	1	4	**1:55**	5.9	11	**2:05**
Fuquay-Varina Middle School	100	10	0.9	3	**1:55**	28.6	50	**2:45**
Holly Grove Elementary School	100	10	7.2	23	**2:15**	25.1	44	**3:00**
Holly Ridge Elementary School	100	10	3.2	11	**2:05**	25.1	44	**2:45**
Holly Ridge Middle School	100	10	3.2	11	**2:05**	25.1	44	**2:45**
Holly Springs Elementary School	100	10	3.8	12	**2:05**	25.1	44	**2:50**
Holly Springs High School	100	10	7.2	23	**2:15**	25.1	44	**3:00**
Hope Montessori	100	10	1.3	5	**1:55**	16.4	29	**2:25**
Lincoln Heights Elementary School	100	10	2	7	**2:00**	28.6	50	**2:50**
Lufkin Rd Middle School	100	10	1.2	4	**1:55**	18.3	32	**2:30**
Olive Chapel Elementary School	100	10	4.3	14	**2:05**	19.6	34	**2:40**
Salem Elementary School	100	10	1.3	5	**1:55**	19.6	34	**2:30**
Salem Middle School	100	10	1.4	5	**1:55**	19.6	34	**2:30**
Southern Wake Montessori School	100	10	5	16	**2:10**	25.1	44	**2:50**
St. Mary Magdalene Catholic School	100	10	4.4	14	**2:05**	10.6	19	**2:25**
The New School Montessori Center	100	10	2.8	9	**2:00**	13.7	24	**2:25**
Chatham County Schools								
Moncure Elementary School	100	10	4.3	14	**2:05**	14.3	25	**2:30**
				Average for EPZ:	**2:00**		**Average:**	**2:35**

Table 8-6. Summary of Transit Dependent Bus Routes		
Route Number	**Number of Buses**	**Route Description**
1	5	NC Hwy 42 from Fuquay-Varina west out of the EPZ toward Sanford
2	6	NC Hwy 55 southbound from entrance into EPZ through Holly Springs and Fuquay-Varina
3	6	US Hwy 64 westbound from intersection with State Hwy 1011 (Salem St) out of EPZ toward Pittsboro
4	8*	Circulate through Apex, then east out of EPZ to Reception Centers
5	5*	Circulate through Holly Springs, then northeast out of EPZ to Reception Centers
6	6*	Circulate through Fuquay-Varina, then northeast out of EPZ to Reception Centers

*Each bus makes 2 round trips out of EPZ

Table 8-7A. Transit Dependent Evacuation Time Estimates - Good Weather												
		Single Wave				Second Wave						
Route Number	Bus Number	Mobilization	Route Travel Time	Pickup Time	ETE	Travel Time to Rec. Ctr	Unload	Driver Rest	Retun time to EPZ	Route Travel Time	Pickup Time	ETE
1	1	90	45	10	2:25	**Second Wave is Not Needed**						
	2	100	45	10	2:35							
	3	115	45	10	2:50							
	4	135	45	10	3:10							
	5	165	45	10	3:40							
2 and 3	1	90	30	10	2:10	**Second Wave is Not Needed**						
	2	100	30	10	2:20							
	3	115	30	10	2:35							
	4	130	30	10	2:50							
	5	150	30	10	3:10							
	6	170	30	10	3:30							
4	1	90	30	10	2:10	25	5	10	20	30	10	3:50
	2	95	30	10	2:15	25	5	10	20	30	10	3:55
	3	100	30	10	2:20	25	5	10	20	30	10	4:00
	4	105	30	10	2:25	25	5	10	20	30	10	4:05
	5	110	30	10	2:30	25	5	10	20	30	10	4:10
	6	115	30	10	2:35	25	5	10	20	30	10	4:15
	7	120	30	10	2:40	25	5	10	20	30	10	4:20
	8	125	30	10	2:45	25	5	10	20	30	10	4:25
5	1	90	30	10	2:10	30	5	10	25	30	10	4:00
	2	95	30	10	2:15	30	5	10	25	30	10	4:05
	3	100	30	10	2:20	30	5	10	25	30	10	4:10
	4	105	30	10	2:25	30	5	10	25	30	10	4:15
	5	110	30	10	2:30	30	5	10	25	30	10	4:20
6	1	90	30	10	2:10	25	5	10	20	30	10	3:50
	2	95	30	10	2:15	25	5	10	20	30	10	3:55
	3	100	30	10	2:20	25	5	10	20	30	10	4:00
	4	105	30	10	2:25	25	5	10	20	30	10	4:05
	5	110	30	10	2:30	25	5	10	20	30	10	4:10
	6	115	30	10	2:35	25	5	10	20	30	10	4:15

Table 8-7B. Transit Dependent Evacuation Time Estimates - Rain												
		Single Wave				Second Wave						
Route Number	Bus Number	Mobilization	Route Travel Time	Pickup Time	ETE	Travel Time to Rec. Ctr	Unload	Driver Rest	Retun time to EPZ	Route Travel Time	Pickup Time	ETE
1	1	90	50	10	2:30	**Second Wave is Not Needed**						
	2	100	50	10	2:40							
	3	115	50	10	2:55							
	4	135	50	10	3:15							
	5	165	50	10	3:45							
2 and 3	1	90	33	10	2:15	**Second Wave is Not Needed**						
	2	100	33	10	2:25							
	3	115	33	10	2:40							
	4	130	33	10	2:55							
	5	150	33	10	3:15							
	6	170	33	10	3:35							
4	1	90	33	10	2:15	28	5	10	22	33	10	4:05
	2	95	33	10	2:20	28	5	10	22	33	10	4:10
	3	100	33	10	2:25	28	5	10	22	33	10	4:15
	4	105	33	10	2:30	28	5	10	22	33	10	4:20
	5	110	33	10	2:35	28	5	10	22	33	10	4:25
	6	115	33	10	2:40	28	5	10	22	33	10	4:30
	7	120	33	10	2:45	28	5	10	22	33	10	4:35
	8	125	33	10	2:50	28	5	10	22	33	10	4:40
5	1	90	33	10	2:15	33	5	10	27	33	10	4:15
	2	95	33	10	2:20	33	5	10	27	33	10	4:20
	3	100	33	10	2:25	33	5	10	27	33	10	4:25
	4	105	30	10	2:25	33	5	10	27	33	10	4:25
	5	110	30	10	2:30	33	5	10	27	33	10	4:30
6	1	90	33	10	2:15	28	5	10	22	33	10	4:05
	2	95	33	10	2:20	28	5	10	22	33	10	4:10
	3	100	33	10	2:25	28	5	10	22	33	10	4:15
	4	105	33	10	2:30	28	5	10	22	33	10	4:20
	5	110	33	10	2:35	28	5	10	22	33	10	4:25
	6	115	33	10	2:40	28	5	10	22	33	10	4:30

9. TRAFFIC MANAGEMENT STRATEGY

This section presents the current traffic control and management strategy that is designed to expedite the movement of evacuating traffic. The resources required to implement this strategy include:

- Personnel with the capabilities of performing the planned control functions of traffic guides (preferably, not necessarily, law enforcement officers).
- Traffic Control Devices to assist these personnel in the performance of their tasks. These devices should comply with the guidance of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA) of the U.S.D.O.T. All state and most county transportation agencies have access to the MUTCD (also available online). Applicable devices include, with reference to the MUTCD:
    - Traffic Barriers: Chapter 6F, section 6F.61, 62 and Figure 6F-4.
    - Traffic Cones: Chapter 3F and section 6F.56.
    - Signs: Chapter 2I
- A plan that defines all necessary details and is documented in a format that is readily understood by those assigned to perform traffic control.

The functions to be performed in the field are:

1. Facilitate evacuating traffic movements that serve to expedite travel out of the EPZ along routes that the analysis has found to be most effective.
2. Discourage traffic movements that permit evacuating vehicles to travel in a direction which takes them significantly closer to the power station, or which interferes with the efficient flow of other evacuees.

We employ the terms "facilitate" and "discourage" rather than "enforce" and "prohibit" to indicate the need for flexibility in performing the traffic control function. There are always legitimate reasons for a driver to prefer a direction other than that indicated. For example:

- A driver may be traveling home from work or from another location, to join other family members preliminary to evacuating.
- An evacuating driver may be taking a detour from the evacuation route in order to pick up a relative, or other evacuees.
- The driver may be an emergency worker en route to perform an important activity.

The implementation of a plan must also be flexible enough for the application of sound judgment by the traffic guide.

The traffic management strategy is the outcome of the following process:

1. A field survey of these critical locations.

   The schematics describing traffic control, which are presented in Appendix G, are based on data collected during field surveys, upon large-scale maps, and on overhead photos.

2. Computer analysis of the evacuation traffic flow environment.

   This analysis identifies the best routing and those locations that experience pronounced congestion.

3. Consultation with emergency management and enforcement personnel.

   Trained personnel who are experienced in controlling traffic and are aware of the likely evacuation traffic patterns have extensively reviewed these control tactics.

4. Prioritization of TCPs.

   Application of traffic control at some TCPs will have a more pronounced influence on expediting traffic movements than at other TCPs. For example, TCPs controlling traffic originating from areas in close proximity to the power plant could have a more beneficial effect on minimizing potential exposure to radioactivity than those TCPs located far from the power plant. Thus, during the mobilization of personnel to respond to the emergency situation, those TCPs which are assigned a higher priority, should be manned earlier. These priorities have been developed in conjunction with county emergency management representatives and law enforcement personnel.

The control tactic at each TCP is presented in each schematic that appears in Appendix G.

Concern was expressed over manpower and equipment shortages at meetings with law enforcement personnel representing the police jurisdictions within the EPZ, especially those within Wake County, where the majority of the traffic congestion is expected based on the analysis presented in Section 7. A sensitivity study was performed to quantify the benefit of manning the traffic control points during the evacuation; the results of this study can be seen in Appendix I. Note that the manning of traffic control points can reduce the ETE by 30 minutes. Traffic control guides at key intersections throughout the EPZ serve as fixed point surveillance for accidents or other problems that may arise during the evacuation which could reduce capacity and extend the ETE. Traffic control guides also provide needed route guidance to those evacuees who may not be familiar with the area and the roadway system (i.e. transients), and to those residents who are uncertain of the proper direction of travel.

Concern was also expressed over mobilization of equipment during an evacuation. Many of the police agencies do not have sufficient cones and barricades readily available to perform the recommended traffic control duties in the event of an emergency, and they would have to rely on the Department of Transportation (DOT) to provide assistance. It is recommended that the counties and the DOT develop joint emergency response implementation procedures to ensure that sufficient resources are available in a timely manner in the event of an emergency.

The use of Intelligent Transportation Systems (ITS) technologies can reduce manpower and equipment needs, while still facilitating the evacuation process. Dynamic Message Signs (DMS) can be placed within the EPZ to provide information to travelers regarding traffic conditions, route selection, and reception center information. DMS can also be placed outside of the EPZ to warn motorists to avoid using routes that may conflict with the flow of evacuees away from the nuclear power station. Highway Advisory Radio (HAR) can be used to broadcast information to evacuees en route through their vehicle stereo systems. Automated Traveler Information Systems (ATIS) can also be used to provide evacuees with information. Internet websites can provide traffic and evacuation route information before the evacuee begins his trip, while on board navigation systems (GPS units), cell phones, and pagers can be used to provide information en route. These are only several examples of how ITS technologies can benefit the evacuation process.

Chapter 2I of the MUTCD presents guidance on Emergency Management signing. Specifically, the Evacuation Route sign, EM-1 on page 2I-3, with the word “Hurricane” removed, could be installed selectively within the EPZ, if considered advisable by local and state authorities. Similar comments apply to sign EM-3 which identifies TCP locations.

10. EVACUATION ROUTES

Evacuation routes are composed of two distinct components:

- Routing from a sub-zone being evacuated to the boundary of the Evacuation Region and thence out of the Emergency Planning Zone (EPZ).

- Routing of evacuees from the EPZ boundary to the reception centers.

Evacuees should be routed within the EPZ in such a way as to *minimize their exposure to risk*. This primary requirement is met by routing traffic to move *away* from the location of the Harris Nuclear Plant, to the extent practicable, and by delineating evacuation routes that expedite the movement of evacuating vehicles. This latter objective is addressed by developing evacuation routes to achieve a balancing of traffic demand relative to the available highway capacity to the extent possible, subject to satisfying the primary requirement noted above. This is achieved by carefully specifying candidate destinations for all origin centroids where evacuation trips are generated, and applying the TRAD model effectively. See Appendices A-D for further discussion.

The routing of evacuees from the EPZ boundary to the reception centers should be responsive to several considerations:

- Minimize the amount of travel outside the EPZ, from the points where these routes cross the EPZ boundary, to the reception centers.

- Relate the anticipated volume of traffic destined to the reception center, to the capacity of the reception center facility.

Figure 10-1 presents a map showing the general population reception centers. The major evacuation routes for the four counties within the EPZ are presented in Figures 10-2 through 10-5.

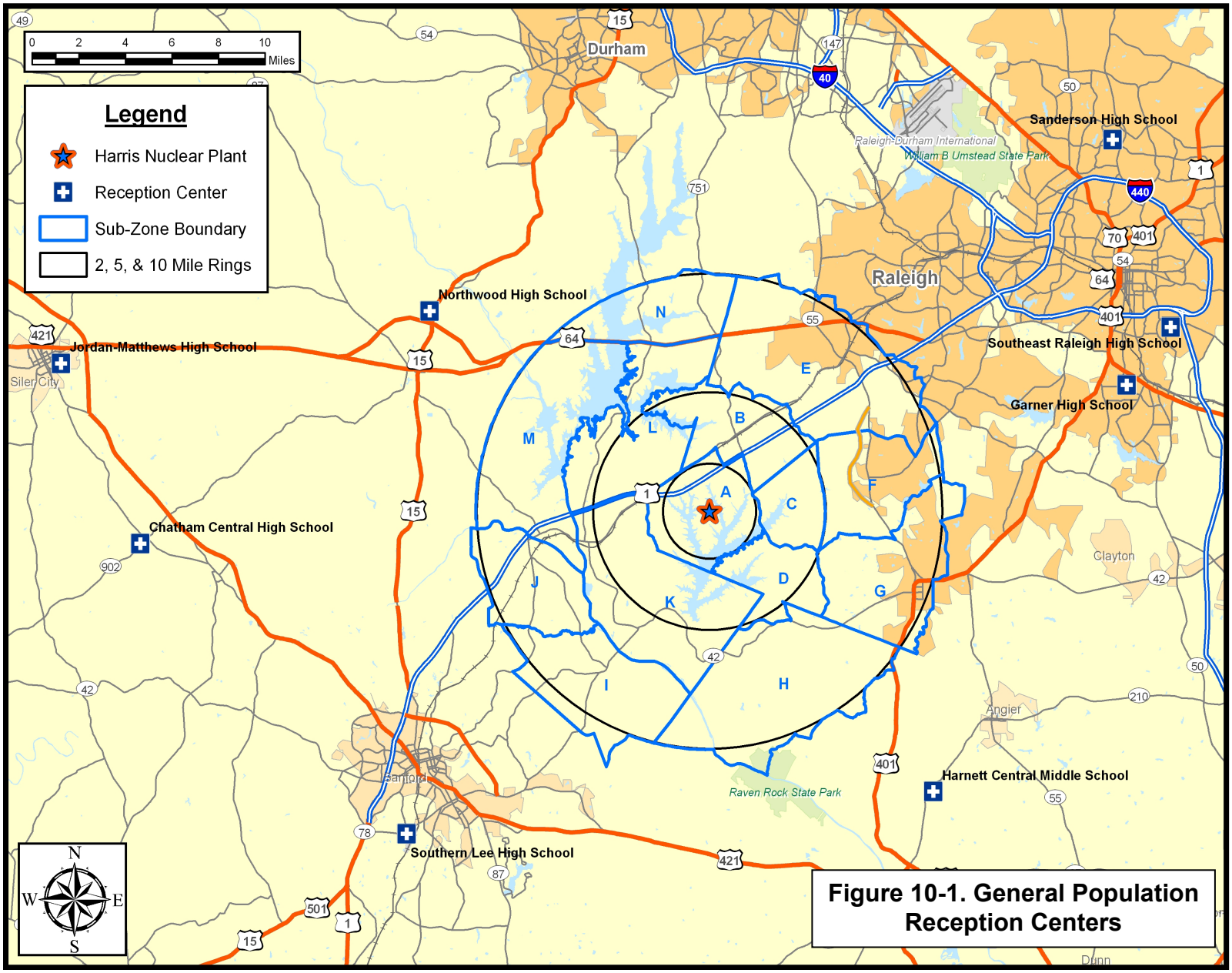


Figure 10-1. General Population Reception Centers

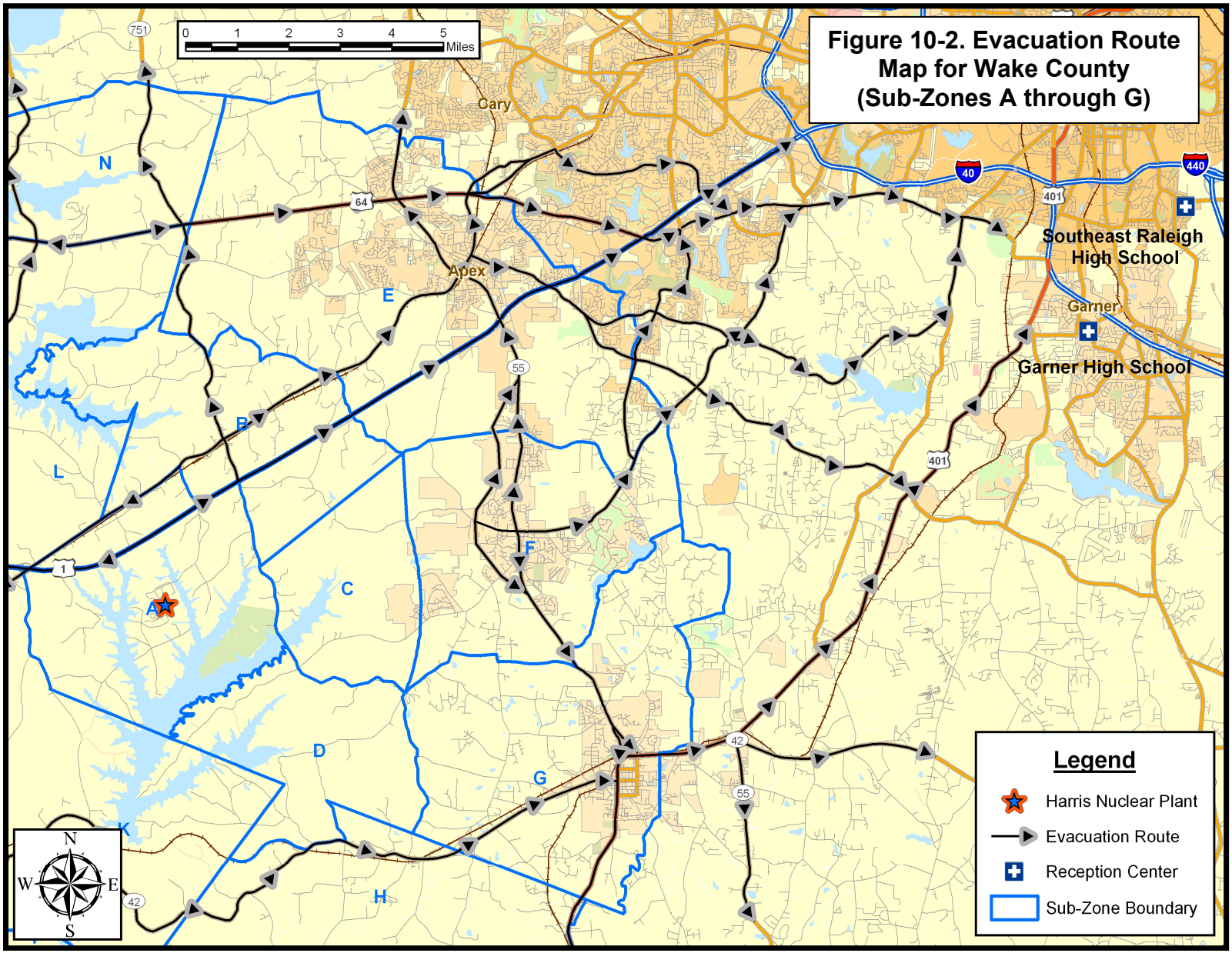


Figure 10-2. Evacuation Route Map for Wake County (Sub-Zones A through G)
0 1 2 3 4 5 Miles
Cary
Apex
Garner
Southeast Raleigh High School
Garner High School
751
64
55
1
40
440
401
42
N
E
B
L
F
C
A
D
G
K
H
Legend
Harris Nuclear Plant
Evacuation Route
Reception Center
Sub-Zone Boundary

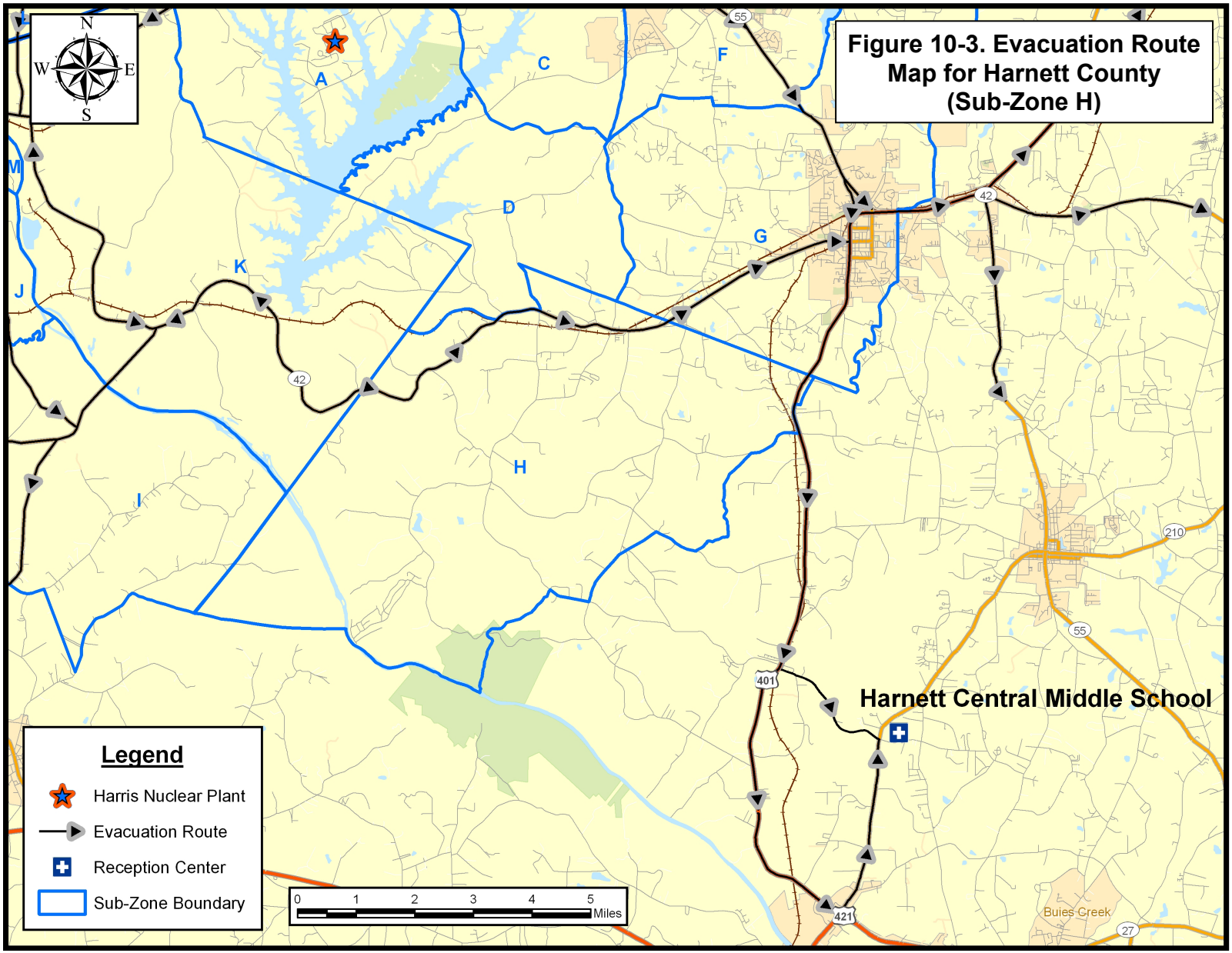


Figure 10-3. Evacuation Route Map for Harnett County (Sub-Zone H)
N
W
E
S
A
C
F
M
D
G
K
J
42
H
I
55
42
210
55
401
Harnett Central Middle School
421
Buies Creek
27
Legend
Harris Nuclear Plant
Evacuation Route
Reception Center
Sub-Zone Boundary
0 1 2 3 4 5
Miles

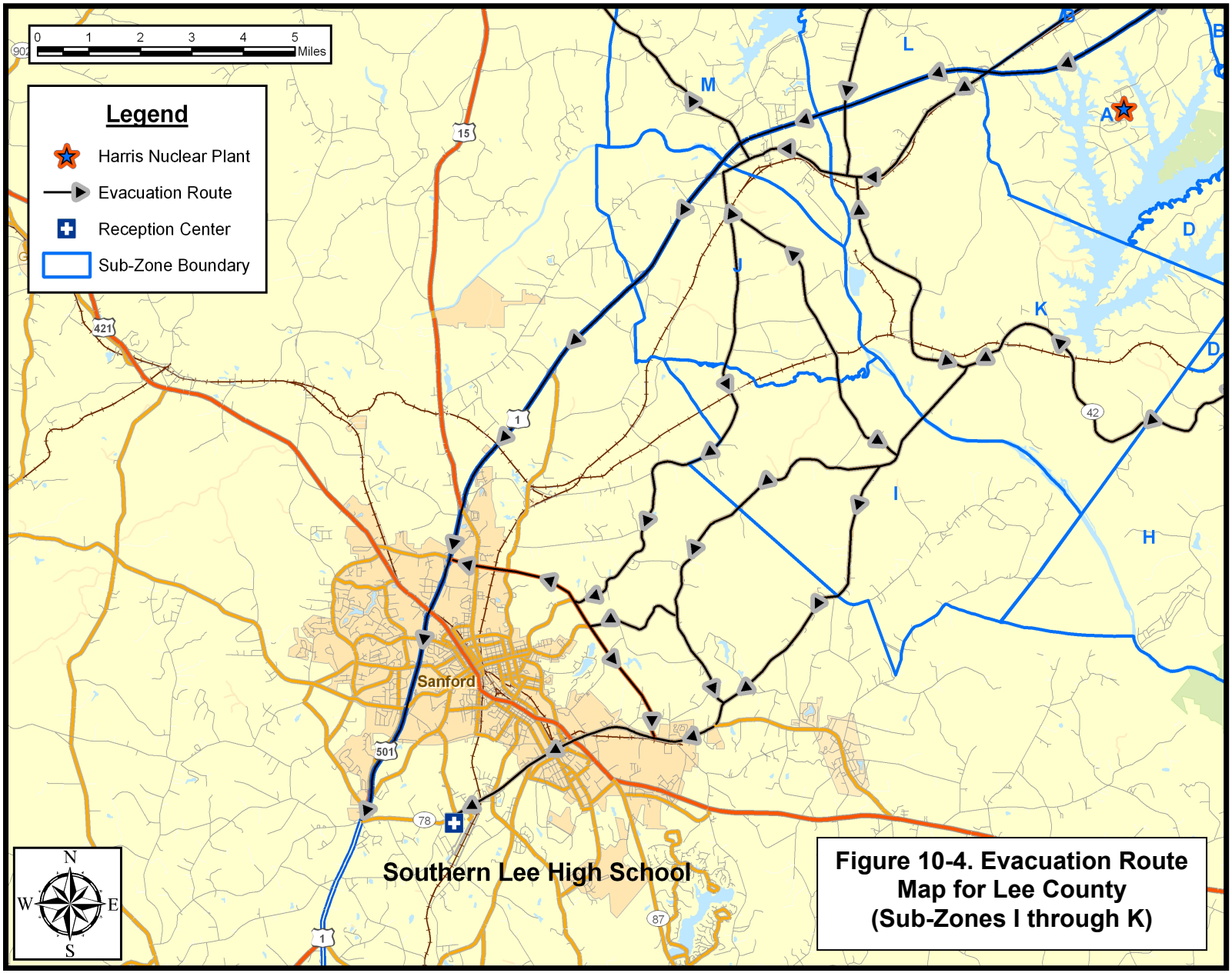


Figure 10-4. Evacuation Route Map for Lee County (Sub-Zones I through K)

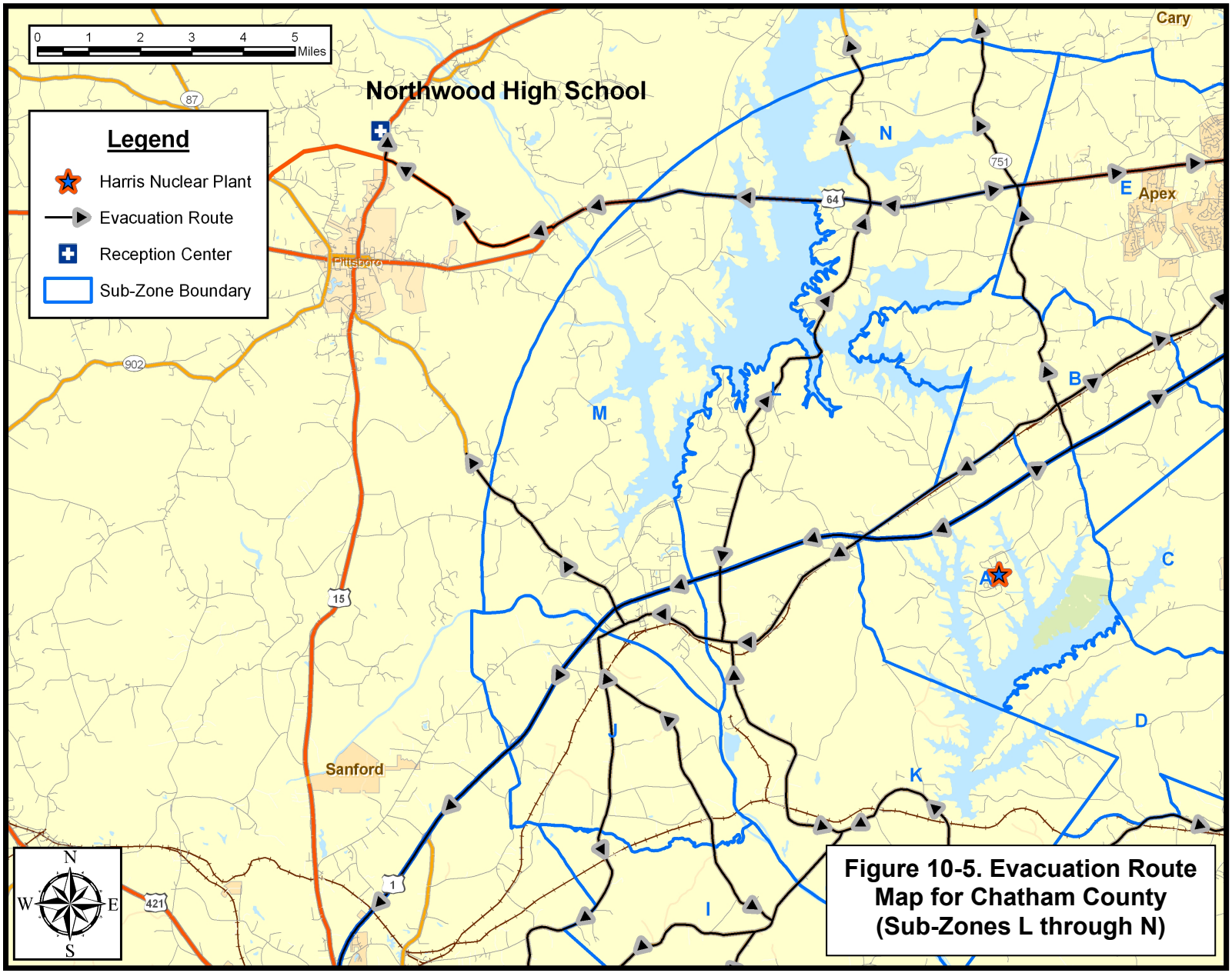


Figure 10-5. Evacuation Route Map for Chatham County (Sub-Zones L through N)