

## 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 and health-support 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 plants, it is estimated that bus mobilization time will average approximately 90 minutes extending from the Advisory to Evacuate to the time when buses are dispatched from their respective depots.

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 units 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 schoolchildren 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, to present an upper bound estimate.

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 schoolchildren. For those evacuation scenarios where children are at school when evacuation is ordered, separate transportation is provided for the schoolchildren. 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  $20 + (2/3 \times 10) = 27$ . On this basis, the average load factor anticipated is  $(27/40) \times 100 = 68$  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 1,270 people. Therefore, a total of 42 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 Lee EPZ:

$$P = 18,417 \times (0.047 \times 1.64 + 0.264 \times (1.94 - 1) \times 0.68 \times 0.29 + 0.388 \times (2.78 - 2) \times (0.68 \times 0.29)^2) = 18,417 \times 0.138 = 2,539$$

$$B = (0.5 \times P) \div 30 = 42$$

These calculations are explained as follows:

- All members (1.64 avg.) of households (HH) with no vehicles (4.7%) will evacuate by public transit or ride-share. The term 18,417 (number of households) x 0.047 x 1.64, accounts for these people.
- The members of HH with 1 vehicle away (26.4%), who are at home, equal (1.94-1). The number of HH where the commuter will not return home is equal to (18,417 x 0.264 x 0.68 x 0.29), as 68% of EPZ households have a commuter, 29% 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 (38.8%), who are at home, equal (2.78 – 2). The number of HH where neither commuter will return home is equal to 18,417 x 0.388 x (0.68 x 0.29)<sup>2</sup>. 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 at the end of 2006. 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 that is in the neighborhood of 3 percent, daily.

We recommend that the counties in the EPZ introduce procedures whereby the schools are contacted prior to the dispatch of buses from the depot (approximately 90 minutes 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. Those buses originally allocated to evacuate schoolchildren 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.

Reception centers have not yet been established for the Lee EPZ. We assume that reception centers will be located in the neighboring cities: Spartanburg to the west, Gastonia to the northeast, Shelby to the north, and Rock Hill to the southeast. Table 8-3 presents a list of the school reception center city for each school in the EPZ. Students 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 end of 2006. Approximately 252 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 ambulance runs is determined by assuming that 2 patients can be accommodated per ambulance trip; the number of wheelchair van runs assumes 4 wheelchairs per trip; and the number of bus runs estimated assumes 30 ambulatory patients per trip.

### 8.4 Evacuation Time Estimates for Transit-Dependent People

EPZ bus resources are assigned to evacuating schoolchildren 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 8-7). 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 bus 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 arrive at the facility to be evacuated. 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. The buses are kept at the school for Hickory Grove-Sharon Elementary in York County and Grover Elementary in Cleveland County, thus the mobilization time is only 30 minutes for these schools, 35 minutes when raining.

Activity: Board Passengers (C→D)

Fort Mill School District in York County conducted evacuation drills in 2006 and estimated bus loading times during the drills. The loading times ranged from 12 to 20 minutes with an average loading time of 15 minutes. Therefore, the bus loading time used for this study is 15 minutes, 20 minutes in rain. Transit dependent bus loading time is estimated at 30 minutes (40 minutes for rain) to account for the delay incurred in making multiple stops along routes to pick up passengers.

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 21.2 mph, while the average speed for an evacuation of the full EPZ under Scenario 2 conditions (Rain) is 20.4 mph. The average speeds are 47.9 mph and 43.8 mph at 30 minutes (mobilization time – York and Cleveland Counties) for good weather and rain, respectively. South Carolina State Law governs school buses to a maximum speed of 45 mph; this value will be used rather than 47.9 mph. The travel time from the EPZ boundary to the Reception Center was computed assuming an average speed of 45 mph and 40 mph for good weather and rain, respectively. Based on discussions with the counties, there are adequate buses to evacuate the schoolchildren 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→C, C→D, and D→E (For example: 90 min. + 15 + 7 = 1:55 for Gaffney High School, with good weather rounded up to the nearest 5 minutes). 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 85 percent of the evacuees will complete their mobilization when the 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. Buses will travel along the major routes in the EPZ as described in Table 8-6. Many of the bus routes will be concentrated in the City of Gaffney as much of the EPZ population lives within the city limits; there are additional routes servicing the smaller towns in the EPZ such as Blacksburg, Grover, Smyrna, Hickory Grove, and Earl. Figure 8-2 depicts proposed bus pick-up routes graphically. The travel distance along the respective pick-up routes within the EPZ is measured using GIS software. Bus travel times within the EPZ are computed using the same average speeds (output by the model) used for school evacuation.

Tables 8-7A and 8-7B present the transit-dependent population evacuation time estimates for each bus route calculated using the above procedures for good weather and rain, respectively. For example, the ETE for Bus Route Number 3 is computed as  $90 + 45 + 30 = 2:45$  for good weather. Here, 45 minutes is the time to travel 15.9 miles at 21.2 mph, the average speed output by the model at 90 minutes. The ETE for a second wave (discussed below) is presented in the event there is a shortfall of available buses or bus drivers.

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

The distances from the EPZ boundary to the school reception centers are measured using Geographical Information Systems (GIS) software along the most likely route from the EPZ to the reception center. The reception centers are assumed to be in the center of the nearest neighboring cities. 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.

Assumed bus speeds of 45 mph and 40 mph for good weather and rain, respectively, will be applied for this activity.

Activity: Passengers Leave Bus (F→G)

A bus can empty 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 schoolchildren. These buses are assigned since they will be the first buses to complete their evacuation service and are therefore the first to be available for the second wave. The passengers leave the bus, and the bus then travels to its route and proceeds to pick up transit-dependent evacuees along the route. The travel time back to the EPZ is calculated using distances estimated from GIS and the assumed bus travel speeds.

The travel times for Bus Route Number 3 are computed as follows for good weather:

- Bus arrives at reception center at 2:20 in good weather (average of “ETE to RC (min)” column in Table 8-5A).
- Bus discharges passengers (5 minutes) and driver takes a 15-minute rest: 20 minutes.
- Bus returns to EPZ: 24 minutes (average of “Travel time EPZ Bdry to RC” column in Table 8-5A).
- Bus completes pick-ups along route and departs EPZ: 30 minutes + (15.9 miles @ 21.2 mph) = 1:15.
- Bus exits EPZ at time 2:20 + 0:20 + 0:24 + 1:15 = 4:20 (rounded up to nearest 5 minutes) after the Advisory to Evacuate.

The ETE for the completion of the second wave are given in Table 8-7.

Evacuation of Ambulatory Persons from Special Facilities

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

- 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 2:20 on average, and about 25 minutes of additional inbound travel time to the special facility from the reception area would be

required. It follows, therefore, that about one hour and fifteen minutes would have to be added to the calculated ETE for special facilities, in the event they are evacuated as a “second wave”.

All of the medical facilities are located in Gaffney near the EPZ boundary. It is estimated that buses will have to travel 2 miles, on average, to leave the EPZ. The average speed output by the model at 90 minutes for Region 3, Scenario 1 is 21.2 mph; thus, travel time out of the EPZ is 6 minutes.

The ETE for buses evacuating ambulatory patients at medical facilities is the sum of the mobilization time, total passenger loading time, and travel time out of the EPZ. For example, the calculation of ETE for the Peachtree Healthcare Center with 35 ambulatory residents is:

$$\text{ETE: } 90 + 35 \times 1 + 6 = 131 \text{ min. or } 2:15 \text{ rounded up. } 3:30 \text{ for “second wave”}.$$

Table 8-4 indicates that 48 wheelchair bus 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 2 minutes per wheelchair bound person as staff will have to assist them in boarding the bus. For example, the ETE for the wheelchair bound at the Peachtree Healthcare Center is:

$$\text{ETE: } 90 + 90 \times 2 + 6 = 4:40 \text{ (rounded up to the nearest 5 minutes).}$$

Thus, the ETE for special facilities may exceed the general population ETE.

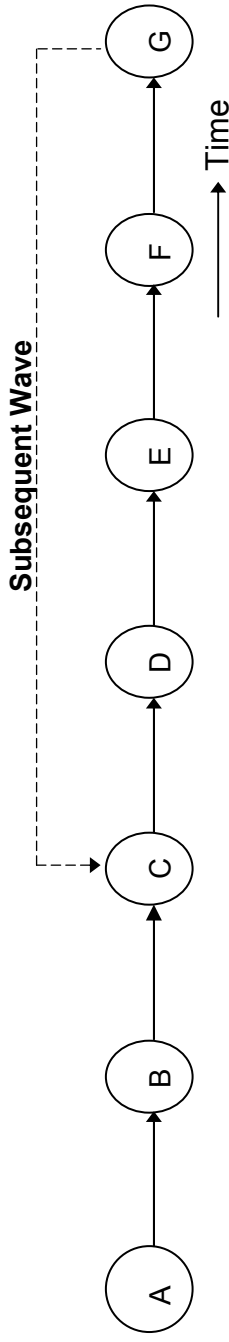
#### Emergency Medical Services (EMS) Vehicles

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 20 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 neighboring cities.

It is conservatively estimated that 30 minutes will be needed to mobilize ambulances and travel to the medical facilities. Loading times are also conservatively estimated as 30 minutes. As with the buses transporting ambulatory patients, ambulances will have to travel 2 miles, on average, to leave the EPZ. The average speed output by the model at 1 hour for Region 3, Scenario 1 is 32.1 mph; thus, travel time out of the EPZ is 4 minutes.

The ETE for ambulances is:  $30 + 30 + 4 = 1:05$  (rounded to the nearest 5 minutes).





<u>Event</u>	
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
<u>Activity</u>	
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**

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 Vehicle	1 Vehicle	2 Vehicle						
Lee	48,249	1.64	1.94	2.78	18,417	4.7%	26.4%	38.8%	68%	29%	2,539	50%	1,270	2.6%

**Table 8-2. School Population Demand Estimates**

<b>ERPA</b>	<b>Distance (miles)</b>	<b>Direction</b>	<b>School Name</b>	<b>Municipality</b>	<b>Enroll- ment</b>	<b>Staff</b>	<b>Bus Runs Req'd</b>
<b>Cherokee County Schools</b>							
<b>Public Schools</b>							
A-2	5.3	N	Blacksburg Middle	Blacksburg	449	20	9
A-2	5.4	N	Blacksburg Elementary	Blacksburg	420	21	6
A-2	5.4	N	Blacksburg High	Blacksburg	544	20	11
A-2	6.8	NNE	Blacksburg Primary	Blacksburg	489	21	7
C-1	3.9	W	Draytonville Elementary	Gaffney	337	18	5
D-1	6.1	WNW	Cherokee Technology Center	Gaffney	625	40	13
G-2	7.9	WSW	Corinth Elementary	Gaffney	404	21	6
G-2	9.2	W	Limestone-Central Elementary	Gaffney	437	21	7
H-2	6.3	WNW	Alma Elementary	Gaffney	206	34	3
H-2	8.9	WNW	B.D. Lee Elementary	Gaffney	424	21	7
H-2	6.8	WNW	Ewing Middle	Gaffney	516	20	11
H-2	9.8	WNW	Gaffney High	Gaffney	1986	30	40
H-2	7.7	WNW	Gaffney Middle	Gaffney	675	20	14
H-2	9.1	WNW	Granard Middle	Gaffney	512	20	11
H-2	11	NW	Grassy Pond Elementary	Gaffney	470	23	7
H-2	7.6	WNW	Mary Bramlett Elementary	Gaffney	309	20	5
H-2	8.5	WNW	Luther Vaughan Elementary	Gaffney	305	20	5
<b>Private Schools</b>							
H-2	5.1	NW	Heritage Christian School	Gaffney	67	12	2
H-2	8.9	WNW	Gaffney Christian Academy	Gaffney	23	3	1
H-2	7.9	W	Limestone College	Gaffney	650	170	13
Cherokee County Totals:					9,848	575	183
<b>Cleveland County Schools</b>							
A-3	10.3	NNE	Grover Elementary	Grover	448	80	7
Cleveland County Totals:					448	80	7
<b>York County Schools</b>							
E-2	8.8	SE	Hickory Grove-Sharon Elementary	Hickory Grove	430	60	7
York County Totals:					430	60	7
<b>EPZ Totals:</b>					<b>10,726</b>	<b>715</b>	<b>197</b>

<b>Table 8-3. Assumed School Reception Centers</b>	
<b>School</b>	<b>City*</b>
Blacksburg Elementary	<b>GASTONIA</b>
Blacksburg High	
Blacksburg Middle	
Blacksburg Primary	
Hickory Grove-Sharon Elementary	<b>ROCK HILL</b>
Grover Elementary	<b>SHELBY</b>
Alma Elementary	<b>SPARTANBURG</b>
B.D. Lee Elementary	
Cherokee Technology Center	
Corinth Elementary	
Draytonville Elementary	
Ewing Middle	
Gaffney High	
Gaffney Middle	
GranArd Middle	
Grassy Pond Elementary	
Heritage Christian School	
Limestone-Central Elementary	
Luthur Vaughn Elementary	
Mary Bramlett Elementary	
Gaffney Christian Academy	

**\*Reception Centers have not yet been designated for WLS; it is assumed the reception centers are in the center of the city.**

Table 8-4. Special Facility Transit Demand												
ERPA	Distance (miles)	Dir- ection	Facility Name	Muni- cipality	Cap- acity	Current Census	Ambu- latory	Wheel- chair Bound	Bed- ridden	Ambu- lance Runs	Wheel- chair Bus Runs	Bus Runs
Cherokee County*												
H-2	8.2	W	Brookview Healthcare Center	Gaffney	132	120	6	90	24	12	23	1
H-2	7.9	WNW	Peachtree Healthcare Center	Gaffney	145	132	35	97	15	8	25	2
J-2	7.9	WNW	Upstate Carolina Medical Center	Gaffney	125	88	N/A	N/A	N/A	N/A	N/A	N/A
Cherokee County Totals:					277	252	41	187	39	20	48	3
EPZ Totals:					277	252	41	187	39	20	48	3

N/A = Not Available      \*No facilities in York County or Cleveland County

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 Bdry to R.C. (mi.)	Travel Time EPZ Bdry to RC (min)	ETE to R.C. (hr:min)
<b>Cherokee County Schools</b>								
Blacksburg Middle	90	15	8.4	24	2:10	14.2	19	2:30
Cherokee Technology Center	90	15	6.9	20	2:05	15.8	22	2:30
Blacksburg Elementary	90	15	8.3	24	2:10	14.2	19	2:30
Blacksburg High	90	15	8.2	24	2:10	14.2	19	2:30
Blacksburg Primary	90	15	5.8	17	2:05	14.2	19	2:25
Corinth Elementary	90	15	6.4	19	2:05	21.4	29	2:35
Limestone-Central Elementary	90	15	4.3	13	2:00	21.7	29	2:30
Alma Elementary	90	15	7.3	21	2:10	15.8	22	2:30
B.D. Lee Elementary	90	15	4.2	12	2:00	20.4	28	2:25
Draytonville Elementary	90	15	10.5	30	2:15	15.8	22	2:40
Ewing Middle	90	15	6.8	20	2:05	15.8	22	2:30
Gaffney Christian Academy	90	15	4.2	12	2:00	20.4	28	2:25
Gaffney High	90	15	2.2	7	1:55	20.4	28	2:20
Gaffney Middle	90	15	5.3	15	2:00	15.8	22	2:25
Granard Middle	90	15	2.9	9	1:55	20.4	28	2:25
Grassy Pond Elementary	90	15	0.4	2	1:50	25.1	34	2:25
Heritage Christian School	90	15	9.2	27	2:15	15.8	22	2:35
Luthur Vaughan Elementary	90	15	4.8	14	2:00	20.4	28	2:30
Mary Bramlett Elementary	90	15	5.8	17	2:05	15.8	22	2:25
<b>Cleveland County Schools</b>								
Grover Elementary	30	15	1.5	2	0:50	9.2	13	1:00
<b>York County Schools</b>								
Hickory Grove-Sharon Elementary	30	15	0.2	1	0:50	14.3	20	1:10
				Average for EPZ:		1:55	Average:	
							2:20	

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 Bdry to R.C. (mi.)	Travel Time EPZ Bdry to RC (min)	ETE to R.C. (hr:min)
<b>Cherokee County Schools</b>								
Blacksburg Middle	100	20	8.4	25	2:25	14.2	22	2:50
Cherokee Technology Center	100	20	6.9	21	2:25	15.8	24	2:45
Blacksburg Elementary	100	20	8.3	25	2:25	14.2	22	2:50
Blacksburg High	100	20	8.2	25	2:25	14.2	22	2:50
Blacksburg Primary	100	20	5.8	18	2:20	14.2	22	2:40
Corinth Elementary	100	20	6.4	19	2:20	21.4	33	2:55
Limestone-Central Elementary	100	20	4.3	13	2:15	21.7	33	2:50
Alma Elementary	100	20	7.3	22	2:25	15.8	24	2:50
B.D. Lee Elementary	100	20	4.2	13	2:15	20.4	31	2:45
Draytonville Elementary	100	20	10.5	31	2:35	15.8	24	2:55
Ewing Middle	100	20	6.8	20	2:20	15.8	24	2:45
Gaffney Christian Academy	100	20	4.2	13	2:15	20.4	31	2:45
Gaffney High	100	20	2.2	7	2:10	20.4	31	2:40
Gaffney Middle	100	20	5.3	16	2:20	15.8	24	2:40
Granard Middle	100	20	2.9	9	2:10	20.4	31	2:40
Grassy Pond Elementary	100	20	0.4	2	2:05	25.1	38	2:40
Heritage Christian School	100	20	9.2	28	2:30	15.8	24	2:55
Luthur Vaughan Elementary	100	20	4.8	15	2:15	20.4	31	2:50
Mary Bramlett Elementary	100	20	5.8	18	2:20	15.8	24	2:45
<b>Cleveland County Schools</b>								
Grover Elementary	35	20	1.5	3	1:00	9.2	14	1:15
<b>York County Schools</b>								
Hickory Grove-Sharon Elementary	35	20	0.2	1	1:00	14.3	22	1:20
				Average for EPZ:	2:15	Average:		2:40

Table 8-6. Summary of Transit Dependent Bus Route for the Lee Nuclear Station			
Route Number	Number of Buses	Route Description	Length (mi.)
1	5	I-85 eastbound from the north-western EPZ boundary; exit for Route 18, Route 18 southbound to US Route 29; Route 29 EB to Route 329; Route 329 NB to Route 18; Route 18 northbound to Wilcox Rd; Wilcox westbound to Route 11; Route 11 northbound out of EPZ	22.3
2	5	US Route 29 eastbound from the western EPZ boundary to Corry St; Corry St southbound to Route 150, Route 150 southbound out of EPZ	9.9
3	5	US Route 29 eastbound from the western EPZ boundary to Route 18; Route 18 southbound out of EPZ	15.9
4	5	Route 105 (Hyatt St) southbound from the north-western EPZ boundary to US Route 29; Route 29 eastbound to Route 18; Route 18 southbound to Route 105; Route 105 southbound out of EPZ	23.9
5	5	US Route 29 eastbound from the western EPZ boundary to Route 11; Route 11 northbound out of the EPZ	7.0
6	5	US Route 29 eastbound from the western EPZ boundary to Route 150; Route 150 northbound out of the EPZ	9.1
7	3	US Route 29 westbound from the eastern EPZ boundary to Route 5; Route 5 northbound to Route 18; Route 18 northbound out of EPZ	12.6
8	3	US Route 29 westbound from the eastern EPZ boundary to Route 198; Route 198 northbound out of EPZ	12.2
9	4	US Route 29 westbound from the eastern EPZ boundary to Route 5; Route 5 southbound to Route 55; Route 55 eastbound out of EPZ	17.4
10	1	Route 211 westbound from the south-eastern EPZ boundary to Route 97; Route 97 northbound to Route 5; Route 5 southbound out of EPZ	18.8
11	1	Route 97 northbound from the south-eastern EPZ boundary to Route 211; Route 211 westbound to Route 105; Route 105 southbound out of EPZ	15.9



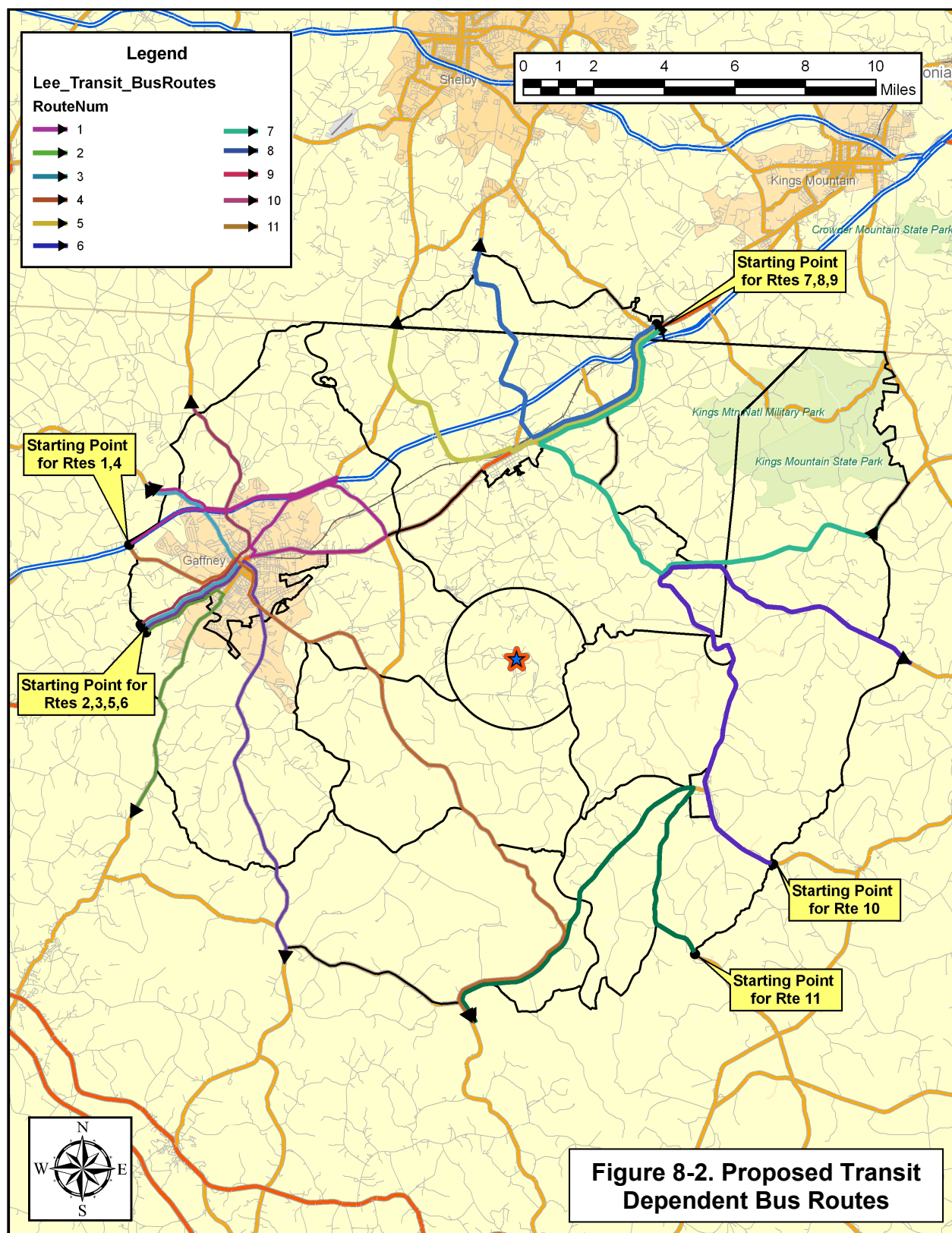


Table 8-7A. Transit-Dependent Evacuation Time Estimates - GOOD WEATHER												
Single Wave						Second Wave						
Route Number	Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)	Arrive at RC (min.)	Unload (min.)	Driver Rest (min.)	Return to EPZ (min.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)
1	90	22.3	63	30	3:05	140	5	15	24	63	30	4:40
2	90	9.9	28	30	2:30	140	5	15	24	28	30	4:05
3	90	15.9	45	30	2:45	140	5	15	24	45	30	4:20
4	90	23.9	68	30	3:10	140	5	15	24	68	30	4:45
5	90	7.0	20	30	2:20	140	5	15	24	20	30	3:55
6	90	9.1	26	30	2:30	140	5	15	24	26	30	4:00
7	90	12.6	36	30	2:40	140	5	15	24	36	30	4:10
8	90	12.2	34	30	2:35	140	5	15	24	34	30	4:10
9	90	17.4	49	30	2:50	140	5	15	24	49	30	4:25
10	90	18.8	53	30	2:55	140	5	15	24	53	30	4:30
11	90	15.9	45	30	2:45	140	5	15	24	45	30	4:20
Average for EPZ:					2:45	Average for EPZ:					4:20	

Table 8-7B. Transit-Dependent Evacuation Time Estimates - RAIN												
Route Number	Single Wave					Second Wave						
	Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)	Arrive at RC (min.)	Unload (min.)	Driver Rest (min.)	Return to EPZ (min.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)
1	100	22.3	66	40	3:30	160	5	15	26	66	40	5:15
2	100	9.9	29	40	2:50	160	5	15	26	29	40	4:35
3	100	15.9	47	40	3:10	160	5	15	26	47	40	4:55
4	100	23.9	70	40	3:30	160	5	15	26	70	40	5:20
5	100	7.0	21	40	2:45	160	5	15	26	21	40	4:30
6	100	9.1	27	40	2:50	160	5	15	26	27	40	4:35
7	100	12.6	37	40	3:00	160	5	15	26	37	40	4:45
8	100	12.2	36	40	3:00	160	5	15	26	36	40	4:45
9	100	17.4	51	40	3:15	160	5	15	26	51	40	5:00
10	100	18.8	55	40	3:15	160	5	15	26	55	40	5:05
11	100	15.9	47	40	3:10	160	5	15	26	47	40	4:55
Average for EPZ:					3:05	Average for EPZ:					4:50	